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Update on the Oklahoma Odonata Project: Anisopterans

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In the last issue of ARGIA we began an update on the Oklahoma Odonata Project (Smith-Patten and Patten, 2016). That update presented some of the more noteworthy records of zygopterans in Oklahoma that occurred in the past couple of years. We continue here with interesting records of anisopterans.

As in the last paper, we use a number of abbreviations, including using M for male, F for female, U for unsexed individuals, and imm for immature. We also truncated locality names: County (Co.); Little River National Wildlife Refuge, McCurtain Co. (LRNWR); National Wildlife Refuge (NWR); Red Slough WMA, McCurtain Co. (Red Slough); The Nature Conservancy (TNC); and Wildlife Management Area (WMA). Museums and other data sources cited include the Dennis R. Paulson Collection (DRP), Essig Museum of Entomology Collection (EMEC), International Odonata Research Institute (IORI), John C. Abbott Collection (JCAC), Odonata Central (OC), Oklahoma Odonata Project (OOP), Smith-Patten/Patten Collection (SP), University of Central Oklahoma (UCO), and University of Michigan Museum of Zoology (UMMZ). Collectors/observers cited multiple times are the authors, Brenda Smith-Patten (BS-P) and Michael A. Patten (MAP), and A. Earl Pritchard (AEP), Berlin A. Heck (BAH), Bill Carrell (BC), David Arbour (DA), Emily A. Hjalmarson (EAH), George H. Bick (GHB), James W. Arterburn (JWA), Ken Williams (KW), Lothar E. Hornuff (LEH), and Mike Dillon (MD). If a specific collector is not named, the record is from BS-P, MAP, or both. Months are abbreviated to three letter codes.

Aeshnidae

In the fall of 2015, Shadow Darner (*Aeshna umbrosa*) was reported twice from Doby Springs Park, Harper Co. The first was when

MAP photographed and collected a lone F on 12 Sep (SP1792, OC436454). The second record, when BC photographed a M on 25 Oct, extended the (then) late date for the species in Oklahoma by six days (OC438261). BC was also responsible for the first record of Shadow Darner at this locale just two years prior when he photographed a F on 1 Sep 2013 (OC409996). That record stands as the earliest date for that locality and for northwestern Oklahoma and the panhandle. But the earliest date for the state as a whole is 26 Aug, which came from a 2006 record from Red Rock Canyon State Park, Rough Horsetail Trail, Caddo Co., in central Oklahoma (1M, OC7299, Randy Anderson). The species was reported only once in 2016, on 16 Nov, which surpassed the 2015 late date by three weeks (3 pair, Cookson WMA, Cherokee Co., Colby Farquhar, 1F as SP2224, 1M as OC458375, Fig. 1).



Figure 1. Male Shadow Darner (*Aeshna umbrosa*) captured on 16 November 2016 at Cookson WMA, Cherokee Co., by Colby Farquhar (OC458375). This record is the late flight date for the species in Oklahoma.

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Calendar of Events

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

Event	Date	Location	Contact
SE DSA Meeting	12–14 May 2017	Conyers, Georgia	Jerrell J. Daigle <jdaigle@nettally.com>
DSA Annual Meeting	9–11 June 2017	Staunton, Virginia	Paul Bedell <pbedell@verizon.net>
Ohio Odo-Con	23–25 June 2017	Ashtabula Co., Ohio	Jim Lemon <jlem@woh.rr.com>
Eagle Hill Odonate Seminar	2–8 July 2017	Steuben, Maine	see < http://tinyurl.com/gvwhupg >
NE DSA Meeting	13–16 July 2017	New Hampshire, Vermont	B. Pfeiffer < http://bryanpfeiffer.com/nedsa/ >

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Regal Darners (*Coryphaeschna ingens*) have been seen in the state every year since they were first discovered in Oklahoma in 2008 (7 Jul, 1M, Red Slough, BAH and DA, JCAC24061, OC282822, Arbour et al., 2009). This species now has two known populations in Oklahoma—Red Slough, McCurtain Co. and Boehler Seeps and Sandhill Preserve, Atoka Co.—and one vagrant record. Its overall flight season is known from 6 May until 10 Sep (early date is from BAH and DA, 1 individual, OC374781; late date is a DA sight record of 1M; both records are from Red Slough). In 2015 Regal Darners were seen at Red Slough between 3 Jun (1 imm F, DA, OC431303) and 26 Aug (6M, BS-P, MAP, DA, MD). In 2016 they were seen between 4 Jul and 2 Aug. The later date was a sighting by DA of a pair. The record with the earlier date was one that was quite startling given that it is from Great Plains State Park in Kiowa Co. This location is well outside the Gulf Coastal Plain, where the species is expected, by some 290 km (180 mi) west of the nearest known population (Boehler Seeps, Atoka Co., at which it was first discovered 20 Jul 2014, 3M, OC424926). MAP managed to snap a couple of blurry photos of the single M, which in addition to getting good views of it in flight, persuaded him to submit the record as OC449014. As remarkable as this record is for Oklahoma, it is not the westernmost for the species given one from Lubbock Co., Texas (Jerry Hatfield, 29 Oct 2012, OC385434).

The Harlequin Darner (*Gomphaeschna fuscillata*) was first found in the state in 2008 at Grassy Slough WMA, McCurtain Co. (7 Apr, BAH, OC281940; Arbour et al., 2009; although the species was likely photographed the day before when DA and Matt White snapped a blurry photo, OC281933). The species has been seen two other times at that locale, both by BS-P and MAP on 11 Apr in 2014 and 2015 (3M, two as SP1116–1117, OC421866; and 1M seen, respective years). We were not able to survey the slough again in 2016 to monitor the population, but given the site's protected status we have no reason to think the population there is not doing well. The species is now known from four additional localities, albeit from only two counties (McCurtain and Atoka). Elsewhere in McCurtain Co., the species has been reported at the nearby Red Slough (8 Apr 2009, 1M, DA, OC312505) and more recently from two locations within LRNWR. BS-P saw three individuals at Forked Lake, LRNWR (1M as SP1847) on 3 Apr 2016, which is the only time the species was reported in 2016, and it became the earliest flight date for the Harlequin Darner in Oklahoma. On the other side of the refuge the Harlequin Darner was first found patrolling a dirt road on 18 Apr 2009 (BAH, OC312574). It was seen again there in 2014 on 3 May (2M, one as SP1165, BS-P, MAP), also patrolling a dirt road, and in 2015 on 18 Apr (DA sight record, 1 individual). The 3 May record is the latest date known for Oklahoma. Harlequin Darners were first found in Atoka Co. on 25 Apr 2015 by MAP (Boehler Seeps and Sandhill Preserve, south end of Hassell Lake, 3M, 1 as SP1562, OC430571). We returned to the site on 1 May when we saw and collected 1M (SP1533). We suspect that there are additional sites in the state that sup-

port this species, but its short flight season makes the species one that is difficult to survey for given our person-power limitations. One final item of note for this species is that we inadvertently omitted it from Table 1 of our 2104 update (Patten and Smith-Patten, 2014b).

Gomphidae

Overall 2015 and 2016 were seemingly slow seasons for clubtails. Because we are studying Ozark Clubtail (*Gomphurus ozarkensis*) and Oklahoma Clubtail (*Phanogomphus oklahomensis*), it was disappointing that we did not encounter many of either species in 2016, especially given the flooding in Oklahoma in 2015 that prevented us from surveying intensively during much of their flight season that year.

Ozark Clubtails are known to fly in Oklahoma from 26 Mar until 9 Jul, but we did not encounter them in 2016 until 11 Jun (6M [2 as SP1942–1943], Osage Co., Salt Creek, 4 km NNE of Burbank, BS-P). Our second encounter was with a single F on 19 Jun in Le Flore Co. (Page, junction of Big Creek and Haw Creek Road, SP1979, MAP). The only other record for the year was a photograph from BC taken of one F at TNC's J. T. Nickel Preserve, Cherokee Co., on 24 Apr. These records make for a paltry sum, and even the eight records reported in 2015 constitute a slow season compared to our first field season intensively surveying for Ozark Clubtails. In 2014 we encountered the species 14 times and tended to see at least a small handful of individuals each time. In that year we also found it in numbers as high as 35 (along a dirt road above a dry creek bed within hardwood forest, 14 km W of Hochatown, McCurtain Co., 5 May 2014, 2M [1 as SP1170], 2F, 31U, with 2 pair). On another occasion in 2014 we had 19 individuals (Glover River, Highway 3, 10 km NE of Wright City, McCurtain Co., 14M [1 as SP1168], 5F). Perhaps 2014 was just a good year for the species in the state, but we continue to think the culprit is actually the 2015 flooding in eastern Oklahoma that presumably affected Ozark Clubtail populations. This seems especially likely when one considers that the species has been reported three other times (in 2009 and 2012) having individuals a dozen or more at a time, including 20 teneral reported from the Glover River (26 Mar 2012, 2M, 1F [all three sexed individuals as DRP] and 19U, BAH, JWA, & KW, OC374179).

Oklahoma Clubtails (*Phanogomphus oklahomensis*) fared better in 2016 than Ozark Clubtails did. There were nine encounters between 26 Mar and 8 May ("normal" Oklahoma flight season being 19 Mar to 14 Jun), but that still means there was roughly a month of the species' flight season in which it was not encountered. We have no guess as to why that was. The number of records for 2016 is comparable to 2015 (11 occasions between 11 Apr and 7 Jun), but it pales in comparison to 2014, when there were twice as many encounters. Despite the late start of a couple of weeks of our 2014 field season, Oklahoma Clubtails were

encountered 18 times (15 by us and three by others) between 11 Apr and 2 Jun. Based on number of records we perhaps ought to consider 2014 an aberrant year for the Oklahoma Clubtail. But when considering numbers of individuals encountered, that argument wears thin. For example, since 2013 there have been four instances in which ≥ 10 individuals were reported during one survey, including in 2015 when MAP had 10M at Boehler Seeps and Sandhill Preserve, Atoka Co. on 25 Apr, and we recorded 50 individuals (10U teneral and 25M and 15F adults, with one pair [SP1511]) at BAH's property, 10 km SE of Idabel, McCurtain Co., on 11 Apr 2015. An earlier record also had a high individual count—AEP reported 24M and 2F on 28 Apr 1934 on Fourche Maline Creek, 8 mi N of Wilburton, Latimer Co. In contrast, in 2014 our highest count on a given survey was seven individuals (12 Apr, 1 adult M [as SP1137] and 2M and 4F teneral, Glover River, McCurtain Co.; 25 Apr, 5 adult M, 2 adult F, including one pair, Lake John Wells, Haskell Co.). Therefore 2014 may have been remarkable for number of records of the species, but abundance was relatively higher in other years.

We set a record in 2015 for the most times Banner Clubtails (*Hylogomphus apomyioides*) were seen in one year—twice! This is a species that was first seen in Oklahoma in 2010 on 15 May by BAH, when he photographed 1M on the Glover River at State Highway 3, 10 km NE of Wright City (OC318873). BAH returned on the 18 and 25 May, but he did not refind the species. He visited the site again the following year on 1 Apr when he photographed a teneral M (OC327591), but on return visits (six in 2011 between 2 Apr and 11 Jul and four in 2012 between 26 Mar and 17 Apr) he did not encounter it again. We surveyed the site twice in 2014 (12 Apr and 4 May), neither time finding a Banner Clubtail. On the latter visit we collected a pygmy Ozark Clubtail (*Gomphurus ozarkensis*, SP1168), whose size, at a mere 39 mm, initially made us think we had captured a Banner Clubtail, but whose pattern and appendages did not jibe (Needham et al., 2014 has total lengths as 35–37 mm for *H. apomyioides* and 50–53 mm for *G. ozarkensis*). We encountered 13M and 5F (2 imm F) Ozark Clubtails of more typical size at the same spot on the same day. Another visit to the location on 26 Apr 2015 did not turn up the species. Finally, on 2 Apr 2016, a single still somewhat-teneral M was collected (SP1843) when BS-P captured it in her baseball cap. No other Banner Clubtails, or other odonates for that matter, were seen that day. MAP returned to the site on 9 May with no luck. EAH visited the site again on 25 Jun, again with no luck. All told we have 20 reported visits to this site since 1996, when Sidney W. Dunkle visited on 12 Jun, but Banner Clubtails have only been seen there three times. It could be argued that for Oklahoma the phenology of the species would preclude visits in Jun and Jul ($n=7$). Banner Clubtails are known to fly in Louisiana, for example, from 25 Mar to 24 Apr (Mauffray, 2014) and Texas 12 Mar to 22 Apr (OC), although in the greater southeast they fly from Mar to 16 Jun (Beaton, 2007; OC); in Oklahoma we have records only from 1 Apr until 15 May. It is reasonable to suppose that it may fly in Oklahoma

until late May, but probably not beyond. Nonetheless, eliminating the Jun and Jul visits still leaves us with 13 visits to the site between Mar and May with a mere three encounters. Surveys elsewhere on the Glover River and at nearby sites that appear to be suitable proved unproductive for finding the species. Not surprisingly the encounter rate at the Glover River and neighboring sites leaves us a puzzled.

The Glover River site remained the only locale for Banner Clubtails in Oklahoma until early May 2015. On 1 May we visited the dam spillway at McGee Creek State Park late in the afternoon when we spotted a lone M perched on a mostly submerged bush in rapidly flowing, rather deep water. We managed to snap a few terrible photos of this M and took a couple of swings at it with a net, but as the sun went down we realized our chances were up. We returned the next day (technically, though deceptively, accounting for the two times the species was seen in 2015!) to find 2M and 1F, all skittish and perching mostly on submerged vegetation in deep, rushing water. We managed to get a couple of passable photos (OC430739) and then we eventually realized that at least one M and the F were occasionally alighting at a nearby hillside spring. That is where MAP was able to capture SP1537, which was the first specimen of Banner Clubtail for the state. To our disappointment, this all took place just days before the state began to experience severe flooding. The spillway was inaccessible until the species flight season was over. We were not able to survey the site in 2016, although EAH did make a visit on 26 Jun with no success, which is not surprising as, mentioned earlier, Jun is likely beyond the species' flight season in Oklahoma.

The Ashy Clubtail (*Phanogomphus lividus*) has been most reliably seen at BAH's property (10 km SE of Idabel) in McCurtain Co., where it was first encountered in the state in 2010 (7 May, BAH, 1F, OC318729). Of the 12 times it has been seen in Oklahoma, ten have been at that locale. The first time it was found away from BAH's property was on 11 Apr 2014, when we discovered 2M at Grassy Slough WMA, McCurtain Co. (1M as SP1510). Later that same day we surveyed BAH's property with BAH and found 2M and 2F. The following year we visited BAH's property, again on 11 Apr, and had 2M (1 as SP1510) and 1F. A survey of Boehler Seeps and Sandhill Preserve, Hassell Lake, Atoka Co., on 1 May 2015 produced the first record of the species outside of McCurtain Co. On that day we saw at least 1M, which we photographed and collected (SP1536, OC430736). MAP was the only person to report the species in 2016 (26 Mar, 1 teneral M, BAH's property). Ashy Clubtails have tended to be reported in low numbers (i.e., <4), but we have one record of approximately 12 individuals, all of which were judged to be teneral (23 Mar 2012, OC374172, DRP). This record is also the early flight date for the species in Oklahoma, with the 7 May 2010 record mentioned above being the late date.

The Cocoa Clubtail (*Gomphurus hybridus*) did not have a good

year in Oklahoma in 2015, or at least we did not have a good year for finding it. It fared better in 2016 but there were still only two reports. The first of the year was on 3 Apr when BS-P encountered 4M, 3F, and 3U at Forked Lake, LRNWR, McCurtain Co. (1M as SP1848, 2F as SP1949–1850). The second came a few days later on 8 Apr, when Ford Hendershot photographed a M at the Salt Creek Lodge, which is near the LRNWR but on the opposite end, some 25 km to the west (OC444887). *Gomphurus hybridus* has been seen in the state every year save two (2013 and 2015) since it was first documented for Oklahoma in 2007 (4 Apr, BAH, LRNWR, 1M, OC281873). All but two records have been at the LRNWR (n = 14; non-LRNWR records: DA photographed a F at Red Slough on 20 Apr 2010 [OC318500], and BS-P has a sight record for a single M at the Glover River, McCurtain Co., on 4 Mar 2014). As with the Ashy Clubtail, this species has a rather short flight season, but it does extend one month longer than *P. lividus* (early date: 29 Mar 2012, 1M, 9U, BAH, OC374204; late date: 6 Jun 2010, 1F, BAH, OC319632).

Two other clubtail species of interest in Oklahoma are the Bayou Clubtail (*Arigomphus maxwelli*) and the Two-striped Forceptail (*Aphylla williamsoni*). At the end of 2014 (Patten and Smith-Patten, 2014b) the Bayou Clubtail had been recorded twice in the state, both times from McCurtain Co. The first was from Grassy Slough WMA on 25 Apr 2002 (mis-reported in Table 1 as 2005; OC6584, DA) and the second from Red Slough on 1 Jul 2014, when the state's first specimens were collected (4M [2 as SP1306–1307], 2F, OC423827, BS-P, DA, MAP). The state's third and fourth records came in 2016, also from Red Slough. On 9 May Sylvia Hanson and DA photographed a F (OC444354), then DA had the species again on 9 Jun, when he photographed a M (OC446030). The known Oklahoma flight season, 25 Apr to 1 Jul, extends the late date for the species slightly but is well within the known early season for neighboring states (Texas: 30 Mar–28 Jun, Louisiana: 12 Apr–19 Jun, Arkansas: 7 May–23 Jun; data from OC). The two specimens taken on our late date remain the only specimens for Oklahoma.

Aphylla williamsoni is an interesting species for Oklahoma because its status in the state remains unclear. It has been seen at least once a year almost every year since 2005, when it was first found in the state (28 Aug, DA at Red Slough, 1M, JCAC20789, OC6542; mis-reported in Mills 2007 as 30 Aug), but it was missed in 2007 and 2012–2014. All but one of the records (1M, 6 Jul 2011, Raymond Gary State Park, Choctaw Co., BAH, OC329467) have come from Red Slough. The species was reported once in 2015 and four times in 2016 (2015: 11 Aug, DA and SE, sight record of 1 individual; 2016: 5 Jul, DA, 1M, OC448397; 9 Jul, MAP, 6M, OC449015, 1M as SP2164, only the second specimen for the state; 19 Jul, DA, 3M, sight record; Aug, no day reported, DA, 2U, sight record). The early flight date for the species in Oklahoma is 8 Jun and the late date is 16 Sep; both dates set by DA (early: 2009, 1M, OC313201 and late: 2008, 1F, OC283956). These dates correspond well with

neighboring states: Arkansas 16 Jun–9 Sep (OC), Texas 16 Jun–27 Sep (OC), and Louisiana 14 Apr–2 Nov (Mauffray 2014).

Cordulegastridae

The Arrowhead Spiketail (*Cordulegaster obliqua*), although fairly widespread and not a terribly uncommon species, is of note for 2015 and 2016 because it was added to five counties—Cherokee, Okfuskee, Okmulgee, Pittsburg, and Sequoyah—and was seen in one, Latimer Co., for the first time in 84 years. It is now recorded in 21 counties in eastern Oklahoma and one, Comanche Co., in southwestern Oklahoma. Notably, there were double the number of reports in 2016 (n=10) compared to a more “usual” 3–5 reports per year. This species is known to fly in Oklahoma from 7 May until 30 Jul (both records from 2011 at or near the Buffalo River in the Ouachita NF, early: 1M, GWL, OC327881; late: 1F, VWF, OC331141).

The Twin-spotted Spiketail (*Cordulegaster maculata*) is a rare species in the state and only known from one locality, BAH's property in McCurtain Co., where it was first discovered on 20 Apr 2010 (1 individual, BAH, OC318493). BAH photographed the species again the next two years (2011: 3 Apr, 1 pair, OC327593; 2012: 23 Mar, 1M, 3U, OC374173 and 26 Mar, 1F, 10U [“mostly females”], with JAW and KW, OC374178). In 2013, we are fairly certain we encountered 2F on 27 Apr but we have left this record as problematic because we saw these individuals late in the day under poor light conditions and we were unable to photograph or capture them. The species was not seen in 2016, but we did have it once in 2015 on 11 Apr when we saw 7M and 1F, and managed to capture the first specimens for the state (2M, SP1507–1508). This species remains inscrutable given that we and others have conducted surveys nearby as well as throughout McCurtain Co. and the Gulf Coastal Plains in the state, but we have yet to find it anywhere but at BAH's property.

Also, there are still no signs of Ouachita Spiketail (*Cordulegaster talaria*) since the single Oklahoma record of 1M that was photographed near Cedar Creek, 13 km WNW of Hochatown, along USFS road 51000/52400, McCurtain Co., on 18 Apr 2011 (Heck 2012; OC327732). In the past few years we have surveyed this area and similar habitat in McCurtain and Le Flore Cos. without success. The species otherwise is known only from a small area of western Arkansas (Fig. 2).

Macromiidae

Another group that we have been working hard at getting new records for and dealing with taxonomic issues of is River Cruisers (*Macromia*). Last year we discussed some recent records of *Macromia* (Patten and Smith-Patten, 2016), including the state's third record of the Allegheny River Cruiser (*Macromia alleghaniensis*) that came in 2016. Since then, there have been a couple of other interesting *Macromia* encounters.

In the past three years we have added 33 county records for *Macromia* to the OOP database: one by BC, one by Randy Kelley, three by BS-P, nine by BS-P and MAP, and 19 by MAP. Four additions were of the Gilded River Cruiser (*M. pacifica*), 10 of the Royal River Cruiser (*M. taeniolata*), and one of the Allegheny River Cruiser (*M. alleghaniensis*). The 18 other additions were for the Swift River Cruiser (*M. illinoensis*). One of those additions, for Ellis Co. (1M, Ellis Co. WMA, Commission Creek, 25 Jun 2016, MAP, OC447433), would have been the farthest west for the species' overall range if Martin Reid and Greg Lasley, had not photographed a M (OC447039) in Hemphill Co., Texas a week prior, just across the state line.

On the other side of the state a couple of days before, we encountered an interesting feeding swarm of at least half a dozen river cruisers on 22 Jun 2016 at a weedy field in a woodland at Spavinaw Game Management Area (GMA), Delaware Co. While working this swarm we captured a M “*wabashensis*” form of Royal (*M. taeniolata*, SP1972, OC447234) and likely had a M Gilded (*M. pacifica*) flying along with three other *Macromia* we were unable to identify. We also saw a perched M of the southern subspecies of Swift River Cruiser (*M. illinoensis georgina*), and to our utter shock captured a M northern subspecies of Swift (*M. illinoensis illinoensis*, SP1971, OC447233).

The state has had two photographic records that may be of the nominate subspecies, but our specimen is the first concrete documentation for the state. The first of those photos was taken in Tulsa Co. at Oxley Nature Center on 29 May 2006 (OC7313). This M appears to be a fairly classic example of the nominate subspecies, at least by its abdominal patterning; however, the wings obscure the auricles, so the diagnostic black auricles of *M. i. illinoensis* (Williamson, 1909; Needham and Westfall, 1955; Cook, 1994; Needham et al., 2000, 2014) are not evident. This is also the case for BC's record for Spavinaw GMA on 19 Jul 2014 (OC424965). Although BC submitted two photos, one dorsal shot and one dorsolateral, it is difficult to say with certainty that the auricle is dark on the right side, even though it appears to be. Other characteristics thought to differentiate the subspecies, for

example the hamules and tibial keel (specifically the hamule-keel ratio, or the H-K index; Donnelly and Tennesen, 1994), are likewise not visible in the photos. Our specimen, having broken hamules, cannot be categorized using the H-K index, but it does have black auricles, a tiny mesepisternal stripe (a mere spot, really), and the tibial keel shape and relative length of nominate *M. illinoensis*, as described by the above sources as well as additional materials provided by Donnelly. SP1971 is well out of range from the subspecific break proposed by Donnelly and Tennesen (1994) but potentially within their intergrade zone.

Corduliidae

Selys's Sundragon (*Helocordulia selysi*) has not been seen in Oklahoma since we collected the second and third specimens for the state on 11 Apr 2014 (1 pair, SP1118). The first specimen, a teneral F (DRP), was collected on 15 Mar 2012 by BAH. This species has only been recorded at BAH's property in McCurtain Co., where it was first found on 21 Mar 2008 (OC281801). The other species of sundragon known for the state, Uhler's Sundragon (*Helocordulia uhleri*), continues to have only one record (1M, vic. Hochatown, Mountain Fork River, McCurtain Co., 12 Apr 1956, LEH, IORI) despite numerous surveys in the region by us and others.

An equally puzzling species for Oklahoma is the Cinnamon Shadowdragon (*Neurocordulia virginienis*). This was also recorded only once, on 18 Jun 1934, when one was collected by John Stankavich and later identified by W. T. Davis, the describer of the species. This record is particularly frustrating for two reasons: 1) the description of the collection location of the specimen is confusing; “Deep Fork River above Broken Bow” (Byers, 1937: 22), is probably actually the Mountain Fork River, north of Broken Bow; and 2) the specimen cannot be located. And, of course, of great frustration is that the species has not been seen again in the state.

The Smoky Shadowdragon (*Neurocordulia molesta*) also continues to elude us. It has been recorded five times in the state, including once by Sidney W. Dunkle during a quick visit in 1996 (11 Jun, Hugo Lake Dam, Kiamichi River, at highway 70, Choctaw Co., IORI). George H. Bick discovered the species in Oklahoma when he collected an exuvia on 3 Jul 1950 near Okay, Wagoner Co. (although actually probably in Muskogee Co.) that was identified by Minter J. Westfall in 1954. Bick's notes and Bick and Bick (1957) indicate that a larval specimen was collected in Bryan Co., on the Blue River, at Blue, on 23 Jul 1954. As with the puzzling *N. virginienis* specimen, the exuvial and larval specimens have yet to be located. And as with that species, we have not seen it in the state in our time conducting intensive surveys. One could start thinking we just have bad luck with Corduliidae, but we seem to do all right with Orange Shadowdragon (*Neurocordulia xanthosoma*) and with emeralds (*Somatochlora*). For example, we added the shadowdragon to 13 counties since 2012.

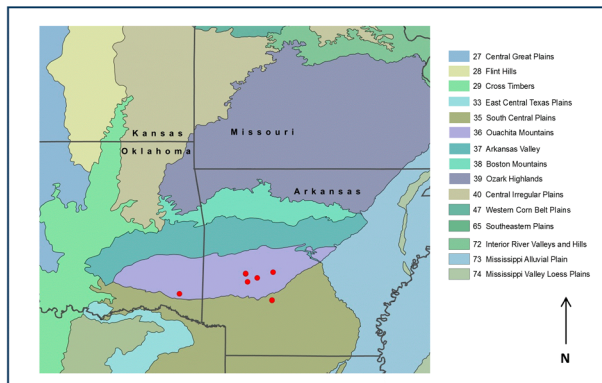


Figure 2. Known locations for the Ouachita Spiketail (*Cordulegaster talaria*), a species endemic to Arkansas and Oklahoma.

Being situated at a rather southerly latitude, Oklahoma is not exactly a hotspot for emeralds, a group much more speciose in northern North America, but three species are known from the state. Mocha Emerald (*Somatoblora linearis*) is a species we tend to encounter half a dozen times or more a year, including in numbers up to 25. Although encounters and abundances indicate that it is a somewhat rare species in the state, of much more interest from a rarity standpoint are Clamp-tipped Emerald (*S. tenebrosa*) and Ozark Emerald (*S. ozarkensis*).

Although in principle it is as widespread throughout eastern Oklahoma (and the US and Canada for that matter) as the Mocha Emerald, Clamp-tipped Emerald is encountered less frequently in the state, being reported from five versus 17 counties, with 12 versus 80 records. Six of the Clamp-tipped Emerald records are documented by specimens (n=8), five are documented by photographs, and one is a literature report. One of the specimen records is the first record of the species for the state, collected on 23 Jun 1934, in Le Flore Co. at Page (1F, AEP, EMEC81619, Pritchard, 1936). The species was not reported again until 2007 when DA captured 1M on 28 Jul at the "Narrows" on the Mountain Fork River, McCurtain Co. He released the individual, but he submitted an in-hand photo to OdonataCentral (OC262978). The other specimen and photo records came in 2008, 2011, and 2015. The literature record is the only record for the species for Latimer Co. (Bick and Bick, 1957). That record is curious because GHB does not have it in his species notes and it was not mentioned by Bird (1932, 1933) for the state nor by Pritchard (1936) for Latimer Co.; we have found no physical documentation for the species in the county.

On 24 Jul 2015, MAP came across a probable breeding population of Clamp-tipped Emeralds. He had six individuals feeding in the Ouachita National Forest, 10 km NE of Broken Bow, McCurtain Co. (collected 1M and 2F as SP1727-1729, and had 1F in hand). This encounter is the largest number of Clamp-tipped Emeralds ever reported in Oklahoma. The next highest total came a couple months later when BS-P captured two ovipositing F on Hasting's Hollow Creek at Cookson WMA, Cherokee Co. (4 Sep, SP1781-1782). The Cherokee Co. record is only the second time the species has been encountered outside southeastern Oklahoma. The first northeastern record was 25 Jul 2011 in Delaware Co., at Ozark Plateau NWR when 1M was photographed in flight (JWA, KW, OC330565). All other records are from Latimer, Le Flore, and McCurtain Counties. The species is known to fly from 23 Jun to 4 Sep, which is fairly consistent with dates reported by Paulson (2011).

The Ozark Emerald (*Somatoblora ozarkensis*) is a species that has taken much of our attention the past three years because we have been studying it via a State Wildlife Grant through the Oklahoma Department of Wildlife (ODWC) in order to get a clearer picture of its status and distribution in the state. We have also been trying to get a better idea of the species' ecology by con-

ducting habitat assessments. For more details about this species in Oklahoma and throughout its range, see Smith-Patten and Patten (2017) in this issue of ARGIA (page 17).

Libellulidae

On 19 Jun 2015 we photographed a lone M Desert Whitetail (*Plathemis subornata*) at Lake Hall in Harmon Co. (OC432152). This record is interesting because the species has not been previously recorded in southwestern Oklahoma; previous records being from northwestern Oklahoma and the panhandle (Beaver, Cimarron, Ellis, Harper, Roger Mills, Texas Counties). Finding it in Harmon Co. may be additional evidence of this species being a colonizer of the state (Patten and Smith-Patten, 2013). This is a species that was reported only nine times between 1926 and 1982 despite rather intensive surveys during the 1930s, 1950s, and 1960s, but it has been found on 28 occasions in the last five years. During the earlier surveys the species was known only from the three panhandle counties (Cimarron, Texas, and Beaver), but since 2012 it has been added to Harper, Ellis, Roger Mills, and Harmon. In 2016 we encountered Desert White-tails four times, all on Commission Creek at Ellis Co. WMA while we were conducting Black Rail (*Laterallus jamaciensis*) surveys. During the earliest survey, MAP collected an imm M on 24 Apr, a date roughly three weeks earlier than the previously recorded early date for the species in Oklahoma. The species is known to fly until 15 Sep (from 2012, 3M, Kiowa Creek, 13 km NE of Slapout, Beaver Co.) and has been reported in numbers as high as 44 (40M, 4F, Mexico Creek, Lake Evans Chambers, Beaver Co., 2 Jun 2012, OC339412, 1M as SP256).

Painted Skimmer (*Libellula semifasciata*) reappeared in the state in 2015 after a five year hiatus. On 3 May we came across 2M at a small pond E of Big Cedar, Le Flore Co. (SP1533, OC430729). This species is rare and likely only sporadic in the state, having been recorded only 14 times between 2007 and 2015 and twice between 1951 and 1968. It was first found in the state by GHB on 23 Jun 1951 when he collected a single M (IORI) 3 mi S of Braggs, Muskogee Co. GHB's record is the late flight date for the species in Oklahoma; the early date is 7 Apr (from 2007, 1F, LRNWR, McCurtain Co., BAH, OC312537). The specimen we collected on 3 May 2015 was only the 5th for the state. The species was not reported in 2016.

Also in eastern Oklahoma, the Yellow-sided Skimmer (*Libellula flavida*) was new for two counties in 2016. On 11 Jun, MAP collected 1 pair (SP1932) and saw another F at Fish Out Pond, Lake Eufaula SP, McIntosh Co. (OC446290) and again had the species on 2 Jul at Pine Creek WMA, Choctaw Co. (SP2008).

In western Oklahoma, Bleached Skimmer (*Libellula composita*) has still only been recorded in three counties: Beckham, where it was found in 2012; Ellis, where it was found in 2013; and Texas, where it was first found in the state (1M, 5 Aug 2011, Optima

Lake, VWF, OC331112). In 2016 the species was seen again in Texas Co.—the first time in three years for the state—when MAP collected a teneral F (OC444931, SP1907) along Coldwater Creek, Optima NWR, on 20 May and saw a M there on 25 Jun. As with the Desert Whitetail, it may be that the Bleached Skimmer is a colonizer, albeit perhaps more a more recent one, to Oklahoma (Patten and Smith-Patten, 2013).

Western Pondhawk (*Erythemis collocata*), a rare species in the state, made a couple of appearances in both 2015 and 2016. In 2015, it was first seen on 7 Aug, 4 km NNE of Kenton, on the Cimarron River, Cimarron Co. (1F, MAP). This is the region where the species was first recorded by BGH and LEH on 5 Aug 1970 (1M, Black Mesa SP, Cimarron Co., IORI, OC400673; Smith-Patten and Patten, 2013). It was not seen again in the state until 2013 when we collected a F at Lake Etling, Black Mesa SP, on 5 Jul (OC401514, SP743) and then later the same day on North Carrizo Creek, 7 km N of Kenton, we collected a M (SP746). BC had the species later in 2013 on 2 Sep along South Carrizo Creek in Black Mesa SP where he had 2M and 1F (OC410019). BC's record is the latest documented record for the species in the state, although there are two possible records that are later. One is a F that we saw on the Cimarron River 3 km northeast of Kenton on 22 Sep 2013, and the other is a M that BAH photographed on 30 Sep 2008, 3 mi southeast of Kenton at a small pond (OC283762). The later record may be a hybrid of the Western and Eastern (*E. simplicicollis*) Pondhawk, given its grayish appendages.

Texas County received its first documented record of Western Pondhawk on 20 May 2016 when MAP collected 1M at Coldwater Creek, Optima NWR (SP1908). In the previous year he collected a F (SP1744) on 8 Aug along the Beaver River, 12 km N of Goodwell, Texas Co., and saw one M that he thought were Western Pondhawks. Upon comparing the specimen to Western and Eastern Pondhawks, it appears that she is probably a hybrid and so we consider the Beaver River record as such. The confirmed Texas Co. record is interesting in that it pre-dates the previous early flight date for the species in Oklahoma by roughly one and a half months and it is the farthest east record for the species' range. Western Pondhawks were seen only one other time in 2016: 12 Jul, Black Mesa SP, South Carrizo Creek, Cimarron Co., 2F (1F, BS-P, SP2021).

We added two new county records of Double-ringed Pennant (*Celithemis verna*) in 2015 and 2016. The species was seen seven times—the most times ever in one year—in five counties in 2015, including in Sequoyah Co., where it was new (6 Jun, Vian Lake, 2M, 1F, including 1 pair, OC431503). In 2016, it was only seen three times, but it was new to Okfuskee Co., where 1M was collected at Weleetka Lake (SP1894, OC444256, MAP). Also of note for the species in 2016 was that it was seen for the first time in Pittsburg Co. since 1934. On 12 Jun, MAP encountered 2M at James Collins WMA, which is not terribly far from where

AEP collected the holotype for the species (vic. Quinton, 10 Jun 1934, UMMZ, Pritchard, 1935).

On 6–7 Jun 2015, at the ponds near Big Cedar in Le Flore Co., we encountered 2M and 1F Little Blue Dragonlets (*Erythrodiplax minuscula*; 1M as SP1641, 1F as SP1632; OC431510), marking only the 11th time the species had been found in Oklahoma. An interesting tidbit about the 2M we found is that they both had gray terminal appendages, as opposed to the “gleaming white” appendages that traditionally define the species. We have investigated variation in cerci color (manuscript in prep.), and our preliminary results indicate that individuals in Oklahoma and elsewhere at the western end of the species' range (e.g., Arkansas, northeastern Texas) more likely to have the cerci dark, sometimes even black, than are individuals farther east, particularly those on the Atlantic coast. Little Blue Dragonlets were not seen in 2016.

Seaside Dragonlet (*Erythrodiplax berenice*) was encountered for the second and third times in the state in 2015 and 2016. Recall that we first found the species in Oklahoma 6 km south of Eldorado at a spot known as the “Jackson Salt Plains” in Jackson Co., on 3 Aug 2014, when we collected a lone M (SP1377, OC425536, Patten and Smith-Patten 2014a). MAP returned to the location on 19 Jul 2015 to find what appears to be a breeding population (7M and 2F, including 2 pairs; OC433554), and then on a visit to the city lake in Altus, Jackson Co. he saw a lone M on 24 Jul 2016 (OC451280). This location is not terribly far, as the crow (or odonate) flies, from the Jackson Salt Plains, but the habitat at Altus city lake does not correspond well with the more typical habitat for this species. Whether that lone M was just a vagrant or was indicative of a potential population at or near the locality will remain to be seen.

On 3 Jul 2015, BS-P and BWH added a new species to the Oklahoma state list when 8M Thornbush Dashers (*Micrathyria hagenii*) were found at a small pond at Pumpkin Flats, TNC's J. T. Nickel Preserve, Cherokee Co. (OC432602, 2M as SP1695–1696, Smith-Patten and Hoagland, 2015). Later in the year in the opposite corner of the state, we had 4–7M and 1–3F (1 ovipositing) at Great Plains SP, Kiowa Co., between 13 Sept and 11 Oct. Thornbush Dasher is an enigmatic species for Oklahoma because despite numerous visits in 2015 and 2016 to the two known localities for this species, it has been reported but a few times and only during 2015 between 3 Jul and 11 Oct. The Nickel Preserve was visited 10 times by seven people between 4 Apr and 6 Sep in 2015, with only two sightings (3 and 5 Jul), and eight times by three people between 26 Mar and 2 Oct in 2016, with no sightings. Great Plains SP was visited nine times by BS-P and MAP between 19 Apr and 11 Oct in 2015, with only five sightings, and 11 times by four people between 10 May and 9 Oct in 2016, with no sightings. The species was last seen in the state on 11 Oct 2015 at Great Plains SP (1M photographed, MAP; OC459327). We hope that with time we will be able to

report an established population of Thornbush Dasher in Oklahoma, but for now we cannot say as such.

We were much surprised on 3 Jun 2015 when we bumped into a M Pale-faced Clubskimmer (*Brechmorhoga mendax*) patrolling the Cimarron River, 4 km NNE of Kenton, Cimarron Co. in the Oklahoma panhandle. We were terribly unhappy that we were unable to catch this individual, but we took solace that BS-P at least got some blurry photos (OC431499). This was only the second time a clubskimmer had been recorded in the panhandle (Bick and Bick, 1957), and the species had not been seen in the state since Vic Fazio had one at Ft. Sill on 31 Aug 2009 (OC315007). Later MAP returned to the Cimarron River and found four individuals (3 M, 1F), one of which he managed to collect (SP1742, 8 Aug 2015). On 7 Sep, BC reported a single individual at the same spot. That year turned out to be a good one for the species at six reports, taking the record for the year with the most reports for it in Oklahoma (it has only been reported 22 times between 1930 and 2015). The Cimarron River spot was the most reliable location for the year, but the species also was reported for two other counties. MAP found 1F at Major Co. WMA on 15 Aug (first county record, OC435075) and again on 29 Aug, when he spotted 6M, taking two as specimens (SP1770, SP1771). BS-P photographed a lone F 8 km S of Davis, at the Falls Creek Baptist Conference Center, Murray Co. on 22 Aug (OC435768). The species had not been reported from Murray Co. since 1970 when LEH collected 1M on 23 Jul 1.2 mi SE of Dougherty (IORI). The species was not seen at all in 2016.

The appearance of Striped Saddlebags (*Tramea calverti*) at Great Plains State Park, Kiowa Co., in 2016 (4 Jul 2016, SP 2015, OC448369) was a surprise. Not only was the date of interest, as the vast majority of Oklahoma records have been in the fall, but the location, well west of Red Slough where the vast majority of records have been, was unexpected. Otherwise, the species has been reported from two other locations—Mohawk Park, Tulsa Co., as the first state record (1M, 19 Aug 2006, BC and John Fisher, OC7350), and Love Valley WMA, Love Co. (1F, 20 Sep 2014, BS-P and MAP, SP1434, OC427081).

Previously we reported (Patten and Smith-Patten, 2014b) that the Marl Pennant (*Macrodiplex balteata*) was first found in Oklahoma on 12 Jul 2009 (1M, Fort Sill Military Reserve, Comanche Co., VFW, OC313904). We have since discovered a larval specimen in the University of Central Oklahoma collection whose identification we confirmed in 2015 (UCO5180, 22 Jun 1989, West Cache Creek, Wichita Mountains Wildlife Refuge, Comanche Co.). Although we cannot rule out that this nymph was an aberrant breeding record or that perhaps we misidentified the specimen, its existence raises the possibility that the species has had a population in the state for longer than we thought and that it was somehow overlooked until 2009.

State list and final notes

One species, the Thornbush Dasher (*Micrathyria hagenii*), has been added to the state list since our 2014 update (Patten and Smith-Patten, 2014b), bringing it to 169 species. Oklahoma now ranks 10th in the U.S. for odonate species richness (Table 1). This may seem surprising given that the general impression of Oklahoma is of a very flat, homogenous state, but from a biogeographic standpoint it is, in reality, indeed rich.


Regular updates on the project, along with the state checklist, species documentation, a seasonality chart, and publications, can be found at <http://www.biosurvey.ou.edu/smith-patten/Oklahoma_Odonata_progress.html> and associated pages.

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Table 1. Ranking of odonate species list totals for US states.

state	list	rank	source
Texas	244	1	Abbott & Lasley 2017; OC
New York	194	2	White, et al. 2010 (also, <i>in litt.</i>); OC (n=193)
Virginia	190	3	OC
North Carolina	187	4	Cuylar, et al. 2017; OC (n = 184)
New Jersey	185	5	OC; NJ Odes (n = 181)
Maryland	183	6	Maryland Biodiversity Project; Orr 2016 (n = 182); OC (n = 172)
Alabama	182	7	OC
Pennsylvania	182	7	OC
Georgia	176	8	Beaton (<i>in litt.</i>); OC (n = 175); Beaton 2007 (n = 171)
Florida	171	9	OC
Oklahoma	169	10	Smith-Patten & Paten 2016; OC
Massachusetts	168	11	OC; Leahy & Forster (odenews.org, n = 165)
Michigan	168	11	O'Brien (<i>in litt.</i>); OC (n = 168); O'Brien 2014 (n = 165)
New Hampshire	164	12	Hunt 2012; OC (n = 154)
Ohio	164	12	McShaffrey & Glotzhober nd.; Glotzhober & McShaffrey 2002 & OC (n = 162)
Tennessee	162	13	OC
South Carolina	161	14	OC
Wisconsin	161	14	OC
Maine	159	15	OC; Maine Damselfly and Dragonfly Survey (n = 158)
Kentucky	153	16	OC
Indiana	151	17	OC
Minnesota	149	18	Mead (<i>in litt.</i>); OC (n = 152)
Connecticut	149	18	OC
Arkansas	145	19	OC
Illinois	145	19	OC
Louisiana	145	19	OC; Mauffray 2014 (n = 141)

state	list	rank	source
Mississippi	144	20	OC
West Virginia	144	20	Olcott 2011; WVDNR (n = 143); OC (n = 141)
Vermont	143	21	OC; Odonata of Vermont webpage (n = 140)
Arizona	140	22	OC; Bailowitz, et al 2015 (n = 137); Deviche (n = 136)
Missouri	139	23	Sims 2012; OC and Trial 2005 (n = 135)
New Mexico	139	23	OC; Larsen & Stuart 2011 (n = 134)
Rhode Island	136	24	OC
Kansas	128	25	OC; Beckemeyer 2004 and Mason nd. (n = 125)
Iowa	118	26	Hummel (<i>in litt.</i>); Iowa Odonata Survey (n = 118); OC (n = 121)
Colorado	116	27	Prather, B (<i>in litt.</i>); OC (n = 115)
Delaware	116	27	White (<i>in litt.</i>); OC (n = 116)
California	115	27	OC; Biggs 2008 (n = 113)
Nebraska	109	29	Paseka 2016; OC
South Dakota	96	30	OC; Hummel 2012 (n = 95)
Nevada	94	31	Johnson 2016; OC (n = 93)
Utah	94	31	Myrup & Baumann 2016; Johnson 2017; OC
Montana	93	32	OC; Johnson 2016 (n = 90)
Oregon	93	32	OC; Kerst & Gordon 2011 (n = 91)
Washington	82	33	Paulson 2016; OC
Wyoming	81	34	OC; Johnson 2016 (n = 76)
Idaho	78	35	Paulson 2011 (n = 78); Sims 2014 (n = 78); OC (n = 79)
North Dakota	62	36	OC
Alaska	35	37	OC; Paulson 2009 (n = 29)
Hawaii	18	38	OC
US	477		

South Florida Odonata, December 2016

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

Netta Smith and I spent 1–14 December 2016 in southern Florida, most of the time from the level of Lake Okeechobee south all the way to Key West. Much time was spent looking for birds and other animals, but we noted dragonflies everywhere we went and visited numerous sites specifically for them. Odonates were recorded at all of these sites:

1. Palm Beach Co., Wakodahatchee Wetlands, 1 Dec.
2. Palm Beach Co., Green Cay Wetlands and Nature Preserve, 1–2 Dec.
3. Palm Beach Co., Loxahatchee National Wildlife Refuge, 2 Dec.
4. Lee Co., Sanibel Island Bailey Tract, 5 Dec.
5. Collier Co., Lake Trafford, 6 Dec.
6. Collier Co., Corkscrew Swamp Sanctuary, 6 Dec.
7. Collier Co., Collier Seminole State Park, 7 Dec.
8. Collier Co., Big Cypress Bend, 7 Dec.
9. Collier Co., Birdon and Turner Roads, 7 Dec.
10. Collier Co., Burns Lake, 8 Dec.
11. Collier Co., Monument Lake, 8 Dec.
12. Collier Co., Loop Road, S of Monroe Station, 8 Dec.
13. Miami-Dade Co., Everglades National Park, 9 Dec.
14. Monroe Co., Key Largo Hammock Botanical State Park, 10 and 13 Dec.
15. Monroe Co., Long Key State Park, 10 Dec.
16. Monroe Co., Bahia Honda State Park, 11 Dec.
17. Monroe Co., Big Pine Key, 11 Dec.
18. Monroe Co., Stock Island, Key West Botanical Garden, 12 Dec.
19. Monroe Co., Key West, Fort Zachary Taylor Historic State Park, 12 Dec.
20. Monroe Co., Vaca Key, Crane Point Hammock, 13 Dec.
21. Miami-Dade Co., lakes and canals east of Homestead, 14 Dec.
22. Miami-Dade Co., Fairchild Tropical Gardens, 14 Dec.

All of the species we encountered are listed here, with numbers indicating the localities/dates from the list above. An asterisk indicates that the species was photographed.

**Lestes tenuatus* (Blue-striped Spreadwing): 13 (Pineland Trail, male just emerged from largest sinkhole along trail).

**Enallagma cardenium* (Purple Bluet): 8, 9, 12 (common at all three on both open and wooded canals).

**Enallagma civile* (Familiar Bluet): 21 (two males at lake at Homestead Hospital on Campbell Drive).



Enallagma pollutum (Florida Bluet) male, Collier Co., Florida, Big Cypress Bend on U.S. 41, 7 December 2016. Photo by Netta Smith.

**Enallagma pollutum* (Florida Bluet): 2 (few), 6 (few); 8, 10, 11, 12 (common at all), 21 (female emerged from canal), 22 (one).

**Ischnura hastata* (Citrine Forktail): female in herbaceous vegetation away from water at roadside on Upper Matecumbe Key.

**Ischnura posita* (Fragile Forktail): 6 (one), 8 (one).

**Ischnura prognata* (Furtive Forktail): 6 (few), 8 (one).

**Ischnura ramburii* (Rambur's Forktail): 1, 2, 5, 8, 9, 10, 11, 13, 18, 21, 22 (common at most of these locations, although surprisingly scarce in the Keys, with one individual on Stock Island our only sighting of a damselfly in the Keys).

**Neocythromma cultellatum* (Caribbean Yellowface): 22 (few).

**Anax junius* (Common Green Darner): 1 (few), 2 (few, with pairs ovipositing), 18 (few); also one at Crystal River, Citrus County, 4 Dec.

**Coryphaeschna ingens* (Regal Darner): 3 (one flying at tree tops, photos allowed identification).

Coryphaeschna viriditas (Mangrove Darner): 2 (a large darner with all-green thorax and dark abdomen that had to be this species flew past at close range at Green Cay; it was too large for *C. adnexa*, Blue-faced Darner, and clearly not an *Anax*; although obviously not sufficiently documented, this would represent the northernmost record of the species in Florida).

Gynacantha nervosa (Twilight Darner): 6 (few), 8 (few), 12 (few), 13 (one, Royal Palm Hammock); also one at dusk at Crystal River, Citrus County, 3 Dec.

**Nasiaeschna pentacantha* (Cyrano Darner): 8 (few), 12 (few).

**Triacanthagyna trifida* (Phantom Darner): 7, 8, 9 (common at all three, many in feeding flights in sun during midday, more than I have ever seen doing), 18 (one hanging in hammock).

**Epithecina stella* (Florida Baskettail): 9 (at least two males over canal), 12 (male over slough), 13 (over water at Anhinga Trail and over clearings southwest to Pa-Hay-Okee).

**Brachymesia furcata* (Red-tailed Pennant): 17 (few at Blue Hole and ponds at Wilder Rd. & South St.), 18 (fairly common).

**Brachymesia gravida* (Four-spotted Pennant): 1 (few), 2 (few), 3, 4, 8, 9 (single males at all locations), 10 (few), 11 (few), 22 (male).

**Brachymesia herbida* (Tawny Pennant): 22 (few).

**Celithemis eponina* (Halloween Pennant): 3 (one), 9 (few), 10 (few), 13 (common at Long Pine Key lake, few at Nine Mile Lake, one at Flamingo), 15 (three on beach, perhaps blown to Keys by winds from the mainland); another on Windley Key, 10 Dec.

**Crocothemis servilia* (Scarlet Skimmer): 1 (few), 2 (few), 7 (immatures, no fresh water apparent), 13 (few at Long Pine Key lake, probably first record for Everglades National Park), 21 (common), 22 (few).



Brachymesia herbida (Tawny Pennant) male, Florida, Miami-Dade Co., Fairchild Tropical Gardens, 14 December 2016. Photo by Netta Smith.

**Erythemis plebeja* (Pin-tailed Pondhawk): 2 (common), 13 (male at slough on road south of Research Road, probably first record for Everglades National Park), 21 (few).

**Erythemis simplicicollis* (Eastern Pondhawk): 3 (few), 13 (one at Long Pine Key lake).

**Erythemis vesiculosa* (Great Pondhawk): 14 (mature male and female in clearing), 22 (one away from water). We looked hard for this elsewhere, but it was clearly much less common than it was in December 2007 (Paulson, 2008) and somewhat less common than in January 2000 (Paulson, 2001). It was one of the most abundant species in some winters in the early 1960s in far southern Florida (Paulson, 1999).

**Erythrodiplax berenice* (Seaside Dragonlet): 17 (male and female at seemingly fresh pond at edge of mangroves at South Street & Wilder Road). I have always considered it surprising that this species is strongly seasonal in southern Florida, even though it lives in a habitat that is not very seasonal.

**Erythrodiplax minuscula* (Little Blue Dragonlet): 4 (one), 9 (immatures very common in dried-up grassy areas), 10 (few), 11 (few), 13 (immature at Long Pine Key lake).

**Erythrodiplax umbrata* (Band-winged Dragonlet): 1, 2, 3, 7, 9, 11, 12, 13, 14, 15, 17, 18, 22 (immatures common almost everywhere we went in wooded situations). Small numbers of mature males were seen at the water at several locations from Green Cay south through the Keys. It was by far the most common odonate of our trip, and clearly thousands are present in southern Florida during the winter, perhaps most of them waiting until the spring rains to mature sexually and breed. It was much scarcer and more local in south Florida during much of my odonate study from 1960–1964 (Paulson, 1999), and as it breeds in shallow marshes, its populations are probably greatly affected by drought. Nevertheless, the species is very successful in the area now.

**Idiataphe cubensis* (Metallic Pennant): 10 (few), 11 (one), 13 (few at Long Pine Key lake), 17 (few), 22 (one).

**Libellula needhami* (Needham's Skimmer): 2 (one), 13 (male at Long Pine Key lake chased persistently from a preferred perch by a male *Crocothemis servilia*, which finally succeeded in chasing it away).

**Macrodiplax balteata* (Marl Pennant): 4 (common at ponds full of *Chara*, an indicator plant of preferred habitat), 17 (few at Blue Hole), 18 (few), 19 (male and two females not near any apparent breeding habitat).

Miathyria marcella (Hyacinth Glider): 1 (one), 2 (one); also one at Crystal River, 4 Dec. Water hyacinths (*Eichhornia crassipes*) have been much reduced in southern Florida in recent decades because of control programs, which I suspect has made *M. marcella* much less common there.

**Micrathyria aequalis* (Spot-tailed Dasher): 21 (few), 22 (few).

**Orthemis ferruginea* (Roseate Skimmer): 8 (few), 21 (few).

**Orthemis* sp. (Antillean Skimmer): 17 (few at Blue Hole and South Street ponds, one at Manillo Trail), 18 (common), 20 (few), 22 (few). I do not consider this as yet unnamed species of Florida and the West Indies the same as *Orthemis schmidtii* of South and Central America (contra Daigle, 2011), as the two differ more genetically than many other species pairs in *Orthemis* (thanks to Jerrell Daigle for genetic information). Indeed they are very similar in appearance and would be difficult to distinguish if they occurred together.

**Pachydiplax longipennis* (Blue Dasher): 1, 2, 3, 6, 10, 11, 12, 13 (Anhinga Trail), 21 (few to common at all localities).

**Pantala flavescens* (Wandering Glider): 8 (one), 9 (one), 13 (fairly common all along main road south to Flamingo), 15-20 (all over Keys in small numbers), 21 (few), 22 (few); in addition, one at Crystal River, 3 Dec, and two at south end of Sunshine Skyway, Manatee County, 4 Dec. The species was generally seen away from water and often seen flying around cars, the most reflective surfaces where puddles were absent during this dry period.

**Perithemis tenera* (Eastern Amberwing): 1 (few), 2 (few), 3 (few), 8 (common), 9 (common), 11 (few), 12 (common).

**Tramea abdominalis* (Vermilion Saddlebags): 13 (one at Long Pine Key lake, another over road south of Research Road), 17 (one at Blue Hole), 22 (one).

**Tramea calverti* (Striped Saddlebags): 16 (female perched high on twig at beach).

**Tramea insularis* (Antillean Saddlebags): 17 (one at South Street pond), 18 (at least one).

**Tramea lacerata* (Black Saddlebags): 1 (few), 2 (few), 4 (common), 8 (one).

**Tramea onusta* (Red Saddlebags): 17 (few at all wetlands), (18) fairly common, 20 (few), 21 (few), 22 (few); also scattered over land along Keys. Other *Tramea*, both broad-saddled and narrow-saddled, were seen at still other loca-

tions but not well enough to distinguish species.

It should be recalled that damselflies generally are harder to see than dragonflies, so damselflies were surely more common relative to dragonflies than our observations indicate. There is no way to estimate how many female *Ischnura* and *Enallagma* we passed by without seeing them.

Nonetheless, we looked long and hard for *Leptobasis lucifer* (Lucifer Swampdamselfly) at Corkscrew Swamp with no luck. We had discovered them there on 13 December 2007 (Paulson, 2008), and others had found them there in 2012 (Daigle, 2011; Tennessen, 2011). There had been a severe drought in the area for some time before this recent visit, and if there weren't basins deep enough where nymphs could persist, the species could have disappeared from Florida and the U.S. A volunteer at Corkscrew recently informed me that he had seen none in the last three years



Erythemis vesiculosa (Great Pondhawk) female, Florida, Monroe Co., Dagny Johnson Key Largo Hammock Botanical State Park, 13 December 2016. Photo by Netta Smith.



Idiataphe cubensis (Metallic Pennant) male, Florida, Collier Co., Burns Lake, 8 December 2016. Photo by Netta Smith.

(Rick Mears, pers. comm.), and every effort should be made to relocate this species in the broad Fakahatchee Strand area.

Another species that barely enters the U.S., *Nehalennia minuta* (Tropical Sprite), may have disappeared from its U.S. range (Daigle, 2011). We did not find it in a brief survey on Big Pine Key. If in fact these species are gone, and if drought caused their demise in the U.S., I would consider this an example of global climate change extirpating a species from a country.


On the other hand, numerous immigrants from the tropics, e.g., *Crocothemis servilia*, *Erythemis plebeja*, and *Tramea calverti*, seem to be consolidating their ranges in Florida. I am at least moderately convinced that *C. servilia* was introduced to one of the islands in the Greater Antilles, where it is known from Cuba, Jamaica, and Puerto Rico, and then made its way north to Florida, rather than the reverse.

The biggest surprise to me on this visit was the finding of *Enallagma civile* near Homestead, two males on a lake east of Homestead on Campbell Road. This species was not present in southern Florida, north to above Lake Okeechobee, when I surveyed the odonates in the early 1960s (Paulson, 1999). But now there are recent records from Manatee (2013), Sarasota (2015), Palm Beach (2008, 2012) and Broward (2009) counties in Odonata Central. Dot-map records in Odonata Central from both Lee and Dade (Miami-Dade) counties within this area have no further information. This damselfly is unlike any other at the extreme southern tip of Florida, and, as we saw no others, it is clearly still quite uncommon in the region, at least in winter. This may be a unique case of an odonate extending its range southward during this period of rising temperatures when so many others are moving north.

However, the species is well known as a pioneer, well adapted to constructed wetlands, and constructed wetlands for “waterfront homes” have become a major habitat all over the area, probably facilitating its spread.

We tallied 42 species of Odonata in 14 days on this visit. On previous winter visits, we found 42 species in five days in January 2000 (Paulson, 2001) and 39 species in seven days in December 2007 (Paulson, 2008), visiting many of the same locations. Mathematically speaking, the 2000 trip showed the highest diversity, but I consider them all roughly comparable. The weather was fine to reasonably good on all three visits, making odonate hunting possible every day. The three trips inclusively found 52 species. Those not encountered on the two previous trips include *Lestes tenuatus*, *Enallagma civile*, *Neoerythromma cultellatum*, *Coryphaeschna ingens*, and *Brachymesia herbida*. Each of these was seen at only one location, in very small numbers, only the *Lestes* at a site visited on one or both of the previous trips. With an additional week, it is not surprising that we discovered additional species.

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Request for *Orthemis sulphurata* specimens from Central America

The distribution of this coastal South American species is widespread. I have either specimens or photos from northwest Peru, Ecuador, Colombia, Venezuela, Aruba, Bonaire, Curacao, Grenada, St. Vincent, Barbados, and Brazil. I suspect it is in coastal Guyane and Suriname as well.

Recently, I collected a series of *Orthemis sulphurata* Hagen in Panama, which is a first for that country and for Central America. If anyone has *O. sulphurata* specimens or photos from Costa Rica or elsewhere in Central America, I would sure like to see them and I would really appreciate it. If you have any questions for me about this species, please let me know. For those traveling in Central America, please keep an eye or two open for them. Photograph or collect them for me, if possible. Thank you very much!

Jerrell J. Daigle <jdaigle@nettally.com>

Turquoise-tipped Darner (*Rhionaeschna psilus*) in Baja California

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On 25 September 2016, RAE visited the small willow wetland at the head of the La Salina estuary on the north coast of Baja California (N 32.05179°, W 116.87011°; approximately 35 miles south of the California border). While looking primarily for migrant landbirds, he noticed an unfamiliar darner at a small freshwater pool. He obtained photographs of the insect hanging on leafless Lemonade Berry (*Rhus integrifolia*) branches over the water (Figure 1). Examination of the photographs by Tim Manolis and Dennis Paulson confirmed that the images were of a male Turquoise-tipped Darner (*Rhionaeschna psilus*). On 22 October 2016, PAG and NL were birding at the same location with knowledge of the September observation. They found a female Turquoise-tipped Darner ovipositing on a submerged Lemonade Berry branch at the same pool (Figure 2; identification confirmed by Paulson), and may have seen a male as well.




Figure 1. Male Turquoise-tipped Darner (*Rhionaeschna psilus*) at La Salina, Baja California, on 25 September 2016. Photo by Richard A. Erickson.

The Turquoise-tipped Darner is a Neotropical species first reported in the United States in 1996, from specimens collected in Texas in the 1970s (Abbott, 1996). Two previous records on the Pacific coast are from Baja California Sur (Caduaño, January 2006; Paulson and Mlodinow, 2007) and California (Huntington Beach, September 2007; Avise, 2007), but this represents the first record for the state of Baja California Norte (fide Paulson, and additional research by Manolis and RAE). The Odonata of the Baja California Peninsula are still relatively poorly known, so it remains to be seen if the Turquoise-tipped Darner is established in either state, or if it is only an occasional visitor.



Figure 2. Female Turquoise-tipped Darner (*Rhionaeschna psilus*) ovipositing at La Salina, Baja California, on 22 October 2016. Photo by Peter A. Gaede.

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Odonata Books from the International Odonata Research Institute (IORI)

Bill Muffray, Managing Director, IORI, Gainesville, Florida <iodonata@gmail.com>

We have only about 30 copies left of *The Dragonflies of North America, 3rd edition* by Needham, Westfall, and May. The publisher has no copies remaining. It is available though our Amazon posting for \$215.95 (U.S. shipping addresses), but you can save \$25.95 by ordering directly through the IORI web site at <www.iodonata.net> for \$190.00 (flat rate; includes shipping and handling for U.S. mailing addresses).

The Damselflies of North America, 2nd edition by Westfall and May is also available in hardcover for \$90.00 vs. \$110 at Amazon; the paperback version is \$5.00 cheaper. Details of these publications are at <www.iodonata.net>.

Profits from sales are used to assist in the curation of the Florida State Collection of Arthropods (FSCA) Odonata collection. 

2017 SE DSA Regional Meeting

F. M. Stiteler <fmmonk@gmail.com> and Jerrell J. Daigle <jdaigle@nettally.com>

The 2017 SE DSA Regional Meeting will be held in Conyers, Georgia at the Monastery of the Holy Spirit, where it will be hosted by F. M. Stiteler. Conyers is just east of Atlanta off of Highway 20. The dates are 12–14 May (Friday–Sunday), but folks may be arriving earlier on Thursday night. The following link shows the location of the monastery: <<https://goo.gl/maps/QMw4TRhjNFS2>>.

Our base motel in Conyers is the Quality Inn. We have reserved 10 rooms, five with a king bed and five with two double beds. To reserve a room, call 770-760-1230 and ask for a lady named Luz. Please mention SEDSA to get the group rate of \$68.00. Also, rustic retreat rooms are available at the monastery. Other motels in Conyers include Jameson Inn (770-760-0777), La Quinta Inn (770-918-0092), and Microtel Inn (770-278-0950). Be aware that there is another event at the International Horse Park nearby so book early if you plan to attend, as rooms will fill up fast.

Nearby restaurants include Cracker Barrel, IHOP, Outback Steakhouse, and several Mexican restaurants, at one of which we plan to have the dinner on either Friday or

Saturday night. Also, Wal-Mart is nearby if one needs to get supplies.

The monastery grounds contain over 2,300 acres of streams, swamps, rivers, ponds, and creeks. For more information on birds, butterflies, and dragonfly species found on the premises, such as *Gomphurus hybridus* (Cocoa Clubtail), as well as information about the retreat rooms, please contact F. M. (short for Francis Michael) Stiteler by e-mail <fmmonk@gmail.com> or phone (770-851-9674). Let us know if you have any questions. You do not need to be a member of DSA to attend. Hope to see you there! 🦋



Gomphurus hybridus (Cocoa Clubtail). Photo by F.M. Stiteler.

New Ohio Odonata Survey and Conference

Jim Lemon <jlem@woh.rr.com>

The Ohio Odonata Society and Ohio Division of Wildlife are conducting a new statewide survey of Ohio Odonata. The survey will run for three years, 2017–2019. A conference, Odo-Con-17, will be the kick-off event for the survey. Odo-Con-17 is being held 23–25 June 2017 at The Nature Conservancy Grand River Conservation Campus (GRCC). GRCC is in the Morgan Swamp area of

Ashtabula County in Ohio's extreme northeast. There will be programs on both the survey and more general topics, as well as guided field trips.

Additional details on the conference and registration information can be found at <<http://w3.marietta.edu/~odonata/ocon17/odo-con-17-index.html>>. 🦋

Photo Submissions for ARGIA

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

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

Phyllogomphoides nayaritensis (West Mexican Leaf-tail) in Southwestern New Mexico, a New Dragonfly Species for the United States

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

Following the protocol of the DSA Check-list Committee to require published records, I am putting on record here a new odonate species for the United States.

On 19 August 2014, Tony Godfrey photographed a male gomphid in Rotary Park, Truth or Consequences, Sierra County, New Mexico. He submitted the record soon thereafter to OdonataCentral <<http://www.odonatacentral.org/>> as OC# 427318. After some discussion and consultation with Doug Danforth and me, it was agreed that the dragonfly was *Phyllogomphoides nayaritensis*, West Mexican Leaf-tail. This was the first and so far the only record of the species in the United States.

This species is locally common on streams and rivers in western Mexico, from northern Sonora (about 160 miles south of the U.S.-Mexico border) and western Chihuahua (Bailowitz et al., 2015) south to Nayarit (Belle, 1987). So far it is known only from these three states in Mexico, but it presumably occurs also in Sinaloa and Durango. Subsequent efforts to find this or another individual of the species at the same location have not been successful, and it was likely a vagrant individual, one of many Mexican dragonflies that probably cross the border every summer in dispersal flights. Let's have no wall!


P. nayaritensis can be easily distinguished from the two *Phyllogomphoides* leaf-tails known from the U.S., both of



Phyllogomphoides nayaritensis (West Mexican Leaf-tail), Rotary Park, Truth or Consequences, New Mexico, 19 August 2014. Photo by Tony Godfrey.

which have been recorded in southern New Mexico but appear to be very scarce there, by its narrower thoracic stripes and mostly black abdomen tip.

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The Ozark Emerald (*Somatochlora ozarkensis*): Status, Distribution, and Ecological Notes from Oklahoma

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The Ozark Emerald (*Somatochlora ozarkensis*) is a regional endemic that occurs in four U.S. states: Arkansas, Kansas, Missouri, and Oklahoma (Fig. 1). Our preliminary data indicates that it has been recorded in 15 counties in Arkansas, seven in Kansas, nine in Missouri, and nine in Oklahoma (10, if Comanche Co. records are truly *S. ozarkensis*, see below), from where the species was described to science by Ralph Durham Bird. The type specimens came from “along Cunneotubby Creek, two and one-half miles northwest of Wilburton, Latimer County, Oklahoma, July 14, 1931, Wilton Fisher, Collector” (Bird, 1933: 5). E. M.

(Edmund Murton) Walker commented that it was “a species related to *provocans* and approaching in some degree *hineana* and *tenebrosa*” (Bird, 1933: 1).

This species is considered to be a globally and nationally at-risk species (ranked as “vulnerable” by NatureServe, <<http://explorer.natureserve.org/>>; and Near Threatened by the IUCN, <<http://www.iucnredlist.org/details/20345/0>>). In Arkansas, Kansas, and Oklahoma it is considered an S1 “critically imperiled” species (NatureServe; Patten and Smith-Patten, 2013), and in Missouri

it currently has a conservation ranking of S2S3 (imperiled/vulnerable), although in recent years, despite species-specific surveys, the species has been reported but a few times in Missouri, indicating that the conservation rank may need to be upgraded.

Since 2014, we have studied Ozark Emerald in Oklahoma through a State Wildlife Grant funded by the Oklahoma Department of Wildlife (ODWC). During this time we have compiled all known records of the species in the state, including from our intensive field surveys conducted throughout the eastern half of Oklahoma. Our research has focused on obtaining a clearer picture of the species' status, distribution, and ecological needs. To date we have compiled 48 confirmed records and four probable records of this elusive species in Oklahoma. These records date from 1931–1934 and 2006–2016. It is interesting to note that despite surveys throughout the region by George H. Bick and Lothar E. Hornuff between 1950 and 1978, the species went unrecorded. During our study, nearly half (44%) of all known records for the species in the state were added to our database ($n = 23$ records, 21 of them confirmed, two probable); $\frac{3}{4}$ (17 of 23) of those records were added by our field surveys.

There are 32 definite and two probable localities in the state where the species has been recorded (Fig. 2); all of the definite records are in a mere nine counties: Adair, Atoka, Cherokee, Latimer, Le Flore, McCurtain, Osage, Pushmataha, and Tulsa. Not all of those localities have been re-surveyed, or if they have, the Ozark Emerald has not been necessarily been recorded there again. For example, the species' type locality, on Cunneo Tubby Creek, 2.5 mi NE of Wilburton, Latimer Co. (Bird 1933), is currently inaccessible (i.e., private land), and we resurveyed the Osage Co. locality (see below) on 11 June 2016 without success. We discuss a couple of other examples of negative resurvey results below.

Our work indicates that the species is rare in Oklahoma, and it appears to be a habitat specialist. It tends to be seen only one or two at a time along creeks, either as single males guarding an ovipositing pool, as mating pairs, or as females ovipositing. On a rare occasion it has been seen at up to eight or nine individuals on a given survey, but only when a lengthy reach (e.g., > 1 km) of a creek was searched. The lower numbers are consistent with sightings in Arkansas and Missouri (George Harp, pers. comm.; Bruce Henry, Missouri Department of Conservation, pers. comm.).

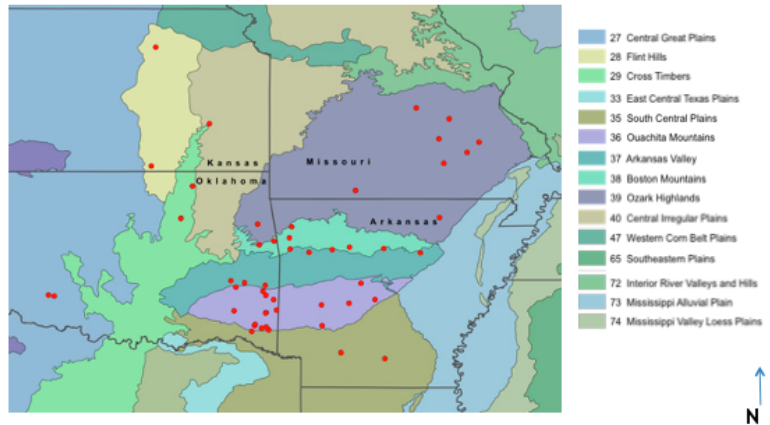


Figure 1. Range of the Ozark Emerald (*Somatochlora ozarkensis*) as indicated by OdonataCentral records. Although all localities of the species are not represented, the map gives an idea of the general known distribution of the species.

In our experience, Ozark Emeralds are seen in larger numbers only when one happens upon a feeding swarm. We have had two occasions where we estimated ≥ 25 emeralds. During these times the emeralds have been in multiple feeding swarms around cleared (often grassy) areas embedded in coniferous or mixed hardwood forest along stretches of dirt or paved roads (1–5 km). Our first large swarm was on 5 July 2014 along Oklahoma Highway 1, the Talimena National Scenic Byway, in Le Flore Co., where we stopped on multiple occasions and managed to capture one male (SP1318) and eight females, and we saw another 25 small emeralds whose species identification could not be confirmed. A second large swarm was also within the Ouachita National Forest (NF), this time in McCurtain Co., along a USFS road 10 km NE of Broken Bow, where the second author (MAP) captured two males and nine females (1 female, SP1726) on 24 July 2015. He estimated there were an additional 14 individuals present, and there were also multiple Clamp-tipped Emeralds (*S. tenebrosa*) and Mocha Emeralds (*S. linearis*). David Arbour reported a swarm of 60 emeralds at Pipe Spring, Ouachita NF, on 29 June 2014 that he thought were all, or at least primarily, Ozark Emeralds, but no individuals were captured for confirmation. We visited this site on 5 July 2014, when we had a mere five individuals, and were able to confirm the species in-hand. Lastly, a modest “swarm,” of about five males (one in hand; MAP) and one ovipositing female, was seen at Robbers Cave Wildlife Management Area (WMA), Latimer Co., 3 July 2016.

Aside from the record above, 2015 was not the best year for the species, or at least the best year for us finding the species. We encountered Ozark Emeralds only one other time, on 29 June, when we found a lone female ovipositing on Fourche Maline Creek, Robbers Cave Wildlife Management Area (WMA). On 2 July, while on a general survey with ODWC staff at Cookson WMA, Cherokee Co.,

BS-P saw a lone female emerald ovipositing on Hasting's Hollow Creek. That female appeared to have an ovipositor like that of an Ozark Emerald, but because the individual could not be captured the record was treated as probable rather than confirmed. She was particularly cautious because the record would have been the first in the state for the Ozark Highlands. There was one other record for the year: while on a tour with David Arbour on 10 August, Steven Easley photographed a single male (OC435326) at "The Narrows" on the Mountain Fork River (9 km S of Smithville), McCurtain Co.; there also may have been a mating pair, but the photo was inconclusive.

We were unable to refind Ozark Emeralds on Crooked Branch Creek in Well Hollow, Ouachita NF, Le Flore Co., where we had it on 5 July 2014 (1 female, SP1317) or on Breadtown Creek at Atoka WMA, Atoka Co., where we had found two males and three females (including one ovipositing) on 13 July 2013 (1 female, SP802) prior to the initiation of this survey. Floods scoured the latter creek heavily in spring 2015, which may account for the species' disappearance. It may also be that the larvae have yet to mature. Still, we did not find the species at either location in 2016.

In 2015 we received an older report of the species, when on behalf of his young daughter, Mark Ferguson, formerly of Oklahoma but now a Natural Heritage Inventory biologist in Vermont, submitted photographs of a male Ozark Emerald (OC435703) they had captured on 2 August 2006 at Torpedo Switch, Osage Co. We consider this record to be third for the county. For many years we had in the Oklahoma Odonata Project database an unconfirmed record of the species from Osage Co. (Donnelly, 2004; OC247853), so we had considered the record dubious. However, we recently tracked the record down to five

male specimens deposited at the Illinois State Museum (ISM 9831-9834 collected on 5 July 1999 and ISM 14035 collected on 3 July 2000).

With flooding greatly reduced relative to the previous year, 2016 proved markedly better for detection of the Ozark Emerald. We added nine new records and five new localities for the species. The season began with a remarkable record for Tulsa Co., where on 5 June Bill Carrell found the species at Keystone Dam in the Cross Timbers Ecoregion (1 male adult, OC445702, and 1 female teneral, OC445701) on 5 June. Although not the first record for the ecoregion (see the Osage Co. record, above), it was not expected at the site where it was found. It thus provided further evidence that the species has a population outside of its expected range on the Ozark Highlands and Ouachita Mountains. Carrell had the species again at that locale on 14 August, when he saw one male and photographed an ovipositing female (OC453133), yet when BS-P surveyed the site on 12 June (with Carrell) and 18 August, she did not find any individuals.

On 19 June and 10 July 2016, MAP surveyed portions of Honobia WMA, Pushmataha Co. (at 8 km SW of Nashoba and 6 km E of Finley, respectively), where he saw three males (OC447526, 1 as SP1981) on the first trip and 1 tandem pair on the next. He encountered the species again on 3 July in Latimer Co. (5 males [1 in hand], and 1 female ovipositing on Fourche Maline Creek at Robbers Cave WMA) and McCurtain Co. (1 female ovipositing on Cooper Creek 9 km ENE of Broken Bow).

A few days later, BS-P documented the first record of the Ozark Emerald in the Oklahoma Ozarks. She encountered nine individuals (6 males, 3 in hand [2 males, SP1998-1999], 3 females, 2 in hand [1 female, SP2000], OC448780) on Hasting's Hollow Creek in Cookson WMA, Cherokee Co., on 6 July. The next day she saw three individuals (2 males, 1 female; female photographed as OC448782, Fig. 3) on Eagle Pass Hollow Creek, Ozark Plateau WMA, Adair Co. The species was not seen at Ozark Plateau WMA when BS-P revisited the site on 16 August.

The 2016 season ended with two additional records for the Ozark region. The first came on 24 September, when Jon Ivy submitted a photo of a single male at The Nature Conservancy's J. T. Nickel Preserve, at Bathtub Rocks (OC456397). This record extended the known flight season for the species by more than a

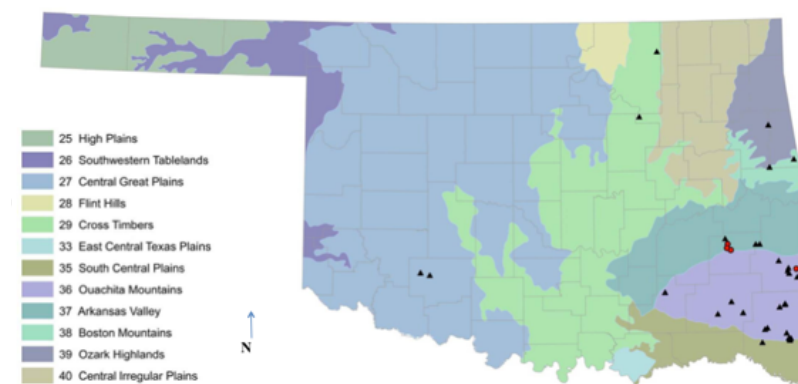


Figure 2. Known locations for Ozark Emerald (*Somatochlora ozarkensis*) in Oklahoma. Historical localities (1931-1934) are red circles; more recent records (2006-2016) are black triangles. The species was not reported between 1934 and 2006. Comanche County records are likely Ozark Emerald but they lack voucher specimens, and the photos cannot without a doubt be attributed to *S. ozarkensis*.

month and a half. Not to be outdone, Cliff Ivy submitted a photo of a single female at the same spot a week later, on 2 October (OC456581). This last record, along with a 2008 record for 28 May (13 km WNW of Hochatown, Cedar Creek, 2 males, both teneral, OC282324), provide the extremes of the known flight season for the Ozark Emerald.

Also in 2016 we received a batch of 2011 and 2012 Ozark Emerald records that had not been reported to us previously. The majority of the records were from McCurtain Co. and are John C. Abbott Collection (JCAC) specimens (6 males, 4 females: 8.5 km SSW of Smithville, Ouachita NF, USFS Rd 28000, 2–3 July 2011). On that same trip, Greg W. Lasley photographed a male and female (iNaturalist 220655, 9 km E of Bethel, 4 km W of Mountain Fork River). The following year on 4 June, Troy Hibbitts reported one individual at the same location of the JCAC specimens, and the next day he photographed a male on the Talimena Highway, 9 km NNW of Big Cedar, Ouachita NF, Le Flore Co. (OC457345). Lastly, on 5 June 2012, Diana and Terry Hibbitts photographed a male in Le Flore Co., 8 km W of Page, Le Flore Co. (iNaturalist 1393295).

Ozark Emeralds have been found within the ecoregions of the Cross Timbers, Ozark Highlands, Boston Mountains, Arkansas Valley, Ouachita Mountains, and South Central Plains (USEPA 2013). There are also two records reported from the Central Great Plains ecoregion. These records are likely Ozark Emeralds, but they lack voucher specimens, and the photographs cannot without a doubt be attributed to *S. ozarkensis* (both by Victor W. Fazio III, in Comanche Co.: OC3134021, 1 male, Fort Sill Military Reserve, West Range, Ketch Canyon, 20 June 2009 and OC328764, 1 male, Wichita Mountains Wildlife Refuge, French Lake, 17 June 2011); i.e., the Texas Emerald (*S. margarita*) or perhaps other emerald species cannot be excluded with certainty.

We have not yet analyzed our habitat assessment data, but we can offer qualitative impressions of where we have encountered the species nonetheless. We have found it in deciduous or mixed deciduous-evergreen woodlands at rocky streams, usually those with much bedrock exposure but sometimes also with sand or fine to pebbly gravel. Stream beds tend to be narrow, only 5–8 m wide. During much of the species' flight season the water in these streams flows at least slightly, but towards the end of the season many streams dry, leaving only scattered pools. Stream water is always clear and usually shallow (approx. 2 cm to <1 m). Males tend to guard small pools or riffles in the stream, waiting for females to arrive. When a female arrives she is more or less immediately captured to mate.

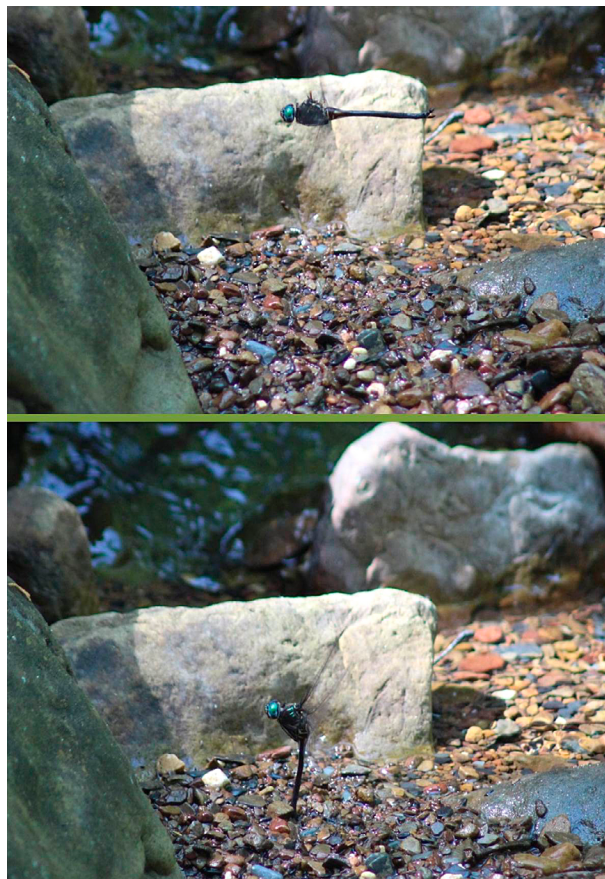


Figure 3. Female Ozark Emerald (*Somatochlora ozarkensis*) ovipositing along Eagle Pass Hollow Creek, Ozark Plateau WMA, Adair Co., Oklahoma, 7 July 2016. Photos by Brenda D. Smith-Patten.

Females have been observed ovipositing most often in trickles of water that flow over gravel or sand, but we have also seen ovipositing in what appear to be non-flowing portions of streams.

We hope to continue habitat assessments during the field season of 2017. Ideally we will also be able to conduct assessments in Arkansas and Missouri. A full report of those assessments will be forthcoming along with a range-wide overview of the Ozark Emerald.

Acknowledgments

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And Now for Something Completely Different...

Nick Donnelly <tdonnelly@binghamton.edu>

Where were you on the day after the election in November? We were flying to Asunción, Paraguay for another southern hemisphere ode adventure. For the first time we were accompanied by two of our three sons, who are marvelous field companions and demon netters of dragonflies.

Why Paraguay? This subtropical country is one of the least-studied for odes in the New World. An Argentine friend, who has several ode projects right across the river from Paraguay, has never been there and his emails suggest that knowledge of Paraguay in bordering countries might be pretty limited.

Our arrival at the airport was a familiar experience: weary passengers in the middle of the night facing equally weary customs officials (the expensive visa was unpleasantly novel), and a long taxi ride down unlit, shabby streets to a barely mid-ranked hotel. We were too tired to really notice that the people were pleasant, and we were pleased that our primitive Spanish seemed to be working unusually well.

We were traveling once again with what Ailsa refers to as the “moth people”, a mainly butterfly/moth bunch, most of whom we knew from previous trips to Panama, Vietnam, and several other countries. The dragonfly people this time comprised half of the group, with a coleopterist and a hemipterist also representing other insect groups.

John Heppner has been organizing these trips for several years, and we now regularly see the world this way, mainly during our northern winter.

Our first collecting place was not far from Asunción, at one of the two Christian evangelical camps where we spent our first week in the country. Very heavy rains just prior to our arrival had filled the streams to hazardous levels and literally dampened our spirits just a bit. The early season odes seem to have been beaten back also, and we spent a week finding somewhat sparse collecting. We did find a new *Gynothemis* species and a *Progomphus* that shouldn't have been there (*P. joergenseni*). All of our group, for different reasons, concluded that November was a little too early for most insects.

Epipleoneura was a new genus for the country. It is a very small, very thin, and very dark protoneturid damselfly. After many trips to the New World tropics I have now developed an eye for these guys. I took it in Panama, Guyana, and Venezuela years ago, and more recently found it in French Guiana and Brazil. The species *E. venezuelensis* is apparently widespread, but I think it is under-reported. In French Guiana a few years ago in the early morning I noticed a common, small plant that grows along clear streams in tropical forest. I noted that one of the attenuate leaves of this plant seemed just a bit longer and a little more attenuate. Try as I did, I simply could not resolve a

clear image of a damselfly on this leaf. Finally I simply swung at a pointy leaf, and found that I had taken a nice male of one of the lesser-known species. My two sons are also keyed in on the habitat where this nearly invisible bug lives, and we found it fairly widespread among our collecting places.

One of the odd bugs that we found at the first of the two camps was noticed by a sharp-eyed member of our group while we were trooping to the dining area on our second evening. He pointed out a fluffy white mold mass next to an outdoor light, and thought that it looked like insect remains. I looked at it and found that it was a dragonfly that had been a spider's dinner. I brought it back and cleaned it as much as possible with acetone and a very fine brush. The fragments are of a female of *Macrothemis* whose name I do not know, but I have a guess. If I ever succeed in identifying it, it will be another new country record.

After a few days it became clear why our Spanish was working so well. Our group had Spanish as a second language, and none of us was really proficient. Then it dawned on all of us: Spanish is not the official language of Paraguay and is spoken by a minority of the people, mainly in cities. The official language is Guaraní, which is an aboriginal language used by everyone, including well-to-do business people in the cities. It was a new experience greeting locals along paths and finding that their Spanish was limited to "hola". We were all speaking Spanish as a second language!

At the end of our first week none of us had found our insects really abundant, and we all agreed that the season was too early. Our little odes group did find some good things: a new species of *Gynothemis* flying over sandy roads, and the very rare *Erythrodiplax lygaea*, which Borrer never saw and only knew from Ris' short description. This last was found at a light during a cold night. (Pro tip: if you are traveling with lepidopterists, pay attention to their lighted sheets and UV light traps; we have found really interesting odes on many occasions.)

We also found this first week some specimens of what I regard as the most beautiful damselfly in the world. This was our second encounter with *Mnesarete pudica*, a *Hetaerina* relative. Sitting on the top of ginger plants in an upland wetland, its transparent, rose-colored wings are the most beautiful that I have encountered in the entire world of odes.

This wetland yielded other treasures: several *Progomphus recticarinatus* and *Macrothemis heteronycha*, an old Calvert species that eluded Mike May's excellent key to

Macrothemis because Calvert had placed it in *Gynothemis*. This was not my first encounter with this bug, but the first time that I really appreciated it. Males flew very slowly in high-grass parts of the wetland where its brown and yellow coloration and very slim physique made it difficult to see, even when they were flying right in front of me.

Our second week we moved on to one of the most famous forest reserves in all of Latin America, the Mbaracayú Reserve, which is a foundation-owned forest reserve on the Brazilian border. Its large size (about 900 km²) makes it a very important island of wildlife and forest in a totally agricultural area. Our bird-watching oldest son Andrew was enchanted; he says he added about 160 species to his life list in Paraguay! Travel in the reserve in our battered old jeep station wagon (we broke an axle!) was muddy and very slow. And the odes came slowly; I told you that we were there too early in their Spring, and there were lots of general specimens. One of the prizes, of which we had few specimens but many sightings, was the very large helicopter damselfly *Mecistogaster amalia*, which was seen several times flying at about 15 feet high along the forest roads searching for juicy spiders. You can't believe their agility. Their numerous escapes, even from expertly swung nets, would amaze anyone except a tropical butterfly collector.

Our prize find in this reserve was a few specimens of an evidently new *Orthemis*, the first of which was found at a lighted Lepidoptera sheet our first evening. During our too-brief stay, we also found several *Perithemis ictoptera*, all of them females, and all at lights during the evening.

We moved on, (following a long drive) back to the southern part of the country, where we spent only a few nights at a very nice tourist hotel (the Tirol, or Tyrol, depending on who painted which sign) close to the Paraná River, which is the border with Argentina. The forest here was very nice but not very extensive. I will remember it mainly for an afternoon swarm of *Coryphaeschna perrensi*, all of which were hard-flying, but too juvenile to have the bright red bodies of adults. Our sons Andrew and Malcolm had a fine hour catching several males of these. Bill Tyson, a coleopterist, whose lighted sheet had yielded the *Erythrodiplax lygaea*, did it again with a fine male of *Brechmorhoga praedatrix*—a country record. I had several years previously found a country record for this species in Argentina—that time in a spider web.

Most of our group muttered slightly mutinous phrases when, after only two nights at the Tirol, our leader announced that we would move on, so as to be in striking distance from the airport; our trip was indeed winding down. We went on to San Ignacio, a country town not far from the Paraná River and also close to Argentina. The

small hotel was comfortable and the chef unusually skilled (you don't go to Paraguay for the food!). We only had two collecting days there, but the findings were wonderful. I saw my first *Aphylla theodorina*, which might be the most strikingly-marked clubtail of my entire experience (though those in southeast Asia are hard to beat). There was also a smaller *Aphylla* which might be an undescribed species (more research is still needed!), a *Macrothemis* I still can't name, and oodles of a *Micrathyria* that looks like a common Argentine species, but is not.

The major find of this stop was a gomphid that Malcolm found in a nearby stream just an hour before we were due to leave for Asunción the last morning. Looking at it with my hand lens, I was puzzled by what appeared to be extra bits of the terminal appendages. When I returned home and relaxed the specimen I found that it was a *Tibiagomphus uncatius*, a gomphid confined to a small part of South America. The odd bit on the appendages was an amazing, forward-directed, long, curved appendage of the cercus. Sometimes you have to ask just how many varieties of

structures exist that enable male gomphids to grasp the heads of females, and how does this particular one work?

Paraguay pleasantly surprised all of us. We could see why the country is not on the wish list of most world travelers. The food is middling, and our Paraguayan hosts do not know how to really prepare coffee. They drink only mate (two syllables), which is also very popular in Argentina—where, however, they also drink coffee. The scenery is dull, unless you are a fan of soybeans, as their vast fields put Iowa to shame. The forest has all but disappeared. However, there are lots of odes in small wooded habitats among the soybean fields.

Our total list was of 86 species. Of these nine are still unnamed, and potentially undescribed. Two more are certainly new species. Of the entire list, 37 species do not appear on the Paraguay portion of the Paulson web list for Latin American odonates. All in all, not a bad result.

Will we go back? You bet!



The Surroundings of Zanderij, the Best-studied Area for the Dragonflies of Suriname

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Going to the unspoiled tropical rain forest in the deep interior of Suriname is a real adventure. But the best-studied part of Suriname for dragonflies is the area where most arrive: around the airport. I hereby present a long list of species which are known from this area, with a map showing most of the known collecting sites.

The area around Zanderij

A preliminary map published by Wasscher and Bos (2000) showed tropical rainforests of the Neotropics and Central America to have probably the highest biodiversity of Odonata in the world; it seems that nowhere else can odonatological diversity be so high. The publication by Paulson (1985) on Explorers Inn, Tambopata River, Madre de Dios in Peru revealed one of the highest densities of species for Odonata known, with then 151 (more recently 185; pers. comm., Dennis Paulson, 2011) known species, in an area with a size of 15 km². At the REGUA area, a restored nature reserve near Rio de Janeiro (in the Atlantic forest of Brazil), Tom Kompier has found 204 species in 75 km² (Kompier, 2015).

I have put an imaginary 15x15 km square (Fig. 1; 225 km²) around the J.A. Pengel International Airport of Zanderij,

Suriname 40 km south of the capital of Paramaribo. This area is in the Northern Savannah Belt of Suriname and it is rather forested and relatively flat, with its highest point at just 50 m being in the southeast. The main habitat of odonatological interest are creeks with a width of 0.5 to 6 m, almost all of which are fed by rainwater. Many are permanent, though some small creeks are not. As far as I know only one source is present, at the upper part of the Troelinde Kreek. In the east is the Para river (with a width of 10–30 m), northwest from the airport a number of sandy pools are present and a marshy area along the Coropina kreek near Bersaba (Fig. 2).

The area around is the hotspot of Suriname to some degree because it is easily accessible and is the most intensively visited by odonatologists. Dirk Geijskes had a holiday home at Republiek, most likely from 1941 until 1965. Jean Belle often came here by car during the weekends (Belle, 1966). One of his frequently visited localities was the creek that forms the Upper Para river, which is the type locality of *Agriogomphus ericae* Belle, 1966 (Fig. 3). Since my own first visit to Suriname in 1989 I have been active in the area on several occasions. In September–October 1990, I spent a few weeks at Plantage Prinsie, and in August 2006 I stayed several very successful days at Plantage Berlijn and

on other occasions I did some day trips from Paramaribo.

Canoe rentals are possible at map localities 3 and 4. If you want to stay in the area during your visit there are several possibilities (Fig. 1): commercial hut rentals are easy to find at map localities 1 and 8; private houses are rented at map locality 9; and you can camp or rent hammocks at map locality 10.

Odonatological qualities

Of the 20,000 adult Odonata collected in Suriname during 1934–1975, nearly 3,400 (16%) were collected around Zanderij. These belong to 185 species: more than 60% of the 302 species now known from the country. Some species must presently be regarded as endemics, as they are only known from this area and its direct surroundings. The first is *Micrathyria coropinae* Geijskes, 1963, named after the Coropina creek. This is an endangered species listed on the IUCN Red List, because it is known only from a very few locations and none are within protected areas; population details are lacking (von Ellenrieder, 2009). Outside the Coropina creek it is only known from Bos Bivak, Onverwacht and Plantage Berlin (Fig. 4) (at resp. 5, 7 and 10 km from this creek).

Another very rare local species is *Tuberculobasis geijskesi* Machado, 2009, of which the type locality is 'Republiek, Lelydorp' (Machado, 2009). This name refers not to one but to two localities: Lelydorp lies 30 km north of Republiek. As the holotype was collected on 15 April 1938, the most likely true locality must be Lelydorp, as that was the only locality where Dirk Geijskes collected dragonflies during that month. On 17 August 2011, I came across a male of this species (Fig. 5) 100 m from the Upper Para river, this being the second-ever record worldwide. Some 50 individuals of three other members of this rare genus have, in addition, been recorded in the area, while only 10 individuals have been collected elsewhere in Suriname. In the area lie seven type localities (e.g. the recently described *Orthemis aciculate* von Ellenrieder, 2012), and for other rare species with a wide distribution in South America, this is the only locality in Suriname where it has been found (e.g. *Staurophlebia auca* Kennedy, 1937).

Species List

The species listed are found in the area (* indicates type localities, 7 spp.) and at the indicated abundances in Suriname (where known): ¹rather rare (75 sp.); ²rare (21 sp.); and ³very rare (7 sp.):

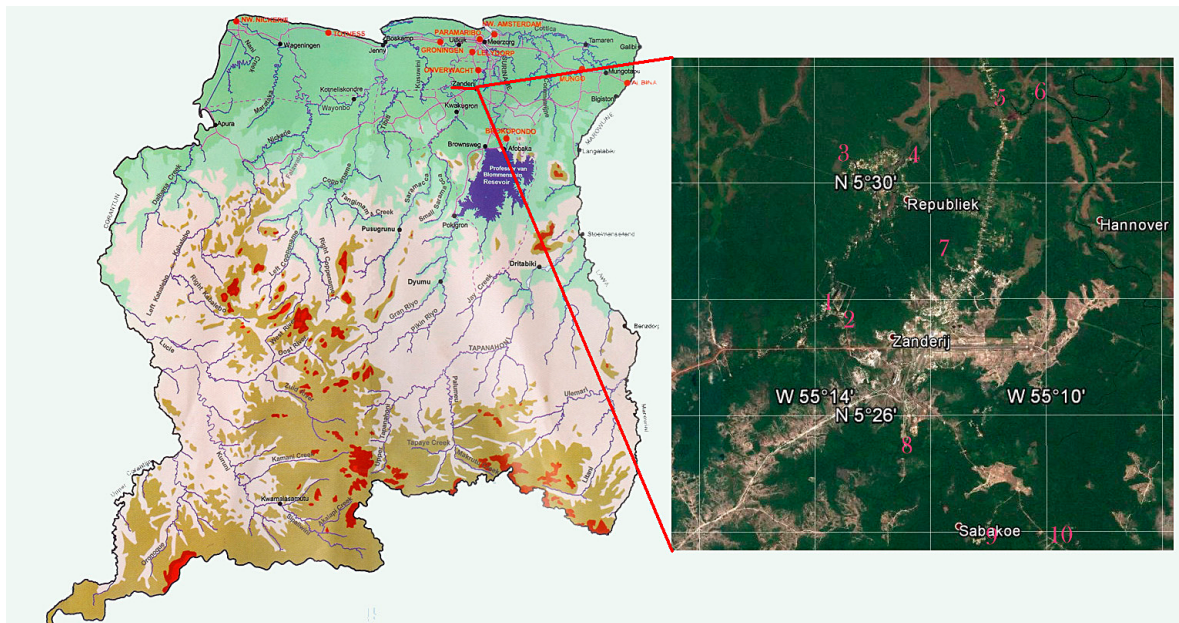


Figure 1. Map of Suriname (left) and Zanderij (right) with localities. Legend: 1) Colakreek, now a recreation park, is the upper part of the Coropina creek, which name was long ago 'Dauwdrupkamp' 2) Area with some savannah pools 3) Vierkinderen, NW from Republiek, both with the Coropina creek 4) Bersaba, Coropina creek 5) Bridge over the Coropina creek at the Martin Luther Kingweg ('Highway') towards Paramaribo 6) Plantage Prinsie, Coropina creek 7) 'Zanderij 1' the former railway station, the old names Troelindekreek (and most likely Pontjikreek and Pontijbrug) are also close by 8) Bos Bivak, nowadays named the Ayoko kazerne 9) Plantage Berlin with the Upper Para river (search for a path to the east in the NE corner of the savannah area to walk to the creek); a less well-known creek is also directly east of the village 10) Palulu camping.

*Acanthagrion adustum*¹, *A. apicale*¹, *A. ascendens*, *A. egeri*¹, *A. indefensum*, *A. inexpectum*², *A. rubrifrons*
Aeolagrion dorsale
Aeschnosoma auripennis^{*2}, *A. forcipula*¹, *Agriogomphus ericae*^{*2}, *A. sylvicola*¹
Anatya guttata
Anax amazili, *A. concolor*
Aphylla dentata, *A. producta*¹
*Archaeogomphus nanus*¹
Argia fumigata, *A. palmata*¹, *A. meioura*¹, *A. gemella*
*Argyrothemis argentea*²
Brachymesia herbida
Brechmorhoga praedatrix
*Cacoides latro*¹
*Coryphaeschna adnexa*¹, *C. viriditas*
*Diastatops obscura*¹, *D. pullata*,
*Ebegomphus conchinus*¹, *E. demerarae*¹, *E. minutus*³
*Elasmothemis williamsoni*¹
Elga leptostyla,
*Epiploneura fuscaenea*¹, *E. lamina*, *E. pereirai*, *E. spatulata*¹
Erythemis attala, *E. credula*, *E. baematogastra*, *E. mithroides*,
E. peruviana, *E. plebeja*, *E. vesiculosa*
*Erythrodiplax amazonica*¹, *E. basalis*, *E. famula*, *E. fusca*, *E. minuscula*², *E. paraguayensis*, *E. umbrata*, *E. unimaculata*,
*E. venusta*¹
*Fylgia amazonica*¹
Gynacantha auricularis, *G. francesca*¹, *G. gracilis*¹, *G. klagesi*¹,
G. laticeps, *G. litoralis*¹, *G. membranalis*, *G. mexicana*, *G. nervosa*, *G. tenuis*, *G. pumila*, *G. uniseti*¹
*Heliogaris amazona*¹
Hetaerina caja dominula, *H. laesa*¹, *H. moribunda*
Heteragrion ictericum
*Idiataphe amazonica*¹, *I. batesi*¹, *I. longipes*
Ischnura capreolus, *I. fluviatilis*, *I. hastata*¹
*Leptobasis vacillans*¹
Lestes curvatus^{*2}, *L. minutus*



Figure 2. Marshes along the Coropina creek at Bersaba; somewhere near here must be the type locality of *Lestes curvatus* Belle, 1997.



Figure 3. Upper Para river near Plantage Berlijn, the type locality of *Agriogomphus ericae* Belle, 1966.

Libellula herculea
*Macrothemis declivata*¹, *M. extensa*¹, *M. flavescens*¹, *M. pumila*
Mecistogaster linearis, *M. lucretia*, *M. ornata*¹
*Melanocacus mungo*¹
*Mesoleptobasis cyanolineata*², *M. elongata*²
*Metaleptobasis quadricornis*¹
Miathyria marcella, *M. simplex*¹
Micrathyria aequalis, *M. artemis*¹, *M. atra*¹, *M. catenata*¹, *M. coropinae*^{*2}, *M. didyma*¹, *M. hippolyte*¹, *M. mengeri*, *M. pseudeximia*, *M. spinifera*, *M. tibialis*
Microstigma maculatum
Misagria parana
*Nehalennia minuta*¹
*Neoneura bilinearis*¹, *N. myrthea*, *N. rubriventris*¹
*Nephepeltia flavifrons*², *N. phryne*
*Neuraeschna calverti*³, *N. costalis*¹, *N. harpya*¹
Oligoclada abbreviata, *O. amphinome*¹, *O. pachystigma*, *O. rbea*¹, *O. risi*¹, *O. walkeri*¹
Orthemis aciculata^{*2}, *O. aequilibris*, *O. ambirufa*¹, *O. anthracina*², *O. attenuata*, *O. biolleyi*¹, *O. concolor*, *O. coracina*², *O. cultriformis*¹, *O. discolor*, *O. schmidti*
*Oxystigma cyanofrons*¹, *O. petiolatum*
Pantala flavescens
*Perilestes gracillimus*¹, *P. kahl*², *Perilestes sp. f*²
*Perithemis cornelia*¹, *P. electra*¹, *P. lais*, *P. thais*
*Phyllogomphoides cristatus*², *P. major*, *P. undulatus*
*Planiplax arachne*¹, *P. phoenicura*¹
*Progomphus brachycnemis*¹, *P. guyanensis*^{*2}
Rhodopygia cardinalis, *R. geijskesi*^{*}, *R. hollandi*¹, *R. pruinosa*²

*Staurophlebia auca*³, *S. reticulata*
Tauriphila argo, *Telebasis demarara*, *T. simulata*¹
Tholymis citrina
*Tramea abdominalis*², *T. basilaris*³, *T. binotata*¹, *T. calverti*, *T. cophysa*, *T. minuta*², *T. rustica*¹
*Triacanthagyna caribbea*¹, *T. dentata*¹, *T. ditzleri*¹, *T. satyrus*¹,
T. septima
*Tuberculobasis geijskesi*³, *T. mammilaris*², *T. macuxi*³, *T. yanomami*³
Uracis fastigiata, *U. imbuta*, *U. infumata*¹, *U. oviposatrix*
Zenithoptera fasciata
*Zonophora batesi*¹, *Z. calippus*¹

Conclusion

The Zanderij area has a very high number of Odonata species. On one hand, this is because the savannah creeks in the area seem to be different from many other creeks in the country, with a sandy bottom and sometimes rich water vegetation. On the other hand, the high number of species is to some extent due simply to the fact that the area has been visited very often over many years.

Acknowledgements

Much thanks are due to Arian Parr and Karin Verspui for checking the English language and helping me improve the article.

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Figure 4. Male *Micrathyria coropinae* Geijskes, 1963, found in a garden in Plantage Berlijn, 50 m from a creek, 16 August 2011.



Figure 5. Male *Tuberculobasis geijskesi* Machado, 2009 found on a trail, 100 m from the Upper Para river E of Plantage Berlijn on 17 August 2011.

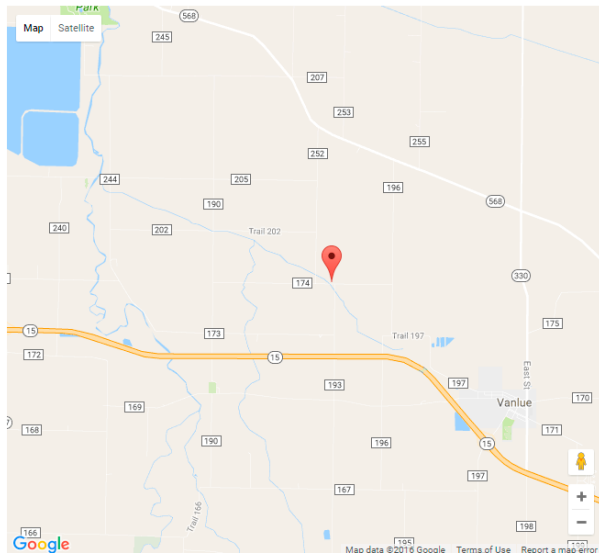
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Enallagma anna (River Bluet) in Hancock County, Ohio

Shane Myers <rebo429@gmail.com>

This year was the first year of my five-year odonate survey for the Hancock Parks District (HPD) and Hancock County Naturalists (HCN). Over the course of the year I've found 13 new species for the county, based on the most recent Ohio Odonata Survey (OOS) database. Additionally, I've confirmed all but two species that had been previously recorded for the state, including *Dromogomphus spoilatus* (Flag-tailed Spinyleg), which hadn't been recorded in the county since 1960!

Bright's Ditch is a small channeled ditch that runs through Amanda and Biglick townships. This is fed by a spring near Vanlue and meanders to the Blanchard River near



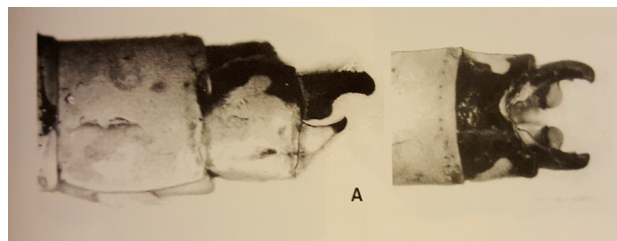
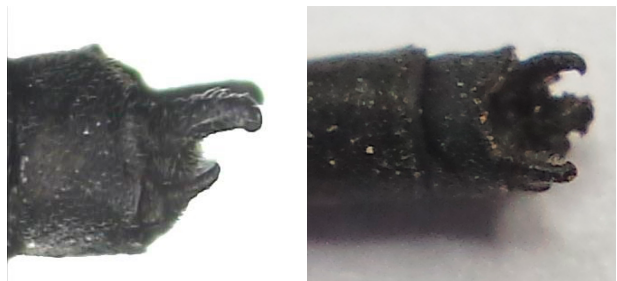
Google Map and photo of Bright's Ditch and collecting location (July 2016). The ditch runs from 244 to Trail 197 northwest of Vanlue.



One of the original images taken on location. Note the long cerci visible even here.

the Findlay Upground Reservoirs. Mostly surrounded by agricultural fields, this ditch has been surprisingly diverse from a biological standpoint. To date, I've recorded 24 species of odonates along the length of this drainage system.


On a whim, I looked from the road and saw an unusual bluet, so I snapped several pictures and headed home (after several hours kayaking around Van Buren Lake trying to get pictures of Cyrano Darners on territory, I admittedly was a bit worn out). Two days later, I finally got around to looking at my pictures for that day and realized this one damsel was something very different. Based on OOS data, *Enallagma carunculatum* (Tule Bluet) was on my list of probable finds in the county, but this seemed different yet. I emailed a handful of far more experienced biologists than myself and they all said the same thing: "Go collect a specimen!"

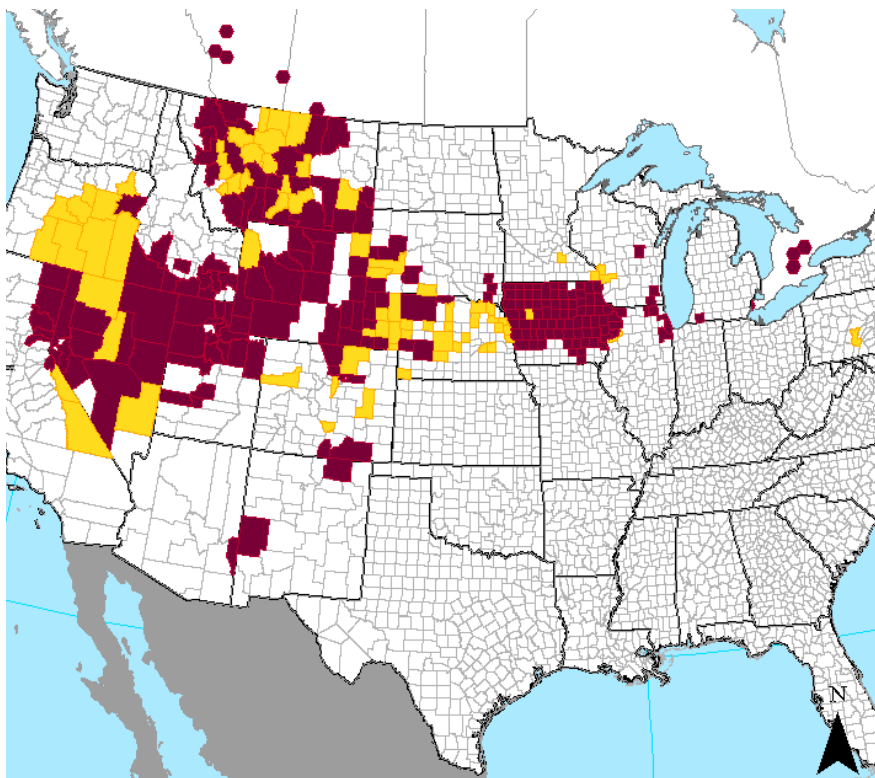
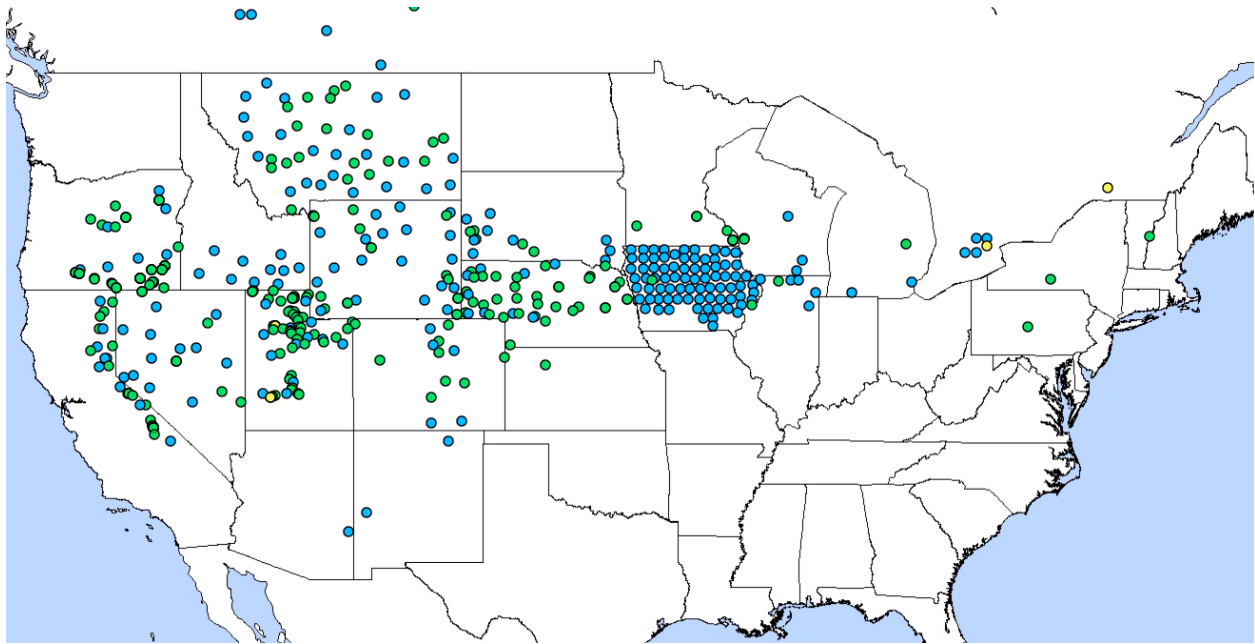


Images of collected potential male *Enallagma anna* (River Bluet) cerci (upper) with *E. anna* male cerci from Westfall and May (p. 353) (lower).

After collecting an individual, I took highly magnified images of the male cerci and compared them to the images in Westfall and May.

At this point, it's difficult to say if this population has been present a while, or even exactly how widespread they are in this single drainage ditch. An updated state-wide Odonata survey beginning in 2017 might shed further

light on these questions. *Enallagma anna* has been found in small numbers in Michigan and in Pennsylvania, representing the closest known populations. This summer I intend to survey more of the ditch, looking for territorial and reproductive behaviors and exuvia or nymphs, and with luck, document this species and ensure its future on Ohio's list of odonates. 



(Upper) OdonataCentral map of *Enallagma anna* (River Bluet) records, downloaded September 2016. Blue: Dot Map record; green: photo-vouchered record. (Left) Distribution of *E. anna* in North America according to NatureServe (created June 2014). Yellow: modern (post-1969) record; red: date unknown.

Anax concolor (Blue-spotted Comet Darner) Again—A Never-ending Color Problem

Nick Donnelly <tdonelly@binghamton.edu>

In terms of color, the Blue-spotted Comet Darner (*Anax concolor*) has to be one of the most interesting odes in the New World. I have encountered it many times, including Dominica (1964), Panama (1970, 2011, 2012), Ecuador (2017), and Argentina (2017), but in my experience the abdominal spots are usually white, not blue. When I first found it in 1964, on the island of Dominica, I was already prepared for the appearance of this marvelous insect: a green thorax and a brick-red abdomen with no spots at all. Dirk Geiskes had written a paper in 1968 (Fauna of Suriname Vol. X) in which he described the Dominica form, and I found his description quite accurate.

My subsequent catches, however, revealed a variety of colors. My next encounter (Panama, 1970) was of a dark *Anax*, green with white spots on the abdomen. Encounters in Ecuador and later trips to Panama revealed what now seems to be a more “typical” color: pale spots (white in my experience) on a dark, red-shaded abdomen and a green thorax. A specimen in northern Argentina in 1997 had an orange abdomen with white spots.


My latest find of the species was from a famous (at least in the bird world) forest reserve in Paraguay: Mbaracayú (during our recent trip; see article on p. 21 in this issue). While collecting with my wife and two sons in November of last year, we encountered a large, darkish, and apparently unmarked darner flying along a muddy road in the forest. We managed to take two males, which I decided had to be *A. concolor* by the shape of the terminal appendages. The phrase “unmarked” does not completely describe the appearance of these specimens. The surface of the body was also uncharacteristically dull for any ode.

I next examined the specimens after my return to Binghamton, about a fortnight later when I was preparing my trip account. The specimens showed very dull pale greenish spots on the abdomen, where the pale spots of *A. concolor* should be (except on Dominica!), so I regarded this only as a confirmation of my field determination.

I should note here that the collected specimens were initially soaked in acetone for 48 hours and dried in a synthetic zeolite (which is a better desiccant than silica gel,

in my experience). I did not look at these specimens again until I put them in plastic envelopes with a printed data card; this was approximately six weeks after capture, during which time they continued to be stored in desiccant. Now the specimens showed a beautiful, very sharp, color pattern with abdominal spots of the very pale blue.

Why were the live darners such a dull green? I have several times seen three-toed sloths in the tropics, and on a sunny day one can clearly see a greenish wash on the fur of these remarkable animals, which is caused by an alga growing on moist fur. I think the greenish color of the *Anax* is also an alga—possibly the same as on the sloth. I have not, to my knowledge, encountered previously anything that I thought might be an algal coating on any species of ode.

There is an obvious lesson here: coloration in some cases may not be at all useful for field identification, and even excellent photography can not provide an identification. What other odes may get covered by algae? 



Slightly teneral *Anax concolor* (Blue-spotted Comet Darner) from Paraguay showing the vivid markings originally totally hidden by a coating believed to be an alga.

Lucky Late-season *Stylurus* Clubtails: Finding the Right Place at the Right Time

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For those of you who enjoy hunting for clubtails, we offer a story of some of our experiences...

Stylurus notatus (Elusive Clubtail)

Our first sightings of Elusive Clubtail occurred at Sumner Park along the Pecatonica River in Winnebago County, Illinois on 13 September 2014. Between the hours of 9:30 am and 2:30 pm, while observing a tree in full sun, Paul D. saw a female on the ground that flew up to a bankside maple tree at about eye level, which was later followed by a male. We also had Elusive Clubtail in the same spot, on the same tree, and within the same time frame on 12 September 2015.

The second sighting was on 2 September 2016 at 10 am, at a Cook County Forest Preserve plank road canoe launch in Lyons, Illinois, on the Des Plaines River. I saw a male that I couldn't document, as I didn't obtain a picture, but the species was later documented by Mark Kluge on OdonataCentral (OC#455554; 13 September 2016), again in a park setting in full sun close to the river.

Our third and most productive spot was at Island Park in Momence, Illinois in Kankakee County on the Kankakee River. Between 13 September and 8 October 2016, we saw Elusive Clubtails of both sexes while making observations within a 10 am to 3 pm time frame, starting at an oak just off the river that was in full sun all day. We observed more males than females, but this species was seen during every visit over that 15 day period, and originally individuals appeared to be freshly emerged, with glossy wings. We first saw them at eye level but later, as sightings became more numerous, we would find them anywhere from ground level to 30 feet high in trees.



Stylurus notatus (Elusive Clubtail), Island Park, Momence, Illinois. Photo by Paul Dacko.

Stylurus plagiatus (Russet-tipped Clubtail)

We had found early-season Russet-tipped Clubtail in La Salle County, Illinois on 1 August 2015; on 22 August in Kenosha County, Wisconsin, Paul D. found a male and I a female. These early-season finds were always singles or pairs. I then decided to visit the plank road canoe launch on the Des Plaines River on 2 September 2016, and late-season Russet-tipped Clubtails were found on this date (although they could have been present there much earlier). They were seen until 27 September 2016; during that time they were found 20 ft up in trees, sunning themselves early in the day by hanging off grapevine leaves and buckthorn, then moving lower to the ground as the dew burned off but always in full sun and out of the wind. At the end of the season we had a dozen males all flying in that one spot.



Stylurus plagiatus (Russet-tipped Clubtail) female. Photo by Paul Massey.

Paul D. had suggested that we survey downriver at other locations, and we also found Russet-tipped Clubtails as far out as three miles downstream. A thought that they should be present elsewhere had us heading out to Dixon, Illinois in Lee County to check out Page Park and Lowell Park, places that were a habitat match for our profile (park setting, trees and shrubs in full sun out of the wind) which we found by using Google Earth.

We found Russet-tipped Clubtails of both sexes at Page Park, where they were very abundant though all seemed to be older worn individuals showing lots of wing damage. Lowell Park produced just a couple of males. We then tried Smississippi Park in Sterling, Illinois in Whiteside County but found nothing.



Stylurus plagiatus (Russet-tipped Clubtail) male. Photo by Paul Massey.

However, I left the best until last:

Stylurus spiniceps (Arrow Clubtail)

Every year we make a wish list of species to pursue, and we still needed to find the Arrow Clubtail. This was our second year of looking for them, and tip from Freda van den Broek of the Wisconsin Dragonfly Society had us heading up to Waubedonia County Park in Ozaukee County, Wisconsin. Here, thanks to Freda's directions, we had our first Arrow Clubtail, a just-emerged teneral male sitting on an unfurled lily pad leaf with its exuvia below. It was found around 2:30pm in a park setting on the sunny side of the Milwaukee River on 6 August 2016.

Now the hunt was on! Every weekend we would look at the weather forecast and pick a new spot to investigate. This year my wife Linda had been smitten with the ode bug and she joined us on our weekly forays, learning to identify and photograph dragonflies and providing a third keen set of eyes in this endeavor.

I was off work and the weather had been miserable, so upon seeing a partially sunny forecast in Kankakee County, I headed south searching for riverside parks (of which this county has many) on Friday 23 September 2016. Paul D. had previous commitments and Linda was working. I arrived at the first park on the list, Island Park

in Momence, Illinois, at 9:45 am and walked the riverbank looking for a tree matching our magic tree profile. At 10:45 am I stood in front of a beautiful acorn-laden oak tree in full sun, and within 15 minutes a male Elusive Clubtail flew down onto a branch at eye level. A call was made immediately to Paul D.'s cell phone: "You'll never guess what just landed in front of me—a male Elusive! Going to take pictures while it's sitting good."

After taking pictures I moved around the tree about eight feet, and there in front of me was a female Arrow Clubtail eating a wasp. Of course I called Paul D. again: "You'll never guess what else is right in front of me—a female Arrow Clubtail. I know where our weekend destination will be! I'll send you pictures when I get home." Saturday 24 September began with us in front of the same magical oak tree and then glassing any sunny spots up in the surrounding trees. We would spread out in every direction, and it wasn't long before I heard Paul D. and Linda calling, "over here, I have one"; "wow I have one too"; "I just had one fly in off the river." We had curious locals, often walking dogs, stop and ask us what we were doing. After showing them the clubtail (usually right in front of us) they would continue on and often made a trip back to us with some really nice phone pictures of both adults and teneral.

This location kept giving and giving, with both sexes of Arrow Clubtail being found on every visit through 8 October 2016, along with Elusive Clubtails, at times on the same branch just three feet apart.

Paul D. had let Marla Garrison and Dr. Tim Cashett know of our finds, and the help and knowledge provided by both of them is always greatly appreciated. After reviewing our lucky finds we think that some of our *Stylurus* observations over the last three seasons are forming a pattern:



Teneral *Stylurus spiniceps* (Arrow Clubtail) perched above its exuvia, Waubedonia Park, Ozaukee County, Illinois. Photo by Paul Massey.

1. The magic tree concept. This includes a park-like setting, with trees spaced apart, mowed grass, and a river running close by. Trees can be 50 ft away from the river as long as they are in full sun from 10 am through 4 pm, with branches draping almost to ground. As soon as you locate such a tree (ours were oak and maple), be patient and scan all the sunny spots using binoculars. We usually found a clubtail within 30 minutes.

2. Food. The food sources were wasps, wasp mimics (not sure if they were flies or other types of insects, but they were docile compared to the wasps they resembled), mayflies, and to a lesser extent mosquitoes. There were plenty of Rubyspots (*Hetaerina*) present but we didn't witness any clubtail predation on them.

3. Late season. Late season appears to be more productive than the early season in our area, perhaps due to cold nights and less daylight and/or sun available for feeding and basking. The sightings occurred within a 10 am to 4pm window.

4. Recheck. In every species of *Stylurus* mentioned here, we witnessed different individuals of the same species but of the opposite sex at the same spot leaf or branch within one hour of the first individual's departure. We have witnessed this over the past three years. Perhaps some kind of scent marker is left behind?

5. Breeding. No tandem pairs were ever seen, and any riffle breeding habitats were at least 100 yards away. This may explain where they went after 4 pm...


6. Birds. Due to the lateness of the season, warblers were migrating as we made our dragonfly sightings. Being a birdwatcher too, I could never resist watching them move down a branch, gleaning insects and caterpillars as they foraged. Often, to my delight, they would displace a clubtail that would usually just do a small indignant flight before returning to its usual spot. Waxwings, however, would eat the clubtails we witnessed in Wisconsin as they emerged and elsewhere at season's end. In fact, when the waxwings had moved on, the clubtails were gone.



Arrow Clubtail (*Stylurus spiniceps*), Island Park, Momence, Illinois. Photo by Paul Dacko.



The magic oak tree in a park setting, Island Park, Momence, Illinois. Photo by Paul Massey.

We hope this information helps others who are on the hunt for clubtails. Good luck for the 2017 season! 

Cast Your Ballot in the 2017 DSA Election!

It's time to vote for the new officers to serve on your DSA Executive Committee. Positions in 2017 include President-elect, Treasurer, and Regular Member. Visit <http://tinyurl.com/z7u3e25> to cast your vote for an existing candidate or add a write-in candidate.

Not Wasted Away Again in Margaritaville, a.k.a. A Whole Month in Yelapa, Mexico

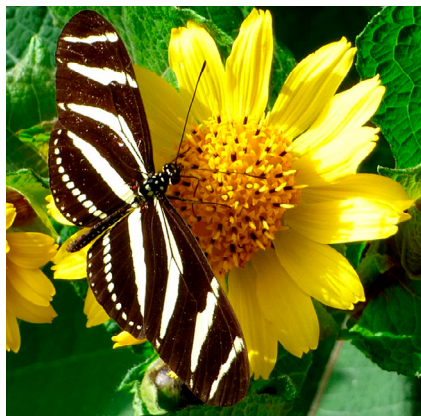
Kathy and Dave Biggs, 308 Bloomfield Road, Sebastopol, California, 95472 <bigsnest@sonic.net>

Dave and I returned to Yelapa in Jalisco, Mexico for a whole month this visit to study the odes and other fauna. (Please feel free to substitute “play with” in place of the word “study”, folks!). This is such a beautiful, safe, and friendly place, teeming with wildlife.

Yelapa is just south of Puerto Vallarta but can't be reached by automobile even though it isn't an island. You take a 45-minute water taxi ride to get there, though often the taxi just drives right onto the beach instead of using the two piers that are available for drop-off. This means that there are no cars and only walkways—it's like stepping back a hundred years into old Mexico! And yes, that does mean that you have to step around “road apples”, as most transportation is by horse or mule if not by foot. Luckily the pathways are wide enough for ATVs, so we had our luggage transported about a mile upriver to the casita we rented.

The absence of cars coupled with the fact that folks there treasure their wildlife (they don't even eat their iguanas) makes it a real nature haven. So far we've been able to document 64 of the State of Jalisco's 137 species in Yelapa. There are two rivers and we didn't waste any time before getting into them! Rio del Tuito has three miles of easily explored length. The river is longer than that, but it's difficult to get beyond the large waterfall three miles up.

Before we even arrived at the casita, we were photographing the gorgeous butterflies that abound there. In fact, we were surprised to find many zebras in Yelapa—Zebra Longwing butterflies (*Heliconius charithonia*) and Zebra-striped Sanddragons (*Phyllogomphoides clendoni*), that is!



Zebra Longwing (*Heliconius charithonia*).

Delightful to us was the fact that only a single species seen there was one that we also see at our Sebastopol, California pond—(Desert Firetail, *Telebasis salva*), though we were in the jungle and not the desert.

When we visited in 2014, I thought I saw a threadtail in the yard's shrubbery, so we were surprised this trip to find the Orange-striped Threadtail (*Protoneura cara*) to be very common and found on



Neoerythromma gladiolatum.

nearly every outing we took (daily outings, of course!). Our usual schedule was to bird until 11 am (we had motmots and trogons in the yard), ode until 3 or 4 pm, then go inside to deal with the photos. After that we'd walk to a dinner of shrimp or other delicacy, as the village is a fishing pueblo. Cell phone signal was somewhat spotty and iffy, but usually we could make phone calls, send texts, and get onto Facebook, so if we had energy that's what we did after dinner. In fact, as of this writing (23 February) I'm still busy whittling down the 100+ images Dave took each day to 30–40 to post as a daily album/diary on Facebook. I'm doing this because when you make albums on Facebook you can share a link to them even with folks who aren't on Facebook (although if you're not on the Internet at all you'll just have to visit us in person).

Some of the highlights were finding yellowface damselflies (*Neoerythromma gladiolatum*) in the lagoon on one of our last days there, and Fiery-eyed Dancers (*Argia oenea*) at almost every spot we accessed on the river (in 2014 we only found them at the pool below the waterfall). There were three species of sylphs: Jade-striped Sylph (*Macrothemis inequiunguis*), White-tailed Sylph (*M. pseudimitans*) and *M. ultima*. In 2014 we also had Straw-colored Sylph (*M. inacuta*). We also saw three species of amberwings: Mexican Amberwing (*Perithemis intensa*), Slough Amberwing (*P. domitia*) and *P. mooma*, but by far our largest thrill was getting to know the Filigree Skimmer (*Pseudoleon superbus*) very well.

I'll close with the *P. superbus* story: For decades we'd longed to see this species, having missed it at a DSA meeting in Arizona and the Southwest Blitz in New Mexico. On our first day in Yelapa, in our own “backyard” that fronts Rio del Tuito, I was perched on a rock below the “cascades” when I saw what appeared to be a dragon with dark wings

fly upriver. For just a moment the sun shone through the wings and I thought they looked lacy. The hunt was on!! The next day I thought I saw a Band-winged Dragonlet (*Erythrodiplax umbrata*), a species we'd seen there in 2014, land some distance away. I pointed the camera and took a distant shot. That evening, when I processed the photos, I was pleasantly surprised to find it was the Filigree Skimmer!! So, the next day I sat right where I'd taken the photo and waited there half an hour (that's pretty patient for me), but then gave up. However, as I looked down at my feet as I was about to stand up, I was dismayed to find just a pair of wings (a predator had likely eaten it).

A few days later, farther down the river, we finally were relieved to find another Filigree Skimmer and by our last day there, we were seeing them two at a time. The quest was over!!



Filigree Skimmer (*Pseudoleon superbus*).

Oh, and did I mention the orchids, the iguanas that were up to eight feet long, or the Ferruginous Pygmy Owls and Military Macaws? Or the fact that some species of odes possibly weren't known species and that at least one has turned out to be a new species for the state of Jalisco? We'd love to share all this with you next year, when I hope to lead a trip—maybe you can help us find the Ornate Helicopter Damselfly (*Mecistogaster ornata*)!

Below is a list of species we have documented in Yelapa. These were seen by Dave, myself, DSA member Laura Gaudette, and/or a Yelapa resident.

Odonata of Yelapa

Bold type indicates species seen in 2014 or 2017 by the Biggs; normal type indicates species not yet seen by them. A single asterisk denotes species new to the Biggs' life list in 2017; a double asterisk denotes species new to the Jalisco state list.

Zygoptera (damselflies)

Hetaerina americana (American Rubyspot)
H. occisa
H. titia (Smoky Rubyspot)
Archilestes grandis (Great Spreadwing)
**Protoneura cara* (Orange-striped Threadtail)
Argia anceps (Cerulean Dancer; found nearby)
A. carlcooki (Yaqui Dancer)
A. extranea (Spine-tipped Dancer)
A. harknessi (Harkness's Dancer)
A. lacrimans (Sierra Madre Dancer)
A. nabuana (Aztec Dancer)
**A. oculata*
A. oenea (Fiery-eyed Dancer)
A. pulla
A. tezpi (Tezpi Dancer)
Enallagma novaehispaniae (Neotropical Bluet)
E. praeviarum (Arroyo Bluet)
E. semicirculare (Claw-tipped Bluet)
Ischnura demorsa (Mexican Forktail)
I. denticollis (Black-fronted Forktail)
I. hastata (Citrine Forktail)
I. ramburii (Rambur's Forktail)
Mecistogaster ornata (Ornate Helicopter Damselfly)
**Neorhythromma gladiolatum*
**Telebasis filiola*
T. salva (Desert Firetail)

Anisoptera (dragonflies)

Anax junius (Common Green Darner)
**Coryphaeschna adnexa* (Blue-faced Darner)
Rhionaeschna psilus (Turquoise-tipped Darner)
Erpetogomphus bothrops
Phyllogomphoides pacificus
P. nayaritensis (West Mexican Leaf-tail)
Progomphus clendoni (Zebra-striped Sanddragon)
**P. mexicanus*
Brachymesia furcata (Red-tailed Pennant)
Brechmorhoga praecox (Slender Clubskimmer)
Dythemis maya (Mayan Setwing)
****D. nigra***
D. nigrescens (Black Setwing)
D. sterilis
Erythemis attala (Black Pondhawk)
E. collocata (Western Pondhawk)
****E. haematogastra***
E. plebeja (Pin-tailed Pondhawk)
E. vesiculosa (Great Pondhawk)
Erythrodiplax basifusca (Plateau Dragonlet)
E. fervida (Red-mantled Dragonlet)
E. funerea (Black-winged Dragonlet)
E. umbrata (Band-winged Dragonlet)

Libellula croceipennis (Neon Skimmer)
L. herculea
 ***Macrotbemis hemichlora*
M. inacuta (Straw-colored Sylph)
M. inequiunguis (Jade-striped Sylph)
M. pseudimitans (White-tailed sylph)
 **M. ultima*
 **Miathyria marcella* (Hyacinth Glider)
Micrathyria aequalis (Spot-tailed Dasher)
 **M. didyma* (Three-striped Dasher)
M. hagenii (Thornbrush Dasher)
M. ocellata
Orthemis discolor (Carmine Skimmer)
O. ferruginea (Roseate Skimmer)
Pantala flavescens (Wandering Glider)
P. hymenaea (Spot-winged Glider)
Perithemis domitia (Slough Amberwing)
P. intensa (Mexican Amberwing)
Perithemis mooma
Sympetrum corruptum (Variegated Meadowhawk)
 **Tauriphila azteca* (Aztec Glider)
Tramea abdominalis (Vermilion Saddlebags)



Fiery-eyed Dancer (*Argia oenea*).

Odonata in the News

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

Ware J., E. Pilgrim, M.L. May, T.W. Donnelly, and K. Tennessen. 2017. Phylogenetic relationships of North American Gomphidae and their close relatives. *Systematic Entomology* 42(2): 347–358. Intrafamilial relationships among clubtail dragonflies (Gomphidae) have been the subject of many morphological studies, but have not yet been systematically evaluated using molecular data. Here we present the first molecular phylogeny of Gomphidae. We include six of the eight subfamilies previously suggested to be valid, and evaluate generic relationships within them. We have included examples of all genera reported from the Nearctic except *Phyllocyca*. This sample includes all North American species of *Ophiogomphus*, which has allowed us to explore intrageneric relationships in that genus. Our particular focus is on the closest relatives of the genus *Gomphus*, especially those North American species groups that have been commonly treated as subgenera of *Gomphus*. The *Gomphus* complex is split into additional genera, supported by molecular and morphological evidence: *Phanogomphus*, *Stenogomphurus*, *Gomphurus* and *Hylogomphus* are here considered to be valid genera. The genus *Gomphus*, in our restricted sense, does not occur in

the western hemisphere; in addition, *G. flavipes* is transferred to *Stylurus*.

Renner, S., G. Sahlen, and E. Perico. 2016. Testing dragonflies as species richness indicators in a fragmented subtropical Atlantic Forest environment. *Neotropical Entomology* 45(3): 231–239. We surveyed 15 bodies of water among remnants of the Atlantic Forest biome in southern Brazil for adult dragonflies and damselflies to test whether an empirical selection method for diversity indicators could be applied in a subtropical ecosystem, where limited ecological knowledge on species level is available. We found a regional species pool of 34 species distributed in a nested subset pattern with a mean of 11.2 species per locality. There was a pronounced difference in species composition between spring, summer, and autumn, but no differences in species numbers between seasons. Two species, *Homeoura chelifera* (Selys) and *Ischnura capreolus* (Hagen), were the strongest candidates for regional diversity indicators, being found only at species-rich localities in our surveyed area and likewise in an undisturbed national forest reserve, serving as a reference site for the Atlantic Forest. Using our selection method, we found it possible to obtain a tentative list of diversity indicators without having detailed ecological information of each species, providing a reference site is available for comparison. The method thus allows for indicator species to be selected in blanco from taxonomic groups that are little known. We

hence argue that Odonata can already be incorporated in ongoing assessment programs in the Neotropics, which would also increase the ecological knowledge of the group and allow extrapolation to other taxa

Renner, S., E. Perico, and G. Sahlen. 2016. List of Odonates from the Floresta Nacional de Sao Francisco de Paula (FLONA-SFP), with two new distribution records for Rio Grande do Sul, Brazil. *Biota Neotropica* 16(3): e20150132. A survey of Odonata was carried out in the National Forest FLONA-SFP, Northeastern region of the Rio Grande do Sul state, Brazil. This conservation unit is mainly covered by Mixed Ombrophilous Forest (MOF), a subtype of Atlantic Forest biome, being also areas covered in planted *Pinus*, planted *Araucaria* and open fields. Our sampling efforts were conducted in thirty aquatic environments inside this reserve during the period between January 2014 and November 2014. The sampling sites were selected randomly, comprehending lakes, bogs, small streams and river sections, all inserted in the four vegetation types occurring in the reserve. Forty-six species of Odonata were collected and grouped into 23 genera and seven families. The dominant families were Coenagrionidae (32%), Libellulidae (32%), Aeshnidae (12%), and Calopterygidae and Lestidae (9%). As expected, the findings revealed the presence of a highly diverse odonate assemblage, mainly represented by generalist species in the most human disturbed sectors (*Pinus* and open fields) and some specialist species in the pristine forest. Two species were registered for the first time in the state of Rio Grande do Sul, Brazil: *Libellula herculea* Karsch, 1889 (Libellulidae) and *Heteragrion luizfelipei* Machado, 2006 (Heteragrionidae).

Smith W.A. and K.J. Tennessen. 2017. Description of the nymph of *Ophiogomphus smithi* (Odonata: Gomphidae), with a key to the species of *Ophiogomphus* in the Western Great Lakes region. *The Great Lakes Entomologist* 49(1-2):78–98. *Ophiogomphus smithi* Tennessen & Vogt is a gomphid dragonfly with restricted distribution which includes northeast Iowa, southeast Minnesota, and central to northwestern Wisconsin. The nymph is described and illustrated based on 173 specimens (66 exuviae of reared specimens plus 107 nymphs) from throughout the species' range. The nymph of *O. smithi* is very similar to nymphs of *O. carolus* Needham, *O. colubrinus* Selys, and *O. rupinsulensis* (Walsh). Nearly all (99%) of *O. smithi* sampled can be distinguished from *O. colubrinus* by prementum terminal width less than or equal to 2.97 mm (98% of *O. colubrinus* greater than 2.97 mm), and from *O. carolus* and *O. rupinsulensis* by the ratio of metatibia length to abdominal segment 10 width being greater than 1.66 (96% of *O. smithi*) vs. less than 1.66 (98.5% of *O. carolus* and *O. rupinsulensis*). Several characters and char-

acter combinations previously unused for *Ophiogomphus* nymphs were found to be of taxonomic value, including color pattern on dorsal hooks and dorsum of abdomen, shape of abdominal mid-dorsal punctae, length and shape of fronto-clypeal ridge setae, and ratio of metatibia length to width of abdomen on segments 9 and 10. An illustrated quantitative key to the 7 species of *Ophiogomphus* occurring in the western Great lakes region is provided, along with a separate, more qualitative key enabling species identification in the field. *Ophiogomphus smithi* is regularly syntopic only with *O. rupinsulensis*, rarely with *O. carolus* and *O. colubrinus* and not with *O. anomalus*, *O. howei*, or *O. susbehcha*; nymphs inhabit small to medium-sized, sandy, cool to warm stream segments with patches of pea-sized gravel.

Khelifa, R. and M. Khalil Mellal. 2017. Host-plant-based restoration as a potential tool to improve conservation status of odonate specialists. *Insect Conservation and Diversity* 10(2): 151-160. Several species worldwide show rapid range retraction due to habitat degradation, and some of them have restricted distribution and specific resource needs. Such cases deserve particular attention and need urgent conservation actions to avoid extinction, and one way is to facilitate colonisation of new habitats by resource supplementation. Here, we investigate the changes in range distribution, during the last decade (2007–2016), of an endangered endemic damselfly, *Calopteryx exul* Selys, and assess the importance of its favourite host-plant (*Potamogeton nodosus*) in colonisation and population dynamics in the last existing population of Algeria. We first used dynamic occupancy models to assess range distribution dynamics and we found that both occupancy and colonisation probabilities of the species were positively dependent on the occurrence of *P. nodosus*. There was also evidence that extinction probability increased with habitat disturbance but decreased with the occurrence of *P. nodosus*. Our experimental restoration showed that augmentation of patches of *P. nodosus* increased the total number of individuals, the number of reproductive events and philopatry. Our study highlights the importance of insect-plant relationship in the establishment of effective restoration plans because of their implication in colonisation and extinction processes and population dynamics. Since most insect species from different orders and ecosystems are ecologically dependent on plants, our restoration approach may benefit a large range of threatened species and improve their conservation status.

Buchsbaum, R., C.W. Leahy, and T. Allison. 2016. Distribution and abundance of Odonata species across Massachusetts: results of a long-term monitoring program. *Northeastern Naturalist* 23(4): 501-524. Surveys of Odonata were carried out at Mass Audubon wildlife

sanctuaries in all regions of the state and in multiple habitats. Our goals were to provide a comprehensive look at patterns of species distribution and relative species richness across Massachusetts and compare surveys where effort was and was not controlled. Observers encountered a total of 146 species, 11 of which were very widespread, having been recorded at more than 40 of the 54 properties examined. Thirty-five species were relatively rare, occurring at only 1 or 2 sanctuaries. A few sanctuaries were particularly notable for supporting somewhat uncommon species. These sites were not located in any particular ecoregion, but reflected local conditions. In surveys where effort was not controlled, a regression analysis indicated that about two thirds of the variation in species richness among sanctuaries could be explained by the amount of observer effort, the size of the sanctuary, and the extent of wetland habitat. Quantitative surveys that used transects or point counts to control for sampling effort resulted in observation of fewer species, including state-listed taxa, compared to the non-quantitative surveys. Despite producing fewer species, data from these quantitative surveys can be used to make statistical comparisons with data from future studies and detect changes over time in species richness, abundance, and frequency of occurrence.

Harabiš, F. 2016. The value of terrestrial ecotones as refuges for winter damselflies (Odonata: Lestidae). *Journal of Insect Conservation* 20(6): 971–977. Habitat requirements of many species may vary significantly throughout the lifecycle. Species are often forced to exchange their habitats to meet requirements of different life stages. Due to the effect of human activities, however, there is a loss of habitat complexity and a consequent disappearance of species associated with multiple habitat types. This also applies to freshwater invertebrates occurring in temporary habitats. However, it appears that many species are able to meet their habitat requirements even in a human-altered landscape. The aim of this study was to analyze the habitat preferences of the damselfly *Sympecma fusca* in an area significantly influenced by human interventions. According to the results of a capture-mark-recapture study and generalized additive models, I found that, during a pre-reproductive period (in the autumn), imagoes utilize predominantly insolated ecotones, which constitute only a small fraction of the available terrestrial habitat. During the reproductive period (in spring), however, imagoes completely change their priorities in favor of reproductive success. At this time, males use ecotones only in adverse weather conditions. Ecotones allow the species to survive a long pre-reproductive period. However, suitable habitat conditions may be lost because of inappropriate interventions (e.g., mowing). These small-scale interventions often resemble natural disturbances and may not necessarily lead to the extinction of an entire population. Imagoes are

able to move on to different habitat patches, but only if they have alternative habitats. This outcome indicates that maintaining a high heterogeneity of keystone structures is crucial for maintaining high levels of biodiversity.


Tichanek, F. and R. Tropek. 2016. Sex-specific spatial patterns in the threatened damselfly *Coenagrion ornatum*: implications for the species' conservation and monitoring. *Journal of Insect Conservation* 20(6): 1107–1112. The damselfly *Coenagrion ornatum* is a threatened species, specialized for lowland headwater streams. As the species is declining and protected across Europe, it represents a species of particular conservation interest. This work aims to provide the first evaluation of fine-scale spatial ecology in this species, especially to assess its general mobility and distribution of adults in relation to larval habitats, and to suggest implications for conservation and efficient monitoring of this species. Adults were captured-recaptured along four distinct streams (5.2 km together) in the Radovesická spoil heap, Czech Republic. Immature adults and breeding individuals were recorded simultaneously. Larvae were sampled in 64 sections of 27 m, evenly distributed across the studied streams. In total, 1152 adult individuals were marked; from these, 240 individuals were recaptured at least once. Larvae were detected in 21 sites with a total number of 61 individuals. The adults were highly sedentary, with a median lifetime dispersal of 11 m. Only one male was reported to move between two distinct streams. Model comparisons revealed that female and breeding pair abundances are a significantly more reliable indicator of larval abundance than male and total adult abundances, especially when used along with records of the immature adults. Moreover, the weighted least square models showed that the female abundances are spatially more specific (i.e., less autocorrelated) than male abundances. These results imply that surveying the adult females, along with the breeding and immature adults, offers the best method for local habitat quality assessment for this Natura 2000 species.

Al Jawaheri, R. and G. Sahlén. 2017. Negative impact of lake liming programmes on the species richness of dragonflies (Odonata): a study from southern Sweden. *Hydrobiologia* 788: 99. Liming programmes aiming to restore fish populations are being implemented in many acidified aquatic systems in northern Europe. We studied Odonata communities in 47 forest lakes in SW Sweden, 13 that are currently being limed, and 8 that have previously been limed. Thirty-one species were recorded, with the highest mean number in untreated lakes, followed by previously treated lakes and currently treated lakes. Species communities differed between untreated and limed lakes, but only few rare species found in the untreated lakes were absent in the treated lakes. Likewise, species known to

thrive in acid environments were either rare or showed no preferences. Comparing the number of records of odonate species within a large regional area to the proportion of lakes inhabited in our study, we found that seven of the most commonly observed species occurred less frequently in limed lakes than in the untreated ones, including two of the three most common taxa. Reduced species numbers in limed lakes might be due to conditions on other trophic levels, including fish predation. We argue that Odonata should be considered when developing new biological indices of water quality, although the causes of the observed occurrence patterns need to be studied further.

Luke, S.H., R.A. Dow, S. Butler, C. Vun Khen, D.C. Aldridge, W.A. Foster, and E.C. Turner. 2017. The impacts of habitat disturbance on adult and larval dragonflies (Odonata) in rainforest streams in Sabah, Malaysian Borneo. *Freshwater Biology* 62 (3): 491–506. Dragonfly assemblages (Odonata: comprising damselflies, Zygoptera; and dragonflies, Anisoptera) in Southeast Asian rainforests are extremely diverse but increasingly threatened by habitat disturbance, including logging and conversion of forest to oil palm plantations. Land-use change can affect dragonfly larval stages by altering within-stream environmental conditions, and adults by loss of perches, shade and hunting habitat. However, the extent to which dragonflies are affected by land-use change is not well known, and strategies for conservation are poorly developed. We surveyed dragonfly adults and larvae, forest quality and stream environmental conditions across 16 streams in Sabah, Malaysia. Habitat surrounding the streams included pristine forest, selectively logged forest, oil palm with forested riparian buffer strips and oil palm without buffers. Overall abundance and species richness of adult dragonflies stayed constant with habitat disturbance, but larval abundance and richness decreased with higher habitat disturbance, and larvae were largely absent from oil palm streams. There was also a clear shift in community composition of both adult and larval drag-

onflies. Anisoptera adults were more species rich and abundant, but Zygoptera adults were less species rich in more disturbed sites. The presence of riparian buffers in oil palm plantations offered some protection for forest-associated dragonfly species, and streams with wider riparian buffers supported adult assemblages more similar to those found in logged forest. However, oil palm streams with riparian buffers still contained a depauperate larval assemblage compared to logged forest areas, and dragonfly assemblages in narrow riparian buffer streams were similar to those found in streams surrounded by continuous oil palm. Our results provide clear evidence of the effect of land-use change on dragonflies. Conservation efforts to conserve forest communities should target the preservation of existing forest areas, but management within oil palm plantation landscapes to preserve riparian buffers can still have a marked beneficial effect on dragonfly communities.

Tennessee, K. 2017. A method for determining stadium number of late stage dragonfly nymphs (Odonata: Anisoptera). *Entomological News* 126(4): 299–306. A method for recognizing the final stadium and the four preceding stadia of dragonfly nymphs (Odonata: Anisoptera) was derived by dividing hind wing sheath length (WSL) by maximum head width (HW). Based on measurements for 15 species representing all seven North American families, five stadia can be delineated, counting backwards from the final (F-0) to the four preceding stadia (F-1, F-2, F-3, and F-4). The ratio WSL/HW over all species ranged as follows: F-0, 0.89–1.39 (mean 1.16); F-1, 0.57–0.88 (mean 0.70); F-2, 0.36–0.61 (mean 0.46); F-3, 0.24–0.44 (mean 0.32); and F-4, 0.15–0.32 (mean 0.23). As a crude guide, a ratio near 1 or greater indicates F-0, about two-thirds indicates F-1, about one-half indicates F-2, about one-third indicates F-3, and about one-fourth indicates F-4. *Plathemis lydia* (Libellulidae) had the highest WSL/HW ratio in F-0 (1.32–1.39). 

Call for Papers for BAO

The Bulletin of American Odonatology needs your submissions for the timely reporting of research on Odonata of the New World. Submitted articles may include faunal synopses, behavioral analyses, and ecological studies. See the last page of this issue of ARGIA for BAO publishing guidelines or contact Steve Hummel, BAO Editor, at <editor@dragonflysocietyamericas.org>.

The Search is on for Regional Endemic Dragonflies

Jason Bried, <bried@uark.edu> and Wade Boys <wadeboys@uark.edu>

The search is on for Ozark Emerald (*Somatochlora ozarkensis*), Ozark Clubtail (*Gomphurus ozarkensis*), Ozark Snaketail (*Ophiogomphus westfalli*), and Ouachita Spiketail (*Cordulegaster talaria*). All four species are endemic to the Ozark-Ouachita mountain region (ca. 160,000 km²) stretching from St. Louis to southeastern Oklahoma, with scattered populations in the Flint/Osage Hills of Kansas/Oklahoma. Many sources have recognized the range restriction and conservation concern for these species (e.g. Bick, 2003; Paulson, 2011; Patten and Smith-Patten, 2013), and all four are understudied and under-surveyed, especially *C. talaria*, as it has only been recently described (Tennessen, 2004).

With generous funding from the Arkansas Game and Fish Commission, we are trying to improve knowledge of the distribution, requirements, and priority status of these species. The project has three main objectives: (1) Baseline surveys to check on historical records, locate new populations, and assess local (in-stream, near-stream) habitat requirements; (2) Niche modeling to improve knowledge of environmental/climatic requirements, assess vulnerability to regional climate change, and generate maps of potential distribution; and (3) Regional (range-wide) prioritization analysis to rank species according to level of conservation need. Agency partners hope the findings will

help in developing a multispecies regional conservation plan, and inform the ESA listing process for *S. ozarkensis* (M. Lombardi, U.S. Fish and Wildlife Service, pers. comm., 9 March 2017).

The first field season may already be underway as you read this. The funded portion is taking place through the end of 2018. We have a map of survey points and a protocol, so if you get down this way and would like to help, please contact us!

Literature cited

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- Tennessen, K.J. 2004. *Cordulegaster talaria*, n. sp. (Odonata: Cordulegastridae) from west-central Arkansas. *Proceedings of the Entomological Society of Washington* 106: 830–839.



The Nick and Ailsa Donnelly Fellowship

The Nick and Ailsa Donnelly Fellowship facilitates the attendance of colleagues to the DSA annual meeting. The award pays up to \$1,000 USD per awardee for travel and related expenses. Preference is given to Latin American colleagues and students, and graduate students conducting research on Odonata. The award committee is made up of members of the DSA Executive Council. Funds in the fellowship that are not awarded for travel may be used for research, educational, and outreach activities that have as their primary purpose promoting the knowledge of Odonata of the New World. The committee will accept applications for travel and research grants and make awards based on merit and potential for successful research leading to publication. Travel grant awardees must make a presentation at the annual Dragonfly Society of the Americas meeting, and research grant awardees are encouraged to present their findings at a DSA annual meeting and publish in a peer-reviewed journal such as the *Bulletin of American Odonatology*.

Additional details about the fellowship and application instructions can be found at <<http://www.odonatacentral.org/index.php/PageAction.get/name/DonnellyFellowship>>. Please encourage interested researchers and students to apply by the 1 April 2017 deadline.

Chris Hill, President, Dragonfly Society of the Americas

New Feature: ID Corner

We've all been there: You saw a detailed Facebook thread regarding the finer points of S2 markings on *Aeshna* darners, but you didn't write it into your field guide and now you can't find the post again. Or maybe you're kicking yourself for not having saved the close-up wing photo that somebody posted (but who?!?) showing exactly where the radial planate is. Facebook is ephemeral; new posts quickly bury old ones, and it's easy to lose a thread or spend a lot of time hunting for something you could swear you read about a year ago but you're not quite sure which group it was in or who posted it. ARGIA, however, is forever (we hope!). With that in mind, welcome to the ID Corner, the brain child of Robert DuBois, who leads our first foray into this new realm. It is our hope that additional DSA members with expertise will contribute notes in the future.

The idea behind ID Corner is that the development of odonate identification is blossoming as more newcomers come into the dragonflying fold. The ranks of DSA members range from those who are happiest looking at detailed characteristics of adult male hamules or palpal lobes of nymphs under a microscope to avid photographers who want to know the best field marks to identify an individual to species. Old hands as well as newcomers can have questions about the best morphological "tells" for challenging species and how they vary. For these reasons, an ID-themed section would provide more structure and accountability than those myriad Facebook threads (even though not peer-reviewed), and could even be interactive, with specific topics raised in one issue and responded to in the next. Topics and questions can address aspects of identification of adults, nymphs, or exuviae. This would not only benefit all users, but could help field guide authors and key builders to improve the next generation of odonate identification tools.

We are still working out the details, but as with all new features in ARGIA, we want to know what you think. If you have comments or a burning ID question that you would like to either see addressed or address yourself in future issues, please contact me at <editor@dragonflysocietyamericas.org>. And now, on to our inaugural ID Corner article...

Reliability of field marks for distinguishing females of *Aeshna canadensis* (Canada Darner) and *Aeshna verticalis* (Green-striped Darner), by Robert DuBois, Department of Natural Resources, Superior, Wisconsin <robert.dubois@wisconsin.gov>

Distinguishing the females of *Aeshna canadensis* (Canada Darner) and *A. verticalis* (Green-striped Darner) has long

been difficult because of the great overall similarity of the two species (Walker, 1912, 1958; Paulson, 2011), and both species can have green-form females. A variety of marks on the thorax and abdomen have been proposed as useful characters in keys, field guides, and some online venues, but they have not been rigorously tested for reliability, and some appear to be variable enough to compromise their use in identification. For this note I tested the reliability of eight character states on four thoracic and abdominal marks for determining females of both species.

Methods

Eleven females of each species were selected for testing from the Odonata Collection of the Wisconsin Department of Natural Resources in Superior, Wisconsin. These included all of the females of *A. verticalis* in the collection, and a like number of females of *A. canadensis* that were selected in chronological order of their collection date. I had previously determined them using a suite of characters in keys by Needham et al. (2014) and Walker (1958). All specimens were from the Upper Midwestern United States (10 specimens of each species from Wisconsin, one *A. verticalis* from Michigan and one *A. canadensis* from Minnesota). Five of the *A. canadensis* and one of the *A. verticalis* had been reared in captivity, so structural aspects of the labia of the exuviae were also considered when determining them.

I used these 22 firmly determined specimens to evaluate the reliability of eight character states on four marks on the thorax and abdomen that have been used for distinguishing the females of these species in keys (e. g. Walker, 1958; Needham et al., 2014), field guides (e. g. Dunkle, 2000; Nikula et al., 2003; Mead, 2009; Paulson, 2011), and have been discussed in at least one blog (Craves and O'Brien, 2011) and at least one Facebook page <<https://www.facebook.com/groups/wisconsindragonflysociety/>>. All estimates and measurements (mm) were made on the left side of the specimens in lateral view. I used t-tests for independent means with alpha set at 0.05 to test for significant differences between measurement and ratio means, but statistically significant differences do not necessarily equal usefulness for identification purposes if the ranges of the measurements and ratios overlap. The value of characters for use in identification was considered to be greater for those that lacked overlap between the species, were unambiguous, and were at least potentially observable in the field through binoculars, in close-up (macro) photographs, or in the hand using a hand lens.

Several attributes of both the anterior lateral thoracic

stripe (ALTS; also known as the mesepimeral pale stripe) and the posterior lateral thoracic stripe (PLTS; also known as the metepimeral pale stripe) were included in this analysis. I assessed two character states regarding the angle of the “indent” or “notch” on the anterior margin of the ALTS and the constriction of the stripe at that point. The angle of the indent was estimated to the nearest 5° with a small protractor held next to the specimen. The width of the ALTS was measured at its narrowest point at the indent and at its widest point below the indent to provide a ratio. Another character of the ALTS, the rearward trailing “flag” at the upper end of the stripe, was measured at its widest point in its vertical dimension. I also measured the vertical dimension of a pale mesepimeral spot that is often visible mid-laterally between the ALTS and PLTS of both species.

Several characteristics on the PLTS were given by Walker (1958) and Needham et al. (2014) to distinguish these species. I therefore noted the shape of the anterior and posterior margins of the PLTS, whether the stripe widened gradually or abruptly at the upper end, and tallied the presence or absence of a posteriorly (ventrally, strictly speaking) directed curve at the upper end.

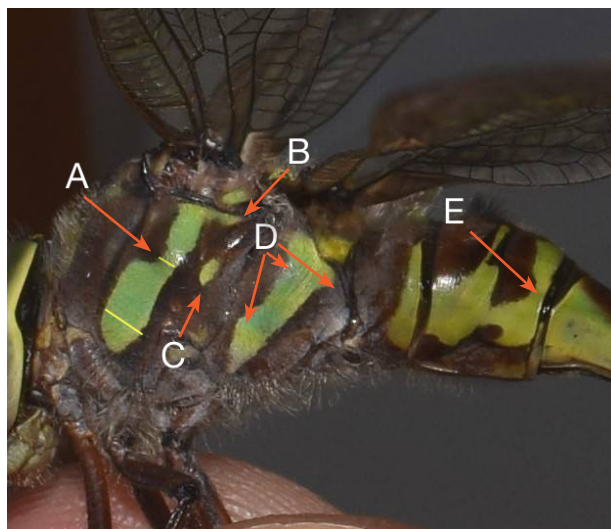


Figure 1. Side view of the thorax and basal abdominal segments of a female Canada Darner (*Aeshna canadensis*) showing the angle of the indent (about 90°) on the front margin of the ALTS (A), and constriction of the stripe at the indent (upper yellow line) relative to the wide part of the stripe below (lower yellow line); the thin, rearward trailing flag at upper end of the ALTS (B); the relatively large mesepimeral pale spot between the ALTS and the PLTS (C), that is longer than the width of the narrow flag above it (B); various attributes of the PLTS showing a slight bulge on the lower front edge (D, left arrow), and an abrupt widening at the upper end (D, center arrow) that includes a rearward-directed curve (D, right arrow); and a shallowly cleft pale mark on S2 that is not completely split (E). Photo by J. Sommerfeld.

A complexly-shaped pale mark is located near the posterior-lateral margin of abdominal segment 2 (S2) on both species. This mark includes the postero-dorsal spot above and the postero-lateral spot below, which may be fused together into what appears to be one mark, or they may be separated. Nikula et al. (2003) noted that the mark is “shallowly cleft” mid-laterally on *A. canadensis*, but “deeply cleft or split” there on *A. verticalis*. I retained their terminology to avoid confusion and tallied whether or not the mark was completely split.

Several structural characters have been used to distinguish females of these species including the lengths of the cerci and two attributes of the genital valves. I did not examine these characters in this analysis for the following reasons. The lengths of the cerci were given by Walker (1958) as a means for distinguishing females of these species, but the ranges given had some overlap and these structures are often partly broken off during oviposition. Except for the specimens I had reared, most of the specimens available to me did not have complete cerci. A small sample of specimens with unbroken cerci would have shed little light on the topic, and the diagnostic value of the cercus is severely limited by its frequently incomplete condition. Regarding the genital valve of the ovipositor, the ventral groove mentioned by Paulson (2011) was difficult for me to see without using a microscope, as was the extent of the lateral ridge along each side of the genital valve of the ovipositor as described by Walker (1958) and Needham et al. (2014). In the absence of illustrations of exceptional clarity and detail, these characters have been challenging to interpret.

Results and Discussion

Despite its frequent use, the angle of the indent on the front margin of the ALTS was variable and did not consistently distinguish the species. The means (in degrees) of this angle differed significantly between the species, but there was considerable range overlap (Table 1). This character was mentioned in all of the resources cited in this report, usually in the context of the angle being about 90° (right-angled) for *A. canadensis* (Figure 1) and somewhat greater than 90° (obtusely-angled) for *A. verticalis* (Figure 2). Although this angle was close to 90° on all *A. canadensis*, about a third of the specimens of *A. verticalis* had angles that were also close to that value. Therefore, the character is only useful if the angle of indent exceeds about 110°, in which case it suggests *A. verticalis*, but an angle of <110° does not necessarily indicate *A. canadensis*.

The ratio of the width of the ALTS at the indent to the width of the ALTS at its widest point below the indent (shown with yellow lines in Figure 1) was also variable for

both species, with significantly different means, but with overlap (Table 1). This ratio was given by Needham et al. (2014) as being about $\frac{1}{3}$ on *A. canadensis* and about $\frac{1}{2}$ on *A. verticalis*, but because the ratio always exceeded $\frac{1}{3}$ for *A. canadensis*, the couplet is problematic as stated. Further, because of intraspecific variation and overlap between the species, use of this character in any form is not recommended. However, the maximum width of the flag at the upper end of the ALTS had mean differences that were highly significant between species and ranges that only barely overlapped (Table 1). This width was consistently close to 1.0 mm for *A. verticalis* and averaged slightly more than 0.5 mm for *A. canadensis*. The flag was described by Walker (1958), Dunkle (2000), Mead (2009), and Paulson (2011) as wider on *A. verticalis* than on *A. canadensis*, and the statement appears to be generally valid.

The size of the mesepimeral pale spot between the ALTS and the PLTS was also significantly different between the species with non-overlapping ranges (Table 1). On *A. canadensis* this spot is relatively large, averaging slightly more than 1.0 mm in vertical height, and was clearly defined in all cases. On *A. verticalis* this spot averaged less than 0.5 mm, did not exceed 0.7 mm, and was faint on three specimens and absent on two others. This spot has not been used as a character in field guides or keys to my knowledge. Nikula et al. (2003) mentioned its placement when discussing *A. canadensis* and it was present in their illustration of that species, but no mention of it was made regarding *A. verticalis* and it was not present in their illustration of that species. However, I have seen Facebook and blog discussions that have speculated that the spot might be larger on *A. canadensis* than on *A. verticalis*.

All three of the shape characters of the PLTS that I examined were consistently different between the species; these were presence or absence choices rather than measurements or comparisons and are therefore particularly well suited for use as field characters. Consistent with statements by Walker (1958) and Needham et al. (2014), the upper end of the PLTS curved posteriorly on all *A.*

Table 1. Comparison of means, ranges, and P values for four characters used to distinguish females of *Aeshna canadensis* and *A. verticalis*.

	Mean (range)		p value
	<i>A. canadensis</i>	<i>A. verticalis</i>	
ALTS angle of indent (°)	92 (85 - 110)	107 (90 - 130)	0.004
ALTS width at indent / maximum width (ratio)	0.45 (0.38 - 0.53)	0.55 (0.47 - 0.69)	0.0003
maximum width of ALTS flag (mm)	0.58 (0.4 - 0.8)	0.85 (0.8 - 1.0)	<0.00001
vertical length of mesepimeral spot (mm)	1.07 (0.95 - 1.30)	0.41 (0 - 0.7)	<0.00001

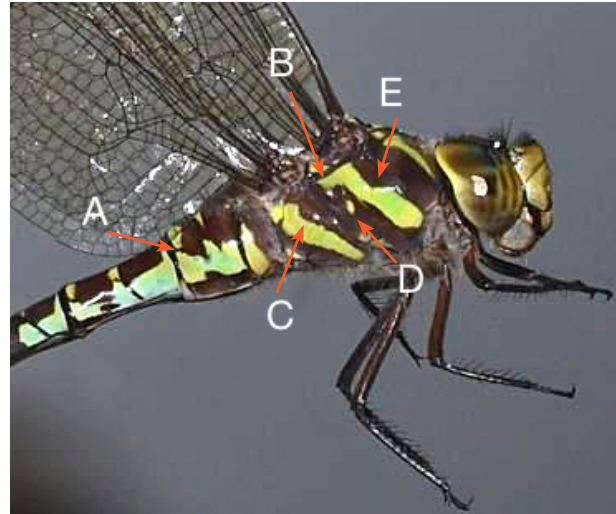


Figure 2. Side view of the thorax and basal abdominal segments of a female Green-striped Darner (*Aeshna verticalis*) showing pale mark on S2 completely split (A); rearward trailing flag at the upper end of the ALTS is relatively wide, as wide as or wider than the length of the spot below it (B); PLTS has front edge straight with notch at upper end, stripe widens gradually and rear edge is straight, lacking a rearward curving extension at upper end (C); mesepimeral spot between the ALTS and PLTS smaller than on Canada Darner (D); and indent angle on ALTS is sometimes $>90^\circ$ (E); if the angle is $>110^\circ$ as here, it is likely a Green-striped Darner, but this angle varies on both species. Photo by J. Sommerfeld.

canadensis, but did not do so on any *A. verticalis*. Thus, the PLTS curves anteriorly (dorsally) and posteriorly (ventrally) at the upper end on *A. canadensis* giving the mark the appearance of widening abruptly there, whereas the PLTS curves only dorsally at the upper end on *A. verticalis* giving the appearance of widening more gradually (Needham et al., 2014). Further, the anterior margin of the PLTS was always straight on *A. verticalis* except at the upper end where a knob was directed dorsally, but on *A. canadensis* the margin consistently had a convex, anteriorly-directed curve or bulge at about the lower third.

The pale mark located mid-laterally on S2 was completely split on all specimens of *A. verticalis*, whereas none of the *A. canadensis* were so marked, having instead the mark shallowly cleft. This character, mentioned by Nikula et al. (2003) and by Craves and O'Brien (2011), appears deserving of wider use.

Conclusions and Recommendations

Based on this analysis there are attributes of four marks that differed consistently and noticeably between females of *A. canadensis* and *A. verticalis*: the vertical width of the ALTS flag, the size of the mesepimeral spot, the overall shape of the PLTS, and the presence or absence of a com-

plete mid-lateral split on the S2 pale mark. All of these could easily be seen in side view with a hand lens and are often visible in close-up photographs of perched or hand-held specimens (based on the author's history of vetting photographs submitted to two Odonata databases).

The often-used angle of indent on the front margin of the ALTS, and the relative width of the stripe at that point, are both too variable to be reliable characters for distinguishing females of these species and their use should be reduced. Because the width of the ALTS flag and size of the mesepimeral spot both lacked significant overlap in their measured ranges and both are easily seen in close proximity in a side view close-up look or photograph of the thorax, they each have potential as diagnostic characters. But because both characters would require measurements if taken individually, their usefulness as field marks could be enhanced by comparing their relative dimensions in combination. Therefore, the following decision rule is recommended:

flag width < spot length = *A. canadensis*;
flag width > spot length = *A. verticalis*

This rule would have correctly determined all of the specimens in this study. The shape of the PLTS was noticeably different between all specimens of both species and several attributes of this stripe could also be worked into a useful decision rule as follows:

PLTS with front and rear margins straight and having no posteriorly curving extension at upper end = *A. verticalis*;
PLTS with front margin curving slightly anteriorly at or below mid-mark and with a posteriorly curving extension at the upper end = *A. canadensis*

The presence or absence of a complete split of the pale mark on S2 would also have correctly determined all specimens in this study and therefore can also be formed into a useful decision rule:

S2 mark shallowly cleft mid-laterally = *A. canadensis*;
S2 completely split mid-laterally = *A. verticalis*

Cultural Odonatology

DSA members are as diverse as the insect order we all love; we approach Odonata as scientists, educators, naturalists, artists, poets, photographers, essayists, bloggers, and more, with many wearing several of these hats. Cultural Odonatology focuses on different aspects of the human relationship with odonates, showcasing dragonflies in art, architecture, literature, and legend, and may contain original works or discussions of odonates in existing works. If

It seems reasonable to postulate the existence of some amount of variation in all of these marks, and I have observed during my vetting experience that the S2 pale mark does not always appear to be completely split on all photographs of females of *A. verticalis*. I therefore recommend a "weight-of-evidence" approach when determining females of these species. When any two of the three decision rules given above point to one of these species, I suggest that the species so indicated is likely to be the correct determination. These recommendations are offered tentatively pending more data and should be applied cautiously outside Wisconsin.

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you would like to contribute to this feature, contact me at <editor@dragonflysocietymamericas.org>.

In this instalment, Jacki Morrison shares her views of the importance of Cultural Odonatology and its intersection with science; and Kitty Leaken provides some fascinating insights on the role of odonates in Navajo culture.

The Role of Cultural Odonatology in Research and Conservation, by Jacolyn Morrison <mndragonflies@gmail.com>

“Study the science of art. Study the art of science. Develop your senses—especially learn how to see. Realize that everything connects to everything else”. Leonardo Da Vinci

Studies on human connections with insects are often thought to be a soft science and considered less relevant than the work done in research labs and field studies, where hardcore science takes place. However, we are currently seeing a revitalization of the supporting role that the public plays in science, and thus the importance of engagement and outreach.

The more one is exposed to a specific topic, the more one develops awareness of the many facets and layers involved with that subject. Entomologist Charles L. Hogue understood this deeply, and made it a point in his career to lend credibility associated with cultural entomology back into the scientific world, and popularize ethnoentomology among his peers.

In preceding centuries, human connections to the sciences were more self-evident, and it was not necessary for scientists such as Hogue to illustrate this to his peers. Scientists understood art, since they often had a role as artists in documenting their research, and they also understood the role of socializing in order to gain funding. However, as time went on and research projects began to be funded by government programs and various organizations, the focus became narrowed. Creative thought process was being replaced with an agenda to justify funding to granting agencies; as a result vital connections to the public were being lost. Loss of this connection meant that the public at large understood less, so they cared less. How can hard science be achieved efficiently, when the public is no longer engaged and does not understand the relevance of the research? Many successful projects dealing with dragonflies and damselflies begin with public understanding and appreciation. Therefore, bridging knowledge base into cultural aspects can help to illustrate relevance to the people and be effective in outreach and support.

One can imagine that Hogue’s popularization of cultural entomology had an impact in odonatology through Philip S. Corbet, who viewed Odonata as “flagships for conservation”. He recognized the significance of public support, and in 1999 when publishing “The Behavior and Ecology of Odonata”, he made it a point to include this model, but more significantly, he pointed out the role and responsibility of societies and organizations in engaging the public.

Through time, it has become increasingly apparent that odonatology in itself is a very multifaceted and layered topic worthy of a branch of cultural studies of its own. Thanks to the insight of scientists like Hogue, it is now common to find these connections in the aspects of hard science. Philip S. Corbet stated that the conservation of dragonflies and damselflies in population, abundance, and habitat relies heavily on organizations and societies to be leaders in setting forth standards and establishing guidelines for the general public to gain awareness and deepen their appreciation. I want to take this opportunity to thank the Dragonfly Society of the Americas for including the topic of cultural odonatology in these efforts, and supporting the important role of framing human connections as relevant models for conservation of dragonflies and damselflies.

Navajo Dragonfly: Symbol of Water, Messenger to the Spirit World, by Kitty Leaken <kleaken@gmail.com>

In beauty I walk, with beauty before me I walk, with beauty behind me I walk, with beauty above me I walk, with beauty around me I walk. Navajo Blessingway Prayer

Pioneering anthropologist Gladys Reichard spent many years studying the Navajo. She lived with a family, learned to weave, learned the language, and was granted special access to the rituals and ceremonies integral to the Navajos’ connection with the cosmos and all beings therein.

In 1936, Reichard sent a specimen of tachinid fly, *Archytas lateralis*, to Harvard zoologist Leland C. Wyman for identification. Wyman, also an anthropologist and keenly interested in Native Americans of the Southwest, understood her curiosity about this earthly cognate of Big Fly, an important creature in Navajo sandpaintings and mythology.

Reichard was looking at the “Innumerable beings (that) assist deity, man, and even the evils. One type, which bridges the supernatural distance between man and god and plays a major role in instruction, I call ‘mentor.’ Mentors are few and, like the gods, each may be a different aspect of a single idea. Those most commonly mentioned in my material are Big Fly and Wind. They are said to ‘sit on the ear’ of a person who needs instruction and to whisper answers to questions or forecast the future.” (Reichard, 1950: 64)

Dragonfly, like Big Fly, is an ever-present mentor of the Navajo. Living as herders or hunter-gatherers, the Diné, or the People, as they prefer, historically lived close to the land and had intimate knowledge of local biota. This essay examines the dragonfly’s place in their culture.

Following the path to Big Fly, Wyman headed west with Flora Bailey in the summers of 1948 and 1949 to conduct a survey of insects to support a new field of study, Navaho Indian Ethnoentomology (current favored spelling is Navajo). Wyman and Bailey showed 801 specimens to 27 informants and asked them to identify them by their Navajo name and to answer questions about the insect's origin, sex, relatives, habits, mythological and ceremonial associations, relations to agriculture, harmful properties, methods of control, and uses. (Wyman and Bailey, 1964). The dragonfly was identified as táni l'ái, meaning 'which is spread out on water' (Figure 1).

They then studied the appearance of insects in 61 myths and ranked the relative importance of each insect's role, from chief actor to very important through secondary and minor. The dragonfly appears as one of the 12 types of Insect People in the creation myth, attesting to its high stature among the Navajo.

Sandpaintings are made by medicine men who sprinkle colored plant pollens and ground minerals from their ger-tips onto a dirt floor as part of a healing ceremony. They depict sacred origin stories with anthropomorphic and supernatural figures. Of the 769 sand paintings examined by Wyman and Bailey, the dragonfly ranks second (after Big Fly), appearing 133 times in 37 paintings. They are considered symbols of pure water and are depicted around central pools of water, drinking from water, and as paired guardians. In the paintings they often have spotted bodies to distinguish them from the very similar Cornbeetle and Big Fly.

Studying the place of insects in a culture's art provides insight on the worldview and specialized knowledge of a people who occupy a particular environment, and the value they ascribe to the other inhabitants of that environment. Wyman and Bailey produced a seminal chart of the dragonfly's appearances in native iconography (Wyman and Bailey, 1964: Plate IV), still used today to assist in identifying images (Figure 2).

For the Navajo and Native Americans in general, every being is infused with its own power and is called upon to play a role in maintaining the balance of the world and restoring hózhó, a central Navajo concept that emphasizes harmony and beauty in all aspects of life. Dragonfly is the guardian of water, symbol and protector of a most basic need, particularly in a semi-desert landscape.

Wyman, Bailey, and Reichard were part of an evolving field of American anthropologists who headed to the Southwest to study every aspect of Native existence ... "in search of science or romanticism. Some found both."

18. táni'l'ái (tá'ni'léi)—dragonfly (F)

This name means "which is spread out on water" or "which projects over water" and is used for dragonflies, damselflies, and ant-lions. The latter may be confused with dragonflies in our culture.

No informant volunteered information concerning the metamorphosis of dragonflies. Nymphs and exuviae either were not recognized or were said to be the young of cicadas. Of two color variants of the same species, the blue was called male, the green female (SJ). Corn pollen in which a living dragonfly has been placed is put under the skin after castrating a colt or sprinkled on a race horse to increase its speed (DS, BN).

Mythologically, dragonflies were harmful to man until subdued by Holy Man (Reichard, 1950, p. 430). As symbols of water they are frequently depicted around representations of pools in the center of sandpaintings (see p. 144; Pl. IV).

Figure 1. Partial ethnoentomological list from Wyman and Bailey (1964), pp. 52–53.

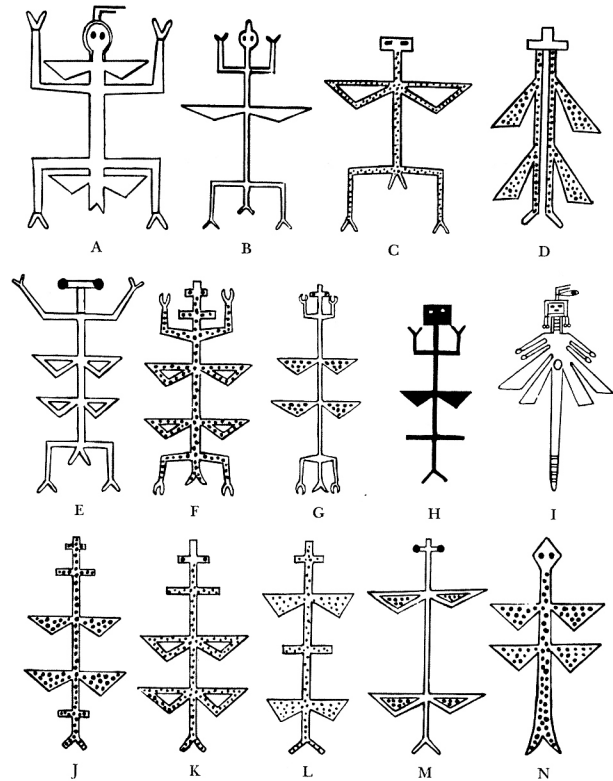


PLATE IV. Representations of Dragonfly in sandpaintings. A. Klagetoh, Ariz. Plumeway—PG. B. Indian Wells, Ariz. Shootingway—3. C. Ganado, Ariz. Male Shootingway—3. D. White Cone, Ariz. Waterway—3. E. Chinlee, Ariz. Male Shootingway—3. F. Lukachukai region, N. Mex. Male Shootingway—3. G. Lukachukai region, N. Mex. Male Shootingway—3. H. Kayenta, Ariz. Shootingway—3. I. Nava, N. Mex. Waterway—PG. J. Nava, N. Mex. Male Shootingway—3. K. Nava, N. Mex. Male Shootingway—3. L. Nava, New Mex. Hailway—3. M. Nava, N. Mex. Male Beautyway—3. N. Sweetwater, Ariz. Plumeway—PG.

Figure 2. Wyman and Bailey (1964), Plate IV, Representations of Dragonfly in sandpaintings.

(Fowler, 2000: 375). There was a sense of urgency to document a way of life that was believed would soon be gone.

Sharing in this urgency was Edward Sheriff Curtis, who photographed the Navajo at Canyon de Chelly in 1906 as part of his documentation of all of the 'vanishing Indians'. Curtis made a photo of a young Navajo woman wrapped in a blanket looking down at her reflection in a pool of

water. This image later inspired a Pendleton blanket with a dragonfly in the center. (Figure 3 and 4).



Figure 3 (top). Edward S. Curtis, *Nature's Mirror*, Navajo, 1904, gelatin silver print, negative x987. U. S. Library of Congress. Figure 4 (left). Pendleton Water Blanket based on photo. "The central dragonfly, an emblem of water, symbolizes life." Benefits American Indian College Fund for scholarships for Native American students and tribal schools. Courtesy of Pendleton.

Enduring more than 200 years of bitter struggles with the white man, the Diné adapted in resourceful and enduring ways to survive and to thrive, instead of vanish. As shepherders, they harvested wool and used natural and synthetic dyes to make saddle blankets, weaving blankets and rugs that were creative and exquisite. Innovative silversmiths designed jewelry such as concha belts and necklaces with turquoise and coral, often with dragonflies, that could be worn and thus transported from camp to camp, pawned, traded and brought out to adorn both men and women at gatherings. (Figure 5 and 6).

Hosteen Klah, born in 1867, was a medicine man, sand-painter, and weaver who "bridged the long span from the old days of tribal greatness and warfare to the new days of change and adjustment." (Newcomb, 1964). His friendship with Mary Cabot Wheelwright and the permission he granted outsiders to study the secret ways of his people was prescient in acknowledging that old ways were changing and their culture needed new ways to be preserved.

The dragonfly remained busy, still deeply rooted in ceremony and chant as healing guardians of pure water,

Among the Diné today, we find the dragonfly in painting, jewelry, fashion, weavings and many other media. A few examples are outlined below.

Tony Abeyta (b. 1964, Gallup, New Mexico) is a hugely successful contemporary artist. Educated at IAIA (Institute of American Indian Arts, Santa Fe, New Mexico), the Art Institute of Chicago, as well as in France and Italy, his painting, *Dragonfly Constellation*, which incorporates sand and oil on canvas, is in the collection of La Fonda, Santa Fe's historical downtown hotel. Abeyta, along with Rhett Lynch, Aaron Kiyaani (Figure 7), and Peterson Yazzie are contemporary Diné artists with very strong ties to their Native traditions.

Cody Sanderson and Fritz Casuse (Figure 8), cutting edge Navajo jewelers with big followings, are all the rage in Japan these days. Casuse recalls an auntie's story of the dragonfly's shimmering wings over water summoning the Thunderbird to bring rain.

Steiner Cody, 35, is a weaver living near Ramah, New Mexico. His weaving, *Dragonfly Pictorial* (Figure 9), depicts a scene from a traditional Navajo story that his friend Nixion Martinez tells during winter months: The Fourth World was flooding and First Man and First Woman were trying to escape. Thirty-two medicine men gathered on the mountain and took seeds and sprinkled them and a (bamboo-like) reed grew thirty-two stories high and they placed crystal windows in every floor. But the water kept on coming and flooding. When they climbed up to the last floor and the water was still rising, Spider Woman and Spider Man asked the animals and the birds and the insects if anyone could help and take them up to the dome



Figure 5. Vintage Dragonfly and Butterfly Yei Rug, ca. 1920's, wool, 32 x 28 inches. Hester/Murphy Collection.

in the sky. The eagles couldn't do it, they were too big. The other birds couldn't do it either. Finally Dragonfly said he could do it, so they agreed to have him help. Spider Man climbed on to his back and they flew up to the dome and Dragonfly clinched onto the dome with everything he had so Spider Man could climb up to the dome. Spider Man then went back and forth, weaving a rope ladder for the animals and people to escape into the next world. To this day, on winter nights, you can see the place in the sky where Dragonfly gave his life to save the world.

This article touches on only a tiny few of the many artists of many tribes making exciting new work. Today, as in the past, dragonflies remain central to the iconography of the Navajo and to understanding the interconnectedness of all beings. They continue to dazzle and amaze.



Figure 6. Vintage dragonfly pin, inscribed M. Morgan, turquoise and silver, 2 3/4 x 2 inches. Berlin Collection.



Figure 8. Fritz Casuse, Dragonfly Bracelet, 2015, pearls, turquoise.




Figure 7. Aaron Kiyaani, Purity, 2015, oil on canvas, 14 x 11 inches. Michael Billie Collection.



Figure 9. T. Steiner Cody, Dragonfly Pictorial, weaving, 2015, Handspun Navajo churro wool, natural wool colors, 24 x 24 inches.

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How I Fell Into the Clutches of the Odonata

This feature presents essays from DSA members describing how, when, where, and why they first became interested in Odonata. It also doubles as a fun way for members to find out a little more about each other. If you would like to contribute, write a short essay describing your first forays into the world of Odonata and how it has affected your life since, including your most interesting ode-hunting tale, and send it to the Editor at <editor@dragonflysocietyamericas.org>. Pictures to illustrate the tale are encouraged. Whether you are discovering odonates this year or have pursued them for decades, I know there are plenty of interesting, entertaining, and inspiring stories out there to be told!

A Photo-baited Ode Hook, by Kurt J. Huebner <khuebener@wi.rr.com>

I am a first-year Baby Boomer, born in Manitowoc, Wisconsin, only a few blocks from the shores of Lake Michigan. It was there that I remember seeing my first dragonflies. Most summers we saw many dragonflies flying in and out of our backyard and along the beach. We called them Sewing Beetles and Darning Needles and thought



Swamp Spreadwing (*Lestes vigilax*), Big Bend, Wisconsin, 25 August 2016.



Blue Dasher (*Pachydiplax longipennis*) close-up, Mukwonago, Wisconsin, 20 July 2016.

they could, in fact, sew... sew what, I don't remember. We tended to chase them away with a small degree of trepidation.

My halting journey to odonates may have started in Wisconsin, but it was through my interest in photography that I developed my attraction to odes. I started shooting macro/close-up photography while living in Fort Worth, Texas in the late 1970s. I owned a film Canon FT and a 100mm macro lens with a 50mm extension tube. I spent many hours laying on my stomach in the hot Texas sun, shooting insects and whatever else came my way. I would go to local swampy parks to photograph turtles, snakes, and never-to-be-identified dragonflies. I found dragonflies amazing in many ways, but primarily they were great photographic subjects. Over the years I improved my photographic skills. I came to consider myself, and have been acknowledged to be, a nature macro/close-up photographer, although photography is strictly a hobby for me.

I am now fully retired from two careers, the United States Air Force and from teaching as a life sciences instructor (Microbiology and Anatomy and Physiology). I am mar-

ried, have two daughters, and five grandchildren and live in a rural area near Mukwonago, Wisconsin.

In 2012, I was walking around in my front yard with my camera and noticed that a small flying insect had landed in the grass near the water in our drainage ditch. I was able to get fairly close and noticed it was a nervous damselfly which, to me, had amazing coloration. I didn't have a macro-lens on my camera but began shooting anyway. I viewed the downloaded images on my computer and noticed the green head and the blue at the end of its abdomen. None of the images were very good, but the colors and small size intrigued me. I looked up my find online and found out that it was an Eastern Forktail (*Ischnura verticalis*), my first identification. The ood hook was there, but I hadn't quite taken the bait yet.

In 2013, I had the opportunity to take a week-long photography field class with the Gerlachs in the Upper Peninsula (UP) of Michigan. In subsequent summers I took a second field class with the Gerlachs and another with the Plancks, also in the UP. The Gerlachs' class turned out to be primarily a macrophotography class. I ended up mainly hunting for odes and imaged Saffron-winged Meadowhawks (*Sympetrum costiferum*), Common White-tails (*Plathemis lydia*), and a number of bluet and spread-wing species, as well as many other insects that week.



Calico Pennant (*Celithemis elisa*), Newald, Wisconsin, 25 June 2016.

As an aside, sometimes I am asked why I don't travel far and wide for these classes. The fact is that our own localities are phenomenal natural sites and I wanted to better understand the resources available in my own areas of Wisconsin and Michigan.

On to 2015. My wife has several perennial gardens, and I like to go down to them to look for butterflies, wasps, bees, unusual insects, etc. to photograph. She chooses plants in part for my photography, as they are attractive to insects.

One morning after a heavy rain I noticed a green dragonfly along the periphery of her garden. I started shooting from 10 feet away and slowly kept moving closer. She flew away but landed nearby and I kept shooting. This was my first Eastern Pondhawk (*Erythemis simplicicollis*). I then noted a powder-blue dragonfly with a black-tipped abdomen in another area of the garden; that was my first Blue Dasher (*Pachydiplax longipennis*). That summer I also shot several species of damselflies in that garden, as well as Cherry-faced, Ruby, and White-faced Meadowhawks (*Sympetrum internum*, *S. rubicundulum*, and *S. obtrusum*), and a Lance-tipped Darner (*Aeshna constricta*).

I was in dire need of references and that summer I purchased my first guide, Kurt Mead's "Dragonflies of the North Woods". That same summer I became curious as to what odes I might find at the nearby Mukwonago River. There is an area below a low dam where the water is relatively slow-moving, very clear and shallow, with brush and low tree branches along the bank. My first venture there I photographed a single male Blue Dasher, a single male Eastern Pondhawk, and several uncooperative damselflies. My next visit I decided to wade the river and soon found my first American Rubyspot (*Hetaerina americana*), Powered Dancer (*Argia moesta*), Stream Bluet (*Enallagma exsulans*), and Skimming Bluets (*E. geminatum*). As I walked back to my car, I noticed a different dragonfly, a beautiful Halloween Pennant (*Celithemis eponina*). A dozen more steps I saw what I thought was an unusual wasp and I stalked it and found that it was another dragonfly I had never seen before, an Eastern Amberwing (*Perithemis tenera*). That season I discovered 16 different ood species. I decided to purchase several more references (and now have 20+) and joined the DSA and the Wisconsin Odonata Society (WOS). I was absolutely hooked. That fall and winter I began studying odonates in some earnest to prepare for the next season. I used book published by the Department of Natural Resources, topographical maps, and Google Earth to find ponds, lakes, streams, and their adjacent fields I could access. I downloaded lists of odes for my area from the WOS. I was ready.

So, 2016 was my first dedicated season. I visited 20+ local sites, many repeatedly, and took several road trips, including a week-long vacation to Van Zile Lake in northern Wisconsin principally to look for odes. Ultimately I found and reported 64 of Wisconsin's 160+ species. All were photographed to validate my finds. I found six odes in my area that were considered WOS priority species and was able to report record late finds for the Familiar Bluet (*Enallagma civile*) and Autumn Meadowhawk (*Sympetrum vicinum*; I shared this one). I was rewarded with a signed and inscribed copy of "Damselflies of the North Woods" presented by Robert DuBois himself.

I have been very lucky and had a great year. I don't expect to come close to matching it in 2017. I still need and will continue to need the readily-given assistance from Robert DuBois, Ryan Chrouser, Dan Jackson, and others from the WOS to correctly identify some of my finds. It is frustrating to think that I may never be able to sort them all out on my own. But I am a neophyte and learning. I now have nets, loupes, and glassine envelopes so I will have a better chance of identifying my odes finds. I will be able to examine and take more detailed images of the caudal appendages, thorax detail, wings etc., then release my finds to their original environment. I now also have a dissecting microscope with camera.

On the amusing side during this season's successful quest for the Blue-ringed Dancer (*Argia sedula*), I fully submerged myself and my camera gear in the Bark River (my camera still functions, therefore 'tis not tragic). I also found myself lost in a marsh. On the bright side, I did find two spreadwing species (Lestidae) I hadn't seen before. Unfortunately, my wife repeatedly tells the "lost in the marsh" story to friends, family, and once in a while to complete strangers. I tell my version and smile. I consider it all to be a grand adventure.

My grandiose goals for 2017 and onward are to find and photograph in nature all of the odes listed for my county

Parting Shots


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

Precarious Perch?, by Jim Burns <jpbaztec@aol.com>

From Collier County, Florida, Jim Burns brings us this photo of a Florida Bluet (*Enallagma pollutum*) relaxing on a reptilian perch—perhaps not as precarious as it might seem, as the bluet blends in remarkably well with the scale pattern!



Four-spotted Skimmer (*Libellula quadrimaculata*), 2 June 2016.

and ultimately the state of Wisconsin. But I will settle for any and all odes I may find. There is no doubt that this fixation is now an integral part of my life. I am an avowed Odonatophile. This of course does come after my beautiful wife, daughters, and grandchildren—although this has not been tested as yet... 



Florida Bluet (*Enallagma pollutum*), Collier County, Florida, December 2016. Photo by Jim Burns.

The End of the Line, by Dennis Paulson <dennispaulson@comcast.net>

Dennis sends this lovely photo of a Marl Pennant (*Macrodiplax balteata*) seen during his recent trip to Florida (see article in this issue).

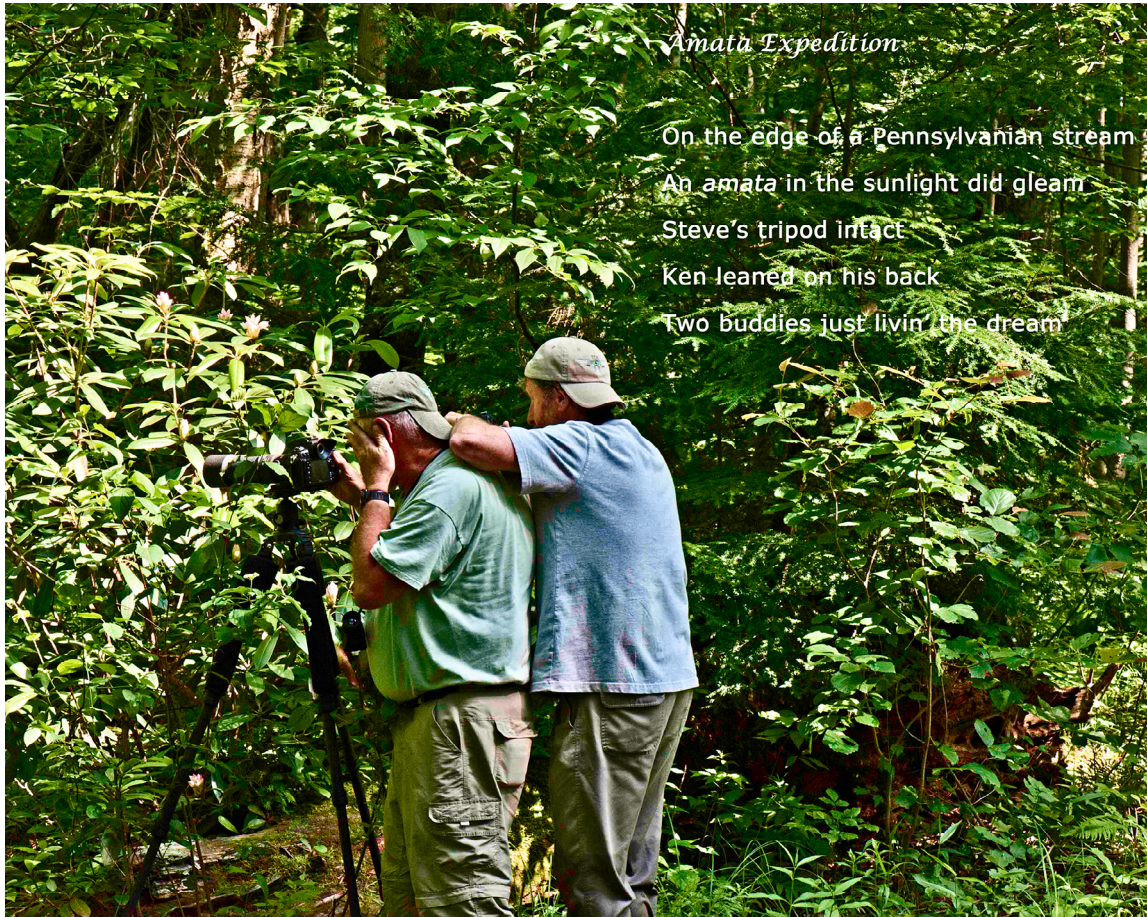
He commented “This is the very end of the line, as far as you can drive south in the continental U.S. I think it shows how delicately odonates hold onto their perch. It seems all they have to do is touch anywhere, and the tension of their muscles holds their body in place even though the contact points seem almost infinitesimal.”

Amata Expedition, by Marla Garrison <mgarrison@mchenry.edu>

Finally, Steve Valley submitted a photograph and poem by Marla Garrison, showing Steve Valley (L) and Ken Tennesen (R) at the 2015 Annual DSA Meeting in Pennsylvania. It pays poetic tribute to the combined joys of ode-hunting, travel, photography, and just hanging out with friends.



Macrodiplax balteata (Marl Pennant) female, Florida, Monroe County, Key West, Fort Zachary Taylor Historic State Park, 12 December 2016. Photo by Netta Smith.



Amata Expedition

On the edge of a Pennsylvanian stream
An *amata* in the sunlight did gleam
Steve's tripod intact
Ken leaned on his back
Two buddies just livin' the dream

ARGIA and BAO Submission Guidelines

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

Articles

All articles and notes should be submitted in Word, Pages, or Rich Text Format (RTF), without embedded figures, tables, or captions. All photos and figures must be submitted as separate files (see Figures below). Only minimal formatting of each article to facilitate review is needed: single column with paragraph returns and bold/italic type where necessary. Include captions for all figures and tables in a separate Word, Pages, or Rich Text Format document. Articles may be edited if needed for clarity, grammar, and/or space.

Begin the article with title, author name(s), and contact information (including e-mail for primary author) with a line between each. The article or note should follow this information. Paragraphs should be separated by a line and the first line should not be indented. The first time each species is mentioned in the article, always give both the scientific name as well as the official common name (where one has been assigned) in parentheses. Subsequent mention of the same species may be done using scientific or common name only, as the author prefers.

Figures

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

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

Charts, graphs, diagrams, and other vector graphics (e.g. computer-drawn maps) can be submitted as raster graphics (PNG or TIFF) with a minimum of 600 ppi at the intended print size. You may be asked to provide the raw data for charts and graphs if submitted graphics are deemed unsatisfactory. When charts and graphs are generated in Excel or Numbers, please submit the file with each chart or graph on a separate sheet and each sheet named appropriately (e.g. "Fig. 1", "Fig. 2", etc.)

Tables

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

The Dragonfly Society Of The Americas

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Journals Published By The Society

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

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

Membership in the Dragonfly Society of the Americas

Membership in the DSA is open to any person in any country and includes a digital subscription to ARGIA and BAO. Dues for individuals in the US, Canada, or Latin America are \$15 us for regular memberships (including non-North Americans), institutions, or contributing memberships; \$5 us or more can be added for sustaining memberships. Dues are payable annually on or before 1 March of membership year. Membership dues can be paid online via credit card; see <http://odonatacentral.org/index.php/PageAction.get/Name/DSA_Membership>. Membership forms can also be downloaded and mailed with a check to The Dragonfly Society of the Americas, Inc., Attn: Cynthia McKee, Accountant, 605 9th Avenue, Ottawa, Illinois 61350-4119. For more information on joining DSA, visit <www.dragonflysocietyamericas.org/join>.

Mission of the Dragonfly Society of the Americas

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

Back cover: (upper) *Sympetrum ambiguum* (Blue-faced Meadowhawk) male, Irwin Prairie, Lucas County, Ohio, 6 September 2016. Photo by Rick Nirschl. **(lower)** Blue-fronted Dancer (*Argia apicalis*) androchrome female, Starved Rock State Park, along the shoreline of the Illinois River, LaSalle County, Illinois, 12 July 2013. Photo by Dick Todd.

