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DSA Annual Meeting, 12–14 July 2019 in Austin, Texas

John Abbott <jabbott1@ua.edu>

The DSA annual meeting will be held in Austin, Texas, immediately prior to the International Congress of Odonatology (see next article in this issue). The DSA meeting will be held from 12–14 July 2019, with the business meeting and presentations on Saturday at McKinney Roughs Nature Park in Bastrop County near Cedar Creek, Texas, about 30 minutes southeast of Austin. There will be a pre-meeting trip to east Texas from 8–11 July. There will not be a post-meeting trip; instead, we encourage you to consider attending the International Congress of Odonatology.

You can view a checklist of the 117 species of odonates documented for Travis County at OdonataCentral at <<https://tinyurl.com/TravisCoOdes>>, and see the seasonality of Texas species at <<https://tinyurl.com/TxOdeSeasonality>>. Some of the highlights that we will be looking for during the meeting include: Rainpool Spreadwing (*Lestes forficula*), Leonora's Dancer (*Argia leonorae*), Coral-fronted Threadtail (*Neoneura aaroni*), Orange-striped Threadtail (*Protoneura cara*), Turquoise-tipped Darner (*Rhionaeschna psilus*), Broad-striped Forceptail (*Aphylla angustifolia*), Narrow-striped Forceptail (*A. protracta*),



Texas Emerald (*Somatochlora margarita*) nymph. Photo by John Abbott.



Orange-striped Threadtail (*Protoneura cara*). Photo by John Abbott.

Five-striped Leaf-tail (*Phyllogomphoides albrighti*), Four-striped Leaf-tail (*P. stigmatus*), Blue-faced Ringtail (*Erpetogomphus eutainia*), Bronzed River Cruiser (*Macromia annulata*), Texas Emerald (*Somatochlora margarita*), Red-tailed Pennant (*Brachymesia furcata*), Gray-waisted Skimmer (*Cannaphila insularis*), Black Setwing (*Dythemis nigrescens*), Thornbush Dasher (*Micrathyria hagenii*), Carmine Skimmer (*Orthemis discolor*), and Slough Amberwing (*Perithemis domitia*).

Details and registration will be available on the Dragonfly Society of Americas new website at the beginning of 2019 (all current DSA members will receive an e-mail when the new site is live). For additional details, contact John Abbott at <jabbott1@ua.edu>.



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	14–19 Jul 2019	Austin, Texas	John Abbott <jabbott1@ua.edu>

International Congress of Odonatology, 14-19 July 2019 in Austin, Texas

John Abbott <jabbott1@ua.edu>

For the first time since 1999, the International Congress of Odonatology (ICO) will be held in the United States. This is a great opportunity to engage with researchers from around world who are studying Odonata. The 2019 ICO will be held in Austin, Texas (Travis County) in the southern U.S.A. from 14-19 July 2019. Austin is a great destination for dragonflies and damselflies, with 116 species known from the Austin area and 245 species in Texas!

The Sunday night icebreaker and all of the meetings will take place in downtown Austin on the 2nd floor of the Palmer Event Center on Lady Bird Lake. On Wednesday night, our congress dinner will take place within walking distance of the Palmer Event Center, on boats touring Lady Bird Lake where we'll watch the famous Mexican Free-Tailed Bats (*Tadarida brasiliensis*) emerge from under the Congress Street Bridge. This colony is the largest urban bat colony in the world.

To make cost more flexible, the mid-conference trip will now be an optional Friday local field trip, where we will take you to some of the hotspots for dragonflies in the Austin area. The post-congress trip will travel to the Rio Grande Valley in south Texas to see some of the Neotropical fauna that just make their way into the U.S.A.

Additional details are available on the congress website at <<https://worlddragonfly.org/meetings/ico2019/>>. Topics likely to be addressed in the program will include: Odonata without borders; Los Odonatos de México; natural history of Odonata; odonate conservation; citizen science as a tool for odonate research; outreach; identification of nymphs; and digitizing collections.



Possible sightings at the ICO include Carmine Skimmer (*Orthemis discolor*), upper; and Five-striped Leaftail (*Phyllogomphoides albrighti*), lower. Photos by John Abbott.

For more details contact John Abbott <jabbott1@ua.edu>.



Don't Forget to Renew Your DSA Membership for 2019!

Start the new year off right and renew your DSA membership. Annual dues are only \$15 USD, and include great benefits such as an electronic subscription to both BAO and ARGIA; fee discounts at DSA annual meetings; and eligibility to vote in DSA elections and serve on the Executive Committee. A sustaining membership of \$20 USD provides even more support for our organization. You can pay your dues for multiple years or take advantage of a Life or Sustaining Life membership (single payment of \$300 USD or \$400 USD, respectively).

Dues can be paid online via credit card, or you can print out the membership form and mail it along with a check or money order. Membership information and forms are on the OdonataCentral web site at <https://www.odonatacentral.org/index.php/PageAction.get/name/DSA_Memberships> (note that this will change early in 2019 when the new DSA web site goes live). You must be logged into your OdonataCentral account to access the credit card payment option. Thank you for supporting the DSA!

2019 Southeast DSA Regional Meeting

Jerrell J. Daigle <jdaigle@nettally.com>

The 2019 Southeast DSA regional meeting will be held in Crestview, Florida from 29–31 March. I am staying at the Baymont Inn (850-423-1200), and I recommend reserving a room here. Folks may want to arrive earlier, on 28 May. Additional nearby hotels include Super 8 (850-682-9649), America Best Value Inn (850-682-8842), Comfort Inn (850-682-1481), and Hilton Motel (850-682-2771). And of course, there are Mexican restaurants nearby! There is also a Walmart in town if you need to purchase supplies.

We will explore the fish hatchery at Holt and nearby Blackwater River. The target species is *Phanogomphus westfalli* (Westfall's Clubtail). Other odonates in the area are *Phanogomphus hodgesi* (Hodge's Clubtail) and *Cordulegaster sayi* (Say's Spiketail); Lepidoptera fans might see Hessel's Hairstreak (*Callophrys hesseli*) and Dusky Roadside Skipper (*Amblyscirtes alternata*). Side trips for *Gomphurus hybridus* (Cocoa Clubtail), *C. sayi*, and *Ophiogomphus australis* (Southern Snaketail) are possible. Bring a DeLorme Florida Gazetteer or map. If possible, please let me know where you're staying. For more information, contact me at <jdaigle@nettally.com>. Hope to see you there! 



Westfall's Clubtail (*Phanogomphus westfalli*), one of the target species for the 2019 SEDSA meeting. Photo by Greg Lasley.

2018 Northeast DSA Regional Meeting Report

Joshua S. Rose <opihi@mindspring.com>

The northeast chapter of the DSA convened this year in Ludlow, Massachusetts on 2–5 August, 2018. The state in general has been well studied for odonates, but Hampden County had received less attention, something we planned to rectify. Little did we know, there was also a discovery brewing just across the county line to the north...

We had our usual Thursday evening gathering on 2 August, then headed out on Friday morning to Wilbraham, home of the furthest-inland Atlantic White Cedar swamp in the state. The cedar stands and surrounding *Sphagnum* bogs were relatively inaccessible, but we encountered two dozen species in the meadows and powerline cut nearby, including *Aeshna constricta* (Lance-tipped Darner), *Dromogomphus spinosus* (Black-shouldered Spinyleg), and *Nehalennia irene* (Sedge Sprite). A stop at a local seafood joint gave us a respite from the oppressive humidity. Most of us spent the remainder of the day exploring locations around the Conant Brook Reservoir in Monson, where we encountered a few nice mixed-species damner swarms, the last one truly spectacular in size and concentration. These swarms included several *Somatochlora tenebrosa* (Clamp-tipped Emerald) amid four or more species of *Aeshna*.

Saturday got off to a disappointing start, with pouring rain for the first hour or so. Fortunately, Dave Small had brought his digital projector, and Peter Hazelton of the Massachusetts Natural Heritage and Endangered Species Program (NHESP) had a slide show about a recent conservation project for *Boyeria grafiana* (Ocellated Darner) in which he had been involved. The rain died down by the end of his talk, so we headed into nearby Facing Rock Wildlife Management Area. We managed to scare up a few odonate species, but our target at this site, *Somatochlora linearis* (Mocha Emerald), failed to make an appearance, despite having shown up for Glenn Corbiere and me a few days earlier.



Variable Dancer (*Argia fumipennis*), one of the few odes out at Facing Rock. Photo by Joshua S. Rose.

After lunch, we drove up to my home neighborhood in Amherst, where I had found the second state record of *Cordulegaster erronea* (Tiger Spiketail) the preceding summer, and Nick Block had glimpsed another about a month before the meeting. Luck still seemed against us when I led the group on a walk to a trailhead and headed down the wrong street, but that impression instantly flipped when Valinn Ranelli yelled in surprise, having spotted a *C. erronea* in a clump of roadside weeds. We managed a few quick photos, then Valinn netted the critter for a voucher. After I re-oriented to the correct street and found the trailhead, we hiked into the woods to the area where Nick's sighting had taken place. There, we saw another adult and collected a larva, confirming that the species was not only present in the state, but breeding! A larval *Lanthus parvulus* (Northern Pygmy Clubtail) in the same patch of habitat was a bonus find.

For icing on the cake, we went to a small river a mile away and had some great looks at a couple of *Stylurus scudderi* (Zebra Clubtail). A few stops on our way back to our hotel led to some more mixed-species swarms of *Aeshna* species and *S. tenebrosa*.

On our final day we headed for Longmeadow, specifically the Stebbins Wildlife Refuge, a tract by the Connecticut River. For-



(Upper) Ocellated Darner (*Boyeria grafiana*), a state Species of Concern in Massachusetts. (Lower) Black-tipped Darner (*A. tuberculifera*). Photos by Joshua S. Rose.



Celebrating the find of a Tiger Spiketail (*Cordulegaster erronea*) in Amherst. Left to right: Meena Haribal, Peter Hazelton, Valinn Ranelli, Soheil Zende, Lenore Swenson, Jason Forbes, and Alan Ankers. Photo by Joshua S. Rose.

merly private land, it was now being managed by The Nature Conservancy (TNC), in transition to becoming part of the Silvio O. Conte National Wildlife Refuge. TNC had contacted me earlier about investigating odonates on the property, with particular interest in *Stylurus amnicola* (Riverine Clubtail), a member of the state's endangered species list that had been reported there many years earlier. We found a few species but nothing really interesting during our initial exploration of Stebbins, until Kirsten Marten showed up with an *S. amnicola* exuvia she'd collected that morning just north of the Refuge, so we eventually relocated over there. Sure enough, we found an adult *S. amnicola*, and just after that a pair mating! A few of us found some *S. spiniceps* (Arrow Clubtail) patrolling over the river nearby, thereby accomplishing a weekend *Stylurus* hat trick.

The meeting concluded with a foray to the Westfield River, a wonderfully scenic rocky stretch of habitat in the hills to the west. Our main target here was another state-listed species, *Boyeria grafiana*, considered Special Concern in Massachusetts. While *B. vinosa* (Fawn Darner) was more common at the location, we managed to net and photograph a few *B. grafiana*. One of them even mistook Valinn's leg for a good egg-laying site and gouged a small hole in his skin with her ovipositor!

So, even though the weather was decidedly uncooperative at times, we found four of our five main target species, including one state-listed as endangered and another of special concern. We also documented a breeding population of a species previously known from the state by just one specimen, one photograph, and one brief sight report. We provided some valuable specimens to the state NHESP and a record of interest to TNC. Now we need to decide where we want to go for next summer's NEDSA meeting. Who wants to invite us to your town and see what we discover there?



Finding Intag and Searching for its Long-lost Odonates

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As follow-up to our recent article in ARGIA (Vol. 30, No. 2), we found out that Intag is not a specific locality but rather a large region in northwest Ecuador that encompasses approximately 150,000 hectares. We visited the region from 22–30 August 2018, mainly to search for two damselfly species not seen since the 1830s. The landscape is mountainous (Fig. 1), ranging in elevation from 1,800 to 2,800 m, with cloud forest and many medium-sized to small streams, seeps, and waterfalls (Fig. 2). The area contains two of the world's biodiversity "hot spots", the Tropical Andes biological hotspot and the Tumbes-Chocó-Magdalena hotspot. Deforestation and agriculture (50% of the land area of Intag has been converted to small and medium-sized farms) have greatly impacted streams in the region. Copper and gold deposits have been found and extraction has been ongoing. Mining is vehemently opposed by residents of the region who recognize the threats to the region's environmental integrity and their quality of life (Fig. 3); environmentalists around the globe are awaiting the outcome of the clash between these two factions.

On the morning of 22 August we met Giovanni Ramón, who teaches biology at Universidad San Francisco de Quito, and drove north and west over the western slopes of the Andes to get to Imbabura Province and the Río Intag valley. On the way we saw fair numbers



Figure 1. Welcome sign on the Ruta La Delicia, indicating entrance to the Intag region in northwest Ecuador. Photo by Bill Mauffray.

of yellow, green, and blue *Rhionaeschna marchali*, stunning red *Sympetrum gilvum* (Fig. 4) and hairy, red and blue *Oxyallagma dissidens* in high elevation seeps and ponds (as high as 3,322 m). Late that afternoon our descent towards the little village of Santa Rosa took us to the El Refugio Cloud Forest Lodge with very comfortable cabins. We met the owner, Peter Joost, who showed us where the Río Tuabunchi flows through his property.



Figure 2. Small waterfall, about 30 m in height, in the Intag region in northwest Ecuador. Photo by Ken Tennessen.

Odonata of Ecuador, to be submitted soon to the journal Zootaxa). In total, we found 14 species of odonates in the Intag region; we searched a limited area and were there at the end of the dry season, which might partially explain the relatively low diversity of odonates that we experienced.

However, as mentioned above, our main goal was to find two species of long-lost damselflies, *Euthore mirabilis* and *Cora dualis* (both described by Robert McLachlan in 1878). These species were last seen alive in 1839 by Charles Buckley, an Englishman and natural history collector. We found the original route that Buckley must have taken during his trek through Intag, the Ruta Plaza Gutierrez, but very little forest remains along the streams in this area. In short, after eight days of searching in mostly sunny weather, we were unable to find these two target species. We feel that our negative findings increase the likelihood that these two species are extinct.



Figure 3. Sign on gate of private property in Intag region warning mining interests to stay out. Photo by Bill Mauffray.

We did find one male of the rare *Euthore fassli* Ris on a small forested stream south of the El Refugio Lodge, which constitutes a new record for Ecuador. In flight, with its colorful fluttering wings, this wonderful damselfly resembles a butterfly.

For the remaining five days of our trip we visited streams and



Figure 4. Male *Sympetrum gilvum*, Imbabura Province, Ecuador, 23 Aug. 2018. Photo by Ken Tennessen.



Figure 6. Male of *Gomphomacromia fallax*, Imbabura Province, Ecuador, 24 Aug. 2018. Photo by Ken Tennessen.

wetlands in the area near San Miguel de los Bancos in Pichincha Province. This area had a few of the same odonate species as the Intag region, such as *Erythrodiplax abjecta*, although we did find some additional interesting things. *Argia fulgida*, with its coppery thorax and blue/black abdomen (Fig. 7), was fairly common on rocks in the middle of a small stream along the Mashpi Road, and we found a smaller, undescribed species of *Argia* along a trail in the Milpe Bird Sanctuary. This latter species, which is not a red-eyed one, is unusual for the genus in that the thorax and abdomen are largely orange! Some of other species seen were *Polythore gigantea*, *Acanthagrion trilobatum*, and the hefty *Libellula herculea*, to mention just a few. We found 23 species of odonates in our limited time in Pichincha Province, 19 of which we did not find in Imbabura Province. The end of our collecting days came way too soon!



Figure 5. Female *Rhionaeschna brevicercia*, Imbabura Province, Ecuador, 28 Aug. 2018. Photo by Ken Tennessen.



Figure 7. Male *Argia fulgida*, Río Huaycuyacu, Mashpi Road, Pichincha Province, Ecuador, 2 Sept. 2018. Photo by Ken Tennessen.

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>.

First County Records in Alabama

Karen Chiasson <kchiasson74@yahoo.com>

I love the outdoors, so I visit local habitats in Alabama looking for birds, butterflies, caterpillars, dragonflies, insects, wildflowers, and anything else to do with nature. I first started documenting odonates in Baldwin County in 2015. As with all my outings, if I see an ode for the first time in any county, I always try to obtain a photograph to document the sighting on OdonataCentral.

One June day, I had decided to visit one of my favorite haunts, Splinter Hill Bog. I didn't find much to photograph on the hike, and I was on the trail heading back to the parking lot when I noticed a Widow Skimmer (*Libellula luctuosa*). It was the first time I had encountered the species in Baldwin County and my first for Alabama. I encountered another in June when my husband and I visited some friends in Autauga County. While riding back to their house after a trip to the farmers market, I noticed Pratt Park, a nice park that Autauga Creek runs through. The following morning I visited the park to see what I could find. This outing netted a Two-striped Forceptail (*Aphylla williamsoni*) as well as another Widow Skimmer. I was able to visit the park again in October; there weren't many odes flying, but I did see Common Green Darner (*Anax junius*), Little Blue Dragonlet (*Erythrodiplax minuscule*), Blue Dasher (*Pachydiplax longipennis*), Common Whitetail (*Plathemis lydia*), and Eastern Pondhawk (*Erythemis simplicicollis*).

The same thing happened when I visited Choctaw National Wildlife Refuge in Choctaw County in March and June 2018. On the March trip, there were lots of butterflies getting my attention, but while walking one of the paths, I was happy to find several Ashy Clubtails (*Phanogomphus lividus*) to photograph as well. In July I made another trip to this area with a friend; he's a more experienced photographer than I am, but we



Libellula luctuosa (Widow Skimmer), Autauga County, Alabama. Photo by Karen Chiasson.

both like to challenge ourselves. One such challenge was trying to photograph flying odes, which gave us two more first county records—Prince Baskettail (*Epithea princeps*) and Royal River Cruiser (*Macromia taeniolata*). (p.s. I need more practice photographing flying odes...)

On our way back from our visit in Autauga County, I told my husband I wanted to stop by the Magnolia Branch Wildlife Reserve in Escambia County. A friend of mine had been very successful in finding caterpillars, which was her main goal in going there. I knew I would not be able to search extensively for caterpillars, so I wanted to concentrate on looking for odes and butterflies. This search netted two first county records: Red-veined Pennant (*Celithemis bertha*) and Cherry Bluet (*Enallagma concisum*). This is a wonderful reserve with several lakes and ponds, and the Big Escambia Creek flows through it. I am looking forward to next year's ode season to see what I can find there in the spring.

New species records for 2018 in Alabama

Magnolia Branch Wildlife Reserve, Escambia County, October 2018: Red-veined Pennant (*Celithemis bertha*), OC #491627; Cherry Bluet (*Enallagma concisum*), OC #491628

Splinter Hill Bog, Baldwin County, June 2018: Widow Skimmer (*Libellula luctuosa*), OC #483170

Choctaw National Wildlife Refuge, Choctaw County, July 2018: Royal River Cruiser (*Macromia taeniolata*), OC #484450; Prince Baskettail (*Epithea princeps*), OC #484176; Ashy Clubtail (*Phanogomphus lividus*), OC #478162

Pratt Park, Autauga County, June 2018: Widow Skimmer, OC #483169; Two-striped Forceptail (*Aphylla williamsoni*), OC #483168



Celithemis bertha (Red-veined Pennant), Magnolia Branch Wildlife Reserve, Escambia County, Alabama, October 2018. Photo by Karen Chiasson.

The Baja Bluet (*Enallagma eiseni*) in Arizona

Rich Bailowitz <raberg2@q.com> and Doug Danforth <dougofbis@gmail.com>

Several odonate species have been considered to be endemic to the Baja California Peninsula. These include *Enallagma eiseni* (Baja Bluet), *Telebasis incolumis*, and *Rhionaeschna manni*. On 28 June 1992, two European visitors to the American Southwest, W. and E. Kappes, reported one of these endemics, Baja Bluet, at Quitobaquito Oasis in Organ Pipe Cactus National Monument (ORPI) in Arizona. Permanent populations of this species have been recorded from as far north as the northern sections of the Baja Peninsula, within 100 km or so of the U.S. border. There, the species is reported to occur at "...sandy-bottomed creeks, desert oases and small ponds." (Bailowitz et al., 2015). This aforementioned 1992 record did not come to light until more than 10 years later when Dennis Paulson, in personal communication, mentioned it to R. Bailowitz, D. Danforth, and S. Upson as they were working on the manuscript of a book dealing with odonates of Arizona and its neighboring state of Sonora.

On 17 October 2006, Bailowitz, Danforth, and Upson visited Quitobaquito, finding *E. eiseni* very common on shrubs around the periphery of the pond. Since the oasis straddles the Arizona-Sonora border, a quick check on the other side of the border fence revealed the species was also in Sonora. At that time, thick stands of bulrushes lined the edge of the pond and immediate access to the pond's shallows was limited. This inaccessibility might account for the species' sightings being limited to some distance from the water.

A second oasis, Quitovac, in Sonora approximately 65 km southeast of Quitobaquito, also seemed to be a likely spot. We visited it on 18 October 2006 but despite intensive searching by the three of us, no *E. eiseni* were found. The Rio Sonoyta, both east and west of the town of Sonoyta just south of the international border, has a few stretches of intermittent water. These locations were subsequently visited as well but no *E. eiseni* specimens were found there.

On 16 June 2007 a single *E. eiseni* was seen and photographed in hand in California at Tiajuana River Valley Regional Park near the international border (OdonataCentral, R. Bledsoe, #7778). After 2006, we assumed the population was secure so the ORPI area was not revisited for a number of years. Beginning in 2007 the pond was discovered to be leaking, during which time it underwent renovation including draining and removal of non-native fish. A new liner was put in after extensive bulrush removal. This event virtually destroyed the pond habitat. The endangered Sonoyta Pupfish (an endemic to the Rio Sonoyta) was saved but the effects on other biota, especially invertebrates, were considerable. The oasis consists of a few springs in the Quitobaquito Hills, one of which is concrete-lined and flows directly into the pond. Since *E. eiseni* appeared to be tied directly to the



Enallagma eiseni (Baja Bluet), Quitobaquito, Organ Pipe Cactus National Monument, Arizona.

pond and not the stream, renovation of the pond was a devastating blow to its population. Visits to Quitobaquito resumed in 2011 by P. Deviche (pers. comm.) and, as recently as spring of 2017, failed to disclose a single specimen.

In late October 2018, the Arizona Field Ornithologists held a meeting in Ajo, Arizona, approximately an hour north of Quitobaquito. On a field trip scheduled to visit Quitobaquito on 25 October, one of the participants (and a budding odonatist), Chris McCreedy, photographed a damselfly unknown to him. Coincidentally, and unaware of McCreedy's find the day before, Bailowitz and Danforth visited the oasis and found and confirmed the recurrence of *E. eiseni* at the pond. Danforth immediately sent out texts to much of the local odonate community, and a member of the birding group texted birders who she knew also had an interest in Odonata. One of those people was McCreedy, who immediately realized the damselfly he photographed the day before must have been the Baja Bluet. He sent a text with a photo to Justin Jones, who verified his sighting. During the following few days, a handful of Arizona's local odonatists visited the pond, where most estimates put the number of males at close to 10.



Habitat at Quitobaquito, Organ Pipe Cactus National Monument, Arizona.

Perhaps most bizarre is what happened during the next two weeks. On 6 November 2018, Bailowitz visited a pond near Mammoth, Pinal County, 234 km (143 mi.) east-northeast of Quitobaquito and found a single male *E. eiseni*. On 8 November, Bailowitz and Danforth found another lone male at a tank near Topawa, Pima County, on the Tohono O'odham Indian Reservation, 109 km (66 mi.) east of Quitobaquito. And on 10 November, P. Deviche, M. Vandewater, and J. Jones located another single male at Kelvin, Pinal County, 225 km (137 mi.) northeast of Quitobaquito.



Enallagma eiseni (Baja Bluet; upper) and *E. civile* (Familiar Bluet; lower) at Organ Pipe Cactus National Monument.

Explaining these isolated findings after years of fieldwork in these well-visited venues requires a history of weather phenomena for a month or two just prior to the late October discovery. Late summer and early autumn are the seasons in which Eastern Pacific Hurricanes occasionally strike Baja California and Sonora in México as well as affecting the weather in Arizona. In early October 2018, Hurricane Rosa passed through the state of Baja California, México and into western Arizona. About 10 days later, Hurricane Sergio repeated the event, travelling a more easterly path across central Arizona. This one-two punch dumped as much as seven inches of rain on parts of western Pima County and more than five inches on the Phoenix metropolitan area. This type of prodigious rain event has two effects on odonate populations. First, it leaves countless filled tanks, pools, puddles, and arroyos that can act as stepping stones for adults to expand their ranges. Second, winds in and ahead of these storms can push teneral and mature adult odonates into new territories. We suggest that these types of hurricanes may have been responsible for the original colonization on or before 1992, and possibly a secondary colonization on or before 2006, and a tertiary colonization on or before 2018. It will be of primary importance in the future to regularly monitor the fauna of the Quitobaquito oasis to keep tabs on the presence and/or absence of *E. eiseni* through the years.

Literature Cited

Bailowitz, R. D. Danforth, and S. Upson. 2015. A field guide to the damselflies and dragonflies of Arizona and Sonora. Nova Granada Publications, Tucson, Arizona. 459 pp. 

River Scouring and the Disappearance of Odonata from British Columbia Rivers

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I drove down from Kelowna to Christina Creek, British Columbia, on 29 July 2018 in search of the famous River Jewelwing (*Calopteryx aequabilis*). Flight period dates listed for this species in B.C. are June–July (Cannings, 2002) and mid-June to early September (Paulson, 2009). I had read in Paulson (2009) that flooding can scour a river clean of odonate larvae. Before leaving, I spoke briefly with Dick Cannings about whether or not the 200-year spring flood on the Kettle River, as well as its tributary Christina Creek, might have had a severe effect on the jewelwings. He felt the Kettle would have backed up Christina Creek, forming a large pool at the confluence, which presumably would have protected the larvae from any damaging scouring.

After searching the creek, its banks, and the oxbows for a total of eight hours over a two-day period, I was unable to observe a single jewelwing. In descending order of abundance, I observed healthy populations of the following: Four-spotted, Eight-spotted, and Twelve-spotted Skimmers (*Libellula quadrimaculata*,

L. forensis, and *L. pulchella*); Common Whitetail (*Plathemis lydia*); equal numbers of darners (*Aeschna* and/or *Rhionaeschna*) and Western River Cruisers (*Macromia magnifica*); Sinuous Snaketails (*Ophiogomphus occidentis*); and Striped Meadowhawks (*Sympetrum pallipes*). However, other than Emma's Dancers (*Argia emma*), I saw very low numbers of the damselflies that I would expect to be present in such wet grassy riparian habitat.

Conditions were sunny, and the temperature both days reached 40°C in the shade. There was no mud or silt to be disturbed when walking through the creek, as the gravel had been scoured clean. The pure white sand, large woody debris, and grass clumps on the brush on the banks above the creek were evidence that the water level had been at least eight feet above present.

An email discussion with Rob Cannings after he reviewed this report revealed one difficulty with assigning river scouring as a cause for the jewelwing absence: "Some of these species prob-

ably wouldn't be developing in the creek bed itself and might not be affected too much by scouring, although *Macromia* and *Ophiogomphus* would. They'd be in/on the stream substrate. But they're still around in decent numbers? Are *Calopteryx* larvae, you think, more susceptible to being washed away because they're up in the vegetation?" (Cannings, R.A., 2018, pers. comm.)

I posit that the very low numbers of *Argia* and lack of other Zygoptera in proportion to the high number of Anisoptera may be indicative of the lack of physical strength necessary to withstand increased streamflow during this year's record-level spring freshette. Stream flows are highest near the surface, with increased turbidity and currents affecting the suitability of the tops of emergent and bank vegetation (i.e. grass blade tips and shrub leaves) as safe harbour. Dragonflies are strong fliers and presumably good dispersers and may be able to recolonize such areas more quickly than the damselflies can. The pooling at the confluence of the creek and river, the oxbows, and temporary seasonal pond may have contributed to the large number of dragonflies present with few damselflies seen. There may also be other explanations such as contamination from oil, fuel, pesticides, etc., in the floodwater and the tolerance of each species to such environments. Further investigation is warranted.

Calopteryx aequabilis populations have also been reported in the Northeast (Cannings, 2010) and Cariboo (Cannings, 2012) regions of British Columbia, and are presently shown as blue listed on the Conservation Data Centre (CDC) website. L. Ramsey, Program Zoologist with the British Columbia CDC, reports "In 2015 we found three more locations in the northeast of B.C. A couple of places east of Fort Nelson (Snake River) and the Petiot River near the Northwest Territory boundary. We also confirmed the healthy population at 100-Mile House." (Ramsay, 2018, pers. comm.). A generalized distribution map for *C. aequabilis* in British Columbia can be found on the CDC web site at <<http://a100.gov.bc.ca/pub/eswp/eoMap.do?id=17372>>.

While the northeastern and Cariboo populations appear healthy as of last reporting in 2015 (Ramsay, 2018), a thorough search by myself for adults only on 29 and 30 July 2018 yielded no jewelwings in a possibly contaminated, 100-year then consecutive 200-year historic level flood-disturbed, fluvial and riparian environment. This opens the question of the present status of the *C. aequabilis* population in the Christina Creek region in British



Christina Creek Oxbow, British Columbia.

Columbia. Hopefully there are still populations somewhere in the region.

I decided that on my return trip from Christina Creek in 2018 I would also investigate what effect these historical flood events might have had on odonates in the flooded rivers in the Boundary-Kootenay area in the southern part of the province. I started the day at two spots on Boundary Creek near Midway, also scoured from flooding as evidenced by bank erosion and clean white sand high on the banks. "Boundary Creek is a colder, rocky creek not fed by a lake so it is possible there are low numbers because of this." (Cannings, 2018, pers. comm.) Not a single odonate was found at the two sites below the falls. I then spent the next part of the day checking the Kettle River from Midway to Rock Creek, and then north to the provincial campground. The scoured river and bank conditions were the same as the Boundary and Christine Creek watercourses. Not a single damselfly was seen, and only one dragonfly, *Sympetrum pallipes* (OC #488111), was to be found along the river and throughout the campground and its trails. During five hours of observations on 1 August, there were sunny cloudless skies, starting temperature of 18°C, and end temperature 32°C.



Argia emma (Emma's Dancer), Christina Creek.

CBC news radio reported widely on the contamination problems from flooded properties along Christina Lake, which feeds Christina Creek, and also the Kettle River. Siltation could also play a significant role in larval extirpation. The complete absence of silt in the gravel beds and the clean white sands deposited high above the banks in the high-water riparian zones indicate that it was swept up and carried away due to sustained increased flow rates. I witnessed the flooding river over the first week of May at the Kettle River Campground; it was a thick mud and debris flow saturated with fine particulate matter for approximately five weeks until the flood waters subsided and began to clear. Such conditions would have a definite effect on larval health and their ability to obtain oxygen from the environment.

It is quite possible that the observed lack of odonates in these affected environments is due to a combination of two years of massive historical flooding having scoured odonate larvae from the rivers in these areas; the siltation starving larval populations of oxygen; pollution in the form of contaminants such as oil, fuel, pesticides, etc. from farmlands, businesses, and rural industries; and the level of tolerance/intolerance of each species to such degraded environments.

If climate change keeps bringing warmer, earlier spring temperatures and the consequent destructive flooding, siltation, pollution and scouring events, then the future of odonate populations

and their possible extirpation in the rivers and creeks of these areas in southern British Columbia is indeed in question. I plan to follow up next year with a regular series of trips to document both the Christina Creek jewelwings and the Kettle River odonate species and populations at the same sites.

Acknowledgments

This report was prepared with the kind assistance of the following persons: Dennis Paulson edited the original observations and final draft. Rob Cannings suggested edits and provided valuable feedback. Leah Ramsay provided updated information on populations in B.C.

Draining the Swamps and Dragonfly Habitat Loss

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Thomas Say was the first native-born American to describe North American Odonata. In 1826 he moved from Philadelphia, Pennsylvania, where he was one of the founders of the Academy of Natural Sciences, to the self-described utopian community of New Harmony in extreme southwest Indiana. He lived there until his death in 1834 and his descriptions of 25 species of North American Odonata, many of which were from Indiana, were published posthumously in 1839.

Indiana was frontier territory then. The remaining Native people, some of whom had fought in the Battle of Tippecanoe in 1811 and had sought refuge in forested wetland areas, were forced to give up their land and made to move to Kansas in 1839. At that time a quarter of Indiana was covered by lakes, ponds, bogs, swamps, and fens, particularly in the north, a legacy of the Wisconsin glaciation. Undoubtedly, these habitats were home to a great abundance and diversity of organisms including Odonata that were soon, along with the Native people, to lose their territory.

Eager to tame the frontier and convert it into productive farmland, the State of Indiana passed the Swamp Act in 1852, supporting the draining of wetlands to create agricultural land. Beaver Lake, in northwestern Indiana by the Illinois state line (Fig. 1), then the largest lake in Indiana, became one target of this effort. The lake was 7.5 mi. (12.1 km) long and 4.5 mi. (7.25 km) wide, but considerably larger counting surrounding marshes at times of high water, and not more than about 10 ft. deep (3 m). A feeble attempt to drain Beaver Lake in 1853 lowered the water level only slightly. Subsequently, in 1873, Lemuel Milk, an enterprising landowner from nearby Kankakee, Illinois, bought a tract containing the lake and surrounding land, and with his associates initiated the construction of a four-and-a-half mile ditch to the Kankakee River. By 1880 the lake was gone and along with it the flocks of waterfowl and schools of fish that had

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lived there. At that time much of the North American dragonfly fauna was yet to be described, and certainly no one had sampled those that called Beaver Lake their home.

Elsewhere in Indiana and other states, draining the swamps was in full swing into the 20th century. By 1970, only 14% of the Indiana's original wetlands remained. The largest remaining natural lake was less than one-tenth the size of Beaver Lake. While anglers and hunters undoubtedly lamented the loss of fish and game, farmers were happy to gain more arable land. But there were others who were not happy. When I was a teenager, I fondly remember reading *Moths of the Limberlost* by Gene Stratton Porter. Her description of female *Cecropia* moths attracting hundreds of males helped fire my early entomological interests. But the well-known author, who had built a home at the edge of the Limberlost swamp and forest in Indiana, moved away in 1913 when draining of the swamps desecrated the place she loved. Now, in the 21st century, restorations of portions of

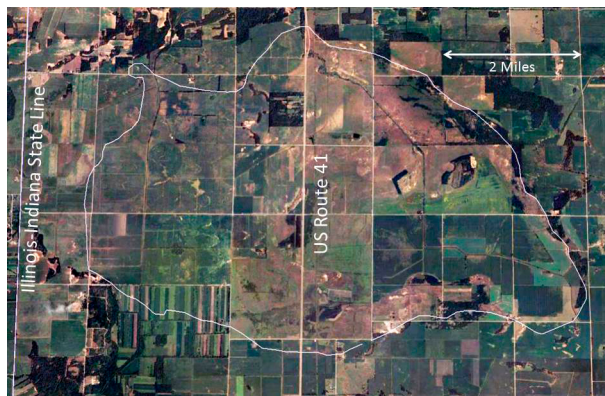


Figure 1. The approximate shoreline of former Beaver Lake (before 1850) outlined in white and superimposed on a recent Google Earth image of northern Newton County, Indiana.

original habitats there and at Beaver Lake are being undertaken by the Indiana Department of Natural Resources, The Nature Conservancy, and other organizations.

Another Indiana naturalist of the times was E.B. Williamson, a prominent North American odonatologist. He was a banker in Bluffton, Indiana, whose passions were dragonflies and irises. Close to Bluffton was a swamp (Fig. 2 and 3) that he and his friends visited regularly for 30 years to collect dragonflies. On 29 July 1913, he wrote to Philip P. Calvert, another prominent odonatologist:

“This summer I am going to write a scathing letter to the editor of Science relative to the scientific (natural [science]) men of this country who flock to the seashore (where biological conditions are practically eternal) or to the largest freshwater lakes they can reach (where biological conditions in permanence compare favorably with the ‘eternal hills’) while all over the country unique biological conditions are being destroyed never to be replaced or duplicated. I have in mind just now Vanneman’s [sic] swamp. (Above is half joke and half dead earnest.) Really when I see that swamp going I can almost cry.” Quoted in *Entomology News* 46(1): 1-13 (1935).

Later in 1922, Williamson wrote of his beloved Vanemon Swamp:

“The modern dredge has laid its unsightly gashes in every direction through the land, the old water level is forever lowered, and the primitive conditions are gone never to return.” Quoted in “Dragonflies of Indiana” by James R. Curry (2001).

Delaware, the small state where I live is, like much of Indiana, mostly flat. It is heavily farmed on the Coastal Plain above the tidal zone and south of the 8% of the state that is in the Piedmont zone. Long straight ditches, often more than five feet deep, border many fields and lead to nearby streams. They are reminders of the past when the land was dominated by swamps and seasonal wetlands not suitable for crops. Notably, in southern Delaware, the Great Cypress Swamp, the northern-most cypress swamp in the U.S., was drained. The few vernal ponds that remain sometimes have drainage channels that indicate unsuccessful attempts to eliminate them. Common dragonflies inhabit these ditches and the mill ponds that have replaced beaver ponds of colonial days. I sometimes try to imagine what species, now rare or extirpated, thrived here before colonization.

One can understand the impetus to convert these “unproductive” lands into rich farmland. However, fewer and fewer swamps and seasonal wetlands remain. Even traditional farmers are becoming an endangered species as large agricultural corporations take over. Conservation values now conflict with the continuing demand to convert farmland and open spaces to housing

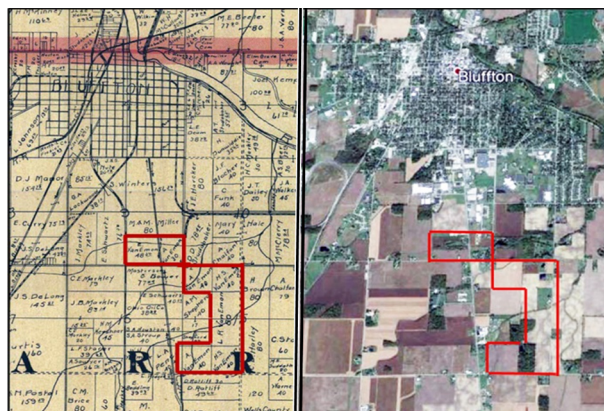


Figure 2. (L) Location of properties south of Bluffton belonging to members of the “Van Emon” family, outlined on a 1912 Wells County, Indiana, property map. Presumably, the Vanemon Swamp revered by E. B. Williamson was by one of the streams that cross these properties. (R) A Google Earth image (2017) with the location of the former Van Emon properties outlined.



Figure 3 Photo taken ca. 1920 of two Odonata collectors, possibly E. B. and/or Jesse Williamson, in Vanemon Swamp. Photo courtesy of Mark O’Brien.

developments and highways. Wetland mitigation projects often fall short of their intended design. Recent proposals to exempt certain seasonal wetlands from protection alarm many people. While one can lament the changes and vilify the perpetrators, the shifting baseline moves with each generation. We don’t know what things were like, but bit by bit habitats disappear. Unfortunately, the loss of dragonflies will not attract attention the way disappearing birds and iconic mammals do. The real focus needs to be on preserving aquatic and wetland habitats that many organisms, in addition to dragonflies, depend on. I wish I could go back in time and talk to my maternal grandmother’s father, my great-grandfather Lemuel Milk, and have him reconsider his plans to drain Beaver Lake.

Acknowledgements

I thank Mark O’Brien for sharing the 1912 Wells County property map and the photograph of Vanemon Swamp. 

First Record of Black-tailed Ringtail (*Erpetogomphus molossus*) for the U.S.

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While looking for odonates along Bear Creek on the south side of the Huachuca Mountains in Cochise County, Arizona, Dennis Paulson, Netta Smith, and I saw a male *Erpetogomphus* land on a large boulder. While all three of us snapped photos of this individual, there was some discussion about its identity. After looking at the appendages through binoculars and seeing that the epiproct extended to about halfway down the cerci, we concluded it was a Straight-tipped Ringtail (*Erpetogomphus elaps*).

After downloading the photos I could see this was not a typical *E. elaps*, as I had never seen one that had such prominent full-length double frontal thoracic stripes. However, I was still thinking it was an aberrant form of *elaps*, which had been recorded several times in Bear Canyon. Several days later the identification of this dragonfly gnawed away at me, and I got out Rosser Garrison's *Erpetogomphus* paper (Garrison, 1994) to see if it was an *Erpetogomphus* I was not familiar with. Some of the species matched the thoracic pattern, but none of those matched the appendages of the Bear Canyon individual.

As outrageous as it seemed, I decided to look at my photos of Black-tailed Ringtail (*E. molossus*). We had discovered this species in 2004 (Bailowitz et al., 2013) and thought it was restricted to the Municipio of Yécora in south-central Sonora. From head to tail the individual that we had photographed in Bear Canyon matched the photos of *E. molossus*. But did it have the unique appendages of *molossus*? I zoomed in and although the image was not sharp, I thought the appendages looked as if they had the laterally expanded bulbous-tipped cerci. I immediately e-mailed Dennis that instead of an aberrant *E. elaps*, I thought we actually had seen and photographed *E. molossus*. To be certain, we

needed sharper photos than I had obtained. Fortunately, both Dennis and Netta had photos that clearly showed the unique laterally expanded bulbous cerci tips, and he agreed that it was unquestionably *E. molossus*.

Bear Creek is approximately 215 mi. (350 km) from the known populations of *E. molossus* in the Yécora Municipio of Sonora. In Sonora those populations inhabit rocky, closed-canopy mountain streams in pine/oak woodland at around 4,550 ft. (1,387 m). Bear Creek is at 5,530 ft. (1,686 m) and flows over bedrock and boulders in oak woodland and in some areas has a closed canopy.

The discovery of *E. molossus* brings the number of odonate species found in Arizona to 141. It also continues the trend in recent years of Sonoran species moving north into Arizona, with some of those species establishing populations.

I wish to thank Dennis Paulson and Netta Smith for visiting southeast Arizona. Without their visit we may not have gone to Bear Creek and without their photos we may have been unable to confirm the identity of this dragonfly. I would also like to thank Dennis for reviewing this article.

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Black-tailed Ringtail (*Erpetogomphus molossus*), Bear Creek, Huachuca Mountains. Photo by Dennis Paulson.



Black-tailed Ringtail (*Erpetogomphus molossus*), Yécora Municipio, Sonora. Photo by Doug Danforth.

Off-season Homework Pays Dividends

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There is an odonate “off-season” during winter in most regions of the contiguous U.S., except for some locations along the southern border and Pacific coast. Think about it this way: winter is either the end of the last odonate-hunting season or the beginning of the next one. We prefer the latter mindset.

Planning for the next season is a good way to stay connected with odonates during the winter months. One off-season activity that can pay big dividends in the future is to research sites for finding new life-list species of dragonflies and damselflies, especially rare and uncommon species. During the winter of 2017–2018, WS and MB independently mined online odonate-related information resources and records databases in search of potential sites for finding Sable Clubtail (*Stenogomphurus rogersi*) in Virginia in Fairfax County (WS) and Albemarle County (MB).

Fairfax County, Virginia

WS used Google Earth to virtually explore the site of a small stream in Fairfax County where Sable Clubtail was discovered by Kevin Munroe, former manager of Huntley Meadows Park. The stream was rejected as practically inaccessible, in part due to residential development since Kevin found the site in June 2012.

WS recalled seeing Sable Clubtail on a species list for one of several sites surveyed regularly by a group of volunteers coordinated by Jim Waggener, in association with the Audubon Society. He contacted Jim and asked for information regarding sightings of *S. rogersi* by the survey group. Jim sent an e-mail to all members of the survey group; Bob Blakney kindly responded by sending a photo taken on 8 June 2012 and providing guidance for finding the location.

As it turns out, only one Sable Clubtail was seen by the survey group in 2012 and that was the last sighting of the species for the next six years. Jim’s group surveys the site once a month, and the adult flight period for *S. rogersi* is estimated to last approximately one month. WS speculates the six-year gap in sightings might be explained by the fact that the survey dates didn’t coincide with this relatively brief adult flight period.

WS scouted the Blakney site for the first time on 1 December 2017. Fred Siskind kindly provided guidance that helped focus the search area. He started actively hunting for adult Sable Clubtail in mid-May 2018, and 4 June 2018 was his last fruitless search. The off-season homework paid dividends for the first time on 8 June (Figure 1), and 5 July was the last date when Sable Clubtail was observed at this site.

The habitat in which this small population of Sable Clubtail in



Figure 1. Sable Clubtail (*Stenogomphurus rogersi*), Fairfax County, Virginia, June 2018. Photo by Walter Sanford.



Figure 2. Habitat for Sable Clubtail (*Stenogomphurus rogersi*) in Fairfax County, Virginia. Photo by Walter Sanford.

Fairfax County was found didn’t look promising (Figure 2). The channel is a few feet deep, and the stream itself is no more than a foot wide and a few inches deep. When scouting the location during the off-season WS recalls thinking, “I don’t see clubtails coming from this tiny stream!”

Albemarle County, Virginia

MB read an article in *Banisteria*, the journal of the Virginia Natural History Society, entitled “Dragonflies and damselflies

of Albemarle County, Virginia (Odonata)” by J.M. Childress. A single paragraph (p.32) describes two locations where Jim found Sable Clubtail 10 years ago. The exact location of the Childress sightings cannot be determined from the Banisteria article, so MB decided to explore Albemarle County in search of “a heavily shaded small stream that feeds into the Moorman’s River about halfway between Millington and White Hall.”

On 9 June 2018, MB started at White Hall and drove toward Millington looking for this stream, and found a road crossing over a creek that flows into Moorman’s River. He explored the stream bed for several hours with no luck and around midday decided to abandon his search. As he was heading back toward White Hall, he noticed a smaller creek—a tributary of the first one he had explored. He parked his car and scouted the new place on foot, checking out the creek from the roadside with binoculars. At 12:45 pm, he spotted a Sable Clubtail perched on a rock in midstream. Unfortunately he didn’t have any photography gear with him, so he ran back to his car to get his camera.

The clubtail was gone when he returned to the stream, but after a half-hour of searching, he spotted one on the far side of the creek. He took several photos from the roadside to document the sighting. That’s when it started raining, a light rain that quickly became a downpour. He returned to his car to sit out what he hoped would be a passing shower.

When the rain stopped and the sun was shining again, he returned to where he’d seen the Sable Clubtail and spotted one 15 minutes later. He noticed a farmer tending a herd of cows and got permission to enter private property. He crossed the barbed-wire fence, slid down the steep, muddy stream bank, and promptly saw the Sable again and took several close-up photographs (Figure 3) and documented the habitat (Figure 4).



Figure 3. *Stenogomphurus rogersi* in Albemarle County, Virginia, 9 June 2018. Photo by Mike Boatwright.



Figure 4. Sable Clubtail habitat in Albemarle County, Virginia. The somewhat sluggish stream is ~10 ft. wide and a few inches deep. Photo by Mike Boatwright.

Rare to uncommon; or, under-reported and under-surveyed?

S. rogersi has a limited range (Figure 5) and is classified as a rare to uncommon species. However, some odonate experts, including Dr. Steven M. Roble (Staff Zoologist, Virginia Department of Conservation), contend that *S. rogersi* might be somewhat more widespread than the map indicates, as this is an underreported species. Steven says that there are more county records in Virginia than have been reported to OdonataCentral, and that there is a need to survey under-sampled counties in the state (Steven Roble, pers. comm.).

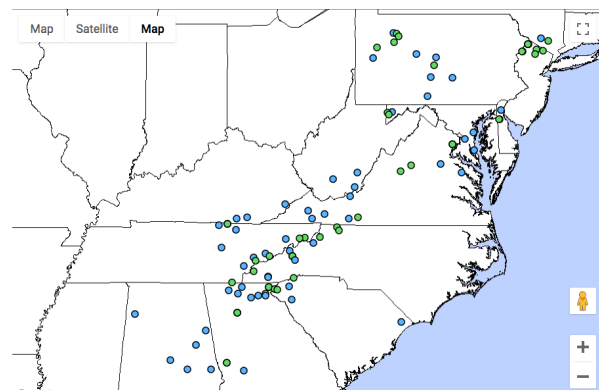


Figure 5. Sable Clubtail records for the U.S. in OdonataCentral (Abbott, J.C. 2006–2018).

There were no *S. rogersi* records in the OdonataCentral database <<http://www.odonatacentral.org>> for Albemarle or Fairfax County in Virginia when MB and WS were starting to plan for re-discovering the species in those two counties—but now there are several records! We strongly urge anyone who has seen this species to submit their records to OdonataCentral.

As for the problem of under-sampled counties, we encourage other odonate hunters to add *S. rogersi* to their list of target species for next season. Do some research and planning during the off-season, then get out there and make it happen. In our experience, no stream is too small for Sable Clubtail but it appears there are streams that are too big. Find a small, forest-shaded stream during winter and visit it a few times in late spring and early summer—we think the results might be surprising!

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Odonata New to Nevada in 2018

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The following two species were documented as new to the state of Nevada in 2018:

Argia lugens (Sooty Dancer)

A male *Argia lugens* (Sooty Dancer) was observed and photographed by Jim Boone on 25 August 2018. It was found at rest on Nevada State Route 317 in Meadow Valley Wash, Lincoln County, Nevada, 5.1 miles north of the ghost town of Elgin. The identification was made by JRT on 30 August when the photograph was received along with a request for identification assistance, and was subsequently confirmed on the Western Odonata Facebook page by Justin Jones and Pierre Deviche, Arizona odonate experts.

Previously unrecorded in Nevada, the species' breeding range extends from west Texas through Colorado, New Mexico, Arizona, Utah, and throughout California north into Oregon. The



Sooty Dancer (*Argia lugens*) male, Meadow Valley Wash, Lincoln County, Nevada, 25 August 2018. Photo by Jim Boone.

closest population to this sighting occurs in Washington County, Utah; *A. lugens* has been recorded along the Beaver Dam Wash at Lytle Ranch, just east of the Lincoln County, Nevada border.

The Meadow Valley Wash, which has been designated as an Important Bird Area by the National Audubon Society, is an

isolated, sparsely-populated southbound drainage consisting of a perennial stream that has some dry and underground stretches at the south end during dry weather. Wetlands and seeps are intermittent within the wash. In areas of permanent water, habitat consists of cottonwood, various willow species, and other riparian vegetation, and stream flow is affected by the occasional beaver dam. Very close to the location of the *A. lugens* sighting is the only known nest of *Buteogallus anthracinus* (Common Black Hawk) in the state.

This diversity in habitats has led to a wealth of odonate species, including *Archilestes grandis* (Great Spreadwing), *Argia nabuana* (Aztec Dancer), *Enallagma praevarum* (Arroyo Bluet), *Ischnura barberi* (Desert Forktail), *Brechmorhoga mendax* (Pale-faced Clubskimmer), *Paltothemis lineatipes* (Red Rock Skimmer), and *Anax walsinghami* (Giant Darner), as well as others.

Tramea calverti (Striped Saddlebags)

On 29 September 2018, while walking at Corn Creek Desert National Wildlife Refuge in Clark County, I saw a red-colored saddlebags dragonfly. The expected species is *Tramea onusta* (Red Saddlebags), but this individual did not have the wider markings on the hindwings as expected. The dragonfly was flying at eye level and finally perched on a vertical twig of a low shrub, allowing for steady observation and good photographs. With that view, the stripes on the side of the thorax were apparent, as were the narrow saddlebag markings on the hindwing, and the dragonfly was identified as a male Striped Saddlebags (*T. calverti*). This is the first time this species has been docu-

mented in the state of Nevada.

The weather that morning consisted of a strong and steady warm breeze coming from the south; temperatures at the time of the observation were in the mid-80s F. Hurricane Rosa was still far to the south in the Pacific Ocean; it is not known if that hurricane or another weather system had the effect of assisting this dragonfly's movement into southern Nevada.

The addition of these two species brings the total number of odonates documented in Nevada to 95. 



Striped Saddlebags (*Tramea calverti*) male, Corn Creek, Desert National Wildlife Refuge, Clark County, Nevada, 29 September 2018. Photo by Jeanne R. Tinsman.

Whiteface (*Leucorrhinia*) Body Slam

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Dragonflies and damselflies exhibit a wide variety of interesting behaviors, which can sometimes come together to produce unexpected results. This paper describes such a case involving a bluet (*Enallagma*) and a whiteface (*Leucorrhinia*). The behaviors are first described separately, as one would observe them in nature, and then the new behavior is described, referred to as a “body slam,” that results when these individual behaviors interact.

Dragonfly Behavior

The dragonfly behavior that comes into play in the body slam is the splash-dunk/spin-dry, as described in previous articles (Walker, 2011; 2014). In this behavior, a dragonfly spins or tumbles head-over-heels at approximately 1,000 rpm to shed the water it picks up when it splash-dunks to bathe.

A number of dragonflies have been observed to splash-dunk/spin-dry, including darners, skimmers, meadowhawks, and pondhawks. The dragonfly involved in the body slam was a male Dot-tailed Whiteface (*Leucorrhinia intacta*; Figure 1). This species has not been observed to exhibit splash-dunk/spin-dry behavior thus far. Even so, the observations reported here suggest that it possesses the spin-dry maneuver as part of its behavior! repertoire, and that it has been able to adapt the maneuver to different purposes.

Damselfly Behavior

Some damselfly species are notorious for being aggressive and pugnacious. Bluets in particular harass damselflies and dragonflies in their territory. In fact, it's not uncommon to get set up to take a photo of a dragonfly, only to have a bluet chase it off before you can get the shot.

At Cranberry Lake in Anacortes, Washington, we often see darners perched in the bushes along the shore. Bluets frequently fly straight into the thorax of a perched damner, where they appear to bite it. The darners generally respond by flipping their wings, or, in more extreme cases, flying away. It's interesting that this sort of aggressive behavior is common in bluets, though it is generally not seen in forktails (*Ischnura*).

It may be that in some cases, the damselflies are attempting to mate with the dragonfly. In the situations we've observed, however, the contact between damselfly and dragonfly seems to be aggressive and harassing, like that of songbirds pestering a raptor in their territory.



Figure 1. Male Dot-tailed Whiteface (*Leucorrhinia intacta*) perched on a lily pad.

The Body Slam Behavior

The behaviors mentioned above may not seem related, but in fact, they lead directly to the body slam. This was observed in a video I took this summer at Heart Lake in Anacortes. The video was taken to show various dragonflies interacting, but when I watched it at home later, I noticed some movement in the lower right corner of the frame. On closer examination, I saw a brief drama unfold between a bluet and a male Dot-tailed Whiteface. The damselfly was either a Northern Bluet (*Enallagma annexum*) or a Boreal Bluet (*E. boreale*), but the video wasn't clear enough to make a positive identification.

Initially, the whiteface was sitting peacefully on its favorite perch—a lily pad. At this point, a bluet entered the scene, stealthily approaching the whiteface from behind. The whiteface reacted by raising its abdomen, and the bluet backed off for a moment. Then, a second or two later, the bluet advanced again, this time flying above the abdomen of the whiteface and grabbing hold of it near segment 4 or 5.

The reaction of the whiteface to this contact was swift and definitive—it did a body slam, i.e. it immediately performed one-and-a-half forward somersaults, exactly as dragonflies do in a spin-dry. As it spun, it took the bluet along for the ride, until it slammed the bluet hard against the lily pad. At this point the bluet lost its grip and came loose. The whiteface hovered briefly while the bluet hastily flew away, then the dragonfly settled back down on the lily pad.

This was a most striking and effective move by the whiteface. It seems that the whiteface has this spin move in its set of behaviors

and while it may be used to shed water, it may also be used to shed an unwanted guest—in this case a bluet—attached to its abdomen. The entire body slam lasted about a second, and can be missed very easily, but it's worth looking for the next time you see damselflies harassing dragonflies. It will be interesting to see just how widespread this behavior is among the Odonata.

Conclusions

Different types of behaviors in dragonflies and damselflies can combine to produce new and unexpected results. In particular, the spin-dry move, which is effective at shedding water, can be used by dragonflies to shed harassing damselflies as well.

Acknowledgements

I wish to thank Betsy Walker and Dennis Paulson for helpful discussions.

Online Material

The video of this interaction, along with more information and an enlargement of the body slam in action can be found at <<https://thedragonflywhisperer.blogspot.com/2018/08/the-dot-tailed-whiteface-does-body-slam.html>>.

Literature Cited

Walker, J.S. 2011. Spin-Dry Dragonflies. *ARGIA* 23(3): 29–31.
Walker, J. S. 2014. Life at 1,000 RPM. *ARGIA* 26(2): 11–13.



The DSA Needs a New Treasurer—Could It Be You???

Our current DSA Treasurer, Cindy McKee, is stepping down so the torch must be passed to a new volunteer willing to serve in that capacity. What does being the Treasurer mean? Per the DSA Bylaws, “The Treasurer shall be responsible for establishing the Society’s bank checking account and/or savings account, and except as noted...shall be the only person empowered to endorse instruments made payable to The Dragonfly Society of the Americas, and shall keep the bank account books current and available for inspection by the Executive Council upon notice.”

In practical terms, this means the Treasurer handles accounting, income, and disbursements for the DSA checking account and PayPal transactions made on the DSA web site. The treasurer maintains the DSA financial records using Quickbooks or similar accounting software, provides an annual report to the Executive Committee, and files the annual IRS form 990-N. The Treasurer is a *de facto* member of the DSA Executive Committee, and as such is expected to attend a majority of the annual meetings and participate in business meetings of the Executive Committee (whether in person, via e-mail, or by conference call). The Treasurer also coordinates with hosts of the DSA annual meeting as needed.

If you are interested in contributing your time and skills as the DSA Treasurer, please contact DSA President Bryan Pfeiffer at <bryan@bryanpfeiffer.com>.

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:

Alves-Martins, F., J. Calatayud, N.G. Medina, P. De Marco, L. Juen, and J. Hortal. 2018. Drivers of regional and local diversity of Amazonian stream Odonata. *Insect Conservation and Diversity* <<https://doi.org/10.1111/icad.12327>>. Large Amazonian rivers may act as dispersal barriers for animals with low dispersal abilities, limiting their distribution to certain interfluves. Consequently, the distribution of these taxa would be less affected by macroclimatic gradients. Conversely, high-dispersal taxa would be less constrained by large rivers and may track suitable climates. We evaluate whether Zygoptera and Anisoptera, two Odonata suborders with different dispersal abilities, show differences in distribution patterns across Amazonian interfluves. We further assess the relative importance of macroclimatic and habitat factors in their community assembly. We used network modularity analyses to identify biogeographic species pools and spatial buffers to define metacommunity species pools. Then, we used structural equation models to estimate the relative importance of multi-scale factors on species richness patterns. Zygoptera communities are more similar in species composition within than between interfluves, suggesting that large Amazonian rivers indeed limit the distribution of Zygoptera species. Conversely, the distribution of Anisoptera extends across Amazonian interfluves. Seasonality has a strong positive effect on Zygoptera and Anisoptera richness across scales. In addition, habitat integrity is negatively correlated with the regional species richness and abundance of Anisoptera and positively correlated with Zygoptera local richness. The contrasting effects of habitat integrity on Anisoptera and Zygoptera suggest that the former is favored in open habitats, whereas the latter is so in forests. Despite these differences, both suborders appear to follow similar community assembly mechanisms in Amazonia, with a strong climatic control across scales and an effect of habitat filters on local communities.

Amari, H., R. Zebsa, A. Lazli, S. Bensouilah, M.K. Mellal, H. Mahdjoub, M. Houhamdi, and R. Khelifa. 2018. Differential elevational cline in the phenology and demography of two temporally isolated populations of a damselfly: Not two but one taxon? *Ecological Entomology* <<https://doi.org/10.1111/een.12680>>. Temporal isolation by cohort splitting is a life-history mechanism that has been reported in many temperate insects, includ-

ing those inhabiting freshwater habitats. Although the cohorts seem to maintain separate temporal niches in a specific location, the temporal isolation may be disrupted across a geographic gradient due to constraints imposed by seasonality. This prediction was tested on two temporally isolated populations of the obligatory univoltine *Lestes virens* (Odonata, Lestidae) in northeast Algeria. Although the two cohorts emerge at the same time in spring, one cohort reproduces in summer, while the second cohort estivates in summer and reproduces in autumn. A survey assessing the phenology and abundance was conducted on eight ponds across an elevational gradient (5–1,012 m asl) using capture–mark–recapture and adult density sampling. In all sites from low to high elevation, the species showed cohort splitting. The phenology of reproduction of both cohorts showed a delay with elevation, but the cline was 2.2 days for the summer cohort and 0.7 days for the autumn cohort per 100 m of elevation. Moreover, the density of adults in the autumn cohort was higher than that of summer cohort across the entire elevational range, and the difference increased with elevation. These findings regarding the differential elevational cline in the phenology show that the temporal isolation of the two cohorts becomes narrower at high elevation, suggesting potential inter-cohort temporal overlap at higher elevations. The claim that the two cohorts of *L. virens* are true temporally isolated species needs further investigation.

Bried, J.T. and R.P. Hinchliffe. 2018. Improving taxonomic resolution in large-scale freshwater biodiversity monitoring: an example using wetlands and Odonata. *Insect Conservation and Diversity* <<https://doi.org/10.1111/icad.12323>>. Immature aquatic insects are a major source of taxonomic difficulty in large-scale freshwater biodiversity monitoring. Adult stages could improve taxonomic resolution for assessing distributions and trends of biodiversity. Odonata (dragonflies and damselflies) have accessible adult stages that should greatly enhance the amount of species-level information. We used Odonata and a wetland monitoring programme 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 odonate 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 col-

lection and 62% of the processed dragonfly collection was left at suborder. We recommend supplementing aquatic sampling with adult rearing, collecting, and observing (at least Odonata) to improve the basic inventory and overall status assessment in large-scale freshwater biodiversity monitoring. This is especially true when aquatic sampling is restricted to a suboptimal time of year for species identifications.

Calvão, L.B., L. Juen, J.M. Barbosa de Oliveira Jr., J. Darc Batista & P. De Marco Jr. 2018. Land use modifies Odonata diversity in streams of the Brazilian Cerrado. *Journal of Insect Conservation* 22(5-6): 675–68. The presence of riparian vegetation provides microclimatic regulation of stream conditions [e.g. luminosity (lux), air temperature (°C) and relative humidity (%)], which varies naturally throughout the day. These variables explain the diurnal behaviour patterns of ectotherms such as Odonata in natural areas. However, human land uses (e.g. pastures) modify the abiotic conditions of riparian environments, favouring the presence of disturbance-tolerant species. In this context, we assess relationships between riparian land use (control streams-natural areas and pasture), abiotic conditions habitat integrity index (in control and pastures streams), (air temperature, luminosity and humidity in control streams), and Odonata diversity (between pasture and control streams and throughout the time of day) in Brazilian savannah (Cerrado) streams. First, the control streams had higher habitat integrity index than pasture. Higher abundance and difference in composition of Odonata species were observed in streams surrounded by pasture relative to natural areas. The conversion of natural areas to pasture near streams was also accompanied by an increase in overall body size of Odonata species. Odonata species richness and abundance in natural areas varied throughout the day, but peaked around 12:00 h, coinciding with changes in air temperature and luminosity. Our study highlights that changes in the physical characteristics of streams through conversion of natural habitats to pasture will change environmental conditions and act as a filter on the distribution and persistence of Odonata species in Cerrado streams.

Denis, A.S., O. Payet, S. Danflous, N. Gouix, F. Santoul, L. Buisson, and L. Pelozuelo. 2018. Intraspecific variability of the phenology and morphology of three protected dragonflies between natural and artificial habitats. *Journal of Insect Conservation* 22(3-4): 419–431. Changes in phenology and in body size are two of the three main consequences of global warming on organisms. We investigated whether living in a warm artificial habitat would induce changes in the phenology and body size of dragonflies. We monitored *in natura* the emergence pattern of three protected and red-listed dragonfly spe-

cies in three geographically close systems which differ in thermal profiles: a medium-sized river, one of its tributaries and an artificial lake fed by the water of the tributary. We also investigated the morphological variability of one of the species between the three systems. We showed an asynchrony of emergence for the three species, as well as morphological variability between the lake and the two rivers. Individuals from the lake emerged earlier and were smaller than those from the two rivers. These results are in agreement with a temperature-induced response hypothesis as the lake is warmer than the two rivers. Asynchrony of emergence between neighbouring populations triggers questions related to metapopulation functioning and about the fitness and the fate of the early-emerging individuals. Understanding the response of these species to local thermal conditions will help to improve population monitoring and conservation.

Hoffmann, J., S. Donoughe, K. Li, M.K. Salcedo, and C.H. Rycroft. 2018. A simple developmental model recapitulates complex insect wing venation patterns. *Proceedings of the National Academy of Sciences* <<https://doi.org/10.1073/pnas.1721248115>>. Insect wings are typically supported by thickened struts called veins. These veins form diverse geometric patterns across insects. For many insect species, even the left and right wings from the same individual have veins with unique topological arrangements, and little is known about how these patterns form. We present a large-scale quantitative study of the fingerprint-like “secondary veins.” We compile a dataset of wings from 232 species and 17 families from the order Odonata (dragonflies and damselflies), a group with particularly elaborate vein patterns. We characterize the geometric arrangements of veins and develop a simple model of secondary vein patterning. We show that our model is capable of recapitulating the vein geometries of species from other, distantly related winged insect clades.

Lambret, P., I. Rutter, P. Grillas, and R. Stoks. 2018. Oviposition plant choice maximizes offspring fitness in an aquatic predatory insect. *Hydrobiologia* 823(1): 1–12. Evidence for the adaptive value of oviposition site selection in terms of increased offspring fitness is rare in predatory insects. We tested this in the damselfly *Lestes macrostigma* that prefers the plant *Bolboschoenus maritimus*. We carried out two experiments with shoots containing eggs: we flooded (1) some shoots of the same type (i.e. combination of species and desiccation state) at different dates and (2) different shoot types at the same date. Earlier flooding increased hatching success. Because *B. maritimus* grows in deeper parts of temporary ponds, it is flooded before other plants after the drought season, suggesting that adult oviposition site selection is driven by lower egg desiccation risk. Independently of flooding

date, hatching success was higher and larvae hatched earlier when eggs were laid in *B. maritimus*. Faster embryonic development enhances chances to complete larval development before pond desiccation and reduces costs associated with time stress. Offspring higher fitness was more constant between shoots of *B. maritimus* compared to the other types of shoot, suggesting that laying eggs in one shoot of this plant leads offspring to high fitness more surely. Our results indicate that adults choose oviposition plants maximizing offspring fitness (higher hatching success and faster embryonic development).

Mellal, M.K., M. Bensouilah, M. Houhamdi, and R. Khelifa. 2018. Reproductive habitat provisioning promotes survival and reproduction of the endangered endemic damselfly *Calopteryx exul*. *Journal of Insect Conservation* 22(3–4): 563–570. Effective habitat management is predicted to have positive effects on populations and species of conservation concern. Although studies have shown that ecological processes such as colonization can be promoted after habitat management, we still need more information on the survival and reproductive consequences at the individual level in order to reach positive conservation outcome. Here we assess the effects of reproductive habitat supplementation (host oviposition plant) on survival and mating success of an endangered endemic damselfly, *Calopteryx exul*, using capture-mark-recapture data. We first determined that the species prefer to oviposit on floating leaves of *Potamogeton* spp. Based on Cormack-Jolly-Seber modeling, we found that recapture and survival probabilities were positively affected by the number of the host oviposition patches of the host plant. Moreover, we showed a strong positive relationship between adult lifespan and lifetime mating success. Our results suggest that host-plant provisioning for reproduction not only increases the survival of individuals, but also increases the number of matings per lifetime. The procedure of supplying reproductive sites may enhance population growth of threatened odonates and other aquatic insects.

Mitchell, F.L. and J.L. Lasswell. 2018. Population characteristics of the dragonfly *Pantala flavescens* (F.) colonizing small constructed ponds. *Southwestern Entomologist* 43(4): 833–839. A series of small ponds was constructed to determine whether dragonflies would oviposit in them. Four pond sizes—0.3, 0.6, 0.9, and 1.2 m²—were replicated and randomized in each of six blocks. Ponds in three of the blocks were planted with cattail (*Typha* sp.) and three with spike rush (*Junca* sp.). Sampling revealed that of 273 nymphs collected, 267 were *Pantala flavescens* (F.) and six were *Orthemis ferruginea* (F.), although adults of 15 other dragonfly species were seen in the study area. Dragonfly nymphs were not found in any of the small-

est size of pond. Significantly more nymphs were found in ponds planted with cattail than rush (215 vs 52), but the nymphs grew larger in ponds with rushes. The mean number of nymphs was larger in the 1.2 m² ponds (21.8) than in the 0.6 m² ponds (8.7), while 0.9 m² was intermediate (15.0). However, when the number of nymphs per unit area was compared, there were no differences between any of the pond sizes within a vegetation class (cattail or rush). Between classes, more nymphs per unit area were in ponds planted with cattails. Because the one species of dominant dragonfly was not representative of distribution of dragonfly species in normal-sized ponds and probably was the only dragonfly found in any similar experiment, use of small reference ponds of these sizes was not feasible for assessing dragonfly diversity and abundance.

Moore, M.P. and R.A. Martin. 2018. Trade-offs between larval survival and adult ornament development depend on predator regime in a territorial dragonfly. *Oecologia* 188(1): 97–106. Trade-offs between juvenile survival and the development of sexually selected traits can cause ontogenetic conflict between life stages that constrains adaptive evolution. However, the potential for ecological interactions to alter the presence or strength of these trade-offs remains largely unexplored. Antagonistic selection over the accumulation and storage of resources could be one common cause of environment-specific trade-offs between life stages: higher condition may simultaneously enhance adult ornament development and increase juvenile vulnerability to predators. We tested this hypothesis in an ornamented dragonfly (*Pachydiplax longipennis*). Higher larval body condition indeed enhanced the initial development of its intrasexually selected wing coloration, but was opposed by viability selection in the presence of large aeshnid predators. In contrast, viability selection did not oppose larval body condition in pools when aeshnids were absent, and was not affected when we manipulated cannibalism risk. Trade-offs between larval survival and ornament development, mediated through the conflicting effects of body condition, therefore occurred only under high predation risk. We additionally characterized how body condition influences several traits associated with predator avoidance. Although body condition did not affect burst distance, it did increase larval abdomen size, potentially making larvae easier targets for aeshnid predators. As high body condition similarly increases vulnerability to predators in many other animals, predator-mediated costs of juvenile resource accumulation could be a common, environment-specific limitation on the elaboration of sexually selected traits.

Remm, L. and G. Sushko. 2018. Dragonfly fauna in rewetted mires in Belarus: diverse but different from natural sites. *Wetlands Ecology and Management*

26(6): 1173–1180. Mire specialist species are under strong anthropogenic pressure. In areas where the exploitation of their habitat has been temporary or unsuccessful, restoration frequently has risen as an objective. The results of the restoration activities for habitat specialists, however, are unclear. In this work we investigated whether raising the water level ca. 10 years ago in degraded bogs has brought back a characteristic group of fauna, and mire specialists therein. Dip-netting for Odonata larvae, together with habitat description, was carried out in restored, unrestored, and natural sites. We found almost no larvae at unrestored sites. The restored sites provided habitat for diverse Odonata fauna, including lagg zone species. Bog specialists only occurred at a former pit-mining site. Based on the study, we suggest three means to support the biodiversity of mire Odonata: (i) protecting the remaining natural mires, (ii) using pit-mining instead of milling for peat extraction, and (iii) creating special pools in former milled sites that have been designated for mire restoration.

Rodrigues, M.E., E.B. Moura, R. Koroiva, A.C. Piovezan Borges and F. de Oliveira Roque. 2018. Survey of dragonflies (Odonata) in the palm swamps of Cerrado hotspot. *Entomological News* 128(1): 24–38. The palm swamps (i.e. Veredas) in the Cerrado, Brazilian Savanna, are priority areas for conservation. The Veredas' hydrological characteristics are fundamental for the maintenance of biodiversity and economic activities in this region. However, despite this importance, only a few studies have been carried out in these areas, primarily surveys for dragonflies (Insecta: Odonata). Here, we sampled twenty-five palm swamps in a Cerrado region. We found 56 species of Odonata, ten of which were new records for the Mato Grosso do Sul State: Coenagrionidae (6), Libellulidae (3) and Aeshnidae (1). The Veredas harbor both lentic and lotic systems which contribute to the great regional diver-

sity of Odonata. Our results increase our knowledge about Odonata diversity in Veredas areas of the Cerrado, show the importance of these environments for Odonata species, and emphasize the importance of maintaining the Veredas as Permanent Preservation Areas.

St. Clair, C.R. and C.A. Fuller. 2018. Atrazine exposure influences immunity in the Blue Dasher dragonfly, *Pachydiplax longipennis* (Odonata: Libellulidae). *Journal of Insect Science* 18(5) <<https://doi.org/10.1093/jisesa/iey095>>. Agricultural runoff containing herbicide is known to have adverse effects on freshwater organisms. Aquatic insects are particularly susceptible, and herbicide runoff has the potential to affect immunity in this group. Here we examined the effect of ecologically relevant levels of atrazine, an herbicide commonly used in the United States, on immune function in larvae of the Blue Dasher dragonfly (Odonata: Libellulidae, *Pachydiplax longipennis* Burmeister 1839) during a long-term exposure at ecologically relevant concentrations. Larvae were exposed to concentrations of 0, 1, 5, and 10 ppb atrazine for 3 or 6 wk. Hemocyte counts, hemolymph phenoloxidase (PO) activity, cuticular PO, and gut PO were measured at the end of each trial period as indicators of immune system strength. Atrazine concentration had a significant effect on hemocyte counts after controlling for larval size. There was a significant interaction between time and concentration for hemolymph PO, cuticular PO, and a marginal interaction for gut PO. The effect of atrazine on the measured immune parameters was often nonmonotonic, with larger effects observed at intermediate concentrations. Therefore, atrazine affects both hemocyte numbers and PO activity over time in *P. longipennis*, and the changed immune function demonstrated in this study is likely to modify susceptibility to pathogens, alter wound healing, and may decrease available energy for growth and metamorphosis. 

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 TransferBig-Files, 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.

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 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>. 

Holiday Book Sale: Good Through 31 January 2019

Bill Mauffray, Managing Director, International Odonata Research Institute; Curator of Odonata, Florida State Collection of Arthropods <iodonata@gmail.com>

I am offering a \$20 reduction on *Dragonflies of North America*, by James G. Needham, Minter J. Westfall, Jr., and Michael L. May. 2014. xvi +680 pp, text figures (7 x 10 in), cloth binding. Scientific Publishers, Gainesville, Florida.

Act now! I only have about 20 copies of this book remaining, and a 4th edition is not planned. This most monographic revision of the classic *Manual of the Dragonflies of North America* (Needham and Westfall, 1955) includes additions and corrections for all the currently known spe-

cies of North American dragonflies (Anisoptera), including all (over 355 species) from Alaska to northern Mexico and the Greater Antilles. Keys to adults and known larvae allow identification of these important aquatic insects. The text is completely revised by Westfall and May, with over 200 added figures for all newly discovered species, an updated checklist to all species, bibliography, glossary, distribution table, and index. Pricing is shown below. The book weighs over 4 lb., so foreign rates are higher due to shipping costs: United States = US\$160; Canada = \$205; Mexico = \$210; all other countries = \$230. 

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

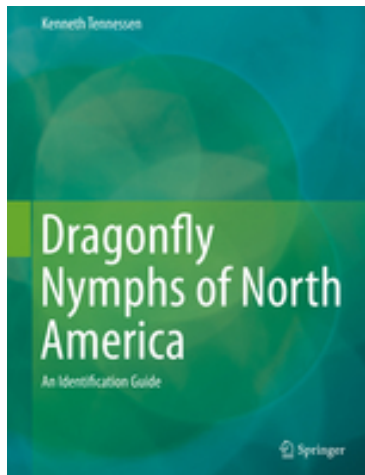
ode-hunting tale, and send it to the Editor at <editor@dragonflysocietyamericas.org>. Photographs to illustrate the stirring tale are encouraged. Whether from those who are discovering odonates this year or who have pursued them for decades, there are plenty of interesting, entertaining, and inspiring stories out there to tell! 

New Book Announcements: *Dragonfly Nymphs of North America, An Identification Guide*, by Ken Tennessen; and *Dragonflies & Damselflies: A Natural History*, by Dennis Paulson

Dragonfly Nymphs of North America, An Identification Guide, by Ken Tennessen. Springer Publishing, 2019. ISBN 978-3-319-97775-1. Hardcover, 800 pp., \$279.99 USD; e-book, \$219 USD. Available from the publisher at <<https://www.springer.com/us/book/9783319977751>> and through U.S. retailers.

From the publisher's web page: This monograph is the first of its kind devoted entirely to the dragonfly nymphs of North America north of Mexico, the focus being accurate identification of the 330 species of Anisoptera that occur in the region. Nymphal external morphology is described and illustrated in detail, and all terms needed to navigate the dichotomous keys are defined. Species are tabulated with references that provide the most detailed, accurate descriptions for each; species that are inadequately described are so indicated. The key separating the seven families in the region contains several new characters. The families are then covered separately: Aeshnidae (13 genera), Gomphidae (17 genera), Petaluridae (2 genera), Cordulegastridae (2 genera), Macromiidae (2 genera), Corduliidae (7 genera), and Libellulidae (29 genera). Each family is further characterized, followed by a generic key.

A drawing of the habitus and diagnostic details for each genus are provided, along with additional diagnostic remarks and notes on habitat and life cycle; for each genus, a map shows its geographic distribution in North America. Full-grown nymphs of all known species of each genus are keyed and diagnosed; characters that apply to earlier instars are noted. Morphological variation in character states was analyzed to assess the reliability of previously utilized characters and to discover new characters.



Most of the characters used to distinguish all levels of taxa are illustrated; a total of 702 figures, comprising 1,800 original drawings, along with selected photographs where necessary for clarity, accompany the keys. Measurements of total length, head width, and other variables for each

species are provided in tables. Difficulties with past keys and descriptions, including errors, omissions and other shortcomings, are addressed. The importance of nymph characters in helping solve generic and specific distinctions and their role in phylogenetic studies is emphasized.

Methods for collecting, rearing, and preserving dragonfly nymphs and exuviae are presented. The final chapter discusses research opportunities on North American Anisoptera nymphs, including taxonomic needs, studies on structure and function, life history and microhabitat, water quality indices and conservation efforts. The habitus drawings of all genera are arranged according to family in five plates (Appendix I); although the book is intended as a lab manual, these plates conveniently allow for comparison based on nymph shape making field identification to genus possible in many cases. Appendix II contains a brief history of dragonfly nymph studies in North America. A glossary and an index to scientific names are included.

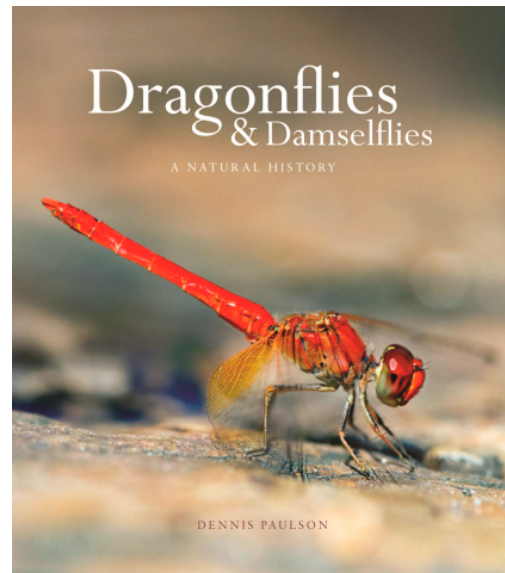
Dragonflies & Damselflies: A Natural History, by Dennis Paulson. Princeton University Press, 2019. ISBN 978-0-691-18036-6. Hardcover, 224 pp., \$29.95 USD. Available from the publisher at <<https://press.princeton.edu/titles/13344.html>> and through U.S. retailers.

From the publisher's web page: Dragonflies and damselflies are often called birdwatchers' insects. Large, brightly colored, active in the daytime, and displaying complex and interesting behaviors, they have existed since the days of the dinosaurs, and they continue to flourish. Their ancestors were the biggest insects ever, and they still impress us with their size, the largest bigger than a small hummingbird. There are more than 6,000 odonate species known at present, and you need only visit any wetland on a warm summer day to be enthralled by their stunning colors and fascinating behavior. In this lavishly illustrated natural history, leading dragonfly expert Dennis Paulson offers a comprehensive, accessible, and appealing introduction to the world's dragonflies and damselflies.

The book highlights the impressive skills and abilities of dragonflies and damselflies—superb fliers that can glide, hover, cruise, and capture prey on the wing. It also describes their arsenal of tactics to avoid predators, and their amazing sex life, including dazzling courtship displays, aerial mating, sperm displacement, mate guarding, and male mimicry.

Dragonflies and Damselflies includes profiles of more than 50 of the most interesting and beautiful species from around the world. Learn about the Great Cascade Damsel, which breeds only at waterfalls, the mesmerizing flight of Blue-winged Helicopters, and how the larva of the Common Sanddragon can burrow into sand as efficiently as a mole.

This is a lavishly illustrated, comprehensive, and accessible natural history that reveals the beauty and diversity of one of the world's oldest and most popular insect groups. It offers a complete guide to the evolution, life cycles, biology, anatomy, behavior, and habitats of dragonflies and damselflies; introduces the 39 families of dragonflies and damselflies through exemplary species accounts; and features tips on field observation and lab research, along with information on threats and conservation. Combining expert text and excellent color photographs, this is a must-have guide to these remarkable insects. 



Coming Soon—A New DSA Web Site!

For many years, the DSA web site has been housed on OdonataCentral, and John Abbott has contributed an incredible amount of time and effort to maintain and update it. That site is still active for now, but even as you read this, a subcommittee comprised of our new webmaster Kendra Abbott and Celeste Searles Mazzacano is busy putting together a new stand-alone site that will streamline membership, annual meeting registration, publications, resources, and more.

Watch for an announcement in your e-mail inbox when the site goes live, which should be no later than early January 2019.

Many thanks to John Abbott for his years of work as DSA webmaster in addition to maintaining OdonataCentral, and to Michael Moore for his work in recent years on creating annual DSA meeting web sites! 

A New Resource for Odonates in México

Dragonflies and Damselflies of Yelapa, Jalisco, México is now available as a PDF. It can be downloaded and printed at <http://bigsnest.powweb.com/southwestdragonflies/YelapaDragonflies/yelapaFrontPage.html>. A paper copy is often much-needed as there is usually no internet available when you are out in the field.

Kathy and Dave Biggs <bigsnest@snic.net>

Would You Like to See Any New Features in ARGIA?

ARGIA is of, by, and for the DSA membership. At the close of each year I like to ask our readers if they have ideas for any potential new features for the journal. I can't promise that all suggestions will be instituted, but you can send your ideas for new features and/or feedback about existing aspects of ARGIA to me at editor@dragonflysocietyamericas.org. Thanks!

Celeste A. Searles Mazzacano, Editor in Chief

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.

A Sense of Place, by Jim Burns <jpbaztac@aol.com>

At this past summer's annual DSA meeting Kurt Mead, in his panegyric to the wildlands of northern Minnesota, spoke reverently of a "sense of place." When I first got religion a few years back and began perusing the bible (Dennis Paulson's *Dragonflies and Damselflies of the West*), the following chapter and verse resonated heavily with me regarding snaketails (*Ophiogomphus*): "These beautiful green clubtails are much sought by dragonfly enthusiasts, as they usually live along pristine rapid streams...and some are quite uncommon."

As a seeker of solitude and a worshipper of wilderness, the pursuit of snaketails quickly became for me a passion and pilgrimage. Darners are impressively large and strikingly patterned, but I've seen them embedded in vehicle grills. Filigree Skimmers are unique and fanciful, but I've seen them flushed by boisterous tubers on several Western rivers. I've now seen 15 of North America's 19 snaketails, but I've never encountered one within sight or sound of paved roads or drunken revelers.

Is it the ethereal green of the thorax and the complex design of the abdomen, or is it the sense of place where



Ophiogomphus colubrinus (Boreal Snaketail), male, Lake County, Minnesota, July 2018. Photo by Jim Burns.

snaketails are found—pristine, unspoiled places? Most memorable for me is a morning spent perched on a boulder above riffles in a creek in the Maine woods, and an afternoon spent wading, thigh deep, below a beaver dam in an Oregon trout stream. Both were typical of snake-tail places, with wind sighing through pines, and ripples purling over rocks; remote and absent of any sound or thought of civilization.

There are species of odonates I know I will never see nor even seek, but the remaining four snaketails I will happily pursue to the ends of the continent, even if to no avail, if only to spend time in the wild, unspoiled places where they can be found.

Savage Attack by a Shadow Darner!, by Rick Nirschl <ricknir@hotmail.com>

I was at Side Cut Metropark in Lucas County, Ohio on 23 August 2018 and went down on one knee photographing this teneral Shadow Darner (*Aeshna umbrosa*) from about four feet away. Suddenly it flew right at me and latched onto my face. I didn't realize it was there at the time, but notice the Hackberry Emperor (*Asterocampa celtis*) butterfly perched on the top of my hat. It was probably waiting for the remains after the darner got done chewing on my face. My first-ever selfie! 



Thank You to Our 2018 ARGIA Contributors!

Thanks to our contributors, it was another great year for ARGIA, filled with the excitement of discovery in the world of odonates. This publication wouldn't be possible without the many DSA members who not only live, work, and play among odonates, but who also take the time needed to jot down an essay, research an article, or share a photo. Everyone has something to contribute as we pursue our different levels of obsession with Odonata. If you enjoy reading ARGIA but have never contributed any observations, discoveries, photos, or event descriptions, I urge you to take a look at your field notes and consider adding your own bit of knowledge to an ARGIA issue in 2019.

Celeste A. Searles Mazzacano, Editor in Chief

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

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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) Dewy Blue Dasher (*Pachydiplax longipennis*) male, Collins Pond, Homer Lake County Forest Preserve, Champaign County, Illinois, 24 June 2018. Photo by Douglas Mills. **(lower)** *Perithemis tenera* (EasternAmberwing) male, Mukwonago, Waukesha County, Wisconsin, 29 July 2016. Photo by Kurt Huebner.

