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President's Report

Bryan Pfeiffer, DSA President <bryan.pfeiffer@uvm.edu>

On 13 August 2018, The Washington Post reported some fake news about dragonflies. Under a headline declaring, "Dragonflies are more active this summer. Blame it on the rain," the Post's website article (<<https://tinyurl.com/y8ugklvd>>) said that all the rain had produced a good hatch of mosquitoes and other prey to help foster the odonate abundance. To set the record straight, I wrote the Post a letter, which as of ARGIA's copy deadline had not yet been published. So goes my clout in the halls of power.

But as your new president, I'll nevertheless work hard with our Executive Council (EC) to raise the status of Odonata and the DSA. One way to keep you all informed about it will be this new column in ARGIA. I'll begin by reporting real news: the DSA is in fine shape, with a growing membership of 456 and a healthy balance sheet that is allowing us to do some new things for members and dragonflies alike.

But before I get to more news, the DSA needs you. We're facing an unusually high rate of turnover on the EC. Cindy McKee is stepping down as Treasurer and Steve Valley, a founding DSA member, is vacating his role as Secretary. Marla Garrison will leave the Council after her six-year member-at-large term and John Abbott will relinquish his lengthy role on the Council, most recently as webmaster (more on that in a bit). Chris Hill, a former DSA president, will also be ending his service.

We have at least one young, talented member with new ideas who is waiting in the wings to join the EC, but we need more candidates. The need to fill Cindy's seat in particular is immediate. So if you're interested in joining us, please contact either me <bryan.pfeiffer@uvm.edu> or Steve Hummel <mshummel@iowatelecom.net>, who is chairing the nominating committee for our 2019 elections. All of the departing EC members have done such great things for the DSA and deserve our gratitude.

Meanwhile, here are a few updates:

We're working to boost membership and diversity, including increasing student participation. One perennial way in which we do this is through the Nick and Ailsa Donnelly Fellowship, which helps offset fees for students attending our annual meetings. Next year we're allocating funds to help students attend the 2019 Worldwide Dragonfly Association's International Congress on Odonatology, which, along with the DSA meeting, will be held in Austin, Texas.

We will soon begin to get results from our first round of research grants (see ARGIA 30(2), 2018). The DSA will be looking to keep this program sustainably funded so that we can continue to fund additional research and field work. If you're interested in donating or applying, read the call for new proposals in this issue of ARGIA, or contact grant committee chair Nancy McIntyre at <nancy.mcintyre@ttu.edu>.

The DSA will have a new website by the new year. OdonataCentral will continue as an incredible resource, while our own site will have new features for members, including annual meeting details and resources. If you're website savvy and would like to help with creating either the site or a new DSA logo design, please contact website committee co-chairs Bryan Pfeiffer <bryan.pfeiffer@uvm.edu> or Celeste Searles Mazzacano <cmazzacano@gmail.com>. Once the new site is live, we'll boost our efforts to attract new members and retain current members. Mike Moore deserves a ton of credit for his work on the annual meeting websites over the past several years.

Finally, even beyond *Aeshna sitchensis* (Zigzag Darner) and *Somatochlora brevicincta* (Quebec Emerald), the 2018 annual meeting in Finland, Minnesota was a huge success, thanks in large part to the work of the Minnesota Dragonfly Association and local organizers. (Trust me, they've got a good thing goin' in

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Calendar of Events

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

Event	Date	Location	Contact
SE DSA Meeting	29–31 Mar 2019	Crestview, Florida	Jerrell J. Daigle <jdaigle@nettally.com>
DSA annual meeting	12–14 Jul 2019	Austin Texas	John Abbott <jabbott1@ua.edu>
Intl. Congress of Odonatology	14–18 Jul 2019	Austin Texas	John Abbott <jabbott1@ua.edu>

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Minnesota.) We're also indebted to Bob Dubois, now the DSA's immediate past-president, who guided us with the same dexterity he displays in the field. And what a pleasure to see Jerrell Daigle honored and awarded lifetime membership during the meeting. Aloha nui, Jerrell. Talk to us later!

By the way, you can read my letter to The Washington Post at <<https://bryanpfeiffer.com/2018/08/14/the-washington-posts-fake-news-on-dragonflies/>>. 

2018 SE DSA Meeting in Sanford, North Carolina

Jerrell J. Daigle <jdaigle@nettally.com> and **Mike Turner** <wmike.turner@gmail.com>

The 2018 SE DSA meeting was held in Sanford, North Carolina from 10–14 May, and was hosted by Mike Turner of the North Carolina Division of Environmental Quality. The 22 attendees included Jerrell J. Daigle, Steven Daniel, Timothy Deering, Sally and Steve Edwards, Randy Emmitt, Boris Kondratieff, Ken Larsen, Greg Lasley, Ken Lebo, Cindy and John McKee, Steve Roble, Buck Snelson, Mike Turner, Tony “Doc” Schoch, Mike Hannisian, Nancy Watson, Richard Yank, Phoebe and George Harp, and Chris Hill.

At least 77 odonate species were seen, including the target species *Gomphurus septima* (Septima’s Clubtail) and *Phanogomphus diminutus* (Diminutive Clubtail). The big rivers like Deep River, Cape Fear River, Rocky River, and Haw River were really good for numerous *G. septima* while *P. diminutus* was common at the McKinney Lake Fish Hatchery. Other notable odonates included *Phanogomphus quadricolor* (Rapids Clubtail), *P. australis* (Clearlake Clubtail), *P. cavillaris* (Sandhill Clubtail), *Enallagma daeckii* (Attenuated Bluet), *Nannothemis bella* (Elfin Skimmer), *Epithea semiaquea* (Mantled Baskettail), and *Hylogomphus parvidens carolinus* (Piedmont Clubtail).

Six species were seen that are designated as Significantly Rare by the North Carolina Natural Heritage Program, and another six species on their Watch List. were observed. Also, almost 450 records were entered into The Dragonflies and Damselflies of North Carolina website (<<http://www.dpr.ncparks.gov/odes/a/accounts.php>>), greatly increasing our knowledge of the distribution and phenology of odonates in North Carolina.

Other interesting wildlife included eastern king snakes



A toast to the Odonata at one of the SE DSA group dinners.

(*Lampropeltis getula*), Hessel’s Hair-streaks (*Callophrys hesseli*), Bachman’s Sparrows (*Peucaea aestivalis*), and Red-cockaded Woodpeckers (*Leuconotopicus borealis*). Several rowdy nighttime banquets were held and the



Phanogomphus quadricolor (Rapids Clubtail). Photo by Anthony “Doc” Schoch.

crowd voted to have the 2019 SE DSA meeting in late March in Crestview, Florida, to be hosted by Jerrell J. Daigle. Target species will be *Phanogomphus westfalli* (Westfall’s Clubtail), *P. hodgesi* (Hodges’s Clubtail), *Cordulegaster sayi* (Say’s Spiketail), and *Gomphurus hybridus* (Cocoa Clubtail). More details to come later. We hope to see you there!

We also wish to thank the following people: Ed Corey, Inventory and Monitoring Biologist with North Carolina State Parks, for granting us permission to net and collect on North Carolina’s State Parks land; and Brian Bockhahn, Piedmont Region Education Specialist with North Carolina State Parks, for leading a very educational and enjoyable field trip to Weymouth Woods-Sandhills Nature Preserve on Sunday. Our thanks as well to the DSA members who contributed their photos to this article, including Ken Larsen, Ken Lebo, Tim Deering, Sally Edwards, and Anthony “Doc” Schoch!

2018 SE DSA species list. North Carolina Natural Heritage Program (NCNHP) status code is in parentheses (SR = Significantly Rare, W = Watch List).

Anisoptera (Dragonflies)

Hylogomphus abbreviatus, Spine-crowned Clubtail (SR)
H. apomyius, Banner Clubtail (W)
H. parvidens, Piedmont Clubtail (W)
Gomphurus hybridus, Cocoa Clubtail (W)
G. septima, Septima’s Clubtail (SR)
G. vastus, Cobra Clubtail

Ophiogomphus incurvatus, Appalachian Snaketail (W)
Phanogomphus australis, Clearlake Clubtail (SR)
P. cavillaris, Sandhill Clubtail (SR)
P. diminutus, Diminutive Clubtail (W)
P. exilis, Lancet Clubtail
P. lividus, Ashy Clubtail
P. quadricolor, Rapids Clubtail (SR)
Progomphus belli, Belle's Sanddragon (SR)
Anax junius, Common Green Darner
A. longipes, Comet Darner
Boyeria vinosa, Fawn Darner
Epiaeschna heros, Swamp Darner
Gomphaeschna fuscillata, Harlequin Darner
Nasiaeschna pentacantha, Cyrano Darner
Didymops transversa, Stream Cruiser
Epithea costalis, Slender Baskettail
E. cynosura, Common Baskettail
E. princeps, Prince Baskettail
E. semiaquea, Mantled Baskettail
Neurocordulia obsoleta, Umber Shadowdragon
N. virginensis, Cinnamon Shadowdragon
Celithemis elisa, Calico Pennant
C. fasciata, Banded Pennant
C. ornata, Ornate Pennant
C. verna, Double-ringed Pennant
Erythemis simplicicollis, Eastern Pondhawk
Erythrodiplax minuscula, Little Blue Dragonlet
Ladona deplanata, Blue Corporal
Libellula auripennis, Golden-winged Skimmer
L. axilena, Bar-winged Skimmer
L. cyanea, Spangled Skimmer

L. flavida, Yellow-sided Skimmer
L. luctuosa, Widow Skimmer
L. semifasciata, Painted Skimmer
L. vibrans, Great Blue Skimmer
Nannothemis bella, Elfin Skimmer (W)
Pachydiplax longipennis, Blue Dasher
Pantala flavescens, Wandering Glider
P. hymenaea, Spot-winged Glider
Perithemis tenera, Eastern Amberwing
Plathemis lydia, Common Whitetail
Tramea carolina, Carolina Saddlebags
T. lacerata, Black Saddlebags

Zygoptera (Damselflies)

Calopteryx dimidiata, Sparkling Jewelwing
C. maculata, Ebony Jewelwing
Hetaerina americana, American Rubyspot
Lestes australis, Southern Spreadwing
L. inaequalis, Elegant Spreadwing
Argia apicalis, Blue-fronted Dancer
A. bipunctulata, Seepage Dancer
A. fumipennis, Variable Dancer
A. moesta, Powdered Dancer
A. tibialis, Blue-tipped Dancer
A. translata, Dusky Dancer
Enallagma basidens, Double-striped Bluet
E. civile, Familiar Bluet
E. daeckii, Attenuated Bluet
E. darvsi, Sandhill Bluet
E. concisum, Cherry Bluet



Some participants in the 2018 SE DSA gathering. Photo by Tim Deering.

E. divagans, Turquoise Bluet
E. dubium, Burgundy Bluet
E. exsulans, Stream Bluet
E. geminatum, Skimming Bluet
E. signatum, Orange Bluet
E. traviatum, Slender Bluet
Ischnura hastata, Citrine Forktail
I. kellicotti, Lilypad Forktail
I. posita, Fragile Forktail
I. ramburii, Rambur's Forktail
Nehalennia gracilis, Sphagnum Sprite
N. integricollis, Southern Sprite



Nannothemis bella (Elfin Skimmer). Photo by Ken Larsen.

Minutes of the DSA 2018 Annual Business Meeting

Steve Valley, DSA Secretary <magnifica.steve@gmail.com>

The annual business meeting of the DSA took place on 14 July 2018 at Wolf Ridge Ecological Learning Center in Finland, Minnesota. DSA President Bob DuBois opened the meeting and introduced the Wolf Ridge staff. He informed the membership that he is stepping down in October and Bryan Pfeiffer, current DSA President-elect, will be President. He thanked everyone for setting up this meeting, which was quite difficult to do, and acknowledged Mike Moore (meeting webpage) and Cindy McKee (DSA Treasurer) for a wonderful job. He also mentioned the spectacular swarm of *Aeshna canadensis* and *A. verticalis* (Canada and Green-striped Darners) hawking over the buildings last night. He thanked and recognized the Minnesota Dragonfly Society (MDS) for the job they do with citizen science, education, etc., including Curt Oien, Mitch Haag, Jacki Morrison, Angela Isackson, and Ami Thompson. He acknowledged Kurt Mead's talk on the geology of the north shore.

Jerrell Daigle handed out the meeting buttons. Steve Valley passed around an attendance list. Attendees introduced themselves and said where they lived:

Kendra & John Abbott from Alabama.
 Anne & Rusty Baldwin from Arkansas.
 Jim Burns and Dany & Pierre Deviche from Arizona.
 Michael Moore from Delaware.
 Jerrell J. Daigle, Bill Mauffray, Steve Collins, and Buck Snelson from Florida.
 Marion Dobbs from Georgia.
 Marcia & Steve Hummel from Iowa.
 Paul Dacko, Cindy & John McKee, Joe Roti Roti, and Marla Garrison from Illinois.
 Jason Bried from Kentucky.
 Darrin O'Brien from Michigan.
 Dianne Rowse, Curt Oien, Michael Moen, Ami Jo Forslund, Jeff Fischer, Clark Gary, Kurt Mead, Mitchell Haag, Ami Thompson, Leah Darst, and Ron Lawrenz from Minnesota

Dave McShaffrey, MaLisa Spring, and Jim Lemon from Ohio.
 Celeste Searles Mazzacano, Steve Valley, and Cary Kerst from Oregon.
 Ken Lebo, Tony Schoch, and Anita & Paul Guris (celebrating their 28th wedding anniversary) from Pennsylvania.
 Chris Hill from South Carolina.
 Nancy McIntyre from Texas.
 Steve Roble from Virginia.
 Bryan Pfeiffer from Vermont.
 Jim Johnson and Dennis Paulson from Washington.
 Ken Tennesen and Dan Jackson from Wisconsin.

Steve Valley made a motion to accept the minutes from the 2017 annual meeting as published in ARGIA Vol. 29, No. 3., Celeste Searles Mazzacano seconded and the motion carried unanimously. Steve reported that the vote to change the by-laws this year to make life membership and sustaining life membership available was unanimous (changes to the by-laws require a vote by the membership). Steve announced that he is retiring from the Secretary position this year. Bob acknowledged Steve's contributions to the society and his tireless effort through the years.

Cindy McKee gave the Treasurer's report. The DSA financial statement was printed in ARGIA Vol. 30, No. 1. In 2017 there were 370 members; this year there are 440. There are 319 currently paid members and 22 life members. There are 67 new members; 24 joined through the registration for this meeting. There was one donation of \$500 to the DSA Research Grants Program, which distributed \$3,917 in grants in this inaugural year. Bob recognized Cindy for her service and noted that she is stepping down as Treasurer as of the end of December.

Jerrell Daigle, coordinator for the DSA annual meeting locations, made a call for volunteers to host a meeting in the future. If you would like to host a meeting, let him know.

The annual meeting next year is in Austin, Texas. John Abbott gave an overview of the meeting and also thanked the Minnesota team for their work this year. The DSA 2019 pre-meeting will be 8–11 July in southeast Texas, with the main meeting on 12–14 July at Hornsby Bend Bird Observatory and Center for Environmental Research in Austin (<<https://www.hornsbybend.org/>>). John noted that we have not held a meeting in Texas since 2001. Texas has 245 odonate species, with 117 in the Austin area. Target species include *Somatochlora margarita* (Texas Emerald; pre-meeting area), *Argia leonora* (Leonora's Dancer), *Erpetogomphus eutainia* (Blue-faced Ringtail), *Aphylla angustifolia* (Broad-striped Forceptail), and *Micrathyria hagenii* (Thornbush Dasher).

The annual meeting is in July because they are also hosting the International Congress of Odonatology (ICO) on 14–18 July 2019. It was last hosted in the U.S. in 1999. It is a more academic meeting but is friendly and John encourages everyone to come. There will be no post-meeting because the ICO follows the main meeting. ICO will meet at the Palmer Event Center in Austin. Dinner on Wednesday will be on a boat trip to see the largest urban bat colony in North America flying out from under the bridge at dusk. The post-meeting trip will be to the Lower Rio Grande Valley, but collecting won't be possible. More information is posted on the Worldwide Dragonfly Association website at <<https://worldddragonfly.org/>>. Kendra Abbott handed out pins made for the ICO meeting by the Austin Chamber of Congress. Bob thanked John for all of his service to the DSA and his leadership and guidance. He has been a great help.

Bryan Pfeiffer talked about the NE regional DSA meeting on 2–4 August 2018 in Ludlow, Massachusetts. *Stylurus* species (hanging clubtails) should be present. You can find the meeting if you Google NE DSA. Josh Rose is the meeting coordinator.

Jerrell Daigle talked about the SE regional DSA meeting, which will be 29–31 March 2019 in Crestview, Florida, west of Tallahassee. Target species are *Phanogomphus diminutus* (Diminutive Clubtail), *Cordulegaster sayi*, (Say's Spiketail) and *Phanogomphus hodgesi* (Hodges's Clubtail).

Bob DuBois asked Jerrell Daigle if he is the only person that has attended all the DSA annual meetings, and Jerrell said yes. Bob congratulated him for this and recognized his service as Treasurer and meeting coordinator. He has worked behind the scenes for a long time. Bob then presented him with a lifetime membership award and a photo plaque.

Nancy McIntyre reported on the new DSA Research Grants Program, which started with an idea from Richard Groover. She chaired a committee with Bryan Pfeiffer and Chris Hill; they received nine proposals and awarded four grants, for a total of \$3,917. A call for proposals will come out this fall, and will be posted on the list serve and in ARGIA (ed. note: see this issue).

Proposals are due by 1 February each year, with notifications made by 1 March. Donations are welcome; please contact the Treasurer if you would like to make a donation.

The four projects funded were:

Assessing rate of DNA degradation in a stream ecosystem for detecting environmental DNA, Y. Can and J.C. Abbott, \$970
Characterization of an undescribed Arizona *Argia* taxon, P. Deviche and R. Garrison, \$978.

Life history traits, behavior, and morphology of the waterfall-dwelling damselfly nymphs of Polythoridae, M. Sanchez-Herrera and C. Beatty, \$969.

Field surveys for an unknown dragonfly in Tennessee, K.J. Tennessen, T. Vogt, R. Glotzhober, R. Connors, and W.A. Smith, \$1000.

Bill Mauffray spoke on the International Odonate Research Institute (IORI). He explained IORI's origins as a spinoff from the International Odonatological Foundation (SIO). IORI has one of the largest collections of Odonata in the world, and Bill can always use volunteers to help; if interested, please contact him at <iodonata@gmail.com> or <iodonata.net>. Bill mentioned that he is getting older and needs someone to take his place. The Lepidoptera guy who was going to help move the odonate collection to the McGuire Center passed away and so now Bill doesn't know when this move will take place, but when it does IORI will have 10 times more storage space than they have now and a full-time curator.

Steve Hummel spoke about Bulletin of American Odonatology (BAO), which is published online as an occasional journal. He is looking for papers; if you have one that is not appropriate for ARGIA, please submit it. Celeste Searles Mazzacano also mentioned that abstracts are now in both Spanish and English.

John Abbott reported on OdonataCentral (<www.odonatacentral.org>). Updates include a user-interface facelift with funding from NSF, including an AI feature for photo determination of species, and scans of preserved specimens.

Celeste Searles Mazzacano, DSA Editor in Chief, talked about ARGIA and mentioned what a great deal it is that your \$15 membership dues include a digital subscription to ARGIA and BAO, and help support OdonataCentral. She came to her first DSA meeting in 2008 and felt guilty that she was using these resources and was not a member, so she joined. She asked people to submit discoveries, photos, etc. for publication in ARGIA. She thanked Jim Johnson for his work doing layout for BAO and final proofreading for ARGIA. She wants to make sure the journal is serving members' needs, so new ideas are welcome. The recent addition of the "ID Corner" was Bob DuBois' idea, and other new occasional features such as "Cultural Odonata", and "How I fell into the clutches of the Odonata"

have been well-received. Contact her with questions at <editor@dragonflysocietyamericas.org>.

Bob asked the Executive Council to stand up and be recognized. The EC has been working on a number of issues over this year. The grants program was a success, and Bryan Pfeiffer and Celeste Searles Mazzacano are heading the effort to create a new DSA website. Our society is strong and growing and with that come growing pains, so we need some changes in our business model, but we will overcome these. Celeste said if anyone is interested in becoming a member at large or in running for an officer position please come forward and get involved.

New business:

Books and reprints are available on the side table. Bill Mauffray said if anyone has a collection of their own, he has some envelope samples they can have. He distributed these to several members.

Mitch Haag (MDS) took the stage and thanked Cindy McKee and Michael Moore for all of their help and ideas and work. The MDS gives an annual lifetime membership award for people who have gone above and beyond; the award this year goes to Curt Oien for his expertise and outstanding enthusiasm. Curt has gotten many people into dragonflies, and has been the backbone of MDS all of these years. MDS started in 2005, and Curt Oien was there from the beginning. He works with young people and he just gives nets away to get them started, and provides a Dairy Queen treat for anyone who gets a new Minnesota

record. When they have their meetings there is always a solid percentage of people that attend through their interactions with Curt. Bob remembered being in a big bog in northern Minnesota on a miserably hot day with mosquitoes and when they got back to the camp, Curt had a huge steak waiting for him!

Ken Tennessen announced that his book on nymphs of the Odonata is done!!!! It has been 30 years in the making and at first it was a slow go because he felt like he was a young guy with plenty of time. He submitted it in early June and has received confirmation from Springer Nature that it is now in production. There are seven steps to publication and while he doesn't know exactly when they will all be done, he's hoping we might have the book in hand by late winter. Steve Valley placed plates from the book—full drawings of each genus (72)—on the side tables for the membership to view. Ken asked how many people might be interested in purchasing them as full posters and almost the entire room raised their hands. The printed version of the book will have 702 figures and over 600 pages of text, so the price will probably be pretty steep. The e-book will be less expensive but you'll probably want a printed copy to flip through if you are sitting at the microscope. Ken doesn't know if there will be a pre-order option. It will be hard bound but will lay flat and stay open.

Bob recognized the founding members present: Jerrell Daigle, Dennis Paulson, Ken Tennessen and Steve Valley.

We then dispersed outside for the group photo, which was taken by Marla Garrison with Steve Valley's camera. 



DSA 2018 Annual Business Meeting. Photo by Marla Garrison.

Abstracts of the DSA 2018 Annual Meeting Presentations

Steve Valley, Albany, Oregon <magnifica.steve@gmail.com>. *Aeshna palmata* egg development as seen with high resolution digital imaging: confessions of a dragonfly stacker. The sophisticated optics, digital cameras, and computational programs available today allow for the detailed study of microscopic features and processes such as those involved in dragonfly ontogeny. A captive *Aeshna palmata* female was induced to oviposit. Embryo development was captured with a photomicrographic focus stacking technique using Mitutoyo microscope objective lenses adapted to a 200mm Micro-Nikkor lens on a Nikon D810 camera mounted on a StackShot rail. Developmental sequences including blastokinesis, organogenesis, katatrepsis, eclosion of the pronymph, and ecdysis of the second instar were captured. The image stacks were processed using Zerene Stacker and Adobe Photoshop software. Data and images collected revealed features of eggs and early instar nymphs not previously recorded photographically. In particular, the process of katatrepsis was imaged and detailed images will be presented. Odonate embryo development can be documented using the equipment and techniques described here. In addition, microscopic features at any life stage can be revealed.

Curt Oien <curtisoiem@gmail.com>, **Mitch Haag, and Ami Thompson** <hami0108@yahoo.com>, **Minnesota Dragonfly Society. Surveying northern Minnesota's vast and inaccessible bogs.** Are "rare" Minnesota odonates truly uncommon or just living in areas where they are not frequently encountered by people? To answer this question, among others, the Minnesota Dragonfly Society has been surveying for odonates in the bogs and fens of Northern Minnesota. We have found that many species are indeed uncommon to rare and have begun documenting their habitat requirements in an effort to inform future conservation efforts. Our survey methods included canoeing, trudging many miles through the bogs, and accessing them with exotic vehicles like marsh masters, argos, and helicopters.

Holly Kundel <kundelh@augsb.org>, **Augsburg University, St. Paul, Minnesota. Needle in a haystack: hunting for a rare dragonfly (*Rhionaeschna mutata*) in the St. Croix River Valley, Minnesota.** The Spatterdock Darner, *Rhionaeschna mutata*, is a rare North American dragonfly which is most widely distributed in the eastern USA. In 2009, a breeding population was found in two kettle ponds in the St. Croix River Valley in eastern Minnesota. This was the first record of this species in Minnesota, establishing a substantial northwestern range expansion. The goal of our research was to characterize *R. mutata* breeding habitat and geographic distribution in Minnesota to inform conservation planning. We compiled information on *R. mutata* habitat preferences, and then selected 25 potential breeding sites, targeting heavily vegetated, fishless ponds with a sphagnum fringe and a wooded riparian zone. We conducted early summer field surveys in 2015 and 2016, using multiple methods to

increase our likelihood of detection (visual adult surveys; shoreline exuviae collections; aquatic nymph sampling with dip-nets, minnow seines, and sweep frames). No *R. mutata* were found. *R. mutata* may be present in this water-rich region, but has gone undetected by our efforts, or a local extirpation may have occurred, possibly linked recent fish colonization in one of the original breeding ponds.

Maia Crews-Erjavec <crewsem@augsb.org>, **Augsburg University, St. Paul, Minnesota. Phenological shift of Canada Darner (*Aeshna canadensis*) emergence in the St. Croix River Valley, Minnesota.** Dragonflies are good bioindicators of environmental change and are particularly useful as sentinels of climate change. We conducted a phenological study of *Aeshna canadensis* (Canada Darner) emergence in three fishless kettle ponds in the St. Croix River Valley, Minnesota. Ponds were sampled three times per week from mid-May through early October, 2017 using methods (emergence traps, rearing cages, emergence screens, and shoreline exuviae hunting) aimed at collecting emerging dragonflies. We documented emergence beginning May 24, peaking the first week of June, and ending July 15. We observed adults flying beginning the last week of August and continuing through the end of our sampling period. Emergence timing of our study population does not align with the observed flight period or with that suggested by published literature. We hypothesize that this species is shifting to an earlier emergence window in response to warming climate. Additionally, we may have detected a migratory population with early-emergers flying elsewhere to reproduce. We are exploring this using hydrogen isotope analysis to detect differences in natal origin of late-flying adults.

Ami Thompson <althomps@umn.edu>, **University of Minnesota, St. Paul, Minnesota. Surviving Minnesota winters: observing the phenology and growth of the Common Green Darner (*Anax junius*).** How do dragonflies survive harsh Minnesota winters? The Common Green Darner (*Anax junius*) is an interesting focus species for this observational study because in fall, individuals can either metamorphose and migrate south or remain aquatic nymphs and wait out winter below the ice. To better understand their phenology, all life stages of *Anax junius* were observed in three fishless prairie pothole ponds for two years at Crow Hassan Park Reserve, near St. Michael, Minnesota. Additionally, *A. junius* nymphs were reared through their last three stadia in five temperature-controlled chambers to quantify the effect of temperature on nymph growth and to calculate their base temperature (the temperature below which they cannot grow). Data is being collected through the summer of 2018 but preliminary results will be presented along with a description of a new winter nymph-collecting method. Many questions about how dragonflies survive winter remain (especially about diapause, freeze tolerance, use of aquatic microhabi-

tats, and more) but this observational work lays the foundation for asking more specific and testable questions.

Jason Bried <bried@okstate.edu> and **Robert Hinchliffe**, Alberta Biodiversity Monitoring Institute, Edmonton, Alberta. **Taxonomic sufficiency rationale for adult Odonata in large-scale freshwater biodiversity monitoring.** Aquatic insects pose special challenges for large-scale biodiversity monitoring. One of the issues is taxonomic resolution and having sufficient information (i.e. species level) to assess the distributions and trends of biodiversity. A potential solution is to focus on adult stages, especially for the readily observed Odonata (dragonflies and damselflies). Adult Odonata surveys should greatly enhance the amount of species-level information and eliminate identifications left at suborder, providing a singular rationale for monitoring this group. We used a wetland monitoring program in Alberta, Canada to illustrate how much taxonomic information can be lost in larval collections, and an extensive adult records database to estimate what could be gained from adult surveys. Despite processing 22,638 specimens from 975 wetlands throughout Alberta, larval monitoring failed to collect or identify almost 60% of the lentic-breeding Odonata species known from adult records. A total of 25 lentic-breeding dragonfly species and 12 lentic-breeding damselfly species were present in adult records and not the larval data, including species of conservation concern. Due to the abundance of early instars, a substantial 82% of the processed damselfly collection and 62% of the processed dragonfly collection was left at suborder. We strongly recommend supplementing aquatic macroinvertebrate collections with adult surveys (at least Odonata) to improve the basic inventory and overall status assessment in large-scale freshwater biodiversity monitoring. This is especially true when sampling is restricted to a suboptimal time of year for species identifications.

MaLisa Spring <spring.99@osu.edu>, **Jim Lemon**, and **Norman Johnson**, The Ohio State University, Columbus, Ohio. **Ohio Dragonfly Survey: Revitalized with citizen scientists and iNaturalist.** Ohio is home to 168 species of dragonflies and damselflies. Of these, 23 are state-listed as endangered, threatened, or species of concern. The Ohio Dragonfly Survey is a citizen-science group attempting to document all species across the state to get a better understanding of the current distribution patterns. Thanks to the help of many dedicated naturalists across the state, we have been able to compile over 12,000 records in iNaturalist to incorporate into the survey in 2017. Over 163 new county records were reported, expanding the known distribution of several species (*Dythemis velox*, *Enallagma traviatum westfalli*, *Libellula incesta*). To date, 401 different users contributed data via iNaturalist. Of these, 22 individuals contributed at least 100 observations to the survey. Fifty-two volunteers reported at least one new county species record, with one individual reporting 26 new records using a targeted approach. A great deal of work remains for upcoming years: 37 of 88 counties in Ohio had fewer

than 20 dragonfly and damselfly observations in 2017. Five counties—Brown, Gallia, Meigs, Morrow, and Pike—had no observations in 2017 and are priorities for the upcoming field season.

Joseph L. Roti Roti <jlrotiroti@gmail.com>, Illinois Master Naturalist, Emeritus professor Washington University, St Louis, Missouri. **Changes in Odonata populations after restoring a native prairie with ephemeral ponds.** The goal of this study is to assess the impact of native prairie and ephemeral pond restoration on Odonata populations. Since prior land use was agricultural with drainage channelized, we hypothesized that the changes would increase species diversity and population numbers. Dragonflies and damselfies were counted at each pond, lake, and along specified trails, two to six times per week. The daily average for each species was calculated for each week of the flight season. The impact of the restoration was obtained by comparing data prior and after the restoration. We designed one pond to attract Great Blue Skimmers (GBS) (*Libellula vibrans*). In 2017, we observed 16 GBS per day for the peak week of their flight season up from 0.5 per day prior to the restoration. The ponds were established August 19, 2015. Within one day five species arrived, with two showing breeding activity. After two weeks there were nine species and 11 after a month, with four showing breeding activity. After two months there were 17 species with seven breeding and four new to the site. Long-term, the total flight season increased by 4–6 weeks, due to the early arrival of Common Green Darners (*Anax junius*) and Southern Spreadwings (*Lestes australis*) and the presence of meadowhawks (*Sympetrum corruptum* and *S. vicinum*) late in the fall. While the increase in the number of dragonfly species was modest (about four per year), several species went from occasional visitor to resident breeding populations. In conclusion, native prairie restoration with ephemeral ponds had immediate and long term positive impacts on Odonata populations.

Dennis Paulson <dennispaulson@comcast.net>, Seattle, Washington. **Madagascar sampler.** Evolution has created a spectacular and unique natural world in Madagascar, the big Indian Ocean island that was last in contact with the Indian mainland 88 million years ago, and was last part of Africa 135 million years ago. Subsequently it has been moving slowly nearer to Africa again and has received modern immigrants from that continent as well, resulting in its present-day mixture of Asian, African, and endemic groups. At present the island supports about 180 species of Odonata, of which three-fourths are endemic. There are 10 endemic genera, and two of these may even represent endemic families. This is a sampling of some of those species from a two-week visit in January 2016. The biota is so fabulous that a few non-odonates may creep into the presentation.



California *Tanypteryx hageni* (Black Petaltail) Success Story

Kathy Biggs <bigsnest@sonic.net>

The story begins...

On 3 June 2003, I took Bob Behrstock up Pine Flat Road in Sonoma County, California to look for dragonflies to photograph. As I recall, we were hoping for Pacific Spiketail (*Cordulegaster dorsalis*). We stopped for lunch beside a small pond along the route and I took off my hiking shoes and changed into my water shoes to wade in to look for bluets (*Enallagma*) and such in the rushes. I inadvertently left my hiking shoes there when we departed and when I discovered they were missing the next day, I had to make the ~60 mile drive back to the site to reclaim them.

Since it was such a long trip to retrieve my shoes, I decided to go back up to the pond at the MM10 site while I was so close. I noted a black and yellow dragonfly at the site, and thinking it might be the spiketail we had missed the day before, I stalked it. ...and was very pleasantly surprised to find it was one of two male Black Petaltails (*Tanypteryx hageni*) that were dueling. I collected one for a Sonoma County voucher (OdonataCentral record #6052). This was and remains only the 2nd site where *T. hageni* have been found in the county and the voucher upgraded the previous photo-only record from the Cedars in Cazadero. I was jazzed!

On 15 May 2004, Alan Wight revisited this area and recorded a pair in mating wheel and then the female ovipositing into a small puddle (see Petaltail at <http://www.sonic.net/%7Eshwand/odonata/black_petaltail.htm>). The Petaltails continued to be seen at this site through 2007, but alarmingly the site had become an off-road ATV 'mudding' site and a shooters' gallery, and serious degradation occurred.

This site was then slated for rehabilitation/clean-up by the Bureau of Land Management (BLM) in 2008, using then-President Obama's recovery fund monies, as it was an old toxic mercury mining site. Dave and Kathy Biggs were dismayed that the *Tanypteryx* habitat might be lost and met with BLM representatives. The positive outcome was that the small (bed-sized) wet area where Alan had observed the female ovipositing was marked off for preservation. It was a huge project and to avoid damaging the puddle took great care. Huge trucks had to navigate a narrow dirt lane with a steep downhill fall on one side and the tiny pond marked off with yellow caution tape on the other. Also, the area where the water seeps out of a culvert was graded so as to re-create the flowing sheet of water this species prefers.

In 2010–2011, Dr. Chris Beatty (Department of Ecology and Evolutionary Biology, Cornell University, Ithaca, New York) did a study of *Tanypteryx* in California and the site was checked

several times. At that time, it was the most southern site for the species or close to it, but the site still produced no *Tanypteryx*. Chris gave some thought to eventually trying to reintroduce the species there.

The site was checked annually by the Biggs and others for six years, since individuals in this species live five years as nymphs in burrows, but alas, no *Tanypteryx* reappeared. The Biggs abandoned checking the site when they started spending their summers at their McCloud home 300 miles away.

The story continues...

Then, on 19 May 2018, 10 years after the rehabilitation of the site, Alan Wight was on Pine Flat Road for a bird survey and decided to take the time to check the *Tanypteryx* site yet again. Amazingly, he discovered two males at the tiny preserved pond! These may have been individuals that emerged there but it is much more likely that these were individuals that had dispersed. Either way it is a good sign that *Tanypteryx* habitat can be preserved and restored, and now Sonoma County once more has two known sites for this ancient species (OdonataCentral record #479918). It also leads us to believe that *Tanypteryx* can (re)colonize sites after years of non-use.

In an email to Kathy Biggs on 22 May 2018, Chris Beatty wrote: "I think there must be a complex of sites up there, and across most of the *Tanypteryx* territory. I've seen them make use of some very small seeps on banks and road cuts, so maybe the males seen there recently are out exploring from other localities. I've been talking with colleagues that do habitat modeling about using hydrology data and other land cover info to see if we



Black Petaltail (*Tanypteryx hageni*) male, Pine Flat Road, Sonoma County, California, 19 May 2018. Photo by Alan Wight.

can make some location predictions. With that sort of data we might be able to sort out some new places to explore.”

Several other folks, including David Hofmann and Jackie Sones, have been to the site and photographed a male in the week after Alan’s discovery was made. We hoped to go soon ourselves to see how the habitat looks and of course to see the Black Petaltail too. So far, only males have been found, but at least now we know that recolonization is possible!

On 30 May 2018, Dave and I were finally able to go up to see the petaltails. We ran into Len Blumin along the way so he followed us up and shared our experience. The wildflowers along the way were an added bonus. We didn’t find *T. hageni* at the small preserved pondlet, but I knew they’d been found further up the hill near the top of the restored wet meadow, so I climbed the hill and told Len, who digiscopes all his images, that I’d call if I saw one. I got towards the top where the vegetation indicated wet

conditions and something black and yellow circled by. It landed on some stems near the ground and looked like a petaltail; I turned to yell down the hill to Len and Dave to come on up, but when I turned back, it was gone! As Len approached, I told him that they sometimes landed on people, especially those wearing light-colored clothing (Len and I both wore light tan pants). Just then, as if on cue, the petaltail returned, circled once around us and landed on my pants leg! Len was backing off to try to get an image (of course our camera battery went dead just then), and it flew a few feet away before that moment could be recorded digitally, but it’s a moment I won’t soon forget.

We ended up finding both of the males previously recorded there but no females. Since our visit, I know of at least one more person who made the trek to come record these beauties, and so at least seven people photographed at least one of the two males between 19 May and 2 June 2018. We hope a female made an appearance while no one was watching. 

New Lubbock County, Texas Record for *Brachymesia furcata* (Red-tailed Pennant)

J.K. Hatfield <l.hatfiejk@gmail.com>

A few years ago, finding this more southerly tropical dragonfly would surely have been most surprising. However, in the last several years *Brachymesia furcata* (Red-tailed Pennant) has turned up repeatedly in Midland County just 183 km to the south of us, so it was just a matter of time and a bit of luck that it would eventually show up in a Lubbock canyon.

Still, when I encountered it for the first time in Ransom Canyon on the morning of 17 July 2018, I was a bit surprised. Fortunately for me, this specimen was perched in a spot easy for photographing and I went to work immediately photo-documenting this new reality: a new Lubbock County record, bringing the totals here to a surprising 71 species. After taking numerous shots from several angles, this single male specimen took to flight up over the trees surrounding the drainage pond just south of the chapel and birding sanctuary of Ransom Canyon and out of sight. I surveyed the area several times throughout the rest of the morning but did not see him again. I have since returned to the area on repeated daily occasions in search of him but to no avail. And although it is undoubtedly another stray, nevertheless, I got photo-records to document *B. furcata* at the foot of the Texas



Red-tailed Pennant (*Brachymesia furcata*) male, Ransom Canyon, Lubbock County, Texas, 17 July 2018. Photo by J.K. Hatfield.

South Plains. How exciting! Dragonfly excursions to me are like treasure-hunting: one never knows what thrilling bejeweled odonate awaits discovery around the next bend or just beyond the next cattail. The thrill of discovery fuels the drive that fires this passion for discovery in all of us OdoNUTS!!! 

Are You One of the DSA Members Still in Arrears for 2018?

There are still more than 100 people who did not renew their DSA memberships for 2018—are you one? To find out, log into OdonataCentral (<www.odonatacentral.org>), click on My Profile, and scroll down page until you see the “ARGIA Paid Through Year:” line. If it doesn’t say 2018, then your membership is lapsed for this year!

Three New Species of Odonata for Cuba

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The fauna of islands such as Cuba is always potentially augmented by migration and dispersal of species from the nearby mainland. Among such species are odonates, with the powerful flight of anisopterans especially allowing them to cross long expanses of water. Corbet (2004) estimated that dragonflies can reach up to 68 mph with favorable winds, facilitating such dispersal. Thus many odonate species are widespread not only on the neotropical mainland but across the Caribbean. Three such species have recently been reported for the first time from Cuba.

1) *Coryphaeschna apeora* (Icarus Darner) was described from Costa Rica and Chiapas, Veracruz, and Yucatan, Mexico (Paulson, 1994) and has not become much better known since then. Gomez-Anaya et al. (2011) reported it from Michoacán, Mexico. A photograph of an immature female of this species sent to DRP by Julie Craves (thank you!) and taken by Rob Williams at Bermeja, Matanzas, 23 April 2001 furnishes the first record from Cuba.

2) *Libellula gaigei* (Red-mantled Skimmer) was described from Yucatan, Mexico (Gloyd, 1938). It is now known from the additional states of Campeche, Quintana Roo, Sinaloa and Veracruz as well as Belize and Guatemala (Paulson, 2018; Paulson and González Soriano, 2018) and has reached southern Texas (Reid, 2009) but also remains poorly known. A photograph of a male of this species sent to ATQ was taken by Rayner Nuñez during an expedition to La Bajada, Peninsula de Guanahacabibes, Pinar del Rio, on 7 July 2010. It furnishes the first record for Cuba.



Coryphaeschna apeora (Icarus Darner) female, Matanzas Province, Bermeja, Cuba, 23 April 2001. Photo by Rob Williams.



Libellula gaigei (Redmantled Skimmer) male, Pinar del Rio Province, La Bajada, Cuba, 7 July 2010. Photo by Rayer Nuñez.

3) *Tramea binotata* (Sooty Saddlebags) is widespread from southwestern United States south to northern Argentina. The species was first known from the Greater Antilles as *Tramea walkeri*, described by Whitehouse (1943) from Jamaica but later synonymized with *binotata* by Garrison (1992), who pointed out that what had been called *T. binotata* in earlier literature (e.g., Alayo, 1968) was actually *T. insularis*. Subsequently reported from Puerto Rico and Hispaniola, there seemed no reason for it to be absent from Cuba, and now it has been found at Lomas de Galindo, Mayabeque, flying with *T. insularis*. It may be widespread on the island.

All three of these newly recorded species have in common their occurrence on the Yucatan Peninsula of Mexico, and at least the first two, not known from elsewhere in the West Indies, probably reached Cuba from there. The distance between them is only about 122 miles, less than a two-hour flight. Four additional species—*Enacantha caribbea*, *Leptobasis candelaria*, *Protoneura corculum*, and *Remartinia secreta* (Secretive Darner)—known to occur only in parts of eastern Mexico, Belize and Guatemala on one side and Cuba on the other, also show this connection.

With these additions, the total odonate fauna of Cuba is now 88 species, including 11 genera with 24 species of Zygoptera (damselflies) and 30 genera with 64 species of Anisoptera (dragonflies). This total includes six endemic species of Zygoptera.

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***Coryphaeschna apeora* (Icarus Darner) in Texas: a New Species for the United States**

Martin Reid, San Antonio, Texas <upupa@airmail.net> and **Mike Rickard**, Mission, Texas

Coryphaeschna apeora (Icarus Darner) is a large, poorly-known neotropical aeshnid that has rarely been recorded since its description (Paulson, 1994). Until 2008 there were a few scattered records from Costa Rica (the type locality), Nicaragua, Belize, and the Mexican states of Veracruz, Michoacán, Colima, Campeche, Yucatan, and Chiapas (the latter two are sight records by Paulson). Since 2008 only a handful of additional specimens have been obtained in Veracruz and Costa Rica. Part of the reason for the paucity of records is that it typically flies high, out of the reach of collectors. In his 1994 description, Paulson applied the specific name *apeora*—Greek for “on high”—to reflect this behavior. The common name Icarus Darner, after the character from Greek mythology who flew too close to the sun, also acknowledges its high-flying behavior.

On the afternoon of 15 April 2008, Reid was looking for odonates on a wide track through light woodland and Tamaulipan scrub next to the bank of the Rio Grande/Bravo about four miles east of Santa Ana National Wildlife Refuge in Hidalgo County, Texas. He saw a large darner flying at or above tree-top height, mostly working a 30 yard “beat”, and attempted to get in-flight photos. At one point the darner dropped down and perched on a steeply upward-angled branch 20 feet from the ground for about 45 seconds, during which time Reid took a handful of photos while also studying it. The shape of the base of the hindwings plus the structure of the S10 appendages established that it was a female. A week before, he had watched a feeding swarm of *Coryphaeschna ingens* (Regal Darner) and *Epiaeschna heros* (Swamp Darner) in eastern Texas, and judged that this darner was between those two in size. Although it superficially resembled *C. adnexa* (Blue-faced Darner), it was clearly larger, had a paler, orange-tinged abdomen, and lacked any hint of blue on the face or rear of the eyes, and Reid realized this was a taxon unknown to him.

He shared a number of his photos in e-mail correspondence with Dennis Paulson and John Abbott. The conclusion was that it was either *C. apeora* or *C. diapyra*, both of which were in described in Paulson’s 1994 paper. DP indicated that it was very likely *C. apeora*, but the lack of any reference material for females of the species stopped him just short of confirming it as such.

On 15 July 2009, Troy Hibbitts photographed a large female darner in flight in Real County, Texas, about 80 miles east-northeast of San Antonio. The similarity to the darner photographed by Reid in 2008 was strong, including the dark mark on the mesepisternum, and Hibbitts and Reid concluded that it must be the same species.

On 20 July 2018, Rickard observed a large female darner perched



Coryphaeschna apeora (Icarus Darner) female, Frontera Audubon Thicket, Weslaco, Hidalgo County, Texas, 20 July 2018. Photo by Mike Rickard.

on the edge of a narrow, shaded trail through an isolated patch of fairly dense Tamaulipan scrub woodland (with nearby wooded ponds) at Frontera Audubon in Weslaco, Hidalgo County, Texas. Noting immediately the unfamiliar brown stripes on the frontal thorax, he took a series of photos and sent them to DP and JA, both of whom recognized it as *C. azeura*. Armed with the detail visible in Rickard's images, Paulson re-visited Reid's 2008 darner, and was convinced that it, and Hibbitts' 2009 individual, were indeed *C. azeura*—the 1st and 2nd records for this species north of Mexico.

Once Rickard knew what *C. azeura* looked like, he recalled photographing an "odd Blue-faced Darner [= *adnixa*]" a few years previously. After re-checking his photos, it turned out that on 3 July 2012 he had unknowingly photographed a female *C. azeura* at Frontera. This became the 3rd U.S. record, and his darner from 20 July 2018 was the 4th.

Reid visited Frontera on 24 July, 2018 and obtained fairly good profile photographs of a female *C. azeura* within 30 yards of where Rickard had photographed his 20 July specimen, and assumed it was the same individual. However, later examination of hindwing venation evident in photographs established that these were different individuals, and thus a 5th U.S. record was established. The following day Reid searched for darners at the



Coryphaeschna azeura (Icarus Darner) female, Frontera Audubon Thicket, Weslaco, Hidalgo County, Texas, 20 July 2018. Same individual as previous image. Photo by Mike Rickard.

National Butterfly Center (which has become the premier rare dragonfly location in the U.S.) in Mission, Hidalgo County. In the afternoon he found another female *C. azeura* and obtained close profile photos, establishing the 6th U.S. record.

At that point all six U.S. records were females with intact cerci, and photos established that they were virtually identical. However, the limited extent of wing venation visible in the images indicated an expected degree of variation. Rickard visited the National Butterfly Center on 7 August 2018 and photographed a male *C. azeura*, the 7th record and first male for the U.S. It too was virtually identical to the preceding six U.S. individuals.

Coryphaeschna azeura is a very large darner; within the Neotropical aeshnids, only *Anax walsinghami* (Giant Darner) and *C. ingens* are larger. Paulson provides an excellent character-state matrix for all *Coryphaeschna* taxa (Paulson, 1994), and I recommend this paper to all with an interest in identification of *Coryphaeschna* darners. A summary of the salient *C. azeura* features includes:

Large size.

Pale green face with an obvious T-spot on the frons that can become obscure with age.

Thorax almost entirely pale green, with thin but obvious brown lines along the sutures, and a distinct elongated brown spot/line on each side of the mesepisternum.

Abdomen mostly orangey-brown, with limited greenish-gold pale markings on S3–S7 in the form of thin lines on the dorsal carina and narrow rings centrally and distally, plus limited green on the basal half of S3.

Features for comparison include:

C. adnixa is clearly smaller; *C. viriditas* is slightly smaller.

C. adnixa adults have a bright pale blue face, but can be all-green on very young individuals, and the rear of the eyes always has some blue regardless of age; on *C. viriditas* the face is green with a distinct T-spot and never blue behind the eyes—as for *C. azeura*.

Eyes of mature *C. adnixa* are entirely pale blue (greenish-toned on immatures); the eyes of mature *C. viriditas* and *C. azeura* have a bluish tone above and a greenish tone below (greenish-toned on immatures).

The thorax is similar on *C. adnixa* except there are no dark marks on the mesepisternum; also similar on *C. viriditas* but dark marks on mesepisternum are present, but small and not strongly elongated (sometimes almost absent).

Abdomen color and pattern can be similar on *C. adnixa*, but usually is darker; on *C. viriditas* the abdomen is always blackish, and the pale markings are pure green and more pronounced.

The epiproct of male *C. adnixa* is distinctly less than half the length of the cerci; on *C. viriditas* and *C. azeura* it is distinctly more than half the length of the cerci.

The flight season for *C. apeora* is given as 17 March to 24 August (Paulson, 1994). July 2017 and 2018 found significant numbers of aeshnids in Hidalgo County, indicating a seasonal cycle. All U.S. records of *C. apeora* have been in July/early August except for the first, which was in April.

The “outbreak” of darners in Hidalgo County in July 2018 was exceptional, with multiple individuals in 10 species photographed at three sites within a 23-mile strip near the river, including: Amazon Darner (*Anax amazili*); Blue-spotted Comet Darner (*A. concolor*); Common Green Darner (*A. junius*); Blue-faced Darner (*Coryphaeschna adnexa*); Icarus Darner (*C. apeora*); Swamp Darner (*Epiaeschna heros*); Bar-sided Darner (*Gynacantha mexicana*); Turquoise-tipped Darner (*Rhionaeschna psilus*); Caribbean Darner (*Triacanthagyna caribbea*); and Pale Green Darner (*T. septima*). During July and August 2018, all of the above species were photographed within a 60-yard stretch of a wooded ditch at the National Butterfly Center.

Acknowledgements

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Coryphaeschna apeora (Icarus Darner) male, Frontera Audubon Thicket, Weslaco, Hidalgo County, Texas, 7 August 2018. Photo by Mike Rickard.

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A Place Worth Its Salt: Surveying a Unique Mix of Species in an Unexpected Place

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Peering out over the salt flat towards the alkaline water, you can make out the shape of various dragonflies through the rippling heat waves. A small creek runs under the road and in the salt grass around it a small damselfly flies up. Following the form, it finally lands, and you can positively identify it as *Ishmura barberi* (Desert Forktail). You take a few steps just beyond the creek into the salt flats to get closer to the water, and that’s when you spot *Erythrodiplax berenice* (Seaside Dragonlet). A brilliant dark male is perched on a twig above the shore, and you get your net ready to try for it. It’s as if he knows your intentions and picks up and flies towards the opposite shore. There is a female, just beyond reach, in her black and orange-striped “party dress”. Then it hits you, where exactly are you? You are hundreds of miles from the closest ocean.

This scene could easily have played out at Bitter Lakes National Wildlife Refuge outside of Roswell, New Mexico, which is a well-known spot for an inland Seaside Dragonlet population and other salt-tolerant species. This is not the case, though; instead, you are in Jackson County, Oklahoma. That’s right, Oklahoma!

The unique “Jackson Salt Plains” area is a small habitat that exists in a field nestled between mesquite ranchland following the Red River and the cotton fields of nearby Eldorado in the southwestern corner of Oklahoma. It was the site of Dr. Michael Patten and Brenda Smith-Patten’s (University of Oklahoma) first state record of the Seaside Dragonlet in 2014, and in the following years, a small breeding population was evident repeatedly at the same location.



View of the Jackson Salt Plains, Jackson County, Oklahoma.

The water is shallow, but any attempt to walk beyond the roadside shore results in almost losing a wader boot. Two *Libellula comanche* (Comanche Skimmer) tussle above your head before zooming off down the shoreline. Straddling the roadside, you look around hoping for a glimpse of the *Macrodiplax balteata* (Marl Pennant) that was reported earlier in the season. Among the many Comanche Skimmers buzzing around, you spot something smaller that is being harassed. It flies close enough to make an identification and, finally, a successful netting: *Libellula composita* (Bleached Skimmer), a county record! New, but not surprising for this type of habitat.

For the past several years, including our recent survey, Oklahoma naturalists have documented the same species at Jackson Salt Plains repeatedly, and the species mix continues to overlap

with species seen at Bitter Lakes, even beyond odonates (several tiger beetle species have been found in both places). Finding the same odes repeatedly suggests sustainable breeding habitat exists, even though it would seem unlikely for some of the species that are more localized to particular parts of the country. If this oddly specific ecosystem can exist in Jackson County Oklahoma, it leads us to wonder what might exist in other less explored counties of other states?



Bleached Skimmer (*Libellula composita*) netted August 2018, a new Jackson County record.



Ohio Dragonfly Survey Update

Jim Lemon <jlem@woh.rr.com> and **MaLisa Spring** <spring.99@osu.edu>

We are in our second year of a statewide survey of Ohio Odonata. The Ohio Dragonfly Survey project is supported by the Ohio Department of Natural Resources, The Ohio State University, and the Ohio Odonata Society. It is a citizen science project, and is conducted primarily through photographs submitted to a project on iNaturalist (<<https://www.inaturalist.org/projects/ohio-dragonfly-survey-ohio-odonata-survey>>). As of August 2018, over 25,000 observations have been submitted; these numbers will greatly expand the Ohio Odonata Society database and serve as our most comprehensive Odonata survey.

For 2018 alone, we have research-grade observations (i.e., identifications confirmed) from every county in Ohio, representing 124 species and provided by nearly 400 observers. We look forward to great finds and good data for the remainder of 2018, and on into 2019.

New Species/Observations in 2018

Paiute Dancer (*Argia alberta*): Paiute Dancer was identified from photos and specimens as a species new to Ohio. JL photographed *A. alberta* at a Clark County fen in May 2018. After



Paiute Dancer (*Argia alberta*), Cedar Bog State Nature Preserve, Champaign County Ohio, 7 August 2018. Photo by Jim Lemon.

the identification was confirmed by Dennis Paulson on 5 June 2018, *A. alberta* was subsequently observed at Cedar Bog Nature Preserve (Champaign County) and Oakes Quarry (Greene County). Specimens were collected and then vetted by Steve Hummel.

The three *A. alberta* locations are within a 20-mile radius in southwestern Ohio. They exhibit emergent sedge vegetation over shallow water. Multiple observations have been made of both males and females, and mating behavior has been documented. A subsequent review of previous years' observations shows photos of *A. alberta* as early as 2015 at Cedar Bog, but visits to other local areas with fen habitat have not yet yielded *A. alberta* sites. Based on observations, the flight period for this species in Ohio is mid-May to late August.

Paiute Dancer populations in Ohio represent a significant range expansion for this species. Records in OdonataCentral indicate the nearest observations are approximately 400 miles west of the three southwest Ohio sites.

Jade Clubtail (*Argomphus submedianus*): Jade Clubtail was identified from photos taken at Lake Loramie in Shelby County, starting in mid-June. Subsequent visits to Lake Loramie documented numerous individuals over the length of the lake, with observations in both Shelby and Auglaize Counties. Paulson (2011) notes *A. submedianus* habitat as "large mud-bottomed lakes, sloughs, and canals"—this would be a good description for Lake Loramie. The flight season for this species is June and July.

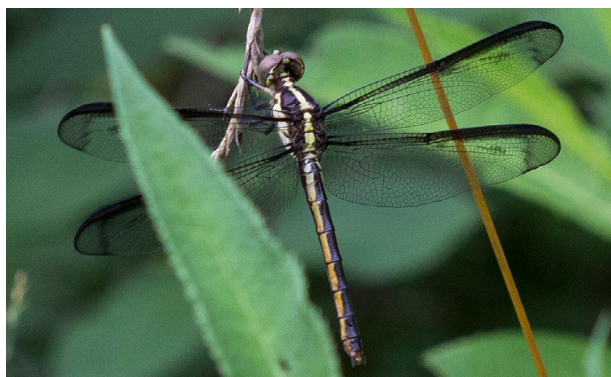
There are a number of OdonataCentral records of *A. submedianus* for Illinois and western Kentucky, and a handful for Indiana. The nearest Indiana OdonataCentral observation is Marion County.

Based on these records, the Lake Loramie population represents an approximately 120-mile range expansion.

Scarlet Skimmer (*Crocothemis servillia*): Scarlet Skimmer was found at a water garden distributor in Green, Ohio (Summit County) on 2 July 2018. Originally, MS had planned to visit the garden center to see if any Rambur's Forktails (*Ischnura ramburii*) were still present, as one had been spotted there in 2016. No Rambur's Forktails were observed, but the Scarlet Skimmer was spotted in a greenhouse that had the sidewalls open. The garden center gave us permission to collect it and it is now in the Triplehorn Insect Collection in Columbus, Ohio.

The garden center receives aquatic plants from Oregon, New Jersey, and Florida. Notable plants include Water Lettuce (*Pistia stratiotes*), Pickerelweed (*Pontederia cordata*), and Mosquito Fern (*Azolla spp.*), among many others. These were all plants that are currently legal to sell in Ohio, even though some of them are listed as potentially problematic invasive species.

Slaty Skimmer (*Libellula incesta*): MS also observed and captured an odd-looking Slaty Skimmer during one of the Ohio Odo-Blitzes. Initially thought to be a possible Bar-winged



Slaty Skimmer (*Libellula incesta*), Lawrence County, Ohio, 6 July 2018. Photo by MaLisa Spring.



Jade Clubtail (*Arigomphus submedianus*), Lake Loramie, Shelby County, Ohio, 1 July 2018. Photo by Jim Lemon.

Skimmer (*L. axilena*), it was later confirmed as a female Slaty Skimmer (*L. incesta*). This specimen had an abnormal amount of black on the leading edges of both the forewings and hindwings, but it lacked the coloration at the base of the hindwings that is characteristic for Bar-winged Skimmer.

Odonata Central records

Arigomphus submedianus: OC #482233, #486661-486666

Argia alberta: OC #481590, #481675-481678, #481680-481685, #483369, #484599-484600, #486942-48943, #487807-487808

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Photo Submissions for ARGIA

Would you like to contribute a photo as a possible front or back cover “glamour shot” for ARGIA? We use high-quality images in TIFF or JPEG format with a resolution of at least 300 ppi at 6.5 inches in width. **Please check your image resolution before sending!** Photos of an interesting behavior or specimen may be suitable for Parting Shots if they have a resolution of 300 ppi at column width (3.2 inches).

Send your photos as e-mail attachments to <editor@dragonflysocietyamericas.org> (up to 15 Mb), via a file transfer service, GoogleDrive, or Dropbox, **NOT in the body of an e-mail or document!** Photos may be kept for use in later issues, but they will never be used for purposes other than ARGIA, and the copyright is retained by the photographer. Please include date, location (state and county at minimum), and photographer's name for each photograph.

Black Phoebe (*Sayornis nigricans*) Predation on Variegated Meadowhawk (*Sympetrum corruptum*)

Michael D. Freehling, Denver, Colorado <freehling.mike@gmail.com> and Kristine Johnson, Natural Heritage New Mexico, University of New Mexico, Albuquerque, New Mexico <kjohnson@unm.edu>

In their review of avian predation on Odonata, Gallucci and Freeman (2007) listed new records of predator and prey species. Subsequent reports in ARGIA provide additional avian and odonate taxa in predator-prey interactions and describe avian foraging behaviors (Babson, 2008; Gregoire and Gregoire, 2008; Worthen, 2011; Trull, 2018).

Throughout their range in California and the southwestern USA, Black Phoebes (Tyrannidae—tyrant flycatchers) are known from habitats (riparian areas, wetlands, shorelines of lakes and ponds, and cattle tanks; Wolf, 1997) associated with Odonata. Black Phoebes capture flying or perching insects and typically forage from low perches near or over water by aerial hawking and perch-to-ground (or perch-to-water) sallies (Fitzpatrick, 1980). Surveys of avian stomach contents compiled by the U.S. Biological Survey in the early 1900s include relatively high frequencies (18–20%) of adult odonates in diets of Black Phoebes in California (63 of 344 stomachs; Beal, 1912) and in North American collection records (67 of 340 stomachs; Kennedy, 1950). Anisoptera (dragonflies) and Zygoptera (damselflies) were not differentiated and species were not identified.

The Black Phoebe appears to be a prime candidate for observations of predation on odonates, but we did not find published records for species or genera of Odonata in diets or foraging observations. Our literature review included other tyrannid flycatchers. We found two additional records of odonate predation that were not reported in Gallucci and Freeman (2007): Great Crested Flycatcher (*Myiarchus crinitus*) and *Macromia* spp. (Williamson, 1921); Eastern Kingbird (*Tyrannus tyrannus*) and *Leucorrhinia intacta* (Dot-tailed Whiteface), *Agrion* (demoselle) spp., and *Argia* (dancer) spp. (Kennedy, 1950). In this note, we report predation on *Sympetrum corruptum* (Variegated Meadowhawk) by Black Phoebes (*Sayornis nigricans*) in south-central New Mexico.

While conducting surveys of Odonata at Holloman Air Force Base, New Mexico (17–20 September 2012), we observed Black Phoebes foraging on dragonflies at monitoring sites along a 2.5 km stormwater conveyance canal. The monitoring area encompasses a mosaic of aquatic and wetland habitats: deep and shallow water, floating algal mats, mudflats, and emergent vegetation. Cosmopolitan bulrush (*Bolboschoenus maritimus*) and saltgrass (*Distichlis spicata*) grow on the canal lower bank and margins of ponds (10–20 m diameter) created by overbank flooding (Figure 1). The opposite, higher bank is a maintenance road on a steep-sided berm. Branches of saltcedar (*Tamarix*

chinensis) growing on the embankment extend over the water. Census sites included three ponds and two 100 m transects along the canal. We recorded nine species during this census period (relative abundance of males is shown as percent occurrence combined for all sites): *Enallagma civile* (Familiar Bluet, 83%); *Sympetrum corruptum* (Variegated Meadowhawk, 9%); *Rhionaeschna multicolor* (Blue-eyed Darner, 3%); *Tramea lacerata* (Black Saddlebags, 2%); *Anax junius* (Common Green Darner, 1%); *Erythemis collocata* (Western Pondhawk, <1%); *Libellula saturata* (Flame Skimmer, <1%); *L. croceipennis* (Neon Skimmer, <1%); and *L. pulchella* (Twelve-spotted Skimmer, <1%). Counts of *E. civile* ranged from 20–270 males per site (mean = 76); *S. corruptum*, 5–15 males per site (mean = 8); other species, <4 males per site (unpublished report, Natural Heritage New Mexico, 2013).

Based on sight or vocalizations, we detected four Black Phoebes along the canal during four days in the field. Each phoebe occupied a foraging territory that included a pond or a 20–30 m section of canal. Birds foraged from perches 2–3 m above the water—saltcedar branches or a fence-line crossing the canal—and often returned with a dragonfly. Initial observations were cursory due to time constraints. Our views of feeding perches were often obscured by vegetation, so identification of the dragonflies was tentative, although they appeared to be *S. corruptum*.

On our final two field days (19–20 September), we watched phoebes in late afternoon for 30 min. periods at two pond sites with unobstructed visibility. Phoebes captured dragonflies that were perched on emergent vegetation or dead saltcedar branches on or near the pond surface. Four *S. corruptum* were captured in



Figure 1. Black Phoebe foraging site on a canal at Holloman Air Force Base, New Mexico.

three observation sessions: a male and female in the first; a male in the second; and a female in the third. Behavior of the birds was similar in all sessions. After capturing a perching meadowhawk, the phoebe returned to its perch, immobilized the insect by beating it against the branch, and swallowed the whole dragonfly. *Enallagma civile* males were conspicuous all day, resting or *in copula* on vegetation and algal mats, but we never saw a Black Phoebe attempt to capture a bluet during our 30 min. sessions or in casual observations. Four other dragonfly species use conspicuous perches at this site (*E. collocata* and three *Libellula* species), but observation of a predation event is unlikely because of their low abundance.

Our observations of Black Phoebe foraging behavior are similar to those reported in southwestern riparian habitats. In Trans-Pecos Texas, Black Phoebes foraged from lower branches of streamside woody plants on odonates and other insects (Ohlendorf, 1976). On the Colorado River in Arizona, Black Phoebes captured dragonflies in sallies above or at the water surface (Rosenberg et al., 1991). Contrary to our observations of prey capture, Ohlendorf (1976) found damselflies to be major constituents in adult stomach contents (21% of total prey volume, $n = 14$ samples), whereas dragonflies were captured infrequently and not found in stomach samples. In that study, relative abundances of damselflies and dragonflies were not given and species were not identified.

We find it intriguing that phoebes preferred Variegated Meadowhawks over abundant and conspicuous Familiar Bluets. Damselfly palatability and capture feasibility should not be a limitation for Black Phoebes, as indicated by the presence of damselflies in Ohlendorf's (1976) diet study. Gregoire and Gregoire (2008) reported similar observations for Cedar Waxwings (*Bombycilla cedrorum*) that foraged exclusively on teneral Calico Pennants (*Celithemis elisa*) and ignored abundant emerging damselflies (*Enallagma* and *Ischnura*). Predator avoidance, including cryptic coloration, choice of substrate, or posture (Corbet, 1999), was not evident for bluets at our site. Caloric value and body mass suggest an explanation for these choices of prey. Orians (1980) used bomb calorimetry to measure caloric content of insects fed to nestling blackbirds; caloric value of an individual dragonfly was 10 times greater than that of a damselfly (500–800 vs. 50 calories). Carbon content analysis by Clarke et al. (1996) led to the conclusion that body mass is the best predictor of energy content for odonates. Corbet (1999: 330) emphasized the favorable cost-benefit ratio per foraging trip

for birds that are capable of capturing large prey such as dragonflies. Assuming that energy expenditure for a foraging sally is constant, the caloric benefit to a phoebe would be substantial if perching dragonflies are present. The positive correlation between caloric value and body size is a compelling explanation for selection of *Sympetrum* over *Enallagma*.

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DSA Odonate Research Grant Program—2019 Call for Proposals

Nancy McIntyre, DSA Research Grant Program Chair <Nancy.Mcintyre@ttu.edu>

The DSA Odonate Research Grant Program awards small grants (up to \$1000) to help pay expenses for odonate research in the DSA focal region (New World). Last year, four awards were made; please see ARGIA Vol. 30, No. 2, p. 10 (2018) for more information. A committee (Nancy McIntyre [chair], Chris Hill, Buck Snelson) will evaluate grant proposals for 2019 on the basis of scientific importance, feasibility, and clarity, and will make funding recommendations to the Executive Council.

Frequently Asked Questions

Q. Who is eligible to apply for a grant?

A. Currently, we are only able to make awards to members of DSA from the U.S. We currently cannot make awards to members of DSA with mailing addresses outside the U.S.

Q. Can a person who has received a DSA grant in the past be eligible in the future?

A. Yes, recipients can receive multiple grants as long as the obligations outlined below are met for each grant.

Q. How many grants will be awarded?

A. The answer depends on the number of meritorious proposals received, the amounts requested by those proposals, and the availability of funds. We are anticipating 1-5 awards of \$500-1000 apiece.

Q. How will the funds be awarded, and are there any restrictions on what can be covered?

A. Awards will be made by check and mailed to the awardee; wire transfers are currently not an option. Awards cannot be used for salary, only for travel, services, supplies, or equipment. Awards will be mailed within three weeks of final approval.

Q. What obligations are associated with receiving a grant?

A. Awardees must submit a progress report to the DSA Executive Council within one year of the grant award; failure to do so will render the recipient ineligible for any future DSA grants. Awardees are strongly encouraged to give a presentation at a DSA meeting or submit a paper to ARGIA or the Bulletin of Odonatology within one year of project completion.

Q. How can I donate to the DSA Odonate Research Grant Program?

A. Please contact the DSA Treasurer at <treasurer@dragonflysocietyamericas.org>. Thank you for your support of this program, which is made possible by member donations!

Q. How can I apply?

A. Fill out the Grant Application Form (below), convert to a PDF, and email to Nancy McIntyre at <nancy.mcintyre@ttu.edu> before 1 February 2019. You will receive an email acknowledgment that your proposal was received. Only proposals using this form will be considered. Please **DO NOT**:

- Submit your proposal by mail.
- Submit your proposal in a form other than PDF.
- Reformat this Proposal Form (e.g., alter font size) or exceed the allotted three pages.
- Include supplemental attachments.
- Contact DSA to check on the status of your proposal. All participants will be notified by 15 March 2019 whether or not they will be awarded funding.

DSA Odonate Research Grant Proposal Application Form

I. Applicant Information

Name(s) of Applicant(s) (and affiliation(s) if applicable):

(For projects with more than one researcher involved, please indicate the primary applicant to whom the award check would be mailed.)

Contact Information (U.S. mailing address, phone, email):

Researcher Qualifications (briefly describe your qualifications for conducting this project, including relevant current and past activities; no more than half a page):

II. Project Information

Project Title:

Amount Requested (not to exceed \$1,000):

Start Date (month, year):

Completion Date (month, year):

Project Summary (100 words maximum):

III. Project Description (2 single-spaced pages including Literature Cited; should include objectives, an explanation of the

scientific importance of the study and its importance to DSA, methods, and location)

IV. Budget and Justification (1 single-spaced page)

Provide a project budget and indicate how DSA grant funds will be used. Note: DSA cannot pay for salaries, overhead, grant administration, or similar costs (can only be used for travel, services, supplies, or equipment).



Odonata in the News

Odonata in the News is compiled by the Editor. Please feel free to send alerts about odonate-related news stories, popular articles, videos, and scientific publications to me at <editor@dragonflysocietyamericas.org>. A sampling of recent newsworthy Odonata includes:

Buden, D.W. 2018. Dragonflies and damselflies (Insecta: Odonata) of the Republic of the Marshall Islands. *Pacific Science* 72(3): 373–387. Seven species of Odonata are recorded from among the numerous atolls and midocean reef islands that make up the Republic of the Marshall Islands (RMI). They include two Zygoptera (damselflies: *Tanymecosticta* sp. and *Ischnura aurora*) and five Anisoptera (true dragonflies: *Anax guttatus*, *Diplacodes bipunctata*, *Pantala flavescens*, *Tholymis tillarga*, and *Tramea transmarina*). The damselfly *Tanymecosticta* sp. is known only from a single World War II-era extralimital record reported here for the first time. Breeding is confirmed for the six other species, which are widely distributed in the Pacific and often further afield. The frequently cited record of *Pantala flavescens* as being the first odonate and one of the first insects to colonize Bikini Atoll after cessation of nuclear testing requires verification. Additional surveys on many of the Marshall Islands not yet sampled for odonates will doubtless result in many new locality records. However, small island size, limited habitat diversity and water resources for breeding, and large distances from potential source populations contribute to an impoverished odonate fauna, and few, if any, species are likely to be added to the list. The six species known to inhabit the Marshall Islands make up the entire known odonate faunas of many other low, coralline islands in the West-central Pacific.

Delpon, G., H. Vogt-Schlib, F. Munoz, F. Richard, and B. Schatz. 2018. Diachronic variations in the distribution of butterflies and dragonflies linked to recent habitat changes in Western Europe. *Insect Conservation and Diversity* <<https://doi.org/10.1111/icad.12309>>. In the context of ongoing global changes, it is crucial to characterise and understand the species distribution dynamics. Despite increasing emphasis on insects' conservation issues, evidence of distribution changes in insects over a wide range of bioclimatic conditions remains scarce in Western Europe. We examined distribution changes in butterflies and dragonflies in three European countries over 34 years, determined the influence of environmental

changes, especially land cover, and assessed how of species ecology related to distinct responses. We analysed the diachronic variations by compiling occurrence data in France, Belgium, and Luxembourg for 240 butterfly and 95 dragonfly taxa. We found contrasting patterns of diachronic variation in butterfly and dragonfly distributions, i.e. a strong gradient of disappearance for butterflies (from northwest to southeast with significantly higher rate of disappearance in urbanised and intensive agriculture areas of north-western France), whereas dragonflies showed lower and heterogeneous variation in occurrences, mainly related to alteration and regression of aquatic habitats. Species responses appeared closely linked to their ecological preferences, with greater decline in habitat specialist species. Butterfly and dragonfly species are constrained by their dependence to host plant species and to aquatic habitats, respectively, and proved to convey complementary insights on the influence of environmental changes in biodiversity dynamics. Conservation priorities were identified across species and administrative units, revealing that almost 80% of the declining taxa were not listed on the current protection lists. Our results support the need to update current French policies in terms of insect conservation.

Ilvonen J.J., K.M. Kaunisto, and J. Suhonen. 2018. Odonates, gregarines and water mites: why are the same host species infected by both parasites? *Ecological Entomology* 43(5): 591–600. Damselflies and dragonflies are widely parasitised insects and numerous studies have tried to understand this host–parasite relationship. However, most of these studies have concentrated on a single host species, neglecting the larger pattern within the Odonata order. The aim of this paper was to examine different damselfly and dragonfly species for common endo- and ectoparasites and whether a general infection pattern can be found. Additionally, the goal was to investigate whether the phylogeny of the host species could explain these possible infection patterns. To this end, a dataset from the existing literature was compiled and the prevalence of endoparasitic gregarines and ectoparasitic water mites was analysed for 46 different odonate species. Three distinct patterns were found: (i) most of the odonate host species had both gregarines and water mites, rather than only either one or neither; (ii) there appears to be a positive association between gregarine and water mite

prevalences across host species; (iii) a weak phylogenetic signal was detected in gregarine prevalence and a strong one in water mite prevalence. It is hypothesised that, due to the infection and transmission mechanisms by which water mites and gregarines infect different odonate host species, parasitism is aggregated to common, high-density species. However, much research is needed in order to fully understand this relationship between odonates and their parasites, especially within the same host populations and host species assemblages.

Jiang, B. and D.J. Mikolajewski. 2018. Shift in predation regime mediates diversification of foraging behaviour in a dragonfly genus. *Ecological Entomology* 43(4): 525–533. Behavioural adaptations to avoid and evade predators are common. Many studies have investigated population divergence in response to changes in predation regime within species, but studies exploring interspecific patterns are scant. Studies on interspecific divergence can infer common outcomes from evolutionary processes and highlight the role of environmental constraints in shaping species traits. Species of the dragonfly genus *Leucorrhinia* underwent well-studied shifts from habitats being dominated by predatory fish (fish lakes) to habitat being dominated by predatory invertebrates (dragonfly lakes). This change in top predators resulted in a set of adaptive trait modifications in response to the different hunting styles of both predator types: whereas predatory fish actively search and pursue prey, invertebrate predators follow a sit-and-wait strategy, not pursuing prey. Here it is shown that the habitat shift-related change in selection regime on larval *Leucorrhinia* caused species in dragonfly lakes to evolve increased larval foraging and activity, and results suggest that they lost the ability to recognise predatory fish. The results of the present study highlight the impact of predators on behavioural trait diversification with habitat-specific predation regimes selecting for distinct behavioural expression.

Rodrigues, M.E., F. De Oliveira Roque, R. Guillermo-Ferreira, V.S. Saito, and M.J. Samways. 2018. Egg-laying traits reflect shifts in dragonfly assemblages in response to different amount of tropical forest cover. *Insect Conservation and Diversity* <<https://doi.org/10.1111/icad.12319>>. Oviposition site selection by aquatic insects is usually influenced by both aquatic and terrestrial cues. Landscape changes (e.g. native vegetation loss) can affect the level of the reproductive success in aquatic insects, changing local species composition and richness. We investigate whether forest cover loss around streams influences the number of species with exophytic (species which lay eggs directly on the water surface), endophytic (species which lay their eggs directly into plant tissue), or epiphytic (species which lay eggs on the exposed sur-

face of rocks, leaves, trunks or other substrates protruding from the stream surface) oviposition behaviour in dragonfly assemblages. We sampled adult dragonflies in 116 streams in a Neotropical savanna region in Brazil. The relationship between species richness for each behavioural category, and the proportion of forest cover around the streams, was tested using regression analysis. We collected 2,413 Anisoptera and Zygoptera individuals, belonging to 8 families, 30 genera, and 63 species. Of these, 25 species were classified as exophytic, 28 as epiphytic, and 10 as endophytic. Our results show the number of species with exophytic or epiphytic behaviour was strongly related to riparian forest loss. Forest loss changes the habitat, and here, specifically changes site suitability for oviposition. We highlight the importance of using behavioural traits as a bioindicator tool for the assessment of anthropogenic impacts on tropical forest.

Tavares R.I.S., G.C. Pestana, A.D. Rocha, D.C. Schiavone, and R. Guillermo-Ferreira. 2018. Come to the dark side: habitat selection of larval odonates depends on background visual patterns. *Ecological Entomology* 43(5): 640–646. Determining which environmental traits enable animals to inhabit and choose preferred habitats is key to understanding ecological processes. Habitat complexity and background colour patterns can act as selective pressures on animal behaviour, and ultimately affect habitat choice. To investigate the role of environmental features on habitat selection, this study looked at whether dragonfly and damselfly larvae show a preference between dark/light or complex environments. Last-instar larvae of *Micrathyria didyma* (Libellulidae) and *Acanthagrion lancea* (Coenagrionidae) were collected in the Neotropical savanna, and five experiments in laboratory conditions were subsequently carried out. The first experiment tested the preference of larvae for leaves in contrast to a white background. The second experiment compared a preference for white and black backgrounds. As both experiments showed a significant preference for darker backgrounds, a predator was included in the black background in the third experiment, and a macrophyte was included in the white background in the fourth experiment. In this way, favourable and unfavourable conditions were included in the habitat of choice. The fifth experiment tested the influence of environmental complexity on habitat choice. The results of these experiments showed that larvae choose darker backgrounds independently of predation risk, and that macrophytes are as attractive as a dark background. They also suggest that the coenagrionid, but not the libellulid, prefer more complex environments. Overall, these findings suggest that larvae exhibit behavioural preferences for background colour and complexity, which may ultimately drive habitat occupation. 

ID Corner

ID Corner addresses the challenges we face as print and electronic resources blossom, and more newcomers come into the dragonflying fold. DSA members range from those who pore over in-hand or microscopic features to hands-off observers who want to know the best field marks to identify an individual to species. Excellent information can be found on different Facebook page threads and e-mail list serves, but even the most detailed post can be lost or buried. This ID-themed section provides more

structure and accountability than those myriad Facebook threads (even though it is not peer-reviewed).

We hope additional DSA members with expertise will contribute notes in the future. Readers can also ask about specific topics for future issues. Topics and questions can address aspects of identification of adults, nymphs, or exuviae. If you have any questions, please contact me at <editor@dragonflysocietyamericas.org>. 

New Book Announcement: Eponym Dictionary of Odonata, by Bo Beolens

Eponym Dictionary of Odonata, by Bo Beolens. Whittles Publishing, 2018. ISBN 978-184995-365-8. Hardback, 480 pp., £45.00. Available directly from the publisher at <http://www.whittlespublishing.com/Eponym_Dictionary_of_Odonata> and through U.S. retailers.

Adapted from the publisher's web page and e-mail:

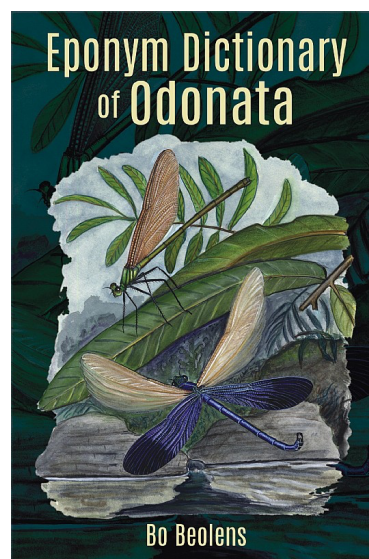
The *Eponym Dictionary of Odonata* is a comprehensive listing of all people memorialized in damselfly and dragonfly scientific or common names. Each entry provides species details and a brief biography of the person. It is cross-referenced so that relationships between scientific authors, entomologists, and others can be followed. Over 1,330 individuals have been immortalized in these species names, and a small number also appear in genus names. This book tells us something of their stories. The biographical accounts of the life and achievements of these 'eponymeers' vary considerably in length and content, but this is no reflection of the importance and merit of the person in question.

The people so honoured are not necessarily odonatologists, entomologists, zoologists, or even great scientists. Many damselflies and dragonflies are named for family members, friends, and those who collected the species holotypes, while others are figures from myth or history. Because entries may include details of dates, places, and educational and work institutions, it is possible to discover information about each person and for a picture to be built of how science sometimes follows groupings of colleagues or those significantly influenced by charismatic teachers.

The dictionary includes other names which might, at a glance, be thought to be eponyms yet are not in the truest sense. These may be species named after character-

istics embodied in characters from literature, whole peoples, acronyms or toponyms, etc. To some extent it can read like a canon of the great women and men of science over the last several centuries. There are species named after as many as three generations of the same family, veiled references to old lovers, sycophantic homage, financial patronage, etc., as well as all the more 'legitimate' reasons for naming species.

Not surprisingly, odonatologists exhibit a range of opinion on the practice, from those wanting to name all species after people, to those wanting all eponyms banned. Like all of us, they can be humourless and pedantic or full of fun and irreverence, and they have as many reasons for their namings as others have for naming their children or pets! Underlying all this, however, is the value of this volume in cataloguing this fascinating aspect of science for all users, whether scientists or interested lay readers. This book will appeal to entomologists with an interest in Odonata, academics and practising field scientists, students in these subjects, scientific libraries, and anyone with an interest in damselflies, dragonflies, and the history of science. 



Cultural Odonatology

DSA members are as diverse as the insect order we all love; we approach Odonata as scientists, educators, naturalists, artists, poets, photographers, essayists, bloggers, and more, with many wearing several of these hats. Cultural Odonatology focuses on different aspects of the human

relationship with odonates, showcasing dragonflies in art, architecture, literature, and legend, and may contain original works or discussions of odonates in existing works. If you would like to contribute to this feature, contact the Editor at <editor@dragonflysocietyamericas.org>. 

How I Fell Into the Clutches of the Odonata

This feature presents essays from DSA members describing how, when, where, and why they first became interested in Odonata. It also doubles as a fun way for members to find out a little more about each other. 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 <editor@dragonflysocietyamericas.org>. Photographs to illustrate the stirring tale are encouraged. Whether from those who are discovering odonates this year or who have pursued them for decades, there are plenty of interesting, entertaining, and inspiring stories out there to be told!

In this instalment, Kelley Stettner <blackrivercleanup@gmail.com> describes how what started as a tool ended up turning into a passion.

I first began looking at aquatic macroinvertebrates from a water quality standpoint in 2003, when my grassroots watershed group, the Black River Action Team, was quite new and couldn't afford the expensive lab tests to run water samples. Bioassessments were quickly termed "Bug Hunts" and they became one of the most popular activities I could do with the public. Ode larvae were new and unusual to me, but they were just part of the "zoo" for the first few years.

I got officially "hooked" in 2012, when I began to look more closely at these little critters. A study was being done on the impact of sudden changes in water levels from a series of hydroelectric dams on the Connecticut River, into which my own Black River empties. Dragonfly larvae were singled out because of their emergence and eclosure near the water line; if the surface of the river was raised too high too quickly, certain species of dragons would likely perish before tenerals could gather the strength to fly off safely.

The more I learned about Anisoptera, the more intrigued I became. I've passed my enthusiasm and awe on to kids of all ages and their parents and teachers, as well as to our two homeschooled children. Our son, now 12, has been collecting exuviae with me since he was old enough to kayak with me. Our daughter, now a sophomore majoring in Biology at Norwich University, adores sifting through the water at the river's edge to discover larvae hiding in the leaves and mud. Both are learning alongside me to properly net, handle, photograph, and catalog adult dragonflies.

I am indebted to the many ode lovers (both expert and hobbyist) who have encouraged this fascination and supported my many clumsy attempts at proper identification of my specimens. I'm also eternally grateful to my husband of nearly 30 years, who tolerates a basement full of lab equipment and jars of empty dragonfly skins! 



Our son, Armando, holding a beautiful dragonfly at a workshop led by Bryan Pfeiffer and Mike Blust at Marshfield Pond in June 2018.

Parting Shots

Parting Shots pays tribute to the endless diversity and interest of odonate behaviors and to the skilled photographers among us, with a nod to the many unexpected (and sometimes downright silly) ways in which odonates can creep into daily life. If you have photos that showcase an odd, bizarre, unusual, unexpected, or amusing aspect of odonate life (or of life with odonates), e-mail them to the Editor at <editor@dragonflysocietyamericas.org>, and include a note describing the photo, location, and event.

Why the Long Face?, by Cathy Perkins <cathy.perkins@gmail.com>

Cathy captured this photo on 26 May 2018 at the Sherburne National Wildlife Refuge on Prairie's Edge Wildlife Drive in Sherburne County, Minnesota. She notes "I had not seen an emergence in person till this year and to see the face parts stretched out like that had me in awe."



Is This Seat Taken?, by Jerry Hatfield <l.hatfiejk@gmail.com>

On 26 July 2018, Jerry documented this colorful crowd of *Neoneura aaroni* (Coral-fronted Threadtail) vying for an oviposition spot at the Medina River Nature Area, San Antonio, Bexar County, Texas.



A String of Emeralds, by Steven Daniel <natdisc@gmail.com> and Fons Peels <info@dragonflypix.com>

Attendees of the DSA Annual Meeting in Minnesota this year were treated to a dizzying array of emeralds, several of which were lifer species for many of us. These emeralds come to us from even further afield. Steven Daniel captured this shot of *Somatochlora williamsoni* (Williamson's Emerald) in flight along the Racquette River in the Adirondack Mountains of New York on 10 August 2018 (top). Fons Peel found this *Somatochlora sahlbergi* (Treeline Emerald) in northern Finland on 21 July 2018 (bottom); in North America, this species has been reported from Alaska and the Yukon Territory. 



Somatochlora williamsoni (Williamson's Emerald), Racquette River, New York, 10 August 2018. Photo by Steven Daniel.



Somatochlora sahlbergi (Treeline Emerald), far northern Finland, 21 July 2018. Photo by Fons Peel.

Call for Papers for the Bulletin of American Odonatology (BAO)

The Bulletin of American Odonatology is DSA's peer-reviewed journal for reporting research on Odonata of the New World. Submitted articles may include faunal synopses, behavioral analyses, and ecological studies. BAO also publishes taxonomic studies, but will not consider the publication of new names at any taxonomic level.

See the last page of this issue of ARGIA for the BAO publishing guidelines. Article submissions or questions should be directed to Steve Hummel, BAO Editor, at <editor@dragonflysocietyamericas.org>.

ARGIA and BAO Submission Guidelines

All materials must be submitted digitally via e-mail or an internet file sharing service (i.e., Dropbox, GoogleDrive, TransferBigFiles, or similar service). If digital submissions are not possible, contact the Editor before sending anything. Material for ARGIA and BAO should be sent to the Editors at <editor@dragonflysocietyamericas.org>. Authors should expect to receive an e-mail confirming receipt of submissions within five business days.

Articles

All articles and notes should be submitted in Word, Pages, or Rich Text Format (RTF), without embedded figures, tables, or captions. All photos and figures must be submitted as separate files (see Figures below). Only minimal formatting of each article 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 Word, Pages, or Rich Text Format document. Articles will be edited if needed for clarity, grammar, and/or space.

Begin the article with title, author name(s), and contact information (including e-mail for primary author) 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. The first time each species is mentioned in the article, always give both the scientific name as well as the official common name (where one has been assigned) in parentheses. Subsequent mention of the same species may be done using scientific or common name only, as the author prefers. Literature should be referenced in the article text using author names, not numbers (i.e., “Carlos and Young, 2009; Quill et al., 2011”).

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 or JPG files with a **minimum of 300 ppi** at the intended print size. If you are unsure about the final print size, keep in mind that oversized 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 Editor 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) can be submitted 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 unsatisfactory. When charts and graphs are generated in Excel or Numbers, please submit the file 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 or Pages documents or as spreadsheets in Excel or Numbers. If Excel or Numbers is used, place each table on a separate worksheet and name each worksheet appropriately (e.g. “Table 1”, “Table 2”, etc.).

The Dragonfly Society Of The Americas

Business address: Celeste Searles Mazzacano, CASM Environmental LLC, 5914 SE Knight St., Portland, Oregon, USA 97206

Executive Council 2017–2019

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President Elect	vacant	
Immediate Past President	R. DuBois	Superior, Wisconsin
Vice President, United States	M. May	New Brunswick, New Jersey
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Secretary	M. Moore	Newark, Delaware
Treasurer	C. McKee	Ottawa, Illinois
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Regular Member (2017–2023)	N. McIntyre	Lubbock, Texas
Regular Member (2013–2019)	M. Garrison	Naperville, Illinois
Editor in Chief	C. Searles Mazzacano	Portland, Oregon
Associate Editor (BAO Editor)	S. Hummel	Lake View, Iowa
Webmaster	K. Abbott	Tuscaloosa, Alabama

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 DSA includes a digital subscription to BAO.

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 and BAO. Dues for individuals in the US, Canada, or Latin America are \$15 us for regular memberships (including non-North Americans), institutions, or contributing memberships; \$20 us or more for sustaining memberships; a single payment of \$300 us for Life membership; and a single payment of \$400 us or more for Sustaining Life membership. Dues are payable annually on or before 1 March of the membership year. Membership dues can be paid online via credit card; see <http://odonatacentral.org/index.php/PageAction.get/Name/DSA_Membership>. Membership forms can also be downloaded and mailed with a check to The Dragonfly Society of the Americas, Inc., Attn: Cynthia McKee, Treasurer, 605 9th Avenue, Ottawa, Illinois 61350-4119. For more information on joining DSA, visit <www.dragonflysocietyamericas.org/join>.

Mission of the Dragonfly Society of the Americas

The Dragonfly Society of the Americas advances the discovery, conservation and knowledge of Odonata through observation, collection, research, publication, and education.

Back cover: (upper) *Gomphurus vastus* (Cobra Clubtail) male eating a damselfly, Hardware River Wildlife Management Area, Fluvanna County, Virginia, 24 May 2018. Photo by Leo Meire. **(lower)** *Pachydiplax longipennis* (Blue Dasher) nymph, Outaouais River, Gatineau, Quebec, 22 July 2017. Photo by Benoît Ménard.

