

ISSN 1061-8503

ARGIA

The News Journal of the Dragonfly Society of the Americas

Volume 25

15 December 2013

Number 4



Published by the Dragonfly Society of the Americas

<http://www.DragonflySocietyAmericas.org/>

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DSA 2014 Annual Meeting in Wisconsin

Ken Tennesen <ktennessen@centurytel.net>

The 2014 DSA Annual Meeting will be held in Wisconsin's North Woods on 11–18 June 2014. The Steering Committee, with members Bob DuBois, Denny Johnson, Joanne Kline, Ryan Chrouser, Carey Chrouser, and chaired by Ken Tennesen, is working on putting together what will hopefully be an enjoyable and memorable meeting.

Main Meeting

The main meeting is scheduled for 13–15 June and will be headquartered at the Rusk County Community Library (418 Corbett Ave. West, Ladysmith, Wisconsin 54848). We have reserved a large conference room (East Room, capacity 99 people). The business meeting will be held on the morning of Saturday 14 June; presentations on odonates will follow and continue the rest of that day. If you plan to present a paper, please contact Ken Tennesen as soon as possible at <ktennessen@centurytel.net>. Presentations are expected to adhere to scientific format. For any early birds, we are currently prepared to receive and review abstracts. A catered banquet is planned for Saturday evening. A registration fee of \$20 is being proposed, in order to cover the catered meal and other minor expenses that attendees would normally have to pay for anyway. More on this later.

The main feature for the field outings during the main meeting on Friday and Sunday will be the Chippewa River near Bruce, which is rich in clubtails. Eighteen species of Gomphidae are recorded in the Chip in this area, although not all will be flying in mid-June. In addition, we will be very close to the Flambeau River, also known for its diverse gomphid fauna, and with many access points. Also nearby are smaller streams, peatlands, lakes, and ponds. The Ladysmith Library sits alongside Corbett Lake (we are temporarily deleting the last “t” of that name for our meeting). Although at this time we don't know what species of

Odonata inhabit this extensive, shallow, weedy lake, I am sure we will find out based on its convenience! More details on field sites will be announced on the website, which we hope to have available soon.

Lodging during the main meeting can be obtained at several motels. We have been given blocks of rooms at the AmericInn and the Fairbridge Inn, listed below; when you call, tell them you are with the Dragonfly Society:

- AmericInn Lodge & Suites, 700 West 9th Street South, Ladysmith, Wisconsin 54848, 715-532-7811. A block of 15 standard rooms reserved for DSA for 13–15 June will be held until early June.
- Fairbridge Inn Express, 800 W. College Avenue, Ladysmith, Wisconsin 54848, 715-532-6650. A block of 15 standard rooms reserved for DSA for 13–15 June will be held until early June.

Other motels in Ladysmith recommended to us include




The Flambeau River in Wisconsin. Photo by Ken Tennesen.

continued next page...

Calendar of Events

For additional information, see <<http://www.odonatacentral.org/index.php/PageAction.get/name/DSAOtherMeetings>>.

Event	Date	Location	Contact
2014 SE DSA Meeting	4–6 April 2014	Gainesville, Florida	Bill Mauffray <iodonata@gmail.com>
2014 DSA Annual Meeting	13–15 June 2014	Ladysmith, Wisconsin	Ken Tennesen <ktennessen@centurytel.net>
2014 NE DSA Meeting	26–29 June 2014	Binghamton, New York	Bryan Pfeiffer <bryan@bryanpfeiffer.com> 

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Carnegie Hall Bed & Breakfast (700 W 9th St, 715-532-7798) and El Rancho Motel (W8500 Flambeau Avenue and Highway 27, 715-532-6666).

There is also Mirr's Gateway Motel right in Bruce (715-868-2015), very close to the Chippewa River. Mike, the manager, has only eight rooms available, but they are very clean, comfortable and also quite affordable (around \$65 for a double). Mike said to call after 2 January 2014.

There are several campgrounds in the Ladysmith area, and we will have information on the website soon. And for a small town (ca. 3000), Ladysmith has a good variety of restaurants.

Pre-Meeting

The pre-meeting trip will be 11–12 June in the Eau Claire area. Denny Johnson is arranging for us to meet at Beaver Creek Reserve <www.beavercreekreserve.org>; there is also a Citizen Science Center here. These facilities are about 15 miles east of Eau Claire, near the town of Fall Creek along County Highway K. We will visit the Eau Claire River for gomphids, including *Ophiogomphus smithi* (Sioux Snaketail) and other odes, pending water level of course, although the river is usually quite wadeable. There are also lakes, tamarack (larch) bogs, and hopefully ephemeral ponds in the area; Pat McKearn is working on group access to several un-surveyed sites.

There are accommodations for lodging at Beaver Creek Reserve; the rooms are inexpensive (\$18/night), bunk style and it's bring-your-own bedding/towels. We will have more detailed information on the website. There is no restaurant or grocery store within 15 miles of the reserve, so supplies will have to be brought in. Motels on the east side of Eau Claire include the following: Holiday Inn: (new, ~\$130/night, 4751 Owen Ayres Court, 715-830-9889); GrandStay Hotel (\$130/night, 5310 Prill Road, 715-834-1700); Hampton Inn (~\$130/night, 2622 Craig Road, 715-833-0003);



Bog-marginal pond in northern Wisconsin. Photo by Ken Tennesen.



Ophiogomphus smithi (Sioux Snaketail) female. Photo by Ken Tennesen.

Maple Manor Motel: (~\$60/night, 2507 S. Hastings Way, 715-834-2618); and EconoLodge Inn & Suites (\$80/night, 4608 Royal Drive, 715-833-8818).

Post-Meeting

The post-meeting trip will begin on 16 June and wrap up on 18 June, up in the north-central part of the state in Vilas County. Ryan Chrouser is working on identifying field sites for outings there. We have reservations for 40 people to stay at Kemp's Biological Station on Tomahawk Lake; rooms are dorm-style. There is a kitchen and dining hall, but we have to bring our own culinary supplies. WiFi is available. There are motels and restaurants close by in Woodruff/Minocqua and also in Boulder Junction, and there are numerous resorts and campgrounds in the area.

At Kemp's, there is a beautiful little bog pond called Jyme Lake. It has *Nannothemis bella* (Elfin Skimmer), *Coenagrion interrogatum* (Subarctic Bluet) and several *Leucorrhinia* (whiteface) species, among others. From Kemp's we will venture north to survey lakes, peatlands and streams.


Airports

The closest large airport in the vicinity of Eau Claire and Ladysmith is Minneapolis/St. Paul International (MSP), just over the state line in Minnesota; Ladysmith is about a 2.5 hour drive from MSP. In Wisconsin, there is the Madison Airport (about a four hour drive northward to Ladysmith) and the Central Wisconsin Airport (126 mile drive west and then north to Ladysmith).

The weather in mid-June in northern Wisconsin ranges from cool to warm. You never know what you're going

to get, so come prepared. That means your field clothing should range from shorts and light shirts to flannel shirt, long pants and rain gear. This is also the time of year that mosquitoes plus other biting flies such as deer flies, horse flies and black flies, and of course several kinds of ticks, are all waiting for you with empty stomachs. You will need repellents; be sure to check yourself regularly in the field


and afterwards for ticks. That's just the way it is up here. No chiggers though.

A final thought: we are considering holding a silent auction during the main meeting, as has been done at the past few annual meetings, in support of OdonataCentral. Please let us know of any items you might want to donate. 

2014 Southeast Regional DSA Meeting in Gainesville, Florida

Bill Mauffray <iodonata@gmail.com>

The Southeast DSA meeting will be held on 4–6 April 2014 in Gainesville, Florida. Highlights will include access to the massive Florida State Collection of Arthropods (FSCA), with tours on Friday 4 April. Access on Saturday 6 April will be limited by appointment. A brief meeting and catered dinner (at an estimated cost of \$10/person) will be held on 4 April at the FSCA facility.

Field trips are tentatively planned for Gold Head Branch State Park to find early spring species including *Cordulegaster sayi* (Say's Spiketail) and to the Santa Fe River or other similar locations to look for river species. For more information contact Bill Mauffray at <iodonata@gmail.com>. 

2014 Northeast Regional DSA Meeting in Binghamton, New York

Nick and Ailsa Donnelly <tdonnelly@binghamton.edu> and **Bryan Pfeiffer** <bryan@bryanpfeiffer.com>

Save the dates for the 2014 Northeast DSA gathering, which will be held in Binghamton, New York from 26–29 June. Our big meeting will feature small species, including *Ophiogomphus howei* (Pygmy Snaketail) and *Nannothemis bella* (Elfin Skimmer).

The 2014 meeting recalls one of the earliest U.S. meetings, an informal gathering hosted by Nick and Ailsa Donnelly the weekend of 4 July 1982. That meeting drew 21 participants plus families (a large fraction of the odonatists in North America at the time), with participants coming from as far away as Florida and Oklahoma.

The Broome County area (including parts of Chenango and Cortland Counties, and Susquehanna County in Pennsylvania) has a rich odonate fauna, but there are opportunities to find additional species. The Susquehanna River close to Binghamton was the place where *Ophiogomphus howei* (Pygmy Snaketail) was found in 1967, after having “disappeared” for 43 years following the 1924 find of the original male in Massachusetts and female in Pennsylvania. The river has a rich ode fauna, is easily accessible, and will be one of the main features of the meeting.

One of our prime spots will be Jam Pond, one of the finest bogs in the state. Although it has one of the longest-




Nannothemis bella (Elfin Skimmer) male (left) and female (right). Photos by Bryan Pfeiffer.

lived colonies of *Aeshna subarctica* (Subarctic Darner) in the United States, it has never yielded any *Somatochlora* species, though a few emeralds have been seen over the years. Late June will be a prime time to find abundant *Enallagma annexum* (Northern Bluet), all intergraded with *E. vernale* (Vernal Bluet). However, we will not find *Aeshna subarctica*, as it flies from mid-August until late September.

Another site is Wier's Pond in northern Pennsylvania, which is a Nature Conservancy property featuring both *Lanthus vernalis* (Southern Pygmy Clubtail) and *L. parvulus* (Northern Pygmy Clubtail), and has apparently stable colonies of *Coenagrion resolutum* (Taiga Bluet) and *Gomphaeschna furcillata* (Harlequin Darner). There are numerous additional sites: the Chenango Valley State Park, where *Rhionaeschna mutata* (Spatterdock Darner) was recently found; Otselic Bog, another fine kettlehole bog;

Geneganslet Creek, where three species of *Calopteryx* (jewelwings) can be found together; and Hawkins Pond and Greenwood Park (Broome County Parks), with several species of interest such as *Boyeria grafiana* (Ocellated Darner) and *Enallagma traviatum* (Slender Bluet) (we are in the zone of intergradation between the subspecies *traviatum* and *westfalli*).

A web site is in progress and is hosted on Bryan Pfeiffer's blog at <<http://bryanpfeiffer.com/nedsa/>>. Please register by 1 March 2014 in order for organizers to obtain necessary permits. To register, send an e-mail to Bryan Pfeiffer at <bryan@bryanpfeiffer.com>. Let Bryan know if you might be interested in presenting during a short meeting.

We're arranging lodging in Binghamton and camping nearby. Please visit the website for updates. 

Proposed Central American Regional DSA Meeting in Costa Rica, June 2015

Marla Garrison <mgarrison@mchenry.edu>

At the annual DSA business meeting in Saskatchewan, Canada in July 2013, interest in holding a regional meeting in Costa Rica in 2015 was sufficient to initiate preliminary planning. Investigations into potential sites for the meeting resulted in conversations with the Organization of Tropical Studies (OTS; <<http://www.ots.ac.cr>>) regarding the use of their three biological research stations as our base of operations: La Selva, Las Cruces, and Palo Verde. All three field stations are associated with the Organization of Biological Field Stations (OBFS) and are intended to promote the interchange of professionals for biological research and education.


These three stations are in different ecoregions of the country. La Selva is located in the Caribbean lowlands, Las Cruces is on the southern Pacific slopes, and Palo Verde is in the northwestern Pacific lowlands. The range of habitats includes wet and dry tropical forests, parkland, buffer zones, and wetlands. They would offer an extraordinary degree of odonate biodiversity as well as opportunities to observe many other groups of animals and plants. The stations can accommodate up to 40 people. The estimated cost (based on current prices and accounting for inflation) would run around \$100 per day by 2015 and include a bed and three meals a day. The main meeting would be held at La Selva, with pre- and post-meeting excursions to the other two stations.

Dennis Paulson has agreed to be the keynote speaker for the conference. He conducted research and surveys in La Selva several decades ago and has a vast knowledge of the

fauna of Costa Rica. He is not only willing to share this with participants, but will also make copies of his mini-field guide available to all attendees!

The stations need to be booked as soon as possible. We would be looking at the first week or two of June, 2015 to maximize odonate diversity (including gomphids). However, before booking, there is a need to survey the membership to get an idea of the number of members who are seriously considering attending such a meeting.

One consideration to address regarding a meeting in Costa Rica is the question of collecting and/or catch and release. Permits will be difficult to obtain and may not even be granted. If we hold the meeting at the stations, OTS will assist with the permitting process, but there are no guarantees. With this in mind, we are asking all interested members whether they would still be interested in attending such a meeting, even if netting and collecting were not allowed.

Email Marla Garrison at <mgarrison@mchenry.edu> as soon as possible if you are seriously considering attending the meeting, even in the event that netting and/or collecting may not be allowed. Please include the number of people likely to be in your party as well. 

Sabertooths

Ken Tennesen <ktennessen@centurytel.net>

Sabertoothed cats were undoubtedly some of the most ferocious vertebrate land predators ever to maraud an herbivore fauna. The flash of their sabers must have struck fear within unsuspecting animals (sorry for the anthropomorphism), and certainly within any human that encountered a hungry *Smilodon* around the time of the last glaciation. Paleontologists believe that the sword-like upper canines were probably used mainly to stab large prey, such as mammoths and horses. Instead of grappling with its victim after the initial attack, the sabertooth probably retreated and waited nearby for the animal to weaken and bleed to death. Sabertooths ranged from small to large, with some species only about the size of a bobcat and others heavier than today's lion. They evolved independently in several different mammalian lineages, a case of convergent evolution.

Sabertooth cats no longer lurk in today's forests and plains. Surely we'd have heard about something like that! No, all of them eventually became extinct (van Valkenburgh and Jenkins, 2002), the last dying out about nine or ten thousand years ago. Well, maybe the sabertooths are gone (for now) as far as vertebrate animals are concerned, but I maintain they do exist in the dragonfly world. To see this we have to look at the nymphs, and in doing so address some aspects of mouthpart anatomy and terminology.

The main part of the dragonfly nymph's labium (lower lip) is called the prementum (Figure 1). The **prementum** is the apical arm of the labium. It bears the "tools" that snag prey, be those teeth, hooks, spines, stout setae, or some such combination, the presence and configuration of which depend on the family. Throughout the order Odonata, the prementum is incredibly variable in shape, from flat to scoop-shaped and from long and slender to short and stout, and its appendages are likewise adapted for catching various types of prey in sundry microhabitats.

In Aeshnidae (darners), the prementum is elongate-trapezoidal in shape (Figure 2). It is flattened and has an apical palpus on each side (odonate labial palpi are specially modified for grabbing prey whereas most other predatory insects use the mandibles or maxillae). Two long, scimitar-like apical structures called **movable hooks** articulate at the end of the palpal lobe. The movable hooks are formidable weapons, used mainly to catch and hold, although it seems likely that they can penetrate the skin of at least soft-bodied prey such as a tadpole or a caddisfly larva. On each **palpal blade** there is a pointed **end tooth** which is quite variable in its development, from rather sharp and

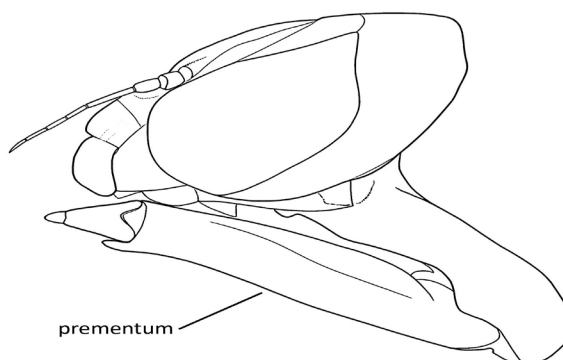


Figure 1. Head of *Aeshna* sp. in lateral view showing the prementum. Ken Tennesen.

protruding to barely existent. The inner margin of the palpal blade is weakly serrated. The end tooth and inner margin of the palpal blade are used in conjunction with the movable hook to snatch dillydallying animals. Stay with me, for as scimitar-like as the movable hooks are, they are not the only sabers I have in mind.

Let's look at another important part of the prementum that functions in holding onto prey, the **ligula**. The ligula is the anterior border of the prementum against which the palpi abut (Figure 2). We can think of a palpal lobe and the ligula acting somewhat like the jaws of pliers; together their grip is strong and extremely effective. In most genera of aeshnids, the ligula is slightly arched and projects forward, with a marginal row of fine setae and an indentation or cleft at the center. Usually

there is a pair of small projections, one on each side of the median cleft, that vary in shape from pointed to rounded (Figure 3), as in *Aeshna eremita* (Lake Darner). In *Boyeria*, the projections are more elongate (Figure 4). But in some aeshnid genera, the ligula

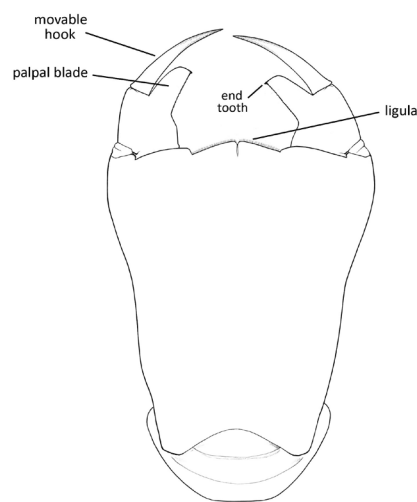
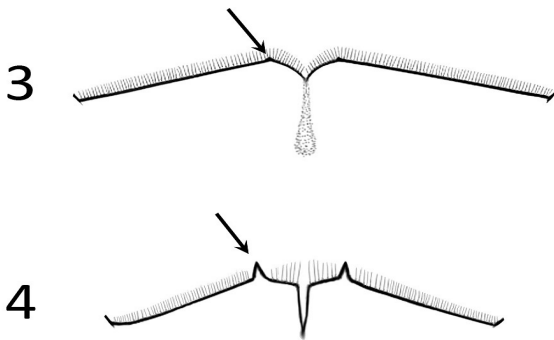


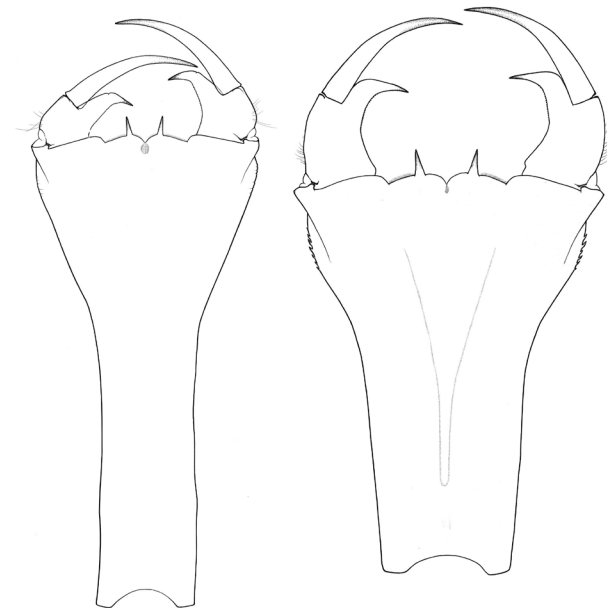
Figure 2. Prementum of *Aeshna canadensis* Walker (Canada Darner), ventral view. Ken Tennesen.

projections are much longer and dagger-like (Figures 5 and 6). I have seen these long daggers in two genera, *Coryphaeschna* and *Staurophlebia*, and the genus *Neuraeschna* also has them (Belle, 1989; Carvalho, 1989). The daggers in these three genera are slightly flattened and sharp-tipped. I don't know if these daggers penetrate prey, but it seems possible, even likely.

If you are wondering about the number of species of aeshnids with ligula daggers, there could be over 20 in the three genera *Coryphaeschna*, *Neuraeschna* and *Staurophlebia*. There are eight species of *Coryphaeschna*; I have examined seven species and six have the daggers (exception is *C. adnexa* [Blue-faced Darner]). There are five species of *Staurophlebia* and the two species known as nymphs



Figures 3 and 4. Ligula of *Aeshna eremita* Scudder (Lake Darner) and *Boyeria grafiana* Williamson (Ocellated Darner). Ken Tennessen.



Figures 5 and 6. Prementum of *Coryphaeschna perrensi* (McLachlan) from Bolivia and *Staurophlebia reticulata* (Burmeister) from Ecuador. Ken Tennessen.

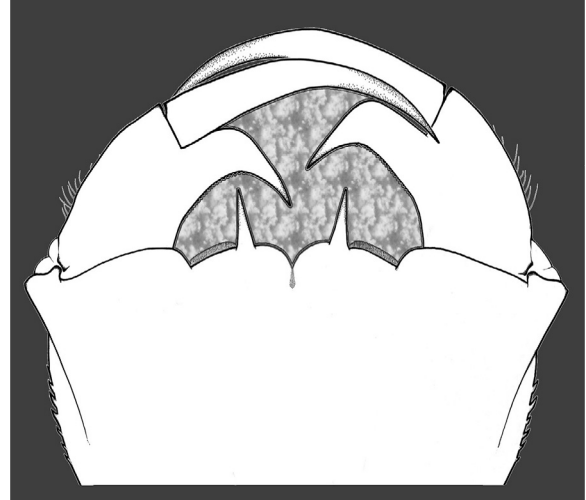


Figure 7. Diagrammatic apposition of *Staurophlebia* palpal and ligular teeth. Ken Tennessen.

have them. There are 16 species of *Neuraeschna*, although the nymphs of only three are known; two of these species have the long ligula daggers, though the latest one to be described has quite short ones.

The end tooth of the palpal blade in these three genera is also slender and dagger-like. When snaggletooth palpi such as these appose the ligula daggers (Figure 7), the captive's chance of escaping, no matter how vigorously it struggles, must be minute.

The sabertooth aeshnids are probably opportunists at mealtime, but the large hook-like and stiletto-like projections on the prementum indicate that these nymphs ambush large prey, and I would not be surprised if a good portion of their diet consists of fish and amphibians. So I like to think of aeshnid nymphs as present-day sabertooths, top carnivores of the aquatic insect world. They are killing machines, just on a smaller scale (to us). Sabertooth odonates obviously do not compare to sabertooth cats in terms of size and roaring ability. But for a moment think of yourself as a tadpole! If tadpoles see even moderately well, a glimpse of an aeshnid predator must be alarming, although I doubt they see the lightning-fast labial strike. There are two other differences between mammalian and odonate sabertooths. For one, odonate sabers are on the lower lip (and they're not called canines). Secondly, odonate nymphs don't stab and release their prey; they hold on and ingest them forthwith.

Speaking of snaggletooths, remember Snagglepuss, the pink cartoon lion? "Heavens to Murgatroid"—time for me to "Exit, stage right!"


Acknowledgements

My thanks to Bryan Pfeiffer for reading a draft version of this article.

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Blue Dasher (*Pachydiplax longipennis*) New to Nova Scotia

Derek W. Bridgehouse <d.bridgehouse@ns.sympatico.ca> and Jim Edsall <jim.edsall@bellaliant.net>

An individual female *Pachydiplax longipennis* (Blue Dasher) was first observed and photographed by Jim Edsall on 21 July 2013 in his backyard at Maynard's Lake in Dartmouth, Halifax County, Nova Scotia. No other individuals were observed in the area.

I (Derek Bridgehouse) vouchered four males and four females on 4 August 2013 at another location at Lake Mic-Mac, which is located within Shubie Park in Dartmouth, Halifax County, Nova Scotia. I returned to the area on 8 August 2013 and observed breeding pairs and ovipositing females and vouchered exuviae, confirming that this is a breeding population of the species in Nova Scotia.


According to ADIP (Atlantic Dragonfly Inventory Program; Brunelle, 2008), the nearest record of this species is in New Brunswick, which is another Maritime province in Eastern Canada. There are two records for New Brunswick: one from Charlotte County on 6 August 1995; and one from Sunbury County on 11 September 2003.

These records represent a range expansion of this species of roughly 260 km (161 mi.) to the east. It is the 125th known odonate species for Nova Scotia.



Pachydiplax longipennis (Blue Dasher) female, Maynard's Lake, Halifax County, Nova Scotia. Photo by Jim Edsall.

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Brunelle, P. M. 2008. Odonata (Dragonflies and Damselflies) of Acadia: Distribution to County: Atlantic Dragonfly Inventory Program, Maine Damselfly and Dragonfly Survey. pp 1-53. 

Don't Forget to Renew Your DSA Membership!

Get a jump on the new year and pay those 2014 DSA dues today! To renew your DSA membership and/or subscribe to Bulletin of American Odonatology, visit OdonataCentral, select the "Societies" tab at the top of the page, and click on the "Information About Joining DSA" link. Or, you can go directly to <http://www.odonatacentral.org/index.php/PageAction.get/name/DSA_Membership>. Remember, if you let your DSA membership lapse, you won't be able to access ARGIA or receive membership e-mail updates, so act now!

Neurocordulia michaeli (Broad-tailed Shadowdragon), a New Genus and Species for Nova Scotia

John Klymko and Sarah L. Robinson, J. Klymko: Atlantic Canada Conservation Data Centre, P.O. Box 6416, New Brunswick, Canada, E4L 1G6 <jklymko@mta.ca>

In late June and mid-July of 2011, *Neurocordulia* exuviae were found in Nova Scotia by JK and SLR at many locations on the West River St. Mary's and the St. Mary's River below the confluence of the West River St. Mary's and the East River St. Mary's (see Figure 1) (45.2557°N, 62.0635°W at confluence, St. Mary's Municipality, Guysborough County). The St. Mary's River and its two major tributaries form a moderate-sized, moderately tannic, oligotrophic, and medium- to fast-flowing river system that traverses very sparsely populated terrain dominated by mixed woods. The river system had been very sparsely surveyed for Odonata prior to 2011 (ADIP, 2013).

All exuviae collected in 2011 were found in stranded flotsam (river levels had spiked in mid-June, after the *Neurocordulia* emergence), therefore collection locations represent at best the approximate emergence locations. These collections represent the first records of *Neurocordulia* for Nova Scotia. With their overall small size, low dorsal hooks, and six palpal setae, the exuviae collected resemble *N. michaeli* (Broad-tailed Shadowdragon) exuviae taken in New Brunswick, and key out to *N. michaeli* in *Dragonflies of North America* (Needham *et al.*, 2000). However, because regional *Neurocordulia* exuviae (*N. obsoleta*, Umber Shadowdragon, known in eastern Maine; and *N. yamaskanensis*, Stygian Shadowdragon, known in New Brunswick) are in general difficult to distinguish due to known variation in regional *N. yamaskanensis*, determination was left as tentative until adults could be collected.

Other Odonata collected on the river as exuviae were *Aeshna umbrosa* (Shadow Darner), *Basiaeschna janata*

(Springtime Darner), *Boyeria grafiana* (Ocellated Darner), *Dromogomphus spinosus* (Black-shouldered Spinyleg), *Gomphus borealis* (Beaverpond Clubtail), *G. exilis* (Lancet Clubtail), *G. spicatus* (Dusky Clubtail), *G. adelphus* (Mustached Clubtail), *Hagenius brevistylus* (Dragonhunter), *Lanthus parvulus* (Northern Pygmy Clubtail), *Stylogomphus albistylus* (Eastern Least Clubtail), *Ophiogomphus carolus* (Riffle Snaketail), *O. mainensis* (Maine Snaketail), *O. rupinsulensis* (Rusty Snaketail), *Cordulegaster maculata* (Twin-spotted Spiketail), *Didymops transversa* (Stream Cruiser), *Cordulia shurtleffii* (American Emerald), *Epithecica canis* (Beaverpond Baskettail), *E. cynosura* or *E. semiaquea* (Common Baskettail or Mantled Baskettail), *E. spinigera* (Spiny Baskettail), and *Helocordulia uhleri* (Uhler's Sundragon). A number of *Ophiogomphus* exuviae collected could not be definitively assigned to any species.

A subset of the *N. michaeli* exuviae collected will be deposited at the Canadian National Collection of Insects, Ottawa, Ontario (CNCI). The remainder of the *N. michaeli* exuviae, as well as all the other material collected, will be deposited at the New Brunswick Museum, Saint John (NBM).

In June 2012, JK revisited the West River St. Mary's River in the hopes of collecting adult *Neurocordulia* during emergence. On 3 June, an upstream site was visited from 08:30 to 13:00 ADT (see Figure 1). Despite good weather and river conditions, no dragonflies were found emerging, though five *Neurocordulia* exuviae were collected. These exuviae had been undisturbed by flood water, thus confirming the site as an emergence location. On the morning of 8 June, a downstream site was visited (Figure 1), again with favourable weather and river conditions. A further two undisturbed exuviae were found and three male and three female adult *N. michaeli* were collected (specimens to be deposited at NBM and CNCI). The adults were found foraging over the head of a riffle, and several were observed taking Plecoptera (stoneflies). The adults were present upon arrival at the riffle at 10:45 and several were still active departure at 11:05 ADT. While no *Neurocordulia* were collected while emerging, given that all *Neurocordulia* exuviae taken on the watercourse closely

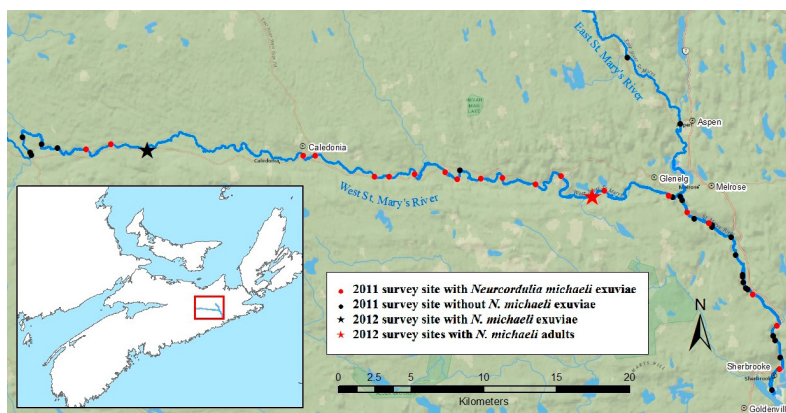


Figure 1. Collection sites on the St. Mary's River system, Nova Scotia.

resemble *N. michaeli* exuviae from New Brunswick, and that adults of the species have been found on the watercourse, all exuviae are assumed to be *N. michaeli*.

The *Neurocordulia michaeli* population on the West River St. Mary's and the St. Mary's River is the most eastern known for the species, being approximately 210 km (130 mi.) further east than the next most easterly known population on New Brunswick's Canaan River. The species appears to be quite common in the areas surveyed, and its population likely extends further upstream on the West River St. Mary's. Several sites were surveyed for exuviae on the East River St. Mary's in 2011 but *Neurocordulia* was not found there (see Figure 1). The daytime flight observed on 8 June 2012, appears to be fairly typical for initial feeding flights of the recently emerged teneral adults. Following these early flights, the species flies only after sundown (ADIP, 2013).

Neurocordulia michaeli was not discovered until 1993 (Brunelle, 2000), but since that time it has been found to be fairly widespread in eastern North America. Surveys have shown the species to be widespread in Maine (Brunelle, 2000) and New Brunswick (ADIP, 2013), and the species has been reported from four locations in Ontario (Catling *et al.*, 2004) and two locations in New York State (White *et al.*, 2010). It is currently reported from a geographical range of 41.74° N to 49.75° N (ca. 990 km [615 mi.] of latitude) and 62.06° W to 83.25° W (ca. 1,600 km [994 mi.] of longitude) (OdonataCentral, 2013).


It is this species' crepuscular habits that delayed its discovery until so recently. Its flight is typically limited to a brief 45 minutes during twilight, and adults have never been observed away from their riverine habitat (Brunelle, 2000). There undoubtedly remain discoveries to be made at the state and provincial level. For example, the species was collected from the Delaware River in New York State where it forms the border with Pennsylvania (E. White, pers. comm.), yet it hasn't been reported from the latter state. Similarly, it is yet to be documented in New Hampshire despite it being known from Maine less than 15 km

(9 mi.) from the New Hampshire border (MDDS, 2009). This species is also almost certain to be found in eastern Québec, having been collected in Maine less than 3 km (1.9 mi.) from the Québec border (MDDS, 2009).

Acknowledgements

Paul-Michael Brunelle is thanked for providing ADIP data and reviewing the manuscript. Dwayne Sabine is thanked for confirming and correcting the identifications of many of the exuviae and for reviewing the manuscript. The Canadian Wildlife Federation is thanked for funding the 2011 surveys. Michael Elliott is thanked for preparing the map.

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Would You Like to See Anything New or Different in ARGIA?

You may have noticed recent (and hopefully welcome) additions to ARGIA such as the Advice Column and this issue's inaugural How I Fell Into the Clutches of the Odonata, both of which were created at the suggestion of readers. If you have creative ideas of your own for features or articles that could help make ARGIA even better, please share them with the Editor at <celeste@xerces.org>.

Field Key to *Heteragrion* of Ecuador

Jerrell Daigle <jdaigle@nettally.com>

Below is a simplified key to the known *Heteragrion* species of Ecuador, for photographic or in-hand determination of male specimens seen or collected alive in the field. Often two to three species will fly together at one time. I have included the recently described *Heteragrion bickorum* Daigle in the key. Color photos/scans for all species can be found on the Internet.

Key to live males of *Heteragrion* species from Ecuador

1. Overall coloration reddish or brownish.....2
Black and yellow contrasting pattern.....3
2. Red abdomen, northwest corner of country only.....
H. erythrogastrum
Brownish-yellow abdomen, western slope only.....
H. cooki
3. Large species, 52–60 mm.....*H. aequatoriale*
Smaller species, 42–45 mm.....4
4. Bright green antehumeral stripe.....*H. inca*
Yellow or cream antehumeral stripe.....5
5. Vertex with yellow “butterfly” design, antehumeral stripe missing or very thin.....*H. angustipenne*
Vertex all black, antehumeral stripe wide.....6
6. Eyes black above, olive green below; thorax with two wide black lateral stripes.....*H. bariai*
Eyes yellow, black rearwards; thorax with three black lateral stripes.....*H. bickorum*



Heteragrion cooki male. Photo by Ken Tennesen.



Heteragrion angustipenne male, near Loreto, Orellana Province, Ecuador, 15 October 2009. Photo by Jim Johnson.

Call for Papers for BAO

The Bulletin of American Odonatology needs your manuscript submissions to help us keep BAO the vehicle for timely reporting of research results on Odonata of the New World.

If you have questions about submission BAO guidelines, please see the last page of this issue of ARGIA or contact Steve Hummel, BAO Editor, at <mshummel@iowatelecom.net>.

SE California/SW Arizona Dragonfly Blitz, 4–7 October 2013: “Ode Blitz 2013”

Bob Miller <bob.miller@mindspring.com>; **Kathy Biggs** <bigsnest@sonic.net>; and **Sandra Hunt-von Arb** <pnwb@suddenlink.net>

This year’s Blitz was centered in Yuma, Arizona, with oding on both sides of the California/Arizona border. Our goal was to find many of the unique southern species of Odes and to discover distribution records. We did quite well on finding the expected species but turned up no real surprises or rarities. It also turns out that what we originally thought were going to be several new county records had been already discovered but not recorded!

We had 15 participants in all, a new high blitz count, although not everyone was there each day. Bob Miller was our organizer and field trip leader and Kathy and Dave Biggs were the co-organizers. Returning blitzers included Lesley Flint, Sandra Hunt-von Arb, Ron Oriti, and Dave Welling. Several folks who were new to Odes joined us this year, including Juddy Canello, BJ Stacey, Bruce and Roxi Aird, and Jim and Charlene Castle. Traveling the greatest distance was Greg Lasley, from Texas. And at the last minute, Ali Sheehey (aka Nature Ali) was able to join us on our last day for her first Ode Blitz experience.

The seven or eight of us there early Friday morning awoke to FIERCE winds—oh no!! Would we see any odes at all? We headed out of Yuma and west to the Gila River (Yuma County, Arizona), where we were so far south we were in view of Mexico. The wind was extreme all day, to say the least, but our leader’s pre-scouting paid off and we were able to find several species that were new to quite a few participants. We also saw some unique habitats and historic sites along the way. Sheltering on the mesquite were many of the desert’s unique odes: Mexican Amberwing (*Perithemis intensa*), Red-tailed Pennant (*Brachymesia furcata*), and Roseate Skimmer (*Orthemis ferruginea*).



Mexican Amberwing (*Perithemis intensa*). Photo by Dave Biggs.

We made our way along the Gila Gravity Main Canal to where it siphons under the Gila River between the Laguna and Gila Mountains <<http://tinyurl.com/pzqybgj>>. We walked the Gila River



Russet-tipped Clubtail (*Stylurus plagiatus*). Photo by Dave Biggs.

beneath McPhaul Bridge <<http://tinyurl.com/op7qpnz>>, which looks like the Golden Gate Bridge in San Francisco; however, this was built first and the Golden Gate was modeled after it. Next we made our way into Dome Valley before heading back to Yuma. Finding Double-striped Bluet (*Enallagma basidens*) in Dome Valley was a pleasant surprise and even more so considering the wind and such a dainty flier! Dinner that night was at a nearby Mexican restaurant (in Jerrell’s honor) and a balloon puppet-maker even made a dragonfly mascot for us to put up at the motel.

On the 2nd day, more folks arrived as it was the weekend, and about 14 of us headed north on the California side of the Colorado River, visiting many of the same locations as we had during our 2006 Ode Blitz. The wind was only slightly less extreme than the day before, but it did let up at midday. Our first stop was near the site of the 1781 Mission San Pedro y San Pablo de Bicuñer <<http://tinyurl.com/nphlry2>>. We then went to the overlook of West Pond on Senator Wash Road just north of the All American Canal, which turned out to be one of the favorite locations of the Blitz. A highlight for all was a cooperatively perched female of the California form of Russet-tipped Clubtail (*Stylurus plagiatus*), with its gorgeous blue eyes. The Marl Pennant (*Macrodiplax balteata*) was another highlight.

On to the north side of West Pond and then to Phil Swing Park at Imperial Dam, where we found White-belted Ringtail (*Erpetogomphus compositus*) and also some great birds: Red-naped Sapsucker and Vermilion Flycatcher. From there we moved on to the stream beneath Senator Wash Reservoir where we had some excitement with Pale-

faced Clubskimmer (*Brechmorhoga mendax*) and some puzzlement over dancers (*Argia*). Sandra's netting of the Clubskimmer and her renowned victory dance was filmed by Bob Miller and is viewable on YouTube; there's a link to see the living, moving Clubskimmer, too (<<https://www.youtube.com/user/swbirder/videos>>). On the way south back to Yuma, we made one last stop near Living Water Ministry Church. We must tell you that early dinners with happy hour prices were a special treat after a day in the sun and wind!! That evening Kathy gave a presentation about dragonflies, with a special focus on those in the southwest, to whoever could attend in the Biggs' upstairs room.

On the third day, a Sunday, the morning was nice and calm for a change and we headed north on the Arizona side of the Colorado River. Our first stop this day was the spillway of the Laguna Diversion Dam <<http://tinyurl.com/pzqybgj>>, which was the first project ever constructed by the U.S. Reclamation Service in 1903. The spillway provided a habitat that we had nowhere else on the trip, swift running shallow water with lots of short vegetation, and it was a lot of fun wading in it. We found many Citrine Forktails (*Ischnura hastata*) there. We then moved north along the Gila Gravity Main Canal overlooking Mittry Lake to Hidden Shores and Imperial Dam where the Gila Gravity Main Canal originates. More good dragons and damsels were found and the rarest bird of the trip, an American Redstart, was a great find.

Because the West Pond overlook <<http://tinyurl.com/q8ahhw6>> was so popular the day before and it was only a mile away, we visited that location a second time. Although we FINALLY didn't have super-strong winds, the Odes seemed scarcer. We wondered if the wind had actually been in our favor the first two days, because IF we found a sheltered place on those days, we found the Odes concentrated and sitting! Bob Miller did a fantastic job of finding those places.



Wild burro. Photo by Dave Biggs.

Most participants had to leave after this stop; however, a "swat" team consisting of Sandra Hunt-von Arb, Kathy and Dave Biggs, Juddy Canello, Bob Miller, and Leslie Flint made a further commitment and drove in two 4 x 4 vehicles an hour even farther north into La Paz County from about 4-5 pm that afternoon. En route through the Imperial National Wildlife Refuge, we stopped in a wash that was lush with vegetation from a monster flash flood that had swept through it a month before. The mosquitoes almost carried us out of there and we were amazed to find no swarms of dragons feasting on them! We especially enjoyed seeing the Painted Desert <<http://tinyurl.com/qaer6u3>> and burro dust bowls at the Colorado River area <<http://tinyurl.com/oh53u4y>>.

Highlights included finding more Double-striped Bluets (*Enallagma basidens*), which we originally thought were county records, but it turned out that they just hadn't been entered on OdonataCentral. Another species we had thought was a county voucher, Black Saddlebags (*Tramea lacerata*), was caught and Bob Miller again caught Sandra's victory dance <<https://www.youtube.com/watch?v=B6pKZ5HFalM>>. We were even rewarded on our way out by seeing two wild burros, one of which brayed at Bob and Leslie who were in car #2 at that point! The military base we skirted had large weapons, tanks, helicopters, and more on display, and we even saw a fake Afghan village they use for training purposes.

Several folks stayed over and headed out Monday morning but most had to get back to reality and work and departed Sunday night.

More images from the 2013 Blitz can be found at the links below:

A Flickr set featuring the unique scenery and Ode Blitzers taken by Bob Miller is at <<http://www.flickr.com/photos/swbirder/sets/72157637920057745/page2/>>.

Blitz activities and species by the Biggs and Ron Oriti on jAlbum is at <<http://jalum.net/en/browse/user/album/1425667;jsessionid=q31871ji4l8f1g7515m6eru59>>.


A Flickr album of Leslie Flint's photos of the 2013 Ode Blitz can be found at <http://www.flickr.com/photos/leslie_flint/sets/72157636885150313/>.

Photos by BJ Stacey are on iNaturalist at <<http://tinyurl.com/llfrcu>>.

A Flickr set by Ali Sheehy is at <<https://www.flickr.com/photos/natureali/sets/72157636311999133/>>.

Our total species number for the Blitz was 26. A complete list is below; where a specimen is indicated, click on the text for a link to the photo (also in image files on pg. 12).

American Rubyspot (*Hetaerina americana*)
California Dancer (*Argia agrioides*), pair
Powdered Dancer (*A. moesta*), female, pair
Blue-ringed Dancer (*A. sedula*), pair
Familiar Bluet (*Enallagma civile*)
Double-striped Bluet (*E. basidens*), female
Desert Forktail (*Ischnura barberi*)
Citrine Forktail (*I. bastata*), female
Rambur's Forktail (*I. ramburii*) female, pair
Common Green Darner (*Anax junius*) female, pair
Blue-eyed Darner (*Rhionaeschna multicolor*) (Darn it—we couldn't find any other darners!)

White-belted Ringtail (*Erpetogomphus compositus*), female
Russet-tipped Clubtail (*Stylurus plagiatus*), female
Red-tailed Pennant (*Brachymesia furcata*), female, eggs
Pale-faced Clubskimmer (*Brechmorhoga mendax*)
Western Pondhawk (*Erythemis collocata*), female
Comanche Skimmer (*Libellula comanche*)
Flame Skimmer (*L. saturata*)
Marl Pennant (*Macrodiplax balteata*), female
Roseate Skimmer (*Orthemis ferruginea*), female
Blue Dasher (*Pachydiplax longipennis*), female
Wandering Glider (*Pantala flavescens*), female
Spot-winged Glider (*P. hymenaea*), female
Mexican Amberwing (*Perithemis intensa*), female
Variegated Meadowhawk (*Sympetrum corruptum*), female
Black Saddlebags (*Tramea lacerata*), female 



SE California/SW Arizona Dragonfly Blitz 2013 participants. Photo by Bob Miller.

Request for Gray Petaltail (*Tachopteryx thoreyi*) Specimens

This is a general request for assistance in collecting Gray Petaltail specimens for a population study that John Abbott, Jessica Ware, and I are performing. We have some questions about the relationships between populations of this species, and we are asking for fresh specimens from anywhere within its range for morphology and DNA work. We have already had help from colleagues in Ohio, Tennessee, and New York, but would like to have as thorough coverage as possible of the entire range of the species.

We would like to have 1–2 specimens (adults or nymphs) mailed to my attention at the address below. If you are able to help, please e-mail me at <cbeatty@scu.edu> and I can provide you with sample containers with preservative, a shipping container, and an account number to cover shipping costs. Thanks in advance for your help!

Christopher Beatty, Santa Clara University, 500 El Camino Real, Santa Clara, California 94061

Twelfth Annual Bitter Lake National Wildlife Refuge Dragonfly Festival

Bill Flynt, II <flynt@plateautel.net>

The Twelfth Annual Bitter Lake National Wildlife Refuge Dragonfly Festival was held on Saturday and Sunday, 7–8 September 2013. Bitter Lake National Wildlife Refuge is located seven miles northeast of Roswell in southeastern New Mexico. The Refuge offers over a hundred species of Odonata in its varied wetland habitats.

The Dragonfly Festival features Dragonfly Tours, Refuge Wildlife Tours, an Early Bird Tour, and arts and crafts, plus a Kids' Treasure Hunt and wildlife presentations in the Visitor's Center auditorium. Ode experts giving the Dragonfly Tours included Jerry Hatfield, Robert Larsen, James Lasswell, and Bill Lindeman.



Freshly emerged female *Pseudoleon superbus* (Filigree Skimmer) on exuvia. Photo by Bill Flynt, II.



Bitter Lake NWR Biologist Jeff Sanchez with a nymph latched onto his finger. Photo by Bill Flynt, II.

Refuge Biologist Jeff Sanchez headed up the Wildlife Tours, which provided hands-on experiences with snakes, turtles, vinegaroons, horned lizards (horny toad), fish, praying mantis and, of course, Odes. The weather was perfect this year and everyone had a great time.

For more information about Bitter Lake National Wildlife Refuge, please visit <http://www.fws.gov/refuge/Bitter_Lake/> or <<http://www.friendsofbitterlake.com/>>. 

Enallagma carunculatum (Tule Bluet), an Addition to the Virginia Damselfly Fauna

Steven M. Roble <Steve.Roble@dcr.virginia.gov> and Anne C. Chazal, Virginia Department of Conservation and Recreation, Division of Natural Heritage, 600 E. Main Street, 24th Floor, Richmond, Virginia 23219; William T. Pendleton, 11 Theresa Circle, Apt. 101, Verona, Virginia 24482-2931

The Tule Bluet (*Enallagma carunculatum*) is one of numerous, similar-looking blue and black bluets found in North America that are difficult to identify in the field without close examination. Its wide range extends across Canada from New Brunswick to British Columbia, and south in the United States to Kentucky, Oklahoma, New Mexico, Arizona, and California, as well as into Baja California (Westfall and May, 1996). In the Northeast, it occurs south as far as Maryland (Lam, 2004).

This species has not been previously recorded from Virginia, but it was listed as a potential member of the state's fauna by Roble (1994). During a visit to the Carnegie Museum of Natural History (Pittsburgh, Pennsylvania) in February 2013, Roble and Chazal learned that their hold-

ings included a small collection of pinned Odonata (n=37) from Virginia, most of which were collected by H. C. Will at Dayton, Rockingham County during 1930–1931. Will's name only appears on the 1931 collection labels (and on several without dates), but the 1930 labels are similar except for the lack of a collector's name. All but a few of these specimens were previously unidentified, including all of the damselflies. Closer examination revealed that two males collected on 14 June 1930 are referable to *E. carunculatum*, the first known specimens from Virginia, thus becoming the 19th *Enallagma* and 56th damselfly species recorded from the state, and extending the species' range in the East slightly to the south.

No extant populations of *E. carunculatum* are currently

known from Virginia, but Pendleton photographed an adult male *Enallagma* on 13 June 2010 at a pond near Grottoes, also in Rockingham County, which appears to be *carunculatum* on the basis of its color pattern and markings (lateral view closely matches the plate in Lam, 2004; see Figure 1 below). However, this record was not accepted by OdonataCentral due to the lack of close-up photographs of the male appendages or a voucher specimen. Several subsequent visits to this pond by Pendleton, plus one joint visit by Roble and Pendleton (15 June 2013), have yielded numerous observations of Familiar Bluet (*E.*



Figure 1. Possible male *Enallagma carunculatum* (Tule Bluet), Grottoes, Virginia, 13 June 2010. Photo by W. T. Pendleton.

civile) but none of *E. carunculatum*. This and other ponds in the region will be surveyed during 2014 in an effort to document a breeding population of *E. carunculatum* in the state.

Acknowledgments

John E. Rawlins, Curator of Invertebrate Zoology at the Carnegie Museum of Natural History, granted permission to study specimens in his care. A State Wildlife Grant from the Virginia Department of Game and Inland Fisheries and the U.S. Fish and Wildlife Service provided funds to support travel to Pittsburgh.

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Final Update on Dragonflies of North America, 3rd Edition

The long-awaited 3rd edition of the classic “Manual of the Dragonflies of North America” by Needham and Westfall (1955) is revised, with numerous additions and corrections for all the currently known species of North American dragonflies (Anisoptera), including all (over 365 species) from Alaska to northern Mexico and the Greater Antilles. The text is completely revised by Westfall and May, with over 200 added figures for all newly discovered species. The book includes an updated checklist to all species, a bibliography, glossary, distribution table, index, and keys to adults and known larvae.

The projected date for the 3rd edition is late January 2014. By special arrangement with the publisher, advance orders can still be taken now with FREE shipping & handling for \$130 US deliveries, \$165 Canada and Mexico, and \$170.00 elsewhere (includes shipping and handling). Florida residents must add 6.25% sales tax. This price is valid only for envelopes postmarked no later than 16 December 2013. Beginning 17 December 2013, prices will rise to \$145 US, \$180 Canada & Mexico, and \$185 elsewhere. On 1 January 2014, there will be another price increase to \$165. All prices include shipping and handling, but not the additional 3% PayPal fee.

All funds are USD and must be paid in advance by check or money order payable to “International Odonata Research Institute” or I.O.R.I. All profits will go to the International Odonata Research Institute.

VISA/Master Card orders can use PayPal to pay online (there is a 3% CC surcharge). You can also e-mail your order to <iodonata@gmail.com> and you will be reverse billed though your e-mail; a Paypal account is not necessary using this method.

Additionally, you can mail a check (USD only) to I.O.R.I., 4525 NW 53rd Lane, Gainesville, Florida 32653 USA, Attn: Bill Mauffray. Envelopes must be postmarked by 16 December 2013 to qualify for the discounted price.

A Possible Hybridized *Plathemis lydia* (Common Whitetail) × *Plathemis subornata* (Desert Whitetail) Specimen?

Jerry K. Hatfield <jerry.hatfield@umchealthsystem.com>

On the Friday before the 2013 Annual Dragonfly Festival at Bitter Lake National Wildlife Refuge in Roswell, New Mexico was to officially begin, I made a morning trip to Bottomless Lakes State Park in search of the resident population of *Phyllogomphoides stigmatus* (Four-striped Leaf-tail) and other interesting odonates to photograph. While there, I stumbled upon a rather odd-looking female *Plathemis* specimen.




View of potential *Plathemis lydia* × *P. subornata* hybrid. Photo by Jerry Hatfield



Potential *Plathemis lydia* × *P. subornata* hybrid. Photos by Jerry Hatfield

At first glance of the body, it appeared to be *P. lydia* (Common Whitetail). However, after managing several photos of this single specimen from various angles and reviewing them on my camera some time later, it appeared also to have markings on the body characteristic of *P. subornata* (Desert Whitetail). But what I discovered more intriguing was the additional dark wing patches interposed between the darkened wing tips and medial patches (the latter two

characteristic of *P. lydia*) giving the specimen almost an appearance of *Pseudoleon superbus* (Filigree Skimmer)! Although several authorities I later consulted (and provided with photo specimens for further examination) have concluded that the specimen is most likely a rare hybridized form of the two species in question, I suppose that any definitive conclusion could only have been confirmed with specimen in hand. 

Odonates of Fahnestock State Park, New York

Walter Chadwick <mrcnaturally@optonline.net>

Fahnestock State Park is in Putnam County, New York and consists of 14,086 acres. It is a multi-use park with a variety of habitats including forests, lakes, ponds, and fields. I made one trip there on 25 July 2012 to search for odonates, and in 2013 I made three trips (4 June, 12 July, and 17 August). The areas I searched were Pelton Pond and the Canopus Lake area. Most of the park is undeveloped but there is a beach, boat launch and campground. Maps and information are available at the park's headquarters.

I had not looked for odonates in Putnam County prior to 2012 and was curious as to what I would find. I found a total of 19 identifiable species and two species of questionable identification: a damner species flying over the field (about six) and a possible *Argia moesta* (Powdered Dancer), both seen on 17 August 2013. Nothing out of the ordinary but I did get one lifer, a *Celithemis fasciata* (Banded Pennant). In 2014 I intend to search different areas of the park at different times during the flight season. All the

trips were enjoyable and I got a lot of exercise wandering around. Below is a list of the species seen and identified.

Lestes eurinus (Amber-winged Spreadwing)
L. rectangularis (Slender Spreadwing)
Argia fumipennis violacea (Variable Dancer)
Enallagma traviatum (Slender Bluet)
Ischnura posita (Fragile Forktail)
I. verticalis (Eastern Forktail)
Gomphus exilis (Lancet Clubtail)
Celithemis elisa (Calico Pennant)
C. fasciata (Banded Pennant)
Erythemis simplicicollis (Eastern Pondhawk)
Ladona julia (Chalk-fronted Corporal)
Libellula cyanea (Spangled Skimmer)
L. incesta (Slaty Skimmer)
L. luctuosa (Widow Skimmer)
L. pulchella (Twelve-spotted Skimmer)
L. semifasciata (Painted Skimmer)
Pachydiplax longipennis (Blue Dasher)
Perithemis tenera (Eastern Amberwing)
Sympetrum vicinum (Autumn Meadowhawk)



Odonates Are All Over Facebook!

Those of you who enjoy staying connected via social media will be happy to know that the number of odonate-specific Facebook Groups pages is burgeoning. In addition to the DSA Facebook page, you can connect with fellow ode enthusiasts via FB groups with broad regional coverage, such as Western Odonata, Northeast Odonata, and Southeastern Odes, as well as more focused groups such as Minnesota Dragonfly Society and Odonata Ohio. Another FB group simply called Dragonflies seems to have world-wide coverage.

To find these groups, just type the name into the search bar at the top of your Facebook page. The discussions are always lively, friendly, and educational! If I have missed any Facebook sites you would like to see included in further announcements, please let me know at <celeste@xerces.org>.

A Mass Movement of Autumn Meadowhawks (*Sympetrum vicinum*)

Scott King <king@meadowhawks.info>

On 8 October 2013, a swarm of Autumn Meadowhawks (*Sympetrum vicinum*) coalesced in our backyard in Northfield, Minnesota. This concentration of dragonflies stayed put throughout the afternoon, busily feeding, and was gone the next day. Dozens of mature meadowhawks, both male and female, perched on garden fences, tree trunks, and grapevines, until all the good spots were taken. Dan Tallman, another Northfield resident, reported seeing them at his home on the opposite side of town on this day as well, so the swarm stretched at least several miles. Whether it was a county-wide cloud or a thin red line fallen by chance across the town like a dropped ribbon, there's really no way to know.

C. B. Williams, in his pioneering book *Insect Migration* (Collins New Naturalist Series, 1965), stated that "time and time again there has been forced upon my notice this problem of insect migration, not as a rare occurrence, but as something quite normal in the lives of millions of individuals belonging to hundreds of species, and recurring with regularity at certain seasons of the year in the same direction." This seems especially true of dragonflies. And yet, dragonfly migration, a topic Williams did discuss at some length, has proven difficult to document (a situation the recently formed Migratory Dragonfly Partnership is doing its best to remedy). The question concerning these

particular Autumn Meadowhawks is whether or not this massing and apparent movement qualifies as a migratory event. Certainly the dragonflies came from somewhere. And certainly they must have flown somewhere else. A single observation along the path between those two unknown "somewheres" doesn't provide much information, it's true. But perhaps, just thinking of migration as a common occurrence, like Williams, not a rare occurrence, is a proper start.



Autumn Meadowhawk (*Sympetrum vicinum*) perched on a fence post, 8 October 2013, Northfield Minnesota. Photo by Scott King.

Population Trends of Odonata Within the Chicago Region

Gareth Blakesley, Illinois Odonate Survey Coordinator <garethblakesley@yahoo.com>

Introduction

The Illinois Odonate Survey, formerly known as the Dragonfly Monitoring Survey, was established in 2003 and based at the Peggy Notebaert Nature Museum/Chicago Academy of Sciences for several years. The goal of the survey was to use modified Pollard transects (Pollard, 1977) to survey Odonata populations. Since 2011, after some reorganization, the Illinois Odonate Survey is now operated out of the Lake Katherine Nature Center and Botanic Gardens. During this time, current and previous data has been investigated. Methodologies on data collection are at <www.illinoisodes.org> and select reference citations are below.

Abridged Methodology

Data analysis falls into two categories: general trend data and species-specific trend data. The general trend data took the average number of species recorded per site visit for the year and compared this with other years. Species-specific trend data took the average number of a particular species (e.g. *Pachydiplax longipennis*, Blue Dasher) and compared that average per site per year with other years of that species.

Using this kind of data analysis has allowed us to take a citizen science based project that has a high volume of inconsistencies but also high data collection and infer trends. Variables of this kind of research include variation in the quantity of data input and in ability to correctly identify species. This high level of variability is to be expected in a citizen science-based project. The volume of information does enable researchers to make some assumptions about trends, though they may not be statistically robust, and allows investigation of further areas of data analysis.

Further analysis led us to compare species data of our 25 most common dragonflies with temperature and precipitation averages over a particular year. This information appears to show correlation with certain species occurrences with rainfall and temperature.

The region monitored includes the whole of Lake, Cook, Will, Dupage, McHenry and Kane counties. Most monitoring took place in 2009, after which there was a decline which could be due to changes in coordination and subse-

quent confusion arising from that change.

Results

Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
DAMSELFLY										
# of visits	N/A	202	138	128	201	269	300	231	101	56
Total Count	N/A	2741	5118	5491	13,251	13,793	13,479	11,452	4273	1392
Average	N/A	14	37	43	66	51	45	50	42	25
DRAGONFLY										
# of visits	72	186	128	130	250	279	317	225	101	56
Total Count	2488	10,855	4952	5621	15,888	16,184	14,455	15,076	5052	1505
Average	35	58	39	43	64	58	46	67	50	27

Table 1. 2003—2013 counts and average number of species across all counties.

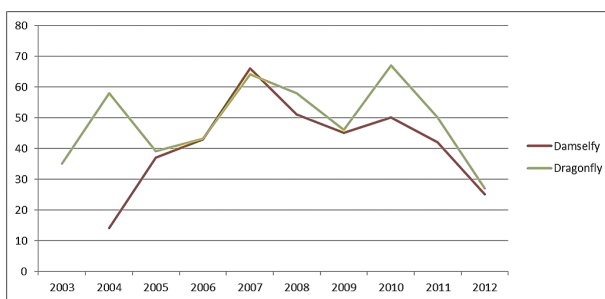


Figure 1. Average number of damselfly and dragonfly species in the survey region.

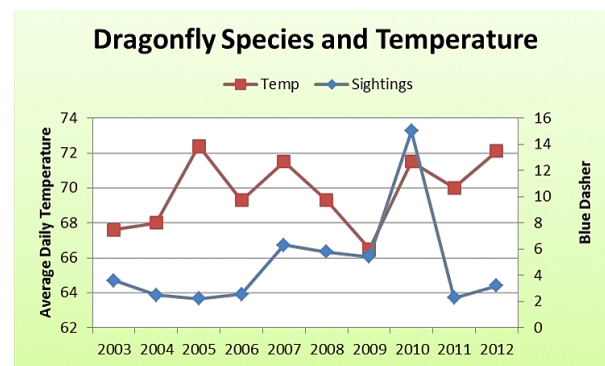


Figure 2. Possible temperature-dependence of Blue Dasher (*Pachydiplax longipennis*). Temperature is based on season averages, from first to last record of the season.

Discussion

Results are not conclusive, but they give baseline information from which inferences can be made. For instance, there are 23 common species of dragonfly in the Chicago region, with the top five most common in order being Common Green Darner (*Anax junius*), Blue Dasher (*Pachydiplax longipennis*), Widow Skimmer (*Libellula luctuosa*), White-faced Meadowhawk (*Sympetrum obtrusum*), and Common Whitetail (*Plathemis lydia*).

There are 25 common species of damselfly, with the top five most common in order being Eastern Forktail (*Ischnura verticalis*), Blue-fronted Dancer (*Argia apicalis*), Powdered Dancer (*A. moesta*), Familiar Bluet (*Enallagma civile*), and Stream Bluet (*E. exsulans*). A full species list will be posted on <www.illinoisodes.org>.

Rare or uncommon species that we have identified include Arrowhead Spiketail (*Cordulegaster obliqua*), Blue-faced Meadowhawk (*Sympetrum ambiguum*), Black Meadowhawk (*S. danae*), Elfin Skimmer (*Nannothemis bella*), and Hine's Emerald (*Somatochlora hineana*). Hine's Emerald is listed as Endangered under the federal Endangered Species Act (FE) and is considered Endangered at the state level (SE), and Elfin Skimmer is considered Threatened at the state level (ST).

Blue Dasher (*Pachydiplax longipennis*) and Common Green Darner (*Anax junius*) are possible precipitation-dependent species, and Blue Dasher, Eastern Amberwing (*Perithemis tenera*) and Black Saddlebags (*Tramea lacerata*) are possible temperature-dependent species:

Clearly the data set is not complete and needs further research, but this gives us a good start to ask the right questions. Declines in trends in 2009 may be in part related to a drop in the number of monitoring volunteers.

A Hovering Darner: Bobbing With Bursts and Orbiting in Cycles

James S. Walker, Anacortes, Washington <jswphys@aol.com>

This summer I had the opportunity to enjoy a sunny afternoon of dragonflying at Beaver Pond near Winthrop, Washington. At one point I decided to take a rest, so I sat on a bench near the shore of the pond. Keeping me company was what I like to refer to as a Happy-face Darner, though it is more generally known as the Paddle-tailed Darner (*Aeshna palmata*). This particular darner was hovering repeatedly at eye level, just a few inches from my face (Figure 1), almost inviting me to take a video.



Figure 1. Paddle-tailed Darner (*Aeshna palmata*); frame from the video used in this analysis of hovering.

Future research


With more data collected in future years and additional statistical analyses, the quality and reliability of the information would improve. The current information may provide details on specific sites and their changes over time, but no analysis of this has been done yet. This can be examined by individual or total species and their changes over time at particular site.

Additional monitoring could be conducted at sites where volunteers missed a year or two, as well as continuing data collection at sites where data has been consistently collected.

Acknowledgements

I would like to acknowledge the help and support of Doug Taron, Craig Stettner, Sandra McNicholas, Doug Kman, Shamim Graff, Beth Johnson, and of course all those who volunteer their time to help monitor Odonata.

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At first I demurred; after all, I have plenty of good videos of hovering. But then, with this excellent vantage point, I noticed something about the hovering that I had been aware of before, but hadn't given much thought. As the darner hovered, it bobbed up and down. This isn't too surprising, given that it hovers with wings that beat up and down. What I hadn't thought about before, however, is that the bobbing motion has a much lower frequency than the wingbeats. After all, I could see the up and down bobbing motion clearly, but the wings were beating so fast they were just a blur. Why should these two frequencies be so different?

The physicist in me immediately began to wonder about possible physical mechanisms. Could there be some nonlinear dynamics involved here? Perhaps a sequence of period doublings? Whatever the case, the darner had now convinced me to take a video, and the rest, as they say, is history.

This article presents the insights obtained from the five-second video I took of this hovering darner. The results include “bobbing up and down with bursts,” using alternating strong and weak wingbeats, and “orbits” of roughly circular motion during each up-and-down cycle.

Analysis of the Video

The video was taken at the normal rate of 30 frames per second, and lasts for about five seconds. The darner bobs up and down roughly 20 times during the video, and then takes off rapidly at the end. The entire sequence, consisting of 150 data points, is shown in Figure 2. The “cluster” of points represents the hover, and the points going off to the right show the takeoff.

The data points in Figure 2 were obtained as follows: first, all 150 frames of the video were captured as independent jpeg files; next, I measured the number of pixels from a reference point in the background (the crossing of two prominent branches) to a fixed point on the body of the dragonfly. This allowed me to correct for any incidental movement of the camera during filming. I used several different reference points on the dragonfly’s body, including the tip of its appendages, its head, and its auricles, and the results were virtually identical in all cases.

The next step was to convert from pixels to centimeters (cm). This was done by measuring the length (in pixels) of the darner in my video, and then associating that number of pixels with the average length of a Paddle-tailed Darner, which I took to be 7.0 cm. Finally, the “zero” for both the horizontal and vertical positions was chosen to be their average value. I now had a nice set of data points, and was ready to proceed.

Flight Level During Hovering: Bobbing With Bursts

The first plot I did was of the darner’s flight level (its vertical position) as a function of time. The results from the beginning of the video to just before the takeoff are shown in Figure 3. These data points correspond to the “cluster” in Figure 2. Two features are immediately apparent from Figure 3. First, hovering is characterized by a series of up

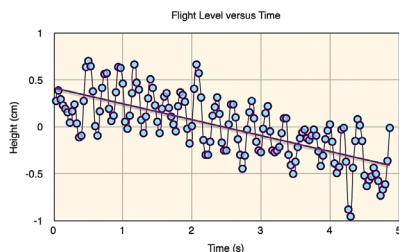


Figure 3. Flight level vs. time for ~5 seconds of hovering.

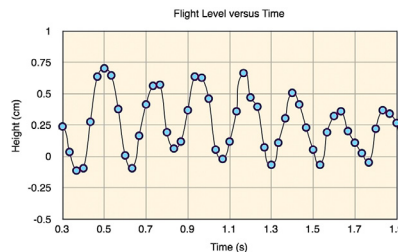


Figure 4. Details of flight level vs. time during hovering.

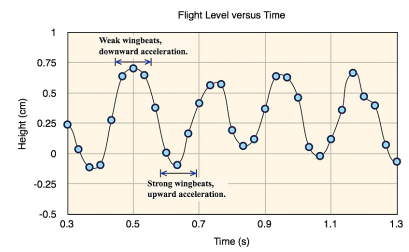


Figure 5. Strong (rising) and weak (dropping) wingbeats during hovering.

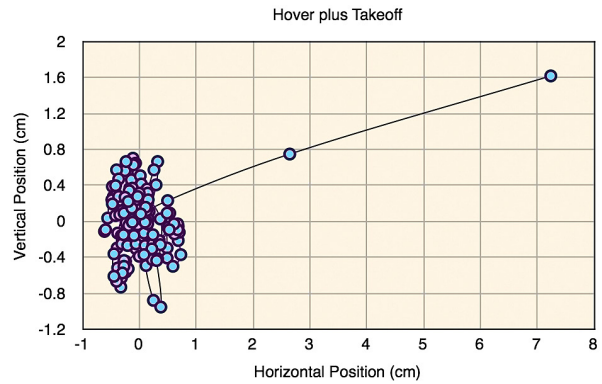


Figure 2. Position points for a hovering darner.

and down displacements, as expected. Second, the average height of the darner drops at a steady rate of about 0.16 cm/s as it hovers. I hadn’t noticed this drop in height when observing the darner in real time, but others have commented on this type of behavior. Corbet (1999) noted “hovering is sometimes combined with slow, continuous displacement, horizontally or vertically”.

To get a better look at the bobbing motion, I expanded the time scale (Figure 4). My first impression on seeing this result was surprise at the well-defined frequency of the bobbing motion. A good mathematical representation for this motion is $y(t) = A \sin(\omega t)$, where y is the vertical position (that is, the height), ω is the angular frequency, t is the time, and A is the amplitude of motion. For the darner in the video we have $A = 0.40$ cm. In addition, the period of the motion is $T = 0.22$ s, and hence the angular frequency is $\omega = 2\pi/T = 29$ rad/s (Walker, 2010).

The acceleration of the darner is obtained by taking two time derivatives of $y(t)$; that is, $a(t) = d^2y/dt^2$. Evaluating these derivatives yields $a(t) = -A\omega^2 \sin(\omega t)$; the minus sign simply indicates that the acceleration is in the opposite direction to the displacement from the average height. It follows that the maximum magnitude of the acceleration is $a_{max} = A\omega^2 = 3.4$ m/s² (Walker, 2010). This is just over 1/3 of the acceleration due to gravity. Thus, the darner is not in free fall when it accelerates downward. Still, its wingbeats are weak as it drops, resulting in a net downward force, and the wingbeats are strong as it rises (see Figure 5).

The darner does about five bobs per second, and has a wingbeat frequency of about 35–40 beats per second. Thus, it appears the darner flaps its wings in “bursts,” with roughly four strong beats alternating with four weak beats. Perhaps the four weak beats give the darner a chance to rest a bit on the wing. The notion of the darner resting during its hover also seems to fit in well with the overall drop in altitude mentioned earlier.

Cyclic “Orbits”

The next step in the analysis was to plot both the horizontal and vertical positions of the darner as it hovered. The result was a series of roughly circular “orbits” for each bobbing cycle (Figures 6 and 7). The orbits produced by the darner were all carried out in a counterclockwise direction. This doesn’t matter too much, because the same orbits would appear to be clockwise if viewed from the other side of the darner. What is important, however, is that the darner has a net forward displacement as it drops in altitude, and a net backward displacement as it rises in altitude. That is the same regardless of the side from which the darner is viewed.

One series of bobbing motions was of particular interest, and the height vs. time plot for this series is shown in

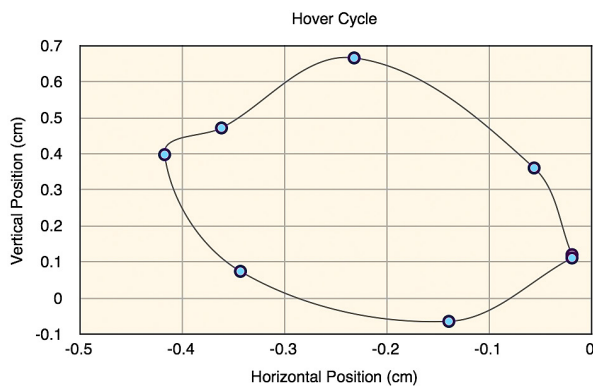


Figure 6. A hover cycle executed by the darner. The “orbit” is traversed in a counter-clockwise direction.

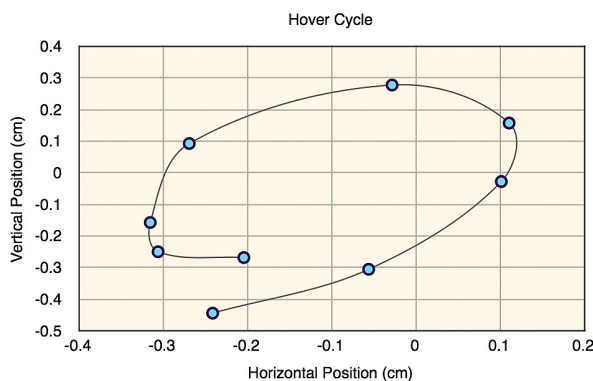


Figure 7. Another example of an “orbital” hover cycle.

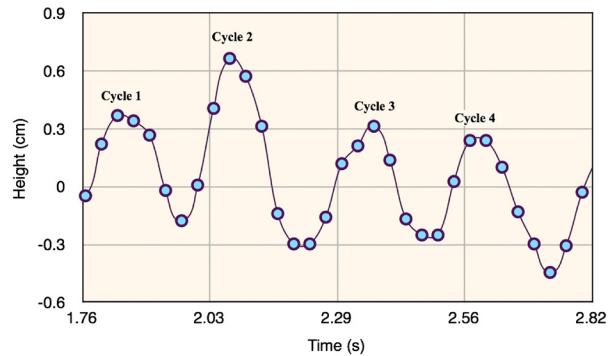


Figure 8. A series of bobbing cycles, including the “oddball” cycle 2.

Figure 8. Cycles 1, 3, and 4 are fairly typical, but cycle 2 is odd. It goes rather high, and takes a greater time to complete than the other cycles. The orbits for cycles 1, 3, and 4 are shown in Figure 9, and the orbit for cycle 2 is shown in Figure 10. Notice that the orbit for cycle 1 has the typical single-loop topology. The orbit for cycle 2 is different, however; it’s a loop-the-loop, consisting of two small loops, each traversed in the same sense as the large loops. After executing the loop-the-loop, the darner went back to its usual single-loop orbits, as seen in cycles 3 and 4.

Finally, a collection of orbital cycles is presented in Figure 11. The center panel shows the motion of the darner just before and during takeoff, and the surrounding panels show different orbits during the five seconds of hovering. This figure is a favorite of mine—after all, it’s nice to be able to publish a figure in a dragonfly journal that is actually drawn by the dragonfly itself!

Conclusions

A number of interesting features are observed in the hovering video of this darner. One should keep in mind, however, that these results are from a single darner hovering for just five seconds, and hence the results obtained may or may not be typical of other darners, or of other families of dragonflies. Further studies will clarify the matter. In the meantime, the basic features of the motion displayed by this hovering darner are as follows:

- Hovering is not done at constant altitude. It consists of an up-and-down bobbing motion with a frequency of five bobs per second. The average height of the hover decreases with time.
- Bobbing is not at the same frequency as the wingbeats, nor is it random. It is at a well-defined frequency that appears to be produced by a burst of several strong wingbeats followed by a resting phase of several weak wingbeats.

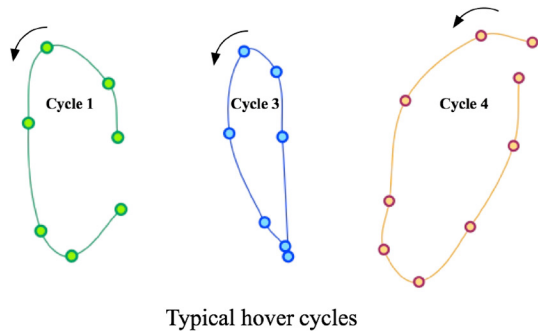
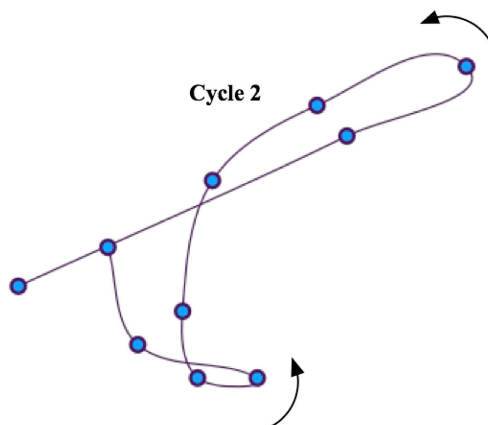


Figure 9. Single-loop hover orbits for cycles 1, 3, and 4 in Fig. 8.



Loop-the-loop cycle

Figure 10. "Loop-the-loop" hover orbit for cycle 2 in Fig. 8.

In addition to the up-and-down vertical motion, hovering also includes forward and backward motion in the horizontal direction, resulting in orbits for each cycle.

A number of other studies have looked at hovering, and at other aspects of dragonfly flight as well. Some hovering analyses are done with computer simulations based on the Navier-Stokes equations (Wang, 2000); others used tethered dragonflies (Wang and Russell, 2007). The study presented here is based on a free-flying dragonfly, and includes results "drawn" by the dragonfly itself.

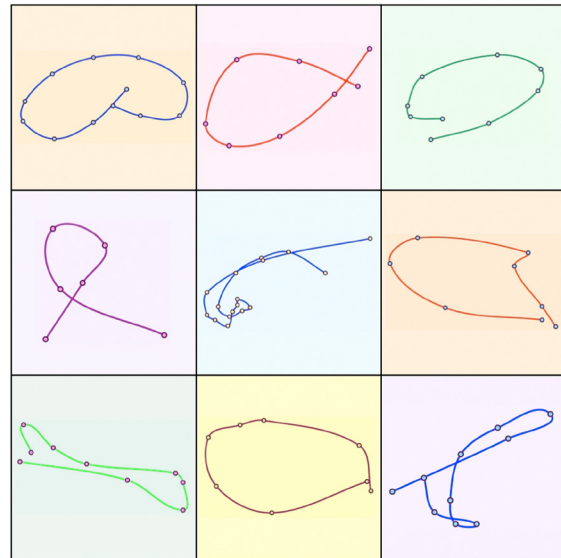


Figure 11. Hover orbits executed by the darner. The center panel shows takeoff.


Acknowledgements

I would like to thank Dennis Paulson for his encouraging feedback on this research, and Betsy Walker for her help with the project and many useful conversations.

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Online Material

The video of the hovering darner is at <http://www.youtube.com/watch?v=r8oLKmfMLBc>. 

Request for Early Emergence Records of Anisoptera

I am gathering information on early season emergence records of anisopterans from 2012–2015 (ARGIA 24(4): 27). If you have early emergence records for dragonflies within that range, please send them to me along with the genus, species, and GPS coordinates for the location. If you have voucher specimens, please report them as well.

Thank you!

Richard Groover <rgroover@reynolds.edu>

The Meadowhawks (*Sympetrum*): America's Oldest Problem Odes; or, the Romance of Hybridization

Thomas (Nick) Donnelly, Binghamton, New York <tdonelly@binghamton.edu>

If you got your start in dragonfly study along the Atlantic seaboard of the U.S., chances are that one of your major problems has been identifying the meadowhawk species. Several are quite easy, but the small complex of Ruby, Cherry-faced, and White-faced Meadowhawks (a.k.a. *Sympetrum rubicundulum*, *S. internum*, and *S. obtrusum*) presents, as Blair Nikula put it in his excellent Stoke's Guide, "... an intractable field problem". The White-faced Meadowhawk (*S. obtrusum*) provides some problems of its own, but I want to focus on the first two.

The earlier American odonatists didn't recognize a problem with the meadowhawks. Philip Calvert, whose "Catalogue of the Odonata (Dragonflies) of the vicinity of Philadelphia" (1893) was America's first field guide, only recognized one species ("*rubicundula*") in the middle Atlantic coastal region. E.B. Williamson, who published North America's second field guide, "The Dragonflies of Indiana" (1900), also only recognized a single species ("*rubicundulum*"). I guess we're all in good company.

But it was E.B. Williamson (1933) who later got it right: there are two species ("*assimilatum*", a.k.a. *rubicundulum*; and "*decisum*", a.k.a. *internum*) which co-exist over a wide range, including much of the eastern U.S. (his illustrated examples were from Michigan). So why have so many people recently failed to recognize two distinct species in much of the eastern U.S.?

The answer seems rather simple: especially near the eastern coast, at a given locality one encounters a single variable dragonfly, rather than two. Collectors who persist find a great deal of variation within what appears to be a single species, but only rarely does one find two distinct forms occurring together in these zones. The answer has been

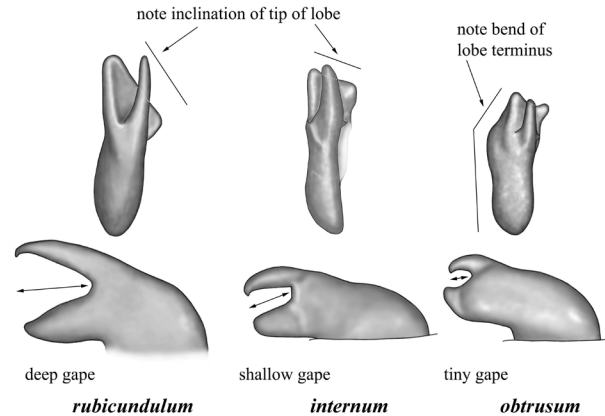


Figure 1. Hamules of the three species of "Ruby Meadowhawks". Upper series: ventral microscopic views; lower series: lateral views.

hiding in plain sight for more than a century: the two species hybridize extensively near the coast, so that one has to be very lucky or very persistent to find two distinct, co-occurring species. Recently, some odonatists, such as Richard Orr in central Maryland, Hal White in northern Delaware, and Bob Barber in southern New Jersey, have collected series of these insects with almost no clear representation of either "pure" species, nor even two co-existing species.

The criterion I have been using for this determination is entirely structural and involves the male hamules. The ventral view is most distinctive, but almost all manuals and guides show only the lateral view. I have found a few instances of inclined views; the best is Williamson (1933). As far as I have been able to determine, the purely ventral views shown here are the first ever published. Face color is of no value, especially as the so-called Cherry-faced Meadowhawk (*S. internum*), throughout its vast range, is

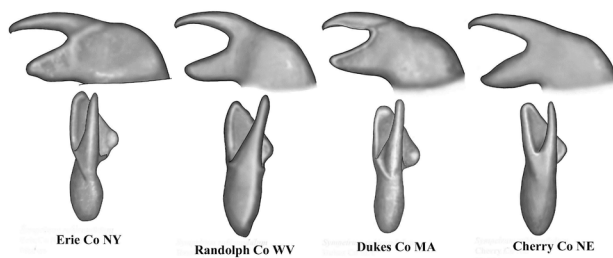


Figure 2. Four examples of *S. rubicundulum* (Ruby Meadowhawk), showing limited variation of the hamule. The example from Massachusetts (Cape Cod) was difficult to find, as hybrids are common there.

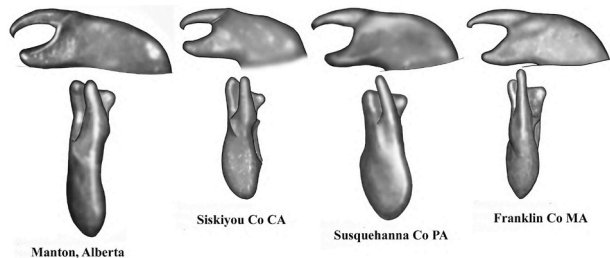


Figure 3. Four examples of *S. internum* (Cherry-faced Meadowhawk). Two (California, Alberta) were taken beyond the range of *S. rubicundulum*; two (Pennsylvania, Massachusetts) were taken within the range of *S. rubicundulum*.

either tan-faced (east) or pink-faced (Great Lakes west to Montana), dull white, dorsally dark with a small red spot, or even conspicuously red in a minor part of its range. The Ruby Meadowhawk (*S. rubicundulum*) is also variable, but is generally darker-faced than the Cherry-faced.

Hybrids have been recognized within the Odonata for some time. Asahina (1974) listed all the examples known to him. The most frequently encountered genera were *Sympetrum* (Asian species) and *Anax*. Corbet (1999) adds little to this but opines “Hybrid Odonata do exist but are very rare.” In the case of the meadowhawks along the U.S. Atlantic coast, they are apparently not only common but dominant in many places. Hybrids between these species are less frequent inland. I have seen many examples from the Hudson Valley of New York, and recently identified a cluster in Schuyler County, New York. These specimens were taken a few months ago from the southern end of Cayuta Lake by Fred Sibley. I asked him if he had specimens from previous years, and he replied that his were all in the FSCA (Florida State Collection of Arthropods) in Gainesville. Then I found that I had taken a specimen from this locality in 1951—and it turned out to be a hybrid! As you can imagine, this raises yet another question—how persistent over time are any taxonomic characters?

These observations are more significant when one observes that in most places where their ranges overlap, the two species occur together (in the same county, or even the same property) with no evidence of hybridization. In my own material, *S. rubicundulum* and *S. internum* are found together or nearly together in several places in western New York. Both species occur in very close proximity in Cherry County, Nebraska and Logan County, Colorado, and in the vicinity of Detroit, Michigan. Also, I have seen extensive examples in several collections.

Thus we have the interesting case of two species hybridizing dominantly, if not universally, in some areas of the eastern U.S., but living side by side with no evidence for hybridization elsewhere! There is a parallel case discussed in Donnelly (1999), in which I note that central New York populations of *Enallagma cyathigerum* (= *annexum*; Northern Bluet) and *E. vernale* (Vernal Bluet) were completely hybridized.

The conclusion is inescapable that in some areas hybridization is so abundant that the hybrids must themselves be fertile! Zoologists have almost universally followed the judgment of Ernst Mayr, author of the Biological Species Concept, who repeatedly downplayed the significance of

hybridization in his concept of biological species and implicitly rejected fertile hybrids for animals. This stands in contrast to botanists, who regard hybridization as an important phenomenon throughout the plant world, with the occurrence of fertile hybrids so widespread as to be without particular interest.

Thus, these putative odonate hybrids deserve a careful second look and should be viewed not as some sort of freaks, but as important players in the ever-changing phenomenon of evolution itself.

Acknowledgements

It should be noted that none of this could have been accomplished without extensive collection and preservation of specimens. I am grateful to many individuals who furnished specimens for my study. In addition to those named above, Blair Nikula, Oliver Flint, Rosser Garrison, Kathy Biggs, Dennis Paulson, Mike May, Bill Prather, Julie Craves, Fred Sibley,

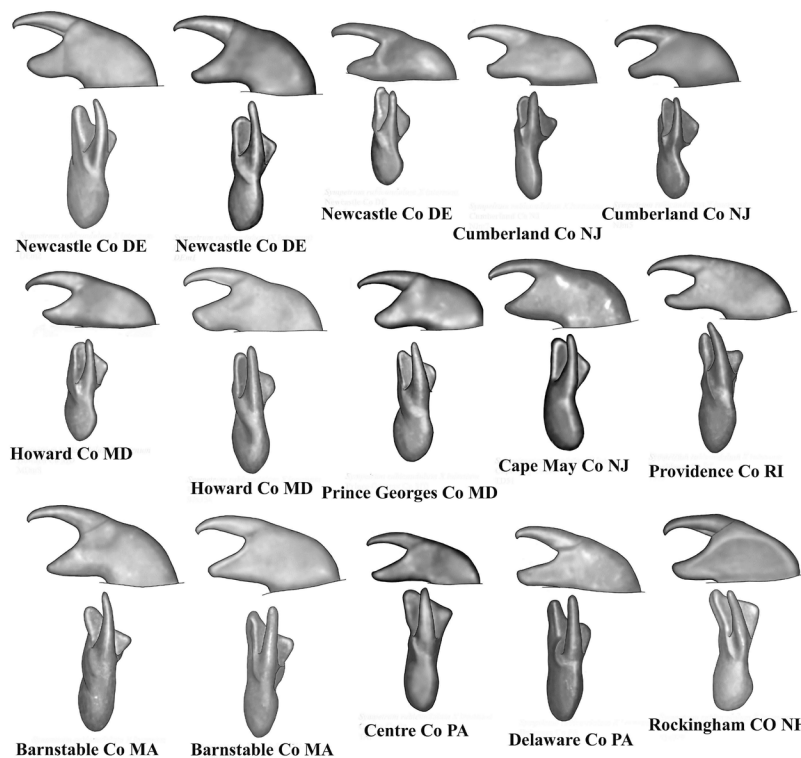



Figure 4. Fifteen examples of hybrids between *S. rubicundulum* (Ruby Meadowhawk) and *S. internum* (Cherry-faced Meadowhawk). Note that several are close to the pure species, but the entire series (these and figures not shown) spans the range between the species.

Pam Hunt, Ginger Brown, and Kevin Hemeon furnished material of special importance.

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In Memory of Burton (Burt) Clyde Cebulski, 1946–2013

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Burt Cebulski, an avid enthusiast of Odonata, lost a battle with esophageal cancer on 29 October 2013. Burt was a native Ann Arborite, born on 6 October 1946. He graduated from Pioneer High School and went on to receive a B.S. degree from Michigan State University. He did post-graduate work at Central Michigan University, and then started teaching. Burt taught biology, physics, general science, and environmental science at Adrian High School for 33 years, and was an effective coach in cross country for 29 years. The Adrian Cross Country Invitational was re-named as the Burt Cebulski Invitational in 2012, to honor him as a runner, a coach, and an example of a caring person. Burt once ran marathons, and just missed qualifying for the Boston Marathon, which totally surprised me when he discussed that part of his life a few years ago. Burt retired from teaching in 2004 and became more involved in working on Odonata, attending various meetings and conferences. Burt and his wife Kerry, who married in 1976, shared a love for camping, motorcycling, making glass beads, and enjoying the outdoors.

I first met Burt in 1981 when he came to the Museum of Zoology to visit Leonora K. (Dolly) Gloyd. He became interested in Odonata in the summer of 1976 while a graduate student at Central Michigan University. Dolly's tutelage of Burt continued for about 10 years; he collected specimens and deposited them in the University of Michigan Museum of Zoology (UMMZ), and developed a technique for collecting Odonata nymphs from under the ice of lakes and ponds. He eventually grew very interested in darners (Aeshnidae) and started rearing them from eggs. This interest grew into a lengthy project of rearing parasitic wasps from the eggs of *Aeshna tuberculifera* (Black-tipped Darner).

Over the span of 20 years, Burt made many visits to a

favorite spot in Alger County, Michigan to collect material for his study of the egg parasites. After his diagnosis of esophageal cancer in January of 2012, Burt asked me to co-author his manuscript to ensure that his project would get published. He and his family were very pleased to see



Burt Cebulski (left) and Ken Tennesen at the 2008 Great Lakes Odonata Meeting (GLOM) in Munising, Michigan.

the paper appear in *Great Lakes Entomologist* in early September 2013. I know it meant a great deal to Burt to see it in print, and I am happy to have been a part of it. In addition to his work on the eggs, he collected over 700 specimens of adult and immature Odonata from Michigan, which are still being cataloged before they are added to the UMMZ collection as part of the Michigan Odonata Survey (MOS) project. Burt also helped students with Odonata projects at Siena Heights College in Adrian, Michigan.

Burt was, by any definition, a very interesting person with diverse interests. He could look like a scruffy biker dude, but had a warm and generous personality. Anyone seeing the twinkle in his eye would know he had a great sense of humor. He was a lot of fun out in the field with an insect net, and didn't always reveal his high level of knowledge about Odonata, preferring to be in the background. He enjoyed hunting and fishing, and was a very competent naturalist. Most people did not get to see the tattoos he had of dragonflies across his back, and he had some



Burt's nymph tattoo in 2009.

amazing ink on his arms of the parasitic wasps that he reared. My favorite, though, was the tattoo on his forearm that was based on a card to Dolly Gloyd from Belyshev, a Russian odonatologist. I had published a scan of the card in the newsletter *Williamsonia*, and Burt surprised me in March 2009 at a Michigan Entomological Society gathering with his new tattoo. It was far better than the card. He also brought dragonfly-shaped cookies that day.

Burt's last Great Lakes Odonata Meeting (GLOM) was in Sault Ste. Marie, Ontario in July 2012. He was feeling well enough to attend, and we had a great time driving around, telling stories, collecting Odonata, and just being



Burt at GLOM 2012 in Ontario, Canada.

out in the field together. Standing around a pond or a stream waiting for a dragonfly to come flying by is a bit like fishing, and we discussed all kinds of topics while out in the field. Burt attended several DSA and most of the GLOM meetings in previous years—in fact, more than I did. He was a good ambassador for the study of Odonata, and introduced his son-in-law Greg Bauman to them. Greg is now enthusiastically collecting specimens for the MOS in Marquette County. Burt touched a lot of people through his life as a teacher, coach, mentor, naturalist, cyclist, outdoorsman, and artist. It is sad to lose a friend too early, and Burt will be missed most of all by his wife Kerry, his daughters Erin and Chelsey, and his extended family.

Odonata Publications of Burt Cebulski

- Cebulski, B. 2009. Collecting odonates under the ice. *ARGIA* 21(3): 8–9.
- Cebulski, B. 2009. *Hetaerina titia* (Smoky Rubyspot) no longer rare in southern Michigan. *ARGIA* 21(4): 21–22.
- Cebulski, B.C. and C.J. Cebulski. 2011. Dragonflies of Ives Road Fen Preserve. *ARGIA* 23(1): 14–15.
- Cebulski, B.C. and M.F. O'Brien. 2013. Observations on egg parasitism of *Aeshna tuberculifera* (Odonata: Aeshnidae) by Eulophidae, Trichogrammatidae, and Mymaridae (Hymenoptera) in Alger County, Michigan. *Great Lakes Entomologist* 46(3–4): 145–153. 🦋


Photos Needed for ARGIA

The next ARGIA cover photo could be yours! Contact the Editor <celeste@xerces.org> if you'd like to make a contribution for the ARGIA front and back covers. Submitted photos may be saved for later issues; if so, the photographer will be contacted again to be sure that publication is still allowed. We need high-quality images with a resolution of 300 ppi at about the sizes you see printed in this issue (6.5 inches in width). Please check that your images will have high enough resolution for printing before sending them. Images in TIFF format are best, but JPEGs work too if they are high quality and compression artifacts are limited. Please send photos as attachments (up to 15 MB) or via a file transfer service as opposed to being embedded in the body of an e-mail.

Final 2013 Treasurer's Report

Jerrell Daigle <jdaigle@nettally.com>

We began the year 2013 with a balance forward of \$20,886.76. Currently, we have a DSA membership totaling about 400. Income and expenses are lower so far due to the new cost structure made possible by the lower cost of electronic publication of ARGIA. Our expenses for the year included ARGIA issue 24:4 (\$1,055.45), incorporation fees (\$61.25), and annual business meeting expenses for the Prince Albert, Canada meeting (\$709.70). The 2013 Donnelly travel grant was unclaimed. We had a one-time permit fee expense (\$100.00) at the SE regional meeting

in Virginia and a library cancellation refund of \$45.00. In addition, we submitted payment of \$1,000.00 to the University of Texas for computer storage space for ARGIA and BAO. Also, it was decided that future expenses must be approved by two members of the Executive Committee, other than the Treasurer. Treasurer's reports will be more detailed and more frequent next year. Finally, it is anticipated that we will finish the year with a balance of approximately \$23,000. 

Odonata in the News

Odonata in the News is compiled by the Editor. Please feel free to send alerts about noteworthy items, news stories, and popular or scientific publications to <celeste@xerces.org>. A sampling of newsworthy odonata includes:

A description of the nymph of *Gomphus lynnae* (Columbia Clubtail) and new records for the species that expand its known distribution: K. J. Tennessen and S. A. Valley. 2013. New Records for *Gomphus lynnae* Paulson (Odonata: Gomphidae), with a description of the nymph. Proceedings of the Entomological Society of Washington 115(4): 333–441.

An update on a study in which tiny backpacks are glued to dragonflies to monitor their neuronal activity as they intercept their prey in flight: <<http://news.nationalgeographic.com/news/2013/10/131008-dragonfly-backpacks-neuroscience-brain-motion/>>.

An examination of the relationships between the size of female damselflies and their egg size and hatching success: K. S. Baker and N. E. McIntyre. 2013. Associations between size and fitness of adult females in the model odonate *Enallagma civile* (Odonata: Coenagrionidae). The Southwestern Naturalist 58(1): 91–96.




A still image of a dragonfly carrying an electronic backpack; screen capture from a video made by National Geographic.

Findings that a non-native lung fluke parasite introduced to control invasive bullfrogs on Vancouver Island, British Columbia, Canada, has adapted to using native damselflies as an intermediate host, especially *Enallagma carunculatum* (Tule Bluet) and *Ischnura cervula* (Pacific Forktail): C. W. Novak and T. M. Goater. 2013. Introduced bullfrogs and their parasites: *Haematoloechus longiplexus* (Trematoda) exploits diverse damselfly intermediate hosts on Vancouver Island. Journal of Parasitology 99(1): 59–63.

In a “double-whammy” effect, those invasive bullfrogs on Vancouver Island are also making quite a meal of the local odonates: K. Jancowski and S. A. Orchard. 2013. Stomach contents from invasive American bullfrogs *Rana catesbeiana* (= *Lithobates catesbeianus*) on southern Vancouver Island, British Columbia, Canada. NeoBiota 16: 17–37.

A brief history of odonate monitoring in Michigan and an account of an 11 year survey of adult odonates in highly urban Wayne County that yielded 90 species; this is over half the total number known for the state and includes several Species of Greatest Conservation Need (SGCN) in the Michigan wildlife action plan: J. A. Craves and D. S. O'Brien. 2013. The Odonata of Wayne County, MI: inspiration for renewed monitoring of urban areas. Northeastern Naturalist 20(2): 341–362.

The discovery of tiny spikes (240 nanometers high) on dragonfly wings that appear to pop bacterial cells that try to attach to the wing has inspired scientists to create microspikes on silicon surfaces in the hopes that they may act as an antimicrobial coating for medical devices: <<https://www.sciencenews.org/article/material-inspired-dragonfly-wings-bursts-bacteria>>. 

Attaching in Tandem: The Role of “Wing Grabbing” and “Wing Pulling”

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One of the most interesting aspects of dragonfly behavior is the fact that they mate like no other creatures on Earth. They begin by attaching in tandem, and from there they maneuver into the wheel position. After mating, many species remain in tandem for quite some time as the eggs are laid. Clearly, tandem coupling is of crucial importance to dragonflies.

As a result, the actual process of attaching in tandem is of some interest. It looks fairly straightforward, but the connection usually happens so quickly that few details can be discerned. In this article, I present observations from a slow-motion video of darners attaching in tandem. As we shall see, the male “grabs” the female’s forewings, and then “pulls” them forward to an extreme extent as it completes the attachment process.

Before the Attachment

The observations reported in this article come from a slow-motion video ($\frac{1}{4}$ speed) of a female Paddle-tailed Darner (*Aeshna palmata*) laying eggs on a floating log. She was spending a lot of time probing the log for suitable places to lay eggs. When satisfied with a location, she would visibly bear down as she made a cut into the wood.

There were several male *A. palmata* patrolling the area, and as I filmed the female, one came swooping in and literally pounced on her, landing on her thorax. Figure 1 shows the male just as he made contact with the female. It was a sudden impact for the female, and the male immediately began to bend his abdomen downward and forward to bring his appendages toward the female’s head. It took only 0.67 s to complete this action, and the male then proceeded with the attachment process in earnest.



Figure 1. A male darner makes first contact with a female on a log.

The Attachment Process

The process of attaching in tandem can be thought of as occurring in three phases. The first phase appears to be a preliminary attachment; the second involves “grabbing” and “pulling” of the female’s forewings; and the third is the completion of a firm attachment to the female’s head.

I flesh out the details of each of these phases below.

Phase 1: Preliminary Oscillations (0.36 s) This phase begins when the male first brings his appendages into contact with the back of the female’s head. After apparently latching onto the female’s head, the male then executes a series of 8–9 sideways oscillations of his abdomen with a frequency of roughly 60 Hz. One might think this would complete the attachment, but there is more to come.

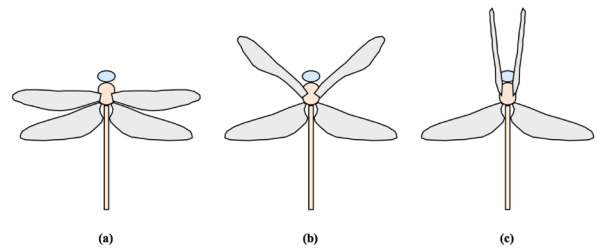


Figure 2. Female wing positions during attachment. (a) Normal wing position. (b) Wing grabbing begins and the forewings are pulled forward. (c) Final phase of wing pulling, where forewings point straight forward.

Phase 2: Wing Grabbing and Wing Pulling (0.60 s) At the beginning of phase 2, the female’s wings are in their normal position, as illustrated in Figure 2(a). The male now reaches his two rear legs downward, putting them between the female’s forewings and hindwings. He then begins to grab her forewings and pull them forward.

When the forewings reach the position shown in Figure 2(b), the legs are pulling quite hard on the forewings, causing a considerable distortion in their membranes. In fact, this particular female had a tear in the middle of her left forewing, into which the male’s rear leg fit nicely. It appears that tears like this on a female’s forewing, which might be chalked up to a bird attack, could instead be a sign of the rough handling that occurs during attachment.

The male continues to pull the female’s forewing toward her head. Eventually, her forewings are pointing directly forward, as in Figure 2(c), and the plane of their membranes is vertical rather than horizontal. The male now does a “bear hug” on the female, pressing her forewings firmly against her thorax. The male holds the wings stationary against the thorax during this “bear hug”, and remains stationary himself, for about 0.22 s.

Phase 3: Final Oscillations (0.29 s) In phase 3, the male executes a series of roughly 15 side-to-side oscillations of his abdomen, as he did in phase 1. The oscillations are

again at about 60 Hz. At the end of phase 3 the male has a good attachment; he releases the female's forewings, and then begins to flap his wings.

After the Attachment

Although the male began to flap his wings at the end of phase 3, he didn't take off, as the female held on too tightly to the log (Figure 3). The male tried and tried to dislodge the female; a few times he even fell into the water during his efforts. After 7.5 s of futile attempts to takeoff, the male finally detached from the female and departed the scene.

Additional Observations

After observing this "wing grabbing" and "wing pulling" behavior, I looked more carefully at other female darners that were potential mating partners for a roving male. I have seen the same behavior in three additional cases now, clearly indicating that grabbing the forewing and pulling it forward are standard parts of their attachment process.

I haven't had much chance to observe attachment in other dragonfly families yet. However, I looked back over earlier slow-motion videos to see if the behavior appeared in any of them, and one of my videos did show wing grabbing. This involved a pair of Black Saddlebags (*Tramea lacerata*) that I filmed doing their egg-laying behavior of the male releasing the female, letting her drop to the water to lay an egg, and then immediately reattaching in flight. The video showed clearly that the male grabbed the female's forewings and pulled them forward as he re-attached. He pulled the forewings into the position shown in Figure 2 (b), which prevented them from flapping until attachment was accomplished.

I've also found a few published results that may be related to the behavior reported here. For example, Corbet (1999; pg. 276) reports "... when a male *Anax junius* in tandem is attacked (bitten) by another male, the tandem male shakes its abdomen in a convulsive movement detectable to the human observer only when portrayed in slow motion." This sounds similar to the oscillations observed in phases 1 and 3, though perhaps performed for a different reason.

The following may be somewhat related to interactions with the female's wings. Corbet (1999; pg. 485) states that when a male *Ischnura graellsii* (Iberian Bluetail) detects a female he rushes at her "... grasping and sometimes even biting her wing bases and simultaneously beating her wings with his abdomen ...". Similarly, he reports that a male *Hemiphysalis mirabilis* (Ancient Greenling) "... flew to a perched female and straddled her, holding her wings over her abdomen with all his legs for one or two minutes ...".

Though quite different from the "wing grabbing" and "wing pulling" described here, these observations may be part of a larger repertoire of wing interactions during attachment.



Figure 3. The male damner attempts to take off after attachment but the female holds on to the log.

Conclusions

It will be of some interest to see just how widespread the wing grabbing and wing pulling behavior is among dragonflies, and whether it is also done by damselflies, as suggested by the above observations. Some questions that can be addressed in future studies include: Is wing grabbing done intentionally, or does the forewing just get in the way of the male's hind legs? If wing grabbing is intentional, as it looks to be in the video, what role does it play in attaining a solid attachment? Does grabbing the forewings give the male a better grip on the female? Does pulling on the wings trigger a response that helps to induce a female to mate?

These and many other questions can be addressed with additional observations over the years. I know that I'll be looking more carefully at the attachment process in the dragonfly seasons to come.

Acknowledgements

I would like to thank Dennis Paulson and Betsy Walker for helpful conversations and feedback.

Literature Cited

Corbet, P. 1999. Dragonflies: Behavior and Ecology of Odonata. Cornell University Press, Ithaca, New York.

Online Material

Male Paddle-tailed Darner (*Aeshna palmata*) attaching to female at <http://www.youtube.com/watch?v=p_ap7Aex9Y4>.

Black Saddlebags (*Tramea lacerata*) laying eggs and re-attaching at <<http://www.youtube.com/watch?v=wukDS-1shAU>>.



Celithemis elisa (Calico Pennant) Emergence Bounces Back

Sue and John Gregoire, Kestrel Haven Aviation Migration Observatory Burdett, New York 14818 <khmo@empacc.net>

2013 brought the ninth season of our study on the emergence of *Celithemis elisa* (Calico Pennant) at our pond. It was a little surprising and a lot of fun.

Each year we perform once-daily circumambulation of the pond, counting *C. elisa* as they emerge and/or take off on their maiden flight. We began in 2005 after noticing a huge emergence and were rather astounded by the sheer volume of a single species pouring out of this small farm pond. Table 1 summarizes our results. In general we can say that they emerge *en masse* for the first few days of their season, then reduce to a much smaller number each day with occasional surges during the emergence period. We also know that they emerge all day long, so our morning counts do not reflect the entire population.

This year, after a few seasons with smallish numbers, we

Table 1. Summary of *Celithemis elisa* (Calico Pennant) activity. Numbers are derived from daily circumnambulation of the study pond.

Year	Season Total	Peak Period	Peak Percent of Total	Total Emergence Period
2005	2,455	7-11 June	83% (2,028)	>62 Days
2006	10,944	5-9 June	47% (5,169)	63 Days
2007	6,497	1-6 June	75% (4,892)	61 Days
2008	8,237	8-12 June	76% (6,244)	64 Days
2009	1,505	6-10 June	15% (229)	68 Days
2010	642	31 May - 4 June	43% (277)	82 Days
2011	1,993	1-7 June	58% (1,152)	51 Days
2012	982	27-31 May	57% (556)	54 Days
2013	3,975	31 May - 3 June	63% (2532)	56 Days


were pretty much convinced the population had leveled off and met a carrying capacity suitable to that pond. Instead we counted many more than we expected—in fact, a good several thousand more. In addition, we spent time at the pond after nightfall and recorded some emergence taking place during the wee hours. The emergence shown in Figure 1 took place a little after midnight on 10 July 2013. By morning, this teneral and others were long gone.



Figure 1. *Celithemis elisa* emerging at 12:30 am on 10 July 2013.

We are intrigued by the occasional surges in numbers. They may plod along at numbers in the single digits for days and days then explode into double or triple digits for a day or two then back to singles again. We have ruled out some variables and are still looking for the cause and are open to suggestion.

Another behavioral quirk is what we call “clumping”, where sometimes a large group will emerge from a single plant, while similar substrates nearby are ignored. Puzzling.


We have summarized each season in past issues of ARGIA. Next season will be year number 10, but I rather doubt we will stop monitoring this species. We admit to being smitten and addicted. Stay tuned. 

New Book Announcement

Rice County Odonata Journal, Volumes One, Two, and Three, by Scott King. Red Dragonfly Press, \$36.

From the author's web site: I'm happy to announce that Rice County Odonata Journal: Volume Three is now available. The largest installment yet, at 220 pages. But in its defense it covers a lot of ground, with many of the journal entries ranging far from Rice County to locations in northern and western Minnesota, to the Rocky Mountains in Colorado, and to the Black Hills in South Dakota. Like the last volume, this volume contains a color inset of 32 photos. New to the series is a species index, a practical addition

given that nearly one hundred species are mentioned and/or encountered in the pages of the book.

In addition, Rice County Odonata Journal: Volume One, which was out of print temporarily, is now available in a slightly revised, second edition, reformatted to match the later volumes. Rice County Odonata Journal: Volume Two remains available as well. The first three volumes can also be purchased as a set (discounted 20% from the individual price) at <<http://reddragonflypress.org/music/5399>>. They are also available at Amazon and at the independent bookstore Monkey See, Monkey Read. 

How I Fell Into the Clutches of the Odonata

A new feature is making its debut! In summer 2013, Dennis Paulson made the excellent suggestion that an interesting addition to ARGIA would be brief essays from DSA members describing how, when, where, and why they became interested in Odonata. This can also be a way for members to find out a bit more about one another.

If you would like to contribute, write a short essay describing your first forays into the world of Odonata and how it has affected your life since, including your most interesting ode-hunting tale, and send it to the Editor at <celeste@xerces.org>. Whether you just discovered odonates this summer or have pursued them for decades, I know there are interesting, entertaining, and inspiring stories to tell.

In this installment, Jim Burns and Bob Martinka both tell a tale of birders gone wrong (or right, depending on your point of view), with Jim placing additional blame for his obsession squarely on the shoulders of Dennis Paulson.

Roseate Skimmers and Dennis Paulson

Jim Burns <jpbaztec@aol.com>

After a lifelong career as a teaching tennis professional with a parallel adult passion for birding and bird photography, in August 2011 I was set up on a Common Black Hawk nest waiting for the parents to return with prey for two nestlings. Getting a little bored, I took a couple frames of a “huge” wine-colored dragonfly which landed minimum focus distance from my 600mm lens. I hadn’t so much as glanced at a dragonfly since my high school biology class (that’s about 55 years, if you’re counting).

I sent the images to a friend who identified it as a male Roseate Skimmer (*Orthemis ferruginea*) and suggested Dennis Paulson’s western field guide. I was blown away by the detail, colors, and patterns on the small ode packages, and loved that Dennis had given them common names that actually made sense and helped with identification. Subsequently I’ve spent the last two summers photographing odes, hardly looking at birds. You think maybe I was getting a little jaded with birds and competitive birders?

My most interesting ode story to date comes from my workplace. The only odes I had seen there were occasional Blue-eyed Darners (*Rhionaesbna multicolor*) and Variegated Meadowhawks (*Sympetrum corruptum*) high above the tennis courts during Arizona’s monsoon season. This past summer the club repainted our courts, switching from traditional green to vision-enhancing royal blue. In September I realized, with initial disbelief, that a dragon

buzzing around inches above the new blue surface was a White-belted Ringtail (*Erpetogomphus compositus*), miles from the nearest water. It would land only on the white lines, never on the blue. I have to believe it briefly mistook the newly repainted surface for open water.

My wife, who knows me too well, thinks I’m on a mission to photograph as many ode species as I can, but we know that’s not true, right? Hope to see you at the DSA conference in Wisconsin next summer.




Mayan Setwing (*Dythemis maya*), male, Cochise County, Arizona, October 2013. Photo by Jim Burns.

My Plunge Into Odonates

Bob Martinka, Helena, Montana <rmartink@aol.com>

After my retirement from Montana Fish, Wildlife, and Parks in 1998, where I had been a wildlife biologist and administrator, becoming a better birder was one of several goals that I pursued. This goal became an all-consuming passion in just a few years. Along with this, my previous interest in photography, which had waned over my working years, was re-kindled by my birding exploits and continuing advances in digital photo technology. My library of bird images grew substantially over the years, but there were a number of Montana species that had escaped my camera lens. In early July 2008, I decided to hike into an area near Seeley Lake, Montana that some birder friends had suggested was a good place to find spruce grouse, a species missing from my bird photo library. After about 45 minutes on the trail, I noticed through the trees what appeared to be a good-sized pond on the right side of the trail. My curiosity led me to investigate to see what kinds of birds or other interesting things I might find on or near the water. The shallow, sphagnum moss-ringed pond was loaded with dragonflies. Since my photography interests spanned the entire spectrum of nature’s plants and animals, I quickly changed from my telephoto to a macro lens and began slowly approaching a variety of perched odonates. After a number of attempts, I was successful in getting good photos of several different species.

Immediately after getting home, my curiosity prevailed and I logged on to the internet to see if I could figure out which species I had photographed. I also contacted birder friend Nate Kohler, whom I recalled had begun chasing odonates several years earlier. The seed had been well planted and watered. Nate helped me with the identification on several species and I quickly became an amateur odonatologist, with Nate as my mentor. The rest is history! The remainder of 2008 was spent pursuing these intrigu-

ing insects in many nearby habitats, and in succeeding years to the present, birds and birding played second fiddle to dragonflies from June through mid-October. To date, Nate and I have charted significant range extensions for a number of species in Montana, and we have added 11 new species to the Montana checklist (presently at 91 species), with Nate finding the majority of these. And what great fun we have in this relatively new pursuit! 

Advice Column

Bring everything. That's it.

There have probably been 100 or more times when I've said to myself, "Well, self, just to check out the pond/river/lake for 10 minutes I can leave the [binoculars or net or field guide or notebook or box for specimens or hand lens] in the car. I can make do with just [subset of binoculars/net/field guide/box for specimens/field notebook/pocket camera]". And probably 95 of those 100 times I've regretted the decision to leave something behind.

Of course I'm not a real photographer, so if you are, I'm not speaking to you. What you carry is your business. And if you're a true dragonfly sage, in tune with the rhythms of the odes, expecting what you find, finding what you expect...you're also on your own. I'm talking to the rest of you who are just learning and might go out and hope to find something unusual or unfamiliar or new.

Incidentally, I have little excuse for leaving stuff behind because I have this nice Pajaro brand field guide waist pack, in which I can keep field guides, Rite in the Rain field notebook, pencil, hand lens and box for dragonflies or exuviae. And this pack has a broad waistband into which I can tuck my net. So all I have to do is don binoculars, strap on the Pajaro pack, and stick the net in the waistband and I'm good to go. Which I will try to remember to do next year.

Chris Hill

No matter whether you are a novice ode-hunter or a long-time dragonflyer, if you have any short notes of advice relating to lessons you've learned in your experiences with chasing odonates, including observing, photographing, collecting, or identifying, we want to read about it. If you would like to pass along your insights to fellow ode enthusiasts, please send them to the Editor at <celeste@xerces.org> and we will share your wisdom with the world.

Correction

A correction note from Rich Bailowitz <raberg2@q.com>:

In cooperation with Doug Danforth, Pierre Deviche, and Jim Burns, I published the article entitled *Seeing Red: Late Summer and Early Fall in the Muleshoe Ranch Region of Southeast Arizona* in ARGIA 25(1): 13-15. Included in the article is a gorgeous photo of what was supposedly a male *Argia lacrimans* (Sierra Madre Dancer). The only trouble is that it is not *A. lacrimans*.

When the article was composed, none of us knew about the invasion of *Argia anceps* (Cerulean Dancer) into southern Arizona, beginning in September of 2012 (see *Cerulean Dancer, Argia anceps, a New Species for the United States*, by Doug Danforth, Rich Bailowitz, and Pierre Deviche, ARGIA 25(2): 10-11). As you probably know, *anceps* has a phenotype close to that of *lacrimans*. In re-examining that photo, it is clear that the image is of *Argia anceps*, not *A. lacrimans*. We are sorry for the sloppy identification and hope that the record is now straight.

Parting Shots

Parting Shots is a new feature in ARGIA that pays tribute to the endless diversity and interest of odonate behaviors and to the quick-moving and skilled photographers among us, with an additional nod to the many unexpected (and sometimes downright silly) ways in which odonates can creep into daily life.

If you have photos that showcase some odd, bizarre, unusual, unexpected, or amusing aspect of odonate life (or of life with odonates), please send them to the Editor at <celeste@xerces.org>, along with a short note describing the photo and event.

It's a Bird-Eat-Dragonfly-Eat-Dragonfly World

Buck Snelson <fnsnelson@bellsouth.net> got this remarkable shot of a Green Heron with two dragonflies in its beak on the afternoon of 1 November 2013 at Paynes Prairie in Gainesville, Florida. He's not sure whether the heron managed to grab both dragonflies at once because they were perched close together, or if he caught them as the Common Green Darner (*Anax junius*) was preying on the Blue Dasher (*Pachydiplax longipennis*). The dasher seemed to be injured already, though whether by the darner or the heron is unknown. The heron proceeded to eat the darner, then picked up the dasher and ate it, and a few minutes later it rounded out the meal with a small catfish!




Green heron with dragonfly bounty. Photo by Buck Snelson.

Mixed-up Meadowhawks

Rick Nirschl <ricknir@hotmail.com> got this shot of a male Ruby Meadowhawk (*Sympetrum rubicundulum*) grabbing the male half of a Blue-faced Meadowhawk (*Sympetrum ambiguum*) wheel at the Kitty Todd Nature Preserve in Toledo Ohio on 12 October 2013. The Ruby Meadowhawk's confusion (or his grasp) was apparently short-lived, as the mating pair and the interloper broke apart a moment later.

From Predator to Prey

Jerry Hatfield <Jerry.Hatfield@umchealthsystem.com> sends us another example of the fine line between predator and prey. He got this shot of a pair of jumping spiders nabbing an outnumbered Variegated Meadowhawk (*Sympetrum corruptum*) on 20 November 2013. 



Spiders vs. dragonfly. Photo by Jerry Hatfield.



Meadowhawk wheel plus one. Photo by Rick Nirschl.

ARGIA and BAO Submission Guidelines

Digital submissions of all materials (via e-mail or CD) are vastly preferred to hardcopy. If digital submissions are not possible, contact the Editor before sending anything. Material for ARGIA should be sent to Celeste Mazzacano, The Xerces Society for Invertebrate Conservation, 628 NE Broadway, Suite 200, Portland, Oregon, USA 97232, <celeste@xerces.org>. Material for BAO must be sent to Steve Hummel, Lake View, Iowa, USA 51450, <mshummel@iowatelecom.net>.

Articles

All articles and notes are preferably submitted in Word or Rich Text Format, without any figures or tables, or their captions, embedded. Please submit all photos and figures as separate files (see Figures below). Only minimal formatting to facilitate review is needed—single column with paragraph returns and bold/italic type where necessary. Include captions for all figures and tables in a separate document.

Begin the article with title, author name(s), and contact information (especially e-mail) with a line between each. The article or note should follow this information. Paragraphs should be separated by a line and the first line should not be indented. Where possible always refer to the scientific name of a species followed by its official common name in parentheses.

Figures

Submit figures individually as separate files, named so that each can be easily identified and matched with its caption. Requirements vary depending on the type of graphic.

Photographs and other complex (continuous tone) raster graphics should be submitted as TIFF (preferred) or JPEG files with a minimum of 300 ppi at the intended print size. If unsure about the final print size, keep in mind that over-sized graphics can be scaled down without loss of quality, but they cannot be scaled up without loss of quality. The printable area of a page of ARGIA or BAO is 6.5 × 9.0 inches, so no graphics will exceed these dimensions. Do not add any graphic features such as text, arrows, circles, etc. to photographs. If these are necessary, include a note to the Editor with the figure's caption, describing what is needed. The editorial staff will crop, scale, sample, and enhance photographs as deemed necessary and will add graphics requested by the author.

Charts, graphs, diagrams, and other vector graphics (e.g. computer-drawn maps) are best submitted in Illustrator format or EPS. If this is not possible, then submit as raster graphics (PNG or TIFF) with a minimum of 600 ppi at the intended print size. You may be asked to provide the raw data for charts and graphs if submitted graphics are deemed to be unsatisfactory. When charts and graphs are generated in Excel, please submit the Excel document with each chart or graph on a separate sheet and each sheet named appropriately (e.g. "Fig. 1", "Fig. 2", etc.)

Tables

Tables may be submitted as Word documents or Excel spreadsheets. If Excel is used, place each table on a separate sheet and name each sheet appropriately (e.g. "Table 1", "Table 2", etc.)

The Dragonfly Society Of The Americas

Business address: Celeste Mazzacano, The Xerces Society for Invertebrate Conservation, 628 NE Broadway, Suite 200, Portland, Oregon, USA 97232

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Journals Published By The Society

ARGIA, the quarterly news journal of the DSA, is devoted to non-technical papers and news items relating to nearly every aspect of the study of Odonata and the people who are interested in them. The editor especially welcomes reports of studies in progress, news of forthcoming meetings, commentaries on species, habitat conservation, noteworthy occurrences, personal news items, accounts of meetings and collecting trips, and reviews of technical and non-technical publications. Membership in DSA includes a digital subscription to ARGIA.

Bulletin Of American Odonatology is devoted to studies of Odonata of the New World. This journal considers a wide range of topics for publication, including faunal synopses, behavioral studies, ecological studies, etc. The BAO publishes taxonomic studies but will not consider the publication of new names at any taxonomic level.

Membership in the Dragonfly Society of the Americas

Membership in the DSA is open to any person in any country and includes a digital subscription to ARGIA. Dues for individuals in the US, Canada, or Latin America are \$15 us for regular memberships (including non-North Americans), institutions, or contributing memberships, payable annually on or before 1 March of membership year. The Bulletin Of American Odonatology is available by a separate subscription at \$20 us for North Americans and \$25 us for non-North Americans and institutions. Membership dues and BAO subscription fees should be mailed to Jerrell Daigle, 2067 Little River Lane, Tallahassee, Florida, USA 32311. More information on joining DSA and subscribing to BAO may be found at <www.dragonflysocietyamericas.org/join>.

Front cover: Male Amelia's Threadtail (*Neoneura amelia*) headshot, Hidalgo County, Texas, October 2013. Photo by Jim Burns.

Back cover: (upper) *Phyllogomphoides albrighti* (Five-striped Leaf-tail), Medina River Natural Area, San Antonio, Bexar County, Texas, 2 July 2013. Photo by Jerry Hatfield. (lower) *Stylurus ivae* (Shining Clubtail), Aiken County, South Carolina, 21 September 2013. Photo by Lois Stacey.

