AGRION

NEWSLETTER OF THE WORLDWIDE DRAGONFLY ASSOCIATION

PATRON: Professor Edward O. Wilson FRS, FRSE

Volume 22, Number 1 January 2018

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.

ISSN 1476-2552

AGRION

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]

WDA Membership

There are several kinds of WDA membership available (single, student, family, affiliated society or sustaining), either with or without the WDA's journal (*The International Journal of Odonatology*). You can sign up for a membership on the WDA's website [http://worlddragonfly.org/?page_id=141] or by contacting the WDA secretary directly [wda.secretary@gmail.com]. Sponsored memberships are also available for those who cannot afford the cost due to currency restrictions or other reasons.

Conference News

5th European Congress on Odonatology (ECOO) 2018 is scheduled to be held in Brno, Czech Republic 9-12 July 2018. For more info please contact Otakar Holuša, Mendel University in Brno, Faculty of Forestry and Wood Technology, Dept. of Forest Protection and Wildlife Management, Zemědělská 3, CZ-613 00 Brno, Czech Republic, mob: +420 606 960 769, e-mail: [holusao@email.cz].

The International Congress of Odonatology 2017 (ICO2017)
The International Congress of Odonatology 2017 (ICO2017), originally scheduled to be held in Algeria, was very successfully held in the Gillespie Centre at Clare College, Cambridge from 15-20 July 2017. Almost 100 participants from 27 countries, including 30 students, many of whom were supported with funding covering registration and the Congress dinner attended. For Congress report see article by Richard Rowe on page 10. ICO2019 will be held in Austin, Texas, USA.

The 4th DragonflyIndia Meeting and the 9th Indian Symposium of Odonatology 2017 was held 15-19 September 2017 in South Goa (see meeting report on page 22). K.A. Subramanian, one of the meeting's report authors, has just co-authored, with R. Babu (September, 2017), an updated (version 3) Indian Odonata checklist titled: ***A Checklist of Odonata (Insecta) of India***, which includes 488 species [Link].

Student Research News & WDA Conservation and Research Report

A report on an *Odonata survey at Juru Seberang, Belitung Island, Indonesia* by Akbar Alfarisyi (WDA student member), that was partly sponsored by a WDA research grant, is provided on page 42.

Cover: *Risiophlebia guentheri* Kosterin, 2015 (Zootaxa 3964: 138-145). Male and female photos taken at type-locality by Oleg Kosterin, 16 Jun 2014 in tall grass, forest swamp, Central Plateau of the Annamense Mountains, Dak Dam village environs, Mondulkiri Province, Cambodia (12°25' N 107°19' E, 780 m a.s.l.). This recently described species has now been recorded from Thailand (see "New national records of Odonata from Thailand" on page 30).

Drones and dragons: tech for assessing wetland health

Geert De Knijf drew *Agrion*'s attention to John Simaika's interesting 'Kickstarter' crowd funding proposal for a project to use drones to detect dragonflies [Link].

A century on from *The Biology of Dragonflies* by Tillyard 1917: what have we learned since then?

The year 2017 marked the 100th anniversary of R. J. Tillyard's seminal work published in his book titled: *The Biology of Dragonflies*. To mark the centenary Rassim Khelifa, Gunther Theischinger and Ian Endersby have published a review of the author's life and his contributions to odonatology in the *Australian Journal of Entolomology* (Khelifa et al., 2017: A century on from The Biology of Dragonflies by Tillyard 1917: what have we learned since then? *Austral Ent.* 56: 138-147 [Link]. As pointed out by Rassim Khelifa in his #dragonfly17 tweet there is an amazing animated video based on Tillyard's odonate physiology drawings produced by Julia Goschke [Link].

Next issue of *AGRION*

For the next issue of *AGRION,* to be published at the beginning of July 2018, 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. Please do not include artwork with the text but provide a separate file or files, ideally in a compressed format (e.g. 'tiff', 'jpeg' or 'gif'). Do not make up plates of multiple photos but send original photo images as separate files.

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*.

AGRION CONTENTS

Letter from the President

Frank Suhling [f.suhling@tu-bs.de]

Dear members of the Worldwide Dragonfly Association!

In the name of the board of trustees I wish you a happy and successful New Year 2018.

WDA had a bit a turbulent year 2017 with some ups and downs. In June 2017 we had a very successful International Congress of Odonatology (ICO2017) in Cambridge with fascinating contributions in all fields of Odonatology. The ICO2017 meeting was truly a worldwide gathering, with students, professionals and citizen scientists from North America, South America, Africa, Europe, Asia, and Australia - about a hundred people from 27 countries. I would like to thank again the organising team of ICO2017, chaired by Richard Rowe and Boudjéma Samraoui, for arranging this event for us at Clare College.

The vibe at the board meetings held in Cambridge was exciting and a number of relevant decisions concerning the future of WDA were brought forward. I will inform you about these below. Unfortunately, in October 2017 our president, Nancy van der Poorten, resigned from the board for personal reasons. I would like to thank Nancy for her contributions as president elect from 2015-17 and also for her constructive work as president in 2017. Nancy's departure not only left a gap on the board but also required that I step in as president after being president elect for only three months. Well, my apprenticeship was a bit shorter than the usual two-year training period as a president elect. I hope that I can serve you anyhow as a reasonable president.

The first order of business as the new president is to fill the gap of the president elect, hence the next president of the society when my term ends in 2019. The WDA board of trustees nominated Adolfo Cordero-Rivera as the new president elect. Adolfo graciously agreed to serve the society and is aware that he eventually would become president. If anyone has additional nominations for president elect, please submit their name after first obtaining the nominee's affirmation that she/he would serve. The name should be submitted to the WDA secretary, Jessica Ware, [wda.secretary@gmail.com], by 15 January, 2018.

One of the board's main responsibilities for the future is to improve communication with our members. The board recognizes that there have been many issues with memberships and IJO subscriptions not working properly over the past few years. Part of the fault has been with the Taylor & Francis Group (T&F) who were contracted to handle the memberships and part of the fault lies with the board. It was up to the board to react on those problems earlier. In the name of the board I apologize for the inconvenience that this has caused members. We have taken some first steps in an attempt to rectify this. Most importantly, during the board meeting in Cambridge, we decided that the WDA would try taking care of its own membership from 2018. We definitely care about our membership and I hope this letter can be seen as a first step toward regaining member satisfaction in WDA! But, we noted that developing the procedures necessary for membership administration - particularly electronic payment via PayPal - requires more time for preparation than we had in 2017, particularly after the unexpected change in the board. We do not want to establish a half-working system that just causes new problems. Therefore, in 2018, you will receive letters for membership renewal, including subscription of the International Journal of Odonatology by T&F. After noting how Ali Paskins of T&F handled some recent matters we are confident that problems with subscriptions will be reduced. If you have problems with your membership, however, for example should you fail to receive an issue of IJO on time, please inform Jessica Ware [wda.secretary@gmail.com], immediately. She will contact all relevant parties and keep me informed as issues are resolved.

Another decision of the board was to moderately raise the membership fees by about 10%. As all of you know everything has become more expensive, whereas the fees for WDA membership have remained stable since 2009. An ordinary membership including subscription and delivery of a paper version of IJO will be £60 sterling in 2018. If you decide to receive IJO as an online *electronic version only*, the price will be £55 sterling. For all other fees i.e. for students, members from developing countries, families, and affiliated societies, please look at our website [http://worlddragonfly.org/membership]. For each paper subscription of IJO, £31 sterling and for electronic only subscription, £28 sterling, goes to our publisher, T&F. The remainder is used by WDA for organizing the ICOs and charity (i.e. research and conservation funds as well as congress grants).

In Cambridge the board decided and announced during the 10th Biennial General Meeting of WDA to name our grants in honour of two respected persons in odonatology. The WDA conservation grant will henceforward be the Philip S. Corbet grant, the WDA grant for attending ICOs will be the Richard Rowe grant. Members can apply for both grants.

Our journal, IJO continues to do well and fill an important niche in the odonatological literature. I would however like to encourage members who publish, to consider IJO as an outlet for your work. The IJO

Editorial Board is working hard to increase the number of quality manuscripts published by the journal. As part of that initiative, we are working on special issues and significant reviews planned for future publication.

I kept the most exciting news for last. As announced during ICO2017, ICO2019 will be in Austin, Texas, thanks to the organisers, Kendra and John Abbott, who have already put in a tremendous amount of work. And unlike in the past, we have no shortage of venues for future congresses. It seems we odonatologists have grown more popular! Our new congress coordinator, Javier Muzón, managed to receive four more invitations, so that we have four prospective locations proposed for ICOs through 2027! We are invited to Cyprus, Colombia, Brazil and Fiji. Details and the chronological order will be announced later.

Sincerely,
Frank

Members updated email addresses required

Jessica Ware, WDA Secretary [wda.secretary@gmail.com]

Dear WDA members,

You may not have received invitations to renew your membership or subscription to IJO for this or last year. Perhaps you did not receive issues of IJO and wonder why. One reason, but surely not the only reason, may have been that we and T&F do not have your recent physical and/or email addresses. Some of you may have moved or changed email addresses and we would like to update our records to reflect this. Please understand that it has been very difficult for us to follow up on address changes with the current T&F system, and thus we are writing to you now for your assistance. Have we "lost" some of you from our member database? Please can you send your current email address to wda.secretary@gmail.com and Alison.Paskins@tandf.co.uk so that we may update our records?

Thank you!

Sincerely,
Jessica (WDA Secretary) and Frank (WDA President)

Stories from social and cultural odonatology: Entomological activities of the 1905 Nobel prize laureate Robert Koch, Father of Microbiology

Matti Hämäläinen [matti.hamalainen@helsinki.fi]

The receipt of a Nobel Prize typically brings the laureate many additional honours. Among these lesser accolades are the receipt of eponymous names in the zoological and botanical nomenclature, dedications of which the honoured person often remains blissfully unaware. Recently, Karube & Kompier (2017) honoured two 2007 Nobel Peace Prize laureates, Al (Albert Arnold) Gore and the Intergovernmental Panel on Climate Change (IPCC), with the names of two new Vietnamese aeshnid dragonfly species: *Cephalaeschna algorei* Karube & Kompier, 2017 and *Cephalaeschna aipishishi* Karube & Kompier, 2017, respectively. The latter name is constructed from the abbreviation of the organization. It is phonetically based on the Japanese syllabary, written in Katakana as アイピーシーシー, hence may not be immediately recognisable to many readers. Al Gore is a former Vice President of the United States and a renowned environmentalist, who has raised the awareness of the need for action to control anthropogenic climate change. Previously Clausnitzer & Dijkstra (2005) dedicated the species epithet of a new gomphid dragonfly species from Kenya and Uganda - *Notogomphus maathaiae* Clausnitzer & Dijkstra, 2005 - to the 2004 Nobel Peace Prize laureate Wangari Muta Maathai (1940-2011), the Kenyan environmental activist and founder of the Green Belt Movement. In the case of these three eponymous names there is no direct connection between the eponymee and the name givers, nor the respective dragonfly species. The names have been given as a token of admiration and appreciation of the contributions of the eponymees to nature conservation, which hopefully also helps these dragonfly species to survive somewhat longer in their endangered habitats.

As far as I know there is only one more eponymous dragonfly name bestowed on a Nobel laureate - *Phyllomacromia kochi* Grünberg, 1911, a species presently ranked as junior synonym of *Phyllomacromia picta* (Hagen *in* Selys, 1871). This dedication however, was not an appendage to the Nobel Prize, but was awarded on account of the recipient's odonatological activity; the type series was part of the dragonfly material collected by the eponymee himself, Robert Koch, Director of the Royal Prussian Institute for Infectious Diseases in Berlin. Koch received the 1905 Prize in Physiology or Medicine. Since this obscure 'dragonfly honour' bestowed on Koch is probably unknown even to most odonatologists, his story may be of interest.

Robert Koch

Heinrich Hermann Robert Koch (1843-1910) (Fig. 1) was arguably the father of microbiology, and certainly one of its leading pioneers. He discovered the cycle of Anthrax disease in 1876, and identified *Mycobacterium tuberculosis*, the bacterium responsible for tuberculosis (1882) and *Vibrio cholerae* which causes cholera (1883). He originated the standard techniques of classical microbiology and greatly improved laboratory practices. The Nobel Prize was awarded for his investigations and discoveries in relation to tuberculosis. He became a national hero in Germany in the 1880's and he is still recognized there as such, as well as among students of microbiology, to whom he is as familiar as Edmond de Selys Longchamps is to us odonatologists. A recent (2017) German TV series *Charité* in six parts, where Koch is one of the main characters, made his great scientific achievements and private life - scandalous in his lifetime - better known to today's general public. Earlier, in 1939 an historical drama film *Robert Koch, der Bekämpfer des Todes* ('Battler of Death') appeared in Germany.

Figure 1. Photographic portrait of Robert Koch.

In 1896-1907, during the latter part of his career, Koch made five long expeditions to Africa studying various tropical diseases of humans and cattle. On his last African expedition ('Schlafkrankheitsexpedition') from May 1906 to October 1907 he focused on sleeping sickness (human African trypanosomiasis, an insect-borne parasitic disease transmitted by tsetse flies, caused by a trypanosome protist). In September 1906 Koch and his team of fellow German researchers set up a field laboratory and patients' camp in Bugala, on the Ssese Islands in the north-eastern part of Lake Victoria in Uganda, where a devastating sleeping sickness

epidemic was raging. Before settling in Bugala, Koch sent his young wife Hedwig Freiberg (1872-1945) back to Germany to protect her health. Previously she had bravely accompanied her husband on most of his tropical expeditions.

Koch spent more than one year on the Ssese Islands doing research on the developmental cycle of the parasites in tsetse flies (*Glossina*) and tried to develop mechanisms to control the spread of the disease and drug therapy to cure infections.

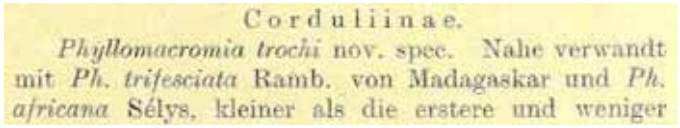
Dragonflies and other insects collected in the Ssese Islands

In addition to his own studies, Koch also collected insects for other researchers during his stay at Ssese. He brought back to Berlin, among others, an extensive collection of Lepidoptera, a small collection of Odonata and an unspecified number of Coleoptera.

Koch presented the Lepidoptera and Odonata specimens to Wilhelm Dönitz (1838-1912), his associate in Berlin and a noted researcher on cholera and leprosy. Dönitz was also an entomologist and arachnologist. After having made preliminary identifications of the specimens Dönitz donated them to the Zoological Museum in Berlin. At the museum the curator Karl Grünberg (1878-1931) studied and published first on the Lepidoptera (Grünberg 1910) and then the Odonata (Grünberg 1911).

The dragonfly collection consisted of 114 specimens. These represented a total of 15 species of the Anisopteran families Gomphidae (2 spp.), Macromiidae (2 spp.) and Libellulidae (11 spp.).

Two of the species were described as new: '*Phyllomacromia trochi* nov. spec.' (Fig. 2), based on two male specimens, and '*Macromia nyanzana* nov. spec. (?)', based on a single female specimen. As pointed out by Pinhey (1966) the species epithet '*trochi*' was a printer's error and was intended to read '*kochi*'. This is evident from the fact that Grünberg in the same paper explicitly stated that the specimens were collected by "Prof. Dr. R. Koch". Therefore, according to the Code of the Zoological Nomenclature, the incorrect original spelling *trochi* should be corrected to *kochi*. Actually the corrected spelling had already been used by Schmidt (1951), Fraser (1954) and Pinhey (1961, 1962), but without explanation of the amendment. Pinhey (1961) opined that *Macromia kochi* might be a melanic form or ecological forest race of *M. picta* (Fig. 3), but only much later he (Pinhey 1984) formally established *kochi* as a junior synonym of *picta*, considering it a melanic form occurring in dense forest. Grünberg's somewhat hesitantly introduced new species *Macromia nyanzana* was synonymised by Dijkstra (2005) with *Phyllomacromia contumax* Selys, 1879 (Fig. 4). Earlier, May (1997) had shown that *Phyllomacromia* Selys, 1878 is a distinct genus,


Corduliinae.

Phyllomacromia trochi nov. spec. Nahe verwandt mit *Ph. trifesciata* Ramb. von Madagaskar und *Ph. africana* Sélys, kleiner als die erstere und weniger

Figure 2. Extract from Grünberg's (1911) paper showing the printer's error in the species epithet honouring Robert Koch.

Figure 3. A male of *Phyllomacromia picta* from South Africa. The darker coloured *P. kochi* is its junior synonym. Photo by John Wilkinson.

Figure 4. A male of *Phyllomacromia contumax* from Namibia. *Macromia nyanzana* is its junior synonym. Photo by Keith Wilson.

including all African '*Macromia*' species.

Koch's Lepidoptera material from Ssese Islands included 225 species of which Grünberg (1910) described 12 new species. Presently six of these 12 taxa are considered as synonyms, two have been downgraded to subspecies and four remain valid species. The satyrine butterfly species dedicated to Koch - *Mycalesis (Bicyclus) kochi* - is a synonym of *Bicyclus sebetus* (Hewitson, 1877) (Fig. 5). So, both Grünberg's dragonfly and butterfly dedications to Koch were 'failures'. I am not aware of any beetle species named after Robert Koch, but at least two new tenebrionid species have been described from his specimens from Ssese Islands: *Selinus interioris* Gebien, 1911 (presently *Quadrideres interioris*) and *Strongylium bipartitum* Gebien, 1920.

Figure 5. The satyrid butterfly *Bicyclus sebetus*, illustrated by William C. Hewitson in his series *Illustrations of the new species of exotic butterflies* (1877). *Mycalesis kochi* is its junior synonym.

Robert Koch's interest in insects goes back to his youth; encouraged by his grandfather he collected insects and kept and observed them in a terrarium. We do not know how much Koch himself participated in the catching of insects in the Ssese Islands. Obviously most of the material was netted by his 'fly-catchers' ('Fliegenfänger') (Fig. 6), whom he had hired to collect tsetse flies for his studies. Three quarters of the dragonfly specimens in the material consisted of three common species: *Brachythemis leucosticta* (Burmeister, 1839), *Trithemis annulata* (Palisot de Beauvois, 1807) and *Ictinogomphus ferox* (Rambur, 1842) - a typical bag for ignorant collectors. One imagines Koch himself might have been more discriminating, given his prowess at scientific observation.

Friedrich Karl Kleine (1869-1951), Koch's co-worker in the Ssese Islands, wrote (Kleine 1924) that the long stay there was not an easy period for the 63-year-old Koch. Living in a simple straw hut, eating a very simple and unbalanced diet, often with daily walks of eight hours in blazing sunshine would be a difficult experience for anyone. The worst ordeal for Koch was caused by the jiggers or burrowing fleas (*Tunga penetrans*), which created open wounds in his legs and caused lymphangitis. This prevented Koch from working for long periods, and at one

Figure 6. A group of Koch's 'fly-catchers' netting tsetse flies and other insects in the lake shore at the Ssese Islands.

phase he pleaded - fortunately in vain - for his colleagues to amputate his big toes to speed up the healing.

Robert Koch was one of the giants of modern science, whose name is less well known than it should be. He reduced immeasurably the total sum of human misery, and then was almost forgotten by those who benefitted most. His reputation survives in his homeland and among students of his discipline. It should therefore be a matter of satisfaction to all odonatologists, that he had a dragonfly named after him, be it a synonym or not, adding in a small way to the preservation of his memory.

Acknowledgements

I am grateful to Albert G. Orr, who provided valuable suggestions on the article and improved the English expression. John Wilkinson and Keith Wilson kindly permitted me to use their photographs of *Pseudomacromia picta* and *P. contumax*, respectively.

References

Clausnitzer, V. & Dijkstra, K.-D.B. 2005. Honouring Nobel Peace Price winner Wangari Maathai: *Notogomphus maathaiae* sp. nov., a threatened dragonfly of Kenya's forest streams (Odonata: Gomphidae). *International Journal of Odonatology* 8(2): 177-182.

Dijkstra, K.-D.B. 2005. The identity of some widespread and variable *Phyllomacromia* species, with a revised grouping of the genus (Anisoptera: Corduliidae). *Odonatologica* 34(1): 11-26.

Fraser, F.C. 1954. New species of *Macromia* from tropical Africa. *Revue Zoologie Botanique Africaines* 49(1-2): 41-76.

Grünberg, K. 1910. Zur Kenntnis der Lepidopteren-Fauna der Sesse-Inseln im Victoria-Nyanza. *Sitzungsberichte der Gesellschaft Naturforschender Freunde zu Berlin* 1910: 146-181. [https://www.biodiversitylibrary.org/item/148185#page/174/mode/1up].

Grünberg, K. 1911. Zur Kenntnis der Odonatenfauna der Sesse-Inseln im Victoria-Nyanza. Entomologische Rundschau 28(13): 103-104. [https://www.biodiversitylibrary.org/item/148367#page/115/mode/1up].

Karube, H. & Kompier, T. 2017. Two new species of the genus *Cephalaeschna* from northern Vietnam (Odonata: Aeshnidae). *Tombo - Acta Odonatologica Japonica* 59: 61-70.

Kleine, F. 1924. Ein Tagebuch von Robert Koch während seiner deutsch-ostafrikanischen Schlafkrankheits expedition i. J. 1906/07 [First part]. *Deutsche Medizinische Wochenschrift* 50: 21-24. [https://www.thieme-connect.com/products/ejournals/pdf/10.1055/s-0028-1133118.pdf].

May, M.L. 1997. Reconsideration of the status of the genera *Phyllomacromia* and *Macromia* (Anisoptera: Corduliidae). *Odonatologica* 26(4): 405-414.

Pinhey, E.C.G. 1961. *A survey of the dragonflies (Order Odonata) of Eastern Africa*. Trustees of the British Museum, London.

Pinhey, E. 1962 A descriptive catalogue of the Odonata of the African continent (up to December 1959). *Publicações Culturais Companhia de Diamantes de Angola* 59: 11-322.

Pinhey, E. 1966. Notes on African Odonata, particularly type material. *Revue Zoologie Botanique Africaines* 73(3-4): 283-308.

Pinhey, E. 1984 A check-list of the Odonata of Zimbabwe and Zambia. *Smithersia* 3: 1-64.

Schmidt, E. 1951. Libellen aus Portugiesisch Guinea, mit Bemerkungen über andere aethiopische Odonaten. *Arquivos do Museu Bocage* 20 [1949]: 125-200.

International Congress of Odonatology 2017
Clare College, Cambridge 15-20 July

Studying dragonflies wherever they are, whatever they do

Richard Rowe [richard.rowe.dragonflies@gmail.com]
Website: [http://www.ico2017.org/]

This Congress was an experiment to see if we could organise a meeting from the other side of the world with just key local participation. We can, but I wouldn't recommend it.

I jetted in from Australia on the preceding Wednesday, and as first in and presumed to be last out, my room was at the top of the stairs and the very end of the corridor. I somehow lugged my luggage up, and after courtesy calls I collapsed.

That evening I went to sleep to the declaimed lines and a song from a 'Summer Shakespeare' offering being performed in a nearby College Gardens … this was to be a nightly occurrence. At breakfast the next morning I found a group of people who had gathered from across the world for just this festival. I hope some of the congress people were able to sample this cultural tour-de-force during an evening.

The next day the rest of the organising team turned up, from Australia and Sri Lanka, and we set ourselves to do everything that had to be done. Registration was almost completed by 4:00 pm Saturday, just as the doors opened. In all of this the Clare College team were a great help, working quietly and efficiently in the background. Our primary local contact, Paloma, had been called away, but her husband, Trevor, in the next lab, and his grad students had stepped up. As he is yet another Aussie we all fitted. We also got first dibs at sampling the many interesting eateries around central Cambridge.

When planning whether or not to attend it is important to recognise that ICOs are real scientific conferences like they used to be. Rather than set piece performances of stuff that has been out for years we discuss the pointy end of research. Not only do you get to hear it first, you can honestly make a difference in how ongoing research is being carried out. In several cases people were requested not to photograph the screen because the stuff wasn't yet even submitted. Take home message: to get the stuff you do have to be there.

We had just over 90 registrants from almost 30 countries. We had hoped that general members of the British Dragonfly Society would take the opportunity and show up, but that wasn't to be. Nonetheless including the Scots the British contingent was (just) the largest, edging out Germany and the USA.

A feature of this Congress was the three special sessions: Sunday afternoon - flight; Monday afternoon - vision; and Thursday afternoon - things Philip Corbet-ish. The flight session was to celebrate the pioneering work at Cambridge of Charlie Ellington. Charlie attended and while exhausted found it very hard to drag himself away from his old colleagues and from the new, young researchers who are now developing the field. The vision session was because of the work done at Cambridge over the past forty years. The Corbet session was included because Philip's PhD was at Cambridge under Sir Vincent Wigglesworth. Moreover, it is almost ten years since his death, and he was interested in almost everything to do with dragonflies … so an excuse to review everything at the end of the Congress.

The mid-Congress excursion

The mid-Congress excursion was to two fenland sites, both closely associated with Charles Rothschild, the banker, entomologist and pioneering conservationist. Unbeknownst to most, we were accompanied by Charles Rothschild's grand-daughter, Miriam Rothschild's niece.

The morning site was Woodwalton Fen, a minimally developed refuge site, bought privately by Rothschild in 1910 and now run by The Bedfordshire, Cambridgeshire and Northamptonshire Wildlife Trust. Our briefing on the place was given by Henry Stanier, the Great Fen Ecology and Recording Officer, while we congregated about the steps of Rothschild's thatched bungalow constructed on stilts. The ponds built by Norman Moore to conduct

Figure 1. ICO2017 attendees outside the Rothschild Bungalow at Woodwalton Fen on the Mid-Congress excursion, 18 Jul 2017. Credit Héctor Ortega-Salas.

his research on damselfly populations have fallen into disuse. Woodwalton Fen is at the heart of the Great Fen Project, a move to link up fens to provide a sustainable ecosystem, as originally envisaged by Charles Rothschild who was among the first to recognise that you can't preserve species unless you preserve habitats[1].

Lunch had been planned for the Almonry of Ely Cathedral, but repairs meant that wasn't to be. Instead we lunched at *The Cutter Inn*, a very pleasant inn alongside the river Great Ouse, and serving a diversity of local beers in very comfortable surroundings.

At Wicken Fen the British Dragonfly Centre was opened for us, then Henry Curry and Pam Taylor of the British Dragonfly Society guided the groups around the habitat. Again Wicken is core to a conservation and recovery project, 'the Wicken Vision', a move to re-establish fen habitats up the river to Cambridge.

Then it was home running through Cambridge's rush hour and, because of traffic restrictions, a drop off a few hundred metres from Clare.

For organising the excursion all credit to Ruary MacKenzie Dodds.

Figure 2. Mid-Congress partcipants outside the Cutter Inn on the River Great Ouse, 18 Jul 2017. Credit Héctor Ortega-Salas.

Figure 3. *Coenagrion puella* taken at Woodwalton Fen mid-congress field trip, 18 Jul 2017. Credit: Ruary MacKenzie Dodds.

Figure 4. Congress dinner in the Old Courts Dining Hall of Gonville and Caius College (Caius), which was Philip Corbet's College. Credit: Ruary MacKenzie Dodds.

The Congress Dinner

The Congress Dinner was held on the last evening in the formal Old Courts Dining Hall of Gonville and Caius College (Caius), Philip Corbet's college during his PhD studies. This building dates from the 1850s and is notable for decorations honouring old Caians - there are coats of arms of old benefactors and notable members, and the stained glass windows honour many of the 14 Nobel Prize winners from the College, together with other notable alumni including Harvey of blood circulation and Fisher, the statistician, geneticist and evolutionary biologist. Philip was in residence when Fisher was President of the College and had tales to tell. He also overlapped with Francis Crick, but they hardly met.

In the early evening we made our way from Clare to Caius in dribs and drabs, a progression, rather than a procession. Enter across the well-worn stones of the Porters' Lodge, then into the College proper.

A last minute surprise was that the budget would stretch to cover pre-dinner

1 There has been review of all Charles Rothschild's conservation sites in the UK recently carried out by the Wildlife Trusts: see [Link].

drinks on the lawn. So we spent a happy 40 minutes in the gathering twilight, mingling and having a wind-down drink with friends. Then summonsed into the hall for dinner.

The dinner seemed well-received (Cajun baked salmon, roast duck with Caius potatoes etc., lemon posset, plus coffee and oddments), the service was excellent and the conversation intense. People kept popping up to inspect and photograph plaques and coats of arms and other decorations. Dining as an undergraduate in such a Hall must be inspiring, nothing can be seen as impossible given what your predecessors at table have done. And the local pub, *The Eagle*, now has a plaque in the bar where Crick first announced the discovery of DNA's structure, we found it. Also Harold Abrahams (of *Chariots of Fire*) was here. A very civilised conclusion to proceedings.

The Sessions

[Programme link**]**

The **Sunday morning session** started a bit late to allow for jet-lag or for misjudging the time needed to complete the College breakfast.

First up was Mike May, who bravely outlined his concept of dragonfly science through to 2050. He will of course be wrong, but how wrong I'll leave to others. So for the sake of it here goes: there will still be odonatologists; basic alpha taxonomy will still be important; major phylogenetic conundrums will be sorted; life is in the tropics, and the major work will be being done there by locals; there will be a lot more work in the details of larval ecology; advances in non-invasive imaging will create new fields in anatomy; the ability to follow individuals through time will open new vistas in ecology. Let's go!

Figure 5. The Congress Auditorium at the Gillespie Centre, Memorial Court, Clare College., Cambridge.

Marcel Wasscher then took us back in time to consider snippets from the rich pre-Selysian history of our science. He was followed by Klaus-Jürgen Conze who spoke on a detailed long term study conducted in Northrhine-Westfalia, Germany. Long term data sets are few and far between, and the 175,000 records collected here by some 400 volunteers over 20 years is surely unique. Such rich data sets enable questions in ecology, population fluctuations, and conservation to be addressed scientifically. This kind of research can only be conducted by strong local associations, not subject to the shifts in fashion currently impacting university and institutional research. A tour de force. The session finished with Cornelio Bota-Sierra who ran us through a case study of tropical mountain Odonata under climate change, in terms of altitudinal gradients and the adults' thermal environment.

After morning tea we moved to a session on seasonality, development and the impact of environmental conditions on larvae. Ulf Norling, in what he had privately asserted was a swan-song, outlined his work on the seasonal regulation of *Lestes sponsa*, including egg diapause termination, hatching synchrony, and effects of photoperiod on larval development. The answer is it is really complicated with interacting effects. As a pre-eminent larval biologist we won't let you go that easily Ulf.

Frank Suhling followed with an account of life cycles and seasonality in African Odonata. In contrast to Sweden, African Odonata are faced with different challenges in the form of wet and dry seasons, which may, or may not, be reliable. Life history strategies to cope with inclement environments are well developed in Africa's tropical and subtropical faunas.

The session finished with a paper by Alice Denis, explaining the effects of water temperature on phenology and morphology of riverine Odonata. These findings will have important application in the face of anthropogenic thermal pollution of waterways.

The first afternoon was devoted to a special session on dragonfly flight. The session began, and finished with superlative high speed Rüppell videotapes, both presented by Georg in Dagmar's absence. The opening session showed the ability of dragonflies to accelerate suddenly (most spectacularly to avoid attacks by frogs) and to manoeuvre in flight. The closing video looked at display flights in coloured winged dragonflies. We have all seen these activities, but high resolution video at 500 or 1000 frames per second shows just how much detail there is in dragonfly flight.

Ed Jarzembowski was supposed to present on the evolution of the odonate wing, most of which is available in text books. This service was covered very quickly, but then he led us though the outstanding new findings being made from fossils preserved in Burmese amber and being analysed in Chinese research institutes. (see figures on page 13). This 100My old material is providing detailed insights into the mid Cretaceous fauna, their anatomy and likely ecology. While the material might be 100My old, many of the discoveries shown were less than a year old.

Stas Gorb provided us with a different gee-whiz experience as he led us through the structure and properties of dragonfly wings currently being worked on by his group at Kiel. Wings are a complex composite structure of fibrous material supplemented by resilin, and in consequence the mechanical properties vary locally, enabling, or preventing, local flexing of the wing shape. Dragonfly wings are amazing pieces of bioengineering.

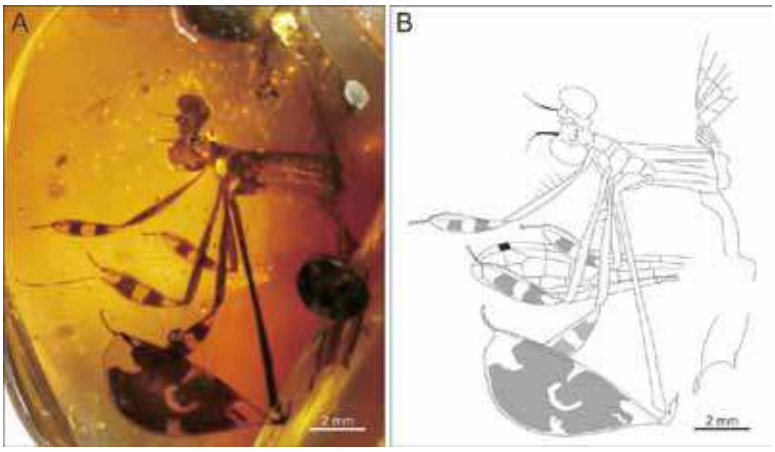


Figure 6. Ed Jarzembowski talked about some of the amazing new findings being made from fossils preserved in Burmese amber including the newly described *Yijenplatycnemis huangi* Zheng, Nel, Jarzembowski, Chang, Zhang, Xia, Liu and Wang, 2017, which had incredibly expanded tibiae, presumably for courtship display. Photo & drawing credit: Daran Zheng (Zheng D. et al., 2017: Extreme adaptations for probable visual courtship behaviour in a Cretaceous dancing damselfly. *Sci. Rep.* 7: 44932 [doi: 10.1038/srep44932] CC BY.

Günther Pass considered the wing as a living structure. At metamorphosis haemolymph flushes out the autolysed cellular layer that generated the wing surfaces, enabling dorsal and ventral acellular surfaces to weld and form the membrane. At the same time the cellular layer is retained within the main longitudinal veins which form tubes. Then through life the longitudinal veins pipe a flow of haemolymph, washing the enclosed nerve and tachea and sustaining the wing.

Some thirty years ago Robin Wootton presented a review of dragonfly flight at the Johnson City Symposium. Today we got an update, focussing on the uniqueness and diversity of dragonfly flight. For many of the basic features we now have answers, but almost every answer leads to new questions as dragonfly wings vary enormously in form and in detail leading to Why?

Fritz-Olaf Lehmann reviewed wing phasing in dragonfly flight. Analysis is complicated. Whereas in phase strokes generate the most power, most dragonflies most of the time fly with fore- and hind-wings markedly out of phase. It turns out that counter phase stroking reduces energy loss to eddies, improving flight efficiency by about 20%.

Richard Bomphrey provided a succinct and eminently understandable review of a major paper that he and co-workers had recently produced. This was a tour de force, covering flight analysis, aerodynamics and flight modes.

The last paper, from Stacey Combes' group, looked at the application of flight in an ecological context. Combes' group has been analysing the comparative flight biomechanics and capture strategies of hunting dragonflies. The word is dragonflies can, and do, use many flight mechanisms during a single predatory flight lasting a second or two. The high speed adjustment of behaviour can only be detected using high-speed filming and frame-by-frame analysis … take home message - require very good odds to bet on the fly.

The first **Monday morning session** focussed on evolutionary processes.

First up was a general account by Erik Svensson, looking at Odonata as a model system to examine the linkage between micro- and macroevolutionary scale analysis, followed by five examples:

David Outomuro analysed why birds prey more often on large-spotted *Calopteryx* damselflies; Ola Fincke presented on visual versus non-visual cues in sex recognition and harassment of *Ischnura elegans* damselflies under field conditions; André Günther then covered signalling with clear wings in African Chlorocyphidae; Yesenia Vega-Sánchez analysed the species recognition system in Rubyspots, considering both morphometric and genetic patterns; and lastly David Outomuro presented on how Polythoridae damselflies avoid predation by mimicking the UV-reflective wing band of unpalatable glasswing butterflies. In all a very diverse and informative session.

After morning tea we moved to a session looking at environmental constraints on dragonfly communities. Göran Sahlén started off with his ever developing research into forests and dragonflies in southern Sweden. The patchwork quilt of remnant forests have provided an excellent system to investigate. And Göran has worked this

system for over two decades.

Stefan Pinkert then led us through a multidimensional study, where detailed knowledge of western Europe's past has enabled the evolutionary processes, dispersal limitations and climatic history that shape current diversity patterns of European dragonflies to be recovered.

Samuel Renner spoke on the influence of land cover and water body type on the Odonata communities in the Brazilian Pampa.

Diana Goertzen presented on the large-scale impact of anthropogenic land-use on dragonfly fauna and diversity in continental Europe.

Ulf Norling reappeared to talk on aspects of European *Coenagrion* life-histories and their regulation, a companion piece to his earlier presentation on lestids (and to those unfortunate enough not to concentrate on Zygoptera, crown group Zygoptera are as removed from the lestids as crown group Anisoptera are from *Epiophlebia*).

The session concluded with Vanessa Amaya-Vallejo presenting on 'new Odonata species from Anchicaya (Valle del Cauca, Columbia): an integrative approach', with the message that our knowledge of both alpha-taxonomy and intra-population structure requires work, and work pays dividends.

Figure 7. Ulf Norling takes questions at the end of his presentation on aspects of European *Coenagrion* life-histories and their regulation. Credit: Ruary MacKenzie Dodds.

Monday afternoon was devoted to the vision session.

First up Richard Rowe redonned his lecturer's hat and gave an introductory account of the organisation of insect visual systems, so we were all starting on the same page.

Gert Stange then spoke on the anatomy and physiology of the ocelli of the dragonfly, *Hemicordulia tau*. Ocelli are the poor relations in insect vision research, but as Gert demonstrated the ocelli of dragonflies are finely tuned organs, able to form specialised images and joined to the central nervous system by very high speed neural circuitry. Ocelli are very important for maintaining flight stability especially during violent manoeuvring. They should not be side-lined in vision studies.

Richard returned for the rest of his time slot to talk about vision (a scientific field) and 'seeing', the internal processing of information. At the moment we know almost nothing about what insects 'see' (although we do know that bees fall for optical illusions). Dragonfly larvae have proved capable of distinguishing the weirdest things … including Richard (who fed them) from other users of the lab. (who of course didn't). And most of us are aware of taking a swing with a net and missing, and then having the patrolling dragonfly adjust its path to avoid us. Processing is happening. They 'see', but what?

Simon Laughlin then spoke on 'why do dragonflies have the longest photoreceptors in the animal kingdom?', work currently under way with a graduate student. If you weren't there then you will need to wait for thesis submission and the papers.

Doekele G. Stavenga spoke on odonate vision and colouration. An important feature of insect vision is that the visual pigments don't dissociate but that one photon pushes the molecule to the active state, and a second photon releases the molecule, generating the nerve signal. Dragonflies have screening pigments that sharpen the frequency response of the visual pigment … but the visual pigment can be transformed to the active state by photons outside the frequency that triggers a nerve spike, making for a very efficient system. From the other direction the colours of dragonflies are created both by chemicals and by nano-scale structures. The intersection of body colouration and the perceptual visual space is presently a very active field of research.

About three years ago Ryo Futahashi and co-workers astonished the scientific world by demonstrating an enormous range of opsin gene diversity in dragonflies. This work has developed and Ryo discussed recent findings and indications from the field. The diversity seems to have functional relevance, and the 'why?' question looms large. We await developments.

Moving from the physiology and physics of vision to what does the animal do, Paloma Gonzalez-Bellido explained how 16 high-speed descending neurons, the TSDNs (Target-Selecting Descending Neurons) enable

dragonflies to intercept and capture prey in active, and evasive flight.

This was followed by Jack Supple, a student from the Gonzalez lab, who explained the differences in descending sensorimotor control in dragonflies and damselflies.

Huai-Ti Lin nominated late and presented in a general session, however logically he should have been here. Huai-Ti described work on wireless neural telemetry recording in freely flying dragonflies currently being conducted by a group at Janelia Farm Research Campus. This work builds on Paloma's findings. New technology enables a backpack to monitor neural traffic from TSDNs, or other selected sensory systems, while the animal is in free flight and its movements and wing positions are recorded by an array of high-speed video cameras for analysis.

Wednesday morning focussed on systematics and phylogeny, and hence was heavily weighted to sequence analysis.

First up was Jessica Ware who demonstrated an analysis of that problematic group the Gomphidae. This study produced a number of new genera and removes *Gomphus* from the Western Hemisphere. She was followed by Seth Bybee who had led a study testing for strength in the backbone of Odonata phylogeny. The take home message is that recognised structure is more firmly supported, but that areas of doubt, presumably due to periods of rapid radiation, are not resolved.

Beatriz Willink demonstrated the use of a species phylogeny within the Coenagrionidae to structure a study of trait evolution in pond damselflies.

Wiebke Feindt then showed that the notionally monotypic *Megaloprepus caerulatus* was represented by four distinct, and separated, populations with evidence for local adaptation.

In the far north Nathalie Johansson demonstrated hidden genetic diversity in *Aeshna grandis* from Sweden, consistent with Manpreet Kohli's results on different populations of *Aeshna juncea*. In contrast Manpreet's work on the treeline emerald, *Somatochlora sahlbergi* showed low levels of genetic variation. So there is work to be done.

Melissa Sanchez-Herrera demonstrated a biogeographical history of the Neotropical banner wing damselflies (Zygoptera: Polythoridae), and Héctor Ortega-Salas discussed the taxonomy and systematics of the interesting Central American genus *Paraphlebia* Sèlys in Hagen, 1861.

The genetics wound up with Jessica Ware's demonstration that *Pantala flavescens* represents a single panmictic global population. Our totem really is a global wanderer.

William Kuhn then spoke on automated dragonfly identification with Odomatic and the Targeted Odonata Wing Digitization (TOWD) project.

The group photo was produced by withholding lunch until it was done. This sort of worked.

Figure 8. ICO2017 participants group-photo outside the Gilbert-Scott Memorial Court, Clare College, Cambridge, 19 July 2017.

Wednesday afternoon was a mixture of papers, workshops and workshop associated presentations.

The afternoon began with a sort of workshop, Alison Paskins (from Taylor & Francis) & John Abbott (editor of IJO) gave a presentation on getting work published, with tips for improving success. Then Karin Verspui & Marcel Wasscher gave a presentation on Selys' watercolour collection with illustrations of damselflies and dragonflies as a source for research, a lead in for a workshop run later in the afternoon.

Then there were two presentations on the neotropics. Rhainer Guillermo-Ferreira on neotropical Odonata followed by Javier Muzón outlining the founding and intended future of the Sociedad(e) de Odonatología Latinoamericana (SOL). SOL was launched at the La Plata Congress and has been very active ever since. A lot of Latin Americans were present at this congress doing interesting work on their outstanding fauna. We wish them well, and a bunch of people signed up.

There followed a block of excellent student papers: José Alejandro Cuéllar-Cardozo Odonate diversity and its relation with land uses along "La Avería" stream in tropical dry forest in Colombia; Amelia Nugrahaningrum The Javanese endemic damselfly *Drepanosticta spatulifera*: distribution and fluctuating population in Petungkriyono Forest, Central Java; Emily L. Sandall Importance of life stage capture in dragonfly specimen digitization; and Velesia Lesch First report of perfluoroalkyl substances in South African Odonata.

After afternoon tea there was the Poster Viewing session and the Selys watercolours workshop. The afternoon finished with the WDA 10th Biennial General Meeting.

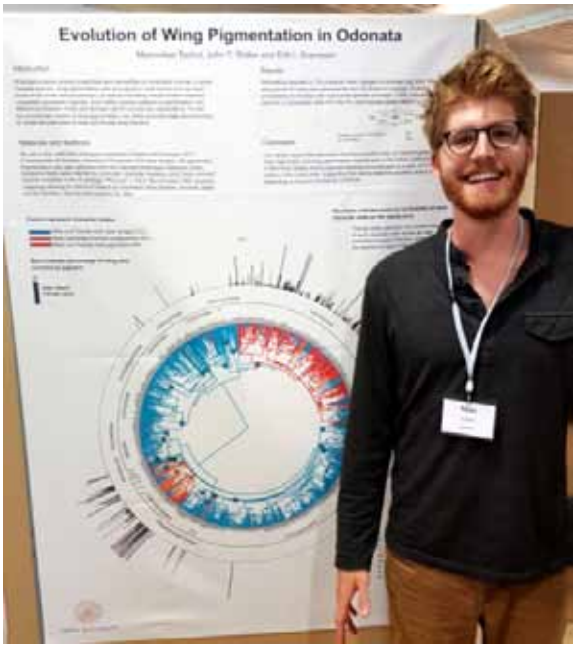


Figure 9. Lund University Master's student Max Tschol and his poster on the evolution of wing pigmation in Odonata. Credit: Erik Svensson.

Thursday morning began with a conservation session.

Michael Samways headed the session with an account of dragonflies in the Cape of Good Hope biogeographic region in the Anthropocene. This was followed by K-D Dijkstra whose programmed presentation on African odonata, titled: *Africa, freshwater and dragonflies: natural history and conservation in the continent of change,* was changed to a global odonate personal overview presentation, titled: *Freshwater futures: dragonflies and damselflies as conservation symbols (a personal history)*.

Xin Yu presented on the amazing Hainan Island endemic, the phoenix damselfly (*Pseudolestes mirabilis*), considering both its taxonomy and conservation.

John C. Abbott considered the status of the recently recognised *Cordulegaster sarracenia* Abbott & Hibbitts, 2011, providing an account of its biology and a description of the final instar nymph.

Finally Dominik Jablotschkin described an approach for prioritizing dragonfly habitats on the basis of heterogeneous data.

The second morning session covered a range of topics.

Milly Sharkey is now with the Bybee lab and spoke on visual pigment evolution in odonates.

Sebastian Büsse spoke on the material composition of mouthpart cuticle in Odonata and its possible biomechanical significance. This talk showed just how recent technological advances could be applied to real biological questions.

Huai-Ti Lin spoke next, but his paper is covered above in the vision session.

Yuta Ichikawa talked on the relationship between daily food intake and egg production in females of *Pantala flavescens*, one of the important components of reproductive success.

Lastly Manuela Rebora, from the Gorb lab, spoke on the diversity, and likely function, of the diverse antennal sensillae found in Odonata larvae.

Thursday afternoon was dedicated to a special session, reflecting on ten years since Philip Corbet. The session opened with an historical overview by Steve Brooks, of the Natural History Museum, and co-author of the 2008 New Naturalist Library *Dragonflies*, Philip's last book. He spoke on 'Philip Corbet: his legacy'. This was followed by Frank Suhling who reminded us all of Corbet's contribution to the knowledge of African dragonfly larvae and their ecology. A body of work completed while Philip officially worked as a fisheries biologist and as a mosquito biologist in Uganda, and while he was also developing the material for *A Biology of Dragonflies*.

Andreas Martens took up ballistic defaecation, a phenomenon identified by Philip late in life. Andreas

showed this was widespread among larval Anisoptera and provided suggestions for further investigation. 'What' and 'where' are determined, 'why' remains an open question.

Mike May reviewed migration, a topic that had fascinated Philip for decades. And a topic regrettably associated with a most unhappy episode in Philip's retirement. In the past decade migration studies have moved forward rapidly. Charles Anderson, documenter of *Pantala flavescens*' trans-oceanic movements through The Maldives was in the audience to keep Mike honest.

Manuel Ferreras-Romero and Boudjéma Samraoui covered seasonality and life history studies, always a topic dear to Philip. Their system of Mediterranean Odonata enables new insights into this complex aspect of a successful biological group.

Last of this section was Mike Samways who reviewed the history of dragonfly conservation, a field of growing concern to Philip, certainly since the 1970s. Mike also touched on the cultural and aesthetic appeal of dragonflies, another of Corbet's causes.

The next four speakers reflected on Corbet's passion for the British dragonflies. David Chelmick produced an entertaining, but information filled, account of Corbet's involvement with the British Dragonfly Society. Following which Adrian Parr described the UK distribution mapping project operated by the BDS, then Gary Powney outlined work from The Centre for Ecology & Hydrology,
using this data to show patterns of change in the Odonata of Britain. And developing the study further Chris Hassall interpreted the evolutionary ecology of urban dragonfly populations.

Klaas-Douwe Dijkstra spoke on Corbet's successes and Moore's successors, and documented odonatology's metamorphosis from a strictly scientific society to a conservation community.

The session concluded with two personal appreciations from Ola Fincke and Richard Rowe. At the conclusion of the Corbet session the WDA International Congress Coordinator, Javier Muzón, led the winding up:

Student prizes were distributed by Boudjéma Samraoui and Nancy van der Poorten. As always standards were very high, and judging difficult. Congratulations to student winners Amelia Nugrahaninfrum, Héctor Ortega-Salas and Lía Ramos for their great presentations and poster.

The Invitation to Austin ICO2019 was delivered by John Abbott, who in turn received the wooden Swedish traditional buþkaflar, the Congress baton.

There were thanks and acknowledgements. And a few final words. The schedule said the Congress was to finish at 1730, however an hour later people were still milling about in the gardens, catching up, saying goodbyes, making arrangements and a thousand other things. And between times the organisers tried to pack up everything into boxes. I thought it was a successful Congress, but then they all are.

Thanks to: Nancy van der Poorten, Ian Endersby and Peter Brown. Boudjéma Samraoui for looking after the science programme. Ruary MacKenzie Dodds. The Clare team (Hetty, Carl and Sally), Laura at Caius, Paloma & Trevor at the University. Every one of whom performed some vital function and without whom there would have been no Congress.

Figure 10. Student awards for best prsentations and poster respectively to Amelia Nugrahaninfrum (3rd from right), Héctor Ortega-Salas (not present; award collected by Perla Bogarín-Topete, 2nd from right) and Lía Ramos (far right). Credit: Jesssica Ware.

Figure 11. Group photo of south American attendees together with Richard Rowe (far left) the WDA's Congress Coordinator from 2005 to 2017. Credit: Héctor Ortega-Salas.

7th Balkan Odonatological Meeting (BOOM) - 2017 Slovenia

Nina Erbida [nina.erbida@gmail.com] & Damjan Vinko [damjan.vinko@gmail.com]
Slovene Dragonfly Society, Verovškova 56, SI-1000 Ljubljana, Slovenia

The idea of a Balkan odonatological camp started at the First European Congress of Odonatology in 2010 in Porto, Portugal. It happened while eating burgers at a small fast food restaurant one day. Those present were mostly, but not exclusively, odonatologists from the countries of the West Balkan Peninsula. Behind the idea was the fact that the Balkans are one of the least researched areas in Europe, which is partly due to a small number of people working on dragonflies in the region. And so, among others the decision to start a summer research and educational camp to unite Balkan odonatologists and create a place to teach young odonatologists and other nature observers and promote odonatology in the region was made (Jovič 2011). It was to be hosted by a different Balkan country each year. This is how the Balkan Odonatological Meeting (or BOOM) was born, with the main goal of further development of odonatology in the Balkans. With its focus on fieldwork, BOOM gives the opportunity of gaining experience in dragonfly identification and to gather new data on dragonfly distribution in selected areas (Vinko 2011a).

The first BOOM was supposed to be held in Macedonia in 2011, but due to various reasons the Slovene Dragonfly Society was the one that bravely took on the burden of being the first organizer. Since then, BOOM has been held in Croatia, Bosnia and Hercegovina, R. Macedonia and twice in Serbia. New regional cooperation and joint research resulted in several papers on dragonfly fauna of the region (Šácha & Bedjanič 2011; Vinko 2011b; Vinko & Vilenica 2013; Rajkov et al. 2015; Kulijer et al. 2016; Vinko et al. 2016, 2017a, 2017b). After six years BOOM returned to Slovenia in 2017.

The 7th Balkan Odonatological Meeting was organized by the Slovene Dragonfly Society from 4th to 11th August 2017, mainly in two regions of Slovenia. A total of 32 participants (making it the largest Meeting so far) from Slovenia, Serbia, Bosnia and Herzegovina, R. Macedonia, Croatia, Germany, the Netherlands and Sweden took part in the Meeting (Vinko 2017). Among them, were two participants who have attended all the previous Meetings. The camp was possible thanks to support from the Worldwide Dragonfly Association, Student Organization of University of Ljubljana and Biotechnical faculty, Gesellschaft deutschsprachiger Odonatologen, Ministry of the Environment and Spatial Planning, Vopex d.o.o., ŠOLT, Študentski kampus, Biotechnical Faculty of the University of Ljubljana and the Centre for Cartography of Fauna and Flora.

It is traditional and also practical for thoroughly surveying as large an area as possible to station the Meeting in different parts of the country or in some cases the region (depending on the size of the country). This year we started BOOM at Gorenjska region in the mountains of Pokljuka (north-west Slovenia) where larger peat bogs are found, one of the rarest habitats in the country. During the two days we stayed there we surveyed the nearby

Figure 1. Group photo, 7th Balkan Odonatological Meeting (BOOM), 10 August 2017, Slovenia. Photo credit: Rudi Krashevec.

and distant surroundings of our camp, which was a scouts' cottage in Zgornje Gorje. We divided into five groups to research Pokljuka Plateau and also drove as far as Radovljica, Kranjska Gora and even to Tarvisio (north-east Italy). On the third day we moved to another scouts' cottage at Bohinj lake (north-west Slovenia), one of the most beautiful lakes in Slovenia and the largest. We shared our accommodation with some young scouts, but on the plus side, for the two days we stayed there, we were served some hot delicious meals (elsewhere we had to cook for ourselves). They also lent us canoes for us to take a look at dragonflies on the lake. Two groups even hiked to survey odonates in the nearby mountains. The last area we chose to stay at was a cultural and youth home in Zapotok pri Igu pri Ljubljani (central Slovenia). And so, the fifth day was dedicated to researching the areas between Bohinj and Ljubljana. We stayed for three days at our final destination and in that time covered the areas between Logatec, Cerknica, Turjak, Grosuplje and Ljubljana. In a week we visited peat bogs, fish ponds, marshes, rivers, gravel pits, streams, lakes, ponds, reeds, clay pits, mountain pools and many more.

During the Meeting it is traditional that some lectures are also organized. This year Damjan Vinko from Slovenia presented dragonfly fauna of the region and the past results of the BOOMs, Robin Pranter from Sweden walked us through his diploma thesis *Intra- and interspecific variation and sexual dimorphism in colour, size, maturation time, phenology and survival of odonates* and Dolf Ramaker from the Netherlands took us on a journey of dragonflies of Ghana, Africa.

During this survey, the number of observed species comprised two thirds of all known dragonfly species in the country. Altogether 780 records for 48 species were collected at 183 investigated sites (Vinko 2017). Larvae of nine species, exuviae of 17 and imagines of 48 species were identified.

The noteworthy results are new records of several nationally rare species - e.g., *Lestes virens vestalis*, *Sympetrum pedemontanum*, *S. meridionale* - as well as new populations of C*ordulegaster heros* and *Ophiogomphus cecilia*, species from the EU Habitats Directive (Council Directive 92/43/EEC). Numerous new records of more common species were also collected. For several species with a relatively low number of previously published records for Slovenia (i.e. *Chalcolestes viridis, Erythromma najas*, *E. lindenii*, *Aeshna affinis*, *Somatochlora flavomaculata*, *Sympetrum vulgatum*), our survey adds new localities and extends their known range in the country (Kotarac 1997; BIOPORTAL.SI 2017). Participants from the southern countries also had a nice opportunity to investigate species rare or absent in their

Figure 2-4. (2) Gorenjska region in the mountains of Pokljuka (north-west Slovenia) where large peat bogs are found. Credit: Ana Tratnik. (3) Bohinj lake (north-west Slovenia). Credit: Klemen Kisovec. (4) Weed choked ditch. Photo credit: Nina Erbida.

Figure 5. Field trip group photo. Photo credit: Damjan Vinko.

countries; for example *Aeshna subarctica*, *A. juncea*, *A. grandis*, *Somatochlora metallica*, *S. arctica*, *S. meridionalis* and *Leucorrhinia dubia*.

The planning for the next year's Meeting has already started, yet for the first time we don't have a definite destination. At the meeting it was decided that the next BOOM will be held in a Balkan country that starts with the letter "B" (Bulgaria or Bosnia and Herzegovina), but an alternative was offered soon after the Meeting - one of the least researched countries of the Balkans, Kosovo. All we know for sure is that the field work will be interesting either way and the company good.

Acknowledgements

BOOM was supported in part by a grant from the Worldwide Dragonfly Association. We would like to thank Nancy van der Poorten for all her support.

References

BIOPORTAL.SI. Ljubljana, Center za kartografijo favne in flore. [*http://www.bioportal.si*]. [21.10.2017]

Jović, M. 2011. BOOM-ing. *Erjavecia* 26: 2-3.

Kotarac, M., 1997. *Atlas kačjih pastirjev (Odonata) Slovenije z Rdečim seznamom: projekt Slovenskega odonatološkega društva*. Miklavž na Dravskem polju, Center za kartografijo favne in flore: 205 pp.

Kulijer, D., Miljević, I. & Jakovljev, J., 2016. Contribution of the participants of the 4th Balkan Odonatological Meeting to the knowledge of Odonata distribution in Bosnia and Herzegovina. *International Dragonfly Fund - report* 95: 1-25.

Rajkov, S., Vinko, D. & Aranđelović, A., 2015. Faunistic results from the 2nd Balkan Odonatological Meeting - BOOM 2012, Serbia. *Natura Sloveniae* 17: 67-76.

Šácha, D. & Bedjanič, M., 2011. Ponovno odkritje ogroženega rumenega porečnika *Gomphus flavipes* (Charpentier, 1825) v Sloveniji po pol stoletja (Odonata: Gomphidae). *Natura Sloveniae* 13: 37-43. [in Slovene]

Vinko, D., 2011a. BOOM 2011: First Balkan Odonatological Meeting, Prvo mednarodno srečanje odonatologov Balkana, Slovenija, 11-18 Julij 2011. *Erjavecia* 26: 3-6. [in Slovene]

Vinko, D., 2011b. BOOM 2011 Favnistični pregled. *Erjavecia* 26: 7-12. [in Slovene]

Vinko, D., 2017. BOOM 2017, 7th Balkan Odonatological Meeting, 7. Mednarodno srečanje odonatologov Balkana - SLOVENIJA, 4-11 Avgust 2017. *Erjavecia* 32: 29-40. [in Slovene]

Vinko, D., Kulić, L. & Gajić, M., 2016. BOOM 2016, 6th Balkan Odonatological Meeting, 6. Mednarodno srečanje odonatologov Balkana, jugovzhodna Srbija, 5-12 Avgust 2016. *Erjavecia* 31: 13-22. [in Slovene]

Vinko, D., Kulijer, D., Dinova, D., Rimčeska, B., Brauner, O. & Olias, M., 2017a. Faunistic results from the 5th Balkan Odonatological Meeting - BOOM 2015, Republic of Macedonia. *Acta entomologica slovenica* 25(1): 89-114.

Vinko, D., Kulijer, D., Billqvist, M. & Martens, A., 2017b. The biting midge *Forcipomyia paludis* (Macfie, 1936) (Diptera: Ceratopogonidae) in Slovenia, Bosnia and Herzegovina, Croatia and Sweden. *Natura Sloveniae* 19(1): 5-21.

Vinko, D. & Vilenica, M., 2013. BOOM 2013, 3rd Balkan Odonatological Meeting, tretje Mednarodno srečanje odonatologov Balkana, Hrvaška, 1-7 Avgust 2013: Rezultati. *Erjavecia* 28: 10-19. [in Slovene]

Viva Australia Post - Australia Post Dragonflies

Gunther Theischinger [theischingergunther@gmail.com]
Jessica Ware [jessicaleeware@gmail.com]

Each year, Australia Post runs Stamp Collecting Month to promote the multi-generational hobby of stamp collecting while simultaneously educating primary school students on a curriculum theme such as history, geography, science, technology and/or the environment.

In July 2017, the theme focused on dragonflies with the release of five beautifully presented stamps and supporting information for educators, children, parents and grandparents. The fascinating beauty and interesting behaviour and life history of dragonflies and the threats to their habitats are of utmost importance in the dry continent Australia.

The launch of the stunningly illustrated stamp collection, which included five images representing both suborders (Zygoptera and Anisoptera) of Odonata, was held in the dragonfly display at an insect exhibition in the Melbourne Museum of Victoria. The stamps featured the genera *Rhyothemis, Petalura, Diplacodes, Diphlebia* and *Ictinogomphus*. The launch involved media photography and filming with a group of very enthusiastic children who were engaged in a live discussion about the relationships between dragonflies, their environment, and other animals including humans.

This exemplary effort by Australia Post in highlighting the beauty and importance of dragonflies to a public audience is greatly appreciated and applauded. The stamp series is currently for sale in Australia while stocks last. Odonatologists and Philatelists unite, as dragonflies travel through the mail, and into stamp collections around the country, visit [www.auspost.com.au/stamps].

Figures 1-6. (1-4) Gunther Theischinger with members of Australia Post family. (5) Sharla's (age 5) enthusiasm for the jewel flutterer is apparent and landed her in the local Herald Sun newspaper. (6) The Dragonflies - Stamp Collecting Month 2017 mini-sheet consisting of the five stamps incorporated into a miniature stamp sheet.

Chasing dragonflies at the 4th DragonflyIndia Meeting and 9th Indian Symposium of Odonatology 2017

Pankaj Koparde[1]*, Parag Ranganekar[2], K. A. Subramanian[3] and R. J. Andrew[4]
[1]Indian Institute of Science Education and Research, Tirupati, Andhra Pradesh, India
[2]Mineral Foundation, Goa, India
[3]Zoological Survey of India, Chennai, Tamil Nadu, India
[4]Hislop College, Nagpur, Maharashtra, India
***Correspondence [pankajkoparde@gmail.com]**

Every dragonfly lover dreams of being in pristine wetland habitats, sitting and watching dragonflies flying around, and sometimes getting lucky to sight that one special endemic species of a particular region. With the idea of bringing together Odonata lovers and researchers across India and showing them the endemic wonders of nature, this year DragonflyIndia and South Asian Council of Odonatology (SACO) joined hands to conduct the 4th annual meeting of DragonflyIndia and 9th Indian Symposium of Odonatology organized in collaboration with Mrugaya Expeditions, Nature's Nest Forest Resort, Goa State Biodiversity Board, and Hislop College, Nagpur. Keeping the informal scientific discussion format alive, the five days/four nights-long event was held during 15-19 September 2017 in South Goa. The event location was in North Western Ghats of India, an area rich in endemic odonate fauna. Forty-two participants hailing from eleven states in India and Sri Lanka and Bhutan participated in the meeting. The event featured two day-long symposium sessions that included keynotes by eminent Indian odonatologists such as Dr R. J. Andrew, Dr K. A. Subramanian and Dr B. K. Tyagi and delegate paper presentations on Odonata behavioral ecology, molecular biology, and ecology. The following three day-long workshop sessions included classroom sessions on a wide range of subjects from Odonata evolution to conservation. During the meeting, four field trips were arranged, to explore wetland habitats in and around Bhagwan Mahaveer Sanctuary. The field exposure provided ample of opportunity to the participants to learn about diversity, distribution, and taxonomy of the Western Ghats odonates. A complete list of subjects discussed is provided in Table 1.

Figure 1. Group photo. Second row, from left to right (on chairs): Dr. R. J. Andrew, Dr. Walia, Dr. K.A. Subramanian. Second row, from right to left (on chairs): V. Balachandran, Dr. Ajita Tyagi, Dr. B. K. Tyagi.

Figure 2 (page 29). Meeting moments. (A) Opening remarks on DragonflyIndia Meeting delivered by Pankaj Koparde. (B) Group photo (from right to left: Parag Ranganekar, Dr K.A. Subramanian, Dr. R. J. Andrew, participants from Hislop college, Gauhati University and Sálim Ali Centre for Ornithology & Natural History, extreme left: Dr. Ashish Tiple). (C) Discussion session on conservation issues in Odonatology; group no. 05 discusses how to create a dragonfly garden (refer Table 2). (D) Landscape of Tambdi-Surla. (E) Campus of Nature's Nest Forest Resort (the meeting venue). (F) Neha Mujumdar talking on Odonata behavior. (G) Prosenjit Dawn talking on Odonata larval taxonomy. (H) Post-dinner discussion over Odonata taxonomy. (I) Group photo; (J-K) Participants exploring odonates in the field.


A


B


C


D


A
E


F


G


H


I


J


K

South Asian Council of Odonatology
Started as a national office of Societas Internationalis Odonatologica (SIO) in 1981 and later renamed as South Asian Council of Odonatology (SACO), SACO is one of the leading organizations in South Asia working on Odonatology. SACO has been arranging the Indian Symposium on Odonatology since 1984 and publishing *Fraseria*, a semi-annual newsletter containing research articles, notes, communication and news on the organization's activities.

The 9th Indian Symposium of Odonatology
A brain-child of South Asian Council of Odonatology, this edition of the Indian Symposium of Odonatology featured oral and poster presentations by Indian odonatologists. The topics covered during the presentations ranged from behavioral ecology, diversity and distribution, habitat ecology, survey methods, and cell biology.

DragonflyIndia
A citizen science-fueled group of Odonata lovers and researchers from India, DragonflyIndia, started as a mailing group in 2005. A part of the bigger DiversityIndia network, over the years, DragonflyIndia has grown in size not only in terms of numbers of members but also the coverage of reach. Current statistics show around 8,000 users following DragonflyIndia Facebook, Twitter, Google, Yahoo, iNaturalist, and India Biodiversity Portal communities. Since its birth, a number of initiatives in terms of research collaborations and outreach have come out from DragonflyIndia. A number of research publications basing on citizen science data collected through DragonflyIndia have been published and a few are in the publication pipeline. The annual meeting of the group that includes workshops and field trips has been facilitating interactions between Odonata enthusiasts and researchers. Many of the meet alumni are conducting regional research and involved in conservation outreach.

The 4th DragonflyIndia Meeting
This year's DragonflyIndia Meeting continued with keeping its signature format of informal learning through interactions with experts and field exposure to study natural history and ecology of dragonflies. This year, the focus of the meeting was on the North Western Ghats of India.

Field trips
During the five-day-long event, the participants visited four localities, recording 34 odonate species, of which six were endemic or restricted to the Western Ghats. The localities sampled were streams and a river in evergreen forest and forest edge. The cloudy and rainy weather limited sampling, but at the same time provided more time for discussion and indoor sessions. A complete list of species sighted is provided in Appendix 1.

Workshop modules
This year, there was a slight modification in the workshop sessions so as to facilitate more interactions. Each workshop session was lead by a teacher, who was assisted by co-teachers. Instead of a classroom teaching format, the co-teaching discussion method was found to be facilitating more interactions. Most of the modules were presented using audio-visual presentations that included short movies and animations. For the Odonata conservation module, participants were split into random groups and each group was given an assignment, listed in Table 2. Each group came up with a unique solution to the conservation problem assigned. This interactive session brought out many ideas on Odonata conservation.

Participants' testimonials
"With this brief communication, I wish to hereby convey my heartfelt gratitude to you both and your team of highly courteous and energetic young dragonfly enthusiasts, for the most memorable hospitality, kindness and, above all, greatly reinvigorating field expeditions. Wishing you all the best for future planning of DragonflyIndia Meets, and looking forward to hearing from you soon." - Dr. B. K. Tyagi, eminent odonatologist, India.

"I had one of the best times in DragonflyIndia Meet and getting to know you all. Thank you, Parag and Pankaj for letting me take part in the meet. I am very eagerly looking forward to the next meet." - Thinley Gyeltshen, independent researcher, Bhutan.

"It was indeed a great pleasure to spend incredible time with all of you guys. The basic needs for living are food, clothing, shelter and nowadays technology; but with these four words, I wish to add one more word that is "DragonflyIndia Meet" (DIM). DIM has become an essential part of our life. I always believe, there is never an end for anything. An end is a new beginning. I wish success to this group." - Sachean Kamble, Assistant Professor, India.

Figure 3. Some of the species sighted during the field trips. (A) Blue hawklet *Hylaeothemis indica* female. (B) Emerald-banded skimmer *Cratilla lineata* female. (C) Stream ruby *Heliocypha bisignata* male. (D) Coorg bambootail *Caconeura ramburi* male. (E) Black marsh dart *Dysphaea ethela* male. (F) Malabar torrent dart *Euphaea fraseri* male.

"It was my pleasure to meet odonatologists not only from India but also from other countries like Sri Lanka and Bhutan. During the meet, I got to meet new people, thoughts, ideas, and odonates (lots of lifers!). Field trips were really awesome. I liked the way everyone was appreciating work done by others and the suggestions given by the great people in this field were really helpful. I got to learn more about Odonata evolution, ecological surveys, and behavioral ecology. This was my first conference and it was a very nice experience for me to meet such a nice and intelligent people. I hope to attend the future meetings." - Apeksha Darshetkar, Masters student, India.

Future meeting

Following this year's success, we will continue to organize these events in upcoming years. In fact, after a brief meeting with DragonflyIndia and South Asian Council of Odonatology admins, we have taken a historical decision to conduct the DragonflyIndia Meet and the Indian Symposium on Odonatology together, calling the event

"**South Asian Dragonfly Meet and Symposium - 2018**". This event will be hosted by Hislop College, Nagpur. The academic session will be held at Hislop College, while the field study will be held at the Pench Tiger Reserve/ Tadoba-Andheri Tiger Reserve. Pench Tiger Reserve is nested in the Satpuda mountain ranges, a unique biogeographic region in Peninsular India and the Tadoba-Andheri Tiger Reserve is a part of the thick forest region of Chandrapur district of Central India, dotted with a large number of water bodies. The official notification of the meeting will be out soon on our twitter handle - @dragonflyindia.

Acknowledgements
We would like to thank Goa State Forest Department, Goa State Biodiversity Board and Staff at Nature's Nest Resort.

Table 1. Topics covered during the event.

Topics	Lead Speakers	Co-teacher 1	Co-teacher 2
From emergence to hatching - some interesting episodes in the life of *Ceriagrion coromandelianum*	Dr. R.J. Andrew	-	-
Biogeography of Indian Odonates	Dr. K.A. Subramanian	-	-
Trends in Indian Odonatology	Dr. B. K. Tyagi	-	-
Odonata Evolution	Pankaj Koparde	Prosenjit Dawn	Neha Mujumdar
Adult Odonata Taxonomy	Parag Rangnekar	Prosenjit Dawn	Shantanu Joshi
Larval Odonata Taxonomy	Prosenjit Dawn	Parag Rangnekar	-
Odonata Taxonomy - Practical	Parag Rangnekar	Prosenjit Dawn	Shantanu Joshi
Odonata Behavioral Biology	Neha Mujumdar	Dipti Thakuria	Prosenjit Dawn
Odonata Sampling and Surveys	Pankaj Koparde	Dipti Thakuria	Prosenjit Dawn
Odonata Photography for Research	Parag Rangnekar	Prosenjit Dawn	-
Citizen Science in Odonata Research	Pankaj Koparde	Prosenjit Dawn	Shantanu Joshi
Odonata Conservation	Pankaj Koparde	Parag Ranganekar	-

Table 2. Conservation assignment and problems given to participants and a brief discussion on each topic.

Group	Assignment/Problem Given
1	Pick up five species of dragonfly and damselfly each. Find out their common English name and any vernacular name available. Coin new name (English and vernacular) based on particular characteristics of the species such as colors, sizes, shape, habitat association, cultural association etc.
2	Create a poster for school kids explaining Odonata, Odonata biology, and significance of Odonata in the ecosystem.
3	Given unlimited funds, how and what research projects will you design that will aid conservation for school kids, undergrads, and grad students?
4	In certain parts of India, tribals eat dragonfly larvae. You have to understand how this practice may affect dragonfly abundance and if a conservation intervention can be planned. If yes, how?
5	How would you create a dragonfly garden?

Appendix 1.

The list of species observed during the event. *Endemic to the Western Ghats. **Distribution limited to the Western Ghats as per current information. TS: Tambdi-Surla. NN: Nature's Nest. IS: *Idionyx gomantakensis* type locality. LDS: Last day stream.

No.	Scientific name	Common name	TS	NN	IS	LDS
	Zygoptera					
1	*Agriocnemis pygmaea*	Pygmy dartlet	X	X	X	
2	*Agriocnemis spelndissima*	Splendid dartlet				
3	*Caconeura ramburi**	Coorg bambootail	X		X	
4	*Ceriagrion cerinorubellum*	Orange-tailed marsh dart				
5	*Ceriagrion coromandelianum*	Coromandel marsh dart		X		
6	*Copera vittata*	Blue bush dfart	X	X	X	X
7	*Disparoneura quadrimaculata*	Black-winged bambootail		X		
8	*Dysphaea ethela*	Black marsh dart			X	
9	*Euphaea fraseri**	Malabar torrent dart			X	
10	*Heliocypha bisignata*	Stream ruby	X		X	X
11	*Ischnura aurora*	Golden dartlet	X			
12	*Ischnura senegalensis*	Senegal golden dart				
13	*Protosticta gravely**	Pied reedtail	X			
14	*Protosticta sanguinostigma**	Red-spot reedtail	X			
15	*Pseudagrion decorum*	Three-striped blue dart				
16	*Pseudagrion indicum**	Yellow-striped blue dart	X			
17	*Pseudagrion microcephalum*	Blue grass dart				
18	*Pseudagrion rubriceps*	Saffron-faced blue dart				
19	*Vestalis apicalis*	Black-tipped forest glory	X	X		
20	*Vestalis gracilis*	Clear-winged forest glory	X	X		
	Anisoptera					
21	*Brachythemis contaminata*	Ditch jewel	X			
22	*Cratilla lineata*	Emerald-banded skimmer				X
23	*Crocothemis servilia*	Scarlet skimmer	X	X		
24	*Diplacodes trivialis*	Ground skimmer	X	X		
25	*Hylaeothemis indica*	Blue hawklet			X	
26	***Microgomphus souteri*	-	X		X	
27	*Merogomphus longistigma*				X	
28	*Neurothemis fulvia*	Fulvous forest skimmer	X			
29	*Orthetrum chrysis*	Brown-backed marsh hawk	X		X	
30	*Orthetrum sabina*	Green marsh hawk	X	X		
31	*Pantala flavescens*	Wandering glider	X	X		
32	*Rhyothemis variegata*	Common picturewing	X			

Sri Lanka's Second Annual Dragonfly Race 2017

Nancy van der Poorten [nmgvdp@aim.com]

On July 30, 2017, over 110 eager nature lovers representing 25 teams gathered at 6:30 am at the Thalawathugoda Biodiversity Study Park in Sri Jayawardenapura near Colombo to take part in the Second Annual Butterfly and Dragonfly Race, sponsored by the Butterfly Conservation Society of Sri Lanka (BCSSL). The first race, held in 2016, attracted 39 participants in nine teams so the 2017 race more than doubled the number of participants. Teams of five competed to see which team could record the most number of butterfly and dragonfly species within the park within the allotted time of 7 - 9 am. The team that recorded the highest number of both species was the winner. The race was followed by a half-hour guided walk to study the butterflies and the dragonflies. The butterfly walk was led by Dr Michael van der Poorten and Himesh Jayasinghe. The dragonfly walk was led by Nancy van der Poorten and Amila Sumanapala.

The winning team was Team YBA (Young Biologists' Association), who were runners-up in 2016. They successfully recorded 16 species of butterflies and 25 species of dragonflies. The panel of judges observed 30 species on the same day. The winning team was presented with a copy of *The Butterfly Fauna of Sri Lanka* (2016) by Michael & Nancy van der Poorten, and each team member received a copy of *A Pocket Guide to the Butterflies of Sri Lanka* by H.D. Jayasinghe, S.S. Rajapakshe & C. de Alwis (2015) and *A Field Guide to the Dragonflies and Damselflies of Sri Lanka* by A.P. Sumanapala (2017). Two teams tied for runner-up: Team UoC (University of Colombo) and Team Psyche. All participants were awarded a certificate.

A new addition to the race day was a Kids Program, called Grow with Nature. It attracted 45 children who were divided into two groups: those aged 5-12 had a "bug hunt" and a session on wetland insects while those aged 12-15 were given a guided nature tour.

It was a beautiful sunny day. The Thalawathugoda Biodiversity Park is a typical lowland wetland habitat. Some of the odonates recorded include *Trithemis aurora*, *Ictinogomphus rapax*, *Rhyothemis*

Figures 1-3. (1) Kids activities. Photo credit Butterfly Conservation Society of Sri Lanka. (2) *Lestes elata*, female. (3) *Lestes elata*, male. *L. elata* photo credit: George van der Poorten.

variegata, *Ceriagrion coromandelianum* and *Lestes elatus*.

For more information about this race and the BCSSL: [www.bcssl.lk/] and [https://www.facebook.com/ButterflyConservationSociety/].

Figures 4-6. (4) Winning team. (5) Butterfly and Dragonfly Race Group photo. (6) Grow with nature group photo. Photo credits: Butterfly Conservation Society of Sri Lanka.

New national records of Odonata from Thailand based mostly on photographs (Odonata: Argiolestidae, Philosinidae, Aeshnidae, Libellulidae)

Udomsak Sribal[1], Yingsak Paweenpermsuk[2], Tosaporn Thitiarchagul[3], Satawan Atdhabhan[4], Chanachol Saengamorn[5], Narong Thepphibalsathit[6], Surapon Chaychum[7], Robert A. Behrstock[8], Pilan Jadoonkittinan[9], Reinthong Ruangrong[10], Jamnongjit Ruangrong[11], Nathathai Thammasangwan[12], Sompong Tesring[13], Surachai Chanhong[14] & Noppadon Makbun[15]*

[1]90 Moo 15, Phra Kaeo, Sangkhla, Surin, 32150, Thailand [Jkong_udom@gmail.com]
[2]66/66 Moo 5, Thepharak Rd., Bang Muang, Muang, Samut Prakan, 10270, Thailand. [ae_iou_s@hotmail.com]
[3]9/154 Pruksa Ville 8/2, Soi Waruwanaram 15, Don Muang, Bangkok, 10210, Thailand. [tosaporn78@yahoo.com]
[4]1 Provincial Electricity Authority, Betong, Yala, 95110, Thailand. [Oolah1205@gmail.com]
[5] 582/35 Soi Ratchadaphisek 3, Din Daeng, Bangkok, 10400, Thailand. [Siroccogold_meri@hotmail.com]
[6]32/65 Butsaba 2 Village, Sukhumvit Rd., Pak Nam, Muang, Samut Prakan, 10270, Thailand. [bemcola@gmail.com]
[7]227 Moo 4, Soi 2C, Phraek Sa, Muang, Samut Prakan, 10280, Thailand. [chaychum@yahoo.com]
[8]10359 S. Thicket Pl., Hereford, Arizona, 85615 USA' [rbehrstock@cox.net]
[9] 14 Moo 2, Rawadee 75, Rawadee Rd., Mueng, Nonthaburi, 11000, Thailand. [pjsign77@gmail.com]
[10]9/9 Moo 10, Lak Sam, Ban Phaeo, Samut Sakhon, 74120, Thailand. [reinthong22@gmail.com]
[11]9/9 Moo 10, Lak Sam, Ban Phaeo, Samut Sakhon, 74120, Thailand. [jammab@hotmail.com]
[12]64 Moo 7, Amphaeng, Ban Phaeo, Samut Sakhon, 74120, Thailand. [nathathai1990@gmail.com]
[13]80 Moo 2, Laksongsongsermvittaya School, Lak Song, Ban Phaeo, Samut Sakhon, 74120, Thailand. [pong@lak2.ac.th]
[14]79 Moo 4, Lak Sam, Ban Phaeo, Samut Sakhon, 74120, Thailand. [kroonueng@lak2.ac.th]
[15]**211/5 Moo 4, Takhi, Nakhon Sawan, 60140, Thailand. [noppadon.makbun@gmail.com]**
*Corresponding author

Abstract
Seven species of Odonata are recorded from Thailand for the first time from records mostly based on credible and authoritative photographs. These are *Podolestes orientalis* Selys, 1862, *Rhinagrion hainanense* Wilson & Reels, 2001, *Heliaeschna simplicia* (Karsch, 1891), *Atratothemis reelsi* Wilson, 2005, *Nannophyopsis clara* (Needham, 1930), *Risiophlebia guentheri* Kosterin, 2015, and *Zyxomma breviventre* (Martin, 1921). Biology and habitat of some species are briefly noted.

Further key words. Dragonfly, Odonata, new records, Thailand, Argiolestidae, Philosinidae, Aeshnidae, Libellulidae

Introduction
The book "Atlas of the dragonflies of Thailand: distribution maps by provinces" by Hämäläinen & Pinratana (1999) provided distribution maps of 315 species, of which 92 are known only from one province. After the Atlas many works were published that added new distributional data (including: Kitagawa & Ichii 1999; Kitagawa & Katatani 2002, 2003, 2005; Hämäläinen 2003; Katatani et al. 2004; Ferro et al. 2009; Katatani et al. 2010) and new species to the Thai list (including: Kosterin et al. 2012; Muraki 2014; Sasamoto 2015, Kosterin 2016, Hämäläinen, 2017; Makbun 2017a, b; Ngiam & Orr, 2017; Pierce 2017). With social network services, especially Facebook groups, and high quality digital photography now available, new provincial and national records in Thailand were further added to fill more gaps (Day et al. 2012). This brings the total number of known species from Thailand (including the species identified to the genus level only) to over 350.

The Facebook group "Dragonflies of Thailand" was created in 2012 as a portal for sharing and exchanging knowledge, identification, and photographs by specialists and dragonfly enthusiasts. This group is administrated by some of the present authors (RR, NTm, JR, ST, SCh & NM). Of 4,757 members covering all parts of Thailand (at October 2017), about 100 members are active contributors. Earlier, one new country record, *Onychargia priydak* Kosterin, 2015 was photographed by our group members and officially reported by Kosterin (2016). Here we report seven other new national records for Thailand based mostly on reliable photographs from our group.

Results
New records for Thailand
All records were divided into suborders Zygoptera and Anisoptera, respectively. Within each suborder, families and species were arranged alphabetically. The collected and observed specimens were indicated unless based on

photograph(s). Each photographer's name was abbreviated to initials. If the abbreviated names are the same, the lowercase of the initial letter of the second syllable of the last name is added behind. The abbreviated name(s) are in parentheses and added at the end of each photographic record.

Zygoptera
Argiolestidae

1) *Podolestes orientalis* Selys, 1862 (Figs. 1-2)

1♂, Thailand, Yala province, Betong, Chulabhorn Development Village 10, 11-vii-2016 (SA), 1♀, Thailand, Narathiwat province, Pru Toh Daeng swamp forest, 23-vi-2017 (Punjapa Phetsri, pers. comm.).

Podolestes is the only genus of Argiolestidae distributed in Sundaland and mainland Southeast Asia (Kalkman & Theischinger 2013). Of eight species currently known (Schorr & Paulson 2017), *P. orientalis* is a widespread species ranging from Borneo and Sumatra to Peninsular Malaysia and Singapore (Orr 2005; Dow 2009; Tang et al. 2010). *P. coomansi* Lieftinck, 1940 was the first member of this genus reported from Thailand (Kosterin & Vikhrev 2009; Day et al. 2012). The photographs from Yala and Narathiwat provinces fit very well with the description and photographs of this species (Lieftinck 1935, 1950; Orr 2005; Tang et al. 2010). This not only extended the species' distribution range but also is the second species of *Podolestes* reported from Thai territory.

Philosinidae

2) *Rhinagrion hainanense* Wilson & Reels, 2001 (Figs 3-4)

1♂ (collected), Thailand, Phetchabun province, Nam Nao National Park, 18-vii-2011, Noppadon Makbun leg., 2♀ (collected), same locality, 7-x-2010, same collector, 1♂, Thailand, Nakhon Ratchasima province, Khao Yai National Park, 11-x-2013 (RR, JR), 1♂, same locality, 30-iii-2014 (RR, JR, NTm), 1♂, same locality, 23-v-2015 (RR, JR, NTm), 2♂, same locality, 4-viii-2017 (JR), 2♂1f, Thailand, Nakhon Nayok province, Khao Yai National Park, 1-xi-2014 (RR, JR, NTm), 1♀, same locality, 23-v-2015 (RR, JR, NTm), 1♀, same locality, 24-x-2015 (RR, JR, NTm, SCh, ST), 1♂, same locality, 29-vii-2017 (TT), 1♂, same locality, 4-viii-2017 (RR), 1♂, Thailand, Nakhon Nayok province, Sarika waterfall, 11-iv-2015 (TT).

Rhinagrion hainanense was described for the first time from Hainan Island, China, by Wilson & Reels (2001). Then Sasamoto (2003) described specimens from Sekong in south-eastern Laos as *R. yokoii*. Subsequently,

Figures 1-4. (1-2) *Podolestes orientalis* Selys, 1862, 11-vii-2016, Betong, Yala province by Satawan Atdhabhan. (1) Male in side view. (2) Male in top view. (3-4) *Rhinagrion hainanense* Wilson & Reels, 2001, 4-viii-2017, Khao Yai National Park. (3) Male in in oblique lateral view by Reinthong Ruangrong. (4) Female in oblique lateral view by Jamnongjit Ruangrong.

Kawashima et al. (2011) synonymized *R. yokoii* with *R. hainanense*. This species is known from China (Hainan and Guizhou), Laos, Cambodia, and Vietnam (Kalkman & Villanueva 2011; Zhang 2011; Yokoi & Souphanthong 2014; Kosterin 2016). This record adds northeastern Thailand to its distribution range. It is possible that '*Rhinagrion* sp.' from Si Sa Ket' listed in the 1999 Atlas (p. 37, 124) refers to this species. It should be noted that this species co-occurs in the same stream with *R. viridatum* Fraser, 1938 at the Nam Nao National Park, Phetchabun province.

Anisoptera
Aeshnidae

3) *Heliaeschna simplicia* (Karsch, 1891) (Figs 5-8)

1♀, Thailand, Samut Sakhon province, Ban Phaeo, Watlaksong Rasbumrung School, 27-ii-2012 (RR), 1♀, same locality, 30-v-2012 (RR), 1♂, same locality, 26-vi-2012 (RR), 1♂ (collected), same locality, 12-viii-2013, Surachai Chanhong leg. (now in coll. Noppadon Makbun), 1♂, same locality, 28-ii-2014 (RR), 1♂, same locality, 27-iii-2014 (RR, NTm), 1♀, same locality, 14-v-2014 (RR), 1♂1♀ (collected), same locality, 29-vii-2014, Nathathai Thammasangwan leg., 1♀, same locality, 24-iii-2015 (NTm), 1♂, Thailand, Narathiwat province, Pru Toh Daeng swamp forest, 2-v-2017 (Punjapa Phetsri, pers. comm.).

Heliaeschna simplicia is known from Philippines (Sulu Region), Borneo, Sumatra, Peninsular Malaysia and Cambodia (Lieftinck 1954; Hämäläinen & Müller 1997; Orr 2001, 2008; Kosterin & Chartier 2014). This is the third record from mainland Asia. The specimens agree well with the description, especially the shape of anal appendages that is unique among the members of this genus. Unfortunately, in 2015 the trees around the pond near Watlaksong Rasbumrung School, Samut Sakhon province were cut down and the area was changed into accommodation. Losing its natural habitat, not a single observation of this species has been reported since.

Figures 5-8. *Heliaeschna simplicia* **(Karsch, 1891). (5) Male by Nathathai Thammasangwan, 27-iii-2014, Ban Phaeo, Samut Sakhon province; (6) Female by Nathathai Thammasangwan, 24-iii-2015, Ban Phaeo, Samut Sakhon province. (7) Male anal appendages in side view. (8) Male anal appendages in top view.**

Libellulidae

4) *Atratothemis reelsi* Wilson, 2005 (Fig. 9)

1♂, Thailand, Phetchaburi province, Kaeng Krachan National Park, 31-v-2014 (PJ), 1♂, same locality, 14-vi-2015 (PJ), 1♂, Thailand, Phetchaburi province, Kaeng Krachan National Park, 4-iii-2016 (RB).

So far, all records were from Kaeng Krachan National Park, Phetchaburi province. This seems to be the only place to see *Atratothemis reelsi* in Thailand. Several individuals were seen flying and perching on dead twigs

sticking out of the water along the single road leading from the park gate to the interior of the park at km.27 and km.9. This species is previously recorded from China (Guangxi, Guizhou, Hainan), Laos and Vietnam (Wilson 2005; Zhang 2011; Yokoi & Souphanthong 2014).

5) *Nannophyopsis clara* (Needham, 1930) (Figs10-11)
3♂, Thailand, Bueng Kan province, Seka, Chet Si waterfall, 5-vi-2017 (US), 5♂, same locality, 6-vi-2017 (YP).
Nannophyopsis clara was first photographed at a small pond along the trail to Chet Si waterfall on June 5, 2017.

This species is characterized by the small size, metallic body with yellow patch at base of wings, and shape of abdomen. Finding this beautiful species in northeastern Thailand represents a notable extension to its range. It was previously known from China (Fujian, Hainan, Jiangsu, and Zhejiang), Hong Kong, Taiwan, Japan? (single sight record), and Vietnam (Wilson 2001; Do 2011).

Figures 9-14. (9) *Atratothemis reelsi* Wilson, 2005 by Robert A. Behrstock, 4-iii-2016, Kaeng Krachan National Park, Petchaburi province. (10-11) *Nannophyopsis clara* (Needham, 1930) at Chet Soi waterfall, Seka, Bueng Kan province. (10) Male, 6-vi-2017 by Yingsak Paweenpermsuk. (11) Male, 5-vi-2017 by Udomsak Sribal. (12-14) *Zyxomma breviventre* (Martin, 1921) in Ban Muang, Sakon Nakhon province by Yingsak Paweenpermsuk. (12) Female, 8-viii-2017. (13) Male with pruinescence on synthorax, 9-v-2017. (14) Male without pruinescence on synthorax, 11-viii-2017.

6) *Risiophlebia guentheri* Kosterin, 2015 (Figs 15-18)
1♂ (observed),Thailand, Chantaburi province, Khao Kitchakut, swamp forest, 21-x-2016 (NM), 1f, 1♂1♀(copula), same locality, 15-vi-2017 (US), 1♀, same locality, 2-3-vii-2017 (US, CS, NTp, SCc), 1♂ (collected), same locality, 2-viii-2017, Noppadon Makbun leg.

This recently described species was hitherto known only from the type locality in East Cambodia (Kosterin 2015). A male specimen from Thailand agreed well with the description, especially shape of posterior hamulus, relative length of cercus, length of hindwing and abdomen (including anal appendages) (22 and 23.5 mm, respectively), and number of antenodal crossveins in forewing and hindwing (10 and 9, respectively). It was found perching on a dry twig above a small and very shallow stream in partly dark swamp forest.

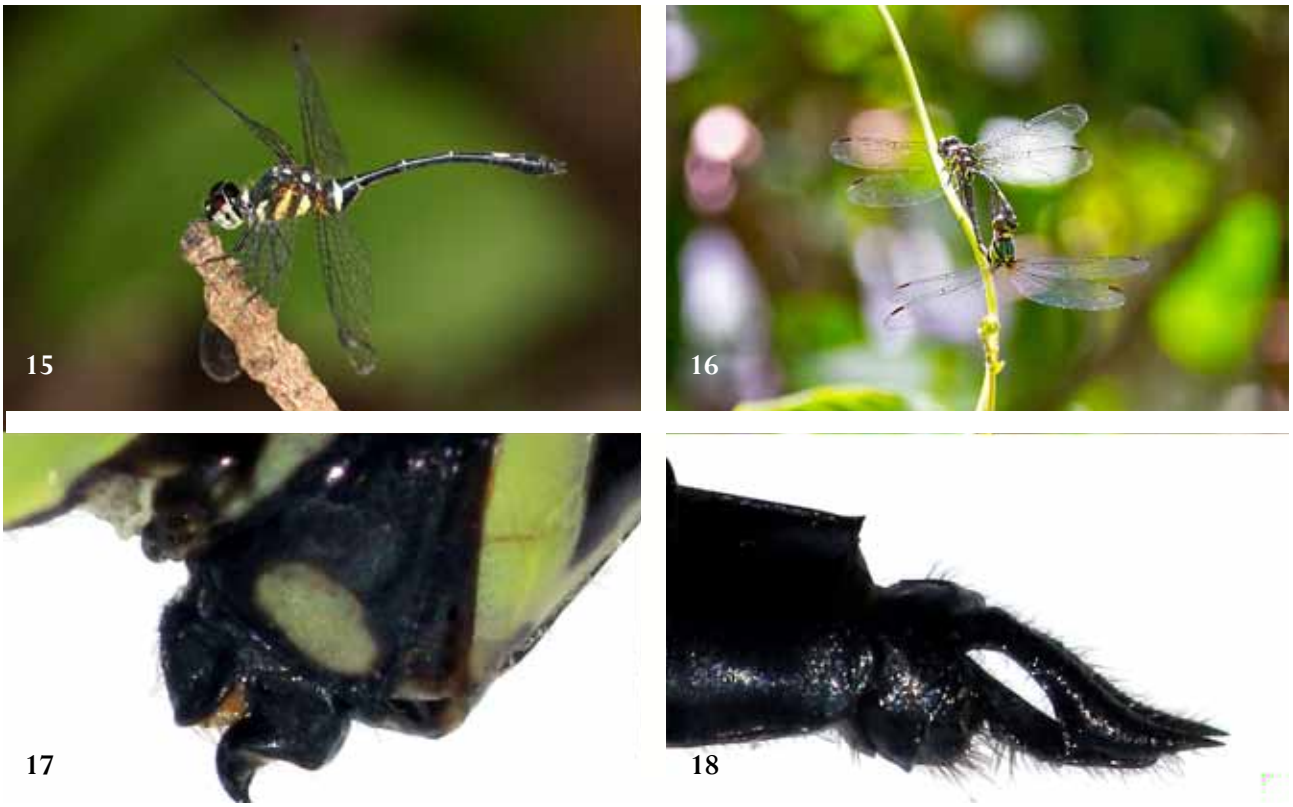


Figure 15-18. *Risiophlebia guentheri* Kosterin, 2015 from Khao Kitchakut, Chantaburi province. (15) Female by Narong Thepphibalsathit, 2-3-vii-2017. (16) Copula in nature by Udomsak Sribal, 15-vi-2017. (17) Accessory genitalia in side view. (18) Male anal appendages in side view.

7) *Zyxomma breviventre* (Martin, 1921) (Figs 12-14)
4♂, Thailand, Udon Thani province, Ban Dung, Kham Chanot forest, 21-4-2014 (YP), 2♂, Thailand, Sakon Nakhon province, Ban Muang, 5-v-2016 (YP), 2♂, same locality, 10-viii-2016 (YP), 2♂2♀, same locality, 9-v-2017 (YP), 2♀, same locality, 10-v-2017 (YP), 1♂, same locality, 14-v-2017 (YP), 1♂, same locality, 8-viii-2017 (YP), 1♂2♀, same locality, 11-viii-2017 (YP), 1♂, same locality, 12-viii-2017 (YP).

Zyxomma breviventre was originally named as *Zyxommoides breviventre* by Martin (1921). Later Asahina (1967) synonymized *Zyxommoides* with *Zyxomma*. Yokoi & Souphanthong (2014) subsequently recorded this species based on three male specimens from Phonsavan south, Xieng Khouang province, Laos. Recently, Seehausen et al. (2016) found several male and female specimens in Angkor Thom and near Sre Noi in Siem Reap, Cambodia. Both sexes were illustrated and the female was described for the first time. The photographs from Northeast Thailand were confirmed by Malte Seehausen and agree well with the description, especially the abdomen stouter than that of *Z. petiolatum* and pruinescence on synthorax in some males (Asahina 1967; Seehausen et al. 2016). This species is now known from Laos, Cambodia and Thailand.

Discussion

The seven new records for Thailand, derived mostly from photos from the Facebook group "Dragonflies of Thailand", comprise: *Podolestes orientalis*, *Rhinagrion hainanense*, *Heliaeschna simplicia*, *Atratothemis reelsi*, *Nannophyopsis clara*, *Risiophlebia guentheri*, and *Zyxomma breviventre*. Of these, three genera (*Atratothemis, Nannophyopsis,* and *Risiophlebia*)

had never been reported before. There is no sign of change or urbanization in the habitat of any species record presented in this paper except *Heliaeschna simplicia*. Its natural habitat, a pond near a school, has now been changed into accommodation. Fortunately, there was recently another record from southern Thailand. This highlights the role of citizen science in helping to fulfill the gap of Odonata data at provincial and national levels.

However, there have been some photos from members of our group that potentially depict new records for Thailand but they are not reliable enough and some of them do not show the key characters for identification in a specific level. Further surveys and specimen collections in the area where those photos were taken, and explorations in new and unstudied areas are needed to confirm their identity and expand the data of Odonata in Thailand.

Acknowledgements
We sincerely thank Malte Seehausen for confirming the identification of *Zyxomma breviventre* and providing some literature, Punjapa Phetsri for photographic records, Sompong Tesring for correcting English texts and Matti Hämäläinen for reviewing and providing valuable comments on this manuscript.

References

Asahina, S., 1967. The Odonata of Cambodia chiefly taken by the Osaka City University Expedition in 1964-1965. *Nature and Life in South-East Asia* 5: 209-215.

Day, L., D. Farrell, A. Günter, M. Hämäläinen, E. Klimsa, A. Korshunov, O. Kosterin, N. Makbun, A. Pelegrin, U. Röder, R. Ruangrong & N. Vikhrev, 2012. New provincial records of Odonata from Thailand mostly based on photographs. *Agrion* 16(1): 16-24.

Do, M.C., 2011. *Nannophyopsis clara*. The IUCN Red List of Threatened Species 2011: e.T190780A8829728. Available from: [http://dx.doi.org/10.2305/IUCN.UK.2011-2.RLTS.T190780A8829728.en] (accessed 27 July 2017).

Dow, R.A., 2009. *Podolestes orientalis*. The IUCN Red List of Threatened Species 2009: e.T163762A5647950. Available from: [http://dx.doi.org/10.2305/IUCN.UK.2009-2.RLTS.T163762A5647950.en] (accessed 25 July 2017).

Ferro, M.L., Sites, R.W. & Vitheepradit, A., 2009. Contributions to the faunistics of Odonata in Thailand. *Insecta Mundi* 104: 1-24.

Hämäläinen, M., 2017. The Caloptera damselflies of Thailand - Distribution maps by provinces (Odonata: Calopterygoidea). *Faunistic studies in South-East Asian and Pacific Island Odonata* 19: 1-28.

Hämäläinen, M. & Müller, R.A., 1997. Synopsis of the Philippine Odonata, with lists of species recorded from forty islands. *Odonatologica* 26(3): 249-315.

Hämäläinen, M., & Pinratana, A., 1999. *Atlas of the Dragonflies of Thailand. Distribution maps by provinces.* Brothers of St. Gabriel in Thailand, Bangkok. vi + 176 pp., incl. 28 col.

Kalkman, V.J. & Theischinger, G., 2013. Generic revision of Argiolestidae (Odonata), with four new genera. *International Journal of Odonatology* 16(1): 1-52.

Kalkman, V.J. & Villanueva, R.J.T., 2011. A synopsis of the genus *Rhinagrion* with description of two new species from the Philippines (Odonata: Megapodagrionidae). *International Journal of Odonatology* 14(1): 11-31.

Katatani, N., Kitagawa, K., Muraki, A. & Matuzawa, T., 2003. Notes on Thai Odonata, Part 3. The Odonata from Chaing Rai. *Aeschna* 41: 59-70.

Katatani, N., Kitagawa, K., Muraki, A., Katoh, T. & Masaki, N., 2010. Notes on Thai Odonata, Part 5. The Odonata from Nan and Phrae. *Aeschna* 46: 45-58.

Kawashima, I., Sasamoto, A., Phan, Q.T. & Do, M.C., 2011. First discovery and description of female and larva of *Rhinagrion hainanense* Wilson and Reels, 2001 (= *R. yokoii* Sasamoto, 2003) (Zygoptera: Megapodagrionidae) from Vietnam. *Tombo - Acta Odonatologica Japonica* 53: 93-99.

Kitagawa, N. & Ichii, H., 1999. Records of the Odonata from Southern Thailand. Aeschna 36: 59-68.

Kitagawa, N. & Katatani, N., 2002. Notes on Thai Odonata, Part 1. The Odonata from Chantaburi in March 1998. *Aeschna* 39: 33-42.

Kitagawa, N. & Katatani, N., 2003. Notes on the Odonata of Thailand, Part 2. The Odonata from Trang Prefectue in March 1998. *Aeschna* 40: 13-23.

Kitagawa, N. & Katatani, N., 2005. Notes on Thai Odonata, Part 4. The Odonata from Kanchanaburi. *Aeschna* 42: 23-30.

Kosterin, O.E., 2015. *Risiophlebia guentheri* sp. nov. (Odonata, Libellulidae) from southeastern Indochina. *Zootaxa* 3964(1): 138-145.

Kosterin, O.E., 2016. A survey of Odonata of Mondulkiri, the elevated eastern province of Cambodia, for ten days in June 2014. *International Dragonfly Fund Report* 98: 1-86.

Kosterin, O.E. & Chartier, G., 2014. Two more Odonata species recorded for Cambodia. *Cambodian Journal of Natural History* 2014(1): 8-11.

Kosterin, O.E., Makbun, N. & Dawwrueng, P., 2012. *Burmagomphus asahinai* sp. nov., a new species from Cambodia and Thailand, with a description of the male of *B. gratiosus* Chao, 1954. *International Journal of Odonatology* 15(4): 275-292.

Kosterin, O. & Vikhrev, N., 2009. Some new provincial records of Odonata made in Thailand in 2007-2009 and a new record for Vietnam. *Agrion* 13(2): 75-79.

Lieftinck, M.A., 1935. New and little known Odonata of the Oriental and Australian regions. *Treubia* 15(2): 175-207.

Lieftinck, M.A., 1950. Two new species of *Podolestes* Selys from Borneo, with a key for the identification of the known species. *Zoologische Mededelingen* 31(4): 39-47.

Lieftinck, M.A., 1954. Handlist of Malaysian Odonata: A catalogue of the dragonflies of the Malay Peninsula, Sumatra, Java and Borneo, including the adjacent small islands. *Treubia (Supplement)* 22: 1-202.

Makbun, N., 2017a. A new species of the genus *Burmagomphus* Williamson (Odonata: Gomphidae) from Northern Thailand. *Zootaxa* 4269(1): 133-136.

Makbun, N., 2017b. *Anisogomphus yingsaki* (Odonata: Gomphidae) sp. nov., a new gomphid species from Thailand. *Zootaxa* 4306(3): 437-443.

Martin, R., 1921. Descriptions d'espèces nouvelles d'odonates. *Annales de la Société entomologique de France* 90: 94-96.

Muraki, A., 2014., Taxonomic notes on the genus *Macromia* in Thailand (1). *Aeschna* 50: 101-123 (in Japanese with English summary).

Ngiam, R.W.J. & Orr, A.G., 2017. *Oligoaeschna sirindhornae* sp. nov., a new dragonfly species from Thailand (Odonata: Anisoptera: Aeshnidae). *Zootaxa* 4353(1): 195-200.

Orr, A.G., 2001. An annotated checklist of the Odonata of Brunei with ecological notes and descriptions of hitherto unknown males and larvae. *International Journal of Odonatology* 4(2): 167-220.

Orr, A.G., 2005. *Dragonflies of Peninsular Malaysia and Singapore*. Natural History Publications (Borneo), Kota Kinabalu, Sabah. 127 pp.

Orr, A., 2008. Eight days in Peninsular Malaysia - and the benefits of hindsight. *Agrion* 12(1): 24-27.

Pierce, A.J., 2017. The first record of *Anax ephippiger* for Thailand and Southeast Asia (Odonata: Aeshnidae). *Notulae odonatologicae* 8(9): 365-368.

Schorr, M. & Paulson, D., 2017. World Odonata List. Available from: [http://www.pugetsound.edu/academics/academic-resources/slater-museum/biodiversity-resources/dragonflies/world-odonata-list2/] (accessed 25 July 2017).

Sasamoto, A., 2003. Description of a new *Rhinagrion* species from Laos (Megapodagrionidae: Zygoptera). *Tombo - Acta Odonatologica Japonica* 46: 17-19.

Sasamoto, A., 2015. *Anisogomphus yanagisawai* sp. nov., a new gomphid dragonfly from northern Thailand (Odonata: Anisoptera: Gomphidae). *Zootaxa* 3904(3): 421-426.

Seehausen, M., Constant, J. & Smets, K., 2016. On a collection of Odonata from Cambodia, with the first record of *Sinictinogomphus clavatus* and a description of the female of *Zyxomma breviventre*. *Notulae odonatologicae* 8(7): 222-230.

Tang, H.B., Wang, L.K. & Hämäläinen, M., 2010. *A photographic guide of the dragonflies of Singapore*. Raffles Museum of Biodiversity Research, Singapore. 223 pp.

Wilson, K.D.P., 2005. Odonata of Guangxi Zhuang Autonomous Region, China, part II: Anisoptera. *International Journal of Odonatology* 8(1): 107-168.

Wilson, K.D.P. & Reels, G., 2001. Odonata of Hainan, China. *Odonatologica* 30(2): 145-208.

Yokoi, N. & Souphanthong, V., 2014. *A List of Lao Dragonflies*. 110 pp., Privately published by N. Yokoi, Koriyama, Japan. 110 pp.

Zhang, H., 2011. Karst forest Odonata from Southern Guizhou, China. *International Dragonfly Fund Report* 37: 1-35.

Islands are calling: short Expedition to the Andaman Islands reveals five new spatial records and research gaps

Pankaj Koparde[1]*, Prosenjit Dawn[2], Amila Sumanapala[3]
[1]Indian Institute of Science, Education and Research, Tirupati, Andhra Pradesh, India
[2]Department of Zoology, Shyampur Siddheswari Mahavidyalaya, Ajodhya, Howrah, West Bengal, India
[3]Butterfly Conservation Society of Sri Lanka, 762/A, Yatihena, Malwana, Sri Lanka
***Correspondence to: [pankajkoparde@gmail.com]**

The eastern biodiversity rich islands of India, the Andaman and Nicobar chain of islands, host numerous endemic odonates (Lahiri 1975, Chhotani et al. 1983, Hämäläinen et al. 1999, Ram et al. 2000, Mitra 2002, Nandy & Babu 2009, Sivaperuman 2015, Rajeshkumar et al. 2017). The fauna of these isolated islands is thought to be a subset of Malayan and Burmese fauna (Ripley & Beehler 1989, Das 1998, Mitra 2003, Satapoomin 2011), probably because of a historic land connection with the mainland Myanmar during the last glacial maxima (around 22,000 years ago). Just like any other endemics, the endemic odonates of the Andaman Islands each have a unique life history and story. These specialist species might be getting affected by the intense and rapid anthropogenic land-use changes that the islands have been experiencing over the past 200 years. Motivated to document and understand the endemic Odonata fauna of the Andaman Islands, we spent a week traveling and documenting the Andaman odonate fauna. During this short trip, we recorded five species not previously reported from the Andaman Islands. This trip report is a compilation of our observations. Here we put forth some scientific questions that may appeal to odonatologists across the world.

During our seven day visit (14-21 August 2017), we opportunistically sampled 23 localities in North and one locality in Middle and South Andaman Islands each (Figure 1). We spent 60 effective man hours sampling for

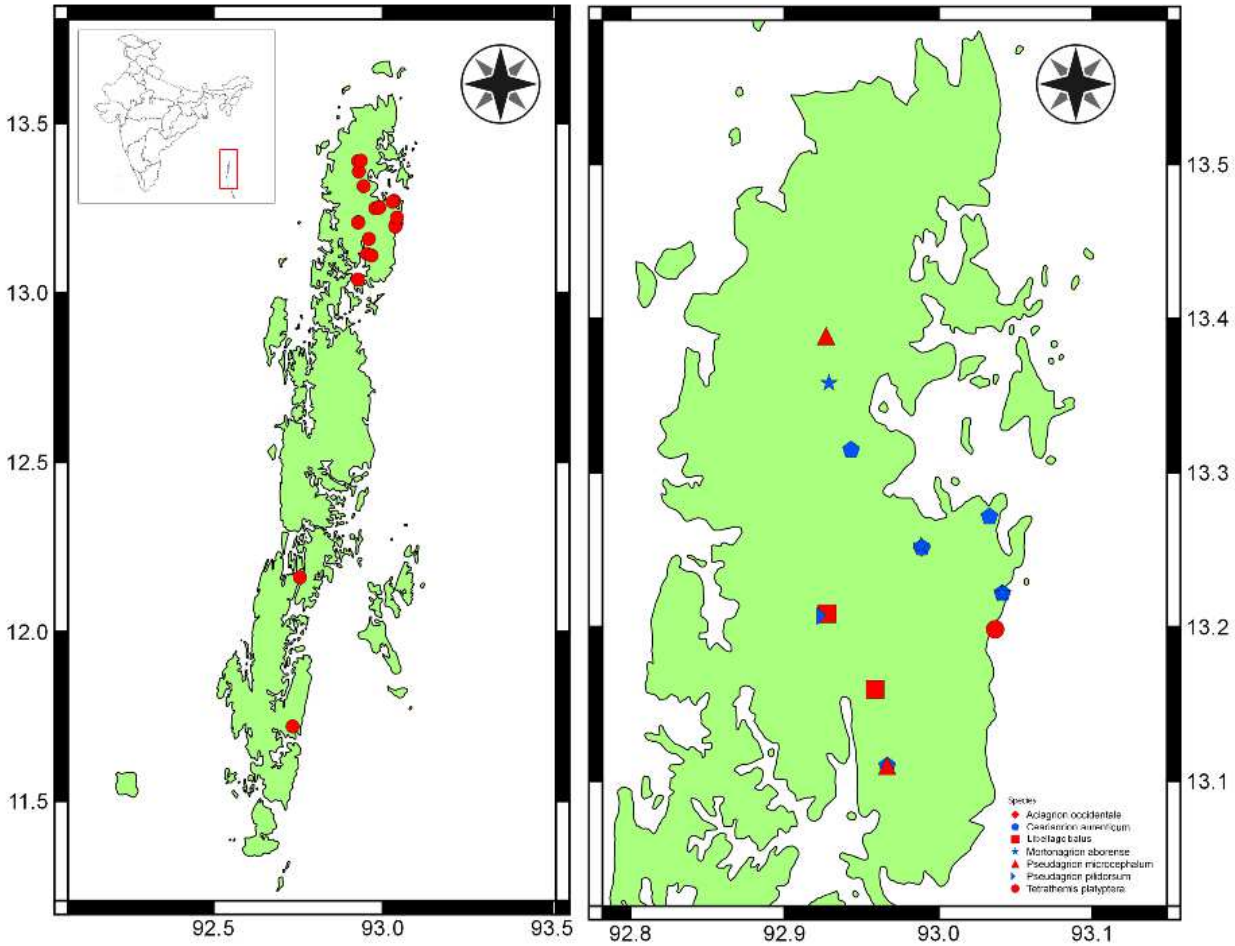


Figure 1. Map of Andaman Islands showing localities sampled (left) and new spatial records along with few other records (right). Red diamond: *Aciagrion occidentale*; blue pentagon: *Ceriagrion auranticum*; red square: *Libellago balus*; blue star: *Mortonagrion aborense*; red triangle: *Pseudagrion microcephalum*; blue triangle: *Pseudagrion pilidorsum*; red circle: *Tetrathemis platyptera*.

Figure 2. A-E represent new spatial records for Andaman Islands. (A) ***Tetrathemis platyptera*****, (B)** ***Libellago balus*** **subadult male. (C)** ***Aciagrion occidentale*****. (D)** ***Mortonagrion aborense*****. (E)** ***Ceriagrion auranticum*****. (F)** ***Libellago andamanensis*****. (G)** ***Pseudagrion pilidorsum*****. (H)** ***Pseudagrion microcephalum*****. Photo credits: A, C,D, F and H by PK; B and E by PD; G by APS.**

Figure 3. Representative photos of some of the habitats sampled. (A) Habitat of *L. andamanensis*. A typical Bengali house in Andaman Islands has a pond in backyard. (B) Habitat of *L. balus* - fast flowing stream in evergreen forest. (C) Typical habitat of *M. aborense* - pond in the vicinity of Bengali house. (D) Habitat of *P. pilidorsum* - moderately flowing stream in secondary forest.

odonates during the expedition. We sampled various habitat types such as freshwater water bodies in evergreen forest, forest edges and human-dominated landscape, estuarine areas, sea shore, riverine areas, and human-made ponds. The uncertain weather of the islands, which was most of the time cloudy and rainy, affected our sampling. By the end of the trip, we had documented 35 odonates (damselflies = 13, dragonflies = 22), of which we could not identify three species (Table 1). Our intense sampling resulted in documenting 27 of 52 species (>50%) recorded from the Andaman Islands (Ram et al. 2000, Sivaperuman 2015) and adding five species, namely *Tetrathemis platyptera* (Figure 2A), IUCN red-listed 'Endangered' *Libellago balus* (Figure 2B), *Aciagrion occidentale* (Figure 2C), *Mortonagrion aborense* (Figure 2D), and *Ceriagrion auranticum* (Figure 2E) as new spatial records for the Andaman Islands (Figure 1). In Anisoptera, we encountered *Diplacodes trivialis* and *Orthetrum sabina* most frequently, followed by *Lathrecista asiatica*. In Zygoptera, we encountered *Copera marginipes* most frequently, followed by *Agriocnemis femina*, *Libellago andamanensis* and *Vestalis gracilis*.

Our record of *L. balus,* which was thought to be endemic to the Nicobar Islands (Dow 2009a), from North Andaman Island, points towards limited sampling of the Andaman Odonata fauna. We sighted IUCN red-listed 'Vulnerable' *L. andamanensis* (Dow 2009b, Figure 2F), which is endemic to the Andaman and Nicobar Islands. In our limited sampling, we found *L. andamanensis* in and around the human-dominated landscape, occupying water bodies with moderate to low water flow (Figure 3A). On the other hand, *L. balus* was seen in association with fast-flowing streams and waterfalls (Figure 3B). With the presence of four *Libellago* species recorded from the Andaman and Nicobar Islands, we think *Libellago* makes an interesting group to study niche and resource partitioning and responses of range-restricted species to anthropogenic land-use change.

Of the five new spatial records, we found *M. aborense* frequently occupying human-dominated landscapes. We found that the unique feature of houses of Bengali communities settled in the Andaman Islands provided suitable habitat for many odonate species. These houses typically have a small-sized pond or stream in their backyard (Figures 3A, 3C). Most of these houses were situated at forest edges, probably providing additional

habitats for the ecotone species. There was a general ignorance about the odonates among the local community members. The five new spatial records reported during this study are generalist species which would have been previously overlooked due to insufficient sampling. Our finding of five new spatial records is not by chance but because we sampled a diversity of land-use types including urban and rural wetlands. We recommend sampling a diversity of land-use types across seasons to understand odonate diversity and distribution and an extensive habitat ecology study to understand if responses of island species differ from their counterparts from the mainland. We sampled parts of Kalpong River, the only river that originates in north Andaman, to check if human-dominated land-use changes species composition. Although in this pilot study and limited sampling, we could not gather much information, we expect that the patches of the river nested in the evergreen forest may be hosting specialists and endemics and there is species turnover as the land-use changes.

From an evolutionary biology point of view, we propose studying the Andaman and Nicobar group of Islands to understand colonization, extinction and speciation of the Islands' odonate fauna. Long-term studies focusing on ecology and conservation of odonates of the Andaman and Nicobar Islands are urgently required. The islands are under high pressure of degradation; this is the time for conservation intervention and minimizing future forest loss. We look forward to continuing our expeditions to the islands, establishing a solid base for future research. We invite other odonatologists to join in our future endeavors.

References

Chhotani, G., Lahiri, A.R., Mitra, T.R., 1983. Contribution to the odonate (Insecta) fauna of the Andaman and Nicobar Islands with description of two new species. *Records of the Zoological Survey of India* 80: 467-494.

Das, A., 1998. Biodiversity in island environment with special reference to Andaman and Nicobar Islands. *In:* Aditya, A.K., Haldar, P. (eds.) *Proceedings of the National Seminar on Environmental Biology* (pp. 191-196). Daya Publishing House, New Delhi, India.

Dow, R.A., 2009a. *Libellago balus*. The IUCN Red List of Threatened Species 2009: e.T163660A5631715. [http://dx.doi.org/10.2305/IUCN.UK.2009-2.RLTS.T163660A5631715.en]. Downloaded on 24 October 2017.

Dow, R.A., 2009b. *Libellago andamanensis*. The IUCN Red List of Threatened Species 2009: e.T163640A5628409. [http://dx.doi.org/10.2305/IUCN.UK.2009-2.RLTS.T163640A5628409.en]. Downloaded on 05 November 2017.

Hämäläinen, M., Prashanth-Mohanraj, Veenakumari, K., 1999. Additions to the odonate fauna of the Andaman and Nicobar Islands, Indian Ocean. *Notulae Odonatologica* 5(3): 25-40.

Lahiri, A.R., 1975. Report on the faunistic survey (Odonata) of the South Andaman Islands. *Records of the Zoological Survey of India* 68: 365-366.

Mitra, T.R., 2002. Note on zoogeography of Odonata (Insecta) of Nicobar Islands, Indian Ocean. *Records of the Zoological Survey of India* 100(3-4): 183-188.

Mitra, T.R., 2003. Ecology and biogeography of Odonata with special reference to Indian fauna. *Records of the Zoological Survey of India occasional paper no. 202*: 1-41.

Nandy, S., & Babu, R., 2009. On a collection of dragonflies (Odonata: Anisoptera) from Andaman and Nicobar Islands. *Records of the Zoological Survey of India* 109(4): 35-51.

Rajeshkumar, S., Raghunathan, C. & Chandra, K., 2017. *Nososticta nicobarica* sp. nov. (Odonata: Platycnemididae: Disparoneurinae) from Great Nicobar Island, India. *Zootaxa* 4311 (3): 426-434.

Ram, R., Chandra, K., Yadav, K., 2000. Studies of the Odonata fauna of Andaman and Nicobar Islands. *Records of the Zoological Survey of India* 98(3): 25-60.

Ripley, S.D., & Beehler, B.M., 1989. Ornithogeographic affinities of the Andaman and Nicobar Islands. *Journal of Biogeography* 323-332.

Satapoomin, U., 2011. The fishes of southwestern Thailand, the Andaman Sea-a review of research and a provisional checklist of species. *Phuket Marine Biological Center Research Bulletin*, *70*, 29-77.

Sivaperuman, C., 2015. Odonata of Andaman and Nicobar Islands, India. *In:* Rawat, M., Dookia, S., Sivaperuman, C. (eds.). *Aquatic Ecosystem: Biodiversity, Ecology and Conservation* (pp. 153-162). Springer India.

Table 1. Odonates recorded during short field expedition in Andaman Islands.

No	Species Name	Common name	NA	SA	Form
	Anisoptera				
	Aeshnidae				
1	*Anax* sp. 1				
2	*Anax* sp. 2				
	Libellulidae				
3	*Brachydiplax chalybea* Brauer, 1868	Blue dasher	X		A
4	*Brachythemis contaminata* (Fabricius, 1793)	Ditch jewel	X	X	A
5	*Crocothemis servilia* (Drury, 1770)	Ruddy marsh skimmer	X		A
6	*Diplacodes trivialis* (Rambur, 1842)	Blue ground skimmer	X		A
7	*Lathrecista asiatica* (Fabricius, 1798)	Asiatic blood tail	X		A
8	*Neurothemis ramburii* (Brauer, 1866)	Ramburi red parasol	X		A
9	*Orthetrum chrysis* (Selys, 1891)	Brown-backed red marsh hawk	X	X	A
10	*Orthetrum* cf *pruinosum* (Burmeister, 1839)	Crimson-tailed marsh hawk	X		A
11	*Orthetrum sabina* (Drury, 1770)	Green marsh hawk	X	X	A
12	*Orthetrum* sp.	-	X		A
13	*Pantala flavescens* (Fabricius, 1798)	Wandering glider	X	X	A
14	*Potamarcha congener* (Rambur, 1842)	Yellow-tailed ashy skimmer	X		A
15	*Rhyothemis variegata* (Linnaeus, 1763)	Common picture wing	X		A
16	*Tetrathemis platyptera* Selys, 1878[N]	Pigmy skimmer	X		A
17	*Tholymis tillarga* (Fabricius, 1798)	Coral-tailed cloud wing	X		A
18	*Tramea limbata* (Desjardins, 1832)	Black marsh trotter	X		A
19	*Tramea transmarina* Brauer, 1867	-	X		A
20	*Trithemis aurora* (Burmeister, 1839)	Crimson marsh glider	X		A
21	*Trithemis festiva* (Rambur, 1842)	Black stream glider	X		A
22	*Zyxomma petiolatum* Rambur, 1842	Brown dusk hawk	X		A
	Zygoptera				
	Calopterygidae				
23	*Vestalis gracilis* (Rambur, 1842)	Clear-winged forest glory	X		A
	Chlorocyphidae				
24	*Libellago andamanensis* (Fraser, 1924)[VU*]	Andaman gem	X		A
25	*Libellago balus* Hämäläinen, 2002 [N, EN*]	Clearwing gem	X		A
	Coenagrionidae				
26	*Aciagrion occidentale* Laidlaw, 1919[N]	Green-striped slender dartlet	X		A
27	*Agriocnemis femina* (Brauer, 1868)	Variable wisp	X		A
28	*Ceriagrion auranticum* Fraser, 1922[N]	Orange-tailed sprite	X		A
29	*Ceriagrion cerinorubellum* (Brauer, 1865)	Orange-tailed marsh dart	X		A
30	*Ischnura senegalensis* (Rambur, 1842)	Senegal golden dartlet	X		A
31	*Mortonagrion aborense* (Laidlaw, 1914)[N]	-	X		A
32	*Pseudagrion microcephalum* (Rambur, 1842)	Blue grass dartlet	X		A
33	*Pseudagrion pilidorsum* (Brauer, 1868)	-	X		A
	Platycnemididae				
34	*Copera marginipes* (Rambur, 1842)	Yellow bush dart	X		A
35	*Prodasineura verticalis* (Selys, 1860)	Black bambootail	X		A

[N]New record for Andaman Islands; [VU]IUCN Red-listed Vulnerable species; [EN]IUCN Red-listed Endangered species; *endemic to Andaman and Nicobar Islands. E: exuvia; A: adult.

Odonata survey at Juru Seberang, Belitung Island, Indonesia

Akbar Alfarisyi [akbaralmulk@gmail.com]
Zoology Division, Belitung Biodiversity Observer Foundation, Belitung, Indonesia

Introduction

Here we present the results of the first phase of dragonfly research focusing on coastal and ex-mining site areas of Belitung Island, Indonesia, particularly the most significant area, Juru Seberang village area. Until recently, dragonfly knowledge in Belitung was limited due to low research intensity. One of the most interesting areas is certainly the ex-mining site at Juru Seberang village area which is now changed into Kerangas Forest. This type of habitat covers the largest part of the village, almost reaching the coastal line. The goal of this research is to better understand the distribution of species and the dragonfly communities present in these relict and threatened habitats.

Belitung, or Billiton, is an Indonesian island, located in the northern part of the Java Sea, between Sumatra and Borneo. Much of the terrain of the island is relatively flat and contains extensive Kerangas forest. The largest town is Tanjung Pandan on the north-west coast. Administratively Belitung is divided into two regencies, Belitung Regency and East Belitung Regency. Belitung is separated from Sumatra by the island of Bangka; together with some much smaller islands these two form the province of Bangka-Belitung. There is a long history of tin mining on the island, which has had a significant impact on the habitats for Odonata there.

One of the old tin mining sites on this island is in the Juru Seberang village area. This village is located on the south side of Tanjung Pandan town by a big river called Sungai Cerucok. The mining activities started in early 1970. Many freshwater sources were contaminated by the mining. This contamination has led to water chestnut (*Eleocharis dulcis*) thriving on many lakes in this village region. The village is also bordered by mangrove forest from the east coast to the northwest. There are no previous records of odonates from this village. Until recently our knowledge of the Odonata of Belitung was based almost entirely on collections made by F.J. Kuiper in the 1930s. M. A. Lieftinck identified most of Kuiper's specimens, the majority of which are now in the collections of the Naturalis Biodiversity Center (RMNH) in the Netherlands. There are several species of Odonata, described by Lieftinck, that appear to be endemic to Belitung: *Amphicnemis billitonis* Lieftinck, 1940, *Amphicnemis kuiperi* Lieftinck, 1937 and *Mortonagrion appendiculatum* Lieftinck, 1937. However, details of locations etc., were published for only a minority of the species collected by Kuiper. Most species were merely recorded in Lieftinck (1954) and in Dow et. al. (2017).

Figure 1. Map of Belitung Island, Indonesia.

Figure 2. Enlargement map of Juru Seberang village, showing the survey location of the four habitat types.

Study Sites

Odonata were searched for at sites covering a wide variety of habitat types; most of the sites are indicated in Fig. 2. The sites visited are indicated by coloured lines; the starting point indicated by "1" and the ending point indicated by "2". Coordinates at a representative point or access point are also given.

1. Mangrove

This habitat is marked on the maps by green coloured line. The line distance for survey is approximately 5,800 m. The starting point coordinate is Lat: 2.778005° S, Long: 107.634206° E and ending point coordinate is Lat: 2.758563° S, Long: 107.621453° E.

2. Marsh

This habitat is marked on the maps by red coloured line. The line distance for survey is approximately 2,000 m. The starting point coordinate is Lat: 2.768966° S, Long: 107.627240° E and ending point coordinate is Lat: 2.754671° S, Long: 107.635859° E.

3. River

This habitat is marked on the maps by yellow coloured line. The line distance for survey is approximately 1,600 m. The starting point coordinate is Lat: 2.772369° S, Long: 107.621370° E and ending point coordinate is Lat: 2.765569° S, Long: 107.612095° E.

4. Lake

This habitat is marked on the maps by blue coloured line. The line distance for survey is approximately 2,400 m. The starting point coordinate is Lat: 2.780886° S, Long: 107.629504° E and ending point coordinate is Lat: 2.773636° S, Long: 107.613675° E.

The Juru Seberang village is located on the south side of Tanjung Pandan town, and actually separated from it by the Cerucok River. In this village area many lakes were created by mining of tin in early 1980 by the locals and the tin company. Most of the lakes are abandoned and now the water chestnut thrives on almost all the lakes. The village area also has a mangrove forest border near the river and the coastal side from the north to the west. The village has more diverse habitat than other villages nearby such as Pilang and Tanjung Pandan itself. As well as mangrove and lakes, this village area also has a savanna, swamp and ponds inside the kerangas forest habitat surrounding the lakes. The biological and geological diversity of this area is imposing, with numerous

Figure 3-10. (3) Pond habitat upstream of the river at the village. (4) Marsh habitat. *Mortonagrion falcatum* moderately rare at this village and only seen at this location. (5) Lake habitat. *Ictinogomphus decoratus* commonly found here. (6) *Aethriamantha brevippenis* (Brauer, 1878), female. (7) *Pseudagrion coomansi* Lieftinck, 1937. (8) *Mortonagrion arthuri* Fraser, 1942. (9) *Ictinogomphus decoratus melaneops* (Selys, 1854). (10) *Pornothemis starrei* Krüger, 1902, female.

plant and animal species as well as geological substrates and soil types. We can find the Chinese crown orchid (*Eulophia graminea*), the smallest sundew (*Drosera burmanii*) in marsh habitats, *Melaleuca* cf *kajuputih* in almost all the kerangas forest habitats, and the milky stork (*Mycteria cinerea*), an IUCN red-listed 'Endangered' coastal wetland bird species, was found in this village region.

The survey goals were to maintain the Odonata species in mangroves, ponds, marshes, river and peat bog fragments. These habitats are known to support populations of several species having their main Belitung Island distribution for the and coastal parts (e.g. *Pornothemis starrei*, and *Mortonagrion arthuri*). Several field trips were conducted in September 2017. The survey of the mangrove habitat was implemented in collaboration with the local NGO community of the Juru Seberang village, that is working on the protection of the freshwater and coastal habitats in the village.

Results and Discussion

At Juru Seberang village area we recorded a total of 46 species, representing 45% of the dragonfly fauna of Belitung Island. The total number of Odonata species in Belitung island is 103 (Alfarisyi, 2017). The highest number of species was recorded at the lake habitats (34 species), mangroves habitats (22 spp.), marsh habitats (28 spp), and river habitats (25 spp.). The most numerous species at the lakes were *Nannophya pygmaea, Chalybeothemis fluviatilis, Pseudagrion coomansi* (see Fig. 7), and *Ichtinogomphus decoratus melaenops* (see Fig. 9). Mangrove habitats at Juru Seberang village were also the habitats with the largest populations of threatened and regionally endangered species. The most important species here was *Mortonagrion arthuri* (see Fig. 8). During this research, several new populations of these species were found at the village area. New populations of *M. arthuri* were discovered at several locations on the coastal mangrove line with a total 34 individuals. Also, this mangrove habitat is the home of *Pornothemis starrei* (see Fig. 10), which is a new addition to the list of species of dragonflies in Belitung. During the survey, we found 39 individuals in mangrove habitats. In the early evening, about 3.00 to 5.00 pm, *P. starrei* will fly together with *M. cora, R. phyllis, U. signata,* and *R. obsolescens* on the beach. This behavior happens almost every day at the same time, except on rainy days.

Among the 25 species found in the river habitats, *Heliaeschna crassa* was the most numerous. Adults were seen flying along streams and rivers, and above roads and forest paths. This species flew only at dawn and dusk, and we captured it by using a light trap. Almost all *Gynacantha* species recorded during this research were captured by light trap. The locality where we found *Macrodiplax cora* most numerous was at the border line of the river to the coastal mangrove line. It is a new record of the species with the largest number of individuals for the area. Several species such as *Urothemis signata, Rhyothemis phyllis* and particularly *Rhyothemis obsolescens,* that are dominant at lake habitats were also found to be abundant in the river habitat.

Following survey work completed at other regions of the island, the range of some Odonata species at Belitung appears to be very small and fragmented. Their habitats are increasingly threatened, mainly due to human activity, which can lead to local extinction of these species. Hopefully, in the future the mangrove forest habitat of this village area will survive as one of the breeding places of *M. arthuri* in Belitung Island. The results of this study are important for threatened species status assessments. The data is also a valuable contribution to the Atlas of Dragonflies of Bangka Belitung Islands currently in preparation. Further research is necessary and will be continued, including other habitat areas. One of the future goals will be to monitor several freshwater systems at Mt. Lalang in Perawas village area. All the species discovered during this research at Juru Seberang village are shown in Table 1.

Acknowledgements

This research was supported in part by a grant from the Worldwide Dragonfly Association. Also we would like to thank the local NGO of Juru Seberang Jaya from Juru Seberang Village and the village chief who gave us permission to explore their village territory.

References

Alfarisyi, A., 2017. Belitung Odonata Exploration: Rediscovery of previously recorded Odonata of Belitung Island. *Agrion* 21(2): 82-86.

Dow, R.A., Alfarisyi, A., & Bilitoni, F. J. 2017. Odonata Survey on Belitung Island, Indonesia. *IDF-Report* 108: 1-24.

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 South-east Asiatic Odonata. *Treubia* 16: 55-119.

Lieftinck, M.A., 1954. Handlist of Malaysian Odonata. A catalogue of the dragonflies of the Malay Peninsula, Sumatra, Java and Borneo, including the adjacent small islands. *Treubia* (Suppl.) 22: i-xiii + 1-202.

Orr, A.G., 2003. *A guide to the dragonflies of Borneo: their identification and biology*. Natural History Publications (Borneo), Kota Kinabalu.

Table 1.The species discovered during the research on four types of habitat in September 2017 at Juru Seberang village area, Belitung Island, Indonesia.

No	Odonata Species	Type of Habitat			
		1	2	3	4
	Zygoptera				
	Lestidae				
1	*Lestes praemorsus decipiens* Kirby, 1894	√	√		√
	Chlorocyphidae				
2	*Libellago hyalina* (Selys, 1859)	√		√	√
	Platycnemididae				
3	*Prodasineura interrupta* (Selys, 1860)	√			
4	*Prodasineura verticalis* (Selys, 1860)	√		√	√
5	*Pseudocopera ciliata* (Selys, 1863)		√		√
6	*Copera vittata* (Selys, 1863)	√			
	Coenagrionidae				
7	*Agriocnemis minima* Selys, 1877		√		√
8	*Archibasis viola* Lieftinck, 1949	√		√	
9	*Ceriagrion cerinorubellum* (Brauer, 1865)		√		√
10	*Ischnura senegalensis* (Rambur, 1842)		√	√	√
11	*Mortonagrion arthuri* Fraser, 1942 *	√			
12	*Mortonagrion falcatum* Lieftinck, 1934		√		√
13	*Pseudagrion coomansi* Lieftinck, 1937		√	√	√
14	*Pseudagrion microcephalum* (Rambur, 1842)		√		√
	Anisoptera				
	Aeshnidae				
15	*Anax guttatus* (Burmeister, 1839)			√	√
16	*Gynacantha basiguttata* Selys, 1882	√		√	
17	*Gynacantha bayadera* Selys, 1891	√		√	√
18	*Heliaeschna crassa* Krüger, 1899	√		√	
	Gomphidae				
19	*Ictinogomphus decoratus melaenops* (Selys, 1854)		√	√	√
	Macromiidae				
20	*Epophthalmia vittigera vittigera* (Rambur, 1842)			√	√
	Libellulidae				
21	*Acisoma panorpoides* Rambur, 1842		√		
22	*Aethriamanta brevippenis* (Brauer, 1878)	√	√		√
23	*Aethriamanta gracilis* (Braurer, 1878)		√		√
24	*Agrionoptera insignis* (Rambur, 1842)	√		√	√
25	*Agrionoptera sexlineata* Selys, 1879	√		√	
26	*Brachydiplax chalybea* Brauer, 1868	√			√
27	*Chalybeothemis fluviatilis* Lieftinck, 1933		√		√
28	*Crocothemis servilia* (Drury, 1773)		√	√	√
29	*Diplacodes nebulosa* (Fabricius, 1793)		√		√

No	Odonata Species	Type of Habitat			
		1	2	3	4
30	*Hydrobasileus croceus* (Brauer, 1867)		√	√	√
31	*Macrodiplax cora* (Kaup, 1867)	√			
32	*Nannophya pygmaea* Rambur, 1842	√	√		√
33	*Neurothemis fluctuans* (Fabricius, 1793)	√	√	√	√
34	*Orchithemis pulcherrima* Brauer, 1878	√		√	
35	*Orchithemis pruinans* (Selys, 1879)	√			
36	*Orthetrum chrysis* (Selys, 1891)		√		√
37	*Orthetrum sabina* (Drury, 1773)		√	√	√
38	*Pantala flavescens* (Fabricius, 1798)		√	√	√
39	*Pornothemis starrei* Krüger, 1902	√			
40	*Raphismia bispina* (Hagen, 1867)	√			
41	*Rhodothemis rufa* (Rambur, 1842)		√	√	√
42	*Rhyothemis obsolescens* Kirby, 1889		√	√	√
43	*Rhyothemis phyllis* (Sulzer, 1776)		√	√	√
44	*Tholymis tillarga* (Fabricius, 1798)		√	√	√
45	*Tramea transmarina euryale* (Selys, 1878)		√		√
46	*Urothemis signata insignata* (Rambur, 1842)		√	√	√
47	*Zyxomma petiolatum* Rambur, 1842	√	√	√	√
	Total	22	28	25	34

Figure 11-12. (11) Milky stork (***Mycteria cinerea***), an IUCN red-listed 'Endangered' coastal wetland species found in the Juru Seberang village area. (12) Sundew (***Drosera burmanii***). This species is one of the smallest sundews and is found on Belitung Island.

Whenever you can get into the field! The Ramblings of two field biologists mesmerized by the magical powers of Vanuatu

Milen Marinov [mg_marinov@yahoo.com] &
Seth Bybee [seth.bybee@gmail.com]

Vanuatu has been a part of Milen's plan for studying South Pacific odonate biogeography for a very long time. It took him all of eight seconds to convince Seth to join him. Eighty three islands, most of which are completely raw and underdeveloped, strewn from ~13° to ~20° southern latitudes have a lot to offer. Few people are lucky enough to experience the excitement of being the first to set foot in a previously unexplored area. If that is what you are looking for - you must consider Vanuatu as your next destination! As we made plans our minds were already on the islands months before our bodies arrived at our target sites. In the lead up to the trip, all seemed to be going to plan except for one big problem, which everybody said was off-season and completely unusual - cyclone Donna.

Cyclone Donna started to form a few days before our departure from Auckland. We (plus Milen's wife Svetla - Figs 1-2) watched it carefully as we made our final plans and began to talk about potential findings of the trip and research that could follow - a fusion between molecular and morphological studies ignited by the lights and force of the storm - that's how we saw it.

First day of field sampling

We were fortunate that our plane took off from Auckland and perhaps more fortunate to have landed at Bauerfield International Airport on Efate the 6th of May despite Donna's imminent arrival and gusty, rainy weather. After years of dreaming about this Pacific island group it was pretty depressing to look down from the plane and see the swells (Fig. 3)! There was not a patch of clear sky the following day (but at least the rain was not constant!). We were out early with nets in hand, walking alongside the roads and checking the side ditches. It felt like being back to the Solomon Islands - *Neurothemis stigmatizans* was very abundant with males and females both performing their daily routines in between the periods of light showers, *Pseudagrion microcephalum* was less abundant, but still persistent at the sites we visited and a single male *Orthetrum villosovittatum* really fuelled our "welcome-to-the-Solomons" feeling. Over the course of the day we managed to see a few more widely distributed Pacific species such as *Agriocnemis exsudans*, *Hemicordulia hilaris*, *Orthetrum serapia*, *Diplacodes trivialis* and *Lathrecista asiatica*. *Diplacodes haematodes* was what we call "the odd one out". Its discovery brought us back to where we were - Vanuatu, which represents the easternmost point (at least that we know about so far) in the distribution for this species.

First thoughts

The expectations were that cyclone Donna would continue its way towards southern parts of New Caledonia. However, on May 08th (the third day of our stay in Vanuatu) it turned back towards Efate Island and we were forced to stay, and sweat it out (literally), inside our motel hiding behind the window shutters. The cyclone alert was raised to yellow (with a possible red alert to follow!) and our mood dropped to the lowest possible level as it seemed our long-planned trip might not work out for us.

Figures 1-4. (1) Svetla and Milen with our hosts at Lakatoro Palm Lodge, Malekula Island. (2) Svetla and Seth on the way for field sampling on Aneityum Island. (3) Bird-eye view of Efate Island during the time of cyclone Donna. (4) Stream Habitat of *Vanuatubasis bidens*, Aneityum Island.

Not sampling in the field gave us time to think about this completely new experience - being shuttered up in a motel room. Naturally, in a moment like this we began thinking about insects being transported by the winds and the significance of the long-distance dispersal that such gusty days must play is the dominant hypothesis explaining the biogeography of Odonata. In 2015 Milen published some of his thoughts in a paper *The seven "oddities" of the Pacific Odonata biogeography*. Looking at the downpouring rain and strong gusts of wind we returned to some questions that he raised then. Two years ago, Milen argued that even if any dragonfly could survive the days of swirling in the air, exposure to freezing temperatures, increased radiation and potential high risk of desiccation it would take much more than just a chance event to establish a viable population and achieve the diversification which we observe for some of the Pacific island groups.

Figures 5-6. *Vanuatubasis bidens*. (5) Young male. (6) Mature male.

The wind speed of cyclone Donna reached 220 km/h which is typical of cyclones of such a magnitude, but travelled ~11km/hr once categorized as a cyclone. Simple math demonstrates that it is moving at such a speed that a storm, and its potential hitchhikers, could travel the distance of ~1,000 km (e.g., the distance between Fiji and Samoa) in almost 4 days, an amount of time that might be possible for some insects to survive. However, cyclones do not travel in a straight line and although the wind velocity is high it may linger within a single island group for days and travel to the neighbouring archipelago may take more than a week (for some insects this is their time they spend as imagos). A few years back a high cyclone alert was given in Fiji because of a cyclone forming over Samoa. It eventually reached Fiji, but after 4-5 days.

We are discussing the movement of storms and species being transported between islands while continuing to watch cyclone Donna progress over 3-4 days roaming over a single island group. Looking out of the window, we ask ourselves how would any insect survive such a swirl without feeding for weeks? Hibernating insects survive months without eating, but they a) evolved in such an environment where hibernation is part of their life cycle, and b) have a long period of time to prepare for this part of their life cycle. Tropical insects, although certainly capable of going without food for a time, do not have this ability!

Second visit

Cyclone Donna showed mercy on us after a few days and we were finally able to fly to the southernmost island of Vanuatu - Aneityum. This is a site of the endemic *Vanuatubasis bidens* which was one of the highlights of our trip. We spent two long days walking along the streams (Fig. 4) and small tributaries asking ourselves what might have been the reason for the low numbers and diversity of Odonata there. Was it the southern latitude, late time of the year, or could it be the effect of cyclone Donna? It may have been a combination of all three factors, but the cyclone seemed to be the most likely reason in our minds. We were not able to verify the amount of rain that Aneityum received as a result of Cyclone Donna but locals told us it was significant. We arrived just after the storm had passed. Debris and erosion at the edge of the rivers showed that river levels had clearly risen but had subsided by the time we arrived. We did find *V. bidens* males and females, but mainly immature imagos (Figs 5-6) or tenerals that must have emerged a short time before our arrival at the area.

Second thoughts

Naturally we started to wonder - if cyclone Donna had knocked down the population so severely that we were observing gradual restoration from newly emerged recruits what kind of cyclone must have brought *V. bidens* ancestors to Aneityum? How did they survive the transport from the "source population" on the mainland or nearby island? Where was the *source population* - was it New Guinea (about 2,000 km away from Vanuatu) or SE Asia (we do not even want to calculate the distance to a specific point!). How is it that if the long-distance dispersal due to a *blown-by-the-wind* scenario was in fact responsible for the colonisation of Aneityum from the source population, the same wind would now destroy the population without, presumably, even taking any members up into the storm?

Final thoughts - Odonata fauna of Vanuatu

The final faunistic checklist will be published separately. We do not want to discuss it here in detail - just to point out some observations that we found very interesting. Excluding very widely distributed species (e.g., *Agriocnemis exsudans*, *Ischnura aurora*, *Ischnura heterosticta*, *Anaciaeschna jaspidea*, *Hemicordulia hilaris*, *Diplacodes trivialis*, *Lathrecista asiatica*, *Macrodiplax cora*, *Orthetrum serapia*, *Pantala flavescens*, *Tholymis tillarga* and *Tramea transmarina*), Vanuatu shares more Odonata species with the Solomon Islands than with New Caledonia. *Diplacodes haematodes* is the only species we sampled in Vanuatu that is also very common on New Caledonia and Australia. Davies (2002) claims *Orthetrum villosovittatum* is "quite common" in New Caledonia, but Grand et al. (in prep) ranked it as Data Deficient because no location is known for the species. The late Daniel Grand failed to find this species during all his field visits to New Caledonia which puts in question Davies' (2002) claim because *O. villosovittatum* is usually very common where it occurs and we found it even on a rainy day with cyclonic weather on Vanuatu. *Neurothemis stigmatizans* is very common on the Solomon Islands and Vanuatu but was recorded for New Caledonia for the first time in 2004, a single male, and never resampled (Grand et al. in prep.). *Pseudagrion microcephalum* is abundant on the Solomon Islands and Vanuatu, and is also probably present in Samoa and Tonga (see the discussion in Marinov et al. 2015), however no representative of the genus is known from New Caledonia. It is too early to speculate, but our expectations are that the molecular phylogeny will show the local endemic genus *Vanuatubasis* is more closely related to *Nesobasis* from Fiji or *Teinobasis* from the Solomon Islands than to anything known from New Caledonia.

This all raised the question - why does the Odonata fauna of Vanuatu have higher affinities to the Solomon Islands and Fiji while in fact the country is much closer to New Caledonia? Indeed, Rueben Neriam, our local guide while visiting Aneityum told us that his island could be seen with the naked eye from the Loyalty Islands! If the winds are responsible for the dispersal between the island groups would it not be logical to see more species shared between Vanuatu and New Caledonia? Moreover, cyclone Donna was moving its way exactly between the two island groups and we saw *N. stigmatizans* and *P. microcephalum* on the wing in between bouts of rain over several days during the storm!

We must again emphasise that we are making this mental analysis without consulting the widespread Pacific species listed above. What is the rationale for leaving them out?

Anthropogenic influence to contemporary biogeography

This is our rationale: in all studies that we have read to date not a single author has considered the possible effect of humans on the modern distribution of Odonata anywhere in the world. We apologize to those authors who might have done so, but we have not had the opportunity to read their studies. In fact the only study on the transoceanic dispersal of insects performed by scientists from the Bishop Museum over the course of more than ten years concluded that:

Overwhelming evidence in the literature as well as the Museum's ship trapping supports the theory that today man is the primary agent in transporting insects from one land area to another. Further research is required to determine accurately to what extent insects are distributed by nature across oceans.

During our stay on Aneityum Island we had the interesting experience of waking up one morning to the arrival of a large cruise ship at the Mystery Island (Fig. 7: compare the size of the ship to the size of the island). We do not have a scale bar, but we will tell you that Mystery Island is where the planes transporting passengers and goods between the other islands of Vanuatu land. In fact, nearly the whole island is an airstrip.

Figures 7. Cruise ship anchored close to Mystery Island (to the left).

Rueben also told us that at least 3-4 ships like that one pictured in Figure 8, arrive to their island every month with maximum to 13-14 ships per month. The one we witnessed carried 5,000

passengers. We leave it to you to do the math for an average of 7-8 ships per month for 12 months each carrying 3,500-5,000 people on board. Further, each of those ships is anchored just offshore and illuminated during the night making each attractive to all sorts of insects including dragonflies. Anyone who has had experience with the widespread species from the list above knows that several of them are crepuscular species and have often been collected at dusk and/or around light sources. We spent one evening catching *A. jaspidea* on Aneityum Island well past dusk. In fact, it was so late we could only see their shadows! They may have been active into the night as there were many and we could hear their wings touching every so often as they flew over the small canal.

Figures 8. At least 3-4 cruise ships visit Mystery Island every month.

What is discussed herein sounds very speculative and lacks solid proof that dragonflies can travel on ships or planes or be transported by any other humans means. However, during our short visit to Vanuatu we had a total of eight domestic flights during which we photographed one moth inside the plane, saw a cockroach crawling on the window and found one weevil on Milen's leg just before we took off to the next island. We did not attempt to count the many flies that we saw hitching a ride in our planes. If we found three hitchhiking insects out of eight flights without even really looking for insects inside the plane, imagine the total number of insects that would be counted for a specific study that actually focused on insect movement by plane between different islands. Human mediated transport, modern or ancient, is something that should be considered when studying biogeography for any plant or animal groups, but especially insects and perhaps even more for insects that require freshwater during their lifecycle (i.e. it would be much easier for eggs or small aquatic insect to be transported between islands). A widespread species cannot be presented as proof for a greater dispersal ability, at least a natural one, simply because it is found over a vast area. Before such a claim can be made disproving human mediated transport is a good idea!

Finally we offer you one very interesting read that we are sure you all would benefit from during your field studies:

Don't let that dragonfly get away!

This is the title of the blog created by Crile Doscher - a GIS lecturer at Lincoln University, New Zealand. Link: [http://blogs.lincoln.ac.nz/gis/2017/05/04/dont-let-that-dragonfly-get-away-offline-mapping-in-vanuatu/]. Crile gives some details about so-called off-line mapping. We are new to it; used it for the first time during our visit to Vanuatu in May, 2017. From our first experience we find it a great way of combining field notes, GPS coordinates and photos of localities plus species found in them. The things get even better because all these are entered as a record in a database organised in a way set up by the user. All in one go - directly in the field!

Our final thoughts go back to the people of Vanuatu. The people of Vanuatu are exceptionally welcoming and warm. They greet each other with broad smiles that are as sincere as any smiles we have ever seen anywhere. The smile from one human to another seems to be a large part of their culture as even the indigenous masks, that are often so foreboding in other countries, seemed to all be carved with smiles. Now that we are back from our field trip we must say that this enchanted country is well worth visiting even if you are not planning a research trip. Vanuatu has a lot to offer for explorers - general naturalists, keen ethnographers or art fanatics.

References

Davies, D., 2002. The odonate fauna of New Caledonia, including the descriptions of a new species and a new subspecies. *Odonatologica* 31(3): 229-251.

Grand, D., Marinov, M., Jourdan, H., Cook, C., Rouys, S., Mille, C. & Theuerkauf, J. (in prep.). Distribution, habitats, phenology and conservation of New Caledonian Odonata.

Holzapfel, E. & Harrell, J. C., 1968. Transoceanic dispersal studies of insects. *Pacific Insects* 10(1): 115-153.

Marinov, M., 2015. The seven "oddities" of the Pacific Odonata biogeography. *Faunistic Studies in South-East Asian and Pacific Odonata, Journal of the International Dragonfly Fund* 11: 1-58.

Marinov, M., Schmaedick, M., Polhemus, D., Stirnemann, R., Enoka, F., Siaifoi Fa'aumu, P. & Uili, M., 2015. Faunistic and taxonomic investigations on the Odonata fauna of the Samoan archipelago with particular focus on taxonomic ambiguities in the "Ischnurine complex". *International Dragonfly Fund Report* 91: 1-56.

Too pervert: an attempt at an interfamiliar homosexual copulation wheel in damselflies

Oleg E. Kosterin [kosterin@bionet.nsc.ru]
Institute of Cytology & Genetics SB RAS, Acad. Lavrentyev ave. 10,
Novosibirsk State University, Pirogova str. 2, Novosibirsk, 630090, Russia.

Aberrations of sexual behaviour resulting in mechanical contacts of improper mates are frequent in Odonata. Aberrational tandems between representatives of different species/genera/families, of the same sex or of more than two individuals are most frequent and recorded in many publications especially in local odonatological journals (see, for instance, the most recent report by Eda 2017). Some quarter of a thousand cases registered to the border of the last millennium were reviewed and discussed by Corbet (1999). Incorrect copulation wheels (copulae) (see for example my old report of a copula between a *Cordulia aenea* (Linnaeus, 1758) male and an *Epitheca bimaculata* (Charpentier, 1825) female; Kosterin 2000) are less frequent (Corbet 1999). This is not surprising as forming a tandem is just an act of male grasping a misidentified odonate individual's head rear (in dragonflies) or prothorax (in damselflies) with its anal appendages, whereas formation of a copulation wheel involves actions of both partners towards each other, in our case towards improper mates. However, curving the female's abdomen towards the male's secondary genitalia may be a reflex induced by being grasped by a male. At the same time mismatch copulae attract special attention as a prerequisite for the possibility of interspecies crosses and introgression to happen (still difficult after a heterospecific wheel formation due to mechanical and genetic barriers). There were also many reports of double male tandems, although less frequent than heterospecific male-female tandems; their formation is thought to result from attempts of two males to mate with the same female implying a triple connection as a transitory state (Eda 1970; Corbet 1999).

On March 3, 2017 while examining a stream near the border of Ream National Park in southern Cambodia (10°33'26-30" N 103°39'26-33" E) flowing through remnants of evergreen tropical forest (a plantation on one side, a cutting at the other side, some trees and bushes left at the river), I noticed in dry forked fern and photographed an incompletely formed copula (Fig. 1) of modestly coloured damselflies and then captured it by hand for identification. It turned out that the 'active' male was *Copera vittata* (Selys, 1863) while the female position was served by an immature (with still pinkish-brown ground colour) male of *Mortonagrion falcatum* Lieftinck, 1934. These were damselflies of different size (*M. falcatum* being considerably smaller, especially shorter) and coloration (male of *M. falcatum* with blue markings, absent in both sexes of *C. vittata*; but the ground colour is similar) belonging to different families (Platycnemididae and Coenagrionidae, respectively) but to the same sex.

Figure 1. A tandem of males of *Copera vittata* and *Mortonagrion falcatum,* Ream Peninsula, Cambodia, 3 March 2017.

In the latter aspect, the behaviour of the 'passive' male was most interesting. No complete copulation wheel was formed. The 'active' male kept its abdomen curved inwards in an attempt to initiate copulation. The 'passive' male regularly, each 30 seconds or so, bent its abdomen towards the base of the 'active' male's abdomen but then relaxed it again (I observed several such movements). It looked like an incomplete version of the feminine

copulatory movements. Unfortunately, all four shots I made for two seconds (e.g. that of Fig. 1) show the passive male with a relaxed, straight abdomen only, for at that time I did not realise what an unusual situation I faced and did not bother to make a multi-shot including images with the supposed female with its abdomen curved. So the most interesting feature of this pair remained undocumented.

Hence, a male of *M. falcatum* retains, although in an abortive version, a feminine copulatory reflex of bending its abdomen in response to its prothorax being grasped by another male. This may be evidence that at least this aspect of the feminine copulatory reflexes is not 'switched off' in males. There can be not much surprise in it if one thinks about the selective cost of sexual dimorphism. No doubt the observed bending of the abdomen is an unconditioned, inherited reflex which makes sense in females. To switch it off in males, a special regulatory link would be necessary in the genetic network governing the developmental programme, which would transmit a suppressive signal from a genetic trigger of development of an organism towards the male sex to a genetic trigger of development of the copulatory reflexes. Establishment of such a link would have been paid for with selective deaths, and its maintenance in 'working condition' would be supported by purifying natural selection. All this would imply some importance of blocking the female reflexes in males. Naturally a much simpler and 'cheaper' solution would be just to drop this genetic 'switching off' of the discussed feminine copulatory reflex in males and retain it, especially as they normally do not experience its behavioral trigger (being grasped by the prothorax) and hence normally do not exhibit (and spend extra energy for) it. However, the seeming absence of reports of observations similar to that reported here, when the 'passive' male in a double male tandem attempts to form a copulative 'wheel', seems to be evidence that this feminine reflex is at least not widespread in males.

It remains unclear if the blunder of the 'active' *C. vittata* male was somehow conditioned or it was purely a rare random event. *C. vittata* is widespread and common in Cambodia while *M. falcatum* is very local and until now was known from only two locations in Koh Kong Province (Kosterin 2011; Kosterin & Chartier 2017) but hitherto not in Preah Sihanouk Province, where the observation reported here was made. This contradicts the most frequently observed situation when the 'passive' partners in aberrant tandems belong to species abundant in respective localities, hence being most frequent targets for not so selective sexual activity (Corbet 1999). One could alternatively speculate that a damselfly male has some 'notion', either inherited or learnt, or both, of the locally common damselfly images as either proper or improper mates, but fails to make a proper 'decision' upon encountering an unusual image.

References

Corbet P.S. 1999. *Dragonflies: Behaviour and Ecology of Odonata*. Harley Books, Colchester, 829 p.

Eda S. 1970. Triple connection in the Odonata. *Tombo* 13: 17-20.

Eda S. 2017. Unusual connections in copulation, and oviposition behaviour in dragonflies. *Tombo* 59: 29-45 (in Japanese).

Kosterin, O. E. 2000. Observation of an intergeneric copulation between a male *Cordulia aenea* (L.) and a female *Epitheca bimaculata* (Charp.) (Anisoptera: Corduliidae). *Notulae Odonatologicae* 5 (5): 55-56.

Kosterin, O.E. 2011. Odonata of the Cambodian coastal regions revisited: beginning of dry season in 2010. *International Dragonfly Fund Report* 40: 1-108.

Kosterin, O.E., Chartier, G. 2017. Update of 2014 and 2016 to Odonata found at the marshy coast of SW Cambodia including three species added for the country. *International Dragonfly Fund Report* 101: 1-26.

New Books

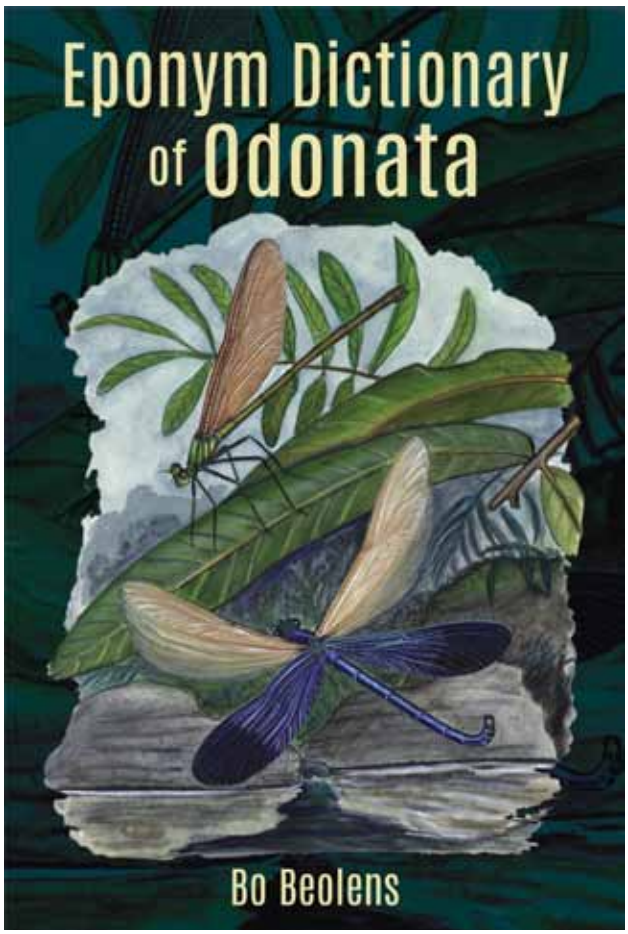
Eponym Dictionary of Odonata

Author: Richard "Bo" Crombet-Beolens

Whittles Publishing
[info@whittlespublishing.com]
[Link]

Hardback due for publication March 2018
pp. 352 - ISBN-13: 9781849953658
Available for pre-order
Price ca. US$60, UK£40

- Provides a listing of all those after whom damselflies and dragonflies have been named
- Each entry is cross-referenced so the relationships between scientific authors, entomologists and others can be followed
- Many entries have been contributed by the people honoured



The Eponym Dictionary of Odonata is a comprehensive listing of all people after whom damselflies and dragonflies have been named in scientific or common names. Each entry provides details of the species and a brief biography of the person. It is also cross-referenced so that the relationships between scientific authors, entomologists and others can be followed. Many entries have been contributed by the people so honoured who are not necessarily odonatologists, entomologists, zoologists or even great men of science. Many damselflies and dragonflies are named for the author's family members, friends and those who collected the species holotypes, while others are figures from myth or history. In fact, it could be anything from the author's mother to a favourite musician.

Because entries may include details of dates, places, educational and work institutions, it is possible to discover information about each person and for a picture to be built of how the science sometimes follows groupings of colleagues or those significantly influenced by charismatic teachers. The Dictionary includes other names which might, at a glance, be thought to be eponyms yet are not in the truest sense. These may be species named after characteristics embodied in characters from literature, whole peoples, acronyms or toponyms, etc. To some extent it can read like a canon of the great women and men of science over the last several centuries. Interestingly there are species named after as many as three generations of the same family, veiled references to old lovers, sycophantic homage, financial patronage, etc., as well as all the more `legitimate' reasons for naming species. Not surprisingly, odonatologists exhibit a range of opinion on the practice, from naming all species after people, to wanting all eponyms banned; they can be totally humourless and pedantic or full of fun and irreverence. Like all of us they have as many reasons for their namings as ordinary folk have for naming their children or pets.

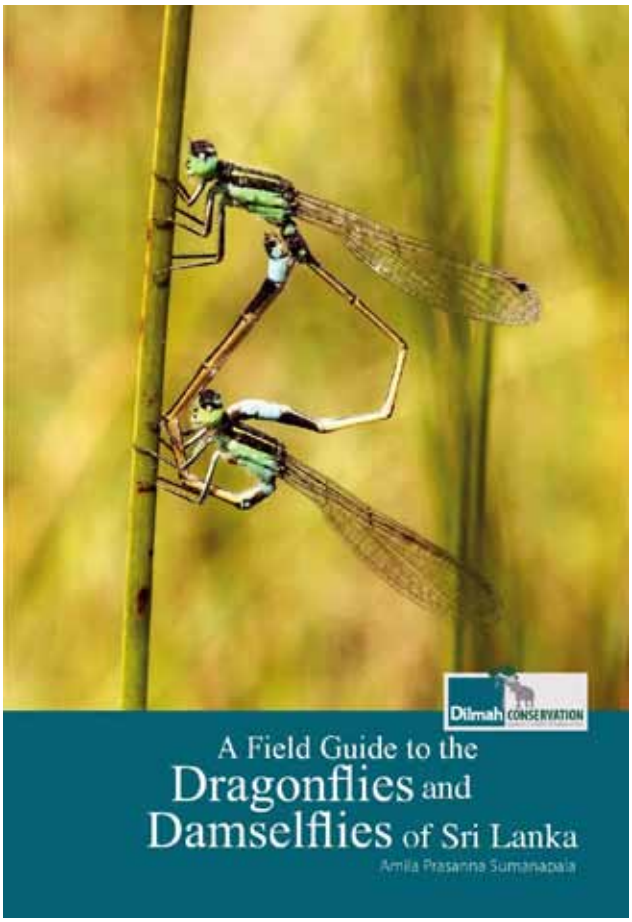
Underlying all this, however, is the value of Eponym Dictionary of Odonata in cataloguing this fascinating aspect of science for all users, whether scientists or interested lay readers.

A Field Guide to the Dragonflies and Damselflies of Sri Lanka

Author: Amila Prasanna Sumanapala
[Link]

174 pages, colour & b/w illustrations, 1 colour map
ISBN 978-955-0081-24-0
Hardback 30 May 2017

Price ca. US$25



The last two decades have seen a lot of important work done in Sri Lanka in the field of odonatology. However, there has been no field guide available on the local market for some time now. This photographic field guide aims to fill that void [Eds: Although not a field guide note Bedjanič et al., 2014: *Dragonfly fauna of Sri Lanka: distribution and biology, with threat status of its endemics*. Pensoft - and its companion e-book pdf, which is free to download (*Agrion* 19(1):17)].

A Field Guide to the Dragonflies and Damselflies of Sri Lanka covers 105 of the odonate species known from Sri Lanka with photographs and description on identification, habits, habitats and distribution. The introductory chapters cover morphology, biology, ecology, diversity and conservation of odonata with special references to Sri Lankan species.

About the Author

Amila is a field biologist studying Sri Lankan biodiversity with a special interest on taxonomy, distribution and ecology of dragonflies and damselflies. With an interest in natural history developed since his childhood, he graduated from University of Kelaniya with an honours degree in Environmental Conservation and Management. He is also an active conservationist.

About Publisher

Dilmah Conservation was initiated in 2007 by Dilmah to incorporate environmental conservation efforts into the MJF Charitable Foundation, which focuses on social justice. Dilmah Conservation works towards the sustainable use of the environment in partnership with various governmental and non-governmental organisations. The pledge made by Dilmah founder Merrill J. Fernando to make business a matter of human service is deeply ingrained in the work carried out by Dilmah Conservation. For additional information visit our website at: www.dilmahconservation.org

E-book version:
A Field Guide to the Dragonflies and Damselflies of Sri Lanka

Available from Dilmah Conservation
Price ca. US$4
[Link]