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In This Issue

Be sure to check out the Calendar of Events and plan accordingly for the various meetings and gatherings occurring in 2012.

Despite, or maybe because of, the interesting weather seen around the United States this year (drought, floods, record setting heat, and early blizzards), there have been some interesting records reported in ARGIA. This issue is no exception. Scott King shares the first record of Great Spreadwing (*Archilestes grandis*) for Minnesota and Chris Rasmussen and Roy Morris report the first record for Florida (and third for the US) of Aztec Glider (*Tauriphila azteca*).

We also have several articles on other distributional records and range extensions of interest. These include a northern range extension of the Widow Skimmer (*Libellula luctuosa*) in Michigan reported by Bob Marr and Fred Sibley's summary of his latest trip to Nebraska in search of new records.

There have been some recent discussions on the value of photographic records in comparison to specimen records. Dennis Paulson has been working on an article discussing this for sometime now and presents his thoughts in this issue. Bruce Lund also shares his thoughts on maintaining state and county checklists and I add few thoughts on the role that OdonataCentral plays.

Scott King reports on observations he has made of migrating Variegated Meadowhawks (*Sympetrum corruptum*). Dennis also has included a note on *Brechmorhoga* in Nayarit, Mexico and Fred Sibley presents some additional information on the confusing pair, *Enallagma annexum* (Northern Bluet) and *E. vernale* (Vernal Bluet).

There have been a number of nice photo series going around the Internet in recent months showing bird predation on dragonflies.


Wade Worthen includes one of those here, where a Common Whitetail (*Plathemis lydia*) goes up against a Green-backed Heron; I'm not sure that was a fair fight!

Nick and Ailsa Donnelly reported on their Panama adventure in the last issue; here Nick describes another trip they made in 2011, this one to Vietnam.

Ron and Barbara Oriti present their take on the western *Cordulegaster dorsalis/deserticola* (Pacific/Desert Spiketail) pair. William Hull shares a recent experience he and his son had while fishing in the Little Miami River of Ohio.


In the last issue, James Walker described a series of "spindry" and "splash-dunk" behaviors he has been able to video. Here he reports further on the "splash-dunk" behavior in which he has been able to quantify several components.

Dennis Paulson and Netta Smith made a visit to southern Oregon in late September where they saw epic numbers of meadowhawks. From his description, it makes the impressive numbers we saw at the DSA meeting in Valentine, Nebraska seem paltry!

Marion Dobbs shares some of her adventures chasing nymphs in Georgia. Ken Tennessen presents a follow-up to his search for Citrine Forktails (*Ischnura hastata*) in Wisconsin and provides a nice summary of where things stand our knowledge of nymphs in the New World. Finally, I review Hal White's new book on the Natural History of Delmarva Dragonflies and Damselflies. This is a great book that reads like a novel in many ways, but is chock-full of information. 

Calendar of Events

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

Event	Date	Location	Contact
NymphFest 2012	18–19 February 2012	Montpelier, Vermont	B. Pfeiffer <bryan@dailywing.net>
DSA Annual Meeting	4–6 May 2012	Florence, South Carolina	C. Hill <Chill@coastal.edu>
DSA Southeast Meeting	8–10 June 2012	Columbia, Tennessee	Steve Krotzer <rskrotze@southernco.com>
Ohio Odonata Society	23 June 2012	Oak Openings	Bob Glotzhober <bglotzhober@ohiohistory.org>
DSA Northeast Meeting	6–8 July 2012	Sault St. Marie, Ontario	B. Pfeiffer <bryan@dailywing.net> 

2011 CalOdes/SoWestOdes/DSA West Blitz AKA Some Like It HOT!

Kathy Biggs <Bigsnest@sonic.net>

The CalOdes/SowestOdes/DSA west blitz was originally planned for 26–29 August in the area of Needles, California and Havasu National Wildlife Refuge (HNWR) in Arizona, just across the Colorado River from each other, with a third location, Clark Co., Nevada nearby. But, due to fear of extreme heat and what it might do to our bodies (Needles is often the hottest place in the nation—per Wikipedia), it was changed to one month later, to 23–26 September. And it *was* cooler then! Instead of the 115°F recorded on the weekend we’d first selected for our blitz, it was *only* 109°F! And in fact, it was only 109° for the first two days, with the temp a cool 101° the last two days . . . and yes, it did feel cooler! The purpose of this blitz was to find new county records, and meet each other for some commonality—fully 50% of us had never been face to face before!

Despite warmer weather than hoped for, the 13 participants had a great time together. And we all enjoyed the siesta tradition—every afternoon we’d come back to our motel to use the swimming pool, or nap in our air-conditioned rooms.

This was the first blitz to canvas a multi-state area in the west (that we know of anyway!) and folks came from as far away as Eureka, California. We had attendees also from Nevada and even New Mexico. Participants included Kathy and Dave Biggs (organizers), Bob Miller (field coordinator), Ron Oriti, Gary Suttle, Chris Heavilin, Rick Schilk, Matthew Matthiessen, Dave Welling, and Sandra von Arb from California; Tony and Shela Godfrey from New Mexico; and Bruce Lund (and Flo Lund) from Nevada.

A few of the folks who had showed up a day or two early went into HNWR to scout for locations on Friday. We had obtained a special use permit and even keys to the locked gates. While they surveyed the refuge, the rest of us drove in (most driving at least 6 hrs that day, or flying and driving combined taking that long) and met at the motel. This is only the second time we’ve headquartered in a motel, but with the heat, it was necessary.

We talked logistics until it cooled down enough at 3 PM to get out into the field. Our first place surveyed was Gowan Cove at Park Moabi on the California side of the Colorado River.

At Park Moabi (one of the very few places on the California side of the river with water access) we immedi-

ately found some of the local (southern California) desert specialties: Double-striped Bluets (*Enallagma basidens*), Mexican Amberwings (*Perithemis intensa*) and Citrine Forktails (*Ischnura hastata*). Although none of these were new county records, they were new species for many of the Californians. Just before we left something with spots on its wings flew by, giving us not much more than a fleeting glimpse . . . but the only dragonflies in the vicinity with spots on their wings would be the Twelve-spotted (*Libellula pulchella*) or Eight-spotted Skimmer (*L. forensis*) and either would be a county record. Of course it flew across the slough-like cove. So we took our vehicles around to the other side, risking getting stuck in the sandy track to hunt it down—with no luck!

We returned to the motel at dusk and all met in the Biggs’s room and discovered that the earlier group had a photo of a female clubtail, taken by the Godfreys which none of them could identify. It turned out to be a female Russet-tipped Clubtail (*Stylurus plagiatus*), our first county record (Mohave, Arizona) and a fairly rare ode for the area, not being known previously from any of the three counties in the tri-state area we were surveying. A nice way to start the blitz!



Russet-tipped Clubtail, *Stylurus plagiatus*.

The next morning we took our blitz to the HNWR in Arizona. The key they’d given us permitted our entry into Pintail Slough at the far northern end of the refuge. There were only a few pools of water left, but an “island” of trees, tall grass and scrubs in the middle of the area enticed us. We ended up spending hours there as the odes were present in good numbers, often sitting, and the photographers in the group (most of us) were having a heyday. One very

interesting phenomenon was the discovery of a Wandering Glider (*Pantala flavescens*) hovering in place over a bush for at least 20 minutes. First Ron Oriti found it, photographed it, and after about five minutes when it was amazingly still hovering in place, he called Dave Biggs over. Dave photographed it another ten minutes before calling Bruce Lund over. They were still photographing it when the rest of us starting beeping car horns to signal to them, wherever they might be, that it was time to move on.

We documented no new species for the county, but worked on a species list for the Refuge. We eventually came up with a list of about 15 species for the slough and 22 for the refuge. Maddening to us was that Striped Saddlebags (*Tramea calverti*) and Twelve-spotted Skimmers were there in fairly good numbers while we couldn't find either of them just a few miles or so away on the California side of the river, where they'd be county records! And, all dragonflies had to be sorted out from the hundreds and hundreds of Variegated Meadowhawk (*Sympetrum corruptum*) that came in an array of sizes, throwing us off time after time. In fact, by the end of blitz we refused to speak the "V" word out loud (Variegated Meadowhawk) because we'd seen thousands and they were so distracting. We began referring to them as "those that must not be named"!

We checked multiple sites within HNWR, but didn't find any other "hot spots" although a refuge ranger found us and spent a full ten minutes scrutinizing our permit and warning us that he saw collecting equipment in our vehicles and admonished us not to give in to temptation and use them (nets) as he'd be back watching for us. When we told him that the permit stated that we could do catch and release of damselflies and darners as needed



Wandering Glider, *Pantala flavescens*.

for identification, he spent another five minutes looking for that text in the permit. Finally satisfied, he left. We hadn't even wanted to mention that we were permitted to keep specimens of damselflies and darners if they were county vouchers! We were amazed at how well our wildlife is protected there!

We checked carefully along the Levee Rd. where the Godfrey's had found the Russet-tipped Clubtail to no avail. We did find a nicely postured White-belted Ringtail (*Erpetogomphus compositus*) though. As the blitz progressed, we would find ringtails at many sites, but all wore the White-belt—none were the Serpent Ringtail (*E. lampropeltis*), which we desired as a county record.

Siesta time at the motel was interrupted by a phone call from the Godfreys, still out in the field who reported that they had just found a male Russet-tipped Clubtail at nearly the identical location (and time) where they had found the female the day before . . . and it was staying put! Most of us abandoned our siesta, threw appropriate shoes/clothes on and dashed to the site. Although we had to cross the state line, we were there within 15 minutes and the blessed ode was still there, not having moved at all. Everyone got a chance to take its picture and he even stayed put as a branch was held away to ease the photography! This county record dragonfly is OC# 333778.



Because we were in a motel instead of our usual blitz campsites with evening campfire, the Biggses brought their digital projector, which enabled wide-ranging evening shows of wonderful images. They

included Sandra's unique Hind's Emerald (*Somatochlora bineana*) photos, Dave's rarities from Texas, Matt's Dragonflies of Africa, Bruce's PowerPoint introduction to oeding, Kathy's PowerPoint showing the species we should be looking for, and the Godfrey's presentation about the new bird and dragonfly preserve being created at Granite Gap, New Mexico—it's a very intriguing idea and I hope they'll write about it in ARGIA too. These were a fun and informative addition to the blitz.

On Sunday, some blitzers had to head home, while about six of us stayed on and searched. Dave Welling found a Striped Meadowhawk (*Sympetrum pallipes*) at Pintail Slough for our second Mohave Co, Arizona record, OC# 333834 and he showed us a photo of a female Plateau Dragonlet (*Erythrodiplax basifusca*) from 5-mile Landing (HNWF) that Shela had found the day before. We went to the site and tried to find it again, later finding out that, although not a record, the dragonlet was a range extension. The Biggs's group again saw the elusive Twelve-spotted Skimmer at Gowan Cove, but was not able to even photograph it, and Bob Miller's group made a foray into Clark Co., Nevada, looking to find sites and odes for that area.

We met for dinner that night as a conclusion, and had a very interesting experience indeed: Matthew's order of enchiladas was billed at only 37 cents! That's just over 18 cents each for the two enchiladas! Maybe because we'd come straight in from the field, they were trying to get rid of us? Well, Matt did then alert the waitress to this price discrepancy!

By Monday morning we all had to head out. As is traditional at DSA meetings though, a Wandering Glider showed up above the motel parking lot. This species has only a sight record for San Bernardino Co., California and although cameras were raised, photographs taken and nets swung from the second story balcony, it will remain only a sight record. In all, 30 species were recorded on the blitz, and although on a good summer day in July, that many species can be recorded in one day, we all felt that we'd given the area a thorough search and did as well as possible considering the heat and how late in the season it was. Anyone want to try again next spring?

A list of places visited by county and state:

San Bernardino Co., California

Park Moabi Regional Park including Gowan Cove & other vicinities around this park, Jack Smith Memorial Park (inside & outside park boundaries), River Edge Golf Course's ponds, Hwy 95 as far north as the Avi Casino (no water access found)

Mohave Co., Arizona

Havasu National Wildlife Refuge including Topock Marsh/Topock Gorge Units, Pintail Slough in particular, Levee Rd. locations, Five Mile Landing, New South Dike Rd, North Dike Rd., Catfish Paradise, Farm Ditch

Clark Co., Nevada

Above and below Big Bend of the Colorado State Rec. Area, Grapevine Canyon, Lake Mohave.

Our list of species found and where (boldface = new county records).

White-belted Ringtail *Erpetogomphus compositus*, San Bernardino (CA), Mohave (AZ), Clark (NV)

Russet-tipped Clubtail *Stylurus plagiatus*, Mohave (AZ) Dike Rd, M&F, photo record Shela & Tony Godfrey+Blitz Participants

Common Green Darner *Anax junius*, San Bernardino (CA), Mohave (AZ), Clark (NV)

Blue-eyed Darner *Rhionaeschna multicolor*, San Bernardino (CA), Mohave (AZ), Clark (NV)

Western Pondhawk *Erythemis collocata*, San Bernardino (CA), Mohave (AZ)

Plateau Dragonlet *Erythrodiplax basifusca*, Mohave (AZ)

Widow Skimmer *Libellula luctuosa*, Mohave (AZ)

Twelve-spotted Skimmer *L. pulchella*, San Bernardino (CA), Gowan Cove, Moabi Park, many Blitz participants & Mohave (AZ)

Flame Skimmer *L. saturata*, San Bernardino (CA), Mohave (AZ)

Blue Dasher *Pachydiplax longipennis*, San Bernardino (CA), Mohave (AZ), Clark (NV)

Wandering Glider *Pantala flavescens*, again sight only San Bernardino (CA) America's Best Value Inn parking lot & Mohave (AZ)

Spot-winged Glider *P. hymenaea*, San Bernardino (CA), Mohave (AZ)

Mexican Amberwing *Perithemis intensa*, San Bernardino (CA), Mohave (AZ), Clark (NV)

Variegated Meadowhawk *Sympetrum corruptum*, San Bernardino (CA), Mohave (AZ), Clark (NV)

Striped Meadowhawk *S. pallipes*, Mohave (AZ) Pintail Slough, HNWR photo record M Dave Welling

Band-winged Meadowhawk *S. semicinctum*, Mohave (AZ)

Striped Saddlebags *Tramea calverti*, Mohave (AZ)

Black Saddlebags *T. lacerata*, San Bernardino (CA), Mohave (AZ), Clark (NV)

Red Saddlebags *T. onusta*, San Bernardino (CA)?, Mohave (AZ)

Powdered Dancer *Argia moesta*, Mohave (AZ)

Aztec Dancer *A. nahuana*, Clark (CA)

Blue-ringed Dancer *A. sedula*, San Bernardino (CA)?, Mohave (AZ)

Double-striped Bluet *Enallagma basidens*, San Bernardino (CA)

Tule Bluet *E. carunculatum*, San Bernardino (CA)

Familiar Bluet *E. civile*, San Bernardino (CA), Mohave (AZ), Clark (NV)

Desert Forktail *Ischnura barberi*, San Bernardino (CA)?, Mohave (AZ)

Pacific Forktail *I. cervula*, Clark (NV)
Citrine Forktail *I. hastata*, San Bernardino (CA)?, Mohave (AZ)
Rambur's Forktail *I. ramburii*, San Bernardino (CA), Mohave (AZ), Clark (NV)
Desert Firetail *Telebasis salva*, San Bernardino (CA)

It wasn't until after the blitz that an e-mail from Rich Bailowitz alerted us to the fact that some of our sightings that weren't county records were actually range extensions for Arizona! He wrote:

"The Blitz, led by Kathy Biggs, was quite successful in the Arizona share of the region. Several locations, all within Havasu National Wildlife Refuge, were focal points for the Blitz attack within the state. The highlight for the 4-day foray was the finding of *Stylurus plagiatu*s. Although this was only a northward extension of 45 miles up the Colorado River from previous reports, it represented a new record for Mohave County. Perhaps even more startling are the Blitz reports of both *Sympetrum semicinctum* and *Sympetrum pallipes* at HNWR. While these are not county records since there are viable populations of both species in extreme northern Mohave County

near the Utah border, it is just over 100 miles to the nearest known populations of both species in west-central Yavapai County near Skull Valley. Perhaps most intriguing of all, however, is the finding of a single fresh female *Erythrodiplax basifusca*. The closest populations are along the middle Bill Williams River, some 45+ air miles from the Refuge. What is most noteworthy about this find is as follows. During late July of this year, two possible specimens of this species were seen (but neither photographed nor collected) far to the north, along Beaver Dam Wash in extreme NW Arizona. One of these two specimens was within 1/2 mile of the Utah border. This Blitz specimen, coupled with the state record for California not far away but along the Colorado River Valley several years ago, helps to support the finding along Beaver Dam Wash, a wash which is a tributary of the Virgin River, itself a tributary of the Colorado River. These records, both verified and unverified, support the notion that, at least of late, *E. basifusca* is colonizing the Colorado River system. Congratulations to the entire Blitz crew for a job well done." —Rich Bailowitz



Ohio Odonata Society Annual Meeting and Field Trips

Bob Glotzhober <bglotzhober@ohiohistory.org>

This year the OOS will combine their half-day annual meeting with field trips centered around Northwest Ohio's famous Oak Openings. The main event will be Saturday, 23 June with a short business meeting and various talks taking place during the morning in the Buehner Center at the Oak Opening Metro Park (see <<http://tinyurl.com/OOMPark>>). Saturday afternoon will be fieldwork in the Metro Park and other areas nearby. There are tentative plans for pre-meeting field trips in Williams and Defiance Counties—with such places as the Auglaize River, Fish

Creek and Mud Lake Nature Preserve as possible places to visit. The Oak Openings and sites in the Williams and Defiance Counties were made famous to odonatologists in the 1950s and 1960s by renowned naturalist/farmer Homer Price.

More information will be developing. Contact Bob Glotzhober for more information at <bglotzhober@ohiohistory.org>.



2012 Southeastern DSA Regional Meeting

Steve Krotzer <rskrotze@southernco.com>

The 2012 southeastern DSA meeting will be held in Columbia, Tennessee, 8–10 June. Columbia is about an hour south of Nashville, which is the location of the nearest international airport. There are a variety of lodging and dining accommodations located in and around Columbia; we're planning to base our operations at the Interstate 65 area east of town. We are planning to stay at the Hampton Inn (931-540-1222), and there are several other hotels here,

including Super 8 (888-288-5081), Comfort Inn (931-388-2500), and Holiday Inn Express (888-465-4329). There are a Cracker Barrel, Waffle House, and a couple of fast food joints at this exit. It's about 10 miles from here to downtown Columbia; in town, there is a Wal-mart supercenter, a shopping mall, a Mexican restaurant (!!!), and several other dining options.

Within an hour's drive to the southwest of Columbia you can visit one of several beautiful Highland Rim streams, with species such as *Calopteryx angustipennis* (Appalachian Jewelwing), *Ophiogomphus acuminatus* (Acuminate Snaketail), *Stylogomphus sigmastylus* (Interior Least Clubtail), *Macromia margarita* (Mountain River Cruiser), and others. Less than an hour to the east is the Duck River, one of the most diverse rivers in the Southeast and home to a wide variety of gomphids including *Gomphus crassus* (Handsome Clubtail), *G. viridifrons* (Green-faced Clubtail), *G. quadricolor* (Rapids Clubtail), *Hagenius brevistylus* (Dragonhunter), and *Ophiogomphus rupinsulensis* (Rusty Snaketail); there are

also historic records for *G. fraternus* (Midland Clubtail) and *G. ventricosus* (Skillet Clubtail). A short drive east of Columbia are the bedrock-bottomed, otherwise unimpressive streams that are home to *Gomphus sandrius* (Tennessee Clubtail). There's not much else flying on these streams, but the chance to see such a highly restricted species makes it worth the effort.

Mary Jane and I hope you can join us for what promises to be a fun meeting. It will probably be hot, so those of you from more northerly areas, plan appropriately! If you have any questions, feel free to e-mail me at <rskrotze@southernco.com>.



Confusion in *Brechmorhoga* (Clubskimmers), and Correction of Distribution Records in Tamaulipas and Nayarit, Mexico

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

Bob Behrstock first recorded *Brechmorhoga vivax* Calvert from Tamaulipas, Mexico (Behrstock, 2005), based on my identification of a male specimen from Rancho El Cielito, 25 Oct 2003. Later, I re-examined the specimen and determined that it was actually *B. tepeaca* Calvert, and the record was corrected (Behrstock, 2006).

Now I am chagrined to write that I have again examined that specimen, while attempting to identify photos of *Brechmorhoga* from Mexico, and I find it to be in fact *B. vivax*. So the original record should stand as it is, with *vivax* occurring in Tamaulipas and no record of *tepeaca* from that state.

This reversal came about in part because I had too few specimens of *tepeaca* to understand its variation, and because the specimen in question is an especially large *vivax*. Larger individuals have more cells in the wings, in my experience, so this specimen keyed to *tepeaca* with regard to the number of rows of cells proximal to the anal loop in the hindwings. In *vivax* and *praecox*, there are two rows. In the larger *pertinax* and *mendax*, there are three rows. In *tepeaca*, although also a small species, there is a mixture of three and two rows. The Rancho El Cielito *vivax* has a mixture of three and two rows, and thus this difference is not as diagnostic as it has been considered (Förster, 2001).

Since I erroneously reidentified the specimen, I collected several *tepeaca* in Sonora, and I now have a better understanding of the difference in the hamules of the two species. In *tepeaca*, the hamules are a bit longer and a bit less curved than in *vivax*. The difference does not jump out at

first glance, but the hamules extending distinctly farther out than the posterior lobe seems to be a good mark for *tepeaca*. In *vivax*, they curve back to almost touch the tip of the posterior lobe, without the short straight stretch in the middle that *tepeaca* shows. In some *vivax*, they do extend a bit beyond the posterior lobe, but the characteristic tight curve is then diagnostic.

I can find no other obvious differences between the two species, which are so similar that I know of no way to distinguish the females. Förster (2001) distinguished them by the shape of the subgenital plate, its terminal notch deeper than wide in *tepeaca* and wider than deep in *vivax* and *praecox*. However, the only presumably definite female *tepeaca* I have examined, from a mated pair in Sonora, has that notch about as deep as wide. Furthermore, numerous *praecox* females, including some from outside the known range of *tepeaca*, have the notch deeper than wide, so I question the distinctness of this character.

Calvert (1907), in his key to distinguish *tepeaca* from *vivax* and *praecox*, listed only the wing-cell difference. He also mentioned the difference in the hamules, but his illustrations confuse the issue. In Plate VIII, Figs. 46–49 are all labeled as *praecox*, but Calvert stated in a correction in the text (p. 280) that 46–48 refer in fact to *vivax*. I suspect that 48 is actually *tepeaca*. His text reference (p. 406) to *tepeaca* illustrations on Plate 10 is correct.

I have two male *Brechmorhoga* from Rio El Limón, 6.3 road km W of Santa Maria del Oro, Nayarit, 3600', 19 Sep 2001, that look absolutely identical. Both have two rows of cells proximal to the anal loop, yet one has the hamules of


tepeaca, the other of *vivax*. These individuals also caused a misidentification, as I had considered them both as *vivax* (Paulson, 2002). Thus *tepeaca* should be added to the list of Nayarit Odonata.

I wonder about the distinctness of these two species.

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DSA Contributes to OdonataCentral

After a recommendation by Marla Garrison at the Ft. Collins DSA annual meeting, Executive Committee member Greg Lasley brought a motion to the committee to make an annual payment in support OdonataCentral as the official web site of the Dragonfly Society of the Americas. The committee agreed to make an annual payment of \$1,000 to the University of Texas at Austin that will go to the maintenance and enhancement of the web site.

Some Observations on the Migrant *Sympetrum corruptum* (Variegated Meadowhawk)

Scott King <nfldkings@gmail.com>

2010: After a weighty Minnesota winter, months of cold weather and snow, months without green leaves, open water, or flying insects of any sort, I look forward to the first flower, the first mud puddle, the first robin, the first day without a jacket, and, in recent years, I've come to look forward to the arrival of *Anax junius* (Common Green Darner). This large, conspicuous migrant arrives shortly after ice-out and reigns over ponds where it will be the only dragonfly until local species begin to emerge weeks later. Because I was expecting *Anax junius*, I was surprised, and a little confused, when the first dragonfly sighting of the year turned out to be *Sympetrum corruptum* (Variegated Meadowhawk) bouncing through my neighbor's sunlit yard. I found many more scattered about town and in the woods, places where the sun warmed the sidewalks or heated up last year's fallen leaves (OC #318432). If not perched flat upon the ground feeding on early season flies, they stayed high in the trees, moving about the leafless branches. This was 15 April, a warm clear day in the wake of a powerful low-pressure system, a system that could be traced back to northern Mexico and the deep southwest. Interestingly, *Anax junius* had shown up in large numbers as well; apparently these two travelers had caught the same flight. I do wonder, however, if it was a direct flight, or were layovers and transfers involved?

Within days the meadowhawks congregated at a small temporary pond in the middle of a restored tall grass

prairie. The pond, no more than fifty feet across, was full of snowmelt and singing frogs, its shoreline edged by winter-flattened grass. Male meadowhawks perched on the grass within a foot or two of the water's edge, facing the center of the pond. They confronted and chased away other males, even the occasional *Anax junius*. Often, after such a chase, they would hover motionless above the water before returning to their perch on shore. Occasionally a male would flick its abdomen under and forward, transferring sperm while in flight.

When females arrived the males were ready. Barely did they have time to come to a full stop and hover before being grabbed by the nearest, most vigilant male. The new couple usually flew twenty or thirty feet straight up then out over the prairie where they landed, somewhat heavily, in the thick prairie thatch. The mated pair would return some time later, ovipositing in tandem, tapping the water, moving, tapping the water, moving, seldom bothered by the territorial males along the shore. This went on for several days until a stretch of rainy weather intervened, after which I no longer saw the adults. What happened to them? Where did they go?

On 7 June, after weeks of hot weather, I revisited the pond and found it completely dry. Flies buzzed above a crust of dead tadpoles where the final pool of water had

concentrated them. I felt I'd lost an opportunity to collect the nymphs. But, as I was walking around surveying wrack and ruin, I happened upon ground that was still squishy and moist. Below the surface the black sediment was packed with living tadpoles and nymphs. The nymphs plucked out of the mud varied in size and color and I suspected them to be of several species. A month later, when the nymphs began to emerge in captivity, I discovered that they were all *Sympetrum corruptum*. A simultaneous emergence took place in the local ponds, refreshed by needed rain, and numerous juveniles were observed in the field.

At this point, I lost track of the population and its fate. Their movement in spring was easier to track because of the lack of vegetation and absence of other dragonflies. Did the juveniles migrate to new locations before mating as the previous generation had done? Or did they stay put? Some circumstantial evidence, namely the appearance of a fresh batch of juveniles in October (see OC #333038), suggests that at least a few of the mid-summer cohorts mated and oviposited locally yielding a second brood.

2011: This year the first dragonfly I saw was *Anax junius*, on 10 April, almost a week earlier than the previous year. The arrival was presaged, once again, by a powerful low pressure system spinning north out of the desert southwest, bringing our first truly warm weather. I suspected that the meadowhawks might have arrived as well, especially after learning both species had been seen in Illinois following the same weather system (OC #327676). So the next day, an incredibly windy day, I went looking for them and found them, not at the temporary pond where they had congregated the year before (maybe the wind kept them away), but in sheltered pockets in the woods, where they perched on a mat of fallen oak leaves and feasted on flies (OC #327684).

The next day, 12 April, I found *Anax junius* and *Sympetrum corruptum* at a spring fed pond at Lake Byllesby Regional Park. Both species were busy mating and ovipositing. Once again the male meadowhawks arrayed themselves along the margin of the pond. I spent several enjoyable hours watching this dragonfly drama. At one point I counted 103 touches as a tandem pair oviposited in front of me. The section of the pond chosen by the dragonflies possessed a slight current and represented a different habitat choice than the still temporary pond chosen the year before. The local assemblage at this spring-fed pond includes a seemingly unchecked population of *Sympetrum semicinctum* (Band-winged Meadowhawk) and solid populations of both *S. costiferum* (Saffron-winged Meadowhawk) and *Amphiagrion* intermediate.

The early warm weather didn't hold and the next day snow

covered the ground and the overnight temperatures during the next week plunged far below freezing. The adult dragonflies were wiped out, certainly a risk of pushing north so early. It would be early May before more darners made their way this far north. As far as I know, no major meadowhawk reinforcements arrived, though a single female was observed on 13 May. No new adults were observed until September. Nymphs were collected at the Byllesby site several times throughout the summer without encountering *Sympetrum corruptum*, so I have no evidence that the eggs did or didn't survive.

Is this spring migration of meadowhawks a yearly occurrence? If so where do these migrant meadowhawks originate? Is it merely a coincidence that they have arrived on the same day as the darners these two consecutive years? Or is this paring a regular occurrence that has gone largely unobserved? Is *Sympetrum corruptum* responding to the same migratory cues as *Anax junius*? And what, exactly, are these cues? Observation of a strong spring migration compliments the strong fall migrations observed along the Pacific coast, except that the two populations are separated by the Rocky Mountains. Evidence that *Sympetrum corruptum* successfully completes a migrational cycle (on either side of the mountains) is scant, contradictory, and confusing—as Dennis Paulson states flatly in his discussion of this species . . . “Not a simple pattern.”

Perhaps *Sympetrum corruptum* retains a relic instinct to migrate, an instinct carried over from a different continent where a full migrational cycle was possible and advantageous. Erik Pilgrim's investigation into the phylogeny and biogeography of the genus *Sympetrum* suggests *S. corruptum*'s closest relative is *S. fonscolombii* (Red-veined Darter), a species found throughout Africa, southern Europe and eastwards to the Middle East, the Indian Subcontinent. Pilgrim's research indicates a common point of origin for both species, or a parent species, in central Asia or possibly South America. While *S. fonscolombii* is not a species I'm familiar with, a look at the literature reveals that it too is a migrant and that it also has the unique trait of ovipositing in the spring like *S. corruptum*.


A host of difficult questions remain to be answered. Luckily, a Migratory Dragonfly Partnership has recently been founded in order to better understand and protect the migration of dragonflies. It will monitor the movements of four species: *Anax junius*, *Tramea lacerata*, *Pantala flavescens*, and *Sympetrum corruptum*. To do this, the partnership hopes to build a network of citizen scientists across Canada, Mexico, and the United States coordinated through the OdonataCentral web site. In addition to this real-time tracking, isotope fingerprints will be used to determine the distance a migrating adult has come from

its place of emergence. Who knows, maybe someday in the not too distant future we will be able to forecast the arrival of these spring migrants, giving us time to ready our nets and cameras, and to arrange for a day off from work to join them in the field.

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DSA is on Facebook



For those of you who stay connected using the social networking web site Facebook, The Dragonfly Society of the Americas now has a Facebook page. Information, announcements, and links relating to the Society as well as photos and discussion contributed by those who “like” the page will be found here. The page is located at <<http://www.facebook.com/DragonflySocietyAmericas>> or just search for “dragonfly society” within Facebook and the page will appear in the results list.

Comments on *Enallagma annexum* (Northern Bluet) and *vernale* (Vernal Bluet) in Upstate New York

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As a beginning amateur odonate enthusiast the distinction between *Enallagma annexum* (Northern Bluet) and *E. vernale* (Vernal Bluet) was beyond me and hours were spent trying to turn specimens of the former into the latter. When I finally found a population of *vernale* the differences, particularly size, were striking and specimens easily separated.

At the *vernale* locality (New York: Madison County, Town of Sullivan, Oneida Lake, boat launch at Briggs Bay, 43° 09.73' N 075° 55.62' W, 370 feet) the species was found primarily in a small patch of sparse emergent aquatic weeds some 10 yards offshore in 1–2 feet of clear water over a rocky bottom. The species was common here on 8 June 2011 and the only *Enallagma* present. In 2007 it was far less common on 13 June and outnumbered by *E. carunculatum* (Tule Bluet) and *E. exsulans* (Stream Bluet). This would be consistent with the comments in Walker (The Odonata of Canada and Alaska, Vol. I, p. 223–224) regarding the early flight season and habitat on lakes rather than ponds.

Enallagma annexum in contrast is widespread and common at small ponds, bogs and marshy areas throughout the area. It is also an early season species and at some ponds has a very short flight season. At the pond, desig-

nated B below, it was abundant in late May and first week of June but replaced almost immediately after by *E. hageni* (Hagen's Bluet). At other ponds this replacement was not seen and the species could be found to July. At both ponds listed below it was found with *E. boreale* (Boreal Bluet), an even earlier emerger, and for a brief period pairs of both *E. annexum* and *E. boreale* are in the same ponds. In this area, any pond with *boreale* will also have *annexum*.

The structural differences in the terminal appendages are well illustrated in the guides but little mention of measurements is made. Walker (vol. 1, p. 221) says of *vernale*: “smaller than the average size of . . . *cyathigerum* [= *annexum*]”. This is not true in central New York state. Westfall and May [Damselflies of North America] give measurement for the species with a 10 mm range for measurements of abdomen and 6 mm for hind wing. This is obviously a collection of measurements from many localities, as in my experience; any one *Enallagma* population has a variation of only a few millimeters in these measurements.

The comparison, below, of two populations of *E. annexum* and one of *E. vernale* illustrates the small range of variation in populations and indicates almost no overlap in measurements between the two species.

The *vernale* population (A) has already been discussed above. Fifty-three males and five females (the latter as members of pairs) on either 8 June 2011 or 13 June 2007.


One *annexum* population (B) is from a small bog and kettle lake [New York: Schuyler County, Town of Hector, 1.5 miles se of Bennettsburg in Texas Hollow, bog with open central lake, 42° 24.8' N 076° 47.2' W, 1200 feet]. Fifty-three pairs were collected between 27 May and 7 June 2001

The other *annexum* population (C) is from a wildlife pond in wooded portion of large wildlife management area [New York, Tompkins County, Town of Newfield, small pond off Swan Hill Road on Connecticut Hill, 42° 20.0' N 076° 41.1' W 1800 feet]. Thirty-five pairs were collected 24 May or 6 June 2001.

The male hind wing for B and C average 18.3 mm in both with a range of 17–19 mm. The *vernale* populations aver-

age 20.7 mm with a range of 20–22 mm. Male abdomen measurements for B and C are 24.7 mm and 24.4 mm with a range of 23–26.5 mm. *E. vernale* averaged 27.4 mm with a range of 26–29 mm. Using only this measurement 13 of the 141 specimens would be indeterminate.

The *vernale* female sample is very small. It still tracks the male measurements but with more overlap. One specimen overlaps on both hind wing and abdomen measurements. Female hind wing B and C average 19.6 and 19.4 with a range of 17.5–21 mm. *E. vernale* averaged 21 mm with range of 19.5–22.5 mm. Female abdomen B and C averaged 24.6 and 24.5 mm but 27.1 mm in *vernale* with a range of 22.5–26.5 mm and 26.5–27.5 mm respectively.

Habitat and terminal appendages would quickly separate these two species in this area but the difference in measurements could be a useful secondary check. 

“My Hovercraft is Full of Eels”

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Way back in 1994 I wrote an article describing a trip through Thailand. Four merry pranksters (Nick and Ailsa Donnelly, John Michalski, and Matti Hämäläinen), accompanied by Brother Amnuay Pinratana and his good friend Mr. Somnuk, and driven by the unflappable Mr. Pong, did a road trip around southern Thailand, finding marvelous dragonflies and feasting on unforgettable cuisine (crunchy frog!!!). Having to drive for hours between sites, and tiring of simply counting elephants along the road, we whiled away the hours comparing our individual Thai phrase books. The phrases found therein inspired us to entitle the ARGIA account of the trip with the best of these. Thus, “Watch Out, It’s Going to Explode” found its way into ARGIA’s contents. Following this splendid tradition, I entitle this account of a recent trip to Vietnam with an indispensable phrase found on a Vietnamese language web site (The sentence is from Monty Python, but the web site tells how to actually pronounce it in flawless Vietnamese.).

In May four of us (Nick and Ailsa, accompanied by Fred and Peg Sibley) joined a small but determined group of lepidopterists (the “moth people” led by John Heppner) in Hanoi. Our destination was the northernmost (and also the highest) part of Vietnam, almost on the Chinese border. We were based in Sa Pa, which had been one of the cities briefly occupied by the Chinese army during their invasion of 1979. Odes from this area had been previously collected by a Japanese team, whose results were published

by Syoziro Asahina in the mid-90s. Having these results to compare, we were simultaneously thrilled and despondent that our results were almost completely different. Because it was a high area (average collecting elevation was 2000 meters) and early in the season, my personal trip list was only 39 species long (Fred had several additional). But what a list it was.

Most of our collecting was in the Hoang Lien National Park, whose mountain peak (the highest in Vietnam) was the objective of numerous hiking parties and the basis of a robust tourist trade. We eschewed the peak, and the tribulation of reaching it, to concentrate on a small valley within the park. There were two main habitats: forest with small streams and hillside seeps, and an open meadow with spring-fed wet spots. The most conspicuous ode was a largish, somewhat thick-bodied, damselfly which sat with wings outspread—clearly a member of the tropical family Megapodagrionidae. I initially took it for a *Rhipidolestes*, but quickly realized that this was incorrect. When we got back home I found that it was *Mesopodagrion tibetanum*, a higher elevation Himalayan damselfly which is a new genus for Vietnam. I dislike terms such as “abundant” but, as Jerrell Daigle would say, “There were millions of them”. Fred found, in the woods, a second (new) species, of this genus. This was a slam-bang start.

The streams in the wooded area featured a beautiful calopterygid damselfly much like a clear winged *Calopteryx*, but

with a shinier body. This was *Caliphaea confusa*, well named for its geographical variation. This pretty much completes the damselfly list, except for two species of the very long *Megalestes* (*micans* and *distans*), both named in 1930 by James Needham in his important work, “The Dragonflies of China”. There were a few of the red-and-black bodied *Calicnemia uenoi*, named in the 90s by Asahina. But there was only a single, scarce coenagrionid, *Ceriagrion fallax*, which was the only coenagrionid we found around Sa Pa.

The dragonflies were dominantly *Orthetrum*, of which the species *japonicum* was abundant, and new for me, and the “usual suspects”, *pruinatum*, *glaucum*, and *sabina*, as well as the scarcer *triangulare*, were all present. There were a few *Palpopleura sexmaculata* (southeast Asia’s *Perithemis* look-alike) and *Crocothemis servilia*, and a *Sympetrum* Fred found on the first day and which we still can’t identify. The most spectacular libellulid was a large, very broad-bodied, very white libellulid that had been misidentified by Needham as *Libellula depressa*. It was later named *Libellula melli* by Schmidt, and should be put in the Old World genus *Platetrum*, which is parallel to our *Plathemis*. Its habitat is a series of small muddy ponds which seemed to have a strong laxative effect on the water buffalos that clustered around and in them (always wear rubber boots!).

Also around the ponds were some thin bodied and very handsome *Anax nigrofasciatus*. The only other aeshnid present was a species of *Oligoaeschna* which is almost certainly undescribed. This interesting genus can be thought of as the *Gomphaeschna* of the Orient, and it generally is only found locally and in small numbers. We found several slowly cruising the meadow. The only gomphid we (Fred, actually) found was a *Davidius fruhstorferi* found on a small stream at the edge of the forest.

The biggest, baddest dragonfly was a species of *Chlorogomphus*. I have now taken four species of this genus in Thailand and Vietnam, and only one has a name. There are nearly 30 described species and at least a dozen more awaiting description. This dragonfly superficially resembles *Macromia*, but flies less predictably and has a reputation for being difficult to net. Although it mainly cruises streams, it also flies high, and often flies far away from water. I saw one mating pair going up into a tree, but I never saw a female close at hand and of course I never caught one. In addition to this species, there were two other cordulegastrids: *Anotogaster sieboldii* and a *Neallogaster*. The very large *Anotogaster sieboldii*, common in Japan and now newly added to the Vietnamese fauna, was ovipositing in a wooded hillside seep, looking just like *Cordulegaster*. The *Neallogaster* (actually taken for me by one of the lep collectors) was simply cruising a very small stream along the main highway. It is apparently a new

genus for Vietnam and is otherwise found at high altitudes in the Himalayan chain.

Fred, Peg, Ailsa, and I visited another location in the park—a tiny village on a tributary to the Hoa Ho River, which occupies the main valley of Sa Pa. Sin Chai is a Hmong village, with a primitive but ingenious water-powered grain-pounding machine. The stream is sandy with huge granite boulders littering the bed. Perched conspicuously on the tops of these boulders were several *Archineura betaerinoides*, certainly the largest calopterygid I have ever seen. This huge damsel is clear winged, with whitish blotches at the wing base. They were difficult to net, but eventually I caught a few. A local boy from the village watched my quest, and, taking out his formidable slingshot, added two slightly damaged specimens to my catch. There were also several *Macromia moorei* on the stream, as well as a *Zygonyx* species that may be undescribed. Fred did not join me on the river, but searched the hillsides and smaller tributary streams. He found a second *Davidius* species, a *Burmagomphus*, and an *Onychogomphus*, the latter two of which I am unable to further identify.

On our way back to Hanoi we stayed an extra day in Son La, a provincial capital at a lower elevation. We went out on a quest for a dragonfly stream, which is a chancy objective in a country with a high population and intensive agricultural development. But we were lucky, and found a small but choice stream only a few kilometers away from the city. Right off the bat we found several gomphids (*Lamelligomphus camelus*, *Paragomphus capricornis*, *Gomphidia kreugeri*, and a *Nihonogomphus* species). There were also two *Onychothemis* species (*testacea* and *culminicola*, both of which also occur in Thailand). This stout, stream-inhabiting libellulid is widespread in Southeast Asia, but is never common. It was definitely memorable to collect dragonflies while the passing road traffic included a pig more or less tied to a bicycle, bound for market, and obviously aware that he wasn’t going home again.

Our visit was very pleasant. The food was good but not up to Thai standards. (I lost fifteen pounds simply by living off of rice and noodles eaten with chop sticks!) If we had gone with the objective of finding birds, we would have been grievously disappointed. Birds are scarce here, because boys and men with those formidable slingshots take a huge toll. The ones killed go into the pot, and those simply winged are put into small cages for sale to city dwellers, whose homes ring with the songs of laughing thrushes and babblers each morning. These are lovely songs—it is a pity that they are rarely heard in the wild.

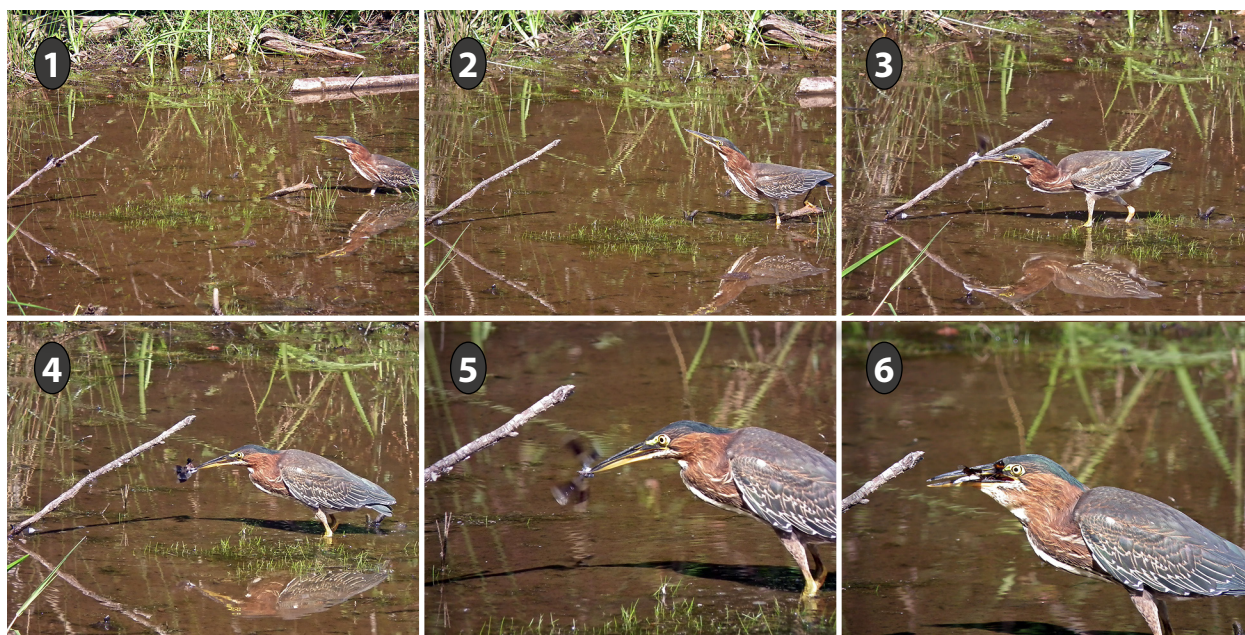


Common Whitetail (*Plathemis lydia*) Versus Green-backed Heron

Wade Worthen <Wade.Worthen@furman.edu>

I was paddling my kayak on Lake Oolenoy at Table Rock State Park in Pickens Co., South Carolina, on 11 September 2011. I was watching a pair of Common White-tails (*Plathemis lydia*). They had mated and the huge male defended the female as she laid eggs. It seems the activity attracted the attention of a Green-backed Heron (*Butorides striatus*) feeding nearby. After the female laid eggs, the male resumed his perch on an emergent branch. The following series of pictures shows what ensued. In the first picture, the heron has its head held high as it sights down its beak at the dragonfly perched on the emergent branch

at left. The heron began its stalk. It was remarkable to me that, as shown in picture two, the heron waited immobile when the whitetail left the perch on a short sortie. Like any good dragonfly hunter, it seems that the heron knew that the male might return to the perch. The third shot shows the moment of predation, when the heron snatched the whitetail off the perch. The heron waited for it to stop thrashing (pictures 4 and 5), and then ate it (picture 6). In addition to snatching minnows from the shallows, this heron made a meal of a meaty whitetail.



Notes on the Pacific Spiketail (*Cordulegaster dorsalis*)

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The Pacific Spiketail (*Cordulegaster dorsalis*) is a large and strikingly beautiful dragonfly found in many western states. Here in the Owens Valley, California, just east of the High Sierra Mountains, they are quite common, and in one of our favorite Spiketail locations we have counted as many as 20–30 individuals in an area no larger than about one acre.

We have taken hundreds of photographs of these specimens and have observed significant variations among them. We have sent off some of these photographs to vari-

ous experts for identification. Some have been identified as *Cordulegaster dorsalis* (Pacific Spiketail), while others have been identified as *C. deserticola* (Desert Spiketail). Some consider *C. deserticola* to be a separate species, while others consider it to be a subspecies of *C. dorsalis*. The Desert Spiketail has more yellow on its abdomen, especially on the lower portion (see photos).

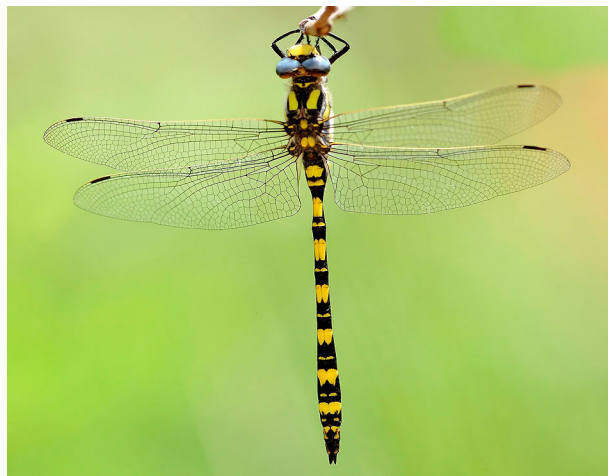
Not being trained biologists, we are uncertain of the criteria for determining what is a species and what is a subspecies of *Cordulegaster*. Perhaps, DNA sampling of the



Cordulegaster dorsalis


various specimens would help to settle this question. The fact remains that we have seen wide variations in the coloring and markings of *C. dorsalis* in the specimens in our favorite one acre Spiketail site. Indeed, we have seen both *C. dorsalis* and *C. deserticola* hang perching within two feet of each other, and obtained photographs of both. Moreover, specimens which appear intermediate between the two are also abundant in this area.

We wonder if it is reasonable to conclude that we are dealing with only one species, namely *C. dorsalis*, and that



Cordulegaster dorsalis deserticola

genetic variations within the species give rise to specimens sufficiently different for some to suspect a new species or subspecies, namely, *C. deserticola*. Perhaps environmental differences (primarily climatic) help to create these variations, since the Pacific Spiketail is found west of the Sierra range, while the Desert Spiketail is seen east of the range.

We have also noted significant differences in the Desert Whitetail (*Plathemis subornata*) and the Four-spotted Skimmer (*Libellula quadrimaculata*) depending on the environment in which they are found. 

The Season of *Stylurus*

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As if I didn't have enough trouble identifying adult odonates, I decided this past winter to take up "nymphing." I had my handyman rig a dredge net for me, found some old neoprene waders around the house, and set off to conquer new worlds. I'm not sure who ended up the conqueror and who the conqueree, but when the spring field season arrived, I had shoeboxes full of little bottles filled with largely unidentified floating objects.

At summer's end, I dragged them out again and started seriously grappling with gomphids. (Could this be a new reality show?) I'd fetched *Stylurus* nymphs out of any number of streams in the north Georgia mountains and soon discovered that most of them keyed out to species that aren't found in this area! I sent a plaintive e-mail to southern nymph expert, Steve Krotzer, and got something like this back from him, "*Stylurus*? I hate them." Undaunted, I persevered, usually defaulting to *Stylurus laurae* as the likeliest candidate for my area and the habitats I was exploring. Still, there seemed to be some that looked not quite like the others. Some that could be *Stylurus "notlaurae"* or

possibly even *Stylurus "maybescudderi"*. This latter species would be a pearl of great price anywhere in Georgia.

Steve offered a lot of help and encouragement, as did Chris Hill and Ken Tennesen.

In the midst of all this cyber-discussion and hand wringing, Chris proposed a meeting to be held in Clayton, in northeast Georgia, in September. It would be called "September Scudderi Soiree." The entire contingent of southeastern nymph geeks (We could all fit into a booth at a Mexican restaurant.) immediately signed on and dates were set. We would be searching for adults, but nymphs were always the backup option. As the weekend approached, problems developed. First, Jerrell Daigle cancelled because he didn't like the weather forecast—boy what a smart decision! Then it turned out that Giff Beaton couldn't juggle his schedule to manage those days off. At the last minute, Chris, the instigator, had to pull put because of a professional conflict.


But Steve and I carried on. We met in Fannin Co. at Noontootla Creek where he had found *scudderi* nymphs in the past. But neither this nor any other species was flying. Pressing on to Rock Creek, also in Fannin, where I'd found the suspicious nymphs, we spent the remaining afternoon hours in search of grown-ups. Steve actually managed a quick photo of one and had a flyby of another. He'd left his net in the truck. I saw nothing.

Steve was able to look at my Rock Creek nymphs that evening and confirm that they were indeed *laurae* (Laura's Clubtail) and *scudderi* (Zebra Clubtail). Bad weather the next day meant an unproductive second visit. Encouraged, however, I met Giff there a few days later to mount yet another search. Being a much faster stream walker than I, he soon vanished downstream as I slogged off in the opposite direction in pursuit of something that shot past me hauling upstream. Sure enough, I caught up with a beautiful male *scudderi* and was able to get a couple of distant and awful photos before he was up and gone again.

I then returned to the pool where Steve had encountered the first individual some days earlier. And, lo, there sat another one on a rock on the far side of the stream beautifully silhouetted with the sun directly behind it. Grrr. I crept across the stream and hacked my way through the underbrush on the opposite bank until I could get a decent shot or two. Crept closer, got a couple more. Closer, more. Of course, the little, uh, fellow sensed the moment I was finally perfectly positioned and took off. Nonetheless, I was thrilled with this lifer and satisfied I'd earned it. Despite my shouts and whistles and honking of car horns, Giff was not to be found. He did eventually turn up with a photo of his own. This species is known from only two counties in Georgia, and it turns out Steve's was the first sighting of an adult in almost 90 years.



Zebra Clubtail (*Stylurus scudderi*) photographed in Fannin County, Georgia by M. Dobbs on 5 Oct. 2011.

There's a parallel story line. In the course of my explorations, I also ran across other *Stylurus* nymphs rare for Georgia. At a newly discovered stream in Stephens Co., I turned up *S. spiniceps* (Arrow Clubtail), new for the county and a new species for me, one that endeared itself to me right away—I could identify it! Of the previous six records for the state, I know of none that were not nymphs. Shortly after this exciting discovery, I stumbled on a veritable cornucopia of *spiniceps* nymphs at a stream in Towns Co. that I frequent regularly during flight season. I'd never seen anything remotely resembling *S. spiniceps* there. On the way to visit family in North Carolina, I stopped at the bridge crossing the Tuckasegee River in Dillsboro. Hopped in and, within minutes, found—yep, *spiniceps* nymphs. Repeated visits to all these locations failed to turn up a single adult. I can only surmise that I have not yet paid the price in nymphs to earn an adult! Next year for sure. 

Dragonfly Records—Collecting and Photography

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

In North America and parts of Europe, there has been a dramatic change in the way dragonfly records are established. Not many years ago, all records of dragonflies that contributed to our knowledge of their distribution, abundance, and flight seasons were specimen-based. All we knew of the spatial and temporal distribution of Odonata was based on the specimens contained in museums and private collections.

Odonatology has long been a field shared by professionals and amateurs, as many of the people who contributed to it were not academicians or, necessarily, even biologists.

They were people who became interested in dragonflies and, understanding how easy it was for them to contribute to the sum of knowledge, did so. And now, in the Twenty-first Century, amateurs are playing an even larger part.

Interest in odonates has increased tremendously with the recent plethora of identification guides, the availability of common names for all the species, and the routine incorporation of dragonflies into the educational programs of nature centers and Audubon societies. The consequence of this is that more and more of the people who are interested in learning about dragonflies, including those who

actively seek to expand our knowledge of them, have little interest in carrying a net into the field or taking the time necessary to process and maintain a collection.

How dragonfly records are incorporated into the common bank of knowledge has changed as well. Formerly, distributional records were published in journal articles and books. Now, many of them come to light in local newsletters and in online e-mail forums, and anyone who wishes to construct a range map or understand the seasonal distribution of a species must consult these additional sources.

When general naturalists become interested in a taxonomic group, I have found that two of the things that are of the most interest are the current taxonomy of the group, furnishing the correct species names by which to communicate, and the distribution and abundance of species. The best way to provide for the former need is through an up-to-date checklist of species, just as has been done in many other taxonomic groups. For this reason, the DSA in 2007 formed a Checklist Committee.

DSA Checklist Committee

The Checklist Committee has set itself three goals, although these have not been formalized other than by the original note in *ARGIA*. First, we judge records of species newly recorded in North America (US/Canada). We have come into this in a way through the back door, as our first mandate was simply to coin names for these newly recorded species that—presumably—did not have English common names. But first we needed to deal with the record itself to be able to give the species the “official” status it gets by having a name conferred on it. Second, we assign each of those species a common name. And third, we try to come to a consensus about the taxonomic status of all North American odonates. The Checklist Committee was formed from a prior Common Names Committee (convened in 1996) that concerned itself with only the first two of the three duties.

Each of these three functions has its own set of criteria, but basically a committee member proposes a course of action, the committee discusses it, and we then vote on it. We post the results in *ARGIA* and change our checklist accordingly. We table some of the taxonomic questions, acknowledging that we don’t know enough to recommend a change in the status quo. But we feel we need an “official” checklist to express that status quo, if for no other reason than the apparent need for a stable set of names.

We are the closest thing in the odonate world to the North American Classification Committee that determines the content of the Check-list of North American

Birds. For a variety of reasons, fewer and fewer records of North American birds are supported by specimens, so photos are well established as part of the currency for bird records, both national and regional. But one thing our committee has never tried to do is arbitrate over regional records. There are so many of them every year in odonates that we can’t reasonably be expected to handle them, and there seem to be only a few states and provinces that are trying to handle this in a way that state bird-record committees do.

OdonataCentral

OdonataCentral, <<http://www.odonatacentral.org/>>, is the closest thing we have to fulfill the function of judging odonate records from all over North America, as records are submitted and then “vetted” by local experts. However, not all records, including some very significant ones, are sent to OC, as it is a voluntary effort, and there are other ways of publicizing records (primarily by publications, including the long series of state odonate lists published in the *Bulletin of American Odonatology*). Some states and provinces have individuals who collect their records and even remind their colleagues to submit their records to OC.

At this time, OdonataCentral is our most complete repository of North American odonate records.

The Value of Photographs

The reality is that large number of amateurs—who we have diligently tried to enlist in odonate studies—aren’t interested in collecting, and some are turned off by it. We would have far fewer odonate enthusiasts, and nowadays far fewer records of odonates, if we insisted that every county record must be based on a specimen. With the proliferation of digital photography, the high quality of the cameras (and of course the photographers), and the ease of sending photos back and forth, photos have taken the place of specimens as vouchers to a large degree.

The downside of having photo-based records is that many species cannot be identified from photos. This is particularly true of females, but it is also true of brightly colored males, some of which look very similar to the brightly colored males of other species in the same genus. The old-time odonatologist would catch one of these, look at some small structure(s), and immediately be able to name it. But these structures are very often not visible in photos.

Not only do photos not always permit identification, but their emphasis may lead to a generation of odonate enthusiasts who know nothing about those diagnostic

structures or how to look at them. They remain the most salient distinguishing features of species in many genera, even more important in tropical regions outside the range of field guides. Authors of field guides try diligently to find characteristics that will allow field identification, and thus identification from photos, but in some cases, they have no luck.

The Value of Specimens and Continued Collecting

Those of us who have been studying odonates for years know that taxonomy depends on specimens. What many don't know is that taxonomy is endangered: Positions of taxonomists in universities and museums have been eliminated left and right, replaced by biologists with other interests if at all. The decline of taxonomists is ongoing, because there are few institutions to train them, and their work is not considered sufficiently glamorous even by their fellow biologists.

There is little doubt that the decline of taxonomists accompanies the decline in specimen collecting. The latter decline has been quantified from museum collections for numerous taxonomic groups. We owe it to future scientists to continue to add specimens to collections for all the varied uses they will have, some of them unknown at present. Many people think of specimens as primarily vouchers for occurrence, but they are so much more than that, often contributing significantly to ecological and behavioral questions. Who would have thought a few decades ago that DNA could be extracted from museum specimens to give us clues about the evolution of dragonflies?

The surprising fact is that there are not enough specimens in collections. Many taxonomic studies are incomplete because specimens from a particular area of interest were not available. Sometimes there is a series of males but no females. There are not only two sexes to be examined, but there are changes in coloration with maturation. There are also seasonal changes in size, and perhaps in coloration. Individual variation is the basis for evolution by natural selection, so it behooves us to understand it, and we can only do so with series of specimens.

We should try to base significant records on specimens whenever possible. This is especially true in poorly known regions, nowhere more than in the tropics. Even in North America, more and more of the places where people seek out odonates in the field are parks and reserves and wildlife refuges, and most people will be unable to get collecting permits for such places. There has been a spate of new US records in south Texas recently, and some of them are based now only on photos, as the spots where interesting

species are likely to turn up are so often the places where collecting is prohibited.

I have no hesitation in stating the viewpoint that, contrary to present-day attitudes, ad hoc insect collecting should be encouraged rather than prohibited in our nature preserves. We have much to learn about just the distribution and occurrence of many species, and such an action would immediately increase that knowledge bank. This is especially true for those along the southern border of the US, where species not in our field guides and unknown to our present-day naturalists armed with cameras rather than nets are likely to turn up.

The constant incursion of tropical species may be because of global warming, if not habitat destruction farther south. Detecting their presence should be facilitated by freely granting collecting permits to anyone interested in adding to the knowledge base, with two important conditions. The collector must deposit all specimens collected in accredited institutions and must immediately submit records of specimens collected to the preserve in question. Finally, the collector would be strongly urged to submit interesting records for publication.

One more thought about dragonfly collecting comes from many remarks I have heard. In the bird community, it would be considered a cardinal sin to collect a rare bird when many others would have greatly enjoyed seeing it. Note this is a people-rights matter, not an animal-rights matter, although of course many of the same people wouldn't want to see the bird killed in any case.

Dragonflies are different. A rare dragonfly that turns up somewhere is unlikely to remain in the same spot, as often happens with rare birds. I don't think you can "stake out" dragonflies. They don't live that long, and they wander around if not territorial. They are much smaller than birds (thus harder to see) and don't sing or call. Actually, even territorial males are often not present in the same spot the next day.

The number of single records of rare dragonflies supported by photos, and the lack of further sightings of these same individuals, supports this statement thoroughly. Thus, the collection of a rare dragonfly is not likely to be a matter of taking it away from other odonate enthusiasts who would have wanted to see it.

Suggested Photographic Protocol

Assuming photographs are part of the currency of Odonata records, we should think about them seriously in that context.

1) Records established on photographic evidence should be limited to those species that can be identified by photos.

2) Anyone attempting to establish records by photos should be fully informed about the difficult species groups. It must be emphasized that in surprisingly many genera, females (and in some cases males) cannot be so identified. A replacement of specimens by photos would result in a real loss with regards to these species.

3) If a species is identifiable in a photo, the parts that identify it should be photographed. This will obviously not be easy, as these parts are often small structures, but in some cases it is the view that is important, a dorsal view of a dragonfly to show wing venation or a ventrolateral view to show the color pattern of the lower sides of the thorax. The more views of a single individual that are available, the greater the likelihood of them including a critical view.

4) Records of major significance (new national and state/provincial records) would be best supported by voucher specimens, but photos are nevertheless acceptable, as disallowing them would throw out an unacceptably large amount of valuable information.

5) Local people should become organized to deal with regional records, whether specimens or photos. A photo file for each state and province would be the simple way to accomplish this, stored in a place (public server?) accessible to all interested parties. The maintenance of online range maps on a regional basis has worked well for a number of regions. Nevertheless, the existence of a continent-wide repository such as OdonataCentral makes it the logical place for all North American records, in my opinion. Local organizations would do well to facilitate the submission of records to OdonataCentral, with the great benefit of having updated range maps on a continent-wide scale.

The Value of Sight Reports

The documentation of bird records has proceeded from a specimen-based documentation to a photo-based documentation over time. In addition, sight reports with no documentation beyond a written description are routinely submitted to record committees and the great majority accepted. With what might be called the “new nature photography,” more reports are substantiated by photos nowadays than just a decade ago, but there are still many that stand on the known expertise of observers and the information presented in their descriptions.

We have not progressed to that state yet in North American odonatology, and sightings of odonates that represent

significant records should still be documented at least by photographs.

Further Comments

Nick Donnelly made the point that we should be paying a lot more attention to the temporal distribution of odonates (flight seasons, not only overall but each year, persistence over the years, and changes in ranges), now that we have a good system in place for documenting their spatial distribution.

The Checklist Committee is happy to discuss protocols for accepting records, but judging records of local significance will remain outside our purview. It would behoove states and provinces where there is a large and active group of odonate enthusiasts to put in place such protocols, and I know some of them have. Perhaps it is time to pull together a summary of what is going on across the continent and publish that in ARGIA.

Acknowledgements

Thanks to John Abbott, Nick Donnelly, and Paul McKenzie for good discussions about these matters. Paul originally suggested that DSA members should be brought into the discussion.



Time to Renew Your Membership?

This is the final ARGIA of 2011, so it's that time of year again. Please renew your membership in a timely fashion, unless you have already paid for 2012 or beyond.

If you are unsure of whether you need to renew or not, check the address label on the envelope. If you see “A11” in the upper right corner, it means that your membership expires with this issue.

The “B” notation, if it is there, refers to your Bulletin of American Odonatology subscription—“B11” means that you are subscribed through volume 11 which we are still in the process of publishing. We are accepting new subscriptions to BAO volume 11, but not future volumes at this time.

To renew your DSA membership and/or subscribe to Bulletin of American Odonatology, use the form included with this issue or visit http://www.odonatacentral.org/index.php/PageAction.get/name/DSA_Membership. Remember the PDF-only option available for ARGIA at a reduced rate.

Hagenius Goes Fishing!

William Hull, Cincinnati, OH <mangoverde@gmail.com>

My son and I were spending some time fishing and surveying dragonflies on the Little Miami River at Armleder Park, Hamilton County, Ohio. I was up river a few hundred feet when he called out that a large clubtail had landed on his rod. I waded towards him to check it out. As I approached I watched the Dragonhunter (*Hagenius brevistylus*) make two unsuccessful attempts at passing *Macromia*. Each time it returned to perch on his rod. After I was close enough to take a photo we watched it make another unsuccessful attempt at a *Macromia* before my son resumed casting.



Great Spreadwing (*Archilestes grandis*), New for Minnesota

Scott King, Northfield, MN <nfldkings@gmail.com>

Last year when Dan Tallman, a local birder, e-mailed a photo he'd taken of a damselfly in his yard in Northfield on 22 August, I was stunned to see that it was a Great Spreadwing (*Archilestes grandis*), a new state record [OC# 322492]. I made several attempts to find it at nearby ponds over the next weeks without any luck. Given it was so far north of its known range, I was inclined to believe it was a vagrant.

This year, on 8 September, while kicking along the edge of the Cannon River, I came upon a Great Spreadwing perched about four feet off the ground in the weeds on the river bank, opening and closing the angle of its wings while I looked at it. When I tried to net it, it flew away. This was my first meeting with this damselfly and I'd probably still be stomping around in a funk if it hadn't showed up again a few minutes later [OC# 332893].

About a month later, on 3 October, while exploring the wooded flood plain along the Mississippi River in Goodhue County, I caught a glimpse of yet another Great Spreadwing. This male perched on the branch of a sapling maple a few feet above my head. I could see the bold yellow racing stripe on the thorax, but didn't have the chance to confirm the record with a photograph or my net.

Finding this big damselfly two years in a row probably indicates breeding populations in the state. It's not clear what local habitats have been colonized. Dennis Paulson, in *Dragonflies and Damselflies of the West*, gives the preferred habitat as "slow streams, usually with wooded banks." Next year, I'll give the nearby streams a better look, with an eye for those great nymphs that can swim as fast as tadpoles or minnows.



Updating County Checklists—Everybody's Job

Bruce Lund <blund@mvdsl.com>

No doubt about it, County Checklists are important and helpful tools for all odonatologists. The initial compilers did a tremendous service for amateurs and professionals alike, *but* we all need to continually upgrade them as new species are identified and even when mistakes are recognized. It may be that County Checklists need to have designated "gatekeepers" to receive and verify changes,

and that may be the original compilers, their designees, or other qualified volunteers in different states or regions.

Here is an example of how much I found the Nye County, Nevada checklist from OdonataCentral (OC) needed upgrading. OC does upgrade its checklists and most recent (25 July 2011) list has 39 species. However, another

seven species should be added as a result of surveys at the Ash Meadows National Wildlife Refuge in 2004–2005 and published as “Odonata of Ash Meadows National Wildlife Refuge, Southern Nevada, USA” (Stevens, L.E. and R.A. Bailowitz. 2008. *Journal of the Arizona–Nevada Academy of Science* 40(2): 128–135.

The seven species are *Anax walsinghami* (Giant Darner), *Ischnura barberi* (Desert Forktail), *Libellula luctuosa* (Widow Skimmer), *Macrodiplax balteata* (Marl Pennant), *Orthemis ferruginea* (Roseate Skimmer), *Pantala flavescens* (Wandering Glider), and *Progomphus borealis* (Gray Sanddragon). All of these are records are supported by specimens on deposit at Ash Meadow NWR and the Museum of Northern Arizona in Flagstaff Arizona.

Of course, these species would not necessarily be known to OdonataCentral unless they had been submitted, and that’s why all of us who find new county records need to submit them to OC. All of us field workers need to support the sites which maintain county checklists by sending them additions or deletions with supporting metadata.

Comments on Metadata

In communications with field workers and in reading literature, published county checklists such as OdonataCentral are often referenced as proof of the occurrence of a species. Sometimes this is qualified that the occurrence is a dot on a range map where it is outside the main species range as it is presently known, but mostly there is no other information.

In my opinion, checklists should provide supporting documentation (literature reference, vetted photograph, vetted specimen) with each species and a species without metadata should not be on a county checklist. For instance, the OdonataCentral county checklists mostly provide species metadata including the date collected, collectors name, date collection location, collection submission date, collection submitter, date vetted, name of vetter, vetter decision (pending, confirmed, etc.), and an Odonata Collection # for quick reference purposes.

However, in looking at OC listed species for Clark County, Nevada, where I have surveyed for 3+ years, I have found species for which there was no metadata except that “This record was originally published in the North American Dot Map Project.” While I believe the Dot Map Project is a trustworthy record and that OdonataCentral had every reason to use it as valid documentation for its own Clark County checklist, I found four species where the reference to the Dot Map Project was the only metadata. Since I was organizing a species historic record, I wanted to deter-

mine the source of these Dot Map Project records. I corresponded with the source for three of these records, but that person was no longer able to provide details to support their records. As a result, with no documentation, I think they should be deleted from the OC Clark County checklist.

A fourth species presents a fascinating little story. *Argia rita* had been reported as collected by Ira LaRivers in the 1930s and documented by Dr. James Needham. Never having heard of the species “*rita*”, I found it was a synonym for *A. munda*. Since Dr. Needham’s collections are at Cornell University, I e-mailed the collections manager to check the validity of this specimen. His reply was most interesting: he could not find the specimen and surmised it had been lost when the collections had been moved. *But* he did find and send me a penciled label from the 1930s which read “*A. rita* Kndy male? Nevada, LaRivers”. That question mark indicates a confirming identification was not made. Based on this, and that *A. munda*’s natural range is northern Mexico with some occurrences into southeastern Arizona and southwestern Texas, I think this record should be deleted from the OC county checklist.


A Note from the OdonataCentral Webmaster

J.C. Abbott, Austin, Texas <jcabbott@mail.utexas.edu>

I was pleased to receive Bruce’s article above as I believe he brings up several valid points that have perhaps been casually discussed in the past, but not acted upon. First, I would really like to make a plea for everyone who keeps up with county, state or regional records to please do so in OdonataCentral, or at least duplicate your effort there. As I have said many times before, OdonataCentral is a community resource that relies on the willingness of the community to contribute to it. I recognize that individuals may want to maintain their own web sites, but the power of OC is that you can see how your data fits in with a much larger region. I would encourage authors who publish records, to submit them to OC. If you do it ahead of the publication, you can then site the OC# within the publication. Not only does this help by likely making a larger audience aware of the record(s), but to me it also adds to the record by providing a unique, trackable identifier that most insect collections can’t offer.

The North American Dot Map Project was a huge endeavor. Compiling county-level records for all of North America took ten years of soliciting, gathering and vetting data. This provided/provides the core of OdonataCentral’s distributional database, however as Bruce points out, an individual Dot Map Record itself cannot be easily tied back to an actual specimen or collection. This is unfortunately, not uncommon with insect records published in

the literature. What is happening on OdonataCentral, largely on its own, but sometimes as a directed endeavor, is that these records are being “replaced” by an actual location record for that species in the county (in some cases this may even be the original record the DMP record was based on). This is great and in fact overtime, I see the Dot Map Records being filtered out in favor of these specific locality records. It however, does require the community to contribute/submit those records to OC.

In December, I will be rolling out a number of enhancements to OdonataCentral including the ability for record keepers to upload large datasets. I hope this will encourage record submission and ultimately enhance our understanding of species distributions continentally. For a breakdown of record submissions, including the most active (and inactive) states, see my article in ARGIA 2010, 22(4): 10–14. 

Northern Range Extension for Widow Skimmer (*Libellula luctuosa*) in Michigan

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The Widow Skimmer (*Libellula luctuosa*) is well documented in the Lower Peninsula of Michigan but has been found in only three counties in the southern half of the Upper Peninsula—Chippewa, Dickinson, and Menominee Counties. This also corresponds to the approximate maximum northern extent of its range in North America (other than a couple of outliers in Ontario and Manitoba).

This summer (2 July 2011) I encountered a new, apparently well-established population in northern Houghton County in a spring-fed pond within 100 meters of the Portage Ship Canal. This pond is an artificial impoundment, which has been in existence since 1981, and is bordered to the north by old fields that have recently been used for pasture. On 2 July 2011 I visited this location and observed dozens of *L. luctuosa*, many of which were teneral or juveniles, flying over and around the pond and many hundreds more in the fields to the north. Specimens of *L. luctuosa* will shortly be sent to UMMZ for inclusion in the Michigan Odonata Survey database. In the four years that I have been collecting in Houghton and Keweenaw Counties, these are the first Widow Skimmers I have observed.

I plan to identify other suitable habitat near this site and search for additional populations in the sum-



Widow Skimmer (*Libellula luctuosa*) photographed in north Houghton County, Michigan.

mer of 2012. Additional species identified at the pond include: *Chromagrion conditum* (Aurora Damsel), *Ischnura verticalis* (Eastern Forktail), *Enallagma hageni* (Hagen's Bluet), *Gomphus spicatus* (Dusky Clubtail), *Dorocordulia libera* (Racket-tailed Emerald), *Libellula pulchella* (Twelve-spotted Skimmer), *Plathemis lydia* (Common Whitetail), *Ladona julia* (Chalk-fronted Corporal), and *Leucorrhinia intacta* (Dot-tailed Whiteface). 

Follow-up Search for *Ischnura hastata* (Citrine Forktail) in Wisconsin (or “What a Difference a Year Makes”)

Ken Tennessen <ktennessen@centurytel.net>

In the summer of 2010 I discovered several populations of *Ischnura hastata* (Say), the Citrine Forktail, in Wisconsin [ARGIA 22(3): 15–16, and 17–18]. This small damselfly is scarce in the upper Midwest, having been reported recently in Michigan for the first time by Craves and

O'Brien (2002), and it has not yet been found in Minnesota. It was first collected in Wisconsin in August 1962, way up north in Vilas County at a small bog near Frank Lake by Mary Ries (1969); the single specimen she found was a teneral male. Subsequent collections were made by

Tim Vogt in Marquette County (Sept. 1989) and Door County (July 1991; Bill Smith, pers. comm.), and by Bob DuBois in Ashland County (June 2006).

Finding numbers of this delightful little damselfly in three central Wisconsin counties in 2010 was exciting because the only existing records are in a few widely separated counties (see most recent map on OdonataCentral's web site). The counties I added to its range within the state last year were Shawano and Waushara (the latter borders Marquette Co.); I collected and reared nymphs from three localities. However, I observed oviposition on only one occasion, and I was puzzled by the fact that throughout the season, even late into fall, I saw very few mature individuals. Nearly all of the numerous males and females I saw were teneral or young. Emergence was still taking place at Hartford Lake (Waushara County) on 11 Oct., my last visit there in 2010 and no doubt near the end of emergence as a freeze came to the area soon thereafter (Fig. 1). This date was later than the "typical" first killing frost in central Waushara County, which usually occurs in the period from late September to early October. The only other species of Odonata present on 11 Oct. 2010, were *Ischnura verticalis* (> a dozen seen, all mature), *Enallagma aspersum* (only one mature male seen), *Sympetrum vicinum* (common, all mature, mating, ovipositing), and *Anax junius* (2 seen, appeared young).

Two things seemed unusual: *I. hastata* was emerging in numbers in central Wisconsin through a time of late season frosts, and I was seeing very few mature individuals throughout September and early October. I wondered if these tiny damselflies were making a huge mistake (emerging and soon freezing to death), or if they could be taking advantage of some of our rather warm fall days by emerging late and then quickly leaving the area for warmer climes. To my knowledge, there are no direct observations of migration in *I. hastata*. Indeed, these damselflies are hard enough to see when one is within a few feet of them. However, several investigators have reasoned that this wide-ranging species must migrate. Dunkle (1990) surmised that they can be carried by winds, evidenced by the fact that they have been netted by airplanes flying at 300 m. Other indirect evidence includes reports of collections on small islands far from large land masses (Peck, 1992 [Galapagos]; Belle, 1992 [Azores]), strong indications that this small damselfly can rise up on air currents and disperse far and wide. While this seems an acceptable hypothesis, there is the alter-

native that some practical joker is carrying gravid females of *I. hastata* around on ships or planes intent on depositing them on small, remote islands.

Bearing all this in mind through the long winter of 2010/2011 (thinking about actual flying odes is what one does from November to May this far north, just ask Bob DuBois who lives near Lake Superior), one of my goals was to search for *I. hastata* again, not only at the sites where I had seen them in 2010, but to look for new localities. Spring was cold, with frequent storms and tornado activity. Summer temperatures finally arrived in late May; rainfall was slightly above normal until early August, after which it became quite dry. However, climate data (Wisconsin State Climatology Office, <<http://www.aos.wisc.edu/~sco/clim-watch/index.html>>) show that we did not get nearly the rainfall totals that fell from June through September of 2010. I visited many localities in central and eastern Wisconsin from June through October 2011. I did not see a single *I. hastata* adult. I checked Hartford Lake for adults and nymphs from early to late summer and found none. Based on my field experiences, I would have to conclude that *I. hastata* was not present in central Wisconsin in 2011. It follows from this absence that neither nymphs nor eggs overwintered in this area. Catling (2008) discussed the possibility that the northward movement of *I. hastata* indicates the effects of climate change. I will remain doubtful until I see overwintering in the more northern areas of its range, preferring the hypothesis that they are adventives on occasional storm systems carrying them a northerly direction.

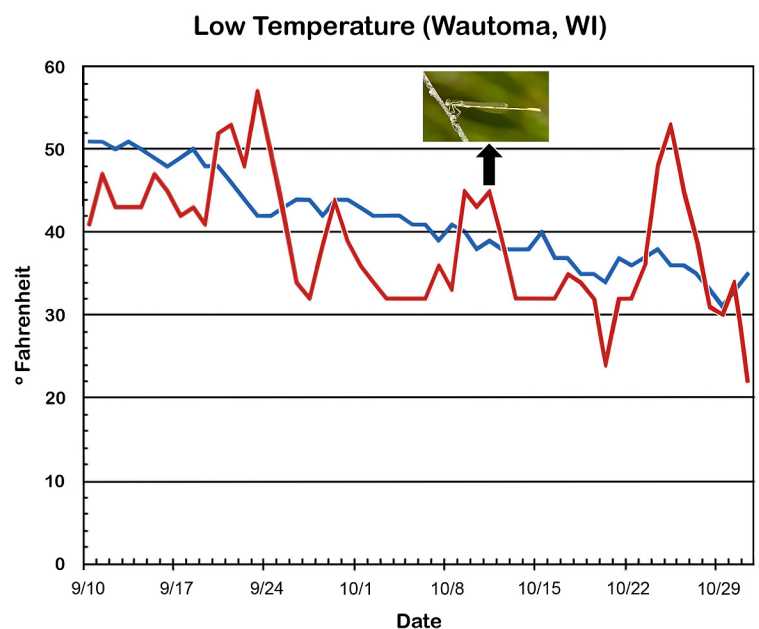


Figure 1. Autumn average low temperatures for Wautoma, Wisconsin (blue line [darker line in black-and-white] = 60-year average; red line [lighter line in black-and-white] = daily lows for 2010).


In retrospect, it appears that 2010 was an exceptional year for *I. hastata* in Wisconsin. A possible scenario for last year is that many adult *I. hastata* came into a large area of the state in early summer, gave rise to several generations, and the last generation left the state before really cold weather hit. Needham (1903) stated “They do not appear to fly above or to depart from their native rush-patches.” Indeed, most literature references on flight of this species characterize them as “fragile,” “delicate” or “weak fliers.” Byers (1930) stated that it “. . . never ventures far afield.” On the contrary, I think they are very capable fliers, much more deliberate than many of their counterparts. We might have missed a rare, golden (citrine?) opportunity last year to add locality records and learn more about the biology of this species in the upper Midwest. In particular, I wonder how far north this species normally overwinters, and what are the particular temperature regimes and weather systems that control its northern distribution patterns from year to year. Bree (2005) found they do not overwinter in Ohio. If they successfully get out of Wisconsin, where do they go? How high into the atmosphere do they go, what time of year, time of day, and under what conditions? And when will we see them in Wisconsin again? Big questions for a little bug.

My thanks to John Abbott, Bob DuBois, Mike May and Dennis Paulson for information and help with literature on dispersal in *Ischnura hastata*.

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Footnote: *Ischnura hastata* is undoubtedly bivoltine and quite probably multivoltine in a large part of its range, although no studies on generation time or voltinism have been conducted (based on Corbet et al., 2006). 

Present Status of our Taxonomic Knowledge on the Odonata Nymphs of the Western Hemisphere

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Taxonomic knowledge on the immature stages of most insect groups lags behind advances based on the respective adults for three main reasons: 1) traditionally, nearly all species are first recognized based on adults; 2) immature stages are often more difficult to find and to rear; 3) fewer experts work on immatures. Description of immatures is probably regarded as tedious, boring work by most people. Surely the above conditions apply to the Odonata, and it is supposedly a well-studied group. Rarely has the nymph been included in the original description of the more charismatic adults of a new species of dragonfly or damselfly; consequently, we are in a constant game of catch-up. Unfortunately, this shortage of knowledge of immatures

presents obstacles to studies in ecology, evolution, phylogeny, life history, habitat requirements, environmental impacts and conservation.

I present here a brief summary of the body of knowledge on the Odonata of the Western Hemisphere*. Let's begin with alpha taxonomy (the business of describing and pigeon-holing new species). In this half of the world, the Americas, there are about 2000 named species of Odonata, with new species descriptions continuing to appear. Overall, the nymphs of about 42 percent are known, although in varying degrees of completeness.

To break this total down a bit further and for the sake of comparison, it is convenient to follow the division of the Western Hemisphere into two continents, North America and South America, at the Isthmus of Panama. These two continents have been separated for most of their long geologic history, being joined, albeit narrowly, only within the last 5 million years. Quite surprisingly, very few species of Odonata are shared by these two large land masses; only 10% of New World Anisoptera and less than 6% of New World Zygoptera occur on both continents. That being said, and to continue with the update, we know the nymphs of approximately 70% of the 800 or so species in North America, but only 28% of the more than nearly 1400 known species in South America (for those of you adding 800 and 1400 and getting a total of 2200, remember the percentage of sharing I just mentioned—nearly 200 species occur on both continents). In North America, 76 percent of the Anisoptera and 61 percent of the Zygoptera are known in the nymph stage, whereas 35 percent of the Anisoptera and 21 percent of the Zygoptera of South America are known (Fig. 1).

Descriptions of the nymphs of nearly as many New World species have appeared within the last 30 years as the prior 100 years (roughly 400 v. 420). Greater effort has been given to the North America fauna. Poorer known of the two suborders on both continents are the Zygoptera (are we avoiding them or are they avoiding us?). A few examples will elucidate the current situation with New World damselfly nymphs: 1) 24 of the 51 Coenagrionidae genera (46%) are undescribed; 2) 77% of the 135 Megapodagrionidae species are unknown; 3) more than 85% of the Perllestidae, Platystictidae, Polythoridae and Protoneuridae

combined are unknown. Some of the most difficult to find damselflies are in the latter five families (e.g., I finally found nymphs of *Heteropodagrion*, a waterfall, shade-dwelling megapodagrionid, after many years of searching for them in mountainous streams, by poking my fingers in sheet flow pouring down near-vertical rock faces; see Tennessen, 2010).

While the situation in South America looks paltry, things are improving. More people are becoming interested in searching for, rearing, and studying nymphs; colleagues in Argentina, Brazil, Venezuela, and more recently in Colombia have been publishing exciting new discoveries, and several colleagues who live in other parts of the world have also contributed papers on our fauna. Still, how much have we caught up? I ask this question because there are many undescribed South American species that are known but awaiting description (probably between 100 and 200 sitting in collections). For example, Rosser Garrison (pers. comm.) has at least 30 new species of *Argia* from the Neotropics yet to describe. If we add just these to the Zygoptera fauna of South America, our percentage of known nymphs drops to less than 20 percent. On top of this, many more new Odonata are yet to be discovered in the Americas, especially in South America where large areas of forest remain under-collected.

On the other hand, while things appear to look pretty good in North America, below the surface it is not so rosy. Middle America lags behind the region from Mexico north. In temperate North America (the United States and Canada) the nymphs of all but 25 species are known (about 95 percent). However, many of the “known” species are merely keyed out, with no detailed description having been published. Others were described long ago when few species were known and so a diagnosis was not possible; moreover, those descriptions were usually extremely short, vague and without illustrations. Furthermore, early workers described some species by supposition, which turned out to later hamper knowledge. Rarely have these problems been addressed in recent times. Another shortcoming is that most of our species are known only as full grown nymphs; very few have been reared from eggs or early stadia, and as a result, we do not know which characters, if any, are reliable in earlier stadia.

The shortage of detailed, comparative description leads to several gaps and questions. We know very little about life history and habitat requirements of most species.

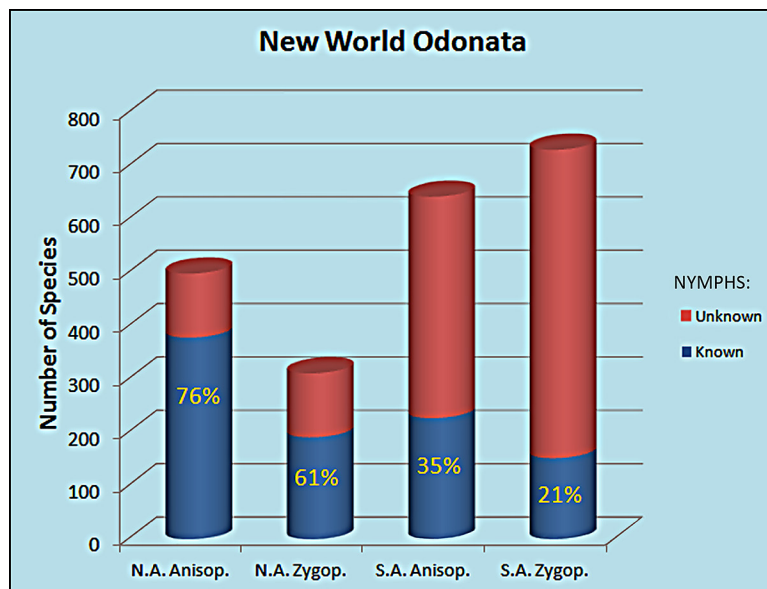


Figure 1. Number of species of Odonata and the percentages of nymphs known in North and South America

If species are in need of conservation efforts, how can we protect them if we don't know where the nymphs are and what their life history needs are? How do factors such as season, habitat change or change in global climate affect taxonomic characters that we rely on to identify nymphs?


In summary, we have a long way to go, and it seems we are going at snail's pace. There are many challenges, major social, economic and environmental hurdles facing future research on Odonata nymphs in this rapidly changing world. In a period when few students are considering careers in whole-organism biology, one wonders if the rate at which taxonomic knowledge is being accumulated will accelerate to the point where dragonfly nymphs become well enough known to provide the information needed for protection efforts. In the same breath, the current meager

status of our knowledge on Odonata nymphs presents rich opportunities for those who wish to contribute to the scientific literature on Odonata.

I thank Rosser Garrison and Frederico Lencioni for advice and information on the Zygoptera of the New World.

*Some of the information included here was part of a paper I presented at the Entomological Society of America annual meeting held in Reno, Nevada, on 13 Nov. 2011.

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First Florida Record of *Tauriphila azteca* Calvert (Aztec Glider)

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On 21 August 2011 we collected a female *Tauriphila azteca* Calvert (Aztec Glider) at Loyce Harpe County Park, in Polk county Florida. It was flying with a swarm of *Miathyria marcella* (Hyacinth Glider) and *Pantala flavescens* (Wandering Glider). Loyce Harpe Park is reclaimed phosphate mine land with mixed second growth hardwoods and open weedy pastures. The park contains numerous lakes and reclaimed pits many with floating vegetation.


This represents the first record for Florida and only the third record for the United States, two in Texas. The known distribution is northern Mexico south to Costa Rica (Paulson & Dunkle, 2011) and Cuba (Dunkle, 2000). The specimen is deposited in the University of Texas Insect Collection, Austin, Texas.

Acknowledgements

Identification was confirmed by Dennis Paulson and John Abbott. Thanks to Ed Lam for providing photographs for comparison and Troy Hibbitts for comments about this species.



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Would You Believe a Million Meadowhawks?

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Yes, I said a million. Or perhaps 100 million. Netta Smith and I visited south-central Oregon on 24–26 September 2011 to look for birds, which as usual were in great numbers. But we were struck even more by the numbers of

odonates. Rather than diversity, we found abundance. Two species were there in prodigious numbers like I have never seen before. All observations were in Harney County.

Striped Meadowhawks (*Sympetrum pallipes*) seemed the most abundant and ubiquitous. Our first stop near water was at a big pond on the east side of Hines. As soon as we stopped, we saw *Sympetrum* everywhere. My first thought was that we were seeing a migration of Variegated Meadowhawks, *S. corruptum*, but as soon as I started looking closely I realized they were all Striped. I never saw a Variegated or any other meadowhawk while we were there, even though I looked constantly. Perhaps if I had realized right away that none of the dragonflies were at the water, I would have shifted my thoughts to one of the species such as *pallipes* that uses seasonal wetlands.

On our first afternoon, the temperature reached 92° F, what anyone would call very hot. We stopped at several places along the road and saw that the barbed-wire fences were covered with meadowhawks. They clearly chose to perch on the barbs rather than the wire between them, and in some places there was a dragonfly on just about every barb.

We stopped at Wrights Point, a long rocky ridge that extends out into the Blitzen River basin, and were flabbergasted at the numbers of Striped Meadowhawks there, flushing from the road and shrubs and dead tree branches. In addition, there were hundreds of Spotted Spreadwings (*Lestes congener*) in the shrubbery, only visible at closer range, although occasionally one would just fly across in front of me, perhaps flushed by one of the meadowhawks we were scaring up.

We got back into Burns at about 6:30 PM, and when we stopped at a gas station to refill, I noticed dragonflies going past. Quickly we realized that we were seeing a flight. In all directions there were single meadowhawks heading just a little east of south, right into the face of a moderate breeze. We estimated at least 10/minute passing right in front of us, and we walked 50 yards to the grass behind the station and saw the same numbers. If they were flying over a broad front, there were hundreds/minute.

The sky was clouding up, and the flight fell off after about 15 minutes. At 6:45, there were still a few dragonflies passing, and there were many perched in the bushes. The flight seemed exactly like a migratory flight, yet the species is not known to be migratory, and I presume this was a local flight, perhaps individuals dispersing to find new breeding areas. I wondered if the high density of individuals would lead to such a flight.



Striped Meadowhawks (*Sympetrum pallipes*), south of Burns, Harney Co., Oregon, 24 September 2011. Photo by Dennis Paulson.

The second day dawned cool, cloudy, and windy, and odonate activity fell dramatically. Nevertheless, the high temperature reached about 60° F, and we still saw meadowhawks and spreadwings wherever we stopped. It was warm enough that they were well able to fly as we flushed them, and many of them were perched in the same situations as on the preceding and following sunny day. The third day dawned clear and cold, but it warmed up rapidly to a high in the low 70s before we left the area to head back to Seattle.

All the odonates were sexually mature; I never saw one that I could call immature. All male meadowhawks had red abdomens, as did a small percentage of the females. All male spreadwings had blue eyes and a pruinose abdomen tip.

On all three days, we stopped at additional oases of trees and shrubs in the midst of the vast prairie, shrub-steppe and wetland habitats, and every one of them was full of both *Sympetrum* and *Lestes*. As we walked along dirt paths, the meadowhawks rose one after another and fluttered off into the surroundings. We could look up a path and see them all over the sunlit ground. A diversion into the edge of any patch of woodland would reveal spreadwings all over the branches and twigs.

In several areas both species were perched on rock walls and sidewalks, the *Lestes* alongside the *Sympetrum*. As we flushed them, many of them ended up landing again near another, which in turn would flush, a chain reaction of fluttering.

Perhaps the third day was the most surprising. As we drove along a road through open fields just east of Burns

at 11:30 AM, temperature around 70° F, we started seeing *Sympetrum* flying across the road as we had on the evening of the first day. But they were in copulating pairs, not individuals! They were moving in the same direction as before, just east of south but still into a light breeze. I speculated that the wind direction was setting the flight direction, but who knows? This flight lasted the half hour that we were in that area and extended across at least a mile of road. Clearly thousands of individuals were participating.

As we drove into Burns at about noon, the flight was still going, patchy because of large buildings and areas of dense trees, but whenever we were in the open, there they were, crossing busy highways, all in exactly the same direction. Perhaps 10% of the individuals were single, but all the rest were in the wheel position. It was a fantastic sight. We saw no evidence of oviposition anywhere, nor did we see any sign of breeding in the spreadwings, yet I have no doubt that it took place somewhere.

We had to leave and started west on highway 20 toward Bend. There were still pairs going across the road up to about 10 miles west of Burns, then we saw no more but a few singles. We stopped in a rest area 16 miles west of




Striped Meadowhawks (*Sympetrum pallipes*), Burns, Harney Co., Oregon, 26 September 2011. Photo by Dennis Paulson.

Burns, and there were Striped Meadowhawks and Spotted Spreadwings all over the open grass, perched on the ground and in shrubs. Still the same species in abundance, but there was no mating, no flight. We stopped again at Hampton Station, much farther west, and again saw a few meadowhawks, but nothing in the air.

These observations were of the greatest interest to me in several ways. (1) I have never seen so many individuals of single odonate species spread over so much landscape. Underestimating all the time, I decided there was a minimum of 100 individuals/acre, and I think it was more like 1000/acre in many places. I thought the dragonflies were distributed over an area at least 50 × 30 miles, or 150 square miles. 150 square miles = 96,000 acres. At 100/acre, there were 9.6 million meadowhawks. Or perhaps there were 10× that many.

(2) Where did they all come from? Both species oviposit over dry land, then the basin fills with water during the winter rains, and the eggs hatch that spring, the larvae develop over the summer, and the adults are present in fall. So these individuals came from whatever wetlands filled during the winter of 2010–2011 and contained their eggs. 2011 has been an especially wet year, on the other hand, with Malheur Lake filling a huge area, so the eggs that were there produced a lot of larvae, thus the numbers we saw. But just a year ago, in spring 2010, there was almost no water in Malheur Lake, and the whole basin was dry, dry, dry. That would have provided much habitat for widespread oviposition of meadowhawks and spreadwings. But if it was dry, where did those adults come from? The puzzling aspect of this is that eggs had to be there in the first place from some previous successful year, and 2010 should have been a poor one for these species, with little water and thus few eggs hatching and relatively few adults. Is it possible that the eggs of these species (and of course other odonates) can lie dormant for multiple years?

(3) The meadowhawks were active in the sun at shockingly low temperatures on the third day. I saw several in flight when our car thermometer (known to be accurate within a degree or two) read 39° and 42° F at two stops. I have no idea how much their body temperature could have been raised by basking, but I rarely see odonates when it is colder than 55° F.

(4) We were really surprised to see no other species at all, except for the very occasional Blue-eyed Darner (*Rhionaeschna multicolor*); about a half dozen were seen over the three days, usually foraging in the lee of a tree grove. We checked several ponds and found nothing at all flying at them. How could one see a million odonates and see only three species? As is so often the case in nature, observations generate more questions than answers. 

Nebraska Summer and *Dythemis fugax* (Checkered Setwing)

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This is the sixth year Peggy and I have visited Nebraska to survey dragonflies. The Panhandle counties at the western edge of the state were the main focus of the trip and the last of the 93 counties to receive a second visit.

In late July we were at our last Nebraska camp in the southwest corner of the state, mainly to look for *Erpetogomphus designatus* (Eastern Ringtail). The Pasekas had found this new state species in September last year in Red Willow County. But Rock Stream WMA in Dundey County was targeted for 22 July 2011. This turned up only five county records but they included *Plathemis subornata* (Desert Whitetail) and *Celithemis elisa* (Calico Pennant).

Plathemis subornata was known from two counties when we started the survey and now from four more. In all the sites where we have found it, *Plathemis lydia* (Common Whitetail) have also been present. In areas where there is a small pond or wide sluggish portion of a stream, both species will interact with vigorous chasing. When the stream narrows, sometimes to the point of only a few inches of open water, one finds nothing but *P. subornata* and often in abundance.

Celithemis elisa was first recorded from the state in Cherry County at the 1998 DSA meeting. Since then it has turned up in 22 other counties scattered over the state, but this was the first sighting for the trip.

I wander off the subject. The 22nd was a particularly warm day, over 100°F, in an unusually warm July, but a stop in Hitchcock County on the way back to camp was tempting. Two years ago a borrow pit on south side of Republican River at Stratton was very productive. Today the Republican River was running very high and *Hetaerina americana* seemed to be the only species present. At first glance the pond was equally bland with the usual three *Libellula* (skimmers), *Erythemis* (pondhawks), *Tamea* (saddlebags) plus *Enallagma civile* (Familiar Bluet) and *E. basidens* (Double-striped Bluet). Then I spotted *Celithemis elisa* and after several missed attempts (heat and fatigue do that to me), I went back to the car for the swat net. This is a 10 × 4 foot section of 25 mm mistnet mounted on fishing rods. The *Celithemis* was then caught with ease. In the process I had noted an unrecognized species—looking into sun it looked like a large *Leucorrhinia* (yellow spot on abdomen) or small *Tamea* as it showed basal wing spots. Finally got sun behind me and saw the red eyes and realized this was something new for the state. The various *Libellula* and *Tamea* constantly harassed it so it

couldn't stay on a perch more than a few seconds before flying. When it flew it went out over the pond and after some time would cross the circling band of odonates and regain its perch only to be driven off again. When it swung close to shore the swat net dropped and a male *Dythemis fugax* was under the net. This was a first for the state and a considerable range extension from southern Kansas. How many others were there? Probably none but the hot day won and I proceeded to camp.

What about the rest of the trip? We started in Lancaster County at the eastern edge looking for the disjunct population of *Ischnura barberi* (Desert Forktail) in the Lincoln area. We had missed it on two previous attempts but this time we had Steve Spomer, University of Nebraska, as a guide and he took us to Dakota Springs. This small salt spring, in open grassland, forms a tiny stream, with water more saline than seawater, overhung by saltgrass. *Ischnura barberi* were super abundant in this habitat and practically the only species present. A better site and close to the area where the species was originally found in the 1930s is a ditch along I-80 and essentially inaccessible because of restrictions on parking on an interstate. Steve says the species is common in June and August and much harder to find in July. Ken Tennessen confirmed the July scarcity on a visit after the Colorado meetings.

From there we went to Custer County, center of state in the Sandhills, where Tim Hadja showed me good odonate sites including the stream where he had found the northernmost record of *Argia nahuana* (Aztec Darner). A heavily modified shallow stream through the Broken Bow city park but with fair flow of water and ample stream vegetation—*Argia alberta* (Paiute Dancer), *Enallagma anna* (River Bluet) and *Amphiagrion* (Red Damsel) also present. Tim is a high school student, a super competent birder and dragonfly enthusiast.

Then time for DSA meeting in Colorado with an overnight in Kimball County on way—*Libellula subornata*, *Erythemis simplicicollis* (Eastern Pondhawk) and *Leucorrhinia intacta* (Dot-tailed Whiteface) were found as new county records. *Erythemis simplicicollis* and *Pachydiplax longipennis* (Blue Dasher) are very difficult to find in the western counties and we found one teneral *Erythemis* and no *Pachydiplax* after visiting several sites with stereotypic habitat. *Leucorrhinia intacta* seems to have good years and bad years and is normally very difficult to find. This was a good year and we added Kimball County and four other counties to the 18 already listed.

After the Colorado meetings we went to Scotts Bluff, forced to camp at a new site as Platte River was out of its banks. Nothing spectacular but picked up some more *Epitheca cynosura* and *petechialis* (Common and Dot-winged Baskettail) for Nick Donnelly to puzzle over and numerous county records from Banner and Morrill counties. Banner County seems to have only one pond and that a small man-made pond for wildlife. Usually I don't revisit ponds, as the chances for new species are limited. No choice here as only the one pond. Three miles of back roads and a mile walk later, I arrived at the pond and quickly recorded a *Lestes* (spreadwing), three *Enallagma* (bluets), *Leucorrhinia* (whiteface) and two *Sympetrum* (meadowhawks) new for the county and pushed county total to 30—for reference only 34 of 93 counties have more species.

Our next camp at Chadron in the northwest corner of state (Dawes, Sioux and Sheridan Counties), was centered on finding *Argia immunda* (Kiowa Dancer) and *A. lugens* (Sooty Dancer). There are disjunct records in the Black Hills of South Dakota and Nick Donnelly felt they might be in streams of the Pine Ridge in Nebraska. A visit to Matt Brust and Randy Lawton at Chadron State College was incredibly productive (some 15 county records in their collections) but also discouraging. They felt there were no rocky streams in the area because the local rocks quickly deteriorate to mud stone in water. As a result Matt and I went to Hot Springs in South Dakota to see what proper habitat was. At Cold Brook on northern outskirts of town we quickly found *Argia immunda*, *Erpetogomphus designatus* (Eastern Ringtail), *Brechmorhoga mendax* (Pale-faced Clubskimmer) and *Libellula saturata* (Flame Skimmer), but no *Argia lugens*. All the above species are isolated from the core range by hundreds of miles but are the dominant species in the stream we sampled near Hot Springs. Are water temperatures in winter important for these disjunct populations? We may revisit to find how far from Hot Springs one can find the species.

The next day Matt Brust and I went to Smith Lake in Sheridan County and then the outflow stream from the lake. It was a banner day with 17 county records (reminiscent of the first Nebraska trip when 20 records a day was common). Highlight was *Somatochlora ensigera* (Plains Emerald), a new state species for me.

This effectively ended the collecting part of the trip although we would go to the Republican River on southern edge of state and do some collecting before meeting our daughter. We then took a day to just be tourists. We went to Toad Stool State Park. A badlands area but with tons of mosquitoes because of recent rains and a surprise second Nebraska record for *Libellula forensis* (Eight-spot-

ted Skimmer), another new state species for me. From there we backtracked and then headed off on a few more miles of marginal dirt roads to Hudson-Meng Bison Bone Beds. Nice to be in a large air conditioned barn looking at the excavated bison bones but there was a small spring fed pond just outside and despite 100 degree heat, I had to check it (bison bone beds were discovered when the pond was being constructed). I was immediately confronted by an abundance of *L. forensis*, plus another first Nebraska specimen for me—*Libellula quadrimaculata* (Four-spotted Skimmer). A fitting close was late lunch at the Drifters Cookshack. You figure the place has to be good if all the tables are taken and it's 50 miles from the nearest town with 20 miles of that over poor dirt roads. Definitely worth a stop while you're finding your *L. forensis* and I recommend the buffalo burger.


This was probably our last major trip to Nebraska, although there are still 13 species I haven't seen in the state and lots of potential candidates for the state list. The Missouri River and southeastern counties best areas to check. When we started there were 843 county records (now close to 3000), 100 species (now 110), over half the counties with no records (now all with at least 21). County lists are never going to be huge. The present county totals represent a nearly comparable coverage of each county and additions will be early or late season species we have missed or less common species. The eastern half of the state falls in the 21–30 species range with an increase in diversity as one goes west and north. Only four counties exceed 50 species and three of these are in the northwest.

Acknowledgements

On this trip we wish to thank Tim Hadja for taking time to show us sites in Custer County. But also thanks to his family and the extended Paseka family for their hospitality. Matt Brust and Ray Lawson of Chadron allowed us access to the Chadron College collection, shared invaluable local knowledge and field assistance as well as welcoming us into their home and community. Steve Spomer, University of Nebraska, took time off on a very hot day to show us a special damselfly. A trailer repair shop in Ogallala and transmission shop in Kearney corrected what could have been potential problems.

On all our trips, this included, we have been assisted by too many people to mention individually, but all of them have been important. First, we appreciate the huge number of landowners who have allowed us to chase odonates on their property. We thank the people in the Nebraska Game and Parks Commission who have been uniformly helpful at parks, state recreation areas, wildlife management areas, answering all e-mail queries and issuing

permits. The entomology section of the state museum at University of Nebraska granted us use of the collection. We thank the many other Nebraska residents who have helped us by just having a curiosity about nature. Roy Beckemeyer and Nick Donnelly, perhaps unknown to them, launched me on this study and have been very sup-

portive. We appreciate the Pasekas of have incorporated the new records in the University of Nebraska web-site, <<http://www-museum.unl.edu/research/entomology/Odonata/index.html>>, thus making them more useful and available to the odonate community than would otherwise have been the case. 

Splash-Dunk Analysis, 2011

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Those who enjoy the study of dragonflies are well aware of their wide range of interesting behaviors. In the fall of 2010, my wife Betsy and I observed and documented with slow-motion videos, a coupled set of behaviors that we found to be most intriguing. As reported in a recent issue of ARGIA (Walker, 2011) we observed dragonflies (mostly darners) hitting hard into the water, producing a distinctive splash-dunk. Then, after one or more splash-dunks, the dragonflies gain altitude and perform a wonderful twirling, tumbling motion that we call the spin-dry. The spin-dry is much like a high diver spinning in the tuck position, except in the case of dragonflies, the rotational rate is in excess of 1,000 rpm! As a result, the dragonflies shed their burden of water in a spiral burst of droplets.

After our initial observations last year, we decided to study these behaviors in more detail this dragonfly season. In this report we focus on the splash-dunks observed during the summer of 2011. A later report will give details of the spin-dry behavior.

Splash-Dunks By Species

Though a few splash-dunks were observed in Four-spotted Skimmers (*Libellula quadrimaculata*) and Autumn Meadowhawks (*Sympetrum vicinum*), the results presented here are for darners. Specifically, the early season splash-dunkers were Blue-eyed Darners (*Rhionaeschna multicolor*), followed by Paddle-tailed Darners (*Aeshna palmata*) and finally Shadow Darners (*A. umbrosa*).

The Paddle-tailed Darners were by far the most commonly observed species in our area, and their splash-dunks provide a good basis for comparison. They hit the water hard, making a big splash, and then rise to a height of perhaps 10–20 ft, where they spin rapidly for about 6 or 7 full rotations. After this spin-dry, they continue upward toward the treetops.

In comparison, Blue-eyed Darners hit the water with less force. They also tend to spin-dry at a lower altitude, and are frequently observed to spin-dry 2 or 3 times in suc-

cession—each spin-dry consisting of several rotations. Shadow Darners also hit the water with relatively little force, and are often seen to fly away afterwards without doing a spin-dry.

Splash-Dunk Dynamics

The splash-dunks of Paddle-tailed Darners are quite impressive in both shape and size. In terms of shape, the splashes have a distinctive three-pronged appearance, looking a bit like a Loch Ness monster with wings. The center prong of the splash is due to the body, and the side prongs are due to the wings.

As for size, a frame-by-frame analysis of the slow-motion videos show that the splashes take about $t = 0.25$ s to rise to their highest point. This height can be calculated with constant-acceleration kinematics. The result is $height = 0.5gt^2$, where $g = 9.81$ m/s² is the acceleration due to gravity. Substituting numerical values yields $height = 31$ cm ~ 1 foot. For comparison, the length of the darner is roughly 7.0 cm. If a 6 ft person produced a similarly proportioned splash, it would be about 26 ft high! Pretty impressive.

Splash-Dunk Distribution

When a dragonfly comes into contact with the water, we refer to it as an event. One of the pieces of data we collected during the summer was the number of splash-dunks during a given event. An event might consist of a single splash-dunk, or a series of dunks in quick succession. For example, Corbet (1999) mentions an observation of a Brown Hawker (*Aeshna grandis*) hitting the water three times in succession.

During the course of the summer we collected data on 148 events, with a total of 288 splash-dunks. The number of splash-dunks per event ranged from 1 to 6, with an average just under 2 (Fig. 1).

The fact that the number of splash-dunks falls off exponentially implies the dunks are independent events—like

successive flips of a coin or the decay of radioactive nuclei. In the case of dragonflies, the implication is that once a

dragonfly dunks, the probability that it will dunk again is independent of the number of dunks it has already performed. You might say that a dragonfly “lives in the moment,” deciding whether to dunk again with no regard to its past history.

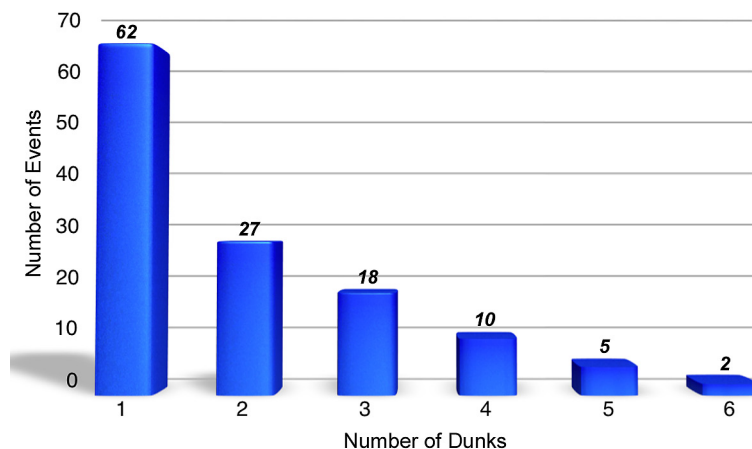



Figure 1. A plot of these results shows a nice drop off in numbers that is well approximated by an exponential decay. A good “fit” is given by $N = e^{-0.65x}$, where N = number of events and x = number of splash-dunks.

We had no idea what to expect for the splash-dunk distribution when we started this project. The results show that the most basic observations can lead to interesting insights into nature.

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Book Review

Natural History of Delmarva Dragonflies and Damselflies—Essays of a Lifelong Observer. By Hal White. University of Delaware Press, Corvallis. 284 pp. ISBN 978-1-61149-000-8. \$30.00

Reviewed by **J.C. Abbott**, Austin, Texas <jcabbott@mail.utexas.edu>

Among the many regional field guides on Odonata that have been published over the last 10 years, Hal White has offered us something different. His book on the Natural History of Delmarva Dragonflies and Damselflies does list the more than 125 species known to occur in the region covered by the book (a small area encompassing parts of Delaware, Maryland, and Virginia bordered by the Chesapeake Bay, Delaware Bay and Atlantic Ocean), but its main objective is not identification. Hal writes in the preface that he “. . . wanted to write for people who already had an interest in dragonflies and damselflies and wanted to know more.”

The book is laid out as a series of vignettes for each of the 131 species of dragonfly and damselfly that occur in the Delmarva Peninsula. These take different forms, but are rich with notes on life cycles, biology, and natural history, all written in an entertaining way and intertwined with stories of people and interactions that makes this a fun, humorous read. The vignettes can be read for both “pleasure and information.”

The Table of Contents is laid out “to accommodate three different types of readers.” The vignette title and the scientific and English names are given for each species being discussed. This makes it incredibly versatile and allows readers with no experience, to those with a solid introduction to the group, and experts alike to make their way to sections of interest. Vignette titles are descriptive and range from musings like “Courtship and Cuckoldry” or “Seeing the Unexpected” to

A Call for Papers for BAO

The Bulletin of American Odonatology is in need of manuscript submissions. It has been more than a year since the last issue of BAO appeared (vol. 11, no. 1), in case you haven’t kept track. That issue contained six relatively short contributions. I now have two short manuscripts in the queue and two other possible manuscripts not yet submitted, but that is not enough to put out an issue. If you have a manuscript in preparation, please contact John Abbott (Editor in Chief) or myself and let us know your timetable.


If BAO is to continue to be a vehicle for timely reporting of research results on the Odonata of the New World, you are the ones who can make it happen. We can’t publish manuscripts we don’t receive.

Ken Tennessen <ktennessen@centurytel.net>, Editor, BAO

“Tribute to Edmund M. Walker” and “A Calvert Species.”

Each vignette includes a small county map of the Delmarva Peninsula showing the range of the species being highlighted. Additionally, there are one or more photographs for each species (most taken by Hal and Jim White).

There are a number of very informative appendices that accompany the main text. They include a list of species that may occur on the Delmarva Peninsula, historic records on the Delmarva Peninsula, habitats and finally a checklist of the species of the Delmarva by county along with their known seasonality.

Hal’s passion for dragonflies and damselflies certainly comes through in this book. It is full of amazing tidbits accumulated over his 50 years of experience. Hal states, “this book is a plea to humankind on behalf of a few or our fellow earthlings whose survival we threaten.” Through his writings Hal is using his years of experience learning about odes, to encourage a return to the wonder of nature—encouraging us to experience biodiversity directly, and to appreciate just how precarious it is. 

Photos Needed

Have any high-quality photos of odonates? We are always looking for great photos to use on the front and back covers of ARGIA. Contact John Abbott at <jcabbott@mail.utexas.edu> if you’d like to make a contribution. Images in TIFF format are best, but JPEGs work too as long as they are high quality and compression artifacts are limited. Resolution needs to be 300 ppi at about the sizes you see printed on this issue (no more than 6.5 inches in width).

ARGIA and BAO Submission Guidelines

Digital submissions of all materials (via e-mail or CD) are vastly preferred to hardcopy. If digital submissions are not possible, contact the Editor before sending anything. Material for ARGIA must be sent directly to John C. Abbott, Section of Integrative Biology, C0930, University of Texas, Austin TX, USA 78712, <jcabbott@mail.utexas.edu>; material for BAO must be sent to Ken Tennessen, P.O. Box 585, Wautoma, WI, USA 54982, <ktennessen@centurytel.net>.

Articles

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

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

Figures

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

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

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

Tables

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

The Dragonfly Society Of The Americas

Business address: c/o John Abbott, Section of Integrative Biology L7000, University of Texas at Austin, 2907 Lake Austin Blvd., Austin, TX, USA 78703

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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 subscription to ARGIA.

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

Membership in the Dragonfly Society of the Americas

Membership in the DSA is open to any person in any country and includes a subscription to ARGIA. Dues for individuals in the US, Canada, or Latin America are \$20 us for regular membership and \$25 us for institutions or contributing membership, payable annually on or before 1 March of membership year. Dues for members in the Old World are \$30 us. Dues for all who choose to receive ARGIA in PDF form are \$15. The Bulletin Of American Odonatology is available by a separate subscription at \$20 us for North Americans and \$25 us for non-North Americans and institutions. Membership dues and BAO subscription fees should be mailed to Jerrell Daigle, 2067 Little River Lane, Tallahassee, FL, USA 32311. More information on joining DSA and subscribing to BAO may be found at <www.dragonflysocietyamericas.org/join>.

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Back cover: Assorted photos of odonata nymphs. From left to right, top row: *Sarracenia* Spiketail (*Cordulegaster sarracenia*), American Rubyspot (*Hetaerina americana*), Gray Petaltail (*Tachopteryx thoreyi*); middle row: Eastern Pondhawk (*Erythemis simplicicollis*), Wandering Glider (*Pantala flavescens*), Ebony Jewelwing (*Calopteryx maculata*); bottom row: Northern Spreadwing (*Lestes disjunctus*), Bronzed River Cruiser (*Macromia annulata*), Common Sanddragon (*Progomphus obscurus*). Photos by John C. Abbott.

