AGRION

NEWSLETTER OF THE WORLDWIDE DRAGONFLY ASSOCIATION

PATRON: Professor Edward O. Wilson FRS, FRSE

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Secretary: Dr. Jessica I. Ware, Assistant Professor, Department of Biological Sciences, 206 Boyden Hall, Rutgers University, 195 University Avenue, Newark, NJ 07102, USA. Email: wda.secretary@gmail.com.
Editors: Keith D.P. Wilson. 18 Chatsworth Road, Brighton, BN1 5DB, UK. Email: kdpwilson@gmail.com.
Graham T. Reels. 31 St Anne's Close, Badger Farm, Winchester, SO22 4LQ, Hants, UK. Email: gtreels@gmail.com.

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NEWSLETTER OF THE WORLDWIDE DRAGONFLY ASSOCIATION

AGRION is the Worldwide Dragonfly Association's (WDA's) newsletter, published twice a year, in January and July. The WDA aims to advance public education and awareness by the promotion of the study and conservation of dragonflies (Odonata) and their natural habitats in all parts of the world. *AGRION* covers all aspects of WDA's activities; it communicates facts and knowledge related to the study and conservation of dragonflies and is a forum for news and information exchange for members. *AGRION* is freely available for downloading from the WDA website at http://worlddragonfly.org/?page_id=125. WDA is a Registered Charity (Not-for-Profit Organization), Charity No. 1066039/0.

Editor's notes

Keith Wilson [kdpwilson@gmail.com]

Conference News

The Third European Congress on Odonatology (ECOO 2014) will be held in Montpellier, France, 7-10 July 2014. For further details see link: [http://www.sfecologie.org/ecodiff/2014/03/26/3rd-european-congress-on-odonatology-ecoo-2014/].

The 2015 International Congress of Odonatology will be held at La Plata City, 60 km south of Buenos Aires, Argentina in association with the Universidad Nacional de La Plata, Museo de La Plata and Instituto de Limnología. The Congress venue is the 'Salon Cultural' of the Seguros Rivadavia Company (7th Avenue and 46th Street). The congress will be held between 15th and 20th November 2015. The post congress tour will be in Patagonia from November 21st; in this tour we will visit Bariloche City (Rio Negro Province) and San Martin de los Andes City (Neuquen Province) visiting two beautiful National Parks: Lanin and Nahuel Huapi, hoping to find several of the patagonic endemics. For Congress enquiries contact Javier Muzón [icoargentina2015@gmail.com]. Enquiries for funding support should be addressed to Dr. Vincent Kalkman, Dorpsstraat 84, 2343BB Oegstgeest, The Netherlands. E-mail: [kalkman@naturalis.nnm.nl].

Agrion Regional Representatives

For the last *Agrion* issue we received very few contributions from members and the matter was discussed briefly by the WDA Board. In today's media rich, internet connected environment, *Agrion* must compete with country based dragonfly societies, blogs, social networking and numerous image hosting and video hosting websites. In theory there should be a vast amount of news and topical information about dragonflies and members activities, much of it disseminated by country based dragonfly societies and country based internet forums. The WDA Board agreed that the appointment of Regional Representatives, reporting any regional-based odonatological information of potential interest to WDA members, would help *Agrion* gather in and disseminate regional news and articles. Six *Agrion* Regional Representatives have recently been appointed covering, South America, Africa, North Asia, East Asia, Southeast Asia and South Asia. Graham and I are most grateful to these individuals, as listed below, for agreeing to take on reporting duties for their respective regions. We are hoping to appoint additional Regional Representatives to cover North America, Europe and Middle East. If any member would be interested in taking on the role for any of these three regions we would be very pleased to hear from you.

North America:	Vacant
South America:	Dr. Javier Muzon [muzon@ilpla.edu.ar]
Africa:	Dr. John P. Simaika [simaikaj@sun.ac.za]
Western Europe:	Vacant
Middle East:	Vacant
North Asia:	Dr. Elena Malikova [e_malikova@inbox.ru]
East Asia :	J.H. Natsume [romluna@y4.dion.ne.jp]
South Asia (India):	Dr. K.A. Subramanian [subbuka.zsi@gmail.com]
Southeast Asia:	Dr. Rory Dow [rory.dow230@yahoo.co.uk]
Australasia:	Vacant

Cover photo: Blue hawker, *Aeshna cyanea* (Müller, 1764) in flight over small pond at Hastings, East Sussex, UK, 26 August 2013. Credit: Keith D. P. Wilson.

New WDA website

It has long been an ambition of the WDA to host and manage its own dedicated website and now we have just such a website managed by Rhainer Guillermo Ferreira and Christopher Hassall. The website address is: [http://worlddragonfly.org/]. It looks very professional and provides all the essential WDA information, publications and far more. Thanks to Rhainer and Christopher for setting up such an impressive website.

WDA's web site was initially hosted by Colgate University, Hamilton, New York and Ron Arnold served very ably as Webmaster. Since 2007 Adolfo Cordero Rivera has managed and hosted the WDA website at the University of Vigo, Spain. Over the past seven years, Adolfo has often been very busy with his research travels, nevertheless, he has always managed to find a way to attend to WDA website matters in an efficient and timely fashion. We are most grateful to Adolfo and owe him a good deal of thanks.

The new webmasters' email contacts are: Rhainer Guillermo Ferreira [rhainerguillermo@yahoo.com.br], Christopher Hassall [c.hassall@leeds.ac.uk].

Facebook and Twitter

WDA is now on Facebook and Twitter. The WDA Facebook website can be found at the link: [https://www.facebook.com/WorldwideDragonflyAssociation] and the WDA Twitter website may be found at the link: [https://twitter.com/WorldDragonfly].

Next issue of *AGRION*

For the next issue of *AGRION,* to be published at the beginning of January 2015, please send your contributions to Keith Wilson [kdpwilson@gmail.com] or Graham Reels [gtreels@gmail.com]. All articles, information and news items related to dragonflies or of interest to WDA members are most welcome and will be considered for publication. Please send all text and figure captions in a Word file by email, preferably, or on a disk by post. Please do not include artwork with the text but provide a separate file or files in soft copy form, ideally in a compressed format (e.g. 'jpeg' or 'gif'), or as files on disk if sent by post.

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

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South-East Asia round-up

Rory Dow [rory.dow230@yahoo.co.uk]

Oleg Kosterin

In the second half of February, Oleg Kosterin found himself taking a private family holiday in Bali (ten days) and Lombok (three days). However he could not resist searching for odonates, which resulted in him adding one species to the known fauna of Bali and six to that of the somewhat less studied Lombok (he wishes the proportion of his time spent on the two islands were reversed)! A note about this outcome has been submitted in a report to IDF. On June 1-20 he was on his next scheduled trip, supported by IDF, aimed at continuing his exploration of the Odonata fauna of Cambodia. This time the destinaton was the eastern Mondulkiri Province, on average the most elevated in the country (mostly 400-700 m a.s.l.), situated in the western outskirts of the Annamese Mts., although the area is hilly rather than mountainous, and still retaining large areas of unspoiled nature. The trip was fruitful, as expected: quite a number of new country records were made.

Robin Ngiam

In the past six months, I've published a paper on the larvae of *Leptogomphus risi* and *L. williamsoni*. I am currently working on a paper on *Ceriagion* sp. nov from Maludam National Park, Sarawak, and an overall Odonata paper for the same site. In Singapore, I am involved in the creation of a dragonfly pond in a semi-urban park; providing expert advice on larva DNA barcoding with the National University of Singapore; and have given a dragonfly talk at an architectural and landscape company. In the coming months, I'll be on a week-long survey at the Sakaerat Research Station in Thailand, followed by a two-week expedition in Sarawak.

C.Y. Choong

Centre for Insect Systematics, Faculty Science and Technology, Universiti Kebangsaan Malaysia, UKM Bangi, Selangor, Malaysia

Odonata Activity Update in Peninsular Malaysia

In the midst of my busy office work in my university, I have managed to get down to the field to conduct dragonfly inventories at a few places in Peninsular Malaysia in the past six months. In January I revisited Chini Lake (Pahang) for a week to update the Odonata checklist for that site. Many additional species were added to the checklist, which now stands at 80 species. The population of *Chalybeothemis chini* (a species described from Chini Lake (Dow et al. 2007)) was found to be healthy during my January visit. *Chalybeothemis chini* has also been recorded outside Chini Lake at Kuala Tahan (Pahang), Gopeng (Perak), Semenyih (Selangor) and Bangi (Selangor). Later in February, I joined the scientific expedition to Kelang Gate, Gombak (Selangor) organised by Institute for Environment and Development (LESTARI) UKM. The expedition site is not far from the place where *Gynacantha corbeti* was described (Lempert 1999). However, I did not manage to spot any *G. corbeti* during the expedition. I have engaged myself with Malaysian Nature Society's (MNS) community project in Tioman Island (Pahang), and in March and May, I visited the island with MNS to survey Odonata. I will be visiting again in the next six months (before the Tioman Island community project ends at the end of 2014) for one or two more field inventories. At the conclusion of the project, I shall produce a more comprehensive Odonata checklist for Tioman Island. In September 2014, I will take part in PERHILITAN's (Department of Wildlife and National Parks) inventory work in Bera Lake (Pahang), which is a Ramsar site, not far from Chini Lake, with a known odonate fauna of 78 species (Norma-Rashid et al. 2001).

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Rory Dow

After a busy time in the first half of this year, I am off to South-East Asia again for July and August. I will be visiting sites in Sarawak (including on the small expedition already mentioned by Robin Ngiam, to a location in the Upper Baram area of Miri division), Sabah and Java.

Monthly meeting of the Tokyo Odonatological Society

Photo taken June 11th, 2014, at the monthly meeting of Tokyo Odonatological Society at Izakaya (Japanese Bar). Monthly meetings are held every second Wednesday evening to exchange and update news of dragonflies and maintain friendship association. Attendants were (from left to right, front row): S. Ugai, N. Seki, K. Tagai; left to right, far row: T. Teramoto, K. Ikeda, H. Yoshino and H. Natsume. They are also the members of the Japanese Society for Odonatology. Credit Sanae-chan at Kagaya.

Email from Dr. Ângelo Parise Pinto
Ângelo Pinto [odonata_angelo@hotmail.com] or [appinto@usp.br]

Festschrift in honor Angelo B. M. Machado

Laboratório de Biologia e Sistemática de Odonata
Departamento de Entomologia, Museu Nacional – UFRJ
Quinta da Boa Vista s/n., São Cristóvão 20940-040
Rio de Janeiro, RJ, BRASIL

Dear Odonatologists,

We are happy in launch an invitation for a festschrift to be published in *Zootaxa* in honor of our friend and inexhaustible colleague odonatologist Angelo B. M. Machado on the occasion of his 80th birthday. Please, find in the link below an invitation letter with detailed information. For now we will need only a draft title for the contribution. You can send the title, including authorship, of your intended contribution directly by email, or preferably through the electronic registration form at the link provided below.

Link: [https://drive.google.com/folderview?id=0By-YYjDwuFFvVGhEU29tMmtISEk&usp=sharing]

Best Regards,
Ângelo

Plagiarism or pragmatism - who cares? An analysis of some 18th century dragonfly illustrations

Albert G. Orr [agorr@bigpond.com] &
Matti Hämäläinen [matti.hamalainen@helsinki.fi]

Moses Harris (1731-1785), a Londoner, was a brilliant water-colourist and in his time a leading entomologist in England. Harris wrote and illustrated the famous insect books *The Aurelian or natural history of English insects* (1766) and *An exposition of English insects* (1776-1780, second edition 1782). He is also regarded as being the inventor of the first organized colour wheel, which was published in his book *The natural system of colours* (1766), 94 years after Isaac Newton had identified the spectral colours by refraction of white light using a glass prism. Harris also engraved most of the 150 copper-plates for Dru Drury's *Illustrations of natural history*, a book depicting mainly exotic insects, which appeared in three volumes in 1770, 1773 and 1782. His contribution to this work tends be less well known, as in an extraordinary act of egotism, Drury not only failed to acknowledge Harris, but expropriated artistic credit by prominently claiming to have personally directed the execution of the artwork. Harris' contribution is indicated only by his signature on some plates. In the second edition (1837) of Drury's work (re-titled *Illustrations of exotic entomology*), Harris' contribution was handsomely acknowledged in a footnote in the preface written by the editor J.O. Westwood.

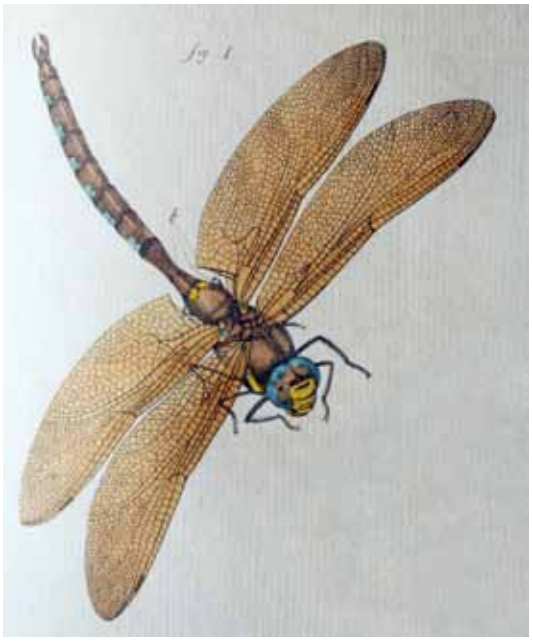

Fig. 1. Extract from Plate XII from *An exposition of English insects* by Harris (1780), showing the 'Large brown'. No scientific name was given for this male specimen of *Aeshna grandis* (Linnaeus, 1758).

For many odonatologists Moses Harris is best known as the author of the Banded Demoiselle, *Calopteryx splendens*, which he described in 1780 in *An exposition of English insects*. This is the first of only four dragonfly species[1] currently recognised to have been described originally from the British Isles and certainly one of the most beautiful of European odonates. In 1780 Harris also described several other new species and it is possible that his descriptions and illustrations of '*Libellula coluberculus*' and '*Libellula aereus*' were the first of the species presently known as *Aeshna mixta* Latreille, 1805 and *Enallagma cyathigerum* (Charpentier, 1840), respectively. However, later authors were not quite sure of their identity (Lucas, 1900) and therefore these names have not been adopted.

Fig. 2. Extract from Plate XVI from *An exposition of English insects* by Harris (1780), showing the 'Large green'. No scientific name was given for this male specimen of *Aeshna cyanea* (Müller, 1764).

Apart from Thomas Mouffet's (1634) black and white drawings of a *Calopteryx splendens* male and a *Libellula depressa* male, Harris was the first English author to illustrate dragonflies identifiable at the species level. Although some of his dragonfly drawings were not especially good, others were superb, such as those of the aeshnids: 'Large brown' (without scientific name), presently known as *Aeshna grandis* (Fig. 1) and 'Large green' (without scientific name), presently known as *Aeshna cyanea* (Fig. 2). The perfectly natural colours of the eyes indicate that Harris had examined living individuals of these aeshnids and either coloured the printed copper plates himself or supervised the colourists. Harris was also the first to illustrate (Fig. 3) and describe the Golden-ringed Dragonfly. Unfortunately he identified it erroneously as *Libellula forcipata*, a species named by Linnaeus in 1758, presently known as *Onychogomphus forcipatus*. Edward Donovan (1807) described *Libellula boltonii* (presently *Cordulegaster boltonii*) with a fine illustration of a male (Fig. 4), which he depicts in a dramatic pose among vegetation in the act of devouring a moth. Donovan represented the colour of *boltonii* eyes as brown,

[1] The other species are *Cordulegaster boltonii* (Donovan, 1807), *Anax imperator* Leach, 1815 and *Oxygastra curtisii* (Dale, 1834).

typical of dead cabinet specimens, but Harris obviously used his imagination and coloured the eyes a deep blue not unlike those of *Aeshna grandis*, suggesting he probably never saw the living dragonfly with its splendid green eyes.

At this stage the reader may be wondering what is the significance of the first part of the title of this article. It is thus – In his '*Exposition*' Harris also illustrated several larvae as follows: On Plate XII a larva of the 'Large brown' (*Aeshna grandis*), on Plate XXIX a larva of *Libellula lugifugus* (*Coenagrion puella*) and on Plate XXX a larva of *Libellula splendeo* (*Calopteryx virgo*). Only the demoiselle larva illustration is of adequate quality, the others are poor, as already pointed out by Lucas (1900), and far from Harris' normal standard. It is evident that Harris did not illustrate these larvae from specimens, but at least two of the larval figures in *Exposition* were copied from the colour plates of the second part of August Johann Rösel von Rosenhof's *Insecten-Belustigung*, which was published in 1749. The *Insecten-Belustigung* was an extraordinary tour de force covering all aspects of European entomology, and to a large degree building on the celebrated 1734-1742 *Mémoires pour servir à l'histoire des Insectes* by René Antoine Ferchault de Réaumur, often regarded as the father of entomology. Rösel's volumes are richly illustrated with coloured copperplate engravings which showed much detailed structure and biology of all insect groups as well as serving as an identification guide, although at the time of its publication binomial Linnaean names had not yet come into use.

Fig. 3. Extract from Plate XXIII from *An exposition of English insects* by Harris (1780), showing the female of '*Libellula forcipata*', which is Harris' misidentification of the species presently known as *Cordulegaster boltonii* (Donovan, 1807).

The strongest similarity is in the depiction of the larva of *Calopteryx virgo*. Figure 5 shows at the top, Rösel's original earlier depiction, at bottom Harris' image as it was reproduced, and in the centre the same image reversed. Despite some small differences in the angles and length of segments of the legs there can be little doubt that Harris' image is modelled on that of Rösel, perhaps even traced. There is an equally striking likeness between the image of the larva of *Coenagrion puella* (Fig. 6). Again at the top figure is Rösel's earlier depiction, at the bottom is Harris's version, and in the centre the latter image is reversed and rotated. Despite small differences in the length and position of the legs, it seems again highly likely that Rösel's drawing was the model for that of Harris. Indeed the latter is so sloppy, with its right foreleg emerging from the head, one wonders if the process of copying was not distasteful to Harris. Finally, the very first larval image in the '*Exposition*' (Fig. 7) shows a very stiff dorso-lateral lateral view of an aeshnid larva with mask extended. No attempt has been made to depict the eyes, antennae or hinge on the mask or labial palps, all inconceivable omissions for an artist of Harris' talent had he actually examined a specimen. A model for this sketch is again to be found in Rösel (1749), where an entire plate (Tab. III) is devoted to the development of the larvae of *Aeshna grandis* from early instars to maturity. Three large (F) larvae are depicted: one otherwise at rest, but showing clearly expulsion of water from the anus; one striking directly forward at a mayfly larva; and one striking laterally in a dramatic movement at a different ephemeropteran species. Detailed enlargements of the extended and retracted mask are also shown. Rösel's next plate (Tab. IV) shows in detail the emergence of this species from the exuviae. Harris has probably based his own drawing of *Aeshna* larva on the frontally striking example in the first plate. Terming the larvae as 'caterpillars', Harris also describes the mode of operation of the mask, which if he had never seen it, was surely based on Rösel's account. From Rösel's illustrations and text it is clear that he must have read and been inspired by Réaumur (1742), who illustrated the mask of 'nymphs' of Odonata, which Rösel acknowledges. Réaumur also figures the emergence of an aeshnid in several stages, and the stages of copulation and oviposition

Fig. 4. Donovan's (1807) plate [430] showing a male of '*Libellula boltonii*', presently known as *Cordulegaster boltonii*.

in a coenagrionid. Rösel illustrates these same events too, although in less detail in the latter case, but in no way could it be suggested that Rösel copied Réaumur's drawings. Rösel's drawings clearly bear the stamp of his own style and attest to close observation in the field. He also collected larvae from the field and reared them to maturity in an aquarium where he could observe their behaviour closely. He would thus have been able to see at first hand 'jet propulsion' and the explosive extension of the mask when catching prey.

Two more images by Harris suggest a strong influence by Rösel. They both appear in Plate XXVII of *The Aurelian* of 1766. One shows a gomphid larva, probably *Gomphus vulgatissimus*, which appears in a plate by Rösel (Tab. VII, Fig. 2), in the text wrongly linked to the male libellulid dragonfly (*Libellula depressa*) which is depicted on the same plate (Tab. VII, Fig. 3), together with an unidentifiable libellulid, perhaps a female *Orthetrum coerulescens* (Tab. VII, Fig. 4). A very similar larva, evidently an inverted and rotated version of Rösel's image, is shown underwater by Harris, together with the same two adult dragonflies as appear on Rösel's plate (Tab. VII). These however are sufficiently original and fresh to suggest Harris drew them from his own material. Nevertheless it would appear that by copying from Rösel, Harris repeats the former's error in associating a gomphid larva with an adult libellulid. Harris also depicts a libellulid, probably meant to be *L. depressa*, emerging from its exuviae. This bears an uncanny similarity with a figure by Rösel on his previous plate (Tab. VI Fig. 3), depicting the (reversed) emergence of this species together with an adult female. The exuvia itself is clearly not an exact copy, nor is the substrate on which it is fixed, but the emerging adult shares many similarities with Rösel's figure. Perhaps Harris had access to exuviae but had never actually witnessed an emergence. The case is open. Finally, in *The Aurelian*, Harris figured numerous larvae and pupae of Lepidoptera. Only one bears any likeness to Rösel's illustrations. This is the larva of The Camberwell Beauty *Nymphalis antiope*, a species which does not breed in Britain. As with other suspected copies, it is reversed.

We must stress that in making these observations we do not in anyway seek to impugn Moses Harris' reputation as an entomologist or as an artist. Rather we believe they shed light on his methods of working and as such are of historical interest. Any author or artist who is attempting a general work of entomology may at some stage need to depict material from secondary sources, and this was true even in the late 18th century. It is interesting that Harris saw the need to reverse the images, a ploy still used today to avoid copyright infringement, and by the poor quality of the copied images, we may conjecture that he did not greatly enjoy having to resort to this method of illustration.

It is probable that to some extent Harris was influenced and perhaps inspired by Rösel but also clear that he preferred to work from nature. In general his images are livelier. His Lepidoptera especially are often portrayed in flight with wings flapping. His adult Odonata tend to look crisper and more animated. Rösel on the other hand provides more accurate detail. The sock-like anal loop of the libellulid hindwing is present in several of his images, but their wings are rather limp, perhaps an attempt to convey life-like flexion. In fact Harris' stiffer wings are more convincing in this regard despite being less accurate in detail. Both Rösel's and Harris' drawings are an enormous improvement on almost all prior attempts to show venation. Despite his beautifully detailed and accurate drawings of internal anatomy and skeletal details the great Réaumur depicted odonate wing venation almost like a fishing net.

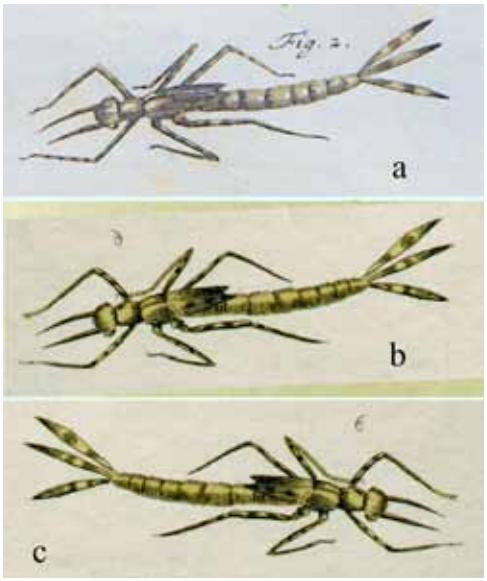

Fig. 5. Details from Rösel's '*Insecten-Belustigung*' and Harris' '*Exposition of English insects*' showing: (a) one of Rösel's figures of *Calopteryx virgo* larvae, (b) Harris' corresponding figure reversed and slightly rotated to show the similarity to that of Rösel's, (c) Harris' figure of *C. virgo* as it appeared.

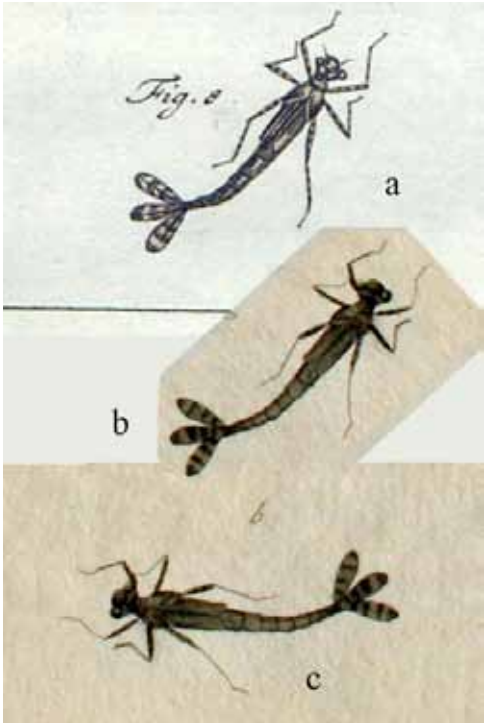

Fig. 6. Details from Rösel's '*Insecten-Belustigung* and Harris' '*Exposition of English insects*' showing: (a) one of Rösel's figures of *Coenagrion puella* larvae, (b) Harris' corresponding figure reversed and rotated to show the similarity to that of Rösel's, (c) Harris' figure of *C. puella* as it appeared.

It may be that Harris was simply more interested in the Lepidoptera than in Odonata and so observed them more keenly. He is best remembered for *The Aurelian or natural history of English insects: namely moths and butterflies together with the plants on which they feed*, which was completed in 1766. This is very much a celebration of living insects and their interaction with their host plants. The four images of odonates which appear on one of its 44 plates seem to be there almost by accident. We may conjecture that he observed butterflies in nature a great deal, and dragonflies a little. Later, he published an essay on the wings of butterflies (Harris 1767), in which he proposed a new classification of butterflies and moths based on the arrangement of veins in the wings.

Moses Harris died around 1785, leaving a wife and at least one child, John Harris (1767-1832) who was also a noted watercolour painter and illustrator.

Fig. 7. Detail from Harris' '*Exposition of English insects*' (Plate XII, Fig. 3) showing a remarkably crude representation of an aeshnid larva.

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Indonesia Dragonfly Society

Tabita Makitan [indonesiadragonfly@gmail.com]
Department of Research and Development, Indonesia Dragonfly Society

The Indonesia Dragonfly Society (IDS) was founded on 15 September 2010. We work for dragonflies because the study of these insects in Indonesia, especially Java, needs more development and it is important to raise awareness among people that dragonflies are vital to our ecosystem. Our main activities are research, education and campaigning. On research, since 2010 we've recorded 88 species occuring in West, Central and East Java. Seven of these are endemic to the island (see accompanying article by Joko Setiyono). In the last six months our focus areas have been Central and East Java (particularly Banyuwangi). On more specific research, we have been trying to learn about and implement a Dragonfly Biotic Index (DBI).

On education programmes, we have visited some junior and high schools to introduce dragonflies and increase the students' interest in studying them. In addition, we are in the process of designing 'Odonata Camp', an educational package for kids, students, families and tourists.

On campaign, an album of music was released on May 2014. This album contains ten dragonfly-related songs created by dragonfly enthusiasts in Malang, East Java. Over the last two years there has been a growing interest among people to observe dragonflies. This has given us the idea to have a forum for people to gather and share information about dragonflies in Indonesia. So we made a group on Facebook, 'Mencintai Odonata Nusantara' (meaning: to love Indonesian dragonflies) where everyone can upload their dragonfly photos and put them on albums based on regions, for instance East Java, Papua, Sulawesi, etc. People can also ask questions and connect with other members in the group.

The other idea was to have a national dragonfly gathering. On 16-18 May 2014 we held a Dragonfly Jamboree. It took place in Diponegoro University, Semarang. The event included workshops on dragonfly identification, science photography, and scientific writing with a field trip to Rawapening swamp. About 54 participants joined the jamboree and they came from almost every major island in Indonesia such as Nusa Tenggara, Sulawesi, and Kalimantan. This is the first national gathering for dragonfly enthusiasts in Indonesia and we plan to have another jamboree next year.

For the next six months we will continue to record dragonflies in Java in order to provide more updated data and will carry out a study, 'Assesment Project for Data Deficient *Amphiaeschna ampla ampla*'. For this year, there are three books already prepared to be published: an identification book of dragonflies in Gadjah Wong River, Yogyakarta written by students of State Islamic University Yogyakarta; a book of dragonflies in Karimunjawa National Park; and 'Dragonflies of Banyuwangi'.

Fig. 1. Giving an introduction of dragonflies to high school students.

Fig. 2. "Capungku" means "my dragonfly", a music album of dragonfly-related songs.

Fig. 4. The participants of the Dragonfly Jamboree.

Java Odonata Survey

Joko Setiyono
Department of Research and Development, Indonesia Dragonfly Society

The complete information on Indonesian dragonflies is still a mystery. The fauna comprises several hundred species. We still need further studies and more updated data to ascertain how many species occur in Indonesia. In the past four years we have been working on dragonflies in Java only. Java is the most densely populated region in Indonesia, but there are still some forests remaining and some places where the biodiversity is still undiscovered.

Java itself has 142 species according to a paper published by M.A Lieftinck (1934), and the number can still increase with continued study. Unfortunately, Java has changed significantly and almost no further studies on dragonflies exist in Java since the work of Lieftinck. The Indonesia Dragonfly Society (IDS) has therefore been working to provide updated data by compiling many checklists of species occurring in Java. The result shows that there are 177 species in Java. However, we still need to re-check the list with the current condition.

Since 2010, IDS has recorded dragonflies occuring in Java, starting from Wendit water area in Malang, East Java which has 31 species of dragonflies. The description and photographs have been published in a book called 'Naga Terbang Wendit' (Sigit et al., 2013).

Over the last four years (2010-2014), IDS has found 88 species in Java, in 14 families. Seven of them are endemic to Java. They are *Amphiaeschna ampla ampla, Gomphidia javanica*, *Paragomphus reindwartii*, *Rhinocypha fenestrata*, *Drepanosticta gazella*, *Drepanosticta spatulifera* and *Drepanosticta sundana*. The areas that have been surveyed are East Java (Banyuwangi, Surabaya, Mount Semeru, Baluran National Park, Alas Purwo National Park), Central Java (Pati, Karimunjawa Island, Semarang, Yogyakarta) and West Java (Jakarta, Kuningan, Tangerang, Bogor).

It is great that there have been some local movements in Java starting to observe dragonflies in many different regions with a hope to enrich references of Indonesian dragonflies. There are now groups of photographers and college students who routinely visit new places for dragonfly surveying.

The table overleaf shows species found in Java by IDS (species marked with an asterisk are endemic).

Fig. 1. ***Heliocypha fenestrata*** **(Burmeister, 1839).**

Fig. 2. ***Drepanosticta sundana*** **(Kruger, 1898).**

Fig. 3. ***Amphiaeschna ampla ampla*** **(Rambur, 1842).**

Fig. 4. ***Paragomphus reindwartii*** **(Selys, 1854).**

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List of species found in Java by IDS (species marked with an asterisk are endemic).

No	Family	Species	No	Family	Species
1	Calopterygidae	*Neurobasis chinensis*	45	Macromiidae	*Epophthalmia vittata*
2		*Vestalis luctuosa*	46		*Macromia cydippe*
3	Chlorocyphidae	*Heliocypha fenestrata* *	47	Libellulidae	*Acisoma panorpoides*
4		*Libellago lineata*	48		*Aethriamanta aethra*
5		*Rhinocypha heterostigma*	49		*Aethriamanta brevipennis*
6	Euphaeidae	*Euphaea variegata*	50		*Aethriamanta gracillis*
7	Coenagrionidae	*Agriocnemis femina*	51		*Agrionoptera insignis*
8		*Agriocnemis minima*	52		*Brachydiplax chalybea*
9		*Agriocnemis pygmaea*	53		*Brachythemis contaminata*
10		*Ceriagrion aurantiacum*	54		*Camacinia gigantea*
11		*Ceriagrion praetermissum*	55		*Cratilla lineata*
12		*Ceriagrion coromandelianum*	56		*Cratilla metallica*
13		*Ischnura aurora*	57		*Crocothemis servilia*
14		*Ischnura senegalensis*	58		*Diplacodes trivialis*
15		*Mortonagrion falcatum*	59		*Hydrobasileus croceus*
16		*Pseudagrion australasiae*	60		*Lathrecista asiatica*
17		*Pseudagrion microcephalum*	61		*Macrodiplax cora*
18		*Pseudagrion pilidorsum*	62		*Neurothemis fluctuans*
19		*Pseudagrion pruinosum*	63		*Neurothemis intermedia*
20		*Pseudagrion rubriceps*	64		*Neurothemis ramburii*
21		*Teinobasis euglena*	65		*Neurothemis terminata*
22		*Xiphiagrion cyanomelas*	66		*Neurothemis tullia*
23	Platycnemidae	*Coeliccia membranipes*	67		*Onychothemis culminicola*
24		*Copera marginipes*	68		*Orchithemis pulcherrima*
25	Platystictidae	*Drepanosticta gazella* *	69		*Orthetrum chrysis*
26		*Drepanosticta spatulifera* *	70		*Orthetrum glaucum*
27		*Drepanosticta sundana* *	71		*Orthetrum pruinosum*
28	Protoneuridae	*Nososticta insignis*	72		*Orthetrum sabina*
29		*Prodasineura autumnalis*	73		*Orthetrum testaceum*
30	Lestidae	*Lestes concinnus*	74		*Pantala flavescens*
31		*Lestes praemorsus*	75		*Potamarcha congener*
32	Aeshnidae	*Amphiaeschna ampla* *	76		*Raphismia bispina*
33		*Anaciaeschna jaspidea*	77		*Rhodothemis rufa*
34		*Anaciaeschna montivagans*	78		*Rhyothemis phyllis*
35		*Anax guttatus*	79		*Rhyothemis variegata*
36		*Gynacantha basiguttata*	80		*Tetrathemis irregularis*
37		*Gynacantha dohrni*	81		*Tholymis tillarga*
38		*Gynacantha subinterrupta*	82		*Tramea transmarina*
39	Gomphidae	*Gomphidia javanica* *	83		*Trithemis aurora*
40		*Ictinogomphus decoratus*	84		*Trithemis festiva*
41		*Leptogomphus lansbergei*	85		*Urothemis signata*
42		*Paragomphus reinwardtii* *	86		*Zygonyx ida*
43	Chlorogomphidae	*Chlorogomphus magnificus*	87		*Zyxomma obtusum*
44	Corduliidae	*Idionyx yolanda*	88		*Zyxomma petiolatum*

Odonata found in Central Sulawesi

René Hoess [r.hoess@1st.ch]
Normannenstrasse 35, CH-3018 Bern, Switzerland

Sulawesi is the main land-mass of Wallacea, where Oriental and Australian faunal and floral elements meet. In 2010 I had the opportunity to visit the central part of it from 17 February to 18 March, searching for dragonflies. I was situated at Palu, the capital of the Province of Sulawesi Tengah. With the aid of a local taxi driver I made one-day trips to examine all possible kinds of standing and running waters. The topography is mountainous with peaks reaching over 2000 m arranged mainly in two parallel ridges to the west and east of the Palu River valley. There are only a few roads outside the city of Palu, mostly connecting the villages along the coast. One road crosses the eastern mountain ridge between Tawaeli and Toboli making a connection between the Palu Bay and the Tomini Bay. In the south, Gimpu is the last settlement to be reached by car.

At Palu City there are only a few water bodies suitable for odonates since ditches are usually polluted and the Palu River is devoid of dragonflies because no species of the island is adapted to open, sunny, gravel-bottomed rivers. There is one pool, densely covered with *Typha*, at Silae Palu (0°53'S, 119°50'E, 1 m) behind the beach where several of the common lentic species like *Acisoma p. panorpoides*, *Brachydiplax c. chalybea* and *Orthetrum serapia* can be found. On Sulawesi the latter is replacing the similar *O. sabina* which is found on most other islands of the Indonesian archipelago.

Along the western side of Palu Bay the road runs to Donggala, with a harbour and a diving resort at the cape. The mountain ridge ends here and the road continues round to the western coast of the island which is rather flat and lined with mangroves where I found only the ubiquitous *Diplacodes trivialis*. East to the low watershed between Donggala and Towale, however, there are two streams and a swampy plantation rich in dragonflies. The stream west of Donggala (0°40'S, 119°44'E, 10 m) is shallow, up to 5 m wide with gravel and sand bottom. The water is clear although laundry and cars are washed in it regularly. This was the only locality where I found *Teinobasis helvola*, which is endemic to Sulawesi. Two more common species of lotic waters, namely *Pseudagrion crocops* and *P. ustum*, were also present. Furthermore, I found exuviae of *Trithemis festiva* and a *Neurothemis* of which two species were captured as adults, viz. *N. r. ramburii* and *N. stigmatizans manadensis*. The brook east of Towale (0°42'S, 119°42'E,

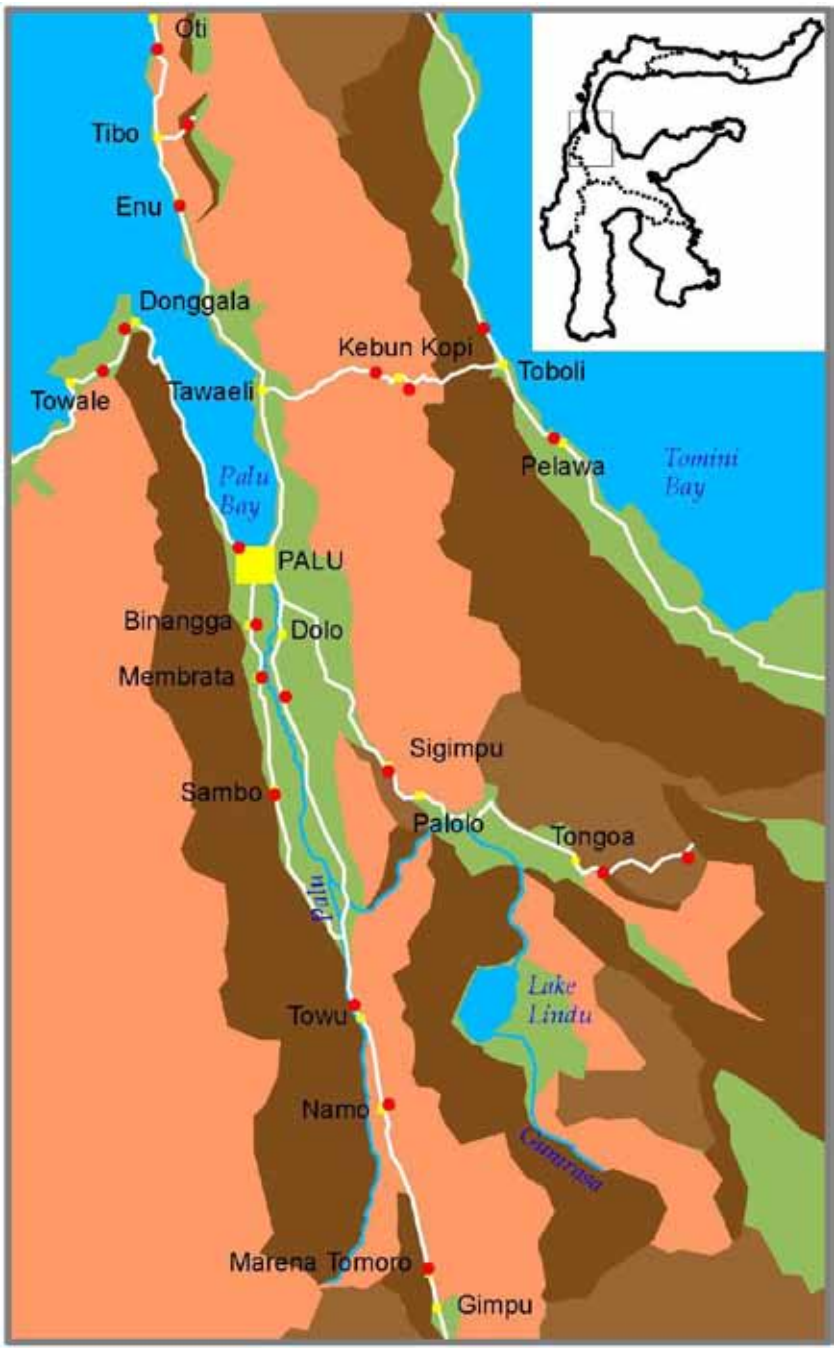

Fig. 1. Locality map of the western part of Sulawesi Tengah. Red dots: dragonfly sites (see text). Inset: Sulawesi with provincial-boundaries.

50 m) runs through a palm plantation on clay accompanied by a variety of small standing waters. Here I found 16 species among which the more interesting were *P. celebense*, *Teinobasis combusta*, *Xiphiagrion cyanomelas*, *Agrionoptera insignis quatuornotata*, *Nannophlebia pygmaea* and *Tetrathemis irregularis leptoptera*. The first three of these I did not find at any other location.

On the east side of the Palu Bay we checked the waters for possible breeding places of Odonata north as far as Oti. Most of the larger river beds which run to the Bay were dry and thus not suitable for dragonflies because of adiabatic processes where the humidity brought by winds from east and west is rained out in the mountains whereas the valley in between remains rather dry. This trip was the best for *O. glaucum*, of which I found several individuals at two streams running to the sea (Enu: 0°33'S, 119°47'E, 20 m; Oti S: 0°24'S, 119°45'E, 20 m). The best place for dragonflies in this region, however, was the low watershed east of Tibo (0°29'S, 119°47'E, 60 m). Here, some well-vegetated sunny brownwater pools housed *Brachydiplax duivenbodei* and two *Rhyothemis*, viz. *R. phyllis snelleni* and *R. pygmaea*. The latter is specially obvious having the wings almost completely dark brown with blue iridescence.

The mountain road that crosses the island between Tawaeli and Toboli climbs up to about 900 m with many serpentine bends. Although precipitation is considerable, only few, weak running waters were encountered along the road. Several steep, rocky seepages situated 2.5 to 9 km west of Kebun Kopi (0°43'S, 119°57'E to 119°58'E, 640 to 700 m) had some interesting damselflies, such as *Celebargiolestes* sp. (one of four species to be revised by Vincent Kalkman, pers. comm.), *Drepanosticta ephippiata* and *Protosticta coomansi* as well as the typical lotic libellulids *Diplacina m. militaris* and *D. torrenticola*. There is no aquatic vegetation but dense rainforest around. Near the top of the road at Kebun Kopi, Babinsa (0°44'S, 120°00'E, 860 m) a nice stream runs south into another valley with plantations and some pools. Here I found no less than 18 species. A member of the *Rhinocypha frontalis* complex and *P. linduensis*, including the still undescribed female, flew at the stream at a section with canopy, and some teneral *Macromia irina* cruised off the stream between light and shadow.

The coastal road north and south of Toboli led us to only a few dragonfly sites. *P. geijskesi* was present at a gravel- and sand-bottomed stream under canopy 5 km north of Toboli (0°40'S, 120°04'E, 10 m), and a sand-bottomed stream with a shadowy cut bank north of Pelawa (0°46'S, 120°08'E, 5 m) was home to the very thin and long *Teinobasis tenuis*. It is fairly common but easy

Fig. 2. Small lake at Sigimpu.

Fig. 3. Brook and swamp east of Towale.

Fig. 4. Immature male of *Libellago xanthocyana*.

to overlook.

From the few roads in the Palu Valley one leaves to the southeast passing by Palolo and reaching the watershed behind Tongoa. In the hills before Palolo is Sigimpu (1°05'S, 119°59'E, 640 m), with the only small lake we could find. It has some floating vegetation comprising water lilies. Behind a dam at the western bay there are two well vegetated and partly shaded pools fed by a seepage. This locality had the highest number of recorded species (21). Typical lake species were *Pseudagrion microcephalum* and the giant *Epophthalmia australis*. There were also two crepuscular species, viz. *Tholymis tillarga* and *Zyxomma* cf. *obtusum*. I found the exuviae of both species and an imago of the former. The exuviae of the latter differed from some *Z. petiolatum* I possess from Chiang Mai, Thailand. In the upper and more shaded pool there was *Lestes quercifolia*, and *Argiocnemis rubescens lunulata* flew over the seepage. The lower pool had more light and was used by a variety of libellulids such as the two previously mentioned *Brachydiplax* spp. and the two red species *Crocothemis s. servilia* and *Rhodothemis rufa*. Behind Tongoa there were some nice mountain streams in secondary or primary forest. The last one, 20 km east of Tongoa (1°10'S, 120°15'E, 1040 m), was crystal clear and the highest point of our trips. It seemed to have so little nutrients that only the two widespread species *Neurobasis kaupi* and *Sclerocypha bisignata* could survive there, in low numbers. Some 5 km east of Tongoa (1°11'S, 120°11'E, 760 m) there was a shallow stream in a wooded canyon which was the only place where I met *Heliaschna filiostyla*.

South of Palu City the straight valley of the Palu River can be explored far behind its headwaters down to Gimpu. The first interesting place is "Binangga Hot Springs" (0°57'S, 119°51'E, 40 m) where water of normal temperature feeds swimming pools and some open air laundries at the foot of the mountain. Streams and channels lead the water to the plain, passing by some ponds. Twelve of the common odonate species were found here. Then at Membrata (1°00'S, 119°52'E, 40 m) the typical low yellow walls along the road indicate the passage over a nice stream running through dense vegetation next to plantations. This was the best site to see the multicoloured *Libellago xanthocyana*. Immature males are tolerated by the territorial males because they still lack the colouration needed for display. The other peculiar species best searched for here is the tiny libellulid *Nannophlebia aglaia*. The last good stream on the left side of the valley is at Sambo (1°07'S, 119°53'E, 100 m). This two-branched, open stream with big pebbles is good for *Neurobasis kaupi* and *Paragomphus capitatus*, one of only two gomphids inhabiting Sulawesi.

The only time that I found *Macrodiplax*

Fig. 5. Male of *Celebothemis delecollei*.

Fig. 6. Male of *Diplacina m. militaris*.

Fig. 7. Male of *Rhyothemis pygmaea*.

cora was at a gravel pit in an open river in the middle of the valley south of Dolo (1°01'S, 119°53'E, 45 m). At the southern end of the valley an open, sunny, gravel-bottomed stream south of Towu (1°18'S, 119°57'E, 210 m) is the best locality to find the endemic *Celebothemis delecollei*. At the watershed near Namo (1°24'S, 119°59'E, 680 m), a steep rocky mountain forest stream with a waterfall is home to some nice Zygoptera such as *Sclerocypha bisignata*, *Protosticta coomansi*, *P. geijskesi* and the dark *Teinobasis superba*. Here I also found the still undescribed female of *Celebophlebia dactylogastra* and two exuviae of *Zygonyx ilia*. Finally, in the vicinity of Gimpu at Marena Tomoro (1°33'S, 120°01'E, 520 m) *Libellago c. celebensis* flew at a gravelled mountain stream under canopy.

The following list shows all 57 species that I found during my stay in the western part of Sulawesi Tengah (numbers of species per family in brackets):

Calopterygidae (1): *Neurobasis kaupi* Brauer, 1867*
Chlorocyphidae (4): *Libellago c. celebensis* van Tol, 2002*, *L. xanthocyana* (Selys, 1869)*, *Rhinocypha frontalis**-complex, *Sclerocypha bisignata* McLachlan, 1870*
Lestidae (1): *Lestes quercifolia* Selys, 1878
Argiolestidae (1): *Celebargiolestes* sp.*
Platystictidae (4): *Drepanosticta ephippiata* Lieftinck, 1937*, *Protosticta coomansi* van Tol, 2000*, *P. geijskesi* van Tol, 2000*, *P. linduensis* van Tol, 2000*
Coenagrionidae (12): *Agriocnemis femina* (Brauer, 1868), *Argiocnemis rubescens lunulata* Selys, 1877*, *Ischnura senegalensis* (Rambur, 1842), *Pseudagrion celebense* Lieftinck, 1937*, *P. crocops* Selys, 1876*, *P. microcephalum* (Rambur, 1842), *P. ustum* Selys, 1876, *Teinobasis combusta* (Selys, 1877), *T. helvola* Lieftinck, 1930*, *T. superba* (Selys, 1877), *T. tenuis* (Martin, 1898)*, *Xiphiagrion cyanomelas* Selys, 1876
Aeshnidae (2): *Anax* sp., *Heliaeschna filiostyla* Martin, 1907*
Gomphidae (1): *Paragomphus capitatus* (Martin, 1908)*
Macromiidae (2): *Epophthalmia australis* Hagen, 1867*, *Macromia irina* Lieftinck, 1950*
Libellulidae (29): *Acisoma p. panorpoides* Rambur, 1842, *Agrionoptera insignis quatuornotata* Brauer, 1867, *Brachydiplax c. chalybea* Brauer, 1868, *B. duivenbodei* (Brauer, 1866), *Celebophlebia dactylogastra* Lieftinck, 1936*, *Celebothemis delecollei* Ris, 1912*, *Crocothemis s. servilia* (Drury, 1770), *Diplacina m. militaris* Ris, 1909, *D. torrenticola* van Tol, 1987, *Diplacodes trivialis* (Rambur, 1842), *Hydrobasileus* sp., *Macrodiplax cora* (Kaup in Brauer, 1867), *Nannoplebia aglaia* Lieftinck, 1948*, *Nannophya pygmaea* Rambur, 1842, *Neurothemis r. ramburii* (Kaup in Brauer, 1866), *N. stigmatizans manadensis* (Boisduval, 1835)*, *Orthetrum glaucum* (Brauer, 1865), *O. pruinosum clelia* (Selys, 1878), *O. serapia* Watson, 1984, *Pantala flavescens* (Fabricius, 1798), *Potamarcha congener* (Rambur, 1842), *Rhodothemis rufa* (Rambur, 1842), *Rhyothemis phyllis snelleni* Selys, 1878*, *R. pygmaea* (Brauer, 1867), *Tetrathemis irregularis leptoptera* (Selys, 1869), *Tholymis tillarga* (Fabricius, 1798), *Trithemis festiva* (Rambur, 1842), *Zygonyx ilia* Ris, 1912*, *Zyxomma obtusum* Albarda, 1881

Taxa with an asterisk (*) are endemic to Sulawesi.

I would like to thank Jan van Tol and Vincent Kalkman for helping to identify some of the species.

Odonata of Rinshinomori Park, Tokyo

Hide Natsume [romluna@y4.dion.ne.jp]

Introduction

Rinshinomori Park is located on the border of Meguro ward and Shinagawa ward in Tokyo metropolitan city. In 1900 this location began to be used as the 'Meguro Experimental Nursery' for the Ministry of Agriculture and Commerce. Later, its name was changed to 'Forestry Research Station', and it was used continuously under the administration of the Forestry Agency until 1978. The site was developed into a park called Meguro Park when research functions had been relocated with the establishment of Tsukuba Science City, and finally opened to the public as Rinshinomori Park on June 1, 1989.

The park has an area of just over 12 ha, with tall trees occupying 6,100 m^2 and shrubs occupying 600 m^2. Although it is a small park in central Tokyo (Meguro ward is surrounded by Shibuya, Minato, Shinagawa, Ota and Setagaya wards) a large variety of birds can be observed. Birdwatchers love this place, and some insect lovers also frequently visit the park, mainly for photography. However, no odonatologist has previously conducted research on dragonflies in the park as the wetland is extremely limited and a huge number of visitors (several hundred every day, several thousand on Saturdays and Sundays) come for hiking, jogging, dog walking, excursions etc. In the park there is only one area (Seseragi Ponds) where odonata larvae can develop. Upper Pond (Fig. 1) and Lower Pond (Fig. 2) are connected by canals (Fig. 3).

Before the park was opened to the public in 1989, the only dragonfly records were those made by Kenji Kato (13 species) and some dragonfly lovers in Meguro ward. I have checked many dragonfly/damselfly photos taken during 1990 to 2013 by the photographers and birdwatchers, and the number of species again reaches 13, although recorded species are slightly different, as shown on the list. Since the location of Rinshinomori Park is fairly close to my residence I have decided to constantly visit this site in this year with the aim of updating the Odonata status in the park. Tentatively, I have marked 24 species as expected to be present, and I started my observations on April 25, 2014.

Fig. 1. Upper Pond.

Fig. 2. Lower Pond.

Fig. 3. Canals.

Result as of June 20, 2014

I visited on three days in late April but could not find any Odonata flying. On May 4, one male of *Anax nigrofasciatus* was observed flying near Upper Pond. This is one of the typical spring species in Tokyo, and on May 7 I collected one male which should be the first official specimen from the park. Figures 4 and 5 are male *Anax nigrofasciatus* both collected on May 20, 2014. I visited the park on 17 days in May and no other dragonfly was observed until May 10, when one young male of *Orthetrum albistylum* was seen (Fig. 6). On May 30, the weather was fine and temperature was 29°C. *Orthetrum melania* (Fig. 7) and *Pseudothemis zonata* (Fig. 8-) were observed for the first time. In June the numbers of these two species increased but *Anax nigrofasciatus* was not seen on June 15. On June 20, one young female of *Polycanthagyna melanictera* was observed at dusk (18:25pm). Five species have been recorded --as of June 20, 2014.


Figs 4-5. ***Anax nigrofasciatus*****. Credit Hide Natsume.**



Figs 6-8. (6) ***Orthetrum albistylum speciosum,*** **(7)** ***Orthetrum melanium,*** **(8)** ***Pseudothemis zonata*****. Credit Hide Natsume.**



Figs 9-11. (9) ***Polycanthagyna melanictera,*** **(10)** ***Sympetrum baccha matutinum*****, (11)** ***Sympetrum darwinianum*****. Credit Harumi Terayama.**

Recent records and future expectation

Indolestes peregrimus was recorded in March 2013 when wintering. This is known as a lotic species so it seems that adults immigrated from neighbouring rivers (probably Tamagawa River). *Ischnura asiatica* was recorded until 2012 but may now be extinct in the park due to a lack of water plants. I tried to find damselflies in May and June but found none, even though it should be the best season for the Coenagrionidae species from past records.

No Gomphidae or Cordulidae have been recorded in the past but some of them can be observed in other parts of Tokyo and I expect that they may fly over to this park. For Aeshnidae and Libellulidae, more species should be recorded as some of them are expanding their areas even in central parts of Tokyo; at the same time, identification of several species (especially *Sympetrum*) only by photo is not very reliable. For Aeshnidae, ordinary photographers and birdwatchers do not want to shoot such fast-flying insects in their crepuscular flights. In 2008, I accidentally found one dead larva of *Anaciaeschna martini* from a small water tank on my house's balcony. This species could fly far and has been expanding its territory successfully in the last twenty years.

The target number of 24 species as this year's expectation in this park already exceeds the 23 species of the past 60 years' record of the whole Meguro ward, so the project will definitely need the active immigration of the dragonflies, and lucky encounters.

Bibliography

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Rinshinomori Park		**Observed by K.Kato 1977-1989**	**Records by photos 1990 - 2013**	**Expected by HN (2014)**
Family LESTIDAE				
Indolestes				
	peregrimus		✓	✓
Lestes				
	temporalis	✓		
Sympecma				
	paedisca		✓	
Family COENAGRIONIDAE				
Ischnura				
	asiatica	✓	✓	
	senegalensis	✓		
Paracercion				
	sieboldii	✓		
Family GOMPHIDAE				
Onychogomphus				
	viridicostus			✓
Sieboldius				
	albardae			✓
Sinictinogomphus				
	clavatus clavatus			✓
Family CORDULEGASTRIDAE				
Anatogaster				
	sieboldiii	✓	✓	✓
Family AESHNIDAE				
Anaciaeschna				
	martini			✓
Anax				
	nigrofasciatus	✓	✓	✓
	parthenope julius	✓		✓
Gynacantha				
	japonica			✓
Polycanthagyna				
	melanictera		✓	✓
Family CORDULIIDAE				
Epophthalmia				
	elegans			✓
Somatochlora				
	uchidai			✓
Family LIBELLULIDAE				
Crocothemis				
	servilia mariannae		✓	✓
Orthetrum				
	albistylum specios	✓	✓	✓
	japonicum internum			
	triangulare melan	✓	✓	✓
Pantala				
	flavescens	✓	✓	✓
Pseudothemis				
	zonata	✓	✓	✓
Rhyothemis				
	fuliginosa			✓
Sympetrum				
	baccha matutinum			✓
	darwinianum			✓
	frequens	✓	✓	✓
	infuscatum	✓	✓	✓
	risi risi			✓
	speciosum			✓
Number of species		**13**	**13**	**24**

Diversity of dragonflies (Odonata) in Himachal Pradesh, India

Babu, R. [baburzsi@gmail.com]
Zoological Survey of India, Southern Regional Centre,
Santhome High Road, Chennai- 600 028, India

Himachal Pradesh in northern India constitutes a major part of the Western Himalaya, bordered by the Indian states of Jammu & Kashmir, Punjab, Haryana, Uttarakhand, Uttar Pradesh and by Tibet (China). The mountainous state of Himachal Pradesh has an altitudal range of from 350 to 7000 m (1050 ft. to 21000 ft.) above sea level. The climate varies from semi-tropical to semi-arctic depending on the altitude of the region. It receives an average annual rainfall of about 160 cm. The winter season from October to February is severe with heavy snowfall in high altitude areas. Some 63.9 % of the total area of the state is under thick forest cover. The vegetation is a blend of the Ban Oak Forest, Moist Deodar Forest, Western Mixed Coniferous Forest, Moist Temperate Deciduous Forest, Himalayan Alpine Pastures and Rhododendron Scrub Forest. The odonate fauna of Himachal Pradesh shows a wide diversity, specially characterised by high altitude species. Studies of the odonates of the Western Himalaya, including Himachal Pradesh, Uttarakhand and Jammu & Kashmir date back to the beginning of the twentieth century. The earliest records of odonate species from Himachal Pradesh are given in *Fauna of British India* by Fraser (1933, 1934 & 1936). Subsequently, the state's Odonata was studied by Bhasin (1953), Singh & Prasad (1974), Prasad (1976), Kumar & Prasad (1981), Kumar (1982, 2000, 2005), Chandra (1983), van Pelt (1993), Uniyal *et al*. (2000), Lahiri *et al* (2007), Babu *et al*. (2009), Babu & Mehta (2009), Babu & Nandy (2010), Babu & Mitra (2011) and Babu (2011). The present study was undertaken to prepare a consolidated account of the odonate fauna of Himachal Pradesh. The nomenclature followed here is after Fraser (1933, 1934 & 1936), Tsuda (2000) and Subramanian (2014). Updated distributions of all the species in Himachal Pradesh are provided.

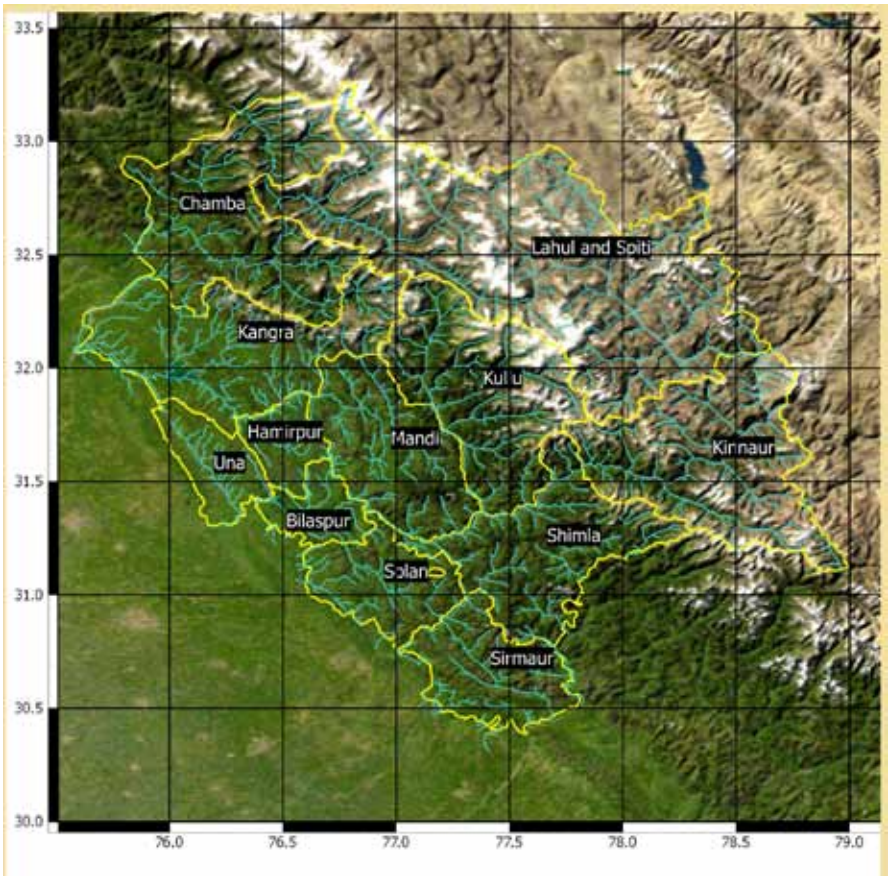

Fig. 1. Map of Himachal Pradesh showing district boundaries.

The Odonata fauna of Himachal Pradesh was comprehensively surveyed and studied during 2005-2008. A total of 125 species/subspecies belonging to 62 genera and 13 families of two suborders are reported from the state based on collections and literature. Seven species of Zygoptera, namely *Aciagrion approximans* (Selys), *Aciagrion azureum* Fraser, *Mortonagrion aborense* (Laidlaw), *Agriocnemis splendidissima* Laidlaw, *Pseudagrion hypermelas* Selys, *Pseudagrion microcephalum* (Rambur) and *Aristocypha bifasciata* (Selys) were earlier recorded only from eastern India and *Lestes dorothea* Fraser from eastern and south Indian states. Four species of Anisoptera namely *Megalogomphus smithi* (Selys), *Cephalaeschna masoni* (Martin), *Neallogaster latifrons* Selys and *Sympetrum orientale* (Selys) were recorded previously only from states in the northeastern region of India. The distribution of the aforementioned species was extended to Himachal Pradesh (Babu & Nandy, 2010; Babu, 2011). For a small number of species reported here, based on literature review where no exact locality is available, the distribution has been recorded as Himachal Pradesh.

Taxon	Distribution
SUBORDER: ZYGOPTERA	
Superfamily: COENAGRIONOIDEA	
Family: COENAGRIONIDAE	
Aciagrion Selys, 1891	
1 *Aciagrion approximans* (Selys, 1876)	Hamirpur Dist.
2 *Aciagrion azureum* Fraser, 1932	Hamirpur Dist.
3 *Aciagrion pallidum* Selys, 1891	Mandi, Kangra, Chamba, Kullu and Hamirpur Dists.
Agriocnemis Selys, 1877	
4 *Agriocnemis clauseni* Fraser, 1922	Shimla Dist.
5 *Agriocnemis pygmaea* (Rambur, 1842)	Solan, Kangra, Shimla, Chamba, Kullu, Una, Bilaspur, Sirmaur & Hamirpur Dists.
6 *Agriocnemis splendidissima* Laidlaw, 1919	Una Dist.
Ceriagrion Selys, 1876	
7 *Ceriagrion cerinorubellum* (Brauer, 1866)	Mandi, Kangra and Sirmaur Dists.
8 *Ceriagrion coromandelianum* (Fabricius, 1798)	Kangra, Shimla, Chamba, Kullu, Una, Bilaspur, Sirmaur and Hamirpur Dists.
9 *Ceriagrion fallax cerinomelas* Lieftinck, 1937	Solan, Mandi, Shimla, Kullu and Sirmaur Dists.
Enallagma Charpentier, 1840	
10 *Enallagma cyathigerum* Charpentier, 1840	Kullu Dist.
11 *Enallagma parvum* Selys, 1876	Solan, Mandi, Kangra, Shimla, Chamba, Kullu, Una, and Hamirpur Dists.
Ischnura Charpentier, 1840	
12 *Ischnura aurora* (Brauer, 1858)	Solan, Mandi, Kangra, Shimla, Chamba, Kullu, Una, Bilaspur, Sirmaur and Hamirpur Dists.
13 *Ischnura forcipata* Morton, 1907	Solan, Mandi, Kangra, Shimla, Chamba, Kullu, Bilaspur, Sirmaur and Hamirpur Dists.
14 *Ischnura nursei* Morton	Mandi and Kangra Dists.
15 *Ischnura rufostigma rufostigma* Selys, 1876	Kangra Dist.
16 *Ischnura senegalensis* (Rambur, 1842)	Bilaspur and Sirmaur Dists.
Mortonagrion Fraser, 1920	
17 *Mortonagrion aborense* (Laidlaw, 1914)	Solan Dist.
Paracercion Weekers & Dumont, 2004	
18 *Paracercion calamorum dyeri* (Fraser, 1919)	Kangra, Una, Bilaspur, Sirmaur and Hamirpur Dists.
Pseudagrion Selys, 1876	
19 *Pseudagrion decorum* (Rambur, 1842)	Kangra, Shimla, Una, Bilaspur and Sirmaur Dists.
20 *Pseudagrion hypermelas* Selys, 1876	Sirmaur Dist.
21 *Pseudagrion laidlawi* Fraser, 1922	Himachal Pradesh
22 *Pseudagrion microcephalum* (Rambur, 1842)	Kangra and Hamirpur Dists.
23 *Pseudagrion rubriceps* Selys, 1876	Solan, Kangra, Chamba, Una, Bilaspur, Sirmaur and Hamirpur Dists.
24 *Pseudagrion spencei* Fraser, 1922	Himachal Pradesh.
Family: PLATYCNEMIDIDAE	
Calicnemia Strand, 1926	
25 *Calicnemia eximia* (Selys, 1863)	Solan, Mandi, Shimla, Chamba and Sirmaur Dists.
26 *Calicnemia miles* (Laidlaw, 1917)	Kangra Dist.
Coeliccia Kirby, 1890	
27 *Coeliccia didyma* (Selys, 1863)	Solan Dist.
28 *Coeliccia renifera* (Selys, 1886)	Himachal Pradesh
Copera Kirby, 1890	
29 *Copera ciliata* (Selys, 1863)	Sirmaur Dist.
30 *Copera marginipes* (Rambur, 1842)	Kangra, Chamba, Sirmaur and Hamirpur Dists.
31 *Copera vittata serapica* (Selys, 1863)	Mandi, Kangra, Chamba, Sirmaur and Hamirpur Dists.
Superfamily: PLATYSTICTOIDEA	
Family: PLATYSTICTIDAE	
Drepanosticta Laidlaw, 1917	
32 *Drepanosticta carmichaeli* (Laidlaw, 1915)	Sirmaur Dist.
Protosticta Selys, 1885	

33 *Protosticta davenporti* Fraser, 1931	Chamba Dist.
Superfamily: LESTOIDEA	
Family: LESTIDAE	
Indolestes Fraser, 1922	
34 *Indolestes cyaneus* (Selys, 1862)	Shimla, Kullu and Bilaspur Dists.
Lestes Leach, 1815	
35 *Lestes dorothea* Fraser, 1924	Solan Dist.
36 *Lestes praemorsus decipiens* Kirby, 1893	Kangra and Hamirpur Dists.
37 *Lestes thoracicus* Laidlaw, 1920	Hamirpur Dist.
38 *Lestes umbrinus* Selys, 1891	Sirmaur Dist.
39 *Lestes viridulus* Rambur, 1842	Bilaspur Dist.
Family: SYNLESTIDAE	
Megalestes Selys, 1862	
40 *Megalestes major* Selys, 1862	Solan, Mandi, Kangra, Kullu, Bilaspur and Sirmaur Dists.
Superfamily: CALOPTERYGOIDEA	
Family: CALOPTERYGIDAE	
Neurobasis Selys, 1853	
41 *Neurobasis chinensis* (Linnaeus, 1758)	Solan, Mandi, Kangra, Shimla, Kullu, Bilaspur, Sirmaur and Hamirpur Dists.
Family: CHLOROCYPHIDAE	
Libellago Selys, 1840	
42 *Libellago lineata lineata* (Burmeister, 1839)	Sirmaur Dist.
Aristocypha Laidlaw, 1950	
43 *Aristocypha bifasciata* (Selys, 1879)	Kangra Dist.
44 *Aristocypha quadrimaculata* (Selys, 1853)	Solan, Mandi, Kangra, Una, Bilaspur, Sirmaur and Hamirpur Dists.
Rhinocypha Rambur, 1842	
45 *Rhinocypha trifasciata* Selys, 1853	Solan, Mandi, Kangra, Una, and Sirmaur Dists.
46 *Rhinocypha unimaculata* Selys, 1853	Solan and Mandi Dists.
Family: EUPHAEIDAE	
Anisopleura Selys, 1853	
47 *Anisopleura comes* Selys, 1880	Bilaspur Dist.
48 *Anisopleura lestoides* Selys, 1853	Solan, Mandi and Kangra Dists.
Bayadera Selys, 1853	
49 *Bayadera indica* (Selys, 1853)	Solan, Mandi, Kangra, Bilaspur and Sirmaur Dists.
Suborder: ANISOPTERA	
Superfamily: GOMPHOIDEA	
Family: GOMPHIDAE	
Anisogomphus Selys, 1857	
50 *Anisogomphus bivittatus* (Selys, 1854)	Mandi and Kullu Dists.
Anormogomphus Selys, 1854	
51 *Anormogomphus heteropterus* Selys, 1854	Mandi and Kangra Dists.
Burmagomphus Williamson, 1907	
52 *Burmagomphus sivalikensis* Laidlaw, 1922	Sirmaur Dist.
Gomphidia Selys, 1854	
53 *Gomphidia t-nigrum* Selys, 1854	Una Dist.
Ictinogomphus Cowley, 1934	
54 *Ictinogomphus rapax* (Rambur, 1842)	Sirmaur Dist.
Megalogomphus Campion, 1923	
55 *Megalogomphus smithi* (Selys, 1854)	Sirmaur Dist.
Nepogomphus Fraser, 1934	
56 *Nepogomphus modestus* (Selys, 1878)	Solan and Sirmaur Dists.
Onychogomphus Selys, 1854	
57 *Onychogomphus biforceps* Selys, 1878	Sirmaur Dist.
58 *Onychogomphus bistrigatus* (Selys, 1854)	Solan, Mandi and Sirmaur Dists.
59 *Onychogomphus duaricus* Fraser, 1924	Mandi, Kangra and Sirmaur Dists.

60	*Onychogomphus risi* (Fraser, 1922)	Solan Dist.
Paragomphus Cowley, 1934		
61	*Paragomphus lineatus* (Selys, 1850)	Mandi, Una and Sirmaur Dists.
Superfamily: AESHNOIDEA		
Family: AESHNIDAE		
Aeshna Fabricius, 1775		
62	*Aeshna mixta* Latreille, 1805	Chamba Dist.
Anax Leach, 1815		
63	*Anax guttatus* (Burmeister, 1839)	Solan and Kangra Dists.
64	*Anax immaculifrons* Rambur, 1842	Mandi, Kangra, Chamba, Bilaspur and Sirmaur Dists.
65	*Anax nigrolineatus* Fraser, 1935	Kangra Dist.
66	*Anax parthenope* (Selys, 1839)	Shimla Dist.
Cephalaeschna Selys, 1883		
67	*Cephalaeschna masoni* Martin, 1909	Shimla Dist.
68	*Cephalaeschna orbifrons* Selys, 1883	Shimla Dist.
69	*Cephalaeschna viridifrons* (Fraser, 1922)	Shimla Dist.
Gynacantha Rambur, 1842		
70	*Gynacantha palampurica* Lahiri & Wallia, 2007	Kangra Dist.
Gynacanthaeschna Fraser, 1921		
71	*Gynacanthaeschna sikkima* (Karsch, 1891)	Shimla Dist.
Hemianax Selys, 1883		
72	*Hemianax ephippiger* (Burmeister, 1839)	Kangra Dist.
Polycanthagyna Fraser, 1933		
73	*Polycanthagyna erythromelas* (MacLachlan, 1896)	Shimla Dist.
74	*Polycanthagyna ornithocephala* (MacLachlan, 1896)	Shimla Dist.
Superfamily: CORDULEGASTEROIDEA		
Family: CHLOROGOMPHIDAE		
Chlorogomphus Selys, 1854		
75	*Chlorogomphus olympicus* Fraser, 1933	Solan and Kullu Dists.
Family: CORDULEGASTERIDAE		
Anotogaster Selys, 1854		
76	*Anotogaster basalis* Selys, 1854	Shimla, Kullu and Sirmaur Dists.
77	*Anotogaster nipalensis* Selys, 1850	Solan and Shimla Dists.
Cordulegaster Leach, 1815		
78	*Cordulegaster brevistigma* (Selys, 1854)	Chamba Dist.
79	*Cordulegaster parvistigma* (Selys, 1873)	Shimla and Chamba Dists.
Neallogaster Cowley, 1934		
80	*Neallogaster hermionae* (Fraser, 1927)	Shimla Dist.
81	*Neallogaster latifrons* (Selys, 1878)	Shimla Dist.
82	*Neallogaster ornata* Asahina, 1982	Shimla Dist.
Superfamily: LIBELLULOIDEA		
Family: MACROMIIDAE		
Macromia Rambur, 1842		
83	*Macromia moorei* Selys, 1874	Mandi , Kangra and Sirmaur Dists.
Family: LIBELLULIDAE		
Acisoma Rambur, 1842		
84	*Acisoma panorpoides* Rambur, 1842	Mandi, Una and Sirmaur Dists.
Brachydiplax Brauer, 1868		
85	*Brachydiplax sobrina* (Rambur, 1842)	Kangra Dist.
Brachythemis Brauer, 1868		
86	*Brachythemis contaminata* (Fabricius, 1793)	Solan, Kangra, Shimla, Chamba, Kullu, Una, Bilaspur, Sirmaur and Hamirpur Dists.
Bradinopyga Kirby, 1893		
87	*Bradinopyga geminata* (Rambur, 1842)	Hamirpur Dist.
Cratilla Kirby, 1900		

88	*Cratilla lineata* (Brauer, 1878)	Mandi Dist.
Crocothemis Brauer1868		
89	*Crocothemis servilia* (Drury, 1770)	Solan, Mandi, Kangra, Shimla, Chamba, Kullu, Una, Kinnaur, Bilaspur, Sirmaur and Hamirpur Dists.
Diplacodes Kirby, 1889		
90	*Diplacodes nebulosa* (Fabricius, 1793)	Solan and Sirmaur Dists.
91	*Diplacodes trivialis* (Rambur, 1842)	Kangra Dist.
Neurothemis Brauer, 1867		
92	*Neurothemis fulvia* (Drury, 1773)	Sirmaur Dist.
93	*Neurothemis intermedia intermedia* (Rambur, 1842)	Kangra, Sirmaur and Hamirpur Dists.
94	*Neurothemis tullia* (Drury, 1773)	Una, Sirmaur and Hamirpur Dists.
Orthetrum Newman, 1833		
95	*Orthetrum anceps* (Schneider, 1845)	Chamba, Kullu and Bilaspur Dists.
96	*Orthetrum brunneum* (Fonscolombe, 1837)	Sirmaur and Hamirpur Dists.
97	*Orthetrum cancellatum* (Linnaeus, 1758)	Solan, Chamba, Kullu and Bilaspur Dists.
98	*Orthetrum chrysis* (Selys, 1891)	Bilaspur Dist.
99	*Orthetrum glaucum* (Brauer, 1865)	Solan, Mandi, Kangra, Chamba, Kullu, Bilaspur, Sirmaur and Hamirpur Dists.
100	*Orthetrum japonicum internum* MacLachlan, 1894	Mandi, Shimla, Chamba, Kullu, Kinnaur, Bilaspur and Hamirpur Dists.
101	*Orthetrum luzonicum* (Brauer, 1868)	Mandi, Kangra, Shimla, Kullu, Una and Sirmaur Dists.
102	*Orthetrum pruinosum neglectum* (Rambur, 1842)	Solan, Mandi, Kangra, Shimla, Chamba, Kullu, Una, Bilaspur, Sirmaur and Hamirpur Dists.
103	*Orthetrum sabina* (Drury, 1770)	Solan, Mandi, Kangra, Shimla, Chamba, Kullu, Una, Sirmaur and Hamirpur Dists.
104	*Orthetrum taeniolatum* (Schneider, 1845)	Solan, Kullu, Una, Kinnaur, Bilaspur, Sirmaur and Hamirpur Dists.
105	*Orthetrum triangulare* (Selys, 1878)	Solan, Mandi, Kangra, Shimla, Chamba, Kullu, Kinnaur, Bilaspur, Sirmaur and Hamirpur Dists.
Palpopleura Rambur, 1842		
106	*Palpopleura sexmaculata* (Fabricius, 1787)	Solan, Mandi, Kangra, Shimla, Chamba, Kullu, Una, Bilaspur and Sirmaur Dists.
Pantala Hagen, 1861		
107	*Pantala flavescens* (Fabricius, 1798)	Chamba, Kullu, Una and Bilaspur Dists.
Potamarcha Karsch, 1890		
108	*Potamarcha congener* (Rambur, 1842)	Solan, Sirmaur and Hamirpur Dists.
Rhyothemis Hagen, 1867		
109	*Rhyothemis triangularis* Kirby, 1889	Hamirpur Dist.
110	*Rhyothemis variegata* (Linnaeus, 1763)	Kangra and Sirmaur Dists.
Sympetrum Newman, 1833		
111	*Sympetrum commixtum* (Selys, 1884)	Solan, Mandi, Kangra, Shimla, Chamba, Kullu, Kinnaur, Bilaspur and Sirmaur Dists.
112	*Sympetrum fonscolombii* (Selys, 1840)	Kangra Dist.
113	*Sympetrum haematoneura* Fraser, 1934	Chamba Dist.
114	*Sympetrum hypomelas* (Selys, 1884)	Solan, Mandi, Shimla, Kinnaur and Kullu Dists.
115	*Sympetrum meridionale* (Selys, 1841)	Chamba Dist.
116	*Sympetrum orientale* (Selys, 1883)	Chamba Dist.
Tholymis Hagen, 1867		
117	*Tholymis tillarga* (Fabricius, 1798)	Kangra Dist.
Tramea Hagen, 1861		
118	*Tramea basilaris burmeisteri* Kirby, 1889	Solan and Kangra Dists.
119	*Tramea virginia* (Rambur, 1842)	Mandi, Kangra, Kullu and Hamirpur Dists.
Trithemis Brauer, 1868		
120	*Trithemis aurora* (Burmeister, 1839)	Kangra, Shimla, Kullu, Una, Bilaspur, Sirmaur and Hamirpur Dists.
121	*Trithemis festiva* (Rambur, 1842)	Solan, Mandi, Kangra, Shimla, Chamba, Kullu, Una, Bilaspur, Sirmaur and Hamirpur Dists.
122	*Trithemis kirbyi* Selys, 1891	Kangra, Shimla, Chamba, Una and Sirmaur Dists.

123 *Trithemis pallidinervis* (Kirby, 1889)	Kangra, Una and Sirmaur Dists.
Zygonyx Hagen, 1867	
124 *Zygonyx torridus isis* Fraser, 1924	Sirmaur Dist.
Zyxomma Rambur, 1842	
125 *Zyxomma petiolatum* Rambur, 1842	Kangra Dist.

Fig. 2. *Anisopleura lestoides* Selys, 1853. Credit R. Babu.

Fig. 3. *Aristocypha quadrimaculata* (Selys, 1853). Credit K.A Subramanian.

Fig. 4. *Aristocypha bifasciata* (Selys, 1879). Credit R. Babu.

Fig. 5. *Rhinocypha trifasciata* Selys, 1853. Credit K.A Subramanian.

Fig. 6. *Megalestes major* Selys, 1862. Credit R. Babu.

Fig. 7. *Anotogaster nipalensis* Selys, 1850. Credit R. Babu.

Acknowledgements

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Fig. 8. *Onychogomphus bistrigatus* (Selys, 1854), Credit R. Babu.

Fig. 9. *Gomphidia t-nigrum* Selys, 1854. Credit R. Babu.

Fig. 10. *Sympetrum commixtum* (Selys, 1884). Credit R. Babu.

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New Books

Comparative functional morphology of vein joints in Odonata

Authors: Esther Appel & Stanislav N. Gorb
Series: Zoologica (Schweizerbart) 159,
104 pages, 53 colour & b/w illustrations, 1 table
Schweizerbart Science Publishers, April 2014
ISBN 978-3-510-55046-3

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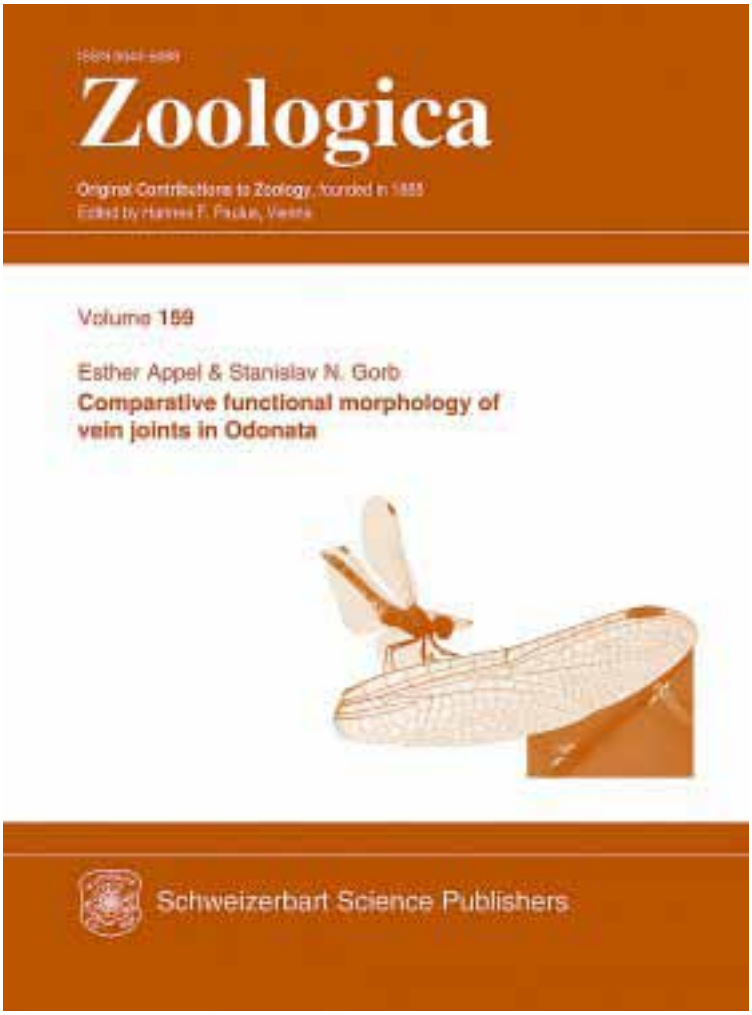

The authors present a thorough study on the distribution of resilin-bearing wing vein joints in wings of Odonata. Twenty-two species of 20 different families of dragonflies and damselflies, showing various wing morphologies and flight kinematics, are examined and reveal interesting evolutionary trends.

Dragonflies and damselflies show an exceptional high lift production and are some of the most manoeuverable flying insects. The important role of their corrugated wing profile in increasing lift production has been shown in various studies. As odonate wings lack internal muscles, their aerodynamic performance relies on passive deformations, such as pleat angle widening and camber formation. The rubber-like protein resilin has been shown to play a crucial role in wing joint flexibility. Thus, it may be assumed that the specific distribution of either stiff or flexible, resilin-bearing vein joints may influence the overall wing deformation during flight.

Using fluorescence light microscopy and scanning electron microscopy, the dorsal and ventral wing sides of different species are compared with respect to the distribution patterns of four types of vein joints, five types of resilin patches, and joint-associated spines. The results reveal a significant difference between dragonflies and damselflies. Variations of the distribution patterns suggest a classification into five different pattern groups. Their occurrence within the two suborders shows some evolutionary trends and gives insight into the wing functionality. In particular, we discuss how the combination of joint morphology, kinematics, and wing morphology may allow different passive wing deformations during flight.

This study, generously illustrated with 53 mostly coloured figures is of great interest to biologists studying insect flight, functional morphology, and evolution of Odonata. Furthermore, the described distribution patterns of different vein joints in combination with wing shape and flight kinematics may possibly inspire their biomimetic imitation in micro air vehicles (MAV).

Namibian Dragonflies: Larval Key and Distribution

Authors: F. Suhling, O. Muller & Andreas Martens
260 pages, b/w illustrations, distribution maps, January 2014
Publishers: Gesellschaft Deutschsprachiger Odonatologen e.V. (GdO)

Hard copies of the Libellula Supplement 13 available from the following book suppliers:
1. [http://www.nhbs.com/namibian_dragonflies_tefno_198234.html]
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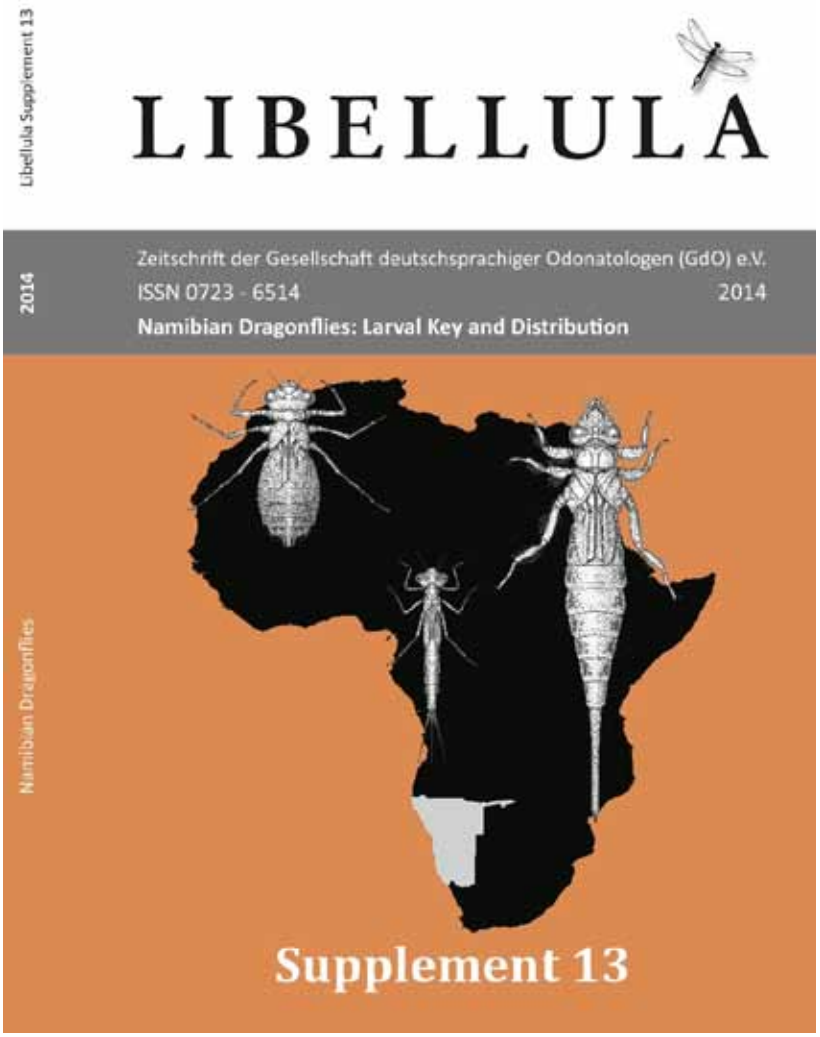
The key is available free as a 'pdf' downloaf file from [https://www.tu-braunschweig.de/Medien-DB/geooekologie/USA/suhling_etal_2014_namkey.pdf]

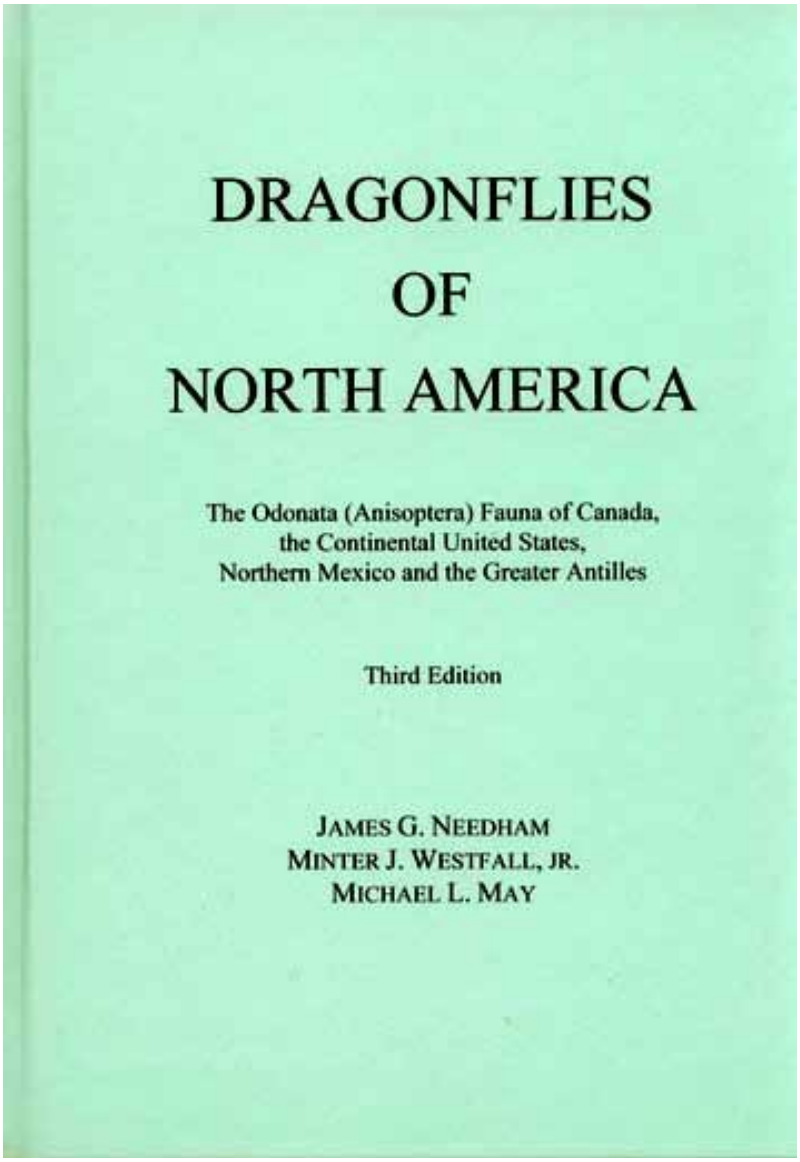
The distribution maps and checklist 'pdf' file is available free from [http://www.researchgate.net/publication/260831032_Distribution_maps_and_checklist_of_Namibian_Odonata]

An illustrated key to the exuviae and final stadium larvae of the dragonflies of Namibia. The key includes some taxa from neighbouring areas, which have not yet been recorded from Namibia. The key is therefore applicable in southern Angola, most of Botswana and the Northern Cape province of South Africa. It includes identification characters of taxa hitherto undescribed, namely *Lestes pallidus, Pseudagrion deningi, P. rufostigma, Ictinogomphus dundoensis, Crenigomphus cornutus, C. kavangoensis, C. hartmanni, Paragomphus cataractae, P. elidius, P. sabicus, Mastigogomphus dissimilis, Anax bangweuluensis* and *Phyllomacromia overlaeti*, and for the first time keys for some widespread African species pairs, such as *Tramea basilaris* and *T. limbata,* and *Zggonyx torridus* and *Z. natalensis*. However, since the larvae of many species and even four out of the 50 ocurring in Nambia remain unknown the key is preliminary. A checklist of the Odonata of Namibia with up to date distribution maps for 130 species is provided.



Dragonflies of North America: The Odonata (Anisoptera) Fauna of Canada, the Continental United States, Northern Mexico and the Greater Antilles

Authors: James G Needham, Minter J Westfall, Jr., Michael L May
New Edition (3), hardback 658 pages, b/w photos, b/w illustrations, b/w maps,
Publisher: Scientific Publishers, March 2014



Since its first publication in 1955, this classic work has become the benchmark reference for the identification of dragonflies (Anisoptera) in North America. After the revised edition came out in 2000, a need arose for an updated edition, with new species and new records added to the fauna up to 2012, revised taxonomy, and revised keys, resulting in the present third edition.

All species known to occur in the United States and Canada, plus the Greater Antilles and the northern states of Mexico bordering the United States, are included, for a total of 365 species, 15 more than the previous edition. The text has been updated to include species discovered over the last 12 years, with these species accounts added, as well as revised and corrected adult and larval keys. Thus, the work encompasses all of the larger Odonata species likely to be encountered in North America north of Mexico.

The core of Dragonflies of North America is a series of carefully researched identification keys, each of which is extensively illustrated with drawings and light micrographs. These are supplemented with detailed notes for adults and larvae of all species. The companion book, Damselflies of North America (1996; revised 2006), treats all the smaller species, the damselflies (Zygoptera). Color images are depicted in the Supplement, 3558B, (2007).

The keys have been rewritten to incorporate species added to the fauna since 2000, as well as added larval discoveries. The most current distribution records are noted, along with the flight dates for each species (including a new phenological table). Many new line drawings and halftones are included for a total of 650 text figures, many of which have multiple images on one numbered figure (thus, several thousand actual figures). Dragonflies of North America for North America, south to northern Mexico and the northern Caribbean, will allow users to identify these important aquatic insects, both the adults and known immature stages.

Available from Flora & Fauna Books through AbeBooks at:
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