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**Front cover:** *Argia barknessi* (Harkness’Dancer) with pensive photobombing fly, San Francisco River, Greenlee County, Arizona, 10 May 2018. Photo by Justin Jones.

## Twilight Time in Yelapa, Jalisco, México

Kathy and Dave Biggs <bigsnest@sonic.net>

We returned to the jungles of Yelapa in Jalisco, México for a third time, this time for a two-month stay. We hoped to find new odes for ourselves and the Yelapa list, and maybe even for the Jalisco state list. We also hoped to document species in March, as my Yelapa flight chart shows this month as having by far the fewest species recorded as flying.

We had a wonderful time. Many of the dragonflies we'd especially enjoyed seeing before made regular meetings with us; in fact a few flew right into our upriver casita! *Dythemis sterilis* (Brown Setwing) and *Erythrodiplax funerea* (Black-winged Dragonlet) were our most common in-home visitors. It may have been a safe hideaway from Motmots and Trogans, but the house geckos would have loved them for a late night snack had they stayed overnight.

The setting upriver in Yelapa is ideal for dragonflies; one naturalist told us Yelapa is the 2nd most diverse spot on Earth, after the Amazon. We did have one setback—two weeks of overcast weather with occasional rain, thunder, and lightning! Those overcast days were good for hiking but not for adding odes to our list.

We arrived on 9 January 2018 and left on 8 March, and managed to see 48 of the 64 species recorded there, with several being new to us. It's really awesome that this small area of three square miles or less has so many species, very few of which also occur in California or even in Arizona or Texas. Yelapa is inexpensive to get to and to stay in, making it quite ideal.

On our first day we went immediately from our casita to the adjoining Río del Tuito riverfront. We were happy to find both *Hetaerina americana* and *H. occisa* (American and Racket-tipped Rubyspots), and even an *Archilestes grandis* (Great Spreadwing) along with *Argia pulla* (Purple Dancer) on the wing. It was

especially exciting to find a female *Erythrodiplax fervida* (Red-mantled Dragonlet), a *Perithemis domitia* (Slough Amberwing), and a *Progomphus clendoni* (Zebra-striped Sanddragon) also on display, giving us seven species.

On our 2nd day we continued walks up the Tuito River within a quarter mile or so of our casita, adding *Orthemis discolor* (Carmine Skimmer), *Dythemis sterilis*, and *Telebasis salva* (Desert Firetail) to our trip list. On our 3rd day, we headed into the pueblo for some shopping and remembered the pool of water under the bridge over the Yelapa River. We got our first lifer there, a lovely *Dythemis maya* (Mayan Setwing) that posed nicely midstream on a boulder and right near an old favorite of ours, the dashing *Macrothemis pseudimitans* (White-tailed Sylph). *Perithemis intensa* (Mexican Amberwing) and *Argia tezpi* (Tezpi Dancer) brought our 2018 list to 14 species. A walk a little further through the pueblo towards the point and its great swimming hole took us across a tiny creeklet/seep where we saw *Argia extranea* (Spine-tipped Dancer) and the recently re-named *Argia oculata*



Río del Tuito in Yelapa, Jalisco, México. Photo by Dave Biggs.

*continued next page...*

## Calendar of Events

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

Event	Date	Location	Contact
Ohio Odo-Con-18	22–24 June 2018	Hancock County, Ohio	Jim Lemon <jlem@rwoh.rr.com>
Annual DSA Meeting	12–17 July 2018	Finland, Minnesota	M. Haag <Mitchell.Haag@threeriverparks.org>
NE DSA Meeting	2–5 August 2018	Hampden County, Mass.	Joshua Rose <opihi@mindspring.com>
Eagle Hill Odonate Seminar	1–7 July 2018	eastern Maine	Joerg-Henner Lotze <joerg@eaglehill.us>
SE DSA Meeting	29–31 Mar or 5–7 Apr 2019	Crestview, Florida	Jerrell J. Daigle <jdaigle@nettally.com>

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(formerly Familiar Dancer, now Oculate Dancer). All of these were at the very same spot where we saw them last year. Our trip total was now 16 species, one lifer.

Our 5th day was quite memorable. We stumbled upon a large puddle in the sandbar along the river that was only about the size of a double bed, but wonderfully rich in ode species. There were multiple *Pseudoleon superbus* (Filigree Skimmer), *Orthemis ferruginea* (Roseate Skimmer), *Erythemis plebeja* (Pin-tailed Pondhawk), *Erythrodiplax basifusca* (Plateau Dragonlet), and a lone *Erythemis vesiculosa* (Great Pondhawk), which was a new species for us in Yelapa, plus numerous *Telebasis salva*. Our “desert” was finding *Argia oenea* (Fiery-eyed Dancer) alongside the river on our return, and very close to home! Our trip total was now 22 species, one lifer.

Our goal the 2nd week was photographing the difficult-to-record *Protoneura cara* (Orange-striped Threadtail). Amazingly, they occurred right in our backyard! We also added *Hetaerina titia* (Smoky Rubyspot), *Enallagma novaehispaniae* (Neotropical Bluet), and *Macrothemis ultima* (Highland Sylph) to the year’s list. A glider kept tempting us; I netted it and was disappointed to find it was a species common even in California, *Pantala flavescens* (Wandering Glider). But not to worry, we found another glider later. *Libellula croceipennis* (Neon Skimmer) rounded out the week for a total of 28 species, one lifer.

The 3rd week was overcast and cool, but during a hole in the overcast, we quickly went a bit upriver and were delighted to find *Dythemis nigra* (Blue-eyed Setwing) again. Interestingly, it was in the exact same spot where we found it last year, when it had been a new state record. Another day we found the gate open to a property where we’d seen ponds through the fence. We talked with the owner, Johnny, who gave us permission to come in and watch or even catch dragonflies any time the gate was open. This was our first real opportunity to access lentic water habitat where it was not directly connected to the river. We immediately noted and photographed a *Lestes* (spreadwing), which Dennis Paulson later identified as *L. sigma* (Chalky Spreadwing),



Fiery-eyed Dancer (*Argia oenea*) in hand. Photo by Dave Biggs.

giving us our 2nd lifer species. Thanks, Dennis! At the back pond we spotted *Erythemis attala* (Black Pondhawk), which was lifer #3. We caught a glimpse of a flying aeshnid that we thought was *Coryphaeschna adnexa* (Blue-faced Darner), which we’d seen but not photographed last year; however,

it evaded our attempts to photograph it. Our biggest thrill at Johnny’s ponds was a female *Micrathyria schumanni* (Dusky Dasher), which was lifer #4. *M. aequalis* (Spot-tailed Dasher) was also present, and we photographed our first *Erythrodiplax funerea* (Black-winged Dragonlet) of 2018. We now had 35 species with four lifers, but no new species for Yelapa or Jalisco.

For the next three weeks we continued walking up and down the river, becoming better acquainted with the ode species, but despairing of adding to the site or state list. We did find *Argia carlcooki* (Yaqui Dancer) on the river, and it was a thrill to see a species named after a fellow DSA member. Other creatures added to our enjoyment; we saw endangered Military Macaws and other beautiful jungle birds such as Elegant and Citreoline Trogons, Squirrel Cuckoos, and Russet-crowned Motmots. We also encountered huge Green Iguanas; colorful Daggerwing, Julia, and Red Postman butterflies; and the giant White Morpho butterfly with wings the size of a child’s hand (locals call it “La Servilleta” because it looks like a napkin blowing gently in the wind). Another highlight was when we found the gorgeous *Argia anceps* (Cerulean Dancer) on Valentine’s Day close to our rental house, as we’d previously only seen it elsewhere in Jalisco. We kept returning to the 2nd crossing of Río del Tuito in hopes of finding *Erythemis haematogastra* (Red Pondhawk), as it had been a new Jalisco record the prior year, but alas, we never did.

Johnny’s ponds turned out to be a fortuitous find, as we added two more species of *Micrathyria* there: *M. bagenii* and *M. didyma* (Thornbrush and Three-striped Dasher). Alas, the *Remartinia luteipennis* (Malachite Darner) seen there evaded both net and camera. It was now week six and we hadn’t added a new species to the Yelapa or Jalisco list, and our count stood at only 40 species, four lifers.

We kept hoping the mouth of Río del Tuito would close and the lagoon would flood. It happened for a few hours, but not long enough for new species to appear. Finally on 24 February the river stayed closed. I feared it wouldn’t last long and abandoned Dave at a musical jam session with friends and ventured on my own into the flooded lagoon. The water was deep and the bottom slippery where it was mud instead of river sand/silt, but it paid off! There again was *Neoerythronma gladiolatum* (West Mexican Yellowface), which we’d found in 2017; I must have taken 30 images of them. I also found *Micrathyria ocellata* (Square-spotted Dasher; thanks to Dennis Paulson for the ID). On another day as we returned from our explorations, we found *Macrothemis inacuta* (Straw-colored Sylph), a species we’d missed in 2017. However, another *Macrothemis* we found in 2014 which was new for the Jalisco list then, *M. hemichlora*, was not to reappear for us. We now had 43 species, four lifers.

By 28 February we were hearing multiple rumors of a “dragonfly phenomenon” occurring at the Oasis Resort each night. So, since they were showing the movie *West Side Story* that night, we

went over to have dinner and see the show. . . .and what a show we got! At least a dozen damer-like dragonflies swarmed above us as we ate dinner. We didn't have a camera or net, but I was able to take several short video clips on the cell phone in hopes that later viewing would enlighten us as to the species. We also obtained permission from the owner to return again with a net. The videos were inconclusive but we assumed it was a crepuscular species, probably either a *Gynacantha* damer or *Tholymis citrina* (Evening Skimmer); we hadn't seen either but they are recorded in the state of Jalisco (though not in Yelapa). This gave us an exciting 44 species, five lifers.

The lagoon remained flooded the next morning so Dave joined me for a further search. I've been collecting flight data for Yelapa odonates, and March is terribly under-censused, which was one reason we stayed this final week. We ended up adding 22 species to the March flight data. I'm glad we went back into the flooded lagoon as either more species were out or else two sets of eyes are better than one (or both). We quickly added *Ischnura ramburii* (Rambur's Forktail) and another lifer, *Dytbemis nigrescens* (Black Setwing), both of which were also new to our 2018 list. A glider kept flying over the water hyacinth; we couldn't reach it with the net, so I clicked the camera every time it flew into view. It wasn't a good shot, but good enough to make it our 7th lifer: *Miathyria marcella* (Hyacinth Glider), of course! Finally, we found another ode we'd seen last year—*Telebasis filiola* (Striped Firetail). Our trip stood at 48 species with seven lifers.

That evening we almost ran the mile to the Oasis as we'd rested up after our Big(gs) day in the lagoon a little longer than planned. We arrived to be told we'd just missed the mystery fliers at the Oasis. Our time in Yelapa was fast coming to a close. Would we be able to figure this out?

We had an all-day tour and other commitments, and the Oasis was closed on Sunday so we couldn't get back until Tuesday 6 March, which was our next-to-last night there. We arrived well before dusk and explained our net and mission to all those dining there. The mystery odes did show up again, but unlike our first visit when they eventually flew low, they stayed very high. Dave bravely wielded the net with all the diners' eyes upon him. I explained that he was pitting himself against 300 million years of evolution. The odes started leaving and we were desperate. Dave took a high leap and pancaked the net against the thatch roof; we didn't have much hope as he brought the net down, but indeed, he'd caught it!

I took the ode out of the net and some diners loaned us their flashlights. I was afraid it was a female, but as I explained what we were doing (thank goodness they were English speakers or that task would have been beyond my vocabulary), they told us they could see a 3rd appendage (are my eyes that old!?). I explained that we'd need to take it with us and refrigerate it, then photograph it in the morning when we had good light.



Twilight Darner (*Gynacantha nervosa*). Photo by Kathy Biggs.

The next morning we anxiously removed the ode from its envelope and held it up to the binder of Yelapa odes I'd printed out before the trip. It was a perfect match for *Gynacantha nervosa* (Twilight Darner)—finally, a new species for the Yelapa list! We photographed it inside the casita for fear of it flying off before we could document it. Thank goodness for the Internet—we sent the photos to Dennis Paulson, who confirmed our ID.

We then took it outside to pose on the casita wall; it was quite complacent and another 30 or so photos were taken as it 'colored up'. But it never tried to leave, and it dawned on me that this was a crepuscular species that probably wouldn't fly off until dusk. I remembered that a Sphinx moth we found last year in the casita at night and released in the daylight had been eaten by a Social Flycatcher, and decided to return the damer to the refrigerator. That evening we took it with us to dinner at our favorite restaurant. We scared the cook so much when we showed it to her that I feared for our meal. Our musical friends joined us and we asked if they'd like to hold and release it. We reassured them that the damer wouldn't bite, and they were game. The damer went into their outstretched hands, where it didn't bite...but it didn't fly either! But then, quick as a wink, it was off and gone into the twilight.

It felt very gratifying to find such an unusual species for the Yelapa list. Our trip list now stood at 48 species, seven lifers, and we added a new flight month for 22 species. But when we returned to California and went to iNaturalist to record the Twilight Darner (<<https://www.inaturalist.org/observations/11374751>>; record #479346 on <[www.odonatacentral.org](http://www.odonatacentral.org)>), we discovered that one was photographed in Yelapa the prior year. So much for our new record, but the hunt sure was fun!

Next year we hope to celebrate our 50th anniversary in Yelapa and you are cordially invited to join us! If you have collected or photographed odonates in Yelapa or the state of Jalisco, please send us your data in a Word chart or Excel file (<[bigsnest@sonic.net](mailto:bigsnest@sonic.net)>).

**Yelapa Species List. \*seen by the Biggs in 2018; ^lifer; #new to Jalisco state list**

**Zygoptera (Damselflies)**

*Hetaerina americana* (American Rubyspot)\*  
*H. occisa* (Racket-tipped Rubyspot)\*  
*H. titia* (Smoky Rubyspot)\*  
*Archilestes grandis* (Great Spreadwing)\*  
*Lestes sigma* (Chalky Spreadwing)\*,^  
*L. tikalus* (Tikal Spreadwing)  
*Argia anceps* (Cerulean Dancer)\*  
*A. carlooki* (Yaqui Dancer)\*  
*A. extranea* (Spine-tipped Dancer)\*  
*A. oculata* (Oculate Dancer)\*  
*A. oenea* (Fiery-eyed Dancer)\*  
*A. pulla* (Purple Dancer)\*  
*A. tezpi* (Tezpi Dancer)\*  
*Enallagma novaehispaniae* (Neotropical Bluet)\*  
*E. semicircularae* (Claw-tipped Bluet)\*  
*Ischnura hastata* (Citrine Forktail)  
*I. ramburii* (Rambur's Forktail)\*  
*Mecistogaster ornata* (Lemon-tipped Helicopter)  
*Neocythromma gladoilatum* (West Mexican Yellowface)\*  
*Protoneura cara* (Orange-striped Threadtail)\*  
*Telebasis filiola* (Striped Firetail)\*  
*T. salva* (Desert Firetail)\*

**Anisoptera (Dragonflies)**

*Anax junius* (Common Green Darner)  
*Coryphaeschna adnexa* (Blue-faced Darner)\*  
*Gynacantha nervosa* (Twilight Darner)\*,^  
*Remartinia luteipennis* (Malachite Darner)\*  
*Rhionaeschna psilus* (Turquoise-tipped Darner)  
*Erpetogomphus bothrops* (One-striped Ringtail)  
*Phyllogomphoides pacificus* (Pacific Leaf-tail)  
*P. nayaritensis* (West Mexican Leaf-tail)

*Gomgomphus clendoni* (Zebra-striped Sanddragon)\*  
*P. mexicanus* (Mexican Sanddragon)  
*Brechmorhoga praecox* (Slender Clubskimmer)  
*Dythemis maya* (Mayan Setwing)\*,^  
*D. nigra* (Blue-eyed Setwing)\*,^#  
*D. nigrescens* (Black Setwing)\*,^  
*D. sterilis* (Brown Setwing)\*  
*Erythemis attala* (Black Pondhawk)\*,^  
*E. haematogastra* (Red Pondhawk)\*  
*E. plebeja* (Pin-tailed Pondhawk)\*  
*E. vesiculosa* (Great Pondhawk)\*  
*Erythrodiplax basifusca* (Plateau Dragonlet)\*  
*E. fervida* (Red-mantled Dragonlet)\*  
*E. fumerea* (Black-winged Dragonlet)\*  
*Libellula croceipennis* (Neon Skimmer)\*  
*L. herculea* (Silver-sided Skimmer)  
*Macrothemis bemichlora* (Three-striped Sylph)#  
*M. inacuta* (Straw-colored Sylph)\*  
*M. pseudimitans* (White-tailed Sylph)\*  
*M. ultima* (Highland Sylph)\*  
*Miathyria marcella* (Hyacinth Glider)\*,^  
*Micrathyria aequalis* (Spot-tailed Dasher)\*  
*M. didyma* (Three-striped Dasher)\*  
*M. hagenii* (Thornbush Dasher)\*  
*M. ocellata* (Square-spotted Dasher)\*  
*M. schumanni* (Dusky Dasher)\*,^  
*Orthemis discolor* (Carmine Skimmer)\*  
*O. ferruginea* (Roseate Skimmer)\*  
*Pantala flavescens* (Wandering Glider)\*  
*P. hymenaea* (Spot-winged Glider)  
*Perithemis domitia* (Slough Amberwing)\*  
*P. intensa* (Mexican Amberwing)\*  
*Pseudoleon superbus* (Filigree Skimmer)\*  
*Tauriphila azteca* (Aztec Glider)  
*Tramea abdominalis* (Vermilion Saddlebags)



***Remartinia secreta*, Secretive Darner**

**Dennis Paulson**, for the DSA Checklist Committee <dennispaulson@comcast.net>

The beautiful neotropical darner *Remartinia secreta* was first recorded for the U.S. by Tripp Davenport (2018) in July 2017. The species already has a common name in the North American dragonfly manual (Needham, Westfall, and May, 2014), but some DSA members don't have that book, so I'm putting on the record the common name for the species: Secretive Darner.

It's an appropriate name, as not much is known about it. Although it is apparently fairly common in the Tuxtlas of Veracruz, other records of it are few and far between in the literature, scattered around the lowlands of Mexico and northern Central America. It was originally described from Cuba, but I don't know if there

have been any recent sightings from that country.

It is apparent that there is much more activity in citizen science than in formal science recently, for the obvious reason that many more people can participate in it, not to mention the inviting user interface of so many projects. iNaturalist is one of those projects, and in addition to the Texas record submitted by Tripp Davenport, there is an observation in iNaturalist of this species from Tulum, Quintana Roo, Mexico, a first record for the state. What you don't see until you go to the observation online is that it is a pair in copula, and the female is a Mangrove Darner, *Coryphaeschna viriditas*! Apparently neither the submitter of the

record nor the three people who confirmed it realized that she wasn't the same species and that they should publicize this interesting hookup more widely. I wonder if its kinky mating habits are why it is so secretive!

Another observation in iNaturalist from Aguascalientes state in Mexico is actually an individual of *Remartinia luteipennis*, Malachite Darner.

## The Quest for Intag

**Bill Mauffray** <iodonata@gmail.com> and **Ken Tennessen** <ktennessen@centurytel.net>

Clarence Buckley, a European, collected a series of Odonata specimens in the Intag area of Imbabura Province, Ecuador, sometime during 1839. The following species have been described as a result of these collections:

*Ormenophlebia imperatrix* (McLachlan, 1878)

*Oreiallagma prothoracium* (Kimmins, 1945)

*Teinopodagrion setigerum* (Selys, 1886)

*Cora munda* McLachlan 1878

*Gomphomacromia fallax* McLachlan, 1881

An additional two species have never been collected again:

*Cora dualis* McLachlan 1878

*Euthore mirabilis* McLachlan 1878


The exact location of "Intag" has been perplexing to researchers since that time. In preparation for the forthcoming publication, A Catalogue and Historical Study of the Odonata of Ecuador, we initially proposed to describe Intag as:

"Intag [Imbabura Prov.] [2.5 hours from Otavalo, on the Cuicocha-Apuela road, 1800-2800m—from Brown (1941). Rosser Garrison speculated that this locality was Cotachchi Canton, Intag (could refer to the Río Intag, WNW of the town of Otavalo, on the road to Selva Alegre), 0.1333, -78.8333, 1175m."

According to Google Earth (accessed 20 March 2016), there is a road that runs west-northwest from the Laguna Cuicocha over the crest of a ridge then down towards Apuela. There is an image labeled "by Lepido-france ALF" along this route at 0.3379°, -78.4089°, 3155m. This road follows a small valley with an unnamed tributary down to the Río Intag northeast of the city of Apuela, which is at 0.5715°, -78.5114°, 1586m. It is most likely that the "Intag" locality is along the Río Intag and this tributary northeast of Apuela.

The proposed reference for our Ecuador publication is "IM, Cotachchi; "Intag" Apuela, NE on Apuela-Cuicocha Road, along Río Intag and tributaries between 1800–2800m, 0.3588°, -78.4509° at junction of Río Intag and a tributary."

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While participating in two IUCN (International Union for the Conservation of Nature) Red List assessment workshops in Bogotá, Colombia during 2015 and 2017, several species were assessed as "DD" (Data Deficient). We decided we had to find Intag and hopefully determine the status of these species and perhaps discover new ones, as the area is under-surveyed.

Since we had a previous invitation of collaboration, we contacted Giovanni M. Ramón Cabrera, a professor at the Universidad San Francisco de Quito, COCIBA (Colegio de Ciencias Biológicas y Ambientales), who has obtained permits and will be joining us for our "Quest for Intag" trip on 22 August–4 September 2018.

After the results of this trip are tabulated, we will finally publish the long-awaited treatise on the Odonata of Ecuador.

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# First Recorded Occurrences of the Calico Pennant (*Celithemis elisa*) in Manitoba, Canada

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Calico Pennant (*Celithemis elisa*) adult females (n=7), previously unreported from Manitoba, were initially observed and photographed on 10 July 2016 (Figure 1) near a small previously-abandoned test gravel pit that has subsequently become a permanent pond in the Sandilands Provincial Forest. Identification was confirmed by one of us (LdM) and Dennis Paulson (Manitoba and North American odonate experts, respectively) from photographs JDR posted on the same date on the Western Odonata Facebook page <<https://www.facebook.com/groups/WesternOdonata>>.

Episodic subsequent searches (11 July to 11 August 2016 and 20 June to 14 August 2017) confirmed the occurrence of both males and females at this and several other small ponds, along the edges of some larger lakes in the immediate area, and occasionally along old access trails through the forest in the immediate area (Figure 2, triangles). Initial occurrences and most of the subsequent sightings were mature individuals of both sexes.

Most surveys yielded small numbers of individuals (e.g., 1–15) at each location and date. In some cases, although suitable habitat appeared to be available near larger lakes (e.g., Reynolds Ponds, Figure 2), no Calico Pennants were observed.

In 2017, during an increased geographical survey of the immediate area, active reproduction (i.e., tandem flights, females ovipositing either in tandem or singly) by relatively large numbers of individuals (60–100+) was observed on 30 July 2017 at a more remote pond in the area (Figure 2, red triangle). A subsequent visit to this pond on 4 August 2017 yielded eight individuals perched or flying in upland vegetation; however, no reproductive activity was observed.

The area in which these ponds are situated is the boreal shield ecozone of south-central and southeastern Manitoba (Smith et al., 1998), a transition zone between the prairies and the Canadian Shield areas of Canada. Large tracts of forest are



Figure 1. Calico Pennants (*Celithemis elisa*) from Manitoba. (Upper left and upper right) Two of the first females observed at the initial site (see text and Figure 3). Photos by J. Reist. (lower left and lower right) Additional images of female (L) and male (R). Photos by L. de March.



present dominated in undisturbed areas by poplars, spruces, and birches with an understory of boreal shrubs such as willows and alder. Disturbed areas regenerate with a mix of boreal grasses, flowering plants, and herbaceous vegetation with low shrubs. Low areas are dominated by peat bogs, marshy ponds, small to medium-sized dark-stained rivers, and small lakes with wet areas forested by tracts of black spruce, tamarack, and willow. Human activities in the area include backcountry recreation, forestry with softwood monoculture re-planting, and mining. The latter has historically and at present included peat mining and removal of surficial deposits of glacial tills such as gravels, down to and sometimes including limestone bedrock strata.

The particular area of Reynolds Ponds (named after the regional municipality), including the area immediately to the south which has larger and deeper lakes, has had a number of past surficial mining activities that created complexes of deeper small-to-moderate sized lakes with limited shoreline vegetation. Many of the larger lakes are stocked with sport fishes such as rainbow trout (<[http://www.gov.mb.ca/waterstewardship/fisheries/fish\\_stocking\\_gMap\\_MVC\\_V2/index.html](http://www.gov.mb.ca/waterstewardship/fisheries/fish_stocking_gMap_MVC_V2/index.html)>, accessed 13 May 2018). There are also smaller exploratory borrow pits, other surface mines (both gravel and peat), and depressions in the landscape. These smaller ponds and small lakes are in areas where much of the original forest has been removed. Subsequent regeneration has resulted in small ‘upland’ open, dry meadows of grasses, herbs, and small shrubs re-generated on soils dominated by clays and occasional gravel/sand mixes. These open drier vegetated ‘upland’ areas appeared to be preferred by Calico Pennants, as most occurrences of perching or flying adults were in such areas, usually within 1–100 m of the nearest pond.

Wet meadows with herbaceous vegetation also occurred adjacent to some locations where Calico Pennant adults were active. Pond levels were relatively high in 2016 with emergent and submerged vegetation present in limited amounts along pond edges; similarly, wet meadows were relatively damp that year. There are submerged beds of the green alga *Chara* sp. in many ponds, including the one where reproduction was observed with females ovipositing in shallow water above *Chara* beds. In 2017, water levels in most ponds were much lower and previously wet meadows were generally much drier. Despite these differences in water levels, use of upland habitats by Calico Pennants was similar in both years.

During both 2016 and 2017, surveys of likely habitats near similar (i.e., ponds in old borrow pits) and naturally occurring ponds and lakes in the wider area (i.e., within a few to tens of kilometers) did not yield any additional occurrences, suggesting either a very restricted geographical distribution in this area, particular habitat requirements, or perhaps both. Accordingly, this cluster of small ponds is the only known location to date where this species occurs

in the province (see notes on general North American distribution below).

The initial location in southeastern Manitoba is approximately 225 km north of the northernmost location in the United States (Figure 3) (Polk County, Minnesota, 47.72730°, -95.72970°, 26 July 2011, K. Mead, OdonataCentral record #419717; distance calculator <[www.nhc.noaa.gov/gccalc.shtml](http://www.nhc.noaa.gov/gccalc.shtml)> accessed 18 May 2018). The southeastern Manitoba initial location is also located approximately 390 km northwest of a northwestern Ontario location where Calico Pennants were observed five days later in 2016 (Figure 3). Both sites are quite distant from other Canadian locations further east. Given the distances and timing involved it is most likely that source populations for the southeastern Manitoba occurrences (assuming this is not a previously unrecorded species natal to the province—see below) are in northern Minnesota.

These occurrences are the first known for the province of Manitoba and the second in Canada for areas west of southern parts of Ontario, Quebec, and the maritime provinces. Both the Manitoba and northwestern Ontario locations are in tracts of boreal forest. Despite surveys of what appears to be suitable habitats in southeastern Manitoba, no additional locations were found, suggesting very limited distribution and/or specific habitat preferences for the species in the province. General literature indicates that *Celithemis* larvae do not compete well with those of other species (Mead, 2017), thus their occurrence in newly-formed ponds and borrow pits appears to be more likely prior to the establishment of other species. Pond succession and colonization by additional odonates, along with ensuing competition, presumably limits population sizes of Calico Pennants and may



Figure 2. Location map for gravel pit/ponds area south of the Reynolds Ponds in the Sandilands Provincial Forest, Manitoba. Location of first observation is indicated; triangles indicate additional ponds where Calico Pennants (both sexes) were moderately abundant in 2016 & 2017. Occasional individuals were also observed along forest trails in the area. Reproductive activities were observed in 2017 at the pond at the northwestern end of the large gravel pit lake (red triangle). The largest gravel pit lake is approximately 1200 m in length.

lead to their extirpation from the site. While the ponds in Manitoba where Calico Pennants occurred were not formed in the immediate past, they are of human origin within the last several decades, thus likely still equilibrating ecologically. Regardless, additional locations of possible occurrence as well as persistence at these ponds should be investigated.

Three explanations are possible for the occurrence of the Calico Pennant in Manitoba: 1) Ephemeral extra-limital occurrences of vagrants in the area, perhaps as a result of high winds or storm events preceding their occurrence in 2016; 2) A recent colonization to the province, possibly linked to an initial transport event noted in #1; and 3) An occurrence as part of the native fauna but one that had simply been overlooked and not previously recorded. Of these three, the most likely explanation is some combination of the first two. Calico Pennants are ecologically local and weak fliers typically not moving far from reproductive ponds (Walker and Corbet, 1975); however, high abundance eruptions have been recorded in the northern parts of the range (Gregoire and Gregoire, 2009). Accordingly, the coincidence of regular emergences or an eruption in location(s) in the northern United States combined with weather conditions favorable to dispersal into the boreal forests of both northwestern Ontario and southeastern Manitoba appears most likely.

Although odonate coverage and reporting in Manitoba is moderate to low relative to many areas elsewhere, several enthusiasts (including LdM and others) have regularly surveyed odonates in southeastern Manitoba including the Reynolds Ponds, making explanation #3 less likely. Moreover, the restricted geographic distribution in Manitoba suggests that an episodic event facilitated the displacement. Assuming the combination of explanation #1 and #2 is most likely, it is probable that the initial event took place in 2016 or in the year immediately prior. Support for this comes from the near-simultaneous observation in northwestern Ontario in 2016. Possible northwards displacement of adult odonates to Manitoba in 2016 is further supported by the report of a vagrant damselfly (Blue-fronted Dancer, *Argia apicalis*) from Winnipeg later that same year (Reist, 2017). However, given the northwards flow pattern of the Red River, this may instead be due to the downstream displacement of a larva.

The observation of reproductive activity in at least one location in 2017 suggests that the species is likely to become fully established in the province and perhaps extend its range in the future. Documentation of continued presence and reproduction and possible range extensions within the province are warranted.

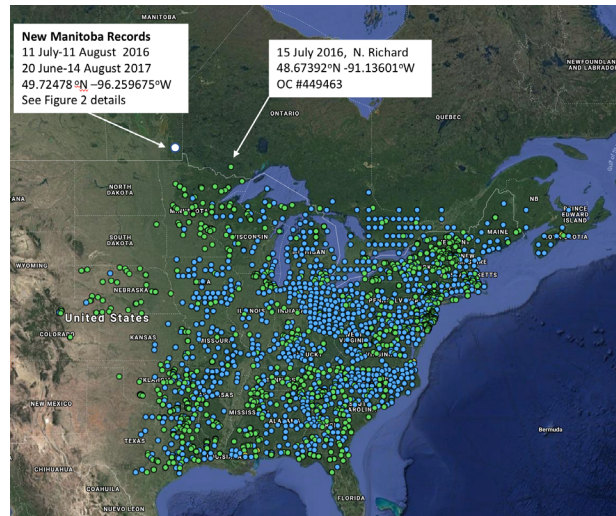



Figure 3. The new Manitoba location added to point distribution map from OdonataCentral (Abbott, 2006–2018). The location in northwestern Ontario reported a few days following the capture noted in this article is also shown.


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## Any Research Projects Out There?

Dennis Paulson, Seattle, Washington <dennispaulson@comcast.net>

Walter Sanford asked me about research projects going on with odonates that might benefit from volunteers, and it stumped me. I wonder if everyone with such projects who might enjoy an intern or volunteer or two would put a note about it in ARGIA. It could be nothing more than a link to a website where your research is described. Even if you are not interested in volunteers

or no volunteers come of it, the rest of us would very much like to know what people are doing. Citizen science, so significant with odonates now, is great, but formal science is even greater. If you aren't doing any such research but know about someone who is, perhaps someone who doesn't read every word in ARGIA, please feel free to tell us about that as well. 

## Volunteers Sought for New Project on Northeast *Enallagma* (Bluets)

Pam Hunt, New Hampshire Audubon <phunt@nhaudubon.org>

Four species of *Enallagma* damselflies are largely endemic to the northeastern United States: *E. laterale* (New England Bluet); *E. minusculum* (Little Bluet, also found in Atlantic Canada); *E. pictum* (Scarlet Bluet); and *E. recurvatum* (Pine Barrens Bluet). Because of their restricted ranges and overlap with a landscape heavily impacted by humans, all four species are considered "Species of Greatest Conservation Need" (SGCN) for the region and in one or more states.

In an effort to better understand their current distributions and conservation needs, partners in seven states (Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, and New Jersey) have banded together for a two-year project funded by the Sarah de Coizart Charitable Trust, and administered by the Audubon Society of New Hampshire. The goals of the project are threefold: 1) update state-level databases on these species' distributions (many records are over 20 years old); 2) develop habitat models that may guide future conserva-

tion efforts; and 3) create a conservation plan for these species in the region.

In 2018 and 2019, staff and contractors from partner agencies will be conducting standardized damselfly and habitat surveys at ponds from Maine to New Jersey, but there is always room for additional experienced observers. We are thus seeking interested odonatists to help collect data. Observers must be exceedingly familiar with the species in question, as well as other *Enallagma* in the region, be able to visit assigned sites at least twice during the flight season (June for two species, July–August for the other two), follow detailed protocols for both damselflies AND vegetation measurements, and submit data in a timely fashion.

Interested parties should contact Pam Hunt at <phunt@nhaudubon.org> for more information. Note that we are still in the process of developing priorities for the 2018 season, so there may not be survey opportunities near all volunteers.

### Announcing Eagle Hill Institute's Seminar on Odonates in 2018

Eagle Hill is on the coast of eastern Maine, between Acadia National Park and Petit Manan National Wildlife Refuge. On 1-7 July 2018, Bryan Pfeiffer and Michael Blust will be the instructors for Dragonflies and Damselflies: Field Techniques and Identification. The seminar includes morning lectures on odonate biology, taxonomy, and ecology; afternoon field excursions to local rivers, wetlands, and lakes; and evening sessions on photography and specimen preparation. For complete details and schedule visit <<https://tinyurl.com/ycfpvsvl>>.

Additional seminars on midges, spiders, and other invertebrates will be taught over the summer. Visit <<https://tinyurl.com/y823lg98>> for a list of invertebrate-based seminars, and <<https://www.eaglehill.us/programs/nhs/nhs-calendar.shtml>> for a complete list of all Eagle Hill seminars and workshops.

Joerg-Henner Lotze, Director, Eagle Hill Institute  
59 Eagle Hill Road, Steuben, Maine 04680-0009  
207-546-2821 ext. 4, <[joerg@eaglehill.us](mailto:joerg@eaglehill.us)>

## DSA Odonate Research Grant Program Funds Its First Projects

Nancy McIntyre, Texas Tech University, Lubbock, Texas <nancy.mcintyre@ttu.edu>

The DSA Odonate Research Grant Program finished its first year of awarding small grants (\$500–1000) to help pay expenses for odonate research in the DSA focal region.

In this inaugural year, grants were accepted until 1 May 2018, but in the future, grants will be due annually on 1 February. This year, nine proposals were received and reviewed on the basis of their scientific importance, feasibility, and clarity, by a committee consisting of Nancy McIntyre (chair), Chris Hill, and Bryan Pfeiffer. Sadly, we had more meritorious proposals than we had funds to allocate. The following awards were made:

Assessing rate of DNA degradation in a stream ecosystem for detecting environmental DNA (Y. Can and J.C. Abbott), \$970.

Characterization of an undescribed Arizona *Argia* taxon (P. Deviche and R. Garrison), \$978.

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

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

Total grant funds awarded: \$3917.

We are looking forward to hearing updates from these researchers on their projects.

All 2018 submissions (listed alphabetically by first author's surname):

Biggs, K. and D. Biggs. Biodiversity of Yelapa and the Cabo de Corrientes region of Jalisco, Mexico. \$1000.

Bilger, E. and M. Merchant. Baseline immunity characterization in dragonflies. \$900.

Can, Y. and J.C. Abbott. Assessing rate of DNA degradation in a stream ecosystem for detecting environmental DNA. \$970.

Deviche, P. and R. Garrison. Characterization of an undescribed Arizona *Argia* taxon. \$978.

Graham, G., J. Kennedy, and M. Sanders. Patterns of dragonfly distributions and diversity in urban and retention ponds along an urbanization gradient in the city of Denton. \$1000.

Hasik, A.Z. Top-down effects of predators on immune function. \$1000.

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

Sandall, E.L. Exiting the burrow: Understanding propulsion of North American Gomphidae from aquatic substrates. \$826.

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

Please consider donating to support the DSA Odonate Research Grant Program! You can contact DSA Treasurer Cindy McKee <treasurer@dragonflysocietyamericas.org> for more information on how to donate. 

### 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>.

## Odonata in the News

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

**Cao, L.-Z., X.-W. Fu, C.-X. Hu, and K.-M. Wu. 2018. Seasonal migration of *Pantala flavescens* across the Bohai Strait in Northern China. *Environmental Entomology* 47(2): 264–270.** *Pantala flavescens* (Fabricius 1798) (Odonata: Libellulidae) is one of the most common species of migratory dragonflies. *P. flavescens* adults were captured by a searchlight trap on Beihuang Island (BH Island; 38°24' N, 120°55' E) from 2003 to 2016, where there is no freshwater. This inspired our research to analyze the pattern of seasonal migration and population dynamics. Stable hydrogen isotope measurement and the Hybrid Single Particle Lagrangian Integrated Trajectory (HYSPLIT) were used to simulate the migration pathway of *P. flavescens* between different breeding habitats. The results showed that there was no significant difference among population numbers of this overseas migration across years ( $F_{13, 2161} = 0.85, P = 0.604$ ); however, the numbers were significantly different across months ( $F_5, 2161 = 3.91, P = 0.003$ ). Our geospatial natal assignment model suggested that *P. flavescens* trapped on BH were originated in different geographical regions and might have three movement strategies: wandering around northern China and north-bound (positive) and south-bound (negative) movements. Among them, the majority were engaged in wandering around northern China. Model simulations suggested that *P. flavescens* toured around BH. The results contribute to the knowledge of *P. flavescens* population ecology in a large-scale geographic region and will aid in the prediction and interpretation of insect migration patterns in response to climate change.

**Chovanec, A. 2018. Comparing and evaluating the dragonfly fauna (Odonata) of regulated and rehabilitated stretches of the fourth order metarhithron Gurtenbach (Upper Austria). *International Journal of Odonatology* 21(1): 15–32.** Mitigation measures carried out at the regulated metarhithron Gurtenbach in Upper Austria were evaluated by a survey of the dragonfly fauna. The assessment method developed in this study was based on the longitudinal distribution of dragonflies along riverine biocoenotic regions (the “Rhithron-Potamon-Concept” explains changes in species composition along a river's length). Numerically expressed habitat preferences led to the definition of a set of six reference species. According to the requirements of the EU Water Framework Directive the current situation of the odonate species was compared

with this inventory of river type-specific reference species and assessed in a five-tiered classification system of the “ecologic status”. At the regulated stretch the record of five species (including one reference species) was classified as class IV (“poor ecological status”). At the three rehabilitated stretches a total of 23 species were found. Two stretches were classified as showing “good ecological status” (class II), due to the occurrence of two autochthonous reference species (*Calopteryx virgo*, *Onychogomphus forcipatus*). The sensitive method applied not only allowed the evaluation of the differences between regulated and rehabilitated stretches but also the assessment of potential effects within the rehabilitated section due to river bed widening and backwater influences.

**French, S.K. and S.J. McCauley. 2018. Canopy cover affects habitat selection by adult dragonflies. *Hydrobiologia* 818(1): 129–143.** The mechanisms structuring aquatic communities across environmental gradients are often difficult to distinguish from one another and can produce similar patterns of species distributions. In freshwater systems, the amount of canopy cover from surrounding trees is often associated with transitions in local community structure. These community changes could be driven by habitat selection prior to colonization of the aquatic habitat and/or species-sorting post-colonization. To assess the contributions of pre- versus post-colonization processes in structuring larval dragonfly assemblages, we tested the impact of artificial and natural canopy cover on the selection of experimental aquatic mesocosms by adult dragonflies, and monitored the performance (i.e. growth and survival) of larval dragonflies that were placed in mesocosms under a gradient of natural canopy cover. We found that greater levels of canopy cover resulted in fewer adult visits to mesocosms, and more natural canopy cover decreased the species richness of visitors. There were no effects of canopy cover on the growth and survival of larvae added to the mesocosms. Our results suggest that adult habitat selection plays a dominant role in structuring larval dragonfly assemblages across a canopy cover gradient, and that canopy cover can be an important environmental filter on species distributions.

**Iivonen, J., K.M. Kaunisto, and J. Suhonen. 2018. Odonates, gregarines and water mites: why are the same host species infected by both parasites? *Ecological Entomology* <https://doi.org/10.1111/een.12634>.** Damselflies and dragonflies are widely parasitised insects and numerous studies have tried to understand this host-parasite relationship. However, most of these studies have concentrated on a single host species, neglecting the larger pattern within the Odonata order. The aim of this paper

was to examine different damselfly and dragonfly species for common endo- and ectoparasites and whether a general infection pattern can be found. Additionally, the goal was to investigate whether the phylogeny of the host species could explain these possible infection patterns. To this end, a dataset from the existing literature was compiled and the prevalence of endoparasitic gregarines and ectoparasitic water mites was analysed for 46 different odonate species. Three distinct patterns were found: (i) most of the odonate host species had both gregarines and water mites, rather than only either one or neither; (ii) there appears to be a positive association between gregarine and water mite prevalences across host species; (iii) a weak phylogenetic signal was detected in gregarine prevalence and a strong one in water mite prevalence. It is hypothesised that, due to the infection and transmission mechanisms by which water mites and gregarines infect different odonate host species, parasitism is aggregated to common, high-density species. However, much research is needed in order to fully understand this relationship between odonates and their parasites, especially within the same host populations and host species assemblages.

**Jiang, B. and D.J. Mikolajewski. 2018. Shift in predation regime mediates diversification of foraging behaviour in a dragonfly genus. *Ecological Entomology* <<https://doi.org/10.1111/een.12530>>. Behavioural adaptations to avoid and evade predators are common. Many studies have investigated population divergence in response to changes in predation regime within species, but studies exploring interspecific patterns are scant. Studies on interspecific divergence can infer common outcomes from evolutionary processes and highlight the role of environmental constraints in shaping species traits. Species of the dragonfly genus *Leucorrhinia* underwent well-studied shifts from habitats being dominated by predatory fish (fish lakes) to habitat being dominated by predatory invertebrates (dragonfly lakes). This change in top predators resulted in a set of adaptive trait modifications in response to the different hunting styles of both predator types: whereas predatory fish actively search and pursue prey, invertebrate predator follow a sit-and-wait strategy, not pursuing prey. Here it is shown that the habitat shift-related change in selection regime on larval *Leucorrhinia* caused species in dragonfly lakes to evolve increased larval foraging and activity, and results suggest that they lost the ability to recognise predatory fish. The results of the present study highlight the impact of predators on behavioural trait diversification with habitat-specific predation regimes selecting for distinct behavioural expression.**

**Kalkman, V.J., J.-P. Boudot, R. Bernard, G. De Knijf, F. Suhling, and T. Termaat. 2018. Diversity and conservation of European dragonflies and damselflies (Odonata).**

***Hydrobiologia* 811(1): 269–282.** Based on a distribution database brought together for the recently published Atlas of the European Dragonflies and Damselflies, we describe the patterns of diversity and endemism of these insect groups. Highest species richness, as well as richness of predominantly lentic species, occurs in central and western-central Europe. Strictly lotic species have their centre of diversity in southwest France and parts of the Iberian Peninsula. The highest number of endemic species is found in southwest France, the Iberian Peninsula and the Balkan Peninsula. A comparison of the diversity patterns of Odonata species listed in the EU Habitats Directive with those listed in the European Red List highlights a strong mismatch between species threatened in Europe, which are mainly found in the Mediterranean, and species legally protected by the European Union, which are concentrated in central and western Europe. This mismatch has a historical origin, as the species listed in the Habitats Directive were mostly selected in the 1970s and 1980s when water quality in western and central Europe was poor. Since the 1990s, water and habitat quality has improved in these parts of Europe while in the same period the pressure on aquatic habitats in the Mediterranean has increased greatly.

**Kalkman, V.J., K.-D.B. Dijkstra, R.A. Dow, F.R. Stovkis, and J. van Tol. 2018. Out of Australia: the Argiolestidae reveal the Melanesian Arc System and East Papua Composite Terrane as possible ancient dispersal routes to the Indo-Australian Archipelago (Odonata: Argiolestidae). *International Journal of Odonatology* 21(1): 1–14.** Information on the origin of distribution patterns shown by freshwater invertebrates in the Indo-Australian Archipelago is poor. Here we present a molecular based hypothesis of the phylogenetic relationships of Argiolestidae, a family of damselflies found throughout the tropical parts of the Eastern Hemisphere. We use this to address the following questions: (1) did Argiolestidae colonize Wallacea and the Philippines from the Eurasian or from the Australian continent? (2) Is the presence of Argiolestidae in New Guinea the result of a single colonization event, i.e. are the Argiolestidae found in New Guinea monophyletic? The results show that clades occurring in the Philippines, Wallacea and New Guinea all originate from Australian ancestors. Representatives in Sundaland are most closely related to African genera and failed to reach the Philippines and Wallacea. The presence of Argiolestidae north of Australia is the result of at least three colonization events from Australia to areas that presently compose New Guinea and probably a fourth from Australia to Sulawesi. The two most diverse lineages found north of Australia show different distribution patterns. One reaching north as far as Luzon, presumably facilitated by Late Oligocene to Miocene islands arcs (Melanesian

Arc System). The other clade shows a diversification of two genera and numerous species in the eastern tail of New Guinea, an area largely corresponding with the East Papuan Composite Terrane (EPCT) followed by the expansion of one genus into the rest of New Guinea. The EPCT's importance as source area for the New Guinean fauna has been suggested on the basis of distribution patterns, but we present the first evidence based on phylogeny reconstruction of strong diversification on this formerly isolated landmass.

**Klein, C.E., N.S. Pinto, Z.A.V. Spigoloni, F.M. Bergamini, F.R. de Melo, P. De Marco J., and L. Juen. 2018. The influence of small hydroelectric power plants on the richness and composition of Odonata species in the Brazilian Savanna. *International Journal of Odonatology* 21(1): 33–44.** Regardless of the economic and social development that damming processes related to hydroelectric power plants bring to a region, they represent a wide range of disturbances to the physical, chemical, and biological characteristics of rivers. We evaluated the effects of dams on Odonata communities from the southeastern region of Goiás, Brazil. Thirteen streams connected to three dams were studied: seven were used as reference samples (located upstream from the damming site, therefore not directly affected by damming) and six were used as affected area samples (located downstream from the dam). A total of 1,128 odonates from six families, 22 genera, and 39 species were captured and identified. The results showed that Odonata richness was affected by the presence of dams, with different effects on Anisoptera and Zygoptera suborders. We discuss that these effects are related mostly to the physical and chemical variables in waterbodies directly affected by small hydroelectric power plants (SHPs). It is possible that negative effects on the Odonata community in SHP areas are related to changes in waterflow, pH and turbidity.

**Marques Pires M., C. Stenert, and L. Maltchnik. 2018. Drivers of beta diversity of Odonata along a forest-grassland transition in southern Brazilian coastal ponds. *Freshwater Science* 37(2): 357–366.** Assessment of  $\beta$  diversity patterns in relation to environmental and spatial drivers can provide useful insights into the underlying mechanisms structuring communities (deterministic and dispersal limitation). However, the relative importance of each mechanism and driver of  $\beta$  diversity patterns in freshwater communities is assumed to change with ecosystem type, scale of observation, and among groups with different dispersal abilities. We assessed  $\beta$  diversity patterns of assemblages of odonate larvae in relation to geographical distances and scale-specific environmental drivers in southern Brazilian coastal ponds along a latitudinal gradient. We expected to find similar contributions

of deterministic and dispersal limitation mechanisms to odonate assemblages and distinct patterns of  $\beta$  diversity between suborders Anisoptera and Zygoptera. We found low values of  $\beta$  diversity (probably related to distribution of generalist taxa and environmental conditions constituted by temporary ponds). Mantel and partial Mantel tests detected distinct relationships between dissimilarity in scale-specific drivers and geographical distances with  $\beta$  diversity of Odonata. Zygoptera was influenced by dissimilarity in local- (presence of riparian vegetation and connectivity) and regional-level (climate) variables, whereas Anisoptera was influenced by geographical distances. Our results supported our hypothesis that changes in the composition of assemblages of odonate larvae in temporary ponds were jointly driven by deterministic and dispersal limitation mechanisms. Furthermore, the similar contributions of nestedness and replacement components and the differing responses of Anisoptera and Zygoptera to local- and regional-level environmental drivers and geographical distances indicate that the relative importance of environmental and spatial drivers to  $\beta$  diversity patterns in ponds is scale-specific.

**Marques Pires M., E. Périco, S. Renner, and G. Sahlén. 2018. Predicting the effects of future climate change on the distribution of an endemic damselfly (Odonata, Coenagrionidae) in subtropical South American grasslands. *Journal of Insect Conservation* 22(2): 303–319.** Climate change is predicted to affect the distribution of freshwater taxa, and stronger impacts are expected on endemic species. However, the effects of future climates on freshwater insects from the Neotropical region have been generally overlooked. In this study, the distribution of a damselfly (*Cyanallagma bonariense*, Odonata, Coenagrionidae) endemic to the subtropical South American grasslands (Pampa) was modelled in relation to future scenarios of high greenhouse gas emissions (RCP 8.5) for 2050 and 2070. For this purpose, ecological niche models were developed based on assumptions of limited dispersal and niche conservatism, and the projected distribution of *C. bonariense* was contrasted with the location of current protected areas (PAs) in the Pampa. A broad potential distribution of *C. bonariense* was indicated throughout the Pampa, and projections predicted a predominance of range contractions rather than range shifts in climatically suitable areas for *C. bonariense* in 2050 and 2070. Projections of suitable areas overlapped in central Argentina and southernmost Uruguay in these periods. Our results indicated a potential resilience of *C. bonariense* to future climate change, which is likely related to the low restrictions in habitat use of *C. bonariense*. In every projection, however, most PAs were expected to lose effectiveness, as by 2070 most PAs fall outside the range of the predicted distribution of *C. bonariense*. Thus, the creation or enlarge-

ment of PAs in these areas is recommended and these results represent an important information for the conservation of endemic freshwater insects under global warming scenarios in an overlooked Neotropical landscape.

Palacino-Rodríguez, F., D.A. Palacino, L. Rache-Rodríguez, A. Cordero-Rivera, A.C. Penagos, and L. Lamas-López. 2018. Larval development and behavior of *Rhionaeschna marchali* Rambur (Anisoptera: Aeshnidae) under captivity conditions. *International Journal of Odonatology* 21(1): 55–70. Very little is known about the biology of larval odonates from the Neotropical region, and in particular there are no data on behavioral changes during ontogeny and growth ratios, though both are crucial to understanding the dynamics of Odonata communities. Here we study growth ratio, development patterns and behavior of *Rhionaeschna marchali* larvae. We characterized larval instars using morphometric variables and describe their general behavior. Larvae were obtained from eggs laid by two females in the laboratory. They were maintained in individual containers until their emergence or death. Larvae hatched between 26 and 30 days after laying, and total development time was 340.5 ( $\pm$ 5.9) days, with 15 instars. Growth ratios between successive instars averaged 1.12 for head width, 1.25 for head length, 1.20 for antenna length, 1.76 for forewing-pad length, 1.74 for hind wing-pad length, 1.19 for metafemur length and 1.22 for total length. *Rhionaeschna marchali* larvae spent most time “resting” and “grooming”. As size increased, larvae became more active and time “resting” decreased. The behavior “upwards abdomen bend” showed a decreasing trend with size, while “body bend downwards” became more common with increasing size. The high altitude (2600 m) of the region acts as a limiting factor for growth, and therefore this species completes one generation per year, similar to many temperate species.

Pfeiler, E. and T.A. Markow. 2017. Population connectivity and genetic diversity in long distance migrating insects: divergent patterns in representative butterflies and dragonflies. *Biological Journal of the Linnean Society* 122: 479–486. A number of insect species undergo annual and strikingly long-distance migrations. While the census sizes appear to be very large in many of these species, our understanding of their population genetics and interpopulation connectivity remains elusive. Here, we summarize the utility and limitations of mitochondrial DNA barcodes to assess migratory patterns and genetic connectivity among populations of four well-known species of long-distance, multigenerational insect migrants, the butterflies *Danaus plexippus* and *Vanessa cardui*, and the dragonflies *Pantala flavescens* and *Anax junius*. We contrast the differences between the two butterfly species, which show low genetic diversity and little or no phy-

logeographic structuring, with the two dragonfly species which show an intriguing pattern of high genetic diversity and no apparent phylogeographic structure. Although a recent population genetic study of *P. flavescens* reported high gene flow and reduced (or diminished) COI genetic diversity across widely separated geographic regions, suggesting global panmixia, reanalysis of the data from that study revealed high genetic diversity in agreement with other studies on both *P. flavescens* and *A. junius*. The presence of isolated populations of *P. flavescens*, such as found on Easter Island that appear non-migratory, as well as evidence for significant structure among some migratory populations, suggest that concluding global panmixia in *P. flavescens* may be premature. We also suggest that cost-effective barcode analyses would be the method of choice for preliminary analyses of large data sets required to assess migratory routes and connectivity among populations on a global scale.

Phan, Q.T. and T.T.T. Tran. 2018. Description of *Coeliccia phamiha* sp. n. from central Vietnam (Odonata: Platynemididae). *International Journal of Odonatology* 21(1): 45–53. *Coeliccia phamiha* sp. n. (holotype male and paratype female from Dak Et bridge, Deo Lo Xo, Phuoc Son district, Quang Nam Province, Central Vietnam, deposited in zoological collection of Duy Tan University) is described based on both sexes. Judging by the structure of genital ligula and appendages of the male and prothorax of the female it seems close to *C. mientrung* Kompier & Phan, 2017, but it is easily separated by its markings and structural details. Differential diagnosis between the new species and its allied species is provided.

Renner, S., E. Périco, M. Schmidt Dalzochio, and G. Sahlén. 2018. Water body type and land cover shape the dragonfly communities (Odonata) in the Pampa biome, Rio Grande do Sul, Brazil. *Journal of Insect Conservation* 22(1): 113–125. The biogeographical region known as the Pampa biome in southern Brazil, was originally mainly covered with open fields or grassland, with areas of riparian forest surrounding the water bodies. Today this landscape appears highly fragmented due to agricultural activities such as rice cultivation, extensive cattle farming, and forest plantations. Studies have shown that the Pampa biome has high levels of biodiversity and endemism, but with regard to invertebrates, this biome is still one of the least known in Brazil. We therefore designed a study comparing the dragonfly (Odonata) communities to environmental and landscape features in this area, measuring diversity by species richness, relative abundance and Shannon index. Our results showed that the Pampa is a biome very rich in odonates, and that the species communities are highly dependent on the environmental conditions of the area. Habitats such as rivers/streams, bordered



by native grasslands and riparian forests, were shown to harbour communities that were ecologically more complex and sensitive than other habitat types. Man-made lakes and agricultural areas displayed lower levels of biodiversity and odonate communities dominated by generalist species. By combining data on the communities of Odonata and other taxa, our analyses may be instrumental in determining priority areas for future conservation measures within the area.


## ID Corner

ID Corner addresses the challenges we face as print and electronic resources blossom, and more newcomers come into the dragonflying fold. DSA members range from those who pore over in-hand or microscopic features to hands-off observers who want to know the best field marks to identify an individual to species. Excellent information can be found on different Facebook page threads and e-mail list serves, but even the most detailed post can be lost or buried. This ID-themed section provides more structure and accountability than those myriad Facebook threads (even though it is not peer-reviewed).

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

**A new field mark for differentiating between females of *Gomphaeschna antilope* (Taper-tailed Darner) and *Gomphaeschna furcillata* (Harlequin Darner), by Mark A. Shields <shieldsm@coastalcarolina.edu> and John Petranka <johnpetranka@gmail.com>**

The pygmy darner species *Gomphaeschna antilope* (Taper-tailed Darner) and *G. furcillata* (Harlequin Darner) can be frustratingly difficult to distinguish in the field, especially the females. In hand, the two can be differentiated by close examination of the pattern of wing venation; *G. antilope* usually has only one bridge crossvein, whereas *G. furcillata* usually has two or more. More definitively, the distal cells between veins M2 and Rs in the hindwings of *G. antilope* occur in either a single row or a double row only 2–3 cells long, while in *G. furcillata* there is a double row about 10 cells long (Needham et al., 2014; pg. 96). However, these venation patterns can be difficult to see or even photograph in the field, making positive identification of perched or flying individuals challenging.

Zhang, H.-M., M. Hämäläinen, and W.-Z. Wang. 2018. *Indocypha cyanicauda* sp. nov. from southern Yunnan, China (Odonata: Chlorocyphidae). *International Journal of Odonatology* 21(1): 71–80. *Indocypha cyanicauda* Zhang & Hämäläinen, spec. nov. (holotype ♂ from Xishuangbanna, Yunnan, China; deposited at the Kunming Natural History Museum of Zoology) is described and illustrated from both sexes and compared with its congener *I. vittata*. Brief notes on the ecology and behaviour of the new species are provided. 

Another feature that can be used to distinguish between females of these two species is an amber wash in the forewing; in *G. antilope* this wash is centered on or proximal to the nodus, whereas in *G. furcillata* it is centered distal to the nodus (Needham et al., 2014; pg. 96). Unfortunately, this wash is not present in all females, and even when present this diffuse amber patch can be difficult to see under field conditions. It would be helpful if a more obvious field mark was present that could reliably separate the females of these species, whether perched or in the hand. In this note, we describe just such a field mark.

While reviewing and vetting *Gomphaeschna* photographs submitted to The Dragonflies and Damselflies of North Carolina <<http://dpr.ncparks.gov/odes/a/accounts.php>>, we detected a distinctive difference in the pattern on abdominal segment 2 (S2) of females that appeared sufficient to reliably distinguish the two species. Specifically, we noted that female *G. antilope* had a dark (brown or black) sideways “fish hook” or inverted J-shaped mark on the side of S2 (Figure 1). Female *G. furcillata* lacked this mark and instead had a thicker, light (white or pale yellow or green) sideways 7-shaped mark (Figure 2). Although these markings are visible in photographs in field guides (e.g. Dunkle, 2000; Plate 3), we are not aware of any previous mention of them in any publications.

To determine if the characters we detected in our small sample were more widely applicable, we examined all photographic records of both species in the OdonataCentral database at <[www.odonatacentral.org](http://www.odonatacentral.org)>. Only confirmed records with photos clearly showing the sides of S2 of females were included in our analysis. Nine such records were found for *G. antilope* and 34 for *G. furcillata* when we conducted the search in the first week of March 2018 (Table 1).

All nine confirmed female *G. antilope* possessed the “J” mark on S2. Thirty-three of the confirmed female *G. furcillata* possessed the “7” mark on S2 instead. The only

one not possessing the “7” had a “J” instead. The wings of this individual (OC#333559) clearly show an amber wash centered proximal to the nodus of the forewing, a single bridge crossvein in the hindwing, and a double row of distal cells in the hindwing between veins R2 and Ms only 2 or 3 cells long. These features definitively identify this specimen as *G. antilope*, indicating that it was misidentified when vetted. Thus, based on our sample, the markings on the side of S2 can distinguish between female *G. antilope* and *G. furcillata* with 100% accuracy. We note that two unconfirmed records of female *G. antilope* (OC# 433140 and 469405) possess the “J” mark, indicating that they were correctly identified by the submitters.

The “J” and “7” marks on the side of S2 have distinct advantages over other characters. They can be seen from a distance with binoculars or a camera with a telephoto lens, allowing for the positive identification of perched female *Gomphaeschna* without the need to net and exam-

ine them in the hand (Figures 3 and 4). And, even with individuals in the hand, the S2 marks can be seen much more easily than the hindwing venation pattern or amber wash in the forewing. Use of these S2 marks should make identifying female *Gomphaeschna* much less frustrating and more accurate. It is important to note that a lateral view is required to see these marks and that these marks occur only in females; male *Gomphaeschna* cannot be distinguished using these features.



Figure 1. Female *Gomphaeschna antilope* (Taper-tailed Darner), showing the dark inverted sideways “J” on the side of S2. Photo by John Petranka.



Figure 2. Female *Gomphaeschna furcillata* (Harlequin Darner), showing the light-colored sideways “7” on the side of S2. Photo by Mark A. Shields.



Figure 3. Lateral view of perched female *G. antilope*, showing distinctive inverted “J” on the side of S2. This is the same individual depicted in-hand in Fig. 1. Photo by John Petranka.



Figure 4. Lateral view of perched female *G. furcillata*, showing distinctive “7” on the side of S2. Photo by John Petranka.

## Acknowledgments

We thank Chris Hill for his helpful comments on an earlier version of this note.

## Literature Cited


- Dunkle, S. W. 2000. Dragonflies through binoculars. A field guide to dragonflies of North America. Oxford University Press, New York, New York.
- Needham, J.G., M.J. Westfall, Jr, and M.L. May. 2014. Dragonflies of North America, 3rd edition. Scientific Publishers, Gainesville, Florida. 

Table 1. OdonataCentral (OC) records used in the analysis of differences in patterns on S2 of female *Gomphaeschna*.

<i>Gomphaeschna antilope</i>		<i>Gomphaeschna furcillata</i>		
284655	7588	328100	421691	450059
313497	263611	333559*	422248	456230
314610	316687	367129	430324	456720
324544	317774	375807	432371	461384
374220	318407	377205	440574	461535
374319	319054	398449	440955	470906
399986	319243	398640	445347	477784
432088	319638	400106	446524	
441279	326765	402990	448005	

## Book Review: The Dragonflies and Damselflies of Santa Barbara County, California, by Nick Lethaby

**Dennis Paulson**, Director Emeritus, Slater Museum of Natural History, University of Puget Sound, Tacoma, Washington, 98416 <dennispaulson@comcast.net>


**The Dragonflies and Damselflies of Santa Barbara County, California**, by Nick Lethaby. Self-published, 2017. Paperback, 91 pp. \$17.00 USD, available only via Amazon <<https://www.amazon.com/Dragonflies-Damselflies-Santa-Barbara-County-California/dp/153902105X/>>.

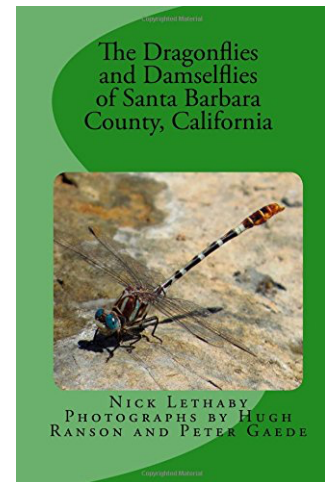
Nick Lethaby has pulled together all the information available on the odonates of his county, including the Channel Islands, and published it in this small but significant book. It covers 53 species, from those that are abundant to others that have been recorded only once or a few times. Each species has its own page, and although this is not an identification guide, each is illustrated with a photo taken in the county, which is a nice touch. Because the book isn't printed on photo-quality paper, some photos are a bit dull, but they suffice perfectly well to show the species. There are also helpful habitat and locality photos.

The author includes an extensive discussion of Santa Barbara County regions and habitats germane to odonate occurrence. To this he adds an interesting further discussion of the dynamics of distribution of both resident and transient species, including annual migrants as well as vagrants from Mexico. With the intensity of fieldwork possible in a restricted area such as a county, he has accu-

mulated good data to back up his conclusions.


Because of anthropogenic habitat change and especially because of prolonged drought, species come and go, with a basically unstable odonate fauna. Lethaby anticipates the return of riverine species lost to drought and speculates on the effect of drought on vagrancy. As water bodies dry up, odonates move around and appear in new places—at least until there are no more water bodies for them to colonize. Let's hope we're not heading in that direction.

This is the sort of book that would be helpful for any small region that it would cover and should serve as an example for odonate enthusiasts everywhere. How about planning to know everything there is to know about the species within your own county? 




## 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@dragonflysocietymamericas.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@dragonflysocietymamericas.org>. Photographs to illustrate the stirring tale are encouraged. Whether from those who are discovering odonates this year or who have pursued them for decades, there are plenty of interesting, entertaining, and inspiring stories out there to be told! 

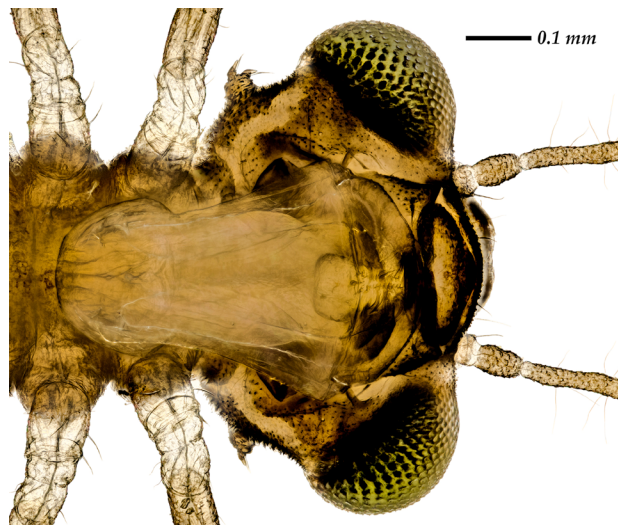
## Parting Shots

Parting Shots pays tribute to the endless diversity and interest of odonate behaviors and to the skilled photographers among us, with an additional nod to the many unexpected (and sometimes downright silly) ways in which odonates can creep into daily life. If you have photos that showcase

an odd, bizarre, unusual, unexpected, or amusing aspect of odonate life (or of life with odonates), please e-mail them to the Editor at <editor@dragonflysocietymamericas.org>, and include a short note describing the photo, location, and event.

*Aeshna palmata* (Paddle-tailed Darner) Grows Up, by Steve Valley <magnifica.steve@gmail.com >

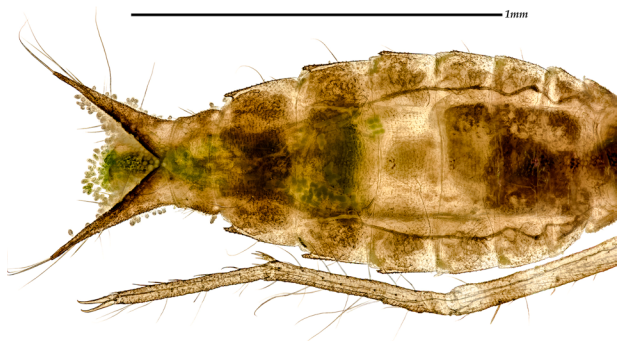
Steve has been delighting folks on Facebook with his images recording the development of embryos and nymphs of *Aeshna palmata* (Paddle-tailed Darner). He sent us a sampling of some of this series.



Ventral shot of the head showing details of the labium and the tubercles on the sides of the head.



Several late stages of egg development.

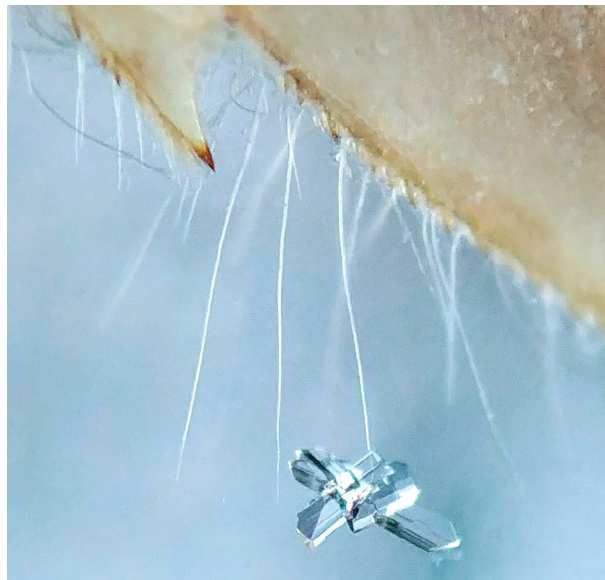


Ventral abdomen with symbiotic algae around the anal opening and inside the branchial basket.

**Crystal Clear?**, by MaLisa Spring <malisa.spring@gmail.com>

The Ohio Dragonfly Survey is trying to compile more species records from across the state. As part of that, I have been working at the Ohio EPA to look through the thousands of larvae they have collected over the years. Since they have so many specimens and I so little time, I have been focusing on identifying large dragonfly larvae in the families Aeshnidae, Cordulegastridae, and Gomphidae. On 21 February 2018, I was going through samples collected by the EPA in summer 2013. These specimens were stored in 95% ethanol with many other arthropods. On one of the *Gomphurus/Phanogomphus* specimens, I noticed a tiny crystal growing on the tip of the lateral hairs on S9. The hairs likely served as a nucleation site for the crystal to grow, similar to how dust serves as the starting point for some snowflakes. After taking a few photos, tweeting them out, and asking around, several people became interested in the tiny crystal. Unfortunately, I did not record the collection location, as I only considered it a weird novelty to find a crystal growing in ethanol. Part of the crystal broke off when I was attempting to identify the specimen and it is likely the the remaining piece disappeared soon

after. My attempts to locate the crystal since have been unsuccessful, but I wanted to share this weird phenomenon. I have not seen any similar crystals, nor have any of the Ohio EPA employees who have been working there for decades.



**I Have Pictures**, by Jim Burns <jpbaztec@aol.com>

It's hard to get excited about looking for odonates in winter in Arizona, especially this past one which was on pace to be the fourth driest in our history, and it's easy for me to drop back into birding mode because I was a lifelong birder before slipping over to the dark side a few years ago. So, one morning this past March I happened upon a Greater Roadrunner as it rambled through a patch of desert scrub looking for breakfast. I followed along at a discreet distance, but within the range of my 600mm "bird" lens, watching a little-realized feeding behavior of this species which involves jumping sometimes three feet from the ground to snatch insects from overhanging trees and vegetation.

Sure enough, this roadrunner seemed to be successful on several occasions. I was far enough away that I was unable to discern what prey was captured, but I was able to capture images of a couple of these successful forays right as the bird hit the ground but before it could swallow whatever it had caught. I assumed breakfast was bees and caterpillars which I had observed roadrunners catch in this manner in the past.

Imagine my surprise and the irony upon downloading images at home and discovering that both the roadrunner and my camera had seen my first odonate of 2018, a female Variegated Meadowhawk (*Sympetrum corruptum*), before

I had, and I had pictures to prove it. Old habits die hard—I caught myself wondering if the roadrunner needed them to verify its list.



A Mystic *Argia*, by John Gregoire <khmo@empacc.net>

John sent in this notification for ode enthusiasts wanting to get away from it all. The good ship *Argia* sets sail on sight-seeing cruises from Schooner Wharf in Mystic Connecticut from May through October. No hints are given on the web site as to the explanation for the schooner's name, but at 81 feet long with 1500 square feet of sail, it weighs in as rather larger than the average dancer...



Friends in Rocky Places, by Jerrell J. Daigle <jdaigle@nettally.com>

Jerrell tells us "While hiking in Tallahassee [Florida] last month, Gail Sloane found this rock, painted by Brian Crum. It looks like an *Aeshna!*"



Dragonfly Great Circle—First Time Documented?, by Dennis Paulson <dennispaulson@comcast.net>

On 14 May 2018, Kevin Aanerud of Seattle [Washington] sent me this photo that he had just taken at Stossel Creek, King County, Washington. A male *Leucorrhinia hudsonica* (Hudsonian Whiteface) had hooked up to another male that was presumably already in tandem with a female.



It's not terribly rare to see this (males will be males), and Corbet (1999: pg. 661) records instances of a triple tandem in 29 species of 22 genera of both Zygoptera and Anisoptera, among them three species of *Leucorrhinia*. This may be especially common in that genus, as only *Lestes* exceeds it, with four species recorded.

Where this went beyond anything so far recorded, as far as I know, was that the female entered into copulation with the first male, presumably swung upward and forward by one or both males in a normal response to being in tandem. She then contacted the second abdominal segment of the first male in the normal copulatory position. Kevin didn't hang around with this menage a trois long enough to see the final outcome, but presumably the males would have eventually let go and the female begin to oviposit, with sperm from the first male rather than the one that held her in tandem.

I posted the photo to two Facebook groups with many members and asked if anyone had seen anything like this in any species of odonate. I received a resounding "no" and many comments about what an amazing thing this was. But now it has been documented, and it's worth watching for. If anyone has evidence for such a connection, I would be interested in hearing of it (and please publish it in ARGIA!).

## References

Corbet, P. S. 1999. Dragonflies. Behavior and Ecology of Odonata. Cornell University Press, Ithaca.



### Photo Submissions for ARGIA

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

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

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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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**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.

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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; \$5 us or more can be added for sustaining memberships. Dues are payable annually on or before 1 March of membership year. Membership dues can be paid online via credit card; see <[http://odonatacentral.org/index.php/PageAction.getName/DSA\\_Membership](http://odonatacentral.org/index.php/PageAction.getName/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](http://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)** *Sympetrum ambiguum* (Blue-faced Meadowhawk), Lums Pond State Park, New Castle County, Delaware, 15 September 2017. Photo by Michael Moore. **(lower)** Calico Pennant (*Celithemis elisa*) male, Claude Moore Park, Loudoun County, Virginia, 12 September 2012. Photo by Fred Siskind.

