

AGRION

NEWSLETTER OF THE WORLDWIDE DRAGONFLY ASSOCIATION

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Volume 12, Number 1

January 2008

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ISSN 1476-2552



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NEWSLETTER OF THE WORLDWIDE DRAGONFLY ASSOCIATION

AGRION is 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. Members can download previous issues of AGRION from the WDA website at <http://ecoeko.uvigo.es/WDA/dragonfly.htm>. WDA is a Registered Charity (Not-for-Profit Organization), Charity No. 1066039/0.

Editorial

Keith Wilson [kdpwilson@gmail.com]

Firstly a big thank you and much praise to Jill Silsby, the outgoing Editor who has skillfully edited and produced AGRION for the past ten years, with great enthusiasm. Gordon Pritchard paid tribute to Jill in the last AGRION issue in his 'Message from the President', not only for all her editorial work but also for her many contributions to the WDA, which I won't repeat here.

Editing AGRION for ten years and faithfully following the production schedule of two issues per year is in itself quite a feat, but many older UK and Commonwealth odonatologists may recall that Jill also initiated and edited the now defunct *Kimminsia* newsletter, from 1991 until the first issue of AGRION was produced in 1997. Jill also helped out with the editorship of several issues of *Selysia* prior to the formation of PHOENIX, the forerunner to WDA. Her involvement with odonate newsletters doesn't end there. British Dragonfly Society members (BDS) will know that Jill edited the BDS newsletter for ten years from 1987 until 1997. In all Jill has gained some 20 years experience of editing no less than four dragonfly newsletters.

Using all her global dragonfly knowledge gained from working stints in the Middle East, India and Africa, extensive travel, and her editorial skills, Jill wrote, 'Dragonflies of the World', which was published by CSIRO Publishing in 2001. It is a unique and highly acclaimed book, which describes the distinctive characteristics of all the odonate families and subfamilies, with many excellent photos of at least one representative from each subfamily. Philip Corbet reviewed her book in AGRION [6(1): 9-12] summarising with the passage, "this book is a *tour de force* of which the principal author, the contributors (of text & illustrations) and publishers can be unreservedly proud. It stands as an impressive testimony to Jill Silsby's skill, vision, determination and capacity for sheer hard work, and she deserves the admiration and gratitude of all odonatologists for having conceived this worthy project and seen it to completion." I'm sure you will agree Jill has now earned a well-deserved rest and retirement, at least from the editorship of AGRION, but I know she still has other goals to achieve, not least a book on African wildlife, which Gordon mentioned in the last AGRION issue.

In all Jill will be an extremely hard act to follow so I have enlisted the help of Graham Reels as a co-editor. Graham lives in Hong Kong and established the territory's conservation newsletter *Porcupine!* in 1992, which has now developed into a highly informative forum for sharing information on the natural history, ecology and conservation of Hong Kong's fauna and flora. At least with two of us, we have a better chance of trying to live up to Jill's impressive editorial achievements.

So, please send me or Graham your contributions to AGRION. 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 a Word file by email (preferably) or on disk by post. Please do not forward any original artwork but send a soft copy, ideally in a compressed format e.g. 'jpeg' or 'gif', or as a file on disk if sent by post.

In keeping with the practice adopted for WDA's official organ, the International Journal of Odonatology a dragonfly photo will now appear on the front cover of each issue of AGRION. If you have a 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 in AGRION.

Cover photo: *Aeshna mixta* migration swarm at the Danube Biosphere Reserve, August 2006. Photo credit: Elena Dyatlova. See also 'Odonatological Year 2007 - Odessa, Ukraine' page 28.

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WDA needs an Archivist

Although we are more than 10 years old, the WDA does not yet have a formal system designed to collect and store the raw material that documents the activities of our Association. The procedures necessary for the establishment of an Archive were detailed by Philip Corbet in AGRION 8 (2), beginning: "The WDA Archivist, acting in collaboration with the WDA Webmaster and several other WDA members who have agreed to assist, shall solicit, assemble, curate and make available to members material (textual, photographic and other) likely to be of interest to present and future members of WDA in documenting the origin and continuing development of the Association." Philip then goes on to describe his view of the necessary procedures and ends with: "I wish to share with members my conviction that building a WDA Archive is a worthwhile venture and also that the sooner this is started the better." In his article in this issue of AGRION, Philip says: "Beyond the tentative actions described in AGRION 8 (2), I have made almost no progress towards assembling and organising archival material, a task that will now fall to my successor(s). I shall recommend that, wherever possible, such material is preserved and submitted in electronic form. In due course, and intermittently thereafter, a list of holdings will probably be made available, either on the WDA website or through AGRION, and instructions given as to how members of WDA can gain access to material in the Archive." The Board of Trustees agrees with these recommendations and solicits applications from individuals who are interested in putting them into operation. Please send your statement of interest and views on how the Archives should be structured to Gordon Pritchard [gpritcha@ucalgary.ca].

Message from the President

Certainly one of the highlights of the last six months for me was a visit that Valerie and I made in September-October to Europe. We started in Germany at a meeting with the Editors of IJO (Reinhard Jödicke, Frank Suhling, and Hansruedi Wildermuth) along with Wolfgang Schneider and Andreas Martens at Reinhard's house in Westerstede. My primary objective was to find out how the journal is put together so that I could meaningfully contribute to a discussion of any problems that arise with IJO. This objective was fulfilled and we also achieved much more. I will not bore you with all of the details, but the principal matters that arose from the meeting are: (1) the role of the Assistant Editors has been upgraded so that they are authorized to take over the complete scientific editing of submissions if delegated. The final check of the formal aspects of each paper remains with Reinhard, but this change should take some of the work-load from Reinhard; (2) the Instructions to Authors have received a thorough reassessment

and been brought up-to-date. Please consult the IJO Web Page at <http://ijo.tu-bs.de/home.html> for the current version; (3) Reinhard is happy to take over the mailing of IJO thereby removing some of the problems that have afflicted us in the past. However, the problem of very slow delivery by surface mail remains and you will note that members living outside of Europe can now opt for airmail delivery by paying an extra cost in their annual subscription; (4) we have been in contact with the Thomson organization with regard to inclusion of IJO in Current Contents, Science Citation Index, etc. It appears that previous applications for evaluation



Photo: Left to right, Frank Suhling, Hansruedi Wildermuth, Andreas Martens, Wolfgang Schneider and Reinhard Jödicke.

were negated by problems in delivery of IJO issues to Thomson. However, we are assured that everything is now in place for a new evaluation, although it could be at least a year from now before a result is available. May I remind everyone that it is important that we submit our best manuscripts to IJO.

After the meeting in Westerstede I spent an afternoon and evening in Bilthoven with Bastiaan and Marianne Kiauta to discuss the merger of the two odonatological journals and the reunification of the international dragonfly community. This too was a very pleasant meeting and I think we made some progress and established a position of trust for future negotiations, although I don't have anything substantial to report at the moment. Bastiaan is currently running my interpretation of his suggestions for the way forward by the other officers of FSIO before I can release it for discussion in WDA.

And last, but of course not least, on this trip was a visit to see Jill Silsby in her new home in Banstead. Jill was looking very well and we were impressed by the tremendous influence she has already had on her residence; there are dragonfly-related items everywhere and she has even established a small pond in the garden.

I hope that everyone's dragonfly work is going well but that you are all also able to find some time to relax. I am looking forward to the next year which I hope will be an exciting one for WDA. With very best wishes to everyone. Gordon.

Gordon Pritchard [gpritcha@ucalgary.ca]



Photo: Jill Silsby in foreground with Valerie Pritchard behind at Banstead.

Searching for the elusive Western Swiftwing

Jan Taylor [jmtay5@bigpond.net.au]

For many years I have tried to find the Western Swiftwing, *Lathrocordulia metallica*. It is restricted to southwestern Australia and its larvae are known from a number of permanent streams, but the adults are little known and only few have been collected. They are uniformly brownish black with a greenish metallic colouration. On 19 December last year I had my first and only view of one in flight. I had gone to a site on the Little Dandalup River near Pinjarra. The weather did not seem good for dragonflies – it was humid and cloudy after an hour of rain

(normal weather would have been 30°C and cloudless). The river is a little stream running through thick undergrowth, but exposed where there was once a bridge, now represented by two logs, which had supported the decking. After waiting and watching for about an hour a dragonfly came to patrol over the old bridge. I could hardly believe it! It was a fine specimen of the elusive *Lathrocordulia*. It stayed only for a few minutes, it even settled briefly on a branch over the water. No photographs this time, but I waited there hoping it might return. After about an hour it came again, and this time I managed a few photos in flight – not much good, but one sufficient to identify it. It left before I could try and catch it.

Further visits to the site were fruitless. I went on the 28 December on a sunny warm day. Watching for dragonflies was a little fraught – the midges were bad, also an unusual



Photo: Western Swiftwing, *Lathrocordulia metallica*.

biting snipe-fly (Rhagionidae: *Spania* sp.) and a few horseflies were unwelcome distractions. Blue-spotted Hawkers, *Adversaeschna brevistyla*, and Blue Skimmers, *Orthetrum caledonicum*, were active and I photographed an Armourtail, *Armagomphus armiger*. A male Turquoise Tigertail, *Austrosynthemis cyanitincta*, was patrolling under the bridge and there were several Stream Flatwings, *Miniaugiolestes minimus*, settled near the water. I was surprised when a Western Petaltail, *Petalura hesperia*, appeared from nowhere and dunked in the water between the two bridge supports. Later in the afternoon an Orange Streamcruiser, *Hesperocordulia berthoudi*, patrolled the area. I caught it and photographed its head – the eyes are brilliant.

I tried again on 8 January. This time I thought I would stay later – perhaps the *Lathrocordulia* flew when cloudy or in the



Photo: Orange Streamcruiser, *Hesperocordulia berthoudi*.



Photo: Red-tailed black cockatoos
Calyptorhynchus banksii.

evening? I saw more *Armagomphus*, *Orthetrum*, *Austrosynthemis* and *Miniaugiolestes* but nothing else. I left before the sun went down because I found the site was a drinking place for red-tailed black cockatoos – there were about 50 of them complaining loudly in the trees overhead!

More information on West Australian dragonflies can be found at: http://www.museum.wa.gov.au/waiss/WA_Dragonflies/Dragonfly%20DVD.htm



Hora est! – A tribute to African Odonatology

Viola Clausnitzer [violacl@t-online.de]

As many of you know, Klaas-Douwe Dijkstra (KD) has been working on African dragonflies over the last years (see Photo 1, to the left: Chlorocyphid diversity). This finally resulted in his PhD ceremony in Leiden, The Netherlands, in May 2007, which I was obliged to attend as “co-promotor”. To take part in a PhD ceremony in The Netherlands is quite an experience, especially when coming from Germany, where anything related to solemnity, ceremony or pomp has been reduced to the absolute minimum. You can even find the candidate



Photo 2. KD plus two paronymphs.

presenting his or her data in an old jumper and sport shoes and the whole party dispersing right after the defence. In The Netherlands on the other hand, you will find a long lists of instructions you need to study prior to the ceremony, to make sure to be correctly dressed, to follow the sitting arrangements in a correct way, not to get lost in between the Latin phrases and to obey the minute timing (“Hora est!”). The candidate has to appear in a tail-coat, as well as his two “paronymphs” (see Photo 2). This alone is worth a journey to Leiden, where the ceremony took place, even if coming from as far as New Jersey (see Photo 3) - Mike May was present as “referent”.



Photo 1. Chlorocyphid diversity.

Photo 3. Mike May & KD. Mike May was present as “referent”.

The relevance for Odonatology lies more in the scientific part of the above mentioned PhD ceremony: the accumulated work of 204 pages on the biogeography, phylogeny and taxonomy of Afrotropical Odonata titled: Demise and rise: the biogeography and taxonomy of the Odonata of tropical Africa. (see KD's thesis cover, Photo 4).

The entire thesis or single papers can be downloaded from KD's website: <http://www.barakken.nl/kddijkstra/> or from <https://openaccess.leidenuniv.nl/handle/1887/11969>.

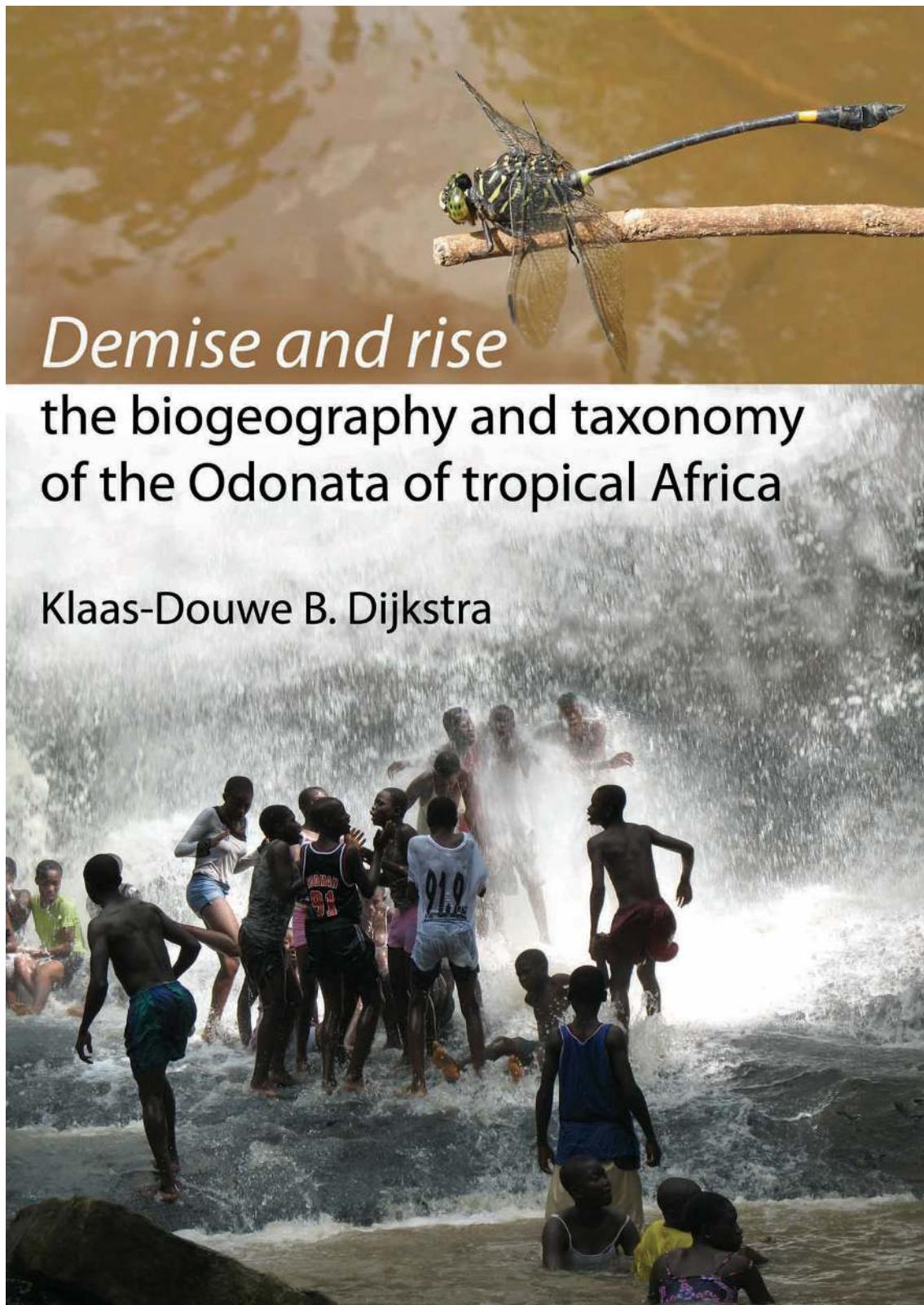


Photo 4. KD's thesis cover.

**The Fifth WDA International Symposium of Odonatology
at Swakopmund, Namibia, April 2007: the scientific programme**
Philip Corbet [philipcorbet@yahoo.co.uk] and
Mike Parr [mima37@tiscali.co.uk]

The scientific programme at Swakopmund, having been orchestrated by Andreas Martens and Frank Suhling, was rich and varied. The venue for the presentations – the National Marine Information & Research Centre, featured every modern facility we could have wished for. This serves to remind us how fortunate WDA members have been during this and previous Symposia with regard to the facilities provided for lectures and poster displays. The venue was situated within easy reach of the residential accommodation. As in previous WDA Symposia, the absence of parallel sessions constituted a distinct advantage, enabling all participants to attend every presentation. A strong point was the time reserved in the programme for viewing the posters. Although talks were grouped approximately according to topic, they were not formally categorised. This reflected the tacit assumption that each participant would be interested in all the talks. We ourselves find this assumption appropriate inasmuch as what unites participants is their common interest in Odonata.



Photo: "The organisers of the WDA Symposium at Swakopmund - (from left) Eugene Marais, Frank Suhling and Andreas Martens."

monograph "Guardians of the watershed", edited by Viola Clausnitzer and Reinhard Jödicke (IJO 7(2)), which reviewed the status quo and needs of odonate conservation in all countries. The WDA Award Lecture, delivered by Rosser Garrison, described his research on Neotropical Odonata. Prizes were awarded for best presentations during the Symposium to Jessica Ware (in collaboration with Mike May and Karl Kjer) for her talk on phylogeny, dating and phylogeography of the Libelloidea and to Yuma Takahashi (in collaboration with Mamoru Watanabe) for his talk on frequency-dependent mating attempts in relation to colour dimorphism during oviposition in *Ischnura senegalensis*). Prize winners of the photographic competition were (1) Jens Kipping (Germany), (2) Oleg E. Kosterin (Russia) and (3) Nikita Vikhrev (Russia). With the attention of experts, dragonflies make inspiring subjects for photography.

We recognise that "the only thing that fits neatly into a pigeon hole is a pigeon" but we have nevertheless grouped the presentations (including posters) under subject categories in order to give an idea of the focus and range of the items on offer. Of the 79 presentations, most dealt with aspects of behavioural ecology (19), conservation (19) and ecology and faunistics (15), whereas the other topics (none of which exceeded 6) addressed biogeography, dragonflies and people, ecology and energetics, environmental impact, morphology, palaeontology, phenology, phylogeny and systematics, predation ecology and techniques.

There was no Plenary Discussion Session of the kind that featured in the first four WDA Symposia, although discussion after some of the talks was vigorous and wide-ranging, a conspicuous example being the Plenary Talk on fliers and perchers.

Although Dagmar and Georg Rüppell contributed a talk to the main programme, they also presented a public film show, with commentary, one evening at a central venue to which residents of Swakopmund were invited. This did not go according to plan because the audience consisted almost entirely of Symposium participants. Nevertheless, it was greatly enjoyed by those attending.

The Fifth WDA International Symposium constituted a milestone in the science of odonatology. All who attended are much in debt to the organisers – Andreas Martens, Eugene Marais and Frank Suhling – all of whom are very busy people who were extremely generous with their valuable time.

Some results of fieldwork in Romania

Cosmin Manci & Vincent Kalkman [kalkman@naturalis.nnm.nl]

In July 2007 almost 30 odonatologists from nine different countries met in Romania in order to do fieldwork. We were stationed in Baile Herculane, an old spa resort in the west of Romania between the Danube and the Carpathian mountains. The weather in Romania had been hot and dry for most of the year and many standing and even running waters were dry. This made it very difficult to find suitable habitats and at many sites dragonflies were rather scarce. Nonetheless many records were collected and an area of approximately 120 by 120 km was visited. In total 36 species were recorded. *Cordulegaster bidentata* and *heros* were widely present. The latter was only recognised in 1979. All old Romanian records were published as *C. boltonii*. Our fieldwork shows that it is likely that *boltonii* is absent from Romania and that it is replaced by *heros*. Fieldwork in the mountains showed *Somatochlora arctica* to be present in Romania and *Somatochlora alpestris* to be far more common than hitherto known. Other interesting records included *Lestes viridis*, the first for Romania (*L. parvidens* being far more common) and a record of *Erythromma lindenii* thus far known from only a few records.

During the meeting Cosmin Manci presented the first set of distribution maps of Romanian dragonflies. In the second half of this year he will incorporate more records in the database (including the ones from the fieldwork) and next year the maps will be published on the internet. The fieldwork in Romania was a success and plans are being made to organise a similar meeting in another country in 2008 or 2009.



Photo: Group picture of the persons attending the fieldwork in Romania.

Preliminary results on the status and distribution of Odonata of the Mediterranean Basin

Elisa Riservato [riserva@unipv.it]

The conservation status of plants and animals is one of the most widely used indicators to assess ecosystems and biodiversity health and provides an important tool in priority-setting exercises for species conservation. At the global level the best source of information on the conservation status of plants and animals is the IUCN Red List. The IUCN Red-listing system is designed to determine the relative risk of extinction, with the main purpose of cataloguing and highlighting those taxa that are facing a risk of global extinction. The IUCN also makes regional Red lists and recently took the initiative to make a Red list of the dragonflies of the Mediterranean and a Red list of the dragonflies of North Africa.

The Odonata group that worked on the assessments was composed of: Jean-Pierre Boudot (France), Sonia Ferreira (Portugal), Milos Jovic (Serbia), Vincent Kalkman (Holland), Boudjema Samraoui (Algeria), Wolfgang Schneider (Germany) and Elisa Riservato (Italy).

During the preliminary workshop, held in Morocco in February 2007, the members of the Odonata group were trained in using the IUCN Criteria and Categories. During spring and summer 2007 all species had their status assessed by the members of Odonata group, using existing literature and data sources. All data collected, including information on distribution, conservation measures, threats, habitats and ecology were entered into the IUCN SSC Species Information Service Data Entry Module (SIS DEM).

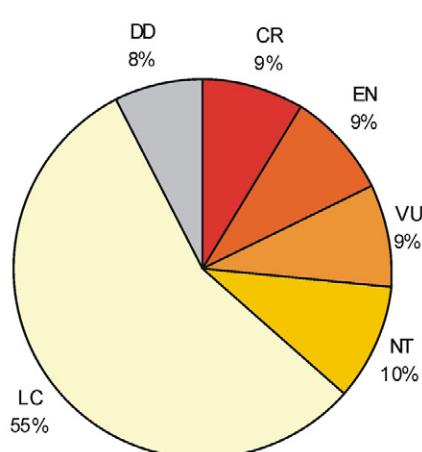
During October 2007 a review workshop was held in Porto where workshop participants and staff from the IUCN Freshwater Biodiversity Assessment Programme and the IUCN Red List Programme, evaluated the preliminary assessments to check if the guidelines were correctly applied and if the most up-to-date information was used.

In 2008 two reports (Mediterranean and North-African) will be made on the status of the dragonflies in the two regions, including an identification of the main threats and a spatial representation of the centres of diversity and threats.

Preliminary results show a worrying situation (Fig 1& 2) in both Mediterranean (Med) and North African (NA) regions. Half of the species (55% Med and 50% NA) have been assessed as Least Concern, but 22% of the species for NA and 10% for Med were put in the Near Threatened category. 27% of the species in Med and 24% in NA are in Threatened categories, in particular in Med 9% of the species and 4% in North Africa is assessed as Critically Endangered.

Discussion during the meeting showed that habitat alteration and pollution are the main threats and that in large parts of the Mediterranean drought is an increasing problem.

Mediterranean assessments



North African assessments

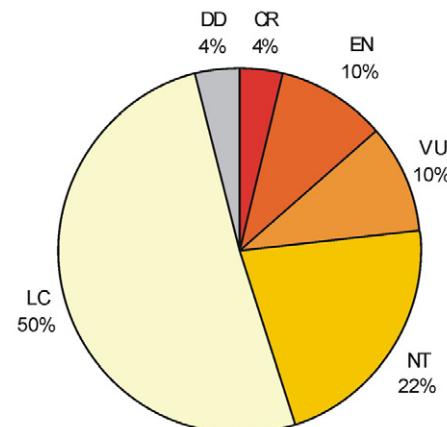


Figure 1. Preliminary results of the Mediterranean assessments. Percentages of species in IUCN Categories. Categories are abbreviated as: LC-Least Concern, DD-Data Deficient, CR-Critically Endangered, EN-Endangered, VU-Vulnerable and NT-Near Threatened.

Figure 2. Preliminary results of the North African assessments. Percentages of species in IUCN Categories. Categories are abbreviated as: LC-Least Concern, DD-Data Deficient, CR-Critically Endangered, EN-Endangered, VU-Vulnerable and NT-Near Threatened.



Photo: IUCN Odonata Group, including persons working on other freshwater organisms. Photo credit: Annabelle Cuttelod, Coordinator for the IUCN mediterranean.

Bingo in a Pingo

Neville Yates [nepay@bigpond.com]

Many years ago, in the time when there was no television, I can remember a thing called **Housey-housey**, which was a complete mystery. Later on I knew it as **Lotto** – a game which consisted of filling in numbered squares as they were called out by a compere; the winner of the game being the first person to have a ‘full house’. Subsequently the name of the game changed once more, to **Bingo** – which is still a mainstay of entertainment in clubs and nursing homes despite the advent of TV.

At the same time, still at the age of short pants, I developed a fascination for dragonflies, and recall vividly my first capture - *Aeshna grandis* – which I was too scared of to handle, and kept it prisoner in a fishing creel. This was where the rot started and the fascination continues to this day. The only books available then were Cynthia Longfield’s, ‘Dragonflies of the British Isles’ in the Wayside and Woodland book series, and Lucas’, ‘British Dragonflies’. They were my chief sources of inspiration, and frequently consulted in the local reference library. Gradually I found all of the species in my local county of Lancashire and even re-discovered *Orthetrum coerulescens* in the southern Lake District. But one could only dream of such wonders as *Coenagrion armatum* and other southern rarities, for which I later spent a great deal of time searching in vain. One such would-be prize was *Lestes dryas*. And this is where the story really gets interesting.

As youth faded somewhat, at the age of 37, I emigrated to Australia and three decades later the obsession continues. There are many wonderful insects here, but the missing British rarities still niggle! So, now in early second childhood, I recently returned to the UK for a visit. Together with a couple of old childhood friends I went birding and naturalizing round some of our previous haunts in Norfolk. We resembled the *Last of the Summer Wine*. We also had a little book giving places where dragonfly species live. One of them was a small area of swampy hollows which had been created by massive ice-blocks left behind in the last ice age, and then filled with marsh after the ice melted away. These hollows are known to geologists as **Pingos**. Imagine our delight as we saw the long sought-after *Lestes dryas* – and exultant cries of **Bingo!** Not only did I get good photos of the target, but also saw another ‘new’ species on a nearby fen – a recent colonizer from the Continent – *Erythromma viridulum*.

For our next trip to the UK we are planning an assault on the Scottish species. It is a never-ending story.

Ulrique and Louise

Matti Hämäläinen [matti.hamalainen@helsinki.fi]

Calopteryx demoiselles have a long history in the European literature. They were first illustrated in medieval manuscripts from the 14th and 15th centuries. The oldest known depiction is in Jean Pucelle's *Bréviaire de Belleville* dating from 1323-1326. Surprisingly, even this earliest of damselfly illustrations can be identified quite reliably as the male of *Calopteryx xanthostoma*. Identifiable illustrations of *C. splendens* males appeared in some manuscripts in the following century. Subsequently *Calopteryx* demoiselles also became illustrated in many early books on insects in the 17th and 18th centuries; for instance in Thomas Moffett's *Insectorum Theatrum* (1634, p. 68).

In spite of, or perhaps because of this long and enduring interest in these beautiful insects, the nomenclature and taxonomy of the European *Calopteryx* taxa was formerly very confused, starting with Carolus Linnaeus' first attempt to classify them in his *Fauna svecica* (1746). Even today their taxonomy and systematics is far from being fully resolved. During the last 250 years around 50 species-group names have been introduced for taxa in the *splendens*, *virgo* and *haemorrhoidalis* groups. Most of the oldest were ranked as synonyms long ago, but surprisingly, new nomenclatorial discoveries can still be made by browsing through old literature.

The species name *splendens*, was introduced by **Moses Harris** in his book *An exposition of English Insects*, first published in 1776-1780 (see below). It became established as the name of the Banded Demoiselle only after Edmond de Selys Longchamps had presented this species under the name *Calopteryx splendens* (Harris) in his *Revue des Odonates ou Libellules d'Europe*, coauthored by H.A. Hagen, in 1850. In earlier major publications of European dragonflies *C. splendens* was known by the species names *ludoviciana* (in E. de Selys Longchamps' (1840) *Monographie des Libellulidées d'Europe*, see below) and *parthenias* (in T. de Charpentier's (1840) *Libellulinae Europaea descriptae ac depictae*). Early authors did not place much emphasis on the priority of taxonomic names. The first attempt to lay down some ground rules for nomenclatorial practice was made in 1842, when Hugh Strickland presented a Code of nomenclature to the British Association for the Advancement of Science.

Incorrect date.

Amazingly, in the odonatological literature, an incorrect date - the year 1782 - is still traditionally linked to the name *Calopteryx splendens* (Harris). In some publications the date is given as 1776, but this is also incorrect for this species. According to data presented by Arthur A. Lisney (1960) in *A Bibliography of British Lepidoptera 1608-1799* (pp. 170-175) and by Neal L. Evenhuis (1997) in *Litteratura taxonomica dipterorum (1758-1930)* (Vol. 2, pp. 341-343), the first edition of Moses Harris' book was published and distributed in parts between 1776-?1780. The book is divided into five decades, each with 10 plates and corresponding text. The first decad was published separately in 1776, the second apparently in 1778. According to Lisney the third decad (including the description of *C. splendens*) contains four dated plates, two for 1779 and two for 1780, and in the fourth decad one plate is dated 1780. Lisney concluded that decades 3-5 were issued together, probably in 1780, but Evenhuis claims that decades 3-4 were issued together, earlier than the fifth decad. However, in both cases we have a good reason to conclude that 1780 is the correct date of the description of *C. splendens*. In any case, the second issue of the first edition of the complete book was already published in 1781, and the second (most widely known) edition, with a slightly different title, in 1782.

In catalogues of other insect groups (such as Syrphidae and various other families in Diptera and Hymenoptera), Harris' species are usually correctly dated, either as 1776, 1778 or 1780. **Therefore, now almost 50 years after Lisney's conclusions, odonatologists also should finally start writing *Calopteryx splendens* (Harris, 1780)!**

Moses Harris' colour plate (Tab. XXX) showing *Libellula splendens* and *L. splendeo* (= *virgo*) can be viewed on the internet; for example at http://special.lib.gla.ac.uk/images/exhibitions/ecology/spcollq512_table30.jpg.

A forgotten name of royal origin.

A much greater surprise was to discover that there is a correctly introduced, available scientific name for the Banded Demoiselle, which has remained unnoticed, or at least neglected, by the taxonomic revisers of the European dragonflies since 1840. The name, which was published only a few years after Harris' *splendens*, is absent also from all catalogues of the world odonate fauna, including those available on the internet. This curiosity is *Libellula ludovicea* Fourcroy, 1785.

Étienne-Louis Geoffroy published a book *Histoire abrégée des insectes qui se trouvent aux environs de Paris, dans laquelle ces animaux sont rangés suivant un ordre méthodique* in 1762. In this two volume publication numerous new insect species collected from the Paris region were described. Geoffroy provided each species with a brief Latin diagnosis as a heading followed by a more detailed French description. Unfortunately in his new species descriptions, Geoffroy did not use the new binomial nomenclature introduced by Linnaeus only a few years earlier, although references

to the Linnaean binomial names where given where available. On the other hand, Geoffroy provided for all species a French name. All 16 dragonfly species listed received feminine names. The first two of them were 'La louise' and 'L'ulrique', which represent our present *Calopteryx splendens* male and *C. virgo* female. A reference to the Linnaean name *Libellula virgo* was correctly given in the caption of L'ulrique. It should be noted however, that the author

considered that La Louise and L'Ulrique may have represented male and female of the same species, as he had only found males of the former and females of the latter. Apparently he was still prepared to provide a separate vernacular name to what could have been male and female of the same species!

'It seems likely that Geoffroy had adopted these names from Linnaeus' *Fauna svecica* (1746). In this publication 'Lovisa' was given as the popular (*vulgo*) name for species Nr 757, which refers to the present *C. virgo* (mature) male. The name 'Ulrica' was presented for species Nr 758, which is a female of *C. virgo*, but no popular name was given to species Nr 759, our present *C. splendens* male (Fig. 1). Interestingly, Linnaeus did not give vulgar names to any other dragonfly species, but he listed many amongst the European butterflies. Undoubtedly, Linnaeus had selected the names 'Lovisa' and 'Ulrica' for these beautiful and delightful demoiselles to honour Her Royal Highness Louise Ulrike (Luise Ulrike; Lovisa Ulrika), Princess of Prussia, who was married with the Swedish Crown Prince Adolf Fredrik in July 1744. Lovisa Ulrika was received with great enthusiasm by the Swedes. Later as the Queen of Sweden (1751-1771) she favoured and endorsed cultural and scientific activities and was a great supporter of Linnaeus himself. However, in the second edition of *Fauna svecica* (1761) these two vulgar names were no longer included.

In order to make Geoffroy's new species descriptions valid, his compatriot **Antoine Francis Fourcroy** introduced formal binomial scientific names for these insects in his book *Entomologia parisiensis* in 1785. In other respects Fourcroy's two-volume book was basically just a summary of Geoffroy's work. The Latin descriptions were copied *verbatim et litteratim*, but French descriptions were not included. Habitats of each species were described with a few words. The Demoiselle 'La louise' was named as *Libellula ludovicea* (a new name) and 'L'ulrique' as *Libellula virgo*, using the Linnaean name (Fig. 2). Ludovica is a Latin version of the feminine personal name Louise.

757. LIBELLULA corpore cæruleo nitido; alis viridi-
cærulecentibus: apice fuscis: margine immacu-
latis.

Raj. inf. p. 50. n. 10. Libella media, corpore cæru-
leo, alis fere totis ex cæruleo nigricantibus.
Vulgo Lovisa.

Habitat ad Fluvios.

DESCR. Magnitudo, figura, color, locus & omnia, ut in præcedenti,
sed alæ, quæ etiam puncto marginali carent, nigro-cærulecentes: apice
pallide fusce. canda unguiculata.

758. LIBELLULA corpore viridi-cæruleo; alis subfu-
scis: pnncto marginali albo.

Raj. inf. 51. n. 12. Libella media, corpore viridi,
alis fulvescentibus maculis parvis albis prope ex-
tremum angulum.

Vulgo Ulrica.

Habitat ad Fluvios.

DESCR. Mediæ est magnitudinis. Corpus viridi-sericeum, nitidum, mini-
me cæruleum. Pedes nigri. Alæ subfuscæ pnncto marginali albicante ob-
longo; Cauda inermis.

Hæc præcedentis fæmina. *De Geer.*

Fig. 1. Extracts of text from (a) *Fauna svecica* by Carolus Linnaeus (1746, p. 228) indicating the use of the names Lovisa and Ulrica for Demoiselles.

References to Fourcroy's name '*ludovicea*' can be found only in a few early publications. These include George Samouelle's (1819) *The Entomologist's useful Compendium or an Introduction to the Knowledge of British Insects* (where two species of the genus *Calepteryx*, '*Virgo*' and '*ludovicia*' [sic] were listed on p. 410), J.F. Stephen's (1829) '*Systematic Catalogue of British Insects*' (where the names '*Ca. Ludovicia*' and '*Li. splendens*' were listed as synonyms of '*Ludoviciana* Leach MSS') and H. A. Hagen's (1840) thesis *Synonymia libellularum Europaearum* (p. 65), where the name appears in the wrongly spelled form '*L. loudovicca*' in references under the misspelled species name

'*Calepteryx Louдовiciana* Leach'. Thereafter Fourcroy's name fell in oblivion, and not even W.F. Kirby listed it, although he recorded some other names introduced by Fourcroy (see below).

Actually the name *ludoviciiana* appears merely to be an emendation of the name *ludovicea* created by W.E. Leach and intended to be used for the Banded Demoiselle, but since he never published it himself it remained a manuscript name until J.F. Stephens formally described it (see below). The name '*ludoviciiana* Leach' first appeared as a *nomen nudum* in J.F. Stephens (1829) *Systematic Catalogue of British Insects* and in John Curtis' (1829 [-1831]) *A Guide to an Arrangement of British Insects*. In both publications only two British species (*virgo* and *ludoviciiana*) were listed in the genus *Calepteryx*. Then in his *Illustrations of British Entomology* (Vol. 6, *Mandibulata*), published in 1835, Stephens created an unfortunate nomenclatorial confusion in the first actual description of the species *ludoviciiana*. Rather than describing the Banded Demoiselle, he described three variants of the Beautiful Demoiselle under this name. An obvious male of the Banded Demoiselle was described as 'Var. a' of *Calepteryx virgo*. Thus Stephens made the name *ludoviciiana* formally a synonym of 'a wrong species'. He also introduced another synonymous name for *virgo*, *Calepteryx anceps*.

On the other hand, in his *Monographie des Libellulidées d'Europe*, E. de Selys Longchamps (1840) recognised and described '*ludoviciana* (Leach)' as 'the species presently known as *splendens*', following Leach's original idea of this insect.

To summarize, *Libellula ludovicea* Fourcroy, 1785 is a synonym of *Calopteryx splendens* (Harris, 1780), but *Calepteryx ludoviciiana* Stephens, 1835 is a synonym of *C. virgo* (Linnaeus, 1758). However '*Calepteryx ludoviciiana* sensu Selys, 1840' [also sensu Rambur (1842)] refers to *C. splendens*.

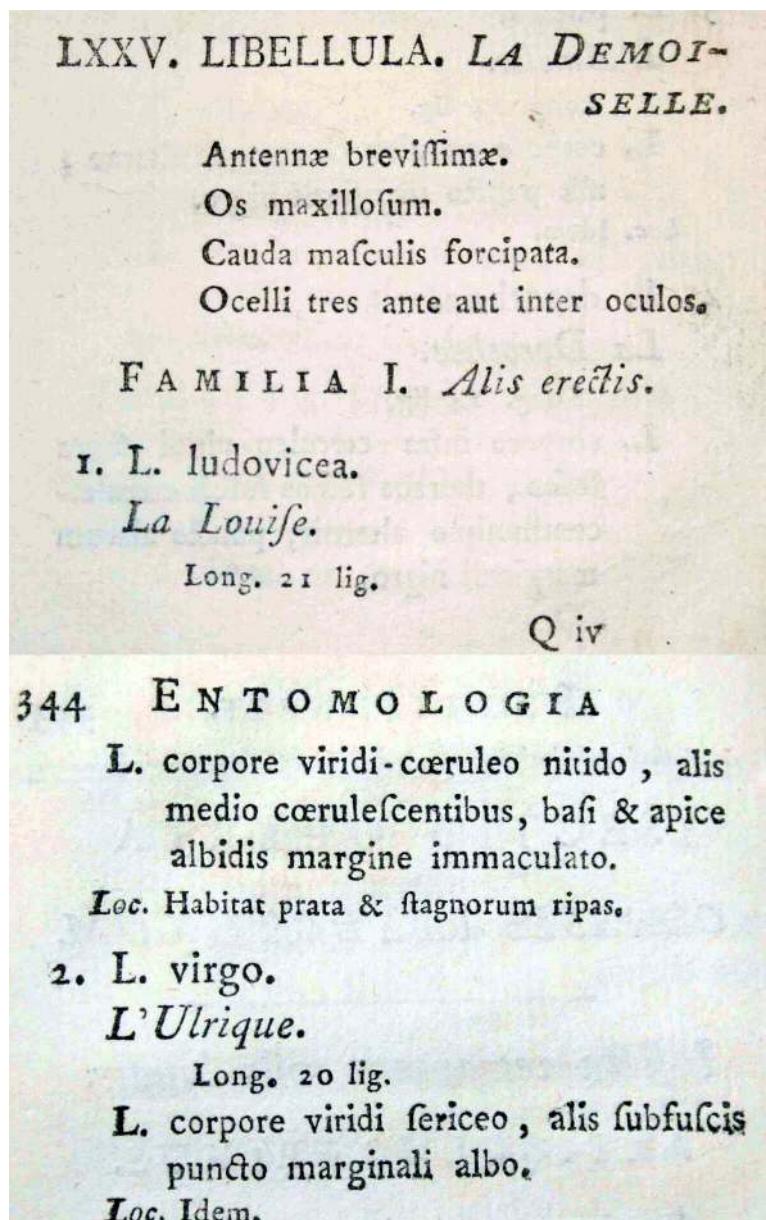


Fig. 2. Extracts of text from *Entomologia parisiensis (Pars secunda)* by Antoine Francis Fourcroy (1785, pp. 343-344) indicating the use of the names Louise and Ulrique with proper scientific names for Demoiselles.

Puzzling Parisiennes.

Geoffroy's and Fourcroy's books still contain many other synonymies yet to be resolved. Thanks to W.F. Kirby's *A synoptic catalogue of Neuroptera Odonata, or dragonflies* (1890) we must now use the species name *Ophiogomphus cecilia* (Fourcroy, 1785) instead of the more traditional *O. serpentinus* (Charpentier, 1825), the name by which I first learned to know this fine species. Kirby placed Fourcroy's *Libellula victoria* as synonym of *Sympetrum flaveolum*, but later some authors considered it to be synonym of *Crocothemis erythraea*. It was perhaps fortunate for all of us

that he was not able to determine what taxa hide behind the names *dorothea*, *sophia*, *adelais*, *philintha* and *sylvia*. The first three are zygopterans, which Kirby listed as ‘valid’ species in his genus *Coenagrion*. *Ludovicea*, *philintha* and *sylvia* were not listed at all. Undoubtedly some of Fourcroy’s new dragonfly names were the first to be introduced for the species in question. Whatever, these species might be, it is fortunate that the present Code of Zoological Nomenclature does not allow any further changes in names based on *nomina oblita* like these. However, for curiosity and for the sake of building complete synoptic lists, it might be worth trying to find out what these ‘Parisiennes’ really are – something for those odonatologists fluent in French and Latin to do. The relevant publications are available on the internet:-

Geoffroy: <http://gallica.bnf.fr/ark:/12148/bpt6k991697/f718.table>.

For dragonflies, see pp. 217-229 and 713-714.

Fourcroy: <http://gallica.bnf.fr/ark:/12148/bpt6k991666>. See pp. 343-348.

Ghana Gold Mine Klaas-Douwe “KD” B. Dijkstra [dijkstra@nnm.nl]

For some reason my expectations of a trip to Ghana in June and July were rather low. Perhaps it was the prospect of pouring rain in the wet season that put me off, but it would prove that, despite the often frustrating persistence of cloud cover, the results were more than spectacular. I found 124 species, 70% of the 177 now known reliably from Ghana, of which 13 were additions. The genera *Aciagrion*, *Neurogomphus*, *Onychogomphus*, *Tragogomphus* and *Atoconeura* were found for the first time.

From 14 to 25 June 2006 I took part in a biodiversity survey by Conservation International in the Atewa Range Forest Reserve, a chain of hills (up to about 800m) threatened by bauxite mining. The most productive site here was the small stream Obeng-ne-obeng (it actually means ‘two streams’). Although the sun only shone here for one or two hours a day, its rays would set the place ablaze, with many mysterious dark spectres suddenly whizzing around my ears. As so often in rainforest, those moments entailed a game of ‘catch a dash’: strike at what you hope is a corduliid or gomphid and find out the dash’s identity when you’ve, for a change, not failed to catch it. One dash was *Orthetrum saegeri*, a species not reliably found west of Cameroon before, two others were conspecific with *Phyllomacromia legrandi*, known only from the Togolese types. However, a third specimen is morphologically identical but much darker, suggesting synonymy with *P. melania* (also new for Ghana). Two females put away without much thought as ‘*Paragomphus nigroviridis*’, a rather common forest stream species, back home proved to be an *Onychogomphus* (near *O. styx*) and a *Tragogomphus* respectively, both genera previously unknown from Ghana!

The personal highlight here, however, was finding the genus *Atoconeura*. A few days before my departure I had submitted a revision of the genus, in which I described the new species *A. luxata* (see Photo 1.) from western Africa (Dijkstra 2006). That species hovered over the rapids in front of me, but as the sun disappeared so

did the dragonfly, and not until next day’s sunshine did I have ‘my species’ in the hand. Unlike the five eastern African *Atoconeura* species, this one does not occur on top of highlands (above 1000m), but at their base. It had previously been found to the east around the Adamawa Massif in Nigeria, Cameroon and the Central African Republic, but also at Mts Nimba (Guinea) and Loma (Sierra Leone) to the west. The Ghana discovery demonstrates Atewa’s highland character despite its modest elevation. It is, for instance, also the only place in Ghana where brambles (*Rubus*) grow. Obeng-ne-obeng is also one of the few places in Ghana where treeferns (*Cyathea*) grow, which are typically montane in Africa.



Photo 1. *Atoconeura luxata* from western Africa.



Photo 2. Densu River.



Photo 3. *Gomphidia gamblesi*.

came rather serendipitously when we spontaneously decided to make a quick late-afternoon visit to the Fuller Falls, just outside Kintampo. The driver, unpleasantly surprised by the unplanned detour, reluctantly crept down the unfamiliar road, constantly enquiring how much further we would venture. As we finally descended down to the falls, a large and dark gomphid landed before my nose on a path-side leaf. By the abdomen shape, I instantly recognised it as a *Neurogomphus* female, a genus that few living odonatologists have seen as adult in the field. A nervous swipe secured what proved to be the fifth known specimen of *N. fuscifrons* and the first outside Cameroon. Lightning never strikes twice, so our return next day yielded nothing more, except *Crenigomphus renei*.

Another feature of the Atewa forest are several swamps brimming with frogs (and the dwarf crocodiles that feed on them) and gynacanthine larvae. Adults were not in evidence, but *Africallagma vaginalis* was, a rather surprising addition to the Ghana list, known previously from Uganda south to northern Zambia. As the fieldwork proceeded, it became clear how unwise it would be to strip the range of its forest, swamps and soil*. Several torrential downpours during our visit did not change the level of the streams and rivers, demonstrating the range's capacity to absorb, filter and gradually discharge water. Three major rivers in this densely populated region have their headwaters in the hills. One is the Densu (see Photo 2), which supplies a third of the water used by Ghana's capital Accra. The site sampled on this river was heavily disturbed and completely open, but still harboured a diverse fauna, including typical dragonflies of both forest and savannah. Among them *Umma cincta*, *Sapho ciliata*, *Chlorocypha curta*, *C. luminosa*, *C. radix*, *Agriocnemis zerafica*, *Gomphidia gamblesi* (see Photo 3), *Ictinogomphus fraseri*, *Paragomphus serrulatus* (new for Ghana; also known by the synonyms *P. bredoi* and *P. xanthus*), *Cyanothemis simpsoni*, *Nesciothemis minor*, *N. pujoli* and *Zygonyx chrysobaphe*.

In the week between the survey and a freshwater biodiversity workshop with IUCN, I travelled north towards Bolgatanga with Bas Kokshoorn, a colleague of the Leiden museum. Here and near the village of Nakpanduri on the savannah-clad Gambaga escarpment (close to both the Burkina Faso and Togo borders) we investigated several tributaries of the White Volta. This revealed a totally different fauna than in Ghana's forested south, with species like *Mesocnemis robusta*, *Gomphidia madi*, *Phyllomacromia pseudafasciana* (see Photo 4), *Orthetrum monardi*, *Trithemis dejouxi* and *Zygonoides fraseri*. We hired a taxi to sample the beautiful lily ponds along the 170 km road between Tamale and Kintampo (see Photo 5), which I had seen six years prior, but had been unable to visit. They produced a typical savannah list (e.g. *Azuragrion vansomereni*, *Trithemis imitata*, *Orthetrum angustiventre*) and one national addition, *Lestes pinheyi* (only previous record in western Africa from Nigeria).

The day's (and possibly the trip's) highlight however



Photo 4. *Phyllomacromia pseudafasciana*.

After five days in Accra, Bas and I travelled east to the forested hills on the border with Togo. While I packed, I glanced shortly at a handful of specimens from Benin that Séverin Tchibozo had given me during the workshop. Among them was a female *Phyllogomphus occidentalis*, only the third specimen known and the first outside Côte d'Ivoire. At the end of the day we walked down from our hilltop guesthouse to the village of Biakpa to watch the World Cup final. An unfamiliar damselfly was noted among the roadside herbage, which commenced oviposition in sedges by a rain puddle. She belonged to *Aciagrion* and a matching male was soon found, pertaining to *A. hamoni*. The puddle was visited many times afterwards, but only single males were found twice, once in the early morning and once shortly before sunset. This suggests rather crepuscular behaviour, which may clarify why some *Aciagrion* species are so elusive.

While the overcast weather may have suited *A. hamoni*, this was untrue for the forest stream species and very little sunshine reached the bottom of the nearby Kulugu canyon. We were therefore lucky to cross the stream during a short sunny spell. That brief moment, a *Phyllogomphus* male perched by the water and although it flew off as I descended towards him, he obligingly returned to be netted. It was *P. moundi*, another addition for Ghana, although it was known from across the border in Togo and also from Nigeria and Guinea. Directly afterwards, mere metres away, I casually caught a *Trithemis* that I assumed was only *T. aconita*, which is widespread in Africa. In the hand, it looked more like the scarcer *T. basitincta*, but it took a while for the coin to drop and the right record in my brain to be picked. Previously I considered *T. basitincta* as the western counterpart of the eastern *T. bifida* and therefore specimens of the latter from Senegal in the Paris museum had puzzled me. Although Hans Olsvik had found *T. basitincta* only a few kilometres away, I had now caught *T. bifida*, narrowing the gap to Senegal.

After a month in Ghana it was time to fly home, but before bussing back to Accra I had two hours of the final morning left for the Dayi River just south of Hohoe (see Photo 6). Its grassy verges yielded a few teneral *Pseudagrion gigas* (yet another national novelty, with exactly the same habitat as its eastern counterpart *P. gamblesi*) and exuviae of *Phyllogomphus*, *Phyllomacromia* and *Zygonooides fraseri*. A male of the latter aggressively patrolled the river, but the water was much too deep and swift to stalk him. Up north this powerful species had also eluded capture, but it was time to leave. As I climbed back onto the road, I spotted another male perched high in the elephant grass. A desperate stretch and a single swoop landed the final bonus of an excellent trip. The British company Greentours, which specialises in butterfly and dragonfly tours, is planning a tour to Ghana in May 2008. Greentours has asked me to be the expert guide. Please contact me if you want to know more.



Photo 6. Dayi River, just south of Hohoe.

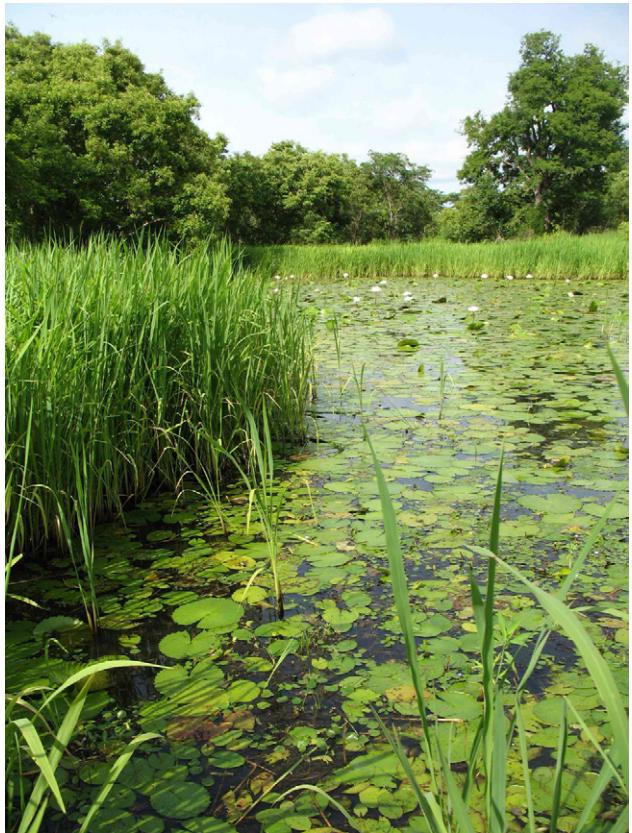


Photo 5. Lily ponds along the 170 km road between Tamale and Kintampo.

* As a result of the RAP, proposals are in preparation to make Atewa a national park.

Reference

- Dijkstra, K.-D.B., 2006. The Atoconeura problem revisited: taxonomy, phylogeny and biogeography of a dragonfly genus in the highlands of Africa (Odonata, Libellulidae). *Tijdschrift voor Entomologie* 149: 121-144.

Damsels, the systematist's muse

Klaas-Douwe "KD" B. Dijkstra [dijkstra@nnm.nl]

1st January 2008 marks the 250th anniversary of zoological nomenclature. To commemorate this, the National Natural History Museum of The Netherlands published a special issue honouring Linnaeus and his legacy. In the words of the Swedish author August Strindberg "Linnaeus was in reality a poet who happened to become a naturalist". Indeed, there are similarities between taxonomy and poetry, which has been described by Samuel Taylor Coleridge as "the best words in the best order". One of the great themes of poetry is love, and love clearly lies behind the use of feminine themes in many of the names of Linnaeus and those of his countless followers. It is said that insects and birds were Linnaeus's favourite animals. Odonata are known as 'the birdwatcher's insects'

for their liveliness and colour, and may have been particular favourites.

Two new damselflies found during Conservation International's rapid biological assessment (RAP) at Lokutu (Democratic Republic of Congo) in November 2004 are described in the issue (Dijkstra 2007; 2008). Lokutu was formerly known as Elisabetha, probably in honour of the wife of Albert I, King of the Belgians from 1909 to 1934. Appropriately,



Photo 1. *Platycypha eliseva* male. Photo by author.

the (full) second name of Linnaeus's wife Sara Lisa *Moraea* was also Elisabeth, as was the first name of his mother-in-law and eldest daughter. The anecdote of Linnaeus changing the name of the iris genus *Morea*, originally coined by Philip Miller to honour Robert More, into *Moraea* is seen as a token of love for his wife and her family. In order not to jeopardise his return to his fiancée, Linnaeus declined an offer from Herman Boerhaave to travel to South Africa (coincidentally the centre of *Moraea* diversity) to work for the botanical garden in Leiden.

The name Elisabeth has connotations such as 'God is my oath' and 'God's promise', but also 'God is bountiful', 'God of plenty' and 'the fullness of God'. This sentiment must have spoken to Linnaeus, a deeply religious man who was fascinated by what we now call biodiversity. Thus, the name borne by Linnaeus's wife and some other family members, can be linked to his fascination with the abundance of creation. Linnaeus believed that everything in nature was created for human benefit, sometimes simply for the admiration of its beauty. It was his duty to study and catalogue these riches. "God created, Linnaeus ordered" is a famous adage attributed to him. Not everyone sees biodiversity as being so purposeful, but naming nature's wonders is inherently utilitarian, as without systematics, humanity cannot understand diversity. Moreover, biodiversity is still the muse of systematists. To honour Linnaeus's systematic zeal and motivation, rooted in his love for nature and family, both species were given names derived from Elisabeth.



Photo 2. *Platycypha eliseva* type locality, the Letissé River near Lokutu. Photo by author.

Mesocnemis saralisa is named after Linnaeus's wife Sara Elisabeth ('Lisa'). After the capture of the first male from a canoe on the Congo River, a special effort was required to obtain a mated pair, because *Mesocnemis* species differ more clearly in the female pronotum than in the male appendages. The whole RAP team had to wait in the canoe while I desperately tried to obtain a tandem. The holotype is from this pair: one is worth little without its partner. Elisabeth is also the root of both given names of Ellis Bettina Grootveld, my companion for fourteen years. The name *Platycypha eliseva* is derived from the original Hebrew name Elisheva, in reference to her beloved Levant. It is the only *Platycypha* in the central Congo Basin and unique by its coloration (see Photos 1-2).

References

- Dijkstra, K.-D.B., 2007. Dragonflies and damselflies (Odonata) of Lokutu. In: T.M. Butynski & J. McCullough: A rapid biological assessment of Lokutu, Democratic Republic of Congo. *RAP Bulletin of biological assessment* 46: 21-36.
- Dijkstra, K.-D.B., 2008. The Systematist's Muse — two new damselfly species from 'Elisabetha' in the Congo Basin (Odonata: Chlorocyphidae, Platycnemididae). *Zoologische Mededelingen* 82 (in press).

Mapping the Australian Odonata Ian Endersby [endersby@mira.net]

For some time I have been registering the label data from the Odonata at the Museum of Victoria which holds about 4,000 specimens in its dry collection. I was interested to know the distribution of species in my own State. There is an interesting boundary between two species of *Austroagrion* (*watsoni* vs *cyane*) somewhere near the South Australian/Victoria state border. The collection manager from the South Australian Museum gave me access to its label data to research this. The Australian National Insect Collection (ANIC) in Canberra put its 16,000 specimens on-line. Suddenly, the scope of my data collection had grown and there was some incentive to gather the whole Australian set.

In Swakopmund the need for point data to support the Global Biodiversity Assessment for Odonata was raised and I mentioned to Viola Klausnitzer and Vincent Kalkman the potential for an Australian database. From your knowledge of those two you will know that incentive becomes imperative.

Through the courtesy of the respective curators I now have access to all of the Australian Odonata distribution information that has been databased, or will have when I finish the Melbourne collection shortly. This totals nearly 25,000 specimens, probably 90% of which have data adequate for mapping. By early to mid 2008 the maps should be completed.

Each collection has its idiosyncrasies: a large proportion of the Melbourne Museum is old (in Australian terms) and comes from Queensland where the curator took his holidays; much of the Hobart collection was obtained under exchange from Tillyard; Launceston is more recent and results from survey work; Northern Territory Museum includes some specimens from countries to the north of Australia; ANIC, the national collection, is the most comprehensive and benefits from the careful curatorship of Tony Watson and Gunther Theischinger but, sadly, now an orphan taxon.

There are still some gaps. University of Queensland has only registered its petalurids. Brisbane Museum is waiting on volunteers to extract its label data. Only some recent surveys have been databased in the Australian Museum (Sydney) and there must be a wealth of Tillyard and Dobson specimens awaiting attention. The Macleay Museum at the University of Sydney contains a collection of Odonata purchased from overseas during the early days of the Colony, and who knows what else? I have seen Australian specimens in the Natural History Museum, London, and Lieftinck's legacy must lie somewhere.

In spite of the gaps Australia should soon have a set of fairly comprehensive maps, all specimen based, and showing, if nothing else, where collectors have been active in this large continent.

The global status of dragonflies (Odonata) based on the Red List Index approach

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Based on the target of reducing the current rate of biodiversity loss by 2010 set by the Convention on Biological Diversity (CBD), the World Conservation Union (IUCN), has developed the Red List Index (RLI). This Index has been designed to measure the rate at which a broad range of species groups are moving toward extinction. At the 8th Conference of the Parties for the CBD 2006, the RLI was formally adopted as the key global biodiversity indicator to measure trends in threatened species for the 2010 target.

To calculate the index a group of species must be assessed using the IUCN Red List Categories and Criteria (http://www.iucnredlist.org/info/categories_criteria), at regular intervals so that genuine changes in conservation status can be identified. The RLI is based on a representative sample of species selected from taxonomic groups within vertebrates, invertebrates, plants, fungi and algae. The selected species will be reassessed at regular intervals and genuine changes in conservation status identified to measure trends in extinction risk. This approach enables the RLI to be applied to a broad range of taxonomic groups and can therefore provide status and trend information more broadly representative of biodiversity. In addition, the sampled approach will help to identify which major taxonomic groups, regions or ecosystems are deteriorating the most rapidly.

Dragonflies play an important role for the RLI, with 1500 species randomly selected from 5680 extant species known to exist globally (Kalkman et al. in press). With over $\frac{1}{4}$ of all dragonflies assessed (26.4%), based on a random selection, the results can be seen to reflect the situation of all species worldwide. Figure 1 shows the distribution of the 1500 selected dragonfly species according to the biogeographic regions, while Figure 2 gives percentages in each Red List Category.

The situation for the Nearctic species is quite satisfying in both respects: available information and threat status. The slightly poorer situation for the Palaearctic species is mainly a result of the data deficient situation in China and adjacent areas.

For many tropical areas a serious gap in knowledge is obvious. Here the only information for the majority of the species is the type specimen and the original description, usually lacking any information concerning habitat and ecology.

The majority of dragonflies, as most other taxa, have shown a decline in distribution and abundance based on human induced habitat changes (e.g. water pollution, deforestation, water management), which has been documented for several temperate regions (Sahlen et al. 2004, Inoue, 2004; Westfall & May, 1996). But most of these species still do not fall in any of IUCN's threat categories, as they generally have large ranges or receive special conservation attention.

The situation in tropical areas, where the majority of species exist (Fig. 1) is different. Here species of open landscapes are often widespread and able to colonise new habitats, while species confined to forest seem often confined to smaller ranges. Unfortunately the forest species of tropical areas are often poorly known, making it difficult to say whether a species is genuinely rare or merely overlooked. Examples of data deficiency are known from Africa (e.g. Clausnitzer, 2003), South America (e.g. De Marmels, 1999; Paulson, 2006) and the Oriental region (e.g. Orr, 2004). More fieldwork is thus essential to establish the true ranges of these species and to determine areas of endemism within larger tropical forest areas. The destruction of tropical forest is therefore the most important threat to global odonate diversity. Especially for species restricted to small tropical islands, e.g. the Philippine islands, Hawaii, the small pockets of forest in the Eastern Arc Mountains of East Africa and the Caribbean islands of Cuba, Hispaniola and Jamaica, urgent conservation measures are needed to avoid a further decline or even extinction.

Compared to the few taxonomic groups entirely assessed, the number of threatened dragonfly species (rated as Critically Endangered, Endangered or Vulnerable) is relatively low: 10% of all dragonflies are regarded as threatened, compared with 32% of the amphibians, 12% of the birds and 20% of the mammals (Baillie et al. 2004).

References

- Baillie, J.E.M., C. Hilton-Taylor & S.N. Stuart (eds.), 2004. *2004 IUCN Red List of Threatened Species. A Global Species Assessment*. IUCN, Gland, Switzerland and Cambridge, UK. 191 pp.
- Clausnitzer, V. & R. Jödicke (eds.), 2004. 'Guardians of the watershed. Global status of dragonflies: critical species, threat and conservation'. *International Journal of Odonatology* 7: 385-398.
- Clausnitzer, V., 2003. Odonata of African humid forest – a review. *Cimbebasia* 18: 173-190.
- De Marmels, J.C., 1999. Rare Venezuelan dragonflies (Odonata) evaluated for their possible inclusion in the national red data book. *International Journal of Odonatology* 2: 55-67.

- Inoue, K., 2004. Critical species of Odonata in Japan. In: Clausnitzer, V. & R. Jödicke (eds.) 'Guardians of the watershed. Global status of dragonflies: critical species, threat and conservation'. *International Journal of Odonatology* 7: 311-324.
- Kalkman, V.J., V. Clausnitzer, K.-D.B. Dijkstra, A.G. Orr, D.R. Paulson, J. van Tol (in press). Global diversity of dragonflies (Odonata) in freshwater. *Hydrobiologia*.
- Orr, A.G., 2004. Critical species of Odonata in Malaysia, Indonesia, Singapore and Brunei. In: Clausnitzer, V. & R. Jödicke (eds.) 'Guardians of the watershed. Global status of dragonflies: critical species, threat and conservation'. *International Journal of Odonatology* 7: 371-384.
- Paulson, D.R., 2006. The importance of forests to neotropical dragonflies. In: Rivera, A. (ed.) *Forest and dragonflies*. 4th WDA International Symposium of Odonatology, Pontevedra (Spain), July 2005. Pensoft Publishers, Sofia-Moscow.
- Sahlén, G., R. Bernard, A.C. Rivera, R. Ketelaar & F. Suhling, 2004. Critical species of Odonata in Europe. In: Clausnitzer, V. & R. Jödicke (eds.) 'Guardians of the watershed. Global status of dragonflies: critical species, threat and conservation'. *International Journal of Odonatology* 7: 385-398.
- Westfall, M.J. & M.L. May, 1996. *Damselflies of North America*. Gainesville, Scientific Publishers.

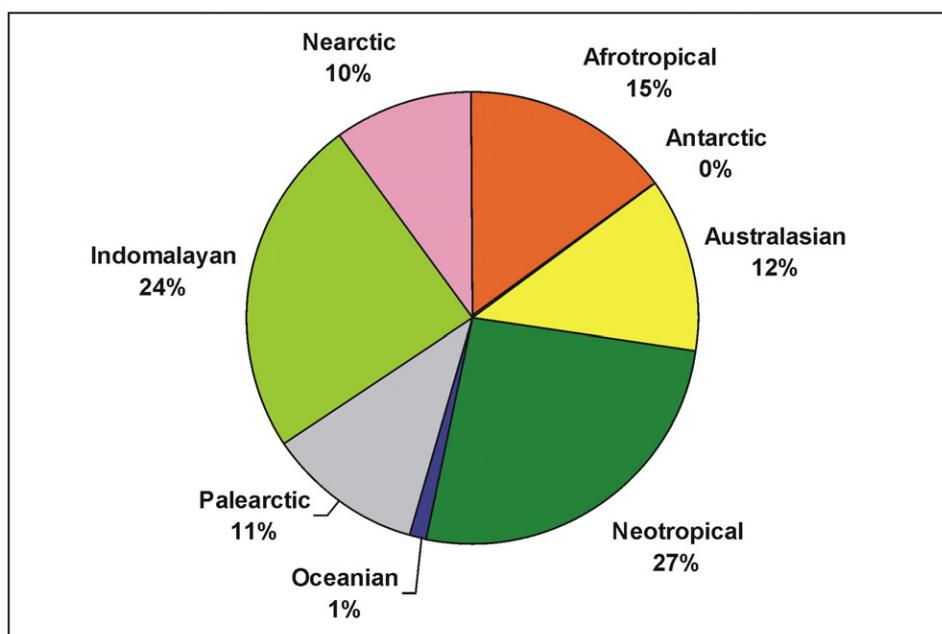


Figure 1. Distribution of 1500 selected dragonfly species according to the biogeographic regions.

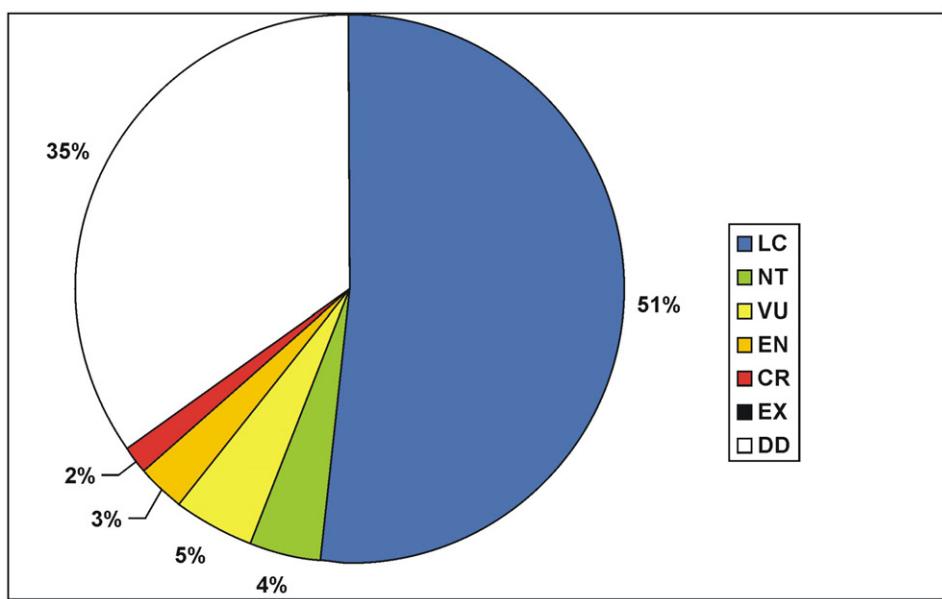


Figure 2. Percentage of dragonflies in each Red List Category.

Accomplishment of the translation project of Philip Corbet's 'Dragonflies' (1999) into Japanese Hidenori Ubukata [ubukata@kus.hokkyodai.ac.jp]

The Japanese edition of Philip Corbet's, "Dragonflies: behavior and ecology of Odonata" was published by Kaiyusha Publishers Co. Ltd., Tokyo, in March 2007, eight years after the publication of the original English version by the Cornell University Press. The publication of the Japanese edition had been eagerly waited for and was enthusiastically greeted by many Japanese dragonfly researchers and dragonfly lovers, ecologists, conservationists, etc. The difficulty in translating a book of more than 800 pages into a language of entirely different grammatical structure and vocabulary is reflected by the number of years which passed during the translation and editorial work. I was the coordinator of this translation project, so I would now like to look back on the process of the book's production.



Photo 1. The bookshelf and front covers of the Japanese edition of P.S. Corbet's 'Dragonflies: behavior and Ecology of Odonata'.

overcome by the enthusiasm of the translator team, agreed to publish in 1998. In March 1999 JSO kindly decided to support the project with a fund, followed by the Hokkaido Odonatological Society and several benevolent persons. Upon publication of the English edition from Cornell Univ. Press in July 1999, every member of the team bought one copy each and started to translate his allotted chapter.

The first WDA International Symposium at Hamilton, N.Y., July, 1999, was a good occasion for Philip and me to have a meeting to reconfirm our wish to publish the Japanese edition and establish arrangements for cooperation between original author, translators and publishers. Soon after my returning home, the team of editors (supervising translators), namely Yoshitaka Tsubaki, Hidenori Ubukata, Tetsuyuki Ueda and Kazunori Higashi, was established, all of whom accepted my request to take the position.

Until the publication of the Japanese edition, I exchanged more than 12,000 e-mails with the rest of the editors, translators or publishers. I also exchanged 350 or more e-mails with Philip to solve problems, which arose during the process of translating the book. During the eight-year period,

The idea of publishing a Japanese edition of the book originated in a conversation between Philip and me during a five-day research tour on the conservation of several important habitats of endangered and rare dragonfly species of Scotland in July, 1996. I was impressed by his passion to realize the idea and promised him that I would try to find translator(s) and a publisher in Japan; holding a vague anxiety as well as a dream that many Japanese can enjoy this valuable book in their mother tongue in the near future.

Within three months after my return to Japan a volunteer translator team was established, comprised of ten entomologists/ecologists/physiologists who all approved my request through e-mail to give the project a helping hand. At the same time I began to find a publisher, to try to obtain funding for the publication from foundations, organizations, etc. I also undertook marketing research on the sales potential of the translated book by advertising the project through leaflets sent to the members of the Japanese Society for Odonatology (JSO) and through mailing lists on entomology, ecology, etc. Fortunately, Kaiyusha Publishers,

a manuscript of every chapter was revised and commented on and sent back and forth again and again (four to six times) from the editors to nineteen translators, and then finally, the manuscripts were checked carefully by more than two editors. Yoshitaka Tsubaki who acted as the final checker of the manuscript, before sending it to the printer, performed a major role in making the sentences more fluent in Japanese. Further discussions among the editors, often involving some translators, contributed to the removal of poor translation and helped make the book more reliable and readable. I called editors meetings three times, during which editorial policies, such as standardization of literary style, unification of technical terms, annotation usage by translators, adoption of 'common names' (Japanese names) for specific, generic and other higher taxonomic categories of dragonflies, were discussed and eventually decided. In connection with this, I set up two websites, one for the translators to provide the editorial policy as well as the lists of technical terms, Japanese names, etc, and the other for advertising the project to the public nationwide. Kiyoji Inoue took on the important role of creating new Japanese names.

The translators were favoured by a dozen Japanese researchers mostly of biology in translating technical terms and by several odonatologists in confirming the Japanese names, titles, and journal names of the cited papers. Fascinating photographs (reproductive behavior of *Calopteryx japonica*, etc.) adorning the cover of the book, were provided by Kazuo Unno, a famous Japanese insect photographer and Shigeo Eda, Yoshitaka Tsubaki and Mrs. Hiroko Higashi. Some overseas colleagues, including Dennis Paulson and K.-D. Dijkstra, helped us to solve questions on odonate taxonomy and several other queries. Philip promptly answered on every occasion when queries, arising during the translation, were put to him, and received in return a number of reports of misprints in the English edition, which were added to the 'Corrigenda' linked to on WDA's homepage. These corrections benefited the publishers of the English edition when making the 'Revised Editions' published in 2001 and 2004. By all the efforts and cooperation mentioned above, the Japanese version appeared, perhaps even more correct than the first and revised editions of the original book and most readable (though only for the Japanese).

I handed Philip a brand-new copy of the Japanese edition in the hall of the National Marine Aquarium of Namibia in Swakopmund, Namibia during the 5th WDA International Symposium held in April 2007 (see Photo 2).

His expression of delight and gratification was not only a sign of his appreciation for my fulfilling the promise of eleven years ago but also a reward to the translators, especially those who devoted a great part of their time for editing the Japanese edition. I hope that this edition will enhance the understanding and interest on dragonfly ecology and behavior to Japanese speaking readers in this and coming centuries.

Photo 3. Meeting of the editorial team of the Japanese edition, March, 2000. From left to right: Mrs. Yoko Homma (Kaiyusha), Kazunori Higashi, Hidenori Ubukata, Yoshitaka Tsubaki, Tetsuyuki Uéda.

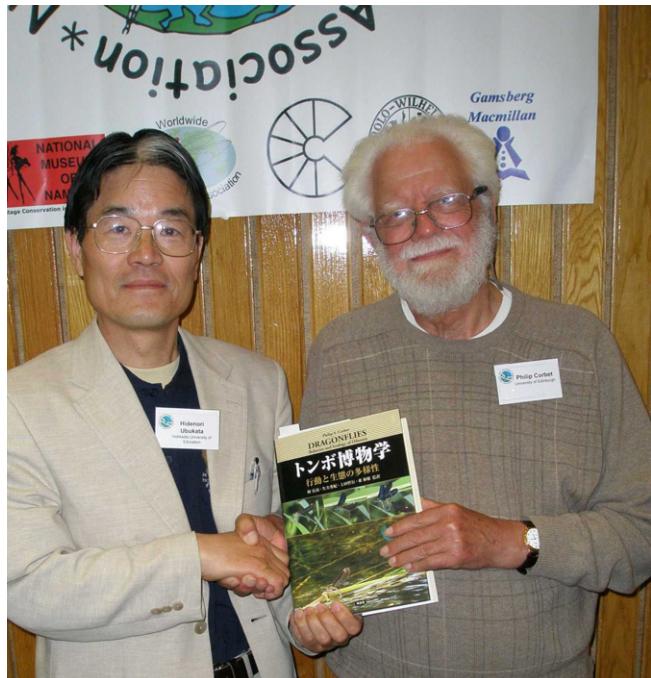


Photo 2. A copy of the Japanese edition presented to Philip Corbet by Hidenori Ubukata on behalf of the translator team at the 5th WDA Symposium at Swakopmund, Namibia, April 2007.



Eight days in Peninsular Malaysia – and the benefits of hindsight

Bert Orr [agorr@bigpond.com]

It has been nearly 30 years since I last set foot on West Malaysian soil. In early 1979 with an itinerant (now eminent) vermicologist I travelled by hire car (extra cheap rates for students then) the length and breadth of the peninsula, entomologising, and vermicologising. My passion was butterflies and dragonflies – his earthworms. It is interesting the effect the splendour of a tropical fauna so often exerts on those students of economically vital but less attractive inhabitants of the Earth. My companion soon abandoned his shovel for a net (my spare net) and collected far more butterflies and gorgeous metalwing demoiselles than earthworms; just as 6 years later in Sulawesi, the renowned student of parasitic Hymenoptera, Dick Askew, seemed also to have collected many more butterflies and dragonflies than dull chalcids when, pipe in hand, he joined me daily for lunch in the forest by the banks of the Sungai Tumpah. We were both for two months members of the Royal Entomological Society's Project Wallace expedition to Sulawesi Utara, and it was the appearance of Dick's classic work on European dragonflies several years later which largely inspired me to attempt to illustrate dragonflies myself. *Inter alia*, and in Dick's defence, he did say that the chalcids seemed



Photo 1. The stream above the Taman Paku-Pakis where *D. argyoides* larvae were found. Photo CY Choong.



Photo 2. *Devadatta argyoides* in wheel, this species is common on the Paku-Pakis stream. Photo CY Choong.

on a topic relating to Malaysian Odonata, to spend some time on fieldwork, and to examine the departmental collections. The timing of my visit coincided exactly with that of Rory Dow, who was en route to Borneo for three months fieldwork, ongoing as this goes to press. We had much to discuss.

very thin on the ground, and we speculated that Sulawesi may harbour a depauperate parasitoid fauna, which, if true, might go some way to explaining the strangeness of the fauna – giant butterflies AND dragonflies.

But I digress - Given this long hiatus, and my recent association with many neighbouring parts of south east Asia, it was with great pleasure that I received from Dr Choong Chee Yen, an invitation to pay a short visit to the department of biology, from 19th-27th November 2007, at the Universiti Kebangsaan Malaysia (UKM; = National University of Malaysia) campus at Bangi, Selangor, just to the south of Kuala Lumpur. My remit was to present a seminar

Of the seminar, suffice it to say that it was well attended and obviously odonatology is alive and well in Peninsular Malaysia. From Prof Abu Hassan Ahmad of Universiti Sains Malaysia (Penang) I received an enormous F0 *Chlorogomphus* larva – probably *C. arooni*. As we approached the seminar hall we saw an appositely named female *Gynacantha subinterrupta* flying along the corridor outside. This was swooped on by Sir Rory, and so played no further part in the proceedings.

Directly after the seminar, Rory and I, (hastily reclad and psychologically readjusted for fieldwork), explored a small stream that rises from the Taman Paku-Pakis (Fernarium on the map, see <http://www.ukm.my/hutan>), no more than 50 metres from the entrance of the biology building (see photo 1). The lower open parts are overgrown with reeds and infested by *Neurothemis fluctuans* and *Tyriobapta torrida*, but a few metres up a stepped, mossy, concrete path brings you to a little stream with large numbers of *Coelicia octogesima* and rather fewer *Devadatta argyoides* (see photo 2). I had no aquatic net, so I turned over stones and twigs in a desultory sort of way, and almost at once I uncovered an

advanced larva of *Devadatta argyoides*, and soon after an immature larva of the same. *Devadatta* belongs to the relic family Amphipterygidae, and is normally associated with pristine habitats – clear forest streams and springs. When living in Brunei in the 1990's I had to drive for at least an hour and a half to find the habitat of the very similar *D. podolestoides*. The larvae of *Devadatta* possess odd sclerotized caudal lamellae (see Orr, 2003, p 138), in their extreme form resembling the cap of an acorn, which obviously can serve no respiratory function. However they also bear ventrally at the base of the abdomen secondary paired branching gill tufts, structures studied in dead specimens by the late Tony Watson and figured in Corbet (1999, p78). These dendritic organs, when fully expanded, are beautiful, suggestive of the tendrils of minute sea anemones or soft corals. When retracted they present two tiny, soft, moist buds. I was able to return these living specimens to the laboratory immediately, and study their behaviour in a Petrie dish under a binocular microscope. At first both individuals pulsated their gill tufts in and out with a regular rhythm, but after about 15 minutes, the larger individual seemed to enter a stupor, and lay on its back as if in *rigor mortis* with the gill tufts fully expanded. Indeed I thought it was dead. That it was not so came to my notice only when, several hours later, I placed it in alcohol, whereupon it briefly rejuvenated, rather frantically, before death. The gill tufts remained fully expanded *post mortem*. The smaller of the two remained active all the while, but the gill tufts pulsated less, especially as it grew quieter with time.

During much of my stay the weather was poor, and although Rory went often to the field, including Templar Park to the north of Kuala Lumpur, in company with the UKM entomologist Dr Alex Ng, where they took both *Echo modesta* and *Indocnemis orang*, among other wonders, I spent much of my time studying the collections, including many drawers in the official insect collection, and recent specimens taken by Dr Choong. These investigations revealed two new records for West Malaysia and Singapore: *Heliaeschna simplicia* (Karsch, 1891), a Bornean species, represented by a single male, taken in Perlis in 1984 (see photo 3), and *Anax panybeus* Hagen, 1867, also known from Borneo and further east, taken very recently on the UKM campus by Dr Choong himself. I also obtained a remarkable piece of literature (Zubaid, 1988), which documents the diet of the now endangered Pomona Round Nosed Bat, *Hipposideros pomona*, living near padi fields in the northern state of Perlis. In this species, at that location, 59% of prey items recorded were Odonata. As the remains are identified as *Pantala*, *Crocothemis* and *Orthetrum*, it seems probable the dragonflies were taken by gleaning while perched, rather than in flight, but it is worth noting that those genuinely crepuscular or nocturnal Odonata lack entirely auditory organs so important to survival in most moths, and may occasionally be taken by bats. Other records of bat predation of odonates seem to involve the prey being taken in flight at dusk (Corbet, 1999).



Photo 3. *Heliaeschna simplicia*, a new record for Pennsular Malaysia. Photo AG Orr.

We three (Drs Choong and Dow and myself) spent one day together in the field in the Bangi Forest Reserve. We explored first a swampy area in the forest off Jalan Dengkil (see <http://www.ukm.my/hutan>), then lunched on excellent *roti chanai*, a great favorite of mine since Brunei days. Then, along with incidental stops, we remained somewhat longer near a ponded area drained by a tiny stream near the engineering faculty. At the first site (see Choong et al, Fig 1. this edition of ECHO) the more open forest swamp hosted a wide variety of libellulids, especially *Tyriobapta torrida*, but notably, *Rhyothemis aterrima*. With two other nets in the cramped sylvan airspace, I concentrated on collecting larvae, and I found many libellulids, mainly *T. torrida* in the shallow leafy margins of the swamp. A little further in I found an adult male *Podolestes orientalis*, perched on a twig over some attractive looking root mats. (See Choong et al, Fig 3. this edition of ECHO). The larva of this genus is not known, and in Brunei, in futile searches for the larva of this common species, I have turned up serendipitously larvae of such great rarities as *Nannophyopsis chalcosoma* (see Fleck & Orr, 2005). However, buoyed by my earlier success with *Devadatta*, itself no mean prize, I endeavoured once more to find this elusive creature. For over an hour I riddled and rifled the root masses, the leaf packs, the bottom mud, and any form of detritus that looked as though it might harbour *Podolestes* larvae. I split open rotten logs, large and small, opening up tunnels revealing coleopteran larvae, crustaceans and every conceivable form of smaller lentic life. This attempt, like all before, was to end in tears, but I did find a very large number of *Copera* larvae. Both *C. vitatta* and *C. marginipes* adults were present, so it is as yet uncertain if larvae of both species were taken. At the second locality (see Choong et al, Fig. 5 in this edition of ECHO) we collected adults of *Vestalis gracilis*, *Copera ciliata* and *Agriocnemis nana*, as well as *Nannophya pygmaea*. I searched the root masses swirling in the tiny streamlet for *Vestalis* larvae, and was rewarded by the greater prize of *Copera ciliata*, which lacks the fringes on the caudal lamellae characteristic of its congeners. There were also several large libellulids (probably *Orthetrum*) oddly green-coloured to match their background. These were released as I had run out of individual containers and did not wish them to eat my precious *C. ciliata* larva.



Photo 4. Dr CY Choong, with *Anax panybeus* he recently collected on the UKM campus.

extension, he has discovered, in Bukit Baut F.R. in Terengganu, a population of *Orchithemis pulcherrima* in which the red form and the rare blue form of the male (see Orr, 2005, p 91) occur in approximately the ratio of 1:1. His samples of *Drepanosticta fontinalis* from Negiri Sembilan and Royal Belum Perak have forced us to reconsider the extent of variation within the species.

I would like however to focus on the remarkable efforts of Dr Choong (see photo 4). It is now three years since he began collecting and photographing dragonflies in his spare time. In that time he has collected 73 species from UKM campus alone. In his expeditions to other parts of the peninsula he has collected at least another 68 species, making a total of 141 species, or 60 percent of the entire fauna for Peninsular Malaysia. For almost all these species he has photographs (some posted on <http://pkukmweb.ukm.my/~choong/dragonfly98/images/dragonfly.html>). Many of these are stunning, and some show interesting behaviour and carry interesting annotations. For example he has superb photographs of female *Euphaea impar* ovipositing while totally submerged, with the note that the female dived into the water, always against the current, just as has been recently recorded in *Neurobasis kaupi*, Guenther (2006), (see also Reels & Dow, 2006). I was interested to note that photos showed several *Pseudagrion* specimens bearing engorged *Forcipomyia* midges (Diptera: Ceratopogonidae) on their wings, and in one case an engorged midge was attached to the pleural membrane on S4 of the abdomen. Dr Choong has discovered and jointly described one new species (*Chalybeothemis chini* Dow, Choong & Orr, 2007), collected a long series of a probable new Libellago, and added the following species to the Peninsular Malaysian checklist: *Anax panybeus* (see photo 5), *Burmagomphus insularis*, *Brachydiplax sobrina* and *Coeliccia kimurai*. He has discovered *Neurobasis longipes* at Royal Belum in Perak, a significant range

Now I must make some corrections to my own texts. When Dr Samuel Johnson was asked why in his dictionary he defined pattern as 'knee of a horse', his reply was famously 'ignorance, ma'am, sheer ignorance'. I wish I could claim the same excuse for my portrayal of a Bornean *Lyriothemis biappendiculata*, with a heavily pruinose white thorax, on p 93 of my guide to dragonflies of Peninsular Malaysia and Singapore (Orr, 2005). In my defence I can only say 'recalcitrance ma'am', which will scarcely satisfy even the most sympathetic of readers. I must now state categorically, that in Peninsular Malaysia (and Thailand), this pruinosity does not develop in mature males and the thorax is dark brown to black. I cannot even claim ignorance as this fact had already been pointed out to me during the preparation of the book, and my own experience in Thailand bore out this advice (just as I had been told of the presence of *Pseudagrion pilidorsum* in Borneo before the publication of 'Dragonflies of Borneo' Orr, 2003, but omitted it as I had not seen the specimens). Other corrections or additions to Orr, 2005 I would like to note are: The body of *Zygonyx iris* (p113) is correct but the discoidal field of the forewing is wrong, showing as it does the Bornean race, using digital trickery; some specimens of *Brachydiplos farinosa* have a distinct yellow suffusion to the hindwing base; in males of *Copera ciliata* (p49) the pale markings on the head and thorax can be a very pale bluish green or even pale caerulean blue; in *Indocnemis orang* (p48) the pale markings of males from Templar Park are violet rather than blue; The blue marking on S8 of *Drepanosticta fontinalis* can be quite reduced, (p 34), more like

that on *D. quadratus*, hence the two species can only be reliably separated by their rather similar appendages – *D. fontinalis* specimens also vary a good deal in size and the relative abdomen length; in *Rhinagrion mima*, (p, 30) the tip of the male abdomen is a rather pinkish orange, not yellow (the yellow was exaggerated in the colour separation in the book but the Peninsular specimens are less yellow than the southern Thai one I figured).

In recent correspondence Dr Choong has kindly described my short visit as 'fruitful indeed'. From my own perspective I can wholly endorse this summation. I would like to thank in particular Dr Choong, but also Prof. Dr Aminah Abdullah, the Dean of the Faculty of Science and Technology, and Prof. Dato' Dr. Abdul Latiff Mohamad, head of the biodiversity programme, and the Universiti Kebangsaan Malaysia, for supporting this visit.



Photo 5. *Anax panybeus* the same specimen as above in life. Photo CY Choong.

References

- Corbet, P.S., 1999. *Dragonflies: behaviour and ecology of Odonata*. Harley Books, Colchester. xxxii + 829 pp.
- Dow, R.A., C.Y. Choong & A.G. Orr, 2007. Two new species of *Chalybeothemis* from Malaysia, with a redefinition of the genus (Odonata: Libellulidae). *International Journal of Odonatology* 10: 171-184
- Fleck, G., & A.G. Orr, 2005. Une larve du remarquable genre *Nannophyopsis* Lieftinck, 1935. Importance pour la phylogénie de la famille (Insecta, Odonata, Anisoptera, Libellulidae). *Ann. Naturhist. Mus.Wien*, 107B: 121-130.
- Guenther, A., 2006. Reproductive behaviour of *Neurobasis kaupi* (Odonata: Calopterygidae). *International Journal of Odonatology* 9: 151-164.
- Orr, A.G., 2003. A guide to the dragonflies of Borneo, their identification and biology. Natural History Publications (Borneo), Sdn. Bhd. Kota Kinabalu. x +195 pp
- Orr, A.G., 2005. *Dragonflies of Peninsular Malaysia and Singapore*. Natural History Publications (Borneo), Sdn. Bhd. Kota Kinabalu. vi + 125 pp.
- Reels G.T. & R. Dow, 2006 Underwater oviposition behaviour in two species of Euphaea in Borneo and Hong Kong (Odonata: Euphaeidae). *International Journal of Odonatology* 9: 197-204.
- Zubaid, A., 1988. Food habits of *Hipposideros pomona* (Chiroptera: Rhinolophidae) from Peninsular Malaysia. *Mammalia* 52: 134-137.

Odonatological Year 2007 - Odessa, Ukraine

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The year started with the creation of the website for Ukrainian odonatology <http://dragonflyforall.narod.ru/>. The website provides information on people working with Odonata in Ukraine and informs the odonatological community about new articles, projects and events. A chapter 'Photo Album' is updated with new pictures of dragonflies by different authors.

Under the framework of the TACIS project (Technical Assistance for the Lower Dniester River Basin Management Planning) inventory work on fauna and flora was carried out in the lower part of the Dniestr river in the future 'Nizhnednestrovsky' National Park. Thirty-three species of dragonflies were recorded from the future National Park territory. Detailed investigations have not been provided on this area before. As the terrain in some places was very difficult, including huge reedy zones, different kinds of transport were used during investigations; a go-anywhere vehicle, a hang-glider and different kinds of water transport etc.



Photo: Field trip in Holland - Elena Dyatlova with Vincent Kalkman, September 2007.

the Dutch ministry of Agriculture and Nature Conservation. The project aims at compiling a list of Important Dragonfly Areas in South-western Ukraine. In order to complete the task a database was created containing existing Ukrainian records and additional fieldwork was undertaken. Distribution maps have been published on the internet at: http://dragonflyforall.narod.ru/projects/checklist_swukraine_engl.html

In September 2007, under the framework of this project, as an interim step I visited Vincent Kalkman in the Netherlands. We had many tasks to cover during my stay. The first was to discuss the progress of the project and tasks which needed to be done before its completion. The second was to visit Odonata collection in Leiden (RMNH) and Amsterdam (ZMAN) to find data on Odonata from Eastern Europe and to send this data to the regional experts. The third was to go on field trips in different parts of the country to see species which are absent or hard to see in Ukraine and to see other habitats.

On the border with Belgium I visited a beautiful nature place, 'Plateaux' near Eindhoven, together with Marcel Wasscher and Vincent Kalkman. Fifteen species were observed on this autumnal day (*Calopteryx splendens*, *L. virens vestalis*, *Sympetrum fusca*, *Ceriagrion tenellum*, *Enallagma cyathigerum*, *Platycnemis pennipes*, *Ischnura elegans*, *Sympetrum danae*, *S. depressiusculum*, *S. striolatum*, *S. fonscolombii*, *Aeshna juncea*, *Ae. cyanea*, *Ae. mixta*, *Orthetrum cancellatum*). Among birds the most attractive was Canada goose (*Branta canadensis*).

Later, together with Vincent and Rene Manger I visited a nearby village Ruinen and a little stream called 'Wold Aa', where we saw *Sympetrum pedemontanum*, *Sympetrum vulgatum* and *Aeshna grandis*. Then, with the same people, I went to Uffelter Binnenveld (nearby Havelte); a place with *Sympetrum paedisca*, *Sympetrum vulgatum*, *L. virens vestalis*. Later, we moved to a peat-bog near Borger, Forest, 'Drouwener veld', a pool called 'Watermolenveen' with *Aeshna subarctica*, *L. virens vestalis*, *Enallagma cyathigerum*, *Sympetrum danae*, *Ceriagrion tenellum* and we had a short stop at Westerbork.

In July, in the company of three Polish biologists (Boguslaw Daraz, Stanislaw and Pawel Czachorowski), I visited Romania (Baile Herculane, a resort between the Danube and the Carpathian mountains). There were some thirty odonatists from nine different countries which came to do fieldwork. Together with my Polish friends we travelled by car from Odessa (Ukraine) to Baile Herculane (Romania) (1,240 km) and we became familiar with different sites in Romania. The camp was organized by Cosmin Manci and Vincent Kalkman in order to get more data on Romania odonates.

The project 'Guardians of the watershed: Identifying Important Dragonfly Areas in Southwest Ukraine', which was started in 2006, finished at the end of 2007. Work for the project was completed by me in close co-operation with Vincent Kalkman and was funded by

During a trip with Rene we met a biologist Bram Koeze who was undertaking a project for the Ministry and searched for some rare species of water Coleoptera in the north of the country. Together with Vincent and Bram I participated in fieldwork on beetles and of course searched for dragonflies at the same time. For a night we stayed in the camping site ‘Us Blau Hiem’ close to Appelscha, province Friesland. Field research was undertaken at two sites, ‘Het Fochtelooerveen’ and ‘Drents-Friese World’, and then we also visited a small village ‘Oosterwolde’. It was interesting to see artificial channels specially created under the roads for frogs and lizards, to find an invasive species of fish in a pond and to observe rare birds, such as common crane (*Grus grus*). Among dragonflies the most interesting was *Lestes viridis*.

With Vincent and Marcel one evening we visited Bastiaan and Marianne Kiauta to discuss literature and “future” of odonatological societies. It was pleasant to write several words in my native language in their guestbook in which many well-known odonatologists had written their wishes.

The final part of the programme was cultural. With Marcel and his friends we visited the Kino-festival in Utrecht in the open air. With Anke Wouters and Vincent Kalkman we visited Amsterdam. The Van Gogh Museum made the biggest impression, and the ‘Red Light’ area was really unusual for me. I went to the Zoo, enjoyed streets and parks of Amsterdam and visited newly built library, near Nemo Museum.

The last day was spent visiting places of interest in Leiden. I decided to visit the City Centre, the People’s Museum (Museum of Ethnography, Museum Volkenkunde) and the most beautiful Botanical Garden in Leiden. In the Botanical Garden we met two teriologists and discussed possibilities of future cooperation in Ukraine.

So my odonatological year 2007 was successful in several ways. The most important result was the successful completion of the Important Dragonflies Areas in the South-Western Ukraine Project and initiation of an informal Odonata-community in the Ukraine.



Photo: *Aeshna mixta* migration swarm at the Danube Biosphere Reserve, August 2006; credit Elena Dyatlova.

WDA Archivist's Report No.1

The origin and development of WDA: the first ten years, 1997-2007 **Philip Corbet [philipcorbet@yahoo.co.uk]**

Preamble and Acknowledgements

In the following account sources (of information) are identified as numbers in parentheses; these numbers refer to references listed at the end, together with abbreviations used in the body of the text. To conform with a stipulation accompanying the appointment of an Archivist, the contents of this Report have been approved by the WDA Council "so as to validate its scope and accuracy." I have much pleasure in recording my gratitude to certain individuals for their valued help. For reviewing the Report, for helpful comments and for confirming the accuracy of its contents I thank Mike Parr, Wolfgang Schneider, Martin Schorr and Jill Silsby. For contributing Table 1 and for endorsing the text in the section headed 'Treasurer' I thank David Fitch.

Origin of WDA

At the Business Meeting of the Societas Internationalis Odonatologica (SIO) held at Maribor, Slovenia on 14 July 1997⁽¹⁾ a faction among those present decided to convert SIO into a Foundation (FSIO), which would thenceforth operate without the constraints of a Constitution and (by implication) would take over the assets of SIO. This decision, which was narrowly reached by majority vote, failed to cater for the many former members of SIO who wished to belong to an international odonatological society that operated in a democratic way. To meet this need a few individuals acted promptly to establish a new society, initially named "Phoenix" (to signify its ascent from the ashes) and then, soon afterwards, the "Worldwide Dragonfly Association." (WDA)⁽²⁾. Events thereafter moved rapidly: the inaugural meeting (proposing the existence of WDA) was held at Maribor on 17 July 1997, and the Association was formally confirmed at the first WDA Council meeting held at Purley, Surrey, UK on 6 and 7 September 1997⁽³⁾ at which the Constitution and By Laws⁽⁴⁾ were ratified. A brief account of the events that took place at Maribor has already appeared in AGRION⁽¹⁾. From this spontaneous and asset-free birth, WDA rapidly gained strength and momentum to become a society of international stature, publishing a reputable scientific journal and mounting biennial symposia. In this first Archivist's Report I trace the steps by which this transformation has taken place, up to July 2007. Although my term as first Archivist terminated in July 2005, for convenience, and by request, I have covered events up to July 2007, thus embracing the first ten years of WDA's existence. This record stands as testimony to the extraordinary determination of those individuals who worked so hard initially to make WDA a reality.

Abstracts

Members of WDA are very fortunate to receive abstracts of publications containing information about Odonata. These are provided by Martin Schorr (who formerly contributed many papers to *Odonatological Abstracts* contained in ODONATOLOGICA) and Martin Lindeboom of the International Dragonfly Fund⁽⁵⁾, and they are produced under the title *Odonatological Abstract Service*. The first issue appeared in January 1998 and contained 112 abstracts⁽⁶⁾. Thereafter abstracts were numbered consecutively, beginning in June 1998 with issue 2. By February 2007 (issue 19) numbered abstracts amounted to 6080, making a total to date of 6192. These abstracts are available to WDA members on DVD from Martin Schorr at ÖSTLAP, Schulstr. 78, 54314 Zerf, Germany. The viability of this service depends partly on authors sending the copies of all that they publish on Odonata to Martin Schorr, Waldrieden 25, D-54314 Zerf, Germany or by pdf⁽⁷⁾. In order to economise on postal costs, the Board decided to place the abstracts directly on a secure site in pdf format as part of the WDA website⁽⁸⁾.

Archival material: assembly and management

Beyond the tentative actions described in AGRION⁽⁹⁾, I have made almost no progress towards assembling and organising archival material, a task that will now fall to my successor(s). I shall recommend that, wherever possible, such material is preserved and submitted in electronic form. In due course, and intermittently thereafter, a list of holdings will probably be made available, either on the WDA website or through AGRION, and instructions given as to how members of WDA can gain access to material in the Archive. Already the WDA website (*q.v.*) provides a wide range of information of interest to members. I hope that such arrangements can be put in place soon, recognising that a common weakness of archives is that they are started too late!

Archivist

Board approval of this office and its Terms of Reference were duly announced⁽⁹⁾, and are referred to in the Preamble to this article.

Awards

In 2003 the Trustees decided to establish an award to honour and recognise excellence in odonatology⁽¹⁰⁾. To be eligible for consideration, a project must be deemed to have made a significant contribution to the advancement of odonatology or its application, preferably on an international scale. In instituting the award, WDA intends particularly to encourage odonatologists less than 35 years old, although older nominees are also eligible. The WDA Award is administered by the Conservation and Funds Committee. A stipulation is that each recipient of the award shall present an account of the successful project, as a lecture, at the next WDA International Symposium of Odonatology after announcement of the award. The first such award was shared, in 2005, between K.-D. B. Dijkstra, for taxonomic studies of African Odonata, and A.G. Orr, for his book on dragonflies of Borneo. The second award was presented in 2007 to R. W. Garrison for his research on the systematics of Neotropical Odonata.

Charitable enterprises

As a Registered Charity in the UK (No. 1066039/0), WDA must satisfy the Charity Commissioners that it is a non-profit-making organisation and that the wording of the Constitution does not conflict with this⁽¹¹⁾. A Conservation Fund, fed initially by donations, and administered by the Conservation and Funds Committee, provides small grants for projects that contribute to conservation of dragonflies or their habitats. The first such grant helped two third-year university students to study the breeding status and habitat requirements of fifteen rare species of dragonfly in British Columbia, Canada under the supervision of the experienced odonatologist Syd Cannings⁽¹²⁾.

Codes of Practice

Two Codes of Practice exist for the guidance of members. The first, proposed jointly by three successive Presidents⁽¹³⁾ was offered as a means of safeguarding the long-term viability of WDA and was based on personal experiences gained from the disintegration of SIO as a democratic institution. The second, relating solely to the collection of dragonflies⁽¹⁴⁾ and ratified by the Trustees on 26 February 2002, was a sequel to a wide-ranging debate of this topic at the Gällivare Symposium⁽¹⁵⁾. The second code enshrines four key principles which apply, respectively, to: (a) respect for life; (b) compliance with regulations; (c) the need for scientific rigour; and (d) the need to show tolerance of differing attitudes towards collecting. The second code, which was amended in 2004⁽¹⁶⁾, was due for review in February 2007.

Conservation Fund

This Fund is financed by voluntary donations from members. A condition of granting a Conservation Fund award is that the results be submitted for publication in the WDA journal (IJO). Research supported jointly by WDA and IDF led to the discovery of an hitherto undescribed species, *Somatochlora borisii* Marinov, in southern Bulgaria⁽¹⁷⁾, and resulted in several publications in IJO, namely by Dijkstra⁽¹⁸⁾, Srivastava et al.⁽¹⁹⁾ and Oppel⁽²⁰⁾. The Fund also supports the Odonatological Abstract Service through a subvention of £2 per year per member of WDA. The Fund is administered by the Conservation and Funds Committee.

Constitution and By Laws

The Constitution and By Laws according to which WDA functioned initially were drawn up in close consultation with the Charity Commission, and were adopted on 6 September 1997⁽⁴⁾ and subsequently ratified by postal ballot.

Minor and uncontroversial changes were proposed in July 2003⁽²¹⁾. They referred to the status of the Past-President as a member of the Board and to a mechanism for terminating the membership of anyone who brings the Association into disrepute and/or who acts in a manner inconsistent with the objects of the Charity.

International Symposia

Stipulations governing international symposia are contained in rubric 5 of the BL⁽²²⁾. WDA International Symposia of Odonatology have been located as follows: No. 1 in July 1999 in Colgate University, New York, USA (organisers: Vicky McMillan and Janet Rith-Najarian; attendance: 90 odonatologists from 12 nations; reports⁽²³⁾; No. 2 in July 2001 in Gällivare, Sweden (Göran and Anna Sahlén; 80 odonatologists from 20 nations; reports⁽²⁴⁾; No. 3 in January 2003 in Beechworth, Victoria, Australia (John Hawking; 54 odonatologists from 14 nations; reports⁽²⁵⁾; No. 4 in July 2005 in Pontevedra, Spain (Adolfo Cordero; 116 odonatologists from 27 nations; reports⁽²⁶⁾; No. 5 in April 2007 in Swakopmund, Namibia (Eugene Marais, Andreas Martens, Frank Suhling; 125 odonatologists from 29 nations; reports⁽²⁷⁾). The Board of Trustees meets twice at each Symposium which also features a Biennial General Meeting. The BL prescribe that, where feasible, International Symposia shall be located according to the following sequence: Europe/Africa, The Americas, Europe/Africa, Asia/Australia, Europe/Africa, The Americas etc. It is customary for the programme of an International Symposium to feature about four days of scientific

presentations, sometimes including a Plenary Seminar, one day (usually day three) devoted to an optional mid-Symposium excursion, to be followed by an optional post-Symposium tour which lasts several days. The post-Symposium tour typically involves visits to habitats containing interesting Odonata.

A feature of the first four WDA International Symposia has been the Plenary Seminar, a tradition established by SIO in 1981. As administered by WDA, the Plenary Seminar entails a two- or three-hour session, moderated and led by a chairman, devoted to one or more topics suited for free-ranging discussion. Focal topics are usually announced in advance so that those participating can, if they wish, be well prepared. A complete list of Plenary Seminars, held under the auspices of SIO and WDA since their inception, including the topics discussed and the name of the chairman, is available from PSC or MLM⁽²⁸⁾. The topics discussed in the Plenary Seminar at Gällivare and Beechworth are listed on the WDA website (*q.v.*) and the topics discussed at Colgate are listed in the published transcript of the discussion⁽²⁹⁾. As operated at most Symposia by SIO, and by WDA in 1999, the proceedings are recorded, subsequently transcribed as rough copy, and then edited by the chairman who adds references and indexes. A published booklet results. This procedure was followed after the Symposium at Colgate University in 1999, the resulting booklet being obtainable from Vicky McMillan, whose office contributed importantly to its production⁽²⁹⁾. The Plenary Seminars held subsequently were recorded, but not subsequently transcribed, which is regrettable because the information exchanged during the discussion is usually unavailable elsewhere. Transcription and editing are laborious, and the production of a booklet entails modest cost, but the finished product can be of great odonatological interest and it is to be hoped that the example set at Colgate will be followed during future Symposia.

The Biennial General Meeting of WDA (a statutory requirement) is held near the end of each International Symposium. It is chaired by the current President. In order to streamline each such Meeting, all the reports (from Officers) that need to be considered are assembled as a composite document and made available in hard copy to each member attending. Each Officer is encouraged to limit his/her report to one side of A4 and to speak to it (if necessary) for no more than two minutes, unless the Officer has requested, and been allotted, more time beforehand. In this way business is transacted expeditiously and the interest of those attending is maintained. The reports for each Meeting are retained by the Secretary and will become part of the WDA archive in due course.

The WDA International Symposia contribute importantly to the advance of odonatology through the communication and exchange of up-to-date scientific information, and they constitute a core activity of the WDA⁽³⁰⁾. They also contribute importantly to the spirit of cohesion and friendliness within the Association. As the first two Presidents of WDA wrote in their description of the 1st WDA International Symposium at Colgate University in 1999⁽³¹⁾: “We have participated in dozens of scientific meetings in many countries but we have never experienced such a congenial and stimulating ambience as prevailed at the Colgate Congress. It made a wonderful initiation for future WDA Symposia.” A contributory factor was that all members met on equal terms, the only distinctions being the functional roles of some as elected Officers. This prompted me to describe the first two WDA International Symposia as “festivals of inclusiveness”⁽³²⁾.

For the architects of WDA, who had seen the need to escape from an authoritarian regime, it was gratifying indeed to read the assessment of five German members⁽³³⁾ when they described the operation of WDA as “democratic through and through.” Members of WDA, past, present and future, owe an incalculable debt to those individuals who organise the Association’s International Symposia.

One responsibility of each Symposium organiser is to ensure that a photograph is taken of the outgoing, and the ingoing, Board of Trustees, for subsequent deposition in the Archives. Group photographs, each accompanied by a key to named individuals are lodged on the WDA website (*q.v.*) for the first three WDA Symposia, and the fifth.

Journal

The first Managing Editor of the WDA journal was Henri Dumont who negotiated a publishing contract with the publishers Backhuys, in Leiden, The Netherlands⁽³⁴⁾. Initially the journal was called PANTALA and subtitled the INTERNATIONAL JOURNAL OF ODONATOLOGY (ISSN 1388-7890). Two issues were published each year, the first appearing in 1998. The contents were predominantly scientific reports and scholarly reviews, refereed by members of an internationally constituted Editorial Board. To start the journal at short notice was a sterling achievement and contributed importantly to the morale of members in WDA’s fragile, formative years. Beginning with volume 4, part 1 in 2001, Reinhard Jödicke took over as Editor-in-Chief, and, beginning with volume 7, part 1 in 2004, the journal was published in-house and printed by Druckerei Koch, Reutlingen, Germany. Since volume 5, part 1 in 2002 the front cover has borne a colour photograph, selected by the Editor from members’ submissions for its odonatological interest and visual effect. A driving objective of the Editorial Board is for the journal to qualify for indexing in *Current Contents*, the *Science Citation Index* and *Research Alert*, the attainment of which still has to wait until a certain minimum number of issues has appeared. A noteworthy achievement has been the publication of volume 7, part 2 in 2004, a Special Issue of 430 pages, edited by Viola Clausnitzer, Chairman of the IUCN Odonata Specialist Group, and Reinhard Jödicke,

and entitled, "Guardians of the watershed. Global status of dragonflies: critical species, threat and conservation." This publication, focusing on conservation and compiled by regional experts, brings together the available information regarding the global threat status of dragonflies and their habitats; 42 authors contributed assessments concerning 22 regions. It will serve as a benchmark for the future conservation of dragonflies.

An author index for the journal is maintained on the IJO website at <http://ijo.tu-bs.de/home.html>.

Membership

Of the 42 persons attending the SIO International Symposium at Maribor in August 1997, 33 became Founder Members of WDA. By October 1997 the membership had reached 76 and by January 1998, 110. Thereafter membership grew steadily, reaching 253 from 35 countries by July 2003⁽³⁵⁾ 263 from 41 countries by July 2006⁽³⁶⁾; where, however, the membership total given on page 27 is incorrect), and 279 from 42 countries by July 2007 (37). Considering that WDA is taxon-defined and only ten years old, these are encouraging figures. Since January 1998 there has in addition been one affiliated society member⁽³⁸⁾.

Newsletter

The BL provide for the production of a newsletter twice a year. Since the first issue in October 1997, Jill Silsby has served as Editor. Researchers should note that the first issue, published in October 1997, was designated volume 1, no.1, and that there was no issue designated volume 1, no.2. The next issue, designated volume 2, no.1, was published in January 1998 and was followed by volume 2, no.2. So volume 1, no. 2 does not exist. It should also be noted that volume 9, no.1 contains pages 1-20 and volume 9, no.2 is paginated 13-27 whereas, to be consistent, the pagination should be 21-35. The newsletter began (volumes 1 and 2) under the name AGRION but for volumes 3-5 bore the name WDA'S AGRION because it was discovered that another publication enjoyed prior right to the name AGRION. When the latter publication ceased, WDA was free once again to use the name AGRION which it has done from volume 6, no.1 onwards; for volumes 3-5 the serial designation was ISSN 1462-8449 and thereafter ISSN 1476-2552⁽³⁹⁾. On 13 January 2003 the Board decided that AGRION thereafter should be made available on the WDA secure website, while members who still wished to receive it in hard copy could do so on request⁽⁴⁰⁾; by decision of the Trustees on 19 April 2007, from 2008 onwards AGRION will be available to members only on the website as a pdf file. Two study groups use the pages of AGRION twice a year to report their activities: PHAON (Pinhey's Heritage African Odonata Network) and ECHO, its Asian counterpart⁽⁴¹⁾. An author index to volumes 1-5 inclusive is included in AGRION volume 5, no.2, pp. 26-27.

For an association, especially a young association, a newsletter provides an invaluable means of keeping members informed of current events and, in that way, helping them to feel part of the society. WDA has been extraordinarily fortunate to have a lively, functional newsletter during its formative years and, on this account alone, owes much to Jill Silsby, who has been tireless, imaginative and dedicated as the founder editor of AGRION; she was succeeded in this role in 2007 by Keith Wilson and Graham Reels. It is no exaggeration to say that AGRION, together with the biennial Symposia, has provided the glue that has held members of WDA together. As the present article illustrates, the newsletter also provides a valuable resource for any Archivist. WDA members owe much to the editors of AGRION.

Patron

In June 2002 the Board unanimously approved two motions: (a) that, if all Board members agreed, WDA would seek a Patron; and (b) that, if all Board members agreed, WDA's choice of Patron would be Professor E.O. Wilson FRS, the distinguished Harvard entomologist. The Board was delighted and honoured when Professor Wilson cordially accepted WDA's invitation. There were several compelling reasons for the Board's choice but prominent among them was Professor Wilson's well-known commitment to in-depth taxon-focused biology. Nowadays taxon-focused biology is not among the most fashionable or well-funded pursuits and so can benefit from advocacy from such a respected source⁽⁴²⁾.

Regional meetings

As opportunity and interest dictate, Regional Meetings have been held, as follows: (i) in July 1998, for the European Region, at Lyndhurst, Hampshire UK⁽⁴³⁾; (ii) in July 2000, for the European region, at Darmstadt, Germany⁽⁴⁴⁾; (iii) in November 2000, for the Japanese Region, in Osaka, Japan⁽⁴⁴⁾; and (iv) in June 2002, for the European Region, in Leiden, The Netherlands⁽⁴⁵⁾.

Secretary

Initially the Offices of Secretary and Treasurer were combined, but from 2001 onwards they were separated. Because WDA is registered as a Charity by the UK Charity Commission, the Secretary (though not the Treasurer) must reside there. The Charity Commission would prefer that more than one Trustee be a UK resident, a situation that obtains in June 2007.

Treasurer

The first Treasurer of WDA was Jill Silsby, serving as joint Secretary/Treasurer. The second Treasurer was Dorothy Gennard, who was succeeded by David Fitch. WDA's financial position since its inception is shown in Table 1. Financial accounts appear in AGRION for varying periods ending 30 June 1999⁽⁴⁶⁾ and 30 June 2001⁽⁴⁷⁾. Subsequent accounts are included with other Officers' reports presented at the Biennial General Meetings.

Trustees

According to clause 3 (a) of BL⁽⁴⁸⁾, later amended⁽⁴⁹⁾, the Board shall consist of a Chairman (the President of WDA), a Vice Chairman (the President-elect of WDA), a Secretary, Treasurer (or Secretary/Treasurer), Managing Editor of the WDA Journal, plus at least two and not more than seven ordinary members. When necessary the Trustees may co-opt not more than two members to the Board provided that a maximum of twelve is not exceeded. According to clause G, an Executive Sub-Committee may be appointed (from among Trustees) by the Board which shall prescribe its function⁽⁵⁰⁾. The Executive shall consist of the Chairman, Secretary, Treasurer and one other Trustee (chosen according to the matter under discussion) and shall be responsible to the Board for day-to-day decisions it may make on the Board's behalf. The By-Laws stipulate that the Trustees shall regulate the allocation of certain tasks among themselves, the Secretary, Treasurer and Managing Editor being exempt from such an allocation. These tasks are: Chairman of an Arbitration Board, Chairman of a Conservation and Funds Committee, Co-ordinator of National Regional Offices, Co-ordinator of International Symposia of Odonatology, and Publicity and Network Officer⁽⁵¹⁾. The first Board of Trustees, representing five nations, together with their responsibilities, was announced to the membership in January 1998⁽⁵²⁾. Subsequently, membership of the Board has been announced in AGRION. The occupancy of elected and appointed positions in WDA since its inception is shown in Table 2. According to the CBL, all Trustees are elected by the membership at Biennial General Meetings, except the Chairman (who is succeeded by the Chairman-Elect) and the Secretary and the Treasurer (who are appointed by the Board of Trustees).

Website

WDA has been very fortunate that Colgate University, Hamilton, New York agreed initially to host its web pages⁽⁵³⁾ and that Rob Arnold volunteered to take over as Webmaster, or Network Officer⁽⁵⁴⁾. As the WDA membership becomes more computer literate, this website will become increasingly important as a vehicle for communication within the Association. BL (clause 9) stipulates that WDA shall use its website to establish an International Network of Odonatological Information (INOI) and also an Odonata Database (ODAT) with the aim of becoming the centre for information about WDA and Odonata on a computerised basis⁽⁵⁵⁾. Lists of links to other Odonata homepages and titles on ODAT appear in the Webmaster's reports to recent Biennial General Meetings^(56, 57). In July 2005 Richard Rowe announced⁽⁵⁸⁾ his and John Trueman's intention of providing web-based databasing of core information on the world odonate fauna, a project that would form an important component of ODAT and could be of inestimable value for future odonatologists. As of 2007 the WDA website is hosted by the University of Vigo, Spain⁽⁵⁹⁾ and the current Webmaster is Adolfo Cordero.

Table 1. The financial position of WDA during certain years

	Period								
	1999	2000	2001	2002	2003	2004	2005	2006	2007
Total income	2,197	6,800	8,034	4,958	8,667	10,673	9,727	13,758	12,841
Total expenditure	750	6,901	4,519	5,096	9,762	9,734	13,292	10,336	13,537
Carried forward	5,692	7,139	7,038	10,554	13,553	12,259	13,198	9,634	13,058
New balance	7,139	7,038	10,554	10,416	12,259	13,198	9,634	13,058	12,362

Notes to Table 1

1. Amounts rounded up to nearest pound sterling.
2. 1999 for six months: July – December; all others calendar year.
3. Annual accounts 2002 and prior did not include expenses or income from non UK accounts (held in US Dollars and Euros), and reported balances in US and Euro accounts as income. Balance carried forward in 2003 includes all funds in all currencies.
4. Amounts carried forward are not adjusted for exchange rate fluctuation.
5. Income in 2006 included a single special donation of 2,756 GBP (\$5,375 USD) via American Fund for Charities, a tax-qualified charity through which US donors may make gifts on a tax-deductible basis.
6. Amounts for 2007 provisional as of December 10, 2007.
7. Income in 2007 included a single special donation of 2,196 GBP (\$4,534 USD) via American Fund for Charities, a tax-qualified charity through which US donors may make gifts on a tax-deductible basis.

Table 2. Occupancy of elected and appointed positions in WDA up to July 2007

Position	Period				
	1997-1999	1999-2001	2001-2003	2003-2005	2005-2007
1. President	MJP	MJP	PSC	MLM	HU
2. President-elect	*	PSC	MLM	HU	GP
3. Past-President	*	*	MJP	PSC	MLM
4. Secretary	JDS	JDS	LMA	LMA	LMA
5. Treasurer	JDS	JDS	DG	DAF	DAF
6. Trustee	VEM	VEM	*	*	*
7. Editor IJO (T)	HJD	HJD	RJ	RJ	RJ
8. ISC (T)	*	J-GP	GP	GP	RJR
9. Chair C/FF (T)	*	*	RK/FS	FS	GS
10. Chair C/FC (T)	*	*	*	*	VC
11. RC (T)	*	*	HU	DRP	DRP
12. Liaison (T)	*	WS	VC	VC	VC
13. Webmaster (T)	*	RA	RA	RA	RA
14. Asst. Webmaster	*	*	*	KA	KA
15. Editor AGRION	JDS	JDS	JDS	JDS	JDS
16. Archivist	*	*	*	PSC	KA
17. NR (Japan)	*	*	KH	KH	YT
18. RC (Germany)	*	WS	WS	WS	WS
19. RC (UK)	*	PA	PA	PA	PA
20. RC (USA)	*	*	VEM	VEM	DAF
21. Patron	*	*	EOW	EOW	EOW

*An asterisk indicates that the position did not exist or that there was no incumbent.

Abbreviations

A	<i>AGRION</i>	KA	Kevin Arnold
BL	ByLaws	KDPW	Keith Wilson
CBL	Constitution and By Laws	KH	Kazunori Higashi
C/FF	Conservation and Funds Committee: Funds	LMA	Linda Averill
C/FC	Conservation and Funds Committee: Conservation	MJP	Mike Parr
DAF	David Fitch	MLM	Mike May
DG	Dorothy Gennard	NR	National Representative
DRP	Dennis Paulson	ODAT	Odonata Database
EOW	E.O. Wilson	PA	Peter Allen
FS	Frank Suhling	PSC	Philip Corbet
FSIO	Foundation Societas Internationalis Odonatologica	RA	Rob Arnold
GP	Gordon Pritchard	RC	Regional Coordinator
GS	Göran Sahlén	RJ	Reinhard Jödicke
HJD	Henri Dumont	RJR	Richard Rowe
HU	Hidenori Ubukata	RK	Robert Ketelaar
IDF	International Dragonfly Fund	SIO	Societas Internationalis Odonatologica
IJO	<i>International Journal of Odonatology</i>	T	Trustee
INOI	International Network of Odonatological Information	UK	United Kingdom
ISC	International Symposia Coordinator	USA	United States of America
JDS	Jill Silsby	VC	Viola Clausnitzer
J-GP	Jean-Guy Pilon	VEM	Vicky McMillan
		WDA	Worldwide Dragonfly Association
		WS	Wolfgang Schneider
		YT	Yoshitaka Tsubaki

References

In the following list the newsletters AGRION is abbreviated as 'A'.

1. A1(1): 3-4.
2. A1(1): 4.
3. A1(1): 12-14.
4. A1(1): 4-12.
5. A4(1): 13.
6. A2(1): 7.
7. A2(2): 21. <bierschorr@online.de>.
8. A5(1): 1.
9. A8(2): 13-14.
10. A8(2): 15.
11. A2(1): 1.
12. A2(2): 15.
13. A6(2): 13.
14. A6(2): 22-23; A9(1): 2.
15. A6(2): 14.
16. A9(1): 2.
17. Marinov, M. (2001). *IDF-Report* 3: 9-16.
18. Dijkstra, K-D. B. (2005). *IJO* 8: 1-32; (2006). 9: 51-70; 119-132.
19. Srivastava, D.S. et al. (2005). *IJO* 8: 67-79.
20. Oppel, S. (2005). *IJO* 8: 243-257. 9: 81-88; 89-102.
21. A7(2): 27-28.
22. A1(1): 10.
23. A4(1): 5-7.
24. A6(1): 3-6.
25. A7(2): 14-18.
26. A10(1): 2-4.
27. A11(1): 2; A11(2): 13-16; A12(1): in press.
28. PSC file designation D\temp\vigo.plen
29. Corbet, P.S. (ed.) (2000). Current topics in odonatology. Colgate University, Hamilton, New York, 33 pp.
30. A9(1): 2.
31. A4(1): 5-6.
32. A6(1): 1.
33. *Libellennachrichten* 8/9: 12.
34. A(1): 13.
35. A7(2): 28.
36. A10(2): 27.
37. A11(2): 20.
38. A6(1): 10.
39. A7(1): 1.
40. A7(1): 11.
41. A8(2): 22-28; A9(1): 18; A9(2): 21-23, 24-26.
42. A7(1): 1.
43. A3(1): 4.
44. A5(1): 2.
45. A6(1): 7; A7(1): 3-4.
46. Biennial Report (2001-2002), Appendix C.
47. Biennial Report (2003-2004), Appendix C.
48. A1(1): 8.
49. A7(2): 28.
50. A1(1): 5.
51. A1(1): 9-10.
52. A2(1): 2.
53. <http://powell.colgate.edu/wda/dragonfly.htm>
54. A2(1): 7.
55. A1(1): 11.
56. Biennial Report (2001-2002). Appendix A.
57. Biennial Report (2003-2004), Appendix D.
58. A9(2): 1-2.
59. <http://ecoevo.uvigo.es/WDA>



Communicating about Odonata of Tropical Asia

No. 5 - January 2008
(published in *AGRION* vol. 12, number 1)

ECHO publishes small notes and articles on dragonflies of tropical Asia. The newsletter is meant to keep other workers updated on work in progress and gives the opportunity to publish small faunistic papers. All those interested and active in this region are invited to contribute. The deadline for the next Echo is the first of May 2008.

This issue of Echo is well filled and includes a book announcement, three small notes, two small articles and two larger articles. It is good to see that this issue covers a large part of the area of interest with articles from Sri Lanka, China, Malaysia, Thailand and the Philippines.

Vincent Kalkman [Kalkman@naturalis.nl]

Book announcement The Metalwing Demoiselles of the Eastern Tropics

"The Metalwing Demoiselles (*Neurobasis* and *Matronoides*) of the Eastern Tropics: Their identification and biology", by Bert Orr and Matti Hämäläinen, was published in August 2007. The book deals with all aspects of the systematics and biology of the genera, *Neurobasis* and *Matronoides*, the 'Birds of Paradise among Odonata'. As well as providing a definitive review and identification guide, special topics include history of discovery, analysis of behaviour, and a discourse on the basis of the iridescent colour of these insects. The book is richly illustrated with 116 figures, more than half in colour. Every species is illustrated by a full colour painting of the male, with females of most represented by paintings and/or by colour photographs. It includes a foreword by Professor Philip Corbet. Vital statistics are as follows.

Publisher: Natural History Publications (Borneo)
First Published: August 2007
No. of Pages: x + 115 pp.
Size: 18.5 x 25.5 cm (Hardcover)
ISBN: 983-812-123-1
Price: \$US 76
Weight: 700g.

It is available from the publisher at <http://www.nhpborneo.com/main.htm> A few copies will be available for purchase from the authors.

Work on dragonflies in Sri Lanka

Nancy van der Poorten, Hammaliya Estate, Bandarakoswatte, Sri Lanka [info@srilankaninsects.net]

My husband and I are currently doing a private study of the butterflies and dragonflies of Sri Lanka. The dragonfly fauna has been relatively well studied starting in the late 1800's, mostly by the British, and continuing until about 1975 with various international expeditions. Little has been done by the Sri Lankans themselves, though in 2000, Terence DeFonseka published a book The Dragonflies of Sri Lanka which was a compilation of the literature to date. It is a great resource but was not based on much field work. Currently, myself and two other non-Sri Lankans, Matjaz Bedjanic and Karen Conniff, are studying the dragonflies here, as well as a few local people. We are working on documenting life histories and distributions; there are still a lot of unknowns. We have found some very interesting information about life histories, new information on distribution and suspect that there are even some new species here! A new field guide, Dragonflies of Sri Lanka, has just been published by Matjaz Bedjanic, Karen Conniff and Gehan de Silva Wijeyeratne. Unfortunately, the political situation in the country is not very good and travel is a little restricted. However, we can still get to some very interesting dragonfly areas. Sri Lanka is a small country but has very diverse ecosystems, from dry, arid plains to wet lowlands and wet hills and montane regions. Much of the dragonfly fauna is similar to that of India but there are a lot of endemics as well. I enjoy raising dragonfly larvae and would be interested in hearing from anyone who also does so.

[Editor] Note the details of the new Sri Lankan book, briefly mentioned by Nancy above, are: -
Bedjanic, M., de Silva Wijeyeratne, G., and Conniff, K. (2007). Dragonflies of Sri Lanka. Gehan's Photo Guide Series. Jetwing Eco Holidays: Colombo. 248 pages (A5). ISBN 978-955-1079-15-4. Rs 1,750. It is a photographic field guide to the dragonflies of Sri Lanka covering 91 of the 118 species found in Sri Lanka. It includes 35 of the 52 endemic species. A pdf of the book can be downloaded (free of charge) from www.jetwingeco.com/ <http://www.jetwingeco.com/>.

Ovipositing of *Ischnura aurora*
Xin Yu [yuxin@mail.nankai.edu.cn]

In the summer of 2006, I went to Yunnan, China for fieldwork. In a valley in Tengchong County I noticed a female *Ischnura aurora* ovipositing in the centre of a little pool on a stem of a kind of horsetail (*Equisetum* sp.). She moved slowly down along the stem into the water and stayed below the water for about two minutes. Suddenly, just like a missile launched from a submarine, she was ejected out of the water without leaving a ripple on the face of the pool and without any interruption she flew around and ceased at another stem nearby. All this happened in a split second and I am sure she came out off the water directly, so without crawling upward along the stem, as the position where she came out of the water was at a little distance from the stem of the plant. About one minute later, she tested the new stem with her ovipositor and went down into the water again. Four minutes later she used the same trick and came out of the water and flew away. I have observed the submerged oviposition behaviour of *Ischnura asiatica*, *Paracercion v-nigrum*, *Euphaea ochracea*, and some other species, but they never showed such an impressive style like this female *Ischnura aurora*.

Some notes on the dragonflies of Dinagat, northeast Mindanao, Philippines
Reagan Villanueva, reaganjoseph@lycos.com

[As part of his study Reagan is currently working at a hospital on Dinagat Island, situated to the NE of Mindanao]. When arriving on Dinagat Island I travelled through the interior from Dinagat town to Albor-Libjo. The entire area from Dinagat to Albor was completely deforested and I saw only some areas with secondary growth, particularly in the mountain areas of Basilisa. Dragonfly habitats seen along the road included small ponds, wet rice field areas and creeks. Some small rivulets and trickles were present along some roadside cliffs. *Pantala flavescens* was often seen at roadsides and in open areas, *Macrodiplax cora* was also seen hovering at some ponds and pools along the road.

While staying in the Albor District Hospital for 3 days I managed to explore few places in its vicinity. The area seems to be bare of forest specialist and only *Prodasineura integra* was noted near a small stream. Several opportunistic species like *Diplacodes trivialis*, *Neurothemis terminata* and *Orthetrum sabina* were the only Anisoptera encountered.

I arrived in Loreto and stayed in Loreto District Hospital where I work as medical officer. I explored the surrounding waterways and managed to collect some specimens of *Teinobasis* sp. (nov?). in the nearby Nipa swamp were *Raphismia bispina* was also present. Aside from several widespread oriental species I managed to collect a *Gynacantha* sp female entering the hospital.

During a short trip to a river near the entrance road to Chromico mining firm I saw *Euphaea amphicyana* and *Drepanosticta mylitta* and *Risiocnemis appendiculata* were found at a shaded rivulet near the river.

A trip to Paragua Forest reserve yielded two new records for the island: *Rhinagrion philippina* and *Teinobasis* cf *filamentum*. *Risiocnemis praeusta* is the commonest species found in the area and was even found at some distance from the waterways.

In total I visited seven sites thus far mostly within Loreto and a total of 29 species were recorded.

**List of Species Recorded at Gunung Mulu National Park,
Sarawak, Malaysian Borneo in 2005-2006**
Rory Dow [rory.dow@virgin.net]
Graham Reels [gtreels@cyberdude.com]

The authors presented a list of species that we had collected at Gunung Mulu National Park in Sarawak as a poster at the 17th SIO meeting in Hong Kong in 2006. However, as many will not have had the opportunity to see these records, we give an updated version here. The current list differs from that presented in Hong Kong mainly in that one species, *Mortonagrion alcyone*, has been removed. After examining genuine *alcyone* in the Natural History Museum, Leiden (Netherlands), it became clear that specimens from Mulu previously treated as *alcyone* were not that species; they are probably a form of *Argiocnemis rubescens rubeola*, and are provisionally listed as such here, although the possibility remains that they may represent an undescribed *Argiocnemis* species.

Gunung Mulu National Park, with an area of 544 km², is the largest national park in Sarawak. It is located in northeast Sarawak close to the border with Brunei. Gunung Mulu, a sandstone massif, dominates the park. The park covers an altitudinal range from close to sea level up to 2376m at the summit of Gunung Mulu. A number of smaller limestone mountains run along the western face of Gunung Mulu. With the exception of mangrove forest, all of the main vegetation types found in Sarawak are represented within the park: mixed dipterocarp forest (MDF), montane forest, limestone forest, alluvial forest (including freshwater swamp forest), kerangas (tropical heath) forest and peatswamp forest.

In 2005 and 2006 we were granted permission to collect Odonata within the park by the Sarawak Forestry Department. Collecting was carried out from 16th April to 24th April 2005 and from 4th February to 20th February 2006.

We are writing this in Sarawak, and the first author will be revisiting Gunung Mulu National Park in January 2008 for further collecting, so the species list presented here will almost certainly need to be updated in the very near future. At present, however, some 106 species are known from the park, of which at least four represent probable new species.

List of Species Recorded at Gunung Mulu National Park, Sarawak, Malaysian Borneo in 2005-2006

ZYGOPTERA

Amphiptyerygidae

Devadatta podolestooides Laidlaw, 1934

Chlorocyphidae

Heliocypha biseriata (Selys, 1859)

Libellago aurantiaca (Selys, 1859)

Libellago hyalina (Selys, 1859)

Libellago semiopaca (Selys, 1873)

Libellago stictica (Selys, 1869)

Rhinocypha eurofulgens Laidlaw, 1931

Rhinocypha cucullata Selys, 1873

Rhinocypha ?spinifer Laidlaw, 1931

Rhinocypha stygia Förster, 1897

Sundacypha petiolata (Selys, 1859)

Euphaeidae

Dysphaea dimidiata (Selys, 1853)

Dysphaea lugens (Selys, 1873)

Euphaea impar (Selys, 1859)

Euphaea subcostalis (Selys, 1873)

Euphaea tricolor (Selys, 1859)

Calopterygidae

Neurobasis longipes Hagen, 1887

Vestalis amabilis Lieftinck, 1965

Vestalis amaryllis Lieftinck, 1965

Vestalis amnicola Lieftinck, 1965

Vestalis amoena (Hagen, 1853)

Vestalis atropha Lieftinck, 1965

Vestalis beryllae Laidlaw, 1915

Megapodagrionidae

Podolestes orientalis Selys, 1862

Rhinagrion borneense (Selys, 1886)

Platystictidae

Drepanosticta barbatula Lieftinck, 1940

Drepanosticta ?forficula Kimmings, 1936

Drepanosticta rufostigma (Selys, 1886)

Drepanosticta ?versicolor (Laidlaw, 1913)

Drepanosticta species near *rufostigma* (Selys, 1886)

Drepanosticta new species

Protosticta species

Protoneuridae

Elattoneura analis (Selys, 1860)

Prodasineura dorsalis (Selys, 1860)

Prodasineura hosei (Laidlaw, 1913)

Prodasineura hyperythra (Selys, 1886)

Prodasineura verticalis (Selys, 1860)

Prodasineura sp. c.f. *peramoena* (Laidlaw, 1913)

Coenagrionidae

Aciagrion borneense Ris, 1911

Agriocnemis femina (Brauer, 1868)

Amphicnemis martini Ris, 1911

Amphicnemis remiger Laidlaw, 1912

Amphicnemis ?wallacii Selys, 1863

Archibasis tenella Lieftinck, 1949

Archibasis viola Lieftinck, 1949

Argiocnemis rubescens rubeola Selys, 1877

Ceriagrion bellona Laidlaw, 1915

Ceriagrion cerinorubellum (Brauer, 1865)

Mortonagrion falcatum Lieftinck, 1934

Pseudagrion lalakense Orr & van Tol, 2001

Pseudagrion perfuscatum Lieftinck, 1937

Pseudagrion pilidorsum (Brauer, 1868)

Stenagrion ?dubium (Laidlaw, 1912)

Teinobasis ?new species

Xiphagrion cyanomelas (Selys, 1876)

Platycnemididae

Coeliccia borneensis (Selys, 1886)

Coeliccia cyaneothorax Kimmings, 1936

Coeliccia new species

Coeliccia nemoricola Laidlaw, 1912

Coeliccia nigrohamata Laidlaw, 1918

Copera vittata (Selys, 1863)

ANISOPTERA

Gomphidae

Gomphidia macclachlani (Selys, 1873)

Heliogomphus borneensis Lieftinck, 1963

Ictinogomphus decoratus (Selys, 1858)

Leptogomphus coomansi Laidlaw, 1936

Leptogomphus pasia van Tol, 1990

Leptogomphus ?new species

Microgomphus ?chelifer (Selys, 1858)

Sieboldius japonicus (Selys, 1854)

Aeshnidae

Gynacantha dohrni Krüger, 1899

Heliaeschna simplicia (Karsch, 1891)

Indaeschna grubaueri (Förster, 1904)

Corduliidae

Idionyx species

Macromia cydippe Laidlaw, 1922

Macromidia fulva Laidlaw, 1915

Libellulidae

Aethriamanta gracilis (Brauer, 1878)

Agrionoptera insignis (Rambur, 1842)

Brachydiplax chalybea Brauer, 1868

Brachydiplax farinosa Krüger, 1902

Brachygonia oculata (Brauer, 1878)

Cratilla metallica (Brauer, 1878)

Hydrobasileus croceus (Brauer, 1867)

Lyriothemis biappendiculata (Selys, 1878)

Lyriothemis cleis Brauer, 1868

Nannophya pygmaea Rambur, 1842

Nesoxenia lineata (Selys, 1868)

Neurothemis fluctuans (Fabricius, 1793)

Neurothemis terminata Ris, 1911

Onychothemis coccinea Lieftinck, 1953

Onychothemis culminicola Förster, 1904

Orchithemis pulcherrima Brauer, 1878

Orthetrum chrysitis (Selys, 1891)

Orthetrum glaucum (Brauer, 1865)

Orthetrum pruinosum schneideri Förster, 1903

Orthetrum testaceum (Burmeister, 1839)

Pantala flavescens (Fabricius, 1798)

Pornothemis serrata Krüger, 1902

Rhodothemis rufa (Rambur, 1842)

Rhyothemis triangularis Kirby, 1889

Tetrathemis irregularis hyalina Kirby, 1889

Trithemis aurora (Burmeister, 1839)

Trithemis festiva (Rambur, 1842)

Tyriobapta kuekenthali (Karsch, 1900)

Tyriobapta laidlawi Ris, 1919

Tyriobapta torrida Kirby, 1889

Zyxomma petiolatum Rambur, 1842

**Checklist of dragonflies of UKM Campus,
including Bangi Forest Reserve, Bangi, Selangor, Malaysia**
Chee Choong [cychoong@ukm.my],
Bert Orr [agorr@bigpond.com] &
Rory Dow [rory.dow@virgin.net]

The Bangi Forest Reserve (Hutan Simpan Bangi), in Selangor state, West Malaysia, occupies much of the grounds of the Universiti Kebangsaan Malaysia (UKM) Bangi campus. The area consists of 100 hectares of old growth secondary lowland dipterocarp forest, effectively an island habitat in the midst of highly disturbed open country, oil palm plantation and urban development. Within the forest are a number of small streams, small ponds and swampy areas. A satellite map of the site may be seen at <http://www.ukm.my/hutan>, in which various locations are indicated. Over the past three years the first author has regularly sampled Odonata from the confines of the UKM Bangi campus, including the forest reserve and adjacent open areas. The second and third authors recently visited the site, and added slightly to the list.

In total 74 species from 13 families were recorded. This compares with 235 species from 15 families recorded from Peninsular Malaysia and Singapore (Orr, 2005, Dow, Choong and Orr, 2007, Choong 2006, Choong and Orr, unpublished records). To find more than 30 percent of a major region's rich fauna concentrated on a single university campus is we believe, some kind of record, and surely provides a magnificent opportunity for using these lovely insects for teaching and research.

As might be expected, the species composition leans towards more common eurytopic species, with specialized caloperygoids and gomphids, inhabitants of running water, less evident. It is interesting also, that certain widespread eurytopic species, such as *Ischnura senegalensis*, (Rambur, 1842) and *Diplacodes trivialis* (Rambur, 1842), to name but two, are yet to be recorded on the campus, and we may expect at least a few further discoveries in the future. On the other hand *Anax panybeus* Hagen 1867, a crepuscular species, was found in the campus. It is a new record for Peninsular Malaysia and Singapore.

CHECKLIST

ZYGOPTERA

Amphiptyeridae

Devadatta argyoides (Selys, 1859)

Calopterygidae

Vestalis gracilis (Rambur, 1842)

Chlorocyphidae

Libellago lineata (Burmeister, 1839)

Euphaeidae

Euphaea impar Selys, 1859

Lestidae

Lestes praemorsus decipiens Kirby, 1893

Megapodagrionidae

Podolestes buwaldai Lieftinck, 1940 (Only old records from 1982 student collections)

Podolestes orientalis Selys, 1862

Coenagrionidae

Agriocnemis femina (Brauer, 1868)

Agriocnemis nana (Laidlaw, 1914)

Archibasis rebecca Kemp, 1989

Argiocnemis rubescens rubeola Selys, 1877

Ceriagrion cerinorubellum (Brauer, 1865)

Mortonagrion aborense (Laidlaw, 1914)

Onychargia atrocyana Selys, 1865

Pseudagrion australasiae Selys, 1876

Pseudagrion microcephalum (Rambur, 1842)

Pseudagrion pruinosum (Burmeister, 1839)

Pseudagrion rubriceps Selys, 1876

Platycnemidae

Coelicia octogesima (Selys, 1863)

Copera ciliata (Selys, 1863)

Copera marginipes (Rambur, 1842)

Copera vittata (Selys, 1863)

Protoneuriidae

Prodasineura humeralis (Selys, 1860)

Prodasineura collaris (Selys, 1860)

Prodasineura notostigma (Selys, 1860)

ANISOPTERA

Gomphidae

Ictinogomphus decoratus melaenops (Selys, 1858)

Paragomphus capricornis (Förster, 1914)

Aeshnidae

Anax guttatus (Burmeister, 1839)

Anax panybeus Hagen, 1867

Gynacantha basiguttata Selys, 1882

Gynacantha bayadera Selys, 1891

Gynacantha subinterrupta Rambur, 1842

Corduliidae

Idionyx yolanda Selys, 1871

Libellulidae

Acisoma panorpoides Rambur, 1842

Aethriamanta brevipennis (Rambur, 1842)

Aethriamanta gracilis (Brauer, 1878)

Agrionoptera insignis (Rambur, 1842)

Agrionoptera sexlineata Selys, 1879

Brachydiplex chalybea Brauer, 1868

Brachydiplex farinosa Krüger, 1902

Brachythemis contaminata (Fabricius, 1793)

Cratilla metallica (Brauer, 1878)

Crocothemis servilia (Drury, 1770)

Diplacodes nebulosa (Fabricius, 1793)

Hydrobasileus croceus (Brauer, 1867)

Indothemis limbata (Selys, 1891)

Lathrecista asiatica (Fabricius, 1798)

Lyriothemis biappendiculata (Selys, 1878)

Nannophya pygmaea Rambur, 1842

Neurothemis fluctuans (Fabricius, 1793)

Neurothemis fulvia (Drury, 1773)

Onychothemis testacea Laidlaw, 1902

Orchithemis pulcherrima Brauer, 1878

Orthetrum chrysis (Selys, 1891)

Orthetrum glaucum (Brauer, 1865)

Orthetrum luzonicum (Brauer, 1868)

Orthetrum sabina (Drury, 1770)

Orthetrum testaceum (Burmeister, 1839)

Pantala flavescens (Fabricius, 1798)

Potamarcha congener (Rambur, 1842)

Pseudothemis jorina Förster, 1904

Rhodothemis rufa (Rambur, 1842)

Rhyothemis aterrima Selys, 1891

Rhyothemis obsoletescens Kirby, 1889

Rhyothemis phyllis (Sulzer, 1776)

Rhyothemis triangularis Kirby, 1889

Tetrathemis irregularis hyalina Kirby, 1889

Tholymis tillarga (Fabricius, 1798)

Tramea transmarina euryale Selys, 1878

Trithemis aurora (Burmeister, 1839)

Trithemis festiva (Rambur, 1842)

Tyriobapta torrida Kirby, 1889

Urothemis signata insignata (Selys, 1872)

Zyxomma petiolatum Rambur, 1842

References

- Choong, C.Y., 2006. *Burmagomphus insularis*: A new Odonata record for Peninsular Malaysia. *Malaysian Naturalist* 59(4): 7-9.
- Dow, R.A., C.Y. Choong & A.G. Orr, 2007. Two new species of *Chalybeothemis* from Malaysia, with a redefinition of the genus (Odonata: Libellulidae). *International Journal of Odonatology* 10(2): 171-184.
- Orr, A.G., 2005. *Dragonflies of Peninsular Malaysia and Singapore*. Natural History Publications (Borneo), Kota Kinabalu. vi + 127 pp.



Figure 1. Forested swamp off Jalan Dengkil, habitat for many libellulids, including *Rhyothemis aterrima*, the platycnemidids *Copera vittata* and *C. marginipes* and the megapodagrionid *Podolestes orientalis*. Photo CY Choong.



Figure 2. *Podolestes orientalis*, male. Photo CY Choong.



Figure 3. *Rhyothemis aterrima*, male, Photo CY Choong.



Figure 4. *Nannophya pygmaea* (wingspan ca 2 cm). Photo, CY Choong.



Figure 5. Pond near engineering faculty drained by a small rivulet (foreground), habitat of *Vestalis gracilis* and *Copera ciliata*. The pond harbours, among others, *Orthetrum*, *Rhyothemis* and *Trithemis* species, *Nannophya pygmaea* and *Agriocnemis nana*. Photo AG Orr.

Revised Checklist of Hainan Odonata, China
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A revised checklist of the odonates of Hainan is provided. In total 146 species are listed, which includes 16 unpublished species records. Six of these species are recorded from Chinese territory for the first time. The Hainan fauna is briefly compared with the odonate fauna from Taiwan.

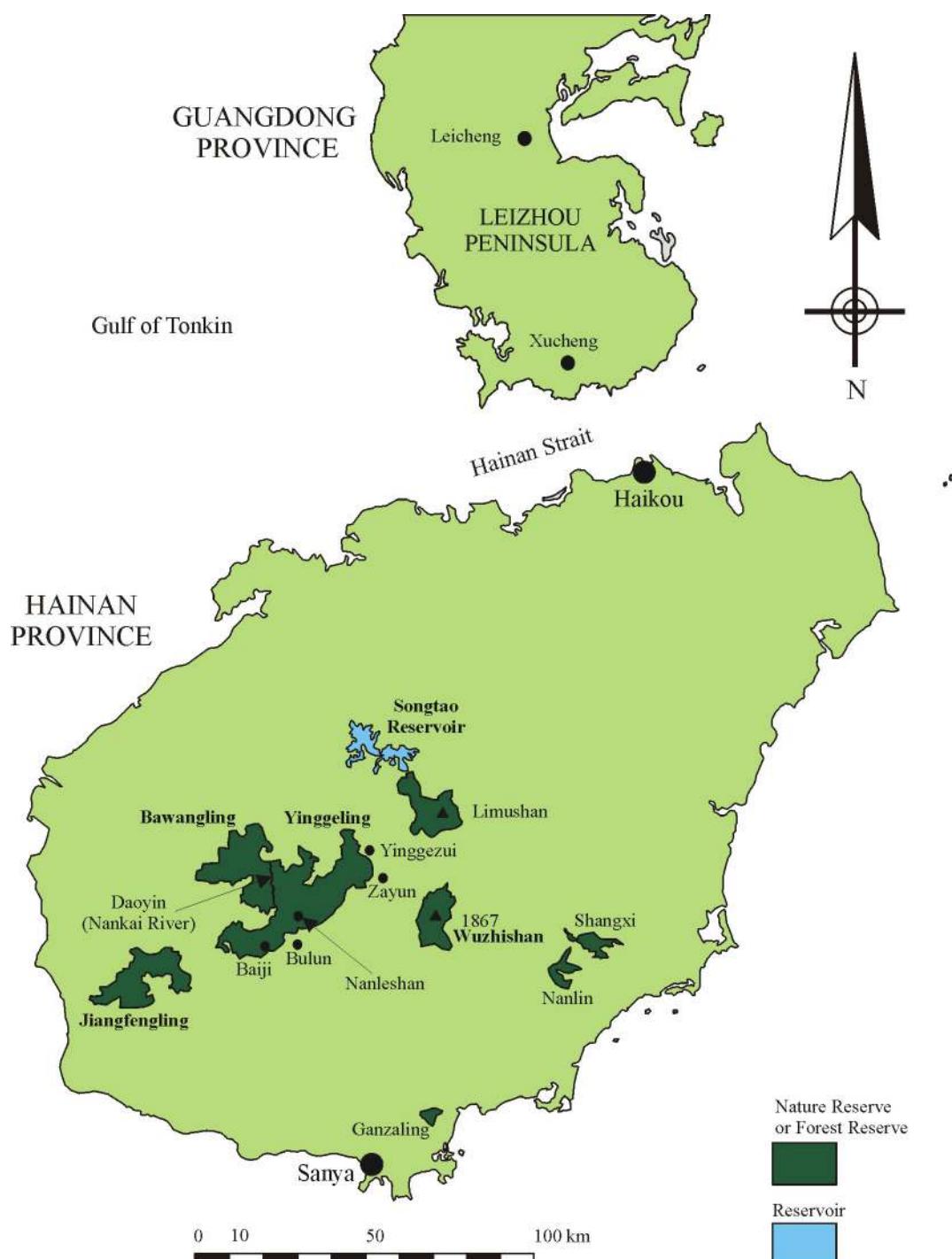


Figure 1. Map of Hainan showing sites surveyed

Introduction

The odonate fauna from Hainan was enumerated by Wilson and Reels (2001) who provided details of 127 species including 12 new species descriptions and 71 taxa previously unrecorded from Hainan. Additional survey work undertaken by the authors, Michael Lau and Bosco Chan from Kadoorie Farm and Botanic Garden Corporation and published records by others has revealed a further 19 species occurring in Hainan. Since the publication of Wilson and Reels's (2001) paper, one new species has been described from Hainan, namely *Heliocypha huai* Zhou & Zhou (2006). Another revision to the 2001 list concerns *Chlorogomphus icarus*, described from Hainan in Wilson & Reels (2001), which was synonymised with *Chlorogomphus usudai* Ishida by Wilson (2002). *Lestes* sp. listed by Wilson & Reels (2001) is replaced here by *Lestes praemorsus* Selys. Details of the 20 species recorded in addition (or amendment) to the Wilson and Reels (2001) list are provided here and comments are also given for doubtful, or questionable, records.

Additional Hainan Records

Details of recorders are as follows: KW = Keith DP Wilson; GR = Graham T Reels; ML = Michael Lau; BC = Bosco Chan; ZX = Zaifu XU. A map showing the location of sites surveyed is provided in Figure 1.

Diphlebiidae

Philoganga vetusta Ris, 1912

Philoganga vetusta Ris, 1912; - Hua, 2000: 6

Specimens: 1 ♂, Limushan NR, 14-vii-2002, coll. KW; 1 ♂, Songtao Reservoir, 16-vii-2002; coll. KW; 1 ♂, Xiaonanning, Shangxi NR, 20-vi-2007, coll. GR.

Remarks: The basal abdomen of mature male *Philoganga vetusta* from the mainland is bright yellowish-orange whereas Hainan males are coloured reddish-orange.

Chlorocyphidae

Rhinocypha (Heliocypha) huai Zhou & Zhou, 2006

Figures 2-7, Photo 1

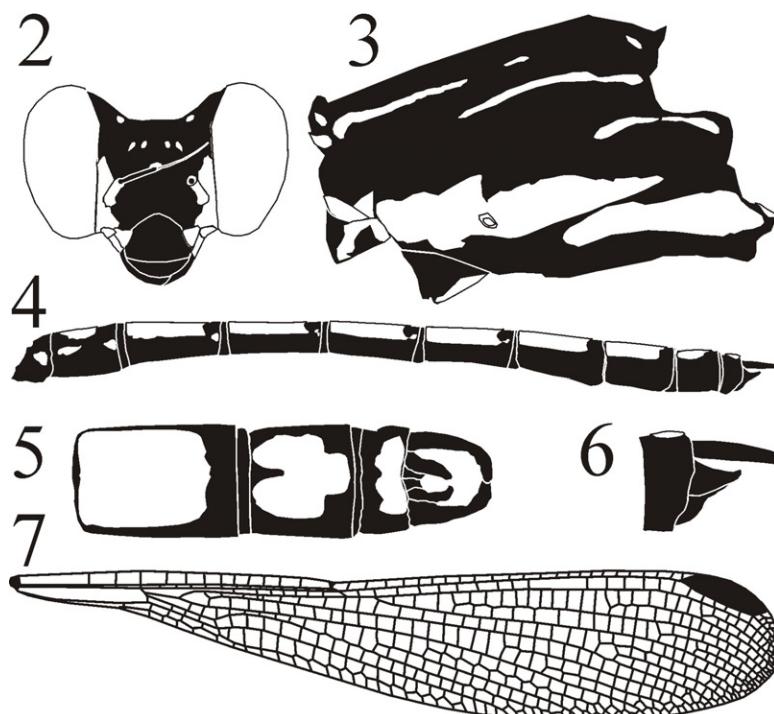
Heliocypha huai Zhou & Zhou, 2006: 13-16 (type-loc. Jianfengling, Hainan, 2 ♂, 21-ix-1981, coll. Hua Lizhong).

Rhinocypha ogasawarensis not of Oguma, 1913; - Hua, 2000: 7 (Hainan).

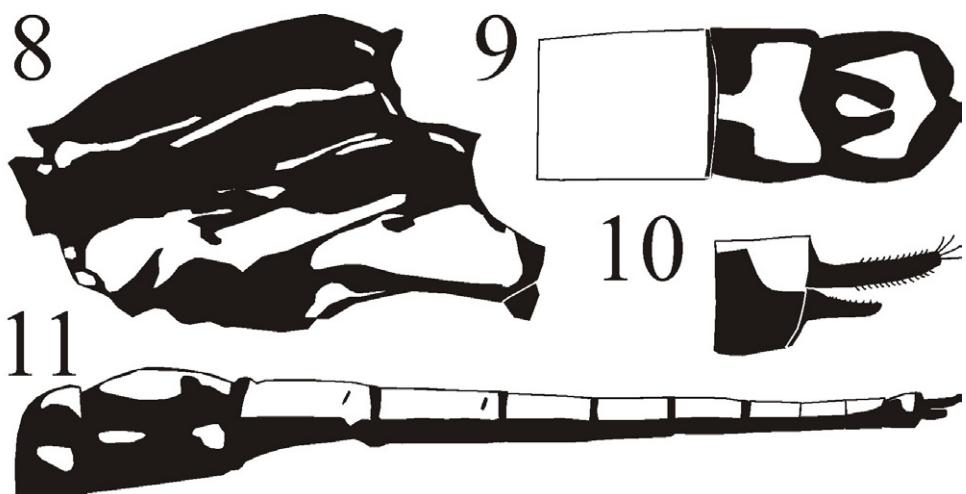
Specimens: 3 ♂, Wuzhishan, 15-vii-2002, coll. KW; 4 ♂, 2 ♀, Songtao Reservoir, 16-vii-2002; coll. KW; 1 ♂, 1 ♀, Baiji River, Yinggeling Nature Reserve, 22-xi-2005, leg. GR.

Description: Small *Rhinocypha* with dorsum of abdomen reddish-orange and black thorax with bright yellow markings. Pterostigmata are initially white but change with age to a bicoloured state, with the basal part turning dark brown first and finally become entirely brown. In some males the apical tip of the hindwing is coloured pale brown.

Remarks: The main differences when compared with *Rhinocypha drusilla* Needham, 1930, which is recorded from south China including Guangdong and Guangxi and illustrated in Figs 8-11, are (i) pterostigma significantly broader, which changes to uniform dark brown in mature males whereas *drusilla* from mainland retains bicoloured state, (ii) dorsum of frons in *huai* is entirely black compared with *drusilla* which is black with a pair of large yellow spots and (iii) abdomen of *huai* has a different pattern on the dorsum with S3-8 red invaded by black distally each side of dorsal carina whereas S3-8 of *drusilla* is entirely red except sutures. *Rhinocypha huai* is very similar in general appearance to *Rhinocypha uenoi* Asahina, 1964, which is hyaline-winged and known only from Iriomote Island, Ryukyus, Japan. It has similar colouration and body markings but its inferior appendages are markedly hooked inwards at their tips in contrast to *huai* which has only slightly hooked tips.



Figures 2-6. *Rhinocypha huai*.
 (2) Head, frontal; (3) synthorax, lateral; (4) abdomen, lateral; (5) caudal abdomen and genitalia, dorsal; (6) caudal genitalia, lateral; (7) hindwing.



Figures 8-11. *Rhinocypha drusilla*, Guangxi. (8) Synthorax, lateral; (9) caudal abdomen, dorsal; (10) caudal genitalia, lateral; (11) abdomen, lateral.



Photo 1. *Rhinocypha huai*, Wuzhishan, Hainan

Euphaeidae

Dysphaea gloriosa Fraser, 1938

Specimens: 1 ♂, Nankai River, Yinggeling Nature Reserve, 25-viii-2005, coll. GR; 1 ♂, Nankai River, 18-v-2007, coll. GR.

Remarks: Only previously recorded in China from Yunnan (Hua, 2000). Also recorded from India, Laos and Thailand.

Lestidae

Lestes (Platylestes) praemorsus Selys, 1862

Specimens: 1 ♂, Yinggezui, 26-v-2007, coll. GR.

Remarks: In view of this second Lestes species now recorded from Hainan, *Lestes* sp., included in the Wilson and Reels (2001) checklist, has been dropped. See also, remarks for *Lestes virens*, under doubtful records.

Synlestidae

Sinolestes editus Needham, 1930

Specimens: 2 ♂, Nanleshan, Yinggeling Nature Reserve, 17-v-2005, coll. ML; 1 ♂, Nanleshan, 18-v-2005, coll. ML; 1 ♂, Nanleshan, 19-v-2005, coll. BC.

Remarks: This species is hitherto known from montane localities throughout south China including Fujian, Guangdong, Guangxi, Taiwan and Zhejiang.

Megapodagrionidae

Rhipidolestes cyanoflavus Wilson, 2000

Specimens: 1 ♂, Nanleshan, 19-v-2005, coll. ML.

Remarks: This is the first *Rhipidolestes* recorded from Hainan. *R. cyanoflavus* is also known from neighbouring Guangdong.

Coenagrionidae
***Ceriagrion fallax* Ris, 1914**

Ceriagrion fallax Ris, 1914; - Hua, 2000: 8 (Hainan).

Specimens: No additional material.

Remarks: *Ceriagrion fallax* is common in south China including neighbouring Guangdong and Guangxi and unlikely to be confused with any other *Ceriagrion* except perhaps *Ceriagrion melanurum* Selys, 1876, which is only known locally from north Guangdong (Wilson & Xu, 2007) and north Guangxi (Wilson & Reels, 2003).

Platycnemididae
***Indocnemis orang* Förster in Laidlaw, 1907**

Specimens: 1 ♂, Limushan NR, 14-vii-2002, coll. KW; 2 ♂, 1 ♀, Xiaonanning, Shangxi NR, 20-vi-2007, coll. GR.

Remarks: All specimens collected were attributable to the 'kempi' form of orang, possessing narrow, pale blue antehumeral bands. These are the first records of the 'kempi' form of orang from China.

Platystictidae
***Sinosticta* sp.**

Specimens: 1 ♀, Yinggeling Nature Reserve, 25-v-2007, coll. GR.

Remarks: This female specimen possesses postocular spots in contrast to *Sinosticta hainanense* Wilson & Reels (2001), which does not. A single male *Sinosticta* specimen, also with postocular spots, has also been discovered in Hainan by Yu Xin (pers. com.). It is similar to the newly described *Sinosticta debra* Wilson & Xu (2007), known from north Guangdong but it is quite distinct and represents a new species, which will be described shortly. It has a yellow and black thorax, bright cyan blue tipped abdomen (S9-10) and broad white superior appendages.

Aeshnidae
***Boyeria karubei* Yokei, 2002**

Specimens: 1 ♀, Limushan NR, 14-vii-2002, coll. ZX.

Remarks: The first author has specimens of this taxon from Guangdong and Guangxi.

Gynacantha bayadera Selys, 1891

Specimens: 1 ♂, Limushan NR, 14-vii-2002, coll. KW.

Remarks: Dorsum of frons uniformly yellowish, without black T-mark.

***Sarasaeschna niisatoi* Karube, 1998**

Specimens: 1 ♂, Yinggeling NR, 31-v-2005, coll. BC.

Remarks: This is the first record of this species from Chinese territory. It was previously only known from north Vietnam.

Gomphidae

***Sinictinogomphus clavatus* (Fabricius, 1775)**

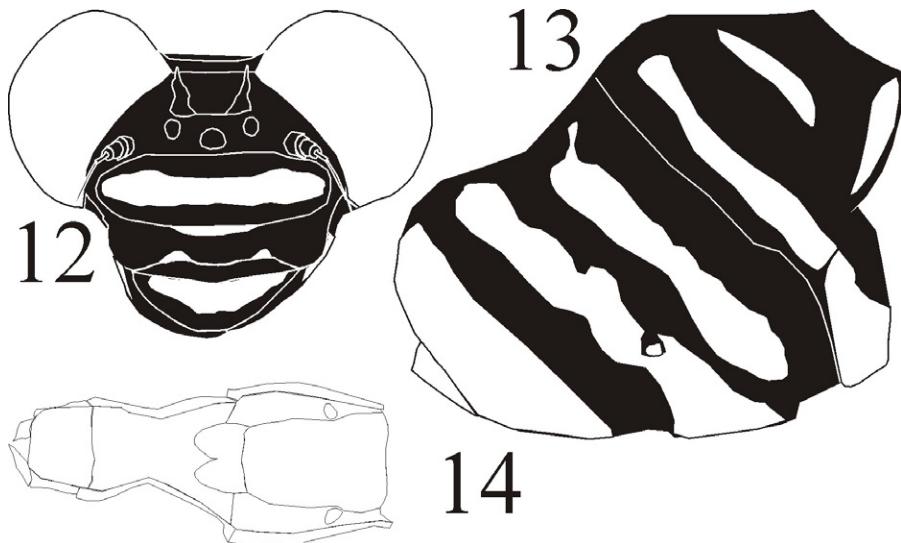
Specimens: 1 ♂, 1 ♀, observed KW, University of South China Tropical Agriculture, Danzhou, 19-vii-2002.

***Stylurus erectocornis* Liu & Chao, 1990**

Figures 12-14

Specimens: 1 ♀, Songtao Reservoir, 16-vii-2002; coll. KW.

Remarks: The head and thoracic colour pattern are the same as described for the Guangxi type specimen illustrated by Liu & Chao in Chao (1990) except for postclypeus. The Hainan specimen appears to have a slightly broader head but otherwise there are no structural differences.



Figures 12-14. *Stylurus erectocornis* Hainan. (12) Head, frontal; (13) synthorax, lateral; (14) caudal genitalia, ventral.

Libellulidae

***Lathrecista asiatica asiatica* (Fabricius, 1798)**

Lathrecista asiatica (Fabricius, 1798); - Liu, 2005: Hainan (1 ♂ [photos], 18°59' 59" N, 109°30' 42" E), 16-xi-2005, photographed Weiting Liu).

Remarks: This polytypic species, whose subspecies range from India through southeast Asia, Australia to Samoa has only previously been reported from Chinese territory in Taiwan, where, according to Lieftinck et al (1984) it is probably confined to low country in the south of the island.

***Orthetrum glaucum* (Brauer, 1865)**

Orthetrum glaucum (Brauer, 1865); - Hua, 2000: 15 (Hainan).

Specimens: 2 ♂, Limushan NR, 14-vii-2002, coll. KW; 1 ♀, Wuzhishan, 15-vii-2002, coll. KW; 1 ♂, Songtao Reservoir, 16-vii-2002; coll. KW.

***Rhodothemis rufa* (Rambur, 1842)**

Specimens: 1 ♀, Songtao Reservoir, 16-vii-2002; coll. KW.

Remarks: This widespread Oriental species has previously only been recorded in China from Guangdong and Hong Kong (Wilson, 2004).

***Rhyothemis obsolescens* Kirby, 1889**

Specimens: 2 ♂, Ganzaling NR, 23-v-2007, coll. GR; 1 ♀, Ganzaling NR, 22-v-2007; coll. GR; 1 ♀, Ganzaling NR, 23-v-2007; coll. GR.

Remarks: This is the first record of this widespread Oriental species from Chinese territory.

***Rhyothemis plutonia* Selys, 1883**

Photo 2

Specimens: 3 ♂, Ganzaling NR, 23-v-2007; coll. GR; 1 ♀, Nanlin NR, 21-vi-2007, coll. GR.

Remarks: This is the first record of this widespread Oriental species from Chinese territory. In the male Hainan specimens, the hindwings are entirely black, with blue/green metallic reflections on the basal third, and the forewings are black apart from an occasionally present tiny clear patch at the tip. The similar *Rhyothemis regia* (Brauer, 1867) is known from southern Taiwan (Wang, 2000). Males of this species differ from *R. plutonia* in having extensive clear patches in the apical third of both forewings and hindwings.

***Tramea transmarina euryale* Selys, 1878**

Specimens: 1 ♂, Hainan, 25-xi-2005, leg. GR.

Remarks: This widespread southeast Asian species has previously only been recorded in China from Hong Kong (Wilson, 2004) and Taiwan (Yeh et al, 2006).

Doubtful or questionable records

Calopterygidae

***Atrocalopteryx atrata* (Selys, 1853)**

Calopteryx atrata Selys, 1853; - Hua, 2000?: 6 (Hainan).

Remarks: *Calopteryx atrata* is common in southwest and central China but is relatively rare in south China. Locally it is known from north Guangdong (Wilson & Xu, 2007) and north Guangxi (Wilson & Reels, 2003) but has not been recorded from the extreme south. Its occurrence in Hainan requires confirmation.

***Mnais andersoni tenuis* Oguma, 1913**

Mnais andersoni McLachlan in Selys, 1873?; - Hua, 2000: 6 (Hainan).

Remarks: *Mnais andersoni tenuis* has been recorded from north, central and southwest Guangdong (Wilson & Xu, 2007). Its presence in Hainan is likely but requires confirmation.

***Vestalis smaragdina* (Selys, 1879)**

Vestalis smaragdina Selys, 1879; - Hua, 2000: 7 (Hainan).

Remarks: Hämäläinen (2004) raised the status of the subspecies *Vestalis smaragdina velata* Ris, 1912 to full species status i.e. *Vestalis velata*. But *Vestalis miao* was described from Hainan in 2001 but the presence of *Vestalis velata* in Hainan has not yet been confirmed. The two species are sympatric in Guangdong.

Euphaeidae

***Euphaea ochracea* (Selys, 1859)**

Allopaea ochracea (Selys, 1859); - Hua, 2000: 7 (Hainan).

Remarks: *Euphaea ochracea* is known from India, Laos, Myanmar, P. Malaysia, Nepal, Thailand and neighbouring Vietnam, but has never been confirmed from Hainan, where the very similar species *Euphaea ornata* is common and widespread.

Chlorocyphidae

***Rhinocypha (Aristocypha) spuria* (Selys, 1858)**

Aristocypha spuria Selys, 1858; - Hua, 2000: 7 (Hainan).

Remarks: *Rhinocypha spuria* is restricted to India and Myanmar (Tusda, 2000). It closely resembles *Rhinocypha fenestrella* which is not uncommon in Hainan.

Lestidae

***Lestes virens* (Charpentier, 1825)**

Lestes paedisca (Eversmann, 1836); - Needham, 1931: 232 (Hainan).

Remarks: Bridges (1994) lists *Lestes paedisca* as a synonym of *Lestes virens* (Charpentier, 1825). However,

virens has not been confirmed to occur east of the Altai Mountains.

Platycnemididae

Coeliccia didyma (Selys, 1863)

Coeliccia didyma (Selys, 1863); - Hua, 2000: 9 (Hainan). *Coeliccia didyma* is easily confused with *Coeliccia cyanomelas* which is common and widespread in Hainan.

Coeliccia renifera (Selys, 1886)

Coeliccia renifera (Selys, 1886); - Hua, 2000: 9 (Hainan).

Remarks: According to Fraser (1933) *renifera* is restricted to upper Assam, Bengal, Sikkim and Simla Hill States. Tsuda (2000) lists its distribution as Bangladesh, India and Nepal. Its occurrence in Hainan is unlikely and the specimens involved were probably aberrant *Coeliccia cyanomelas* which occasional feature restricted blue markings on the dorsum of the synthorax.

Calicnemia sinensis Lieftinck, 1984

Calicnemia sinensis Lieftinck (1984)?; - 359-361 (double labelled specimen, either from Guangdong or Hainan).

Remarks: The type locality for *Calicnemia sinensis* is Fujian but it also occurs throughout Guangdong (Wilson & Xu, 2007). Its presence in Hainan requires confirmation.

Platycnemis foliacea foliacea Selys, 1886

Platycnemis foliacea foliacea Selys, 1886; - Hua, 2000: 9 (Hainan).

Remarks: This species is superficially similar to *Copera ciliata*, which is common in Hainan. *Platycnemis foliacea foliacea* is a temperate, northern Chinese species with Beijing the type locality. It is not known from Guangdong or Guangxi and its distribution is unlikely to extend to tropical Hainan.

Cordulegasteridae

Anotogaster kuchenbeiseri (Förster, 1899)

Anotogaster kuchenbeiseri (Förster, 1899)?; - Hua, 2000: 12 (Hainan).

Remarks: No species of *Anotogaster* has been recorded, reliably, from Hainan. The first author has collected specimens of *Anotogaster kuchenbeiseri* (Förster, 1899), *Anotogaster gregoryi* Fraser, 1924 and *Anotogaster sieboldii* (Selys, 1854) from neighbouring Guangdong. Of these *Anotogaster sieboldii* (Selys, 1854) is relatively common through S China.

Corduliidae

Idionyx imbricata Fraser, 1926

Idionyx imbricata Fraser, 1926; - Hua, 2000: 13 (Hainan).

Remarks: According to Fraser (1936) this species is only known from Shillong, Assam. Its presence in Hainan is doubtful.

Libellulidae

Lyriothemis bivittata (Rambur, 1842)

Lyriothemis bivittata (Rambur, 1842)?; - Hua, 2000: 13 (Hainan & Guangdong).

Remarks: This species has never been recorded, reliably, from China. According to Tsuda (2000) it is known from Bangladesh, India, Laos, Myanmar, Nepal, P. Malaysia, Thailand, and neighbouring Vietnam. Male *bivittata* is a relatively small, lowland forest-dwelling species of *Lyriothemis* with a bright blood-red coloured abdomen not easily confused with its congeners. Its presence in Hainan would not be unexpected but the extensive loss of lowland forest is likely to restrict the occurrence of suitable habitat.

Orthetrum albistylum speciosum (Uhler, 1858)

Orthetrum albistylum sic (Selys, 1848)?; - Hua, 2000: 14 (Hainan).

Remarks: *Orthetrum albistylum speciosum* is known throughout much of China and locally from north Guangxi (Wilson, 2005) and north Guangdong, but it has not been recorded from the extreme south of China, apart from Taiwan where it is common throughout the island to 500m (Lieftinck et al, 1984). Its presence in Hainan requires confirmation.

Orthetrum japonicum internum McLachlan, 1894

Orthetrum japonicum internum McLachlan, 1894?; - Hua, 2000: 14 (Hainan).

Remarks: *Orthetrum japonicum internum* is known from southwest and central China and locally from montane areas in north Guangxi (Wilson, 2005) and north Guangdong (Fellowes et al, 2003) but it has not been recorded from the extreme south of China. Its presence in Hainan requires confirmation.

Comparison between Hainanese and Taiwanese faunas

Hainan, with an area of 33,991 km² (MSN Encarta, 2007a) is only slightly smaller than Taiwan, which has an area of approximately 36,000 km² (MSN Encarta, 2007b). Hainan is entirely located in a tropical zone between 18°12'-20°10'N and 108°40'-111°03'E, whereas Taiwan is more northerly positioned between 21°45'-24°56'N and 119°18'-124°34'E. Taiwan is also more mountainous, with peaks rising to 4,000 m, whereas the highest peaks in Hainan are below 2,000 m.

Yeh et al (2006) reported 147 odonate species (151 taxa including subspecies) from Taiwan which is comparable to the 146 species listed here for Hainan. A complete checklist of Hainan odonata is provided in Appendix 1. Sixty-six species, which comprise almost half the respective faunas, are recorded from both Hainan and Taiwan. A breakdown of the number of species per family found in Hainan and Taiwan is provided in Table 1 overleaf.

The most striking differences between the two faunas are the relatively high numbers of representatives from the tropical, zygopteran families Diphlebiidae, Megapodagrionidae, Pseudolestidae and Platystictidae from Hainan. In contrast the anisopteran families Aeshnidae and Libellulidae have far greater representation in Taiwan. Generally, the proportion of Zygoptera in the odonate fauna tends to increase towards the equator, which is clearly reflected in the two faunas. Moreover, Hainan has ten endemic Zygoptera species compared with just four species from Taiwan. The situation is reversed within the Anisoptera with ten endemics from Hainan compared with 12 from Taiwan. Species with Palaearctic origins, such as *Sympetrum* spp. and *Aeshna petalura*, are found in Taiwan but are generally absent from Hainan. Given Taiwan's more northerly location and higher montane areas this is not unexpected.

Representatives of the megapodagrionid genera *Podolestes* and *Rhinagrion* are restricted to tropical Southeast Asia (countries south of China, east of India and north of Australia) but also include single endemic representatives in Hainan. Apart from Hainan these two genera are absent from China including Taiwan. Hainan is quite disjunct from the main distribution of the two genera *Podolestes* and *Rhinagrion*, which is worthy of further consideration.

Throughout the Quaternary period (0 to 1.8 mya) there have been several episodes of maximum glaciation, when the extent of the South China Sea has been greatly reduced and the Sunda Shelf has been connected to Indo-China. During the last glacial maximum, which was approximately 21 thousand years ago, the South China Sea was some 116 m lower than present day sea levels (Sathiamurthy & Voris, 2006). During such 'maximum glaciation' periods the drainage systems from Hainan and north Borneo discharge to the South China Sea at positions much closer to each other but nevertheless probably too distant for catchment transfer of weak flying zygopterans. However, during the Tertiary geological time interval (1.8 to 65 mya) there have been periods when the South China Sea has been reduced even further in extent and the proximity of drainage systems from Hainan and north Borneo would have been much closer and possibly adjacent to each other at their point of discharge to sea. The close proximity of these drainage systems might explain today's distribution of *Rhinagrion* and *Podolestes*.

Table 1. Number of species representatives from each family in Hainan and Taiwan

Family	Hainan	Taiwan
Diphlebiidae	2	0
Calopterygidae	5	4
Chlorocyphidae	5	3
Euphaeidae	4	2
Lestidae	3	4
Synlestidae	1	2
Megapodagrionidae	6	1
Pseudolestidae	1	0
Coenagrionidae	15	17
Platycnemididae	5	5
Platystictidae	4	0
Protoneuriidae	2	1
Aeshnidae	13	23
Gomphidae	29	21
Cordulegasteridae	2	6
Corduliidae	10	7
Libellulidae	39	51
Total no of species	146	147
Endemic Zygoptera species	10	4
Endemic Anisoptera species	9	12
Total no of endemics	19	16

Acknowledgements

The Kadoorie Farm and Botanic Garden Corporation is gratefully acknowledged for funding and supporting survey work. We also thank Michael Lau, Bosco Chan and Lee Kwok Shing of the Kadoorie Farm and Botanic Garden Corporation for collecting material and for comments and help with proof reading. The Hainan Forestry Department and the South China Institute of Botany are also thanked for their assistance and advice in arranging and undertaking field work. We also are grateful to Prof. Cai Ducheng, Prof. Peng Zhengqiang, Mr Zhang Zhongrun, Mr Ruan Derong, Mr Liu Jingxian, Mr Te Lakang for their company and assistance with collection of specimens during the fieldwork.

References

- Bridges, C.A., 1994. *Catalogue of the family-group, genus-group and species-group names of the Odonata of the World* (3rd edn.). Pub. C.A. Bridges, Urbana, Illinois.
- Chao, H.-F., (= Zhao, Xiufu) 1990. *The Gomphid Dragonflies of China (Odonata: Gomphidae)*. The Science and Technology Publishing House, Fuzhou, Fujian, China. (Chinese with Eng. sum. and keys).
- Fellowes, J.R., B.P.L. Chan, M.W.N. Lau, S.C. Ng, G.L.P. Siu & L.K. Shing (eds), 2003. *Report of Rapid Biodiversity Assessments at Nanling National Nature Reserve, Northwest Guangdong June-July 2000*. South China Forest Biodiversity Survey Report Series 29. Kadoorie Farm & Botanic Garden, Hong Kong.
- Fraser, F.C., 1933. *Fauna of British India, including Ceylon and Burma. Odonata. Vol I*. Taylor & Francis, London.
- Fraser, F.C., 1936. *Fauna of British India, including Ceylon and Burma. Odonata. Vol III*. Taylor & Francis, London.

- Hämäläinen, M., 2004. Caloptera damselflies from Fujian (China), with description of a new species and taxonomic notes (Zygoptera: Calopterygoidea) *Odonatologica* 33: 371-398.
- Hua, L., 2000. *List of Chinese insects. Vol. 1.* Zhongshan University Press, Guangzhou.
- Lieftinck, M.A., 1984. Further notes on the specific characters of *Calicnemia* Strand, with a key to the males and remarks on some larval forms. (Zygoptera: Platycnemididae). *Odonatologica* 13(3): 351-375.
- Lieftinck, M.A., Lien, J.C. & Maa, T.C. 1984. *Catalogue of Taiwanese Dragonflies (Insecta: Odonata).* Asian Ecol. Soc., Taichung, Taiwan.
- Liu, W., 2005. Photos taken in Hainan uploaded to Flickr website, 24th November 2005: <<http://www.flickr.com/photos/kentishplover/66629291/in/set-1432282/>>.
- MSN Encarta, 2007a. Online Encyclopedia. Webpage downloaded 3rd September 2007. http://encarta.msn.com/encyclopedia_761570691/Hainan.html
- MSN Encarta, 2007b. Online Encyclopedia. Webpage downloaded 3rd September 2007. http://encarta.msn.com/encyclopedia_761577607/Taiwan.html
- Needham, J.G., 1931. Dragonflies of Hainan. *Lingnan Sci. Jour.* 10(2-3): 223-232.
- Sathiamurthy, E. & H.K. Voris, 2006. Maps of Holocene Sea Level Transgression and Submerged Lakes on the Sunda Shelf. *The Nat. His. J. Chulalongkorn University (Singapore), Supplement.* 2: 1-44.
- Tsuda, Shigeru, 2000. *A World Distributional List of World Odonata.* Osaka.
- Wang, L-J., 2000. *Dragonflies of Taiwan.* Pub. Jemjem Calendar, Taipei.
- Wilson, K.D.P., 2002. Notes on Chlorogomphidae (Odonata: Anisoptera) from southern China. *Odonatologica* 31(1): 67-74.
- Wilson, K.D.P., 2004. *A Field Guide to the Dragonflies of Hong Kong.* Agriculture, Fisheries and Conservation Department, Friends of the Country Parks and Cosmos Books Ltd., Hong Kong, 2nd edn.
- Wilson, K.D.P., 2005. Odonata of Guangxi Zhuang Autonomous Region, China, part II: Anisoptera. *Int. J. Odonatology* 8(1): 107-168.
- Wilson, K.D.P. & G.T. Reels, 2001. Odonata of Hainan, China. *Odonatologica* 30(2): 145-208.
- Wilson, K.D.P. & G.T. Reels, 2003. Odonata of Guangxi Zhuang Autonomous Region, China, Part I: Zygoptera. *Odonatologica* 32(3): 237-279.
- Wilson, K.D.P., & Z-F. Xu, 2007. Odonata of Guangdong, Hong Kong and Macau, South China, part 1: Zygoptera. *Int. J. Odonatology* 10(1): 87-128.
- Yeh, W-C., H-C. Tang, S-L. Chen & M-H. Tsou, 2006. Three dragonflies (Odonata) newly recorded in Taiwan. *Formosan Entomol.* 26: 187-195.
- Zhou, X., & W-B. Zhou, 2006. Two new species of the family Chlorocyphidae (Odonata) from China. *Entomotaxonomia* 28(1): 13-16.



Photo 2: *Rhyothemis plutonia* Selys, ♂, Ganzaling NR, Hainan, Graham Reels.

Appendix 1. Revised Checklist of Hainan Odonates

Family	Species	Family	Species
Diphlebiidae	<i>Philoganga vetusta</i> Ris, 1912		<i>Asiagomphus septimus</i> Needham, 1930
	<i>Philoganga robusta</i> Navás, 1936		<i>Burmagomphus vermicularis</i> (Martin, 1904)
Calopterygidae	<i>Calopteryx melli</i> Ris, 1912		<i>Fukienogomphus prometheus</i> Lieftinck, 1939.
	<i>Matrona b. basilaris</i> Selys, 1853		<i>Gomphidia a. abbotti</i> Williamson, 1907
	<i>Mnais mneme</i> Ris, 1916		<i>Gomphidia k. kruegeri</i> Martin, 1904
	<i>Neurobasis c. chinensis</i> (Linnaeus, 1758)		<i>Heliogomphus retroflexus</i> (Ris, 1912)
	<i>Vestalis miao</i> Wilson & Reels, 2001		<i>Heliogomphus scorpio</i> (Ris, 1912)
Chlorocyphidae	<i>Libellago lineata</i> (Burmeister, 1939)		<i>Ictinogomphus pertinax</i> (Hagen, 1854)
	<i>Rhinocypha (Heliocypha) b. biforata</i> Selys, 1859		<i>Labrogomphus torvus</i> Needham 1931a
	<i>Rhinocypha (Heliocypha) huai</i> Zhou & Zhou, 2006*		<i>Lamelligomphus camelus</i> (Martin, 1904)
	<i>Rhinocypha (Aristocypha) fenestrella</i> Rambur, 1842		<i>Lamelligomphus hainanensis</i> Chao, 1954
Euphaeidae	<i>Rhinocypha p. perforata</i> (Percheron, 1835)		<i>Leptogomphus celebratus</i> Chao, 1982
	<i>Bayadera kirbyi</i> Wilson & Reels, 2001*		<i>Megalogomphus sommeri</i> (Selys, 1854)
	<i>Dysphaea basitincta</i> Martin, 1904		<i>Merogomphus paviei</i> Martin, 1904
	<i>Dysphaea gloriosa</i> Fraser, 1938		<i>Nihonogomphus thomassoni</i> (Kirby, 1900)*
	<i>Euphaea ornata</i> (Campion, 1924)		<i>Nychogomphus flavicaudus</i> Chao, 1982*
Lestidae	<i>Lestes concinnus</i> Hagen in Selys, 1892		<i>Orientogomphus armatus</i> Chao et Xu, 1987
	<i>Lestes (Platylestes) praemorsus</i> Selys, 1862		<i>Paragomphus hoffmanni</i> Needham, 1931*
	<i>Orolestes selysi</i> McLachlan, 1895		<i>Paragomphus pardalinus</i> Needham, 1942
Synlestidae	<i>Sinolestes editus</i> Needham, 1930		<i>Paragomphus wuzhishanensis</i> Liu, 1988*
Megapodagrionidae	<i>Agriomorpha fusca</i> May, 1933		<i>Phaenandrogomphus tonkinicus</i> (Fraser, 1926)
	<i>Burmargoilestes xinglongensis</i> Wilson & Reels, 2001*		<i>Sinictinogomphus clavatus</i> (Fabricius, 1775)
	<i>Philosina alba</i> Wilson, 1999		<i>Stylogomphus chuniuae</i> Chao, 1954
Pseudolestidae	<i>Podolestes pandanus</i> Wilson & Reels, 2001*		<i>Stylurus amicus</i> (Needham, 1930)
Coenagrionidae	<i>Rhinagrion hainanensis</i> Wilson & Reels, 2001*		<i>Stylurus erectocornis</i> Liu & Chao, 1990
	<i>Rhipidolestes cyanoflavus</i> Wilson, 2000		<i>Macromia berlandi</i> Lieftinck, 1941
	<i>Pseudolestes mirabilis</i> Kirby, 1900*		<i>Macromia calliope</i> Ris, 1916
	<i>Aciaugiron tillyardi</i> Laidlaw, 1919		<i>Macromia clio</i> Ris, 1916
	<i>Agriocnemis femina oryzae</i> (Lieftinck, 1962)		<i>Macromia katae</i> Wilson, 1993
	<i>Agriocnemis lacteola</i> Selys, 1877		<i>Macromia moorei malayana</i> Laidlaw, 1928
	<i>Agriocnemis pygmaea</i> (Rambur, 1842)		<i>Macromia sp. cf. Macromia icterica</i> Lieftinck, 1929
	<i>Ceriagrion auranticum ryukyuuanum</i> (Asahina, 1967)		<i>Macromia urania</i> Ris, 1916
	<i>Ceriagrion indochinense</i> Asahina, 1967		<i>Epophthalmia elegans</i> (Brauer, 1865)
	<i>Ceriagrion fallax</i> Ris, 1914		<i>Idionyx victor</i> Hämäläinen, 1991
	<i>Ischnura aurora</i> Brauer, 1865		<i>Macromidia rapida</i> Martin, 1907
	<i>Ischnura senegalensis</i> (Rambur, 1842)		<i>Acisoma p. panoroides</i> Rambur, 1842
	<i>Mortonagrion</i> sp.		<i>Brachydiplex chalybea flavovittata</i> Ris, 1911
	<i>Paracercion calamorum dyeri</i> (Fraser, 1919)		<i>Brachythemis contaminata</i> (Fabricius, 1793)
	<i>Pseudagrion australasiae</i> Selys, 1876		<i>Cratilla lineata</i> (Brauer, 1878)
	<i>Pseudagrion microcephalum</i> (Rambur, 1842)		<i>Crocothemis servilia</i> (Drury, 1770)
	<i>Pseudagrion pruinosum fraseri</i> Schmidt, 1934		<i>Diplacodes nebulosa</i> (Fabricius, 1793)
	<i>Pseudagrion rubriceps</i> Selys, 1876		<i>Diplacodes trivialis</i> (Rambur, 1842)
Platycnemididae	<i>Coelicia cyanomelas</i> Ris, 1912		<i>Hydrobasileus croceous</i> (Brauer, 1867)
	<i>Coelicia scutellum hainanense</i> * Laidlaw, 1932		<i>Lathrecista asiatica asiatica</i> (Fabricius, 1798)
	<i>Copera ciliata</i> (Selys, 1863)		<i>Lyriothemis tricolor</i> Ris, 1919
	<i>Copera marginipes</i> (Rambur, 1842)		<i>Nannophyopsis clara</i> (Needham, 1930)
	<i>Indocnemis orang</i> Förster in Laidlaw, 1907		<i>Neurothemis fulvia</i> (Drury, 1773)
Platystictidae	<i>Drepanosticta elongata</i> Wilson & Reels, 2001*		<i>Neurothemis intermedia</i> Rambur, 1842
	<i>Drepanosticta zhoui</i> Wilson & Reels, 2001*		<i>Neurothemis t. tullia</i> (Drury, 1773)
	<i>Sinosticta hainanense</i> Wilson & Reels, 2001*		<i>Onychothemis testaceum tonkinensis</i> Martin, 1904
	<i>Sinosticta</i> sp.*		<i>Orthetrum chrysium</i> (Selys, 1891)
Protoneuridae	<i>Prodasineura autumnalis</i> (Fraser, 1922)		<i>Orthetrum glaucum</i> (Brauer, 1865)
	<i>Prodasineura croconata</i> (Ris, 1916)		<i>Orthetrum luzonicum</i> (Brauer, 1868)
Aeshnidae	<i>Anax guttatus</i> (Burmeister, 1839)		<i>Orthetrum pruinosum neglectum</i> (Rambur, 1842)
	<i>Anax immaculifrons</i> Rambur, 1842		<i>Orthetrum s. sabina</i> (Drury, 1770)
	<i>Boyeria karubei</i> Yokei, 2002		<i>Orthetrum t. triangulare</i> (Selys, 1878)
	<i>Gynacantha bayadera</i> Selys, 1891		<i>Orthetrum testaceum</i> Burmeister, 1839
	<i>Gynacantha saltatrix</i> Martin, 1909		<i>Palpopleura s. sexmaculata</i> (Fabricius, 1787)
	<i>Gynacantha subinterrupta</i> Rambur, 1842		<i>Pantala flavescens</i> (Fabricius, 1798)
	<i>Sarasaeschna niisatoi</i> Karube, 1998		<i>Potamarcha congener</i> (Rambur, 1842)
	<i>Oligoaeschna petalura</i> Lieftinck, 1968*		<i>Pseudothemis zonata</i> (Burmeister, 1838)
	<i>Oligoaeschna sabre</i> Wilson & Reels, 2001*		<i>Rhodothemis rufa</i> (Rambur, 1842)
	<i>Perlaeschna magdalena</i> Martin, 1909		<i>Rhyothemis obsoletes</i> Kirby, 1889
	<i>Planaeschna celia</i> Wilson & Reels, 2001*		<i>Rhyothemis plutonia</i> Selys, 1883
	<i>Polycanthagyna erythromelas</i> (McLachlan, 1896)		<i>Rhyothemis variegata aria</i> (Drury, 1773)
	<i>Tetraclanthagyna waterhousei</i> McLachlan, 1898		<i>Tetrathemis platyptera</i> Selys, 1878
Cordulegasteridae	<i>Chlorogomphus gracilis</i> Wilson & Reels, 2001*		<i>Tholymis tillarga</i> (Fabricius, 1798)
	<i>Chlorogomphus usudai</i> Ishida, 1996		<i>Tramea transmarina euryale</i>
Gomphidae	<i>Amphigomphus hansonii</i> Chao, 1954		<i>Tramea virginia</i> (Rambur, 1842)
	<i>Anisogomphus koxingai</i> Chao, 1954		<i>Trithemis aurora</i> (Burmeister, 1839)
	<i>Anisogomphus wuzhishanii</i> Chao, 1982*		<i>Trithemis festiva</i> (Rambur, 1842)
	<i>Asiagomphus hainanensis</i> (Chao, 1953)		<i>Urothemis s. signata</i> (Rambur, 1842)

* Endemic to Hainan

**Crepuscular activity in *Orientogomphus minor* (Laidlaw) comb. nov.
from Thailand and clarification of the taxonomic status of closely related species
Keith D.P. Wilson [kdpwilson@gmail.com]**

Thailand is a great place for dragonflies at almost any time of year and springtime in Asia can be an especially good period if you are interested in observing gomphids on the wing. My family and I travelled from Hong Kong on the 7th April 2001 and travelled to Krabi, Thailand to spend a short Easter Break. On three successive days from 9-11th April I explored the Khao Phanom Bencha Forest National Park. Matti Hämäläinen was very helpful and provided me with a list of odonates recorded from Krabi Province and the Park. Some 60 species in total had previously been found but the gomphids appeared under recorded as just four species were listed prior to my visit in 2001.

Crepuscular activity

After three days in the Park I had enjoyed watching and photographing some colourful and interesting damselflies, such as *Echo modesta* Laidlaw and *Euphaea pahyapi* Hämäläinen but, disappointingly, I had not encountered any new gomphids. At the very end of the third day I was about to depart back to my hotel when I noticed a relatively small dragonfly flying over a riffle section of a small stony stream. The time was 18:10 with dusk rapidly approaching. At this late hour I expected to see either *Tholymis tillarga* or *Zyxomma petiolatum*, which often appear in Asia at late afternoon or just before dusk, but the dragonfly, now flying in front of me, was neither of these species and looked like a small to medium-sized gomphid. It was already too dark to be certain if it was a gomphid and the stream, being well shaded with steep banks covered in shrubs, made observation difficult. Before long several males were patrolling sections of the stream and hovering over gravel riffles for short periods. The hovering activity by males over riffle sections is an indication of territorial breeding behaviour rather than hawking for food. I watched the dragonflies in very dim light for several minutes before attempting to catch one of the males. By 18:20 I had caught two males and shortly afterwards it was completely dark making any further observation and netting impossible. The official sunset time for this locality and date was 18:35. Patrolling activity probably ceased at around or shortly after sunset, when I could no longer hear the rustle of wings above the stream's babbling. Once in the hand I was able to identify the dragonfly as a small onychogomphine. It looked a lot like *Orientogomphus armatus* Chao, which is known from Fujian and Hainan (Wilson & Reels, 2001) but the Thai specimens were perhaps a little smaller. I have observed *armatus* males, engaged in territorial activity, at a swift flowing, boulder and gravel-bottomed stream in Hainan throughout the morning and middle of the day period, which is the normal diel pattern exhibited by gomphid males at breeding sites. Territorial activity at dusk and early night is exceptional for gomphids and, as far as I'm aware, has not previously been reported.

Once I had returned home identifying the gomphid in question proved to be quite a convoluted process. After reading all the relevant literature there were four main possibilities viz. (i) my Thai specimens were either *Orientogomphus circularis* (Sélys, 1894) described from Burma, or (ii) they belonged to *Acrogomphus minor* (Laidlaw, 1931), known from the type male taken in Kuala Lumpur and a single female collected in peninsular Thailand, or (iii) they were *Acrogomphus naninus* (Förster, 1905) described from northern Vietnam, or lastly (iv) they were a new species. The literature was certainly very unclear. I couldn't even be sure that *minor* and *circularis* were not synonyms. Since the types of these two species are held at the British Museum of Natural History (BMNH) I arranged to view the specimens. My assessment of type material and my Thai specimens is given below.

Interestingly, the paratype female of *minor* was taken, 'at light', which is not unusual for some crepuscular and nocturnal feeding aeshnids, such as *Anaciaeschna*, *Gynacantha*, *Indaeschna*, *Oligoaeschna* and *Polycanthagyna*, but is exceptional for a gomphid. I have observed light trapping in southern Chinese forests on many occasions but never observed a gomphid coming to light. I am grateful to Matti Hämäläinen for pointing out that he recorded a female *Burmagomphus arthuri* Lieftinck landing on a wall illuminated by light in Pahang at 21:40 hrs 23rd April, 1995 (Hämäläinen, 2000 & Hämäläinen, 2002). Rory Dow (pers. com.) has observed a male *Macrogomphus parallelogramma* (Burmeister) hawking at late dusk at the side of a deep stream in secondary peat swamp forest, in Sarawak during 2006, but such records and reports of gomphids engaging in crepuscular activity are rare.

Comparison of *circularis* and *minor* type material

Laidlaw (1931) said, in his original description of *Acrogomphus minor*. "On comparing this description with that given by de Sélys for his *Onychogomphus circularis* it is quite evident that the two are almost identical save for size. *Circularis* has the abdomen, ♂ 41 mm., hind-wing 32 mm. ♀ 41 mm., 38mm. It is in fact very probable that this *minor* is only a local race of *circularis*. As the dimensions are so different I see no objection to giving the present form a name". Earlier in the same paper Laidlaw stated: "In addition to *fraseri*, *malayanus*, and *minor*, de Sélys' species *circularis* must be included in the genus *Acrogomphus*. On comparing the types of *minor* with his description of *circularis* the resemblances are so great that I was for a time inclined to regard my new species as really belonging to *circularis*. Though I have decided to give it a name I am quite prepared to admit the likelihood of its being a small local race of de Sélys' species". It is clear Laidlaw was by no means certain that *minor* was a new species when he created it and he did not examine the *circularis* type material.

I examined the type pairs of *minor* and *circularis* and a further specimen of *circularis* collected from Maymyo (17 v 1924, leg. F. Wall) at the BMNH on 7th December 2007. Leaving aside wing venation I could find no overt differences between the *minor* type male, designated as lectotype by D.E. Kimmins, when compared with the *circularis* type male, other than size and the overall extent of yellow colouration, which is far more developed in *circularis*. The yellow crest across the top the frons is finely divided centrally in *minor* and only minimally extends onto the face of the frons, whereas in *circularis* the yellow crest is indented but not divided and it broadly extends onto the face of the frons (see Figs 4 & 7). The secondary genitalia of *minor* are illustrated in Fig. 11. It should be noted the *circularis* type male has been reconstructed; much of the body has been glued together, the caudal genitalia are missing and the secondary genitalia have been glued back in place.

The anterior hamulus is illustrated in Fig. 2. According to Fraser's (1934) description of the *circularis* type male the superior appendages are yellow. Judging by the remnant of pale amber colouration at the base of the wings, the pale brown pterostigma, and extensive yellow markings, which are poorly defined at the edges, the poor and fragile condition of the body, the *circularis* type male maybe a slightly teneral specimen. Nevertheless the well-developed yellow pattern is also featured in the female, but more so (see Fig. 5). The male hamuli of the *circularis* specimen collected from Maymyo are similar to *minor* (see Figs 3 & 11). The superior appendages of the Maymyo specimen have been glued back on, both not quite in their proper alignment.

Both the *minor* and *circularis* 'type' females possess an occipital margin which is entirely free of any structures and the vertex is largely yellow (see Figs 4 & 12). The valvules are similar (see Figs 6 & 13). The yellow dorsal stripe of the *circularis* female is slightly broader than the *circularis* male and clearly broader than the *minor* female and it is linked, albeit narrowly, to the collar stripe see Fig. 5). The broad yellow stripes across the mesepimeron and metepisternum of the *circularis* female are also broader than the male and are conjoined from just beyond the spiracle to almost the wing margin. This colour pattern in the female *circularis* is markedly different from the *minor* paratype female, which resembles the *minor* male.

In both hindwings of *minor* and *circularis* the anal triangles are four-celled with the smallest cell a well-defined rectangle, typical of onychogomphines, and the anal field is 2-celled with A2 arising from the subtriangle rather than directly from anal vein between cu-a and the subtriangle (see Figs 1 & 12). There is a key venational feature which distinguishes *circularis* from *minor*; 1A and CuP diverge towards the wing margin in *minor* whereas in *circularis* these two veins are parallel. This character separation is consistent in all the specimens examined at the BMNH i.e. the lectotype male and paratype female of *minor* and the type pair of *circularis* and the Maymyo male *circularis*.

Size difference alone is not a sound basis for establishing a separate species but based on my examination of all the relevant specimens at the BMNH I am confident they are distinct species. The parallel 1A and CuP hindwing veins and more developed yellow colouration of *circularis* serve to separate the two species.



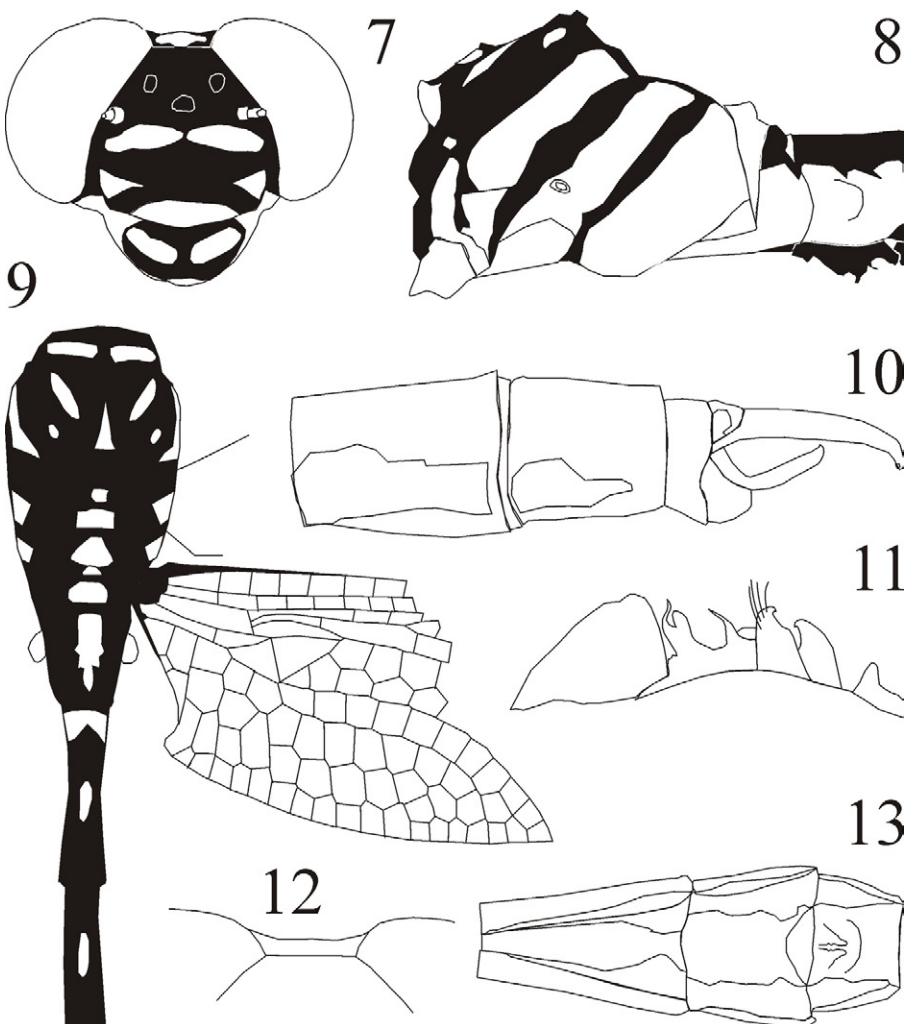
Figures 1-6.

Orientogomphus circularis Selys, Burma.
(1-2) 'type' male: [1] hindwing base; [2] anterior hamulus, lateral view. (3) male, from Maymyo, north Burma, hamuli, lateral view.
(4-6) 'type' female: [4] head, frontal oblique; [5] synthorax, lateral; [6] caudal abdomen, ventral.

Orientogomphus Chao & Xu 1987

Fraser (1934, page 337) commented on the genus *Acrogomphus* in India and stated: "Only one species occurs within our limits. (*O. circularis* Selys is not an *Acrogomphus*, as formally surmised by Laidlaw [1931]; a specimen of this insect which I possess has the venation typical of that of *Onychogomphus*)". According to Fraser (1934) the genus *Acrogomphus* has parallel 1A and CuP hindwing veins. The CuP vein in the forewings of *minor* is only slightly pectinate, whereas distinct pectination of this vein is a key feature characterising the *Acrogomphus* genus (Laidlaw, 1925). Moreover, members of the *Acrogomphus* genus do not possess superior appendages which are abruptly curved downwards apically (see Fig. 10).

Chao and Xu (1987) established the genus *Orientogomphus* to receive the Chinese species *armatus* and Chao (1990) included the species *Onychogomphus circularis*, *Onychogomphus earnshawi* Fraser (1924) and *Onychogomphus aemulus* Lieftinck (1937), within the genus but made no mention of *minor*. The genus *Orientogomphus* is characterised by small to medium-sized onychogomphines with divergent inferior appendages much shorter, usually about half length of superior appendages, with apical margin shallowly concave; posterior lobe (prepuce) of penile organ absent; superior appendages long, bracket-like in dorsal view, and abruptly curved apically in lateral view, with a minute peg-like process at tip. The lectotype male of *minor* possesses all these key characters of *Orientogomphus* and is transferred here to this genus. The type species for the genus *armatus* has hindwing with 1A and CuP diverging towards the wing margin as in *minor*.



Figures 7-13.
Orientogomphus minor Laidlaw.
(7-11) Lectotype male: [7] head, frontal; [8] synthorax, lateral; [9] dorsal view of synthorax, basal abdomen and basal hind wing; [10] caudal abdomen and genitalia, lateral; [11] secondary genitalia, lateral. (12-13) paratype female: [12] caudal abdomen, ventral; [13] occipital margin.

Thai specimens (not including the '*minor*' paratype female collected from peninsular Thailand)

Asahina (1986) figured two male specimens collected from Mae Klang Waterfalls and Ratapoon, Thailand (see Figs 19-25), which he considered to belong to *Onychogomphus circularis*, but according to R.G. Kemp in Hämäläinen & Pinratana (1999, page 126) who examined McLachlan's material: "*O. circularis* Sélys, 1894 material at BMHN London does not agree with the illustrations given by Asahina (1986). The male accessory genitalia are quite different". I communicated with Bob Kemp by email and ascertained that when he visited the BMNH he was trying to identify an *Orientogomphus* specimen from Kuala Atok, Pahang, which he informed me: "subsequently turned out to agree with *Orientogomphus aemulus* (Lieftinck, 1937)". Asahina (1981) commented that his two male Thai specimens agreed well with Fraser's (1934) description of *circularis* specimens obtained from Maymyo, Burma.

The dimensions given by Asahina (1986) for his Thai ♂ specimens are abd. + app. 35.0-36.0 mm, hw 27.0 mm, which is more or less the same as the Khao Phanom Bencha Forest male specimens from Krabi, which are abd. + app. 35.0-36.5 mm, hw 27.0. They have identical genitalia and markings. There is one venational difference. Three of the hindwing anal triangles in the Krabi males are reduced to just three cells (see Fig. 18) and one is 4-celled, but even the smallest cell of this latter anal triangle is reduced in size with just three sides instead of the usual four sides. The anal field is 2-celled except one of the hindwings, which is 1-celled, as illustrated in Fig. 18. Asahina (1986) reports his specimens with anal triangles 4-celled. Asahina has also figures the tip of the abdomen with a greater expansion than is featured in the Krabi males (see Fig. 24). 1A and CuP diverge towards the wing margin in the Thai specimens in common with *minor* (cf Fig. 9). The body colour pattern is also similar (see Figs 8, 9, 14, 20 & 24). Notwithstanding the anal field and body shape differences, the two males I collected from Krabi are conspecific with the Asahina's (1986) Thai males. The size of the Thai specimens is similar to the size reported by Laidlaw (1931) for *minor* i.e. 'abdomen 33 + 2 mm, hindwing 25 mm'. The body markings, colouration and structure of the caudal and secondary appendages are also identical. The wing venation is identical save for the anal triangle which matches the Asahina's Thai material but not the Krabi specimens. All Thai specimens belong to *Orientogomphus minor*.

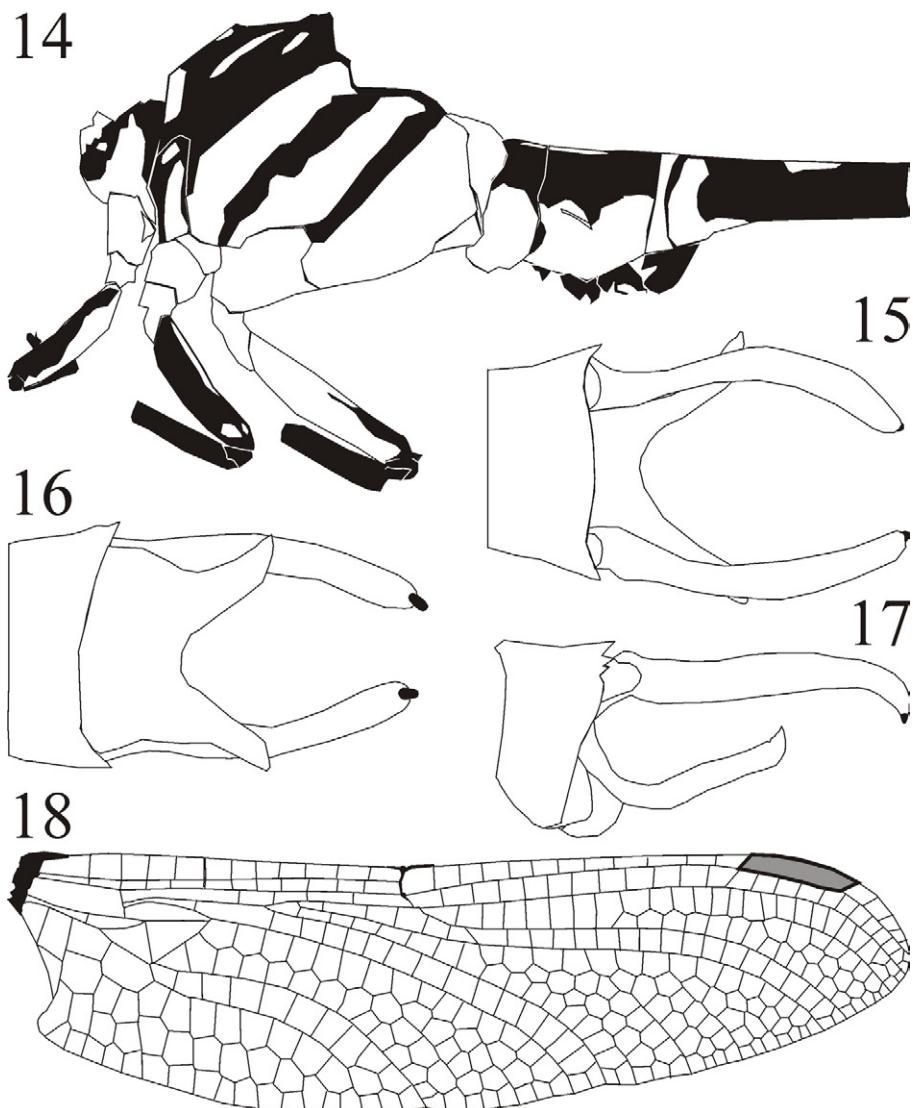
An unusual feature of the Thai material is the presence of a minute, peg-like process at the tip of the superior appendages (see Figs 15-19). This feature is shared with *Orientogomphus armatus* Chao and Xu (1987) the type species for the genus *Orientogomphus* (Ibid). Indeed the venation and structure of the secondary and caudal appendages are very similar to *Orientogomphus armatus*. Only a careful examination of the two insects reveals they are separate species. The secondary genitalia are similar but not identical. I compared my Thai material directly with *armatus* specimens collected from Hainan (Wilson & Reels, 2001). *O. armatus* is significantly larger and more robust with an inferior appendage which has uniformly straight divaricate arms. Thai specimens have slightly curved divaricate arms (see Fig. 16). In addition the vertex of female *armatus* bears a double-horned tubercle.

***Acrogomphus naninus* from northern Vietnam**

Förster (1905) described *naninus* from Tonkin (Than Moi) under the genus *Heterogomphus*. Lieftinck (1937) redescribed and figured a paratype male of *naninus* (see Figs 26-30) collected from northern Vietnam (Mau Sau, 3000 ft, leg. H. Fruhstorfer). It is the same size as Burmese *circularis*, circa abd. 43.0 mm and hw 32.5 mm, and shares the small peg-like process at the tip of the superior appendages. The paratype lacks the small yellow antehumeral spot observed in Thai, Malay and Burmese specimens and type *naninus* but otherwise the description matches *circularis*, although judging from Lieftinck's drawings (see Figs 26-30) the colour pattern is less developed. Chao (1990) stated *naninus* is a junior synonym of *circularis*. But, nobody has compared the type specimens of *O. naninus* and *O. circularis*, and the synonymy presented by Chao may have been based just on misinterpreting of Asahina's and Lieftinck's comments. In the list of the name-bearing types of species-group names in Odonata preserved in the University of Michigan Museum of Zoology (UMMZ), where the *naninus* type male is held, Garrison & al. (2003) doubted the synonymy of *naninus* and *circularis* and wrote: "Chao (1990: 342) listed *Heterogomphus naninus* as a synonym of *Onychogomphus* (now *Orientogomphus*) *circularis* Selys, 1894, apparently based on the sentence by Asahina (1986: 24): "This [*circularis*] is a Burmese insect, but if *O. nanius* (Sic!) Förster (1905) is synonymous with *circularis* the range of the latter species reaches Tonkin". This was only a supposition, not a taxonomic decision. Pending comparison of the types of *naninus* and *circularis* we prefer to recognize them as separate species." Mark O'Brien, the Collection Manager at UMMZ kindly forwarded a photograph of the *naninus* holotype male. A drawing of the hindwing is illustrated in Fig. 31. The 1A and CuP veins clearly diverge towards the wing margin in contrast to *circularis*, which features parallel veins. Superficially *naninus* strongly resembles *minor* but the wing venation is significantly denser in *naninus*. From the point where 1A leaves the hindwing triangle to the basal wing margin there are four blocks of cells in *naninus* whereas *minor* only has three cell blocks. It is self evident that *naninus* is not a synonym of *circularis* or *minor* but represents another distinct species of *Orientogomphus*.

Synonymic notes

In the light of the above assessment synonymic notes are provided overleaf for *Orientogomphus circularis*, *Orientogomphus minor* and *Orientogomphus naninus*.



Figures 14-18.
Orientogomphus minor
Laidlaw, ♂, Khao, Phanon
Bench National Park, Krabi,
Thailand: (14) thorax, legs
(less tarsi) and basal abdomen,
lateral; (15) caudal genitalia,
dorsal; (16) caudal genitalia,
ventral; (17) caudal genitalia,
lateral; (18) hindwing.

***Orientogomphus circularis* (Sélys, 1894)**

Figures 1-6

Orientogomphus circularis Sélys, 1894; - Chao, 1990: 342 (transferred *circularis* from the genus *Onychogomphus*); - Schorr et al., 2007: 53 (list); - Bridges, 1994: VII.51, VIII.50; - Steinmann, 1997: 172 (list).

Onychogomphus circularis Sélys, 1894; - Martin, 1904: 212 (Tonkin); - Williamson, 1907: 312: (pair from north Burma in McLachlan collection, which comprises the type ♂ and 'type' ♀, now held at BMNH); - Laidlaw, 1922: 412 (short note); - Fraser, 1924: 115-116 (pl. 1, fig. 4, McLachlan pair from north Burma); - Laidlaw, 1930: 191 (list only); - Fraser, 1934: 261-263 (fig. 79, McLachlan pair from Burma and male from Maymyo, upper Burma); - Davies & Tobin, 1985: 43 (list).

Acrogomphus circularis Sélys 1894; - Laidlaw, 1931: 215 (transferred *circularis* from *Onychogomphus*).

***Orientogomphus minor* (Laidlaw, 1931) comb. nov.**

Figures 7-25

Material: 2 ♂, Khao Phanon Bencha National Park, Krabi, Thailand, 9-iv-2001, coll. K.D.P. Wilson).

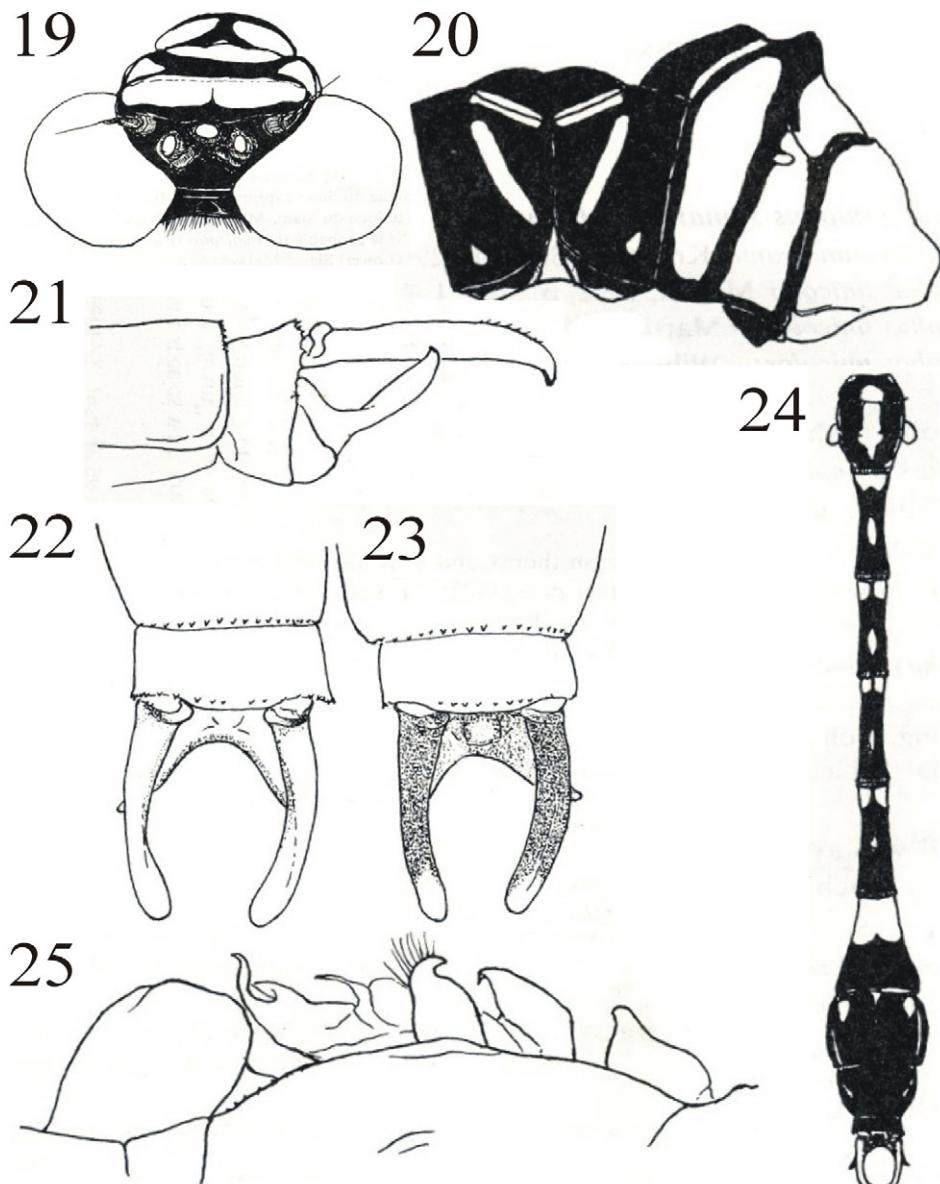
Measurements: abd. + app. 35.0-36.5 mm, hw 27.0.

Onychogomphus circularis nec Sélys, 1894; - Asahina, 1981: 9 (1 ♂, Mae Klang Waterfall, Thailand, 11.vi.1965; 1 ♂, Ratapoon, Thailand, 27.vi.1965); - Asahina, 1986: 22-24, 34 (figs 67-73, 123, ♂, Mae Klang Waterfalls, Thailand; 1 ♂, Ratapoon, Thailand).

Onychogomphus sp.; - Hämäläinen & Pinratana, 1999: 85, 126 (records from Thailand: Chiang Mai, Tak, Sakon Nakhon and Songkhla).

Acrogomphus minor Laidlaw, 1931: 215-217 (type: ♂ Kuala Lumpur, Selangor, July 1922, paratype: 1 ♀, Phattalung, Koh Wangse, peninsular Thailand, at light, 24th May 1924, IHN Evans); - Lieftinck, 1935: 205 (list and comment); - Lieftinck, 1954: 90 (list); - Asahina, 1986: 22 (list and comment); - Hämäläinen & Pinratana, 1999: 71 (record from Phattalung, peninsular Thailand); - Davies & Tobin, 1985: 41 (list); Bridges, 1994: VII.154, VIII.1 (list); - Steinmann, 1997: 164 (list); - Orr, 2005: 65 (peninsular Malaysia & southern Thailand); - Schorr et al., 2007: 32 (list).

Acrogomphus sp.; - Laidlaw, 1930: 192 (Malaya).



Figures 19-25.

Orientogomphus minor Laidlaw, ♂, Thailand, from Asahina (1986) as *Onychogomphus circularis* Sélys: (19) head; (20) synthorax; (21) caudal genitalia, lateral; (22) caudal genitalia, ventral; (23) ditto; (24) abdomen, dorsal; (25) secondary genitalia, lateral.

***Orientogomphus naninus* (Förster, 1905) comb. nov.**
Figures 26-31

Acrogomphus naninus Förster, 1905; - Laidlaw, 1930: 192 (transferred to *Acrogomphus*); - Schorr et al., 2007: 32 (list).

Heterogomphus naninus Förster, 1905: - 19-21 (δ Than Moi, Tonkin); - Williamson, 1907: 314-316 (no specimens examined); - Laidlaw, 1922: 414 (remarked 'not a *Heterogomphus*').

Onychogomphus naninus Förster, 1905; - Förster, 1914: 75 (transferred from *Heterogomphus*); - Lieftinck, 1937: 113-115 (figs. 29-30, paratype δ , Mau Sau, Tonkin); - Davies & Tobin, 1985: 44 (list); - Steinmann, 1997: 177 (list).

Orientogomphus circularis nec Sélys, 1894; - Cuong & Hoa, 2007: 92 (Lang Son: Dong Mo [Than Moi], northern Vietnam - refers to Martin's 1904 record from Tonkin and Förster's 1905 type pair of *naninus*); - Chao, 1990: 342 (listed *Heterogomphus naninus* Förster as a synonym of *circularis* Sélys); - Bridges, 1994: VII.162, VIII.50 (listed as syn. of *circularis*)

Conclusions

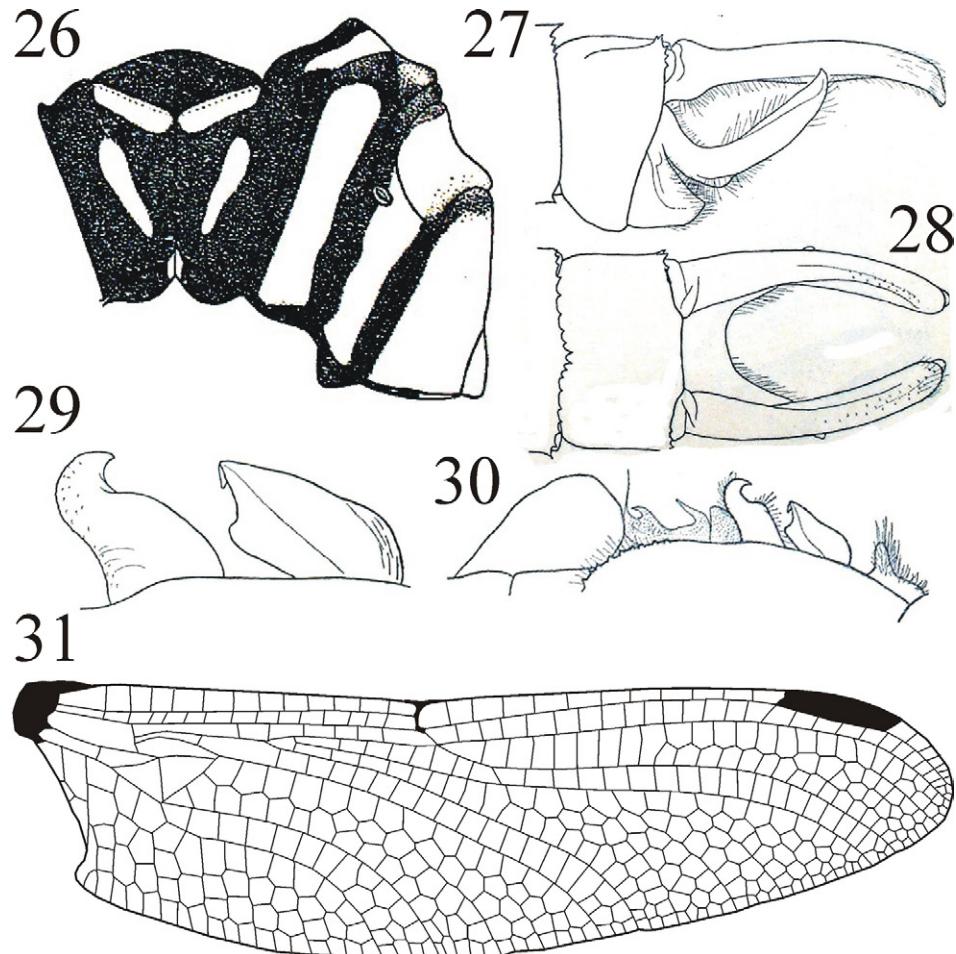
All Thai specimens, formally attributed to *circularis* or *Onychogomphus* sp., belong to *Orientogomphus minor*. *Orientogomphus circularis* is a distinct and relatively large species from north Burma. *O. minor* is a small species ranging throughout Thailand to Peninsular Malaysia (abd. 35.0-36.5, hw 25.0-27.0). *Orientogomphus naninus* is of similar size to *circularis* but is not its junior synonym and neither is it a synonym of *minor*; it is another distinct species from northern Vietnam. A map showing the distribution of all specimens collected belonging to the genus *Orientogomphus* is provided in Fig. 32.

Acknowledgements

I am most grateful to David Goodger of the BMNH for his kind hospitality and help with viewing specimens and thanks are also due to Mark O'Brien of the UMMZ for his assistance with the *naninus* holotype. I am also grateful to Matti Hämäläinen for providing me with information on the dragonflies of Krabi Province and Khao Phanom Bencha Forest National Park and for helpful comments and advices on this article.

References

- Asahina, S., 1981. Records of little or unknown Odonata from Thailand. *Tombo* 23(1-4): 3-16.
 Asahina, S., 1986. A list of the Odonata recorded from Thailand, Part XIV. Gomphidae 2. *Tombo* 29(1-2): 7-53.
 Bridges, C.A., 1994. *Catalogue of the family-group, genus-group and species-group names of the Odonata of the World* (3rd edn.). Pub. C.A. Bridges, Urbana, Illinois.
 Chao, H-f. (= Zhao, Xiufu), 1990. *The Gomphid Dragonflies of China* (Odonata: Gomphidae). The Science and Technology Publishing House, Fuzhou, Fujian, China. (Chinese with Eng. sum. and keys).



Figures 26-31.
 (26-30) *Orientogomphus naninus* Förster, from Lieftinck (1937) as *Acrogomphus naninus* Förster, δ , Than Moi, northern Vietnam: [26] synthorax; [27] caudal genitalia, lateral; [28] caudal genitalia, dorsal; [29] hamuli, lateral [30] secondary genitalia, lateral. (31) Holotype male *naninus*, hindwing.

- Cuong, D.M. & Hoa, D.T.T., 2007. *Checklist of Dragonflies from Vietnam*. Vietnam National University Pub
- Chao, H-f. & Xu J-F, 1987. Descriptions of a new genus and species of gomphid dragonfly reared from nymph in Fujian Province, with notes on allied species (Gomphidae: Onychogomphinae). *Journal of Fujian Agricultural College* 16(4): 259-266. Iisher, Hanoi, Vietnam.
- Davies, D. A. L. & P. Tobin, 1985. *The Dragonflies of the World: A systematic list of the extant species of Odonata*. Vol. 2. Anisoptera. S/O, Rapid Communication (Supplements) No.5. Utrecht.
- Förster, F., 1905. Libellen von Tonkin. *Wiener entomologische Zeitung* 24: 19-24.
- Förster, F., 1914. Beiträge zu den Gattungen und Arten der Libellen. III. *Archiv für Naturgeschichte (Berlin)* (A)80(2): 59-83.
- Garrison, R.W., N. von Ellenrieder & 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.
- Fraser, F.C., 1924. Indian dragonflies, XIX. *Journal of the Bombay natural History Society* 30(1): 106-117.
- Fraser, F.C., 1934. *Fauna of British India, including Ceylon and Burma. Odonata*. Vol II. London, Taylor & Francis.
- Hämäläinen, M., 2000. Ten species added to the list of Peninsular Malaysia Odonata. *Notulae Odonatologica* 5(5): 53-55.
- Hämäläinen, M., 2002. Remembering dinner table and other backyard records. *Agrion* 6(2): 19-20.
- Hämäläinen, M., Bro. A. Pinratana, 1999. *Atlas of the dragonflies of Thailand: Distribution maps by provinces*. Brothers of Saint Gabriel in Thailand, Bangkok.
- Laidlaw, F.F., 1922. A list of the dragonflies recorded from the Indian Empire with special reference to the collection of Indian Museum. Part V. The subfamily Gomphinae, with an appendix by F.C. Fraser. *Record of the Indian Museum* 24(3): 367-426.
- Laidlaw, F.F., 1925. Description of a new genus and two new species of dragonflies (Odonata) belonging to the family Gomphidae from Tropical Asia. *Proceedings, Zoological Society of London* 1925(1): 439-444.
- Laidlaw, F.F., 1930. A synonomic list of dragonflies of the family Gomphidae (Odonata, Anisoptera) found in the Oriental Region. *Transactions of the entomological Society of London* 78(2): 171-197.
- Laidlaw, F.F., 1931. A list of the dragonflies (Odonata) of the Malay Peninsula with descriptions of new species. *Journal of the Federated Malay States Museum* 16(3/4): 175-233.
- Lieftinck, M.A., 1935. New and little known Odonata of the Oriental and Australian Regions. *Treubia* 15(2): 175-207.
- Lieftinck, M.A., 1937. Descriptions and records of Southeast Asiatic Odonata. *Treubia* 16(1): 55-119.
- Lieftinck, M.A., 1954. Handlist of Malaysian Odonata. A catalogue of dragonflies of the Malay Peninsula, Sumatra, Java, and Borneo, including adjacent small islands. *Treubia* 22 (suppl.).
- Martin, R., 1904. Liste de Neuroptères de l'Indo-Chine. In *Mission Pavie Indo-Chine* 3: 204-221.
- Orr, A.G., 2005. *A Pocket Guide to Dragonflies of Peninsular Malaysia*. Natural History Publications (Borneo), Sabah.
- Schorr, M., M. Lindeboom & D. Paulson, 2007. *World list of Odonata* (last revision August 2007). [web pages accessed 14th December 2007] <http://www.ups.edu/media/SlaterMuseum/WorldOdonataList.pdf>.
- Sélys-Longchamps, M. E. De., 1894. Causeries Odonatologiques. No. 7. Gomphines nouvelles communiquées par M. MacLachlan. *Annales de la Société entomologique de Belgique (Bruxelles)* 38: 163-180.
- Steinmann, H., 1997. *World Catalogue of Odonata II. Anisoptera*. Das Tierreich/The Animal Kingdom. (Wermuth, H. & Fischer, M., eds.). Teilband/Part 111. Pub. W. de Gruyter, Berlin-NewYork.
- Williamson, E.B., 1907. The dragonflies (Odonata) of Burma and lower Siam – II. Subfamilies Cordulegasterinae, Chlorogomphinae, and Gomphinae. *Proceedings U. S. national Museum* 33: 267-317.
- Wilson, K.D.P. & G.T. Reels, 2001. Odonata of Hainan, China. *Odonatologica* 30(2): 145-208.

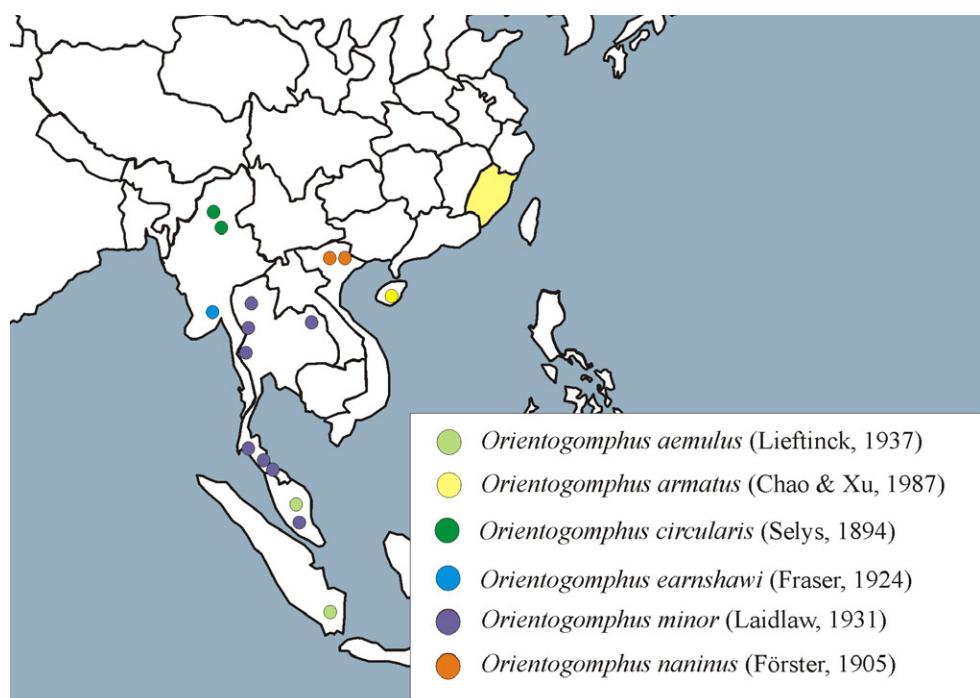


Figure 32. Distribution of all taxa belonging to the genus *Orientogomphus* Chao & Xu.