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Front cover: *Calopteryx angustipennis* (Appalachian Jewelwing) at Rivanna River, Milton Landing, Albemarle County, Virginia, taken during the DSA Annual Meeting, 7–12 June 2017. Photo by Michael Moore.

DSA 2017 Annual Meeting Report

Steve Roble, Virginia Department of Conservation and Recreation, Division of Natural Heritage, Richmond, Virginia
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For the first time, the annual DSA meeting was held in Virginia this year, spanning Wednesday 7 June to Monday 12 June. Previous southeast regional meetings had been held in Virginia, in Galax (2009) and Richmond (2013). The Richmond-area contingent of Paul Bedell (unofficial chairman), Anne Wright, Richard Groover, and Steve Roble were the primary members of the local host committee, assisted by fellow Virginians Bruce Grimes, Emily Luebke, Jim Childress, and Mike Boatwright. Tamra Willis and Mary Jane Epps of Mary Baldwin University helped with logistics and Mike Moore served as the meeting webmaster for the third year in a row. The meeting T-shirt (designed by Kim Harrell) and button (designed by Jerrell Daigle) featured the Appalachian Jewelwing (*Calopteryx angustipennis*), a species that most participants were able to see at one or more sites during the field trips.

Total attendance during the week exceeded 90 participants (70 appear in the group photo) and a new high was established for species found (108, including 106 in Virginia), topping the mark of 84 set at the State College, Pennsylvania meeting in 2015.

Paul Bedell leads DSA group along the Bullpasture River, Highland Co., Virginia. Photo by Richard Connors.

Libellula auripennis (Golden-winged Skimmer) at Chub Sandhill Natural Area Preserve, Sussex Co., Virginia. Photo by Ken Larsen.

Odonata enthusiasts came from 25 states and the District of Columbia; Ontario, Canada; and Australia. The weather was very cooperative throughout the entire meeting, with no rain and daytime highs in the low 70s during the first several days, increasing to the 80s during the latter half.

Many participants began arriving on Tuesday night at the pre-meeting hotel located about 20 miles south of the Richmond airport. Maps and species checklists (for 12 Virginia counties) were distributed on Wednesday morning as groups departed for the main pre-meeting sites that included Harrison Lake National Fish Hatchery in Charles City County and Chub Sandhill Natural Area Preserve in Sussex County. The fish hatchery ponds had a nice diversity of odonates including Banded Pennant (*Celithemis fasciata*), Little Blue Dragonlet (*Erythrodiplax minuscula*), Southern Sprite (*Nehalennia integricollis*), and Attenuated Bluet (*Enallagma daeckii*). Blackwater Bluets (*E. weewa*), Sparkling Jewelwings (*Calopteryx dimidiata*), and

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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 2018	mid-late May 2018	Pittsboro, North Carolina	Jerrell J. Daigle <jdiagle@nettally.com>
Ohio Odo-Con-18	22–24 June 2018	Hancock County, Ohio	Jim Lemon <jlem@rwoh.rr.com>
Annual DSA Meeting	10–17 July 2018	Duluth, Minnesota	M. Haag <Mitchell.Haag@threeriverparks.org>

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Ebony Jewelwings (*C. maculata*) were found in nearby Herring Creek. The sandpit ponds and Nottoway River Swamp at Chub Sandhill Natural Area Preserve yielded uncommon species such as Yellow-sided Skimmer (*Libellula flavida*), Duckweed Firetail (*Telebasis byersi*), Burgundy Bluet (*Enallagma dubium*), Attenuated Bluet, and Southern Sprite, as well as Golden-winged Skimmer (*Libellula auripennis*), Bar-winged Skimmer (*L. axilena*), Painted Skimmer (*L. semifasciata*), Great Blue Skimmer (*L. vibrans*), Double-ringed Pennant (*Celithemis verna*), Elegant Spreadwing (*Lestes inaequalis*), Swamp Spreadwing (*L. vigilax*), and Skimming Bluet (*Enallagma geminatum*). The Nottoway River was low and less productive than normal, but species present near the bridge crossing included Common Sanddragon (*Progomphus obscurus*), Black-shouldered Spinyleg (*Dromogomphus spinosus*), Stream Bluet (*Enallagma exsulans*), and Powdered (*Argia moesta*), Blue-tipped (*A. tibialis*), and Blue-fronted Dancers (*A. apicalis*). Some participants also found Duckweed Firetails along the roadside at Carson Wetlands in Prince George County.

(Upper) Members of the Blue Ridge Young Birders Club were enthusiastic participants in field trips and exhibited great expertise in identifying Odonata. (Lower) DSA group surveying for Odonata at Tucker Park along the James River, Goochland County, Virginia. Photos by Paul Bedell.

On Thursday, Pocahontas State Park in Chesterfield County south of Richmond was the first field trip destination of the day. The park has a species list of 73 (mostly due to the efforts of Paul Bedell), some of which were seen that morning, including Elegant Spreadwing, Attenuated Bluet, Slender Bluet (*Enallagma traviatum*), Lilypad Forktail (*Ischnura kellicotti*), and Gray Petaltail (*Tachopteryx thoreyi*).

After departing the state park, the goal was to head west from Richmond and stop at Tucker Park (Goochland County) and several boat landings (e.g., Hardware River Wildlife Management Area) along the James River, with the ultimate destination being the main meeting hotel (Sleep Inn) in Staunton. Species found along the James River included Cobra Clubtail (*Gomphurus vastus*), Eastern Ringtail (*Erpetogomphus designatus*), Dragonhunter (*Hagenius brevistylus*), Black-shouldered Spinyleg, Allegheny River Cruiser (*Macromia alleghaniensis*), Prince Baskettail (*Epitheca princeps*), American Rubyspot (*Hetaerina americana*), and several species of dancers (*Argia*). Sparkling Jewelwings were found along the Hardware River near its confluence with the James River.

The group size grew on Thursday night as additional DSA members and other attendees arrived in Staunton for the main meeting. Field trip destinations on Friday and Sunday included numerous sites within about an hour's drive of Staunton. A special beginner field trip catering to those new to dragonflies and damselflies was led by Richard Groover on Friday. This group visited Braley Pond and Elkhorn Lake, both within the George Washington National Forest in Augusta County. Aurora Damsel (*Chromagrion conditum*) was among the species found at both sites. The beginner field trip, believed to be the first offering of its kind at a DSA meeting, was well received by the eight participants and should be made available at future DSA meetings to encourage more people to learn about and appreciate Odonata.

Gomphurus vastus (Cobra Clubtail) at James River, Hardware River Wildlife Management Area, Fluvanna County, Virginia. Photo by Michael Moore.

The "Big Levels" area east of Staunton at the foot of the Blue Ridge Mountains in the George Washington National Forest contains the sinkhole pond complex known as Maple Flats. Of the 67 species previously documented in this area (Roble, 1999 and subsequent records), some of which are more typical of the Coastal Plain region of Virginia, participants found at least 38 species including Comet Darner (*Anax longipes*), Golden-winged, Painted, Bar-winged, and Great Blue Skimmers, Double-ringed Pennant and Calico Pennants (*Celithemis elisa*), Carolina Saddlebags (*Tramea carolina*), Sable Clubtail (*Stenogomphurus rogersi*), Lilypad Forktail, Aurora Damsel, Southern Sprite, and Attenuated, Azure (*Enallagma aspersum*), and Turquoise Bluets (*E. divagans*).

(Upper) *Enallagma daeckii* at Pocahontas State Park, Chesterfield County, Virginia. Photo by Paul Dacko. (Lower) *Telebasis byersi* (Duckweed Firetail) at Carson Wetlands, Prince George County, Virginia. Photo by Michael Moore.

Farther east near Charlottesville in Albemarle County, riverine species were sought at sites such as Darden Towe Park and Milton Landing on the Rivanna River, and Warren Ferry Landing on the James River. Appalachian Jewelwing, Splendid Clubtail (*Gomphurus lineatifrons*), Eastern Least Clubtail (*Stylogomphus albistylus*), Eastern Ringtail, and Common Sanddragon (plus Gray Petaltail) were among the best finds, with those returning to Warren Ferry near dusk on several dates being rewarded with good numbers of the crepuscular Cinnamon Shadowdragon (*Neurocordulia virginiensis*). The latter species was originally described from the James River in Buckingham County, Virginia based on an adult female collected on 21 June 1919 (Davis, 1927), but it was not recorded again in the state until the past decade. However, recent surveys have revealed that it is widespread and common in the Piedmont section of the James River, spanning the reach from Richmond upstream for more than 100 miles.

West of Staunton, multiple parties of meeting attendees visited various river, stream, and small pond sites on both public and private lands, such as the Bullpasture River Gorge within the Highland Wildlife Management Area; Braley Pond, Todd Lake, Sherando Lake, and Shaws Fork in the George Washington National Forest; and the Maury River at Goshen Pass. This area includes Highland County, a sparsely settled and high-elevation county that borders West Virginia. Species found at these river and stream sites included Uhler's Sundragon (*Helocordulia uhleri*), Harpoon Clubtail (*Phanogomphus descriptus*), Splendid Clubtail, Eastern Least Clubtail, and Appalachian Jewelwing. Gray Petaltails were observed at several sites, including Braley Pond and Goshen Pass, and Comet Darner was recorded at Todd Lake. A marshy pond at the edge of a cattle pasture near Headwaters in Highland County provided excellent views of Spatterdock Darner (*Rhionaeschna mutata*), Twelve-spotted Skimmer (*Libellula pulchella*), and Amber-winged Spreadwing (*Lestes eurinus*). Several Great Blue Skimmers, a species more typical of coastal Virginia, were also seen here as well as at Braley Pond and Milton Landing. Arrowhead Spiketail (*Cordulegaster obliqua*) and Northern Pygmy Clubtail (*Lanthus parvulus*) were observed near Braley Pond.

Saturday 10 June was devoted to the DSA business meeting and oral presentations (see this issue for business meeting minutes and presentation abstracts), followed by a catered banquet dinner and blacklighting activity. Bryan Pfeiffer, President-elect of DSA, presided over the meeting in the absence of President Bob DuBois, who was unable to attend at the last minute. The meeting was held on the campus of Mary Baldwin University in Staunton. The oral presentation program was organized and moderated by Steve Roble and included 11 talks on a variety of Odonata-related topics. During his introductory presentation on Virginia Odonata, Steve noted that Nick Donnelly, Ollie Flint, and Hal White, all of whom were in attendance at the 2017 DSA meeting, had also attended the first North American dragonfly conference held in 1963 at Purdue University (the

Blacklighting for insects at Maple Flats, George Washington National Forest, Augusta County, Virginia. Photo by Paul Bedell.

audience acknowledged these long-time Odonata experts with applause). Ken Tennessen gave two talks, including an update on the status of his long-anticipated manual on North American Odonata larvae. Following the paper session, most participants attended the banquet held in the ballroom of the Student Activities Center at Mary Baldwin University. Later that evening, some attendees joined Art Evans, a well-known coleopterist and insect field guide author, at Maple Flats to observe, photograph, or collect insects attracted to several ultraviolet light sheets that he had erected near the ponds.

Although some attendees departed after the Sunday field trips, most remained to attend the post-meeting field trip on Monday that went farther west of Staunton to high-elevation areas in Highland County near the West Virginia border (a few ventured across the state line to Shavers Fork, West Virginia; see White, 2017). Smaller groups visited various other sites of their own choosing as they began their journeys home. The initial stop for the post-meeting field trip was a small private pond that impounds a headwater stream near Mustoe. Participants were able to observe and photograph several northern species in abundance along and near the dam, including Chalk-fronted Corporal (*Ladona julia*), American Emerald (*Cordulia shurtleffii*), and Hagen's Bluet (*Enallagma hageni*), as well as good numbers of Unicorn Clubtails (*Arigomphus villosipes*).

The group then moved on to Straight Fork, a remote private property north of Monterey that contains numerous beaver ponds and a cold stream. Again, northern species were featured, and many participants observed more Chalk-fronted Corporals, American Emeralds, Unicorn Clubtails, and Hagen's Bluets, as well as Sedge Sprite (*Nehalennia irene*), Harpoon Clubtail, and Twelve-spotted Skimmer. Some attendees also found Riffle Snaketail (*Ophiogomphus carolus*), Dot-tailed Whiteface (*Leucorrhinia intacta*), Beaverpond Baskettail (*Epitheca canis*), Uhler's Sundragon, Brown Spiketail (*Cordulegaster bilineata*), Tiger Spiketail (*C. erronea*), Little Blue Dragonlet, Northern Spreadwing (*Lestes disjunctus*), and Eastern Red Damsel (*Amphiagrion saucium*) at this site. A few ventured farther north along the same county road until it crossed Laurel Fork to reconfirm the continued existence of a small population of Superb Jewelwings (*Calopteryx amata*) that was first documented by Ollie Flint in 1971. Two species were seen only at Shavers Fork in Randolph County, West Virginia: Maine Snaketail (*Ophiogomphus mainensis fastigiatus*) and Mustached Clubtail (*Hylogomphus adelphus*). Other species recorded there included Harpoon Clubtail, Brown Spiketail, Superb Jewelwing, Aurora Damsel, and Eastern Red Damsel.

Nehalennia irene (Sedge Sprite) at Straight Fork, Highland County, Virginia. Photo by Judy Gallagher.

(Upper) *Rhionaeschna mutata* (Spatterdock Darner) at roadside marsh near Headwaters, Highland County, Virginia. (Lower) *Phanogomphus descriptus* (Harpoon Clubtail) at Straight Fork, Highland County, Virginia. Photos by Drew Chaney.

Although no new state records were obtained during the meeting, several new county and locality records were documented. Clubtails (Gomphidae; 19 species), skimmers (Libellulidae; 29 species), and pond damselflies (Coenagrionidae; 29 species, including 14 bluets, [*Enallagma*]), were the best-represented families. The record high species total (108) for the meeting can be attributed at least in part to the fact that field sites included a variety of habitats in four of the five major physiographic provinces of Virginia, including the Coastal Plain, Piedmont, Blue Ridge, and Ridge and Valley.

Many participants obtained new "lifer" species during the field trips and everyone seemed to leave the meeting happy and looking forward to seeing old and meeting new friends at the 2018 DSA meeting near Duluth, Minnesota. I thank everyone who

helped to organize and run the meeting, gave presentations, led field trips, and shared their sightings, photographs, and/or specimens, as well as the various private landowners and public agencies that granted access to their properties.

Addendum

DSA member Tom Pendleton returned to the ponds at Chub Sandhill Natural Area Preserve and Harrison Lake National Fish Hatchery on 20 July and 11 August, respectively. He photographed an adult female Amanda's Pennant (*Celithemis amanda*) at Chub, a new state record (species #196) for Virginia, and yet another southern species found in the state for the first time after 2000. Tom later observed (and photographed) at least two male Red-veined Pennants (*C. bertha*) at the Harrison Lake fish hatchery ponds, which is only the second documented Virginia locality (first reported by Bedell, 2014).

Literature Cited

Bedell, P. 2014. *Celithemis bertha* (Red-veined Pennant), new for Virginia. Argia 26(3): 10–11.

Davis, W.T. 1927. A new dragonfly from Virginia. Bulletin of the Brooklyn Entomological Society 22: 155–156.

Roble, S.M. 1999. Dragonflies and damselflies (Odonata) of the Shenandoah Valley sinkhole pond system and vicinity, Augusta County, Virginia. Banisteria 13: 101–127.

White, H. 2017. Dragonflies, habitats, collecting and the shifting baseline. Argia 29(3): 12–14.

2017 DSA Meeting Species List. *Recorded only in West Virginia ; #recorded in Virginia by attendees en route to the meeting or within two days after the post-meeting field trip.

Petaluridae (Petaltails)
Gray Petaltail (*Tachopteryx thoreyi*)

Aeshnidae (Darners)
Common Green Darner (*Anax junius*)
Comet Darner (*A. longipes*)
Springtime Darner (*Basiaeschna janata*)
Fawn Darner (*Boyeria vinosa*)
Swamp Darner (*Epiaeschna heros*)
Cyrano Darner (*Nasiaeschna pentacantha*)
Spatterdock Darner (*Rhionaeschna mutata*)

Gomphidae (Clubtails)
Unicorn Clubtail (*Arigomphus villosipes*)
Black-shouldered Spinyleg (*Dromogomphus spinosus*)
Eastern Ringtail (*Erpetogomphus designatus*)
Splendid Clubtail (*Gomphurus lineatifrons*)
Cobra Clubtail (*G. vastus*)
Dragonhunter (*Hagenius brevistylus*)

Mating pair of *Didymops transversa* (Stream Cruisers) at Braley Pond, Augusta County, Virginia. Photo by Paul Dacko.

Spine-crowned Clubtail (*Hylogomphus abbreviatus*)
Mustached Clubtail* (*H. adelphus*)
Northern Pygmy Clubtail (*Lanthus parvulus*)
Riffle Snaketail (*Ophiogomphus carolus*)
Maine Snaketail* (*O. mainensis*)
Rusty Snaketail (*O. rupinsulensis*)
Harpoon Clubtail (*Phanogomphus descriptus*)
Lancet Clubtail (*P. exilis*)
Ashy Clubtail (*P. lividus*)
Common Sanddragon (*Progomphus obscurus*)
Sable Clubtail (*Stenogomphurus rogersi*)
Eastern Least Clubtail (*Stylogomphus albistylus*)
Russet-tipped Clubtail# (*Stylurus plagiatus*)

Cordulegastridae (Spiketails)
Brown Spiketail (*Cordulegaster bilineata*)
Tiger Spiketail (*C. erronea*)
Arrowhead Spiketail (*C. obliqua*)

Macromiidae (Cruisers)
Stream Cruiser (*Didymops transversa*)
Allegheny River Cruiser (*Macromia alleghaniensis*)

Corduliidae (Emeralds)
American Emerald (*Cordulia shurtleffii*)
Beaverpond Baskettail (*Epitheca canis*)

Common Baskettail (*Epitheca cynosura*)
Prince Baskettail (*E. princeps*)
Uhler's Sundragon (*Helocordulia uhleri*)
Umber Shadowdragon (*Neurocordulia obsoleta*)
Cinnamon Shadowdragon (*N. virginiensis*)

Libellulidae (Skimmers)
Calico Pennant (*Celithemis elisa*)
Halloween Pennant (*C. eponina*)
Banded Pennant (*C. fasciata*)
Double-ringed Pennant (*C. verna*)
Swift Setwing[#] (*Dythemis velox*)
Eastern Pondhawk (*Erythemis simplicicollis*)
Little Blue Dragonlet (*Erythrodiplax minuscula*)
Blue Corporal (*Ladona deplanata*)
Chalk-fronted Corporal (*L. julia*)
Dot-tailed Whiteface (*Leucorrhinia intacta*)
Golden-winged Skimmer (*Libellula auripennis*)
Bar-winged Skimmer (*L. axilena*)
Spangled Skimmer (*L. cyanea*)
Yellow-sided Skimmer (*L. flavida*)

(Upper) Obelisking *Erpetogomphus designatus* (Eastern Ringtail) at James River, Warren Ferry Landing, Albemarle Co., Virginia. Photo by Ken Larsen. (Lower) *Ophiogomphus mainensis fastigiatus* (Maine Snaketail) at Shavers Fork, Cheat Bridge, Randolph Co., West Virginia. Photo by Michael Moore.

Slaty Skimmer (*L. incesta*)
Widow Skimmer (*L. luctuosa*)
Needham's Skimmer (*L. needhami*)
Twelve-spotted Skimmer (*L. pulchella*)
Painted Skimmer (*L. semifasciata*)
Great Blue Skimmer (*L. vibrans*)
Elfin Skimmer[#] (*Nannothemis bella*)
Blue Dasher (*Pachydiplax longipennis*)
Wandering Glider (*Pantala flavescens*)
Spot-winged Glider (*P. hymenaea*)
Eastern Amberwing (*Perithemis tenera*)
Common Whitetail (*Plathemis lydia*)
Autumn Meadowhawk (*Sympetrum vicinum*)
Carolina Saddlebags (*Tramea carolina*)
Black Saddlebags (*T. lacerata*)

Calopterygidae (Broadwing Damsels)
Superb Jewelwing (*Calopteryx amata*)
Appalachian Jewelwing (*C. angustipennis*)
Sparkling Jewelwing (*C. dimidiata*)
Ebony Jewelwing (*C. maculata*)
American Rubyspot (*Hetaerina americana*)

Lestidae (Spreadwing Damsels)
Southern Spreadwing (*Lestes australis*)
Northern Spreadwing (*L. disjunctus*)
Amber-winged Spreadwing (*L. eurinus*)
Elegant Spreadwing (*L. inaequalis*)
Slender Spreadwing (*L. rectangularis*)
Swamp Spreadwing (*L. vigilax*)

Coenagrionidae (Pond Damsels)
Eastern Red Damsel (*Amphiagrion saucium*)
Blue-fronted Dancer (*Argia apicalis*)
Variable (Violet) Dancer (*A. fumipennis violacea*)
Powdered Dancer (*A. moesta*)
Blue-ringed Dancer (*A. sedula*)
Blue-tipped Dancer (*A. tibialis*)
Dusky Dancer (*A. translata*)
Aurora Damsel (*Chromagrion conditum*)
Azure Bluet (*Enallagma aspersum*)
Double-striped Bluet (*E. basidens*)
Familiar Bluet (*E. civile*)
Attenuated Bluet (*E. daeckii*)
Turquoise Bluet (*E. divagans*)
Atlantic Bluet (*E. doubledayi*)
Burgundy Bluet (*E. dubium*)
Big Bluet[#] (*E. durum*)
Stream Bluet (*E. exsulans*)
Skimming Bluet (*E. geminatum*)
Hagen's Bluet (*E. hageni*)
Orange Bluet (*E. signatum*)
Slender Bluet (*E. traviatum*)
Blackwater Bluet (*E. weewa*)

Citrine Forktail (*Ischnura hastata*)
Lilypad Forktail (*I. kellicotti*)
Fragile Forktail (*I. posita*)
Eastern Forktail (*I. verticalis*)
Southern Sprite (*Nehalennia integricollis*)
Sedge Sprite (*N. irene*)
Duckweed Firetail (*Telebasis byersi*)

Minutes of the DSA Annual Business Meeting, 10 June 2017

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

Paul Bedell gave opening remarks and thanked Steve Roble, Ann Wright, Michael Moore, Bruce Grimes, Mary Jane Epps and Tamara Willis for their work organizing the meeting. Martha Walker, Dean of Life Sciences at Mary Baldwin University, welcomed everyone and thanked us for bringing science to a small college and its undergraduate students. Thanks for helping us bring research to the school.

Chris Hill gave his final remarks as President, thanking meeting organizers and handing over gavel to Bob DuBois. The new President-elect, Bryan Pfeiffer, will be presiding because Bob is unable to attend.

Bryan opened the business meeting introducing Bob DuBois as president despite his absence. As acting President he immediately called for a motion to adjourn the meeting. He thanked Chris Hill for his tenure as President. DSA has expanded membership, and now has an online system for payment of dues and fees. The society gave a donation to the new Latin American Odonata group of $1000 to help start them up. We are working on a DSA logo. Jim Johnson is completing a 12-year tenure on the Executive Committee (EC). Jerrell Daigle handed out the meeting buttons.

The founding members in attendance stood and were introduced: Jerrell Daigle, Nick Donnelly, Ken Tennessen, and Steve Valley. The members of the EC stood and were acknowledged.

Steve Valley made a motion to approve the minutes from the 2016 meeting as published in Argia Vol. 28, No. 3, 15 September 2016. Jim Johnson seconded it and all approved. Steve read results of the online election; Bryan Pfeiffer (President-elect) got 91 votes, Nancy McIntyre (Regular Member) got 90 votes, and Cindy McKee (Treasurer) got 91 votes.

Steve Valley passed around an attendance list and attendees introduced themselves and where they lived.

Anne & Rusty Baldwin from Arkansas.
Pierre & Dani Deviche and Jim Burns from Arizona.
Jeff Cook from Alabama.
Maria Maruca and Luigi Casagrande from Australia.
Ann & John Cooper and Boris Kondratieff from Colorado.
Michael Moore, Hal White, and Jim White from Delaware.
Jerrell J. Daigle and Buck Snelson from Florida.
Marcia & Steve Hummel from Iowa.
Paul Dacko, Linda & Paul Massey, Doug Mills, Cindy & John McKee, Mark Donnelly & Veta Bonnewell, and Marla Garrison from Illinois.
Joshua S. Rose, David Small, and Jason Forbes from Massachusetts.
Mike Turner from North Carolina.
Pam Hunt from New Hampshire.
Kitty Leaken from New Mexico.
Nick & Ailsa Donnelly from New York.
Emily Hjalmarson from Oklahoma.
Colin Jones from Ontario, Canada.
Steve Valley from Oregon.
Lane Loya, Tony Schoch, Dan Bogar, and Anita & Paul Guris from Pennsylvania.
Chris Hill from South Carolina.
Sally Edwards, Steven Edwards, and Richard Connors from Tennessee.
Greg Lasley from Texas.
Carol & Oliver Flint, Paul Bedell, Michael Boatwright, Gail Brodfuehrer, Jim Childress, Bruce Grimes, Richard Groover, Karen Kearney, Kenneth Larson, Emily Luebke, William Pendelton, Steve Roble, Walter Sanford, Fred Suskind, Anne Wright, and Michael Ready from Virginia.
Mike Blust, Joshua Lincoln, and Bryan Pfeiffer from Vermont
Jim Johnson from Washington.
Matthew Muir from Washington DC.
Ken Tennessen from Wisconsin.

New Business

Bryan Pfeiffer thanked Jerrell Daigle for his years of service as Treasurer.

Treasurer's Report by Cindy McKee: Cindy appreciated Jerrell and his support in transitioning. She has QuickBooks and financial statements are available. We have $28,000 in the bank as of 10 June 2017. None of the receipts have been put in yet for the meeting so that will probably go up by $2000 in the next few weeks. We have 321 members, about 51 have not paid this year's dues yet. We need to "tighten up" on access to Argia, etc. through OdonataCentral for members that are not current

on dues. John Abbott got PayPal up and running and everything is working smoothly.

Jerrell Daigle is looking for 2022, 2023, and 2024 meeting sites. Next year's meeting is with the Minnesota Dragonfly Society. It will be held near Duluth, Minnesota at Wolf Ridge Recreation Center on 10–17 July, with the business meeting on 15 July.

Donnelly fellowship recipients: Chris Hill thanked Jim Johnson and Bob DuBois for evaluation of applicants (Past President and President-elect are now the standard committee for this). This year the awards went to Emily Hjalmarson and Kitty Leaken.

Executive Committee Reports

1. Welcomed Nancy McIntyre (Regular Member) and Cindy McKee (Treasurer) as new EC members.

2. We are trying to separate some of the membership maintenance, growth, etc. from job of the Treasurer, perhaps with a subcommittee. Bob DuBois, Colin Jones, and Bryan Pfeiffer have informally been kicking around ideas for expanding membership. Did some marketing on Facebook and social media. Richard Groover stated that he had approached the Entomology Committee from the Virginia Academy of Science and said all states may have such academies with entomology departments. Since Virginia's wasn't even aware we existed, this might be a good strategy to get new members.

3. Discussed a separate website from OdonataCentral (OC). We own the domain name but it directs you to OC site. The EC is considering a separate website for DSA. A logo and a brochure is another thing that we are working on and they will be important for branding and marketing.

4. Steve Valley said our bank account is now with Bank of America. Cindy McKee said the Secretary/Assistant Treasurer and the Treasurer are the only two people that can access and sign for this account.

5. Bryan Pfeiffer said the EC is working on formalizing the registration fees for meetings, making them clear and standardized. We want to make them reasonable for members but they can generate real money for the society.

6. Celeste Searles Mazzacano (Editor-in-Chief) could not be here to do the report for Argia so Chris Hill reported in her stead and read her statement, which introduced new members to our two publications and described them. Non-members can access only issues that are three years old or older. They are cited by EBSCO index. She provided an explanation of the variety of articles submitted to Argia and how to submit articles.

7. Steve Hummel gave the BAO update and mentioned that it is an occasional publication now. We currently have one paper in the works. If any of the presenters today might have possibilities for publication in this peer-reviewed journal contact Steve. He explained the process of submission and review. It is online so it is instantaneously available.

8. John Abbott (Webmaster and Manager of Odonata Central) couldn't be here. Chris Hill read his report. It continues to grow with over 5000 members and 150,000 user-submitted records. He has a large data set to upload including some from Latin America. The dragonfly app continues to be upgraded. An Android version is due to be rolled out in the next thirty days. He is working on an 'Odomatic' technology for photo ID system for the app. Bryan mentioned that he and Mike Blust launched the Dragons and Damsels of Vermont and sent 7000 records to OC, and OC is now the repository for all of that state's data and their website calls up records from OC.

Other Business

Hal White's book is available for sale at this meeting. Jerrell has some reprints available. Called for specimens for trade but no one was interested. Maple Flats paper is available. Light sheeting will be there tonight. The group photo will be shot before lunch by Steve Valley in court yard.

New Business

Richard Groover said at the 2015 DSA Annual Meeting in Pennsylvania he brought something up and hasn't seen it brought up by the EC. The way to get new members is to offer a little money in the form of a grant. He received a Donnelly Fellowship grant. Money follows money. He offers, if the DSA will create a small $1000 fund, he will put in the first $500. We need this to help young faculty members. He promised DSA that he will write the first check for $500 if DSA will put up $500.

Marla Garrison said we did have an anonymous donor after Pennsylvania but it fell through.

John McKee said that we are in good shape for small grants.

Nick Donnelly said that small grants for young people to do projects is probably the best idea he's heard in recent meetings and it cuts to the heart of what we are doing.

Greg Lasley said there are other people who would contribute.

Cindy McKee said that we need to maintain $15,000 in bank. Said $20,000 would be a good critical balance.

Marla Garrison said that means we have $8000 that we can immediately begin using for grants.

Dan Bogar said as treasurer of a society he has zero fees. Cindy rebutted that ours is an international organization so that is why we have fees.

Chris Hill said we've dug into the finances this past year with projections of expenses through a subcommittee of Marla Garrison, Jim Johnson, Colin Jones, and Cindy McKee behind the scenes so now we can take some big steps. Cindy said special projects would be in a restricted fund and there would be no other use for it.

Steve Valley said maybe he should write up a report for ARGIA and have further discussions in EC over the next year and can put a plea for funds in ARGIA as well.

Nick Donnelly asked if the state of the society is such that donations can be tax deductible? Cindy says yes. Nick said this should be published then.

Greg Lasley said you can be a lifetime member for a fee with all other organizations he belongs to. Is that a possibility for the DSA?

Discussion followed regarding long term memberships and their financial consequences.

Bryan summarized that we are in a good financial position and that we agree we should begin putting funding forward to move towards our mission.

Someone mentioned the possibility of paying Celeste Searles Mazzacano a modest fee for her editing work on ARGIA. EC will consider this.

Steve Valley motioned to adjourn, Steve Hummel seconded, all ayes.

Attendees at the 2017 Annual Meeting of the DSA in Staunton, Virginia. Photo by Steve Valley.

Abstracts of Presentations at the Annual Business Meeting of the DSA, Staunton, Virginia

History and Current Status of Odonatology in Virginia, with Emphasis on the Distribution and Conservation of the Fauna. Steve Roble, Virginia Department of Conservation and Recreation, Division of Natural Heritage, Richmond, Virginia <steve.roble@dcr.virginia.gov>. Virginia was first settled by Europeans more than 400 years ago, but the study of its native biota, especially insects, has lagged behind many other states. Although few biologists and amateur naturalists collected Odonata during this span, 195 species have been recorded in the state at least once. This total ranks second only to Texas among all U.S. states and Canadian provinces. The state's varied geography likely accounts for this high diversity. Recent additions to the Virginia fauna are primarily southern species, whereas several northern species have not been recorded in the state in several decades. Survey efforts by staff of the Virginia Department of Conservation and Recreation, Division of Natural Heritage (VDCR-DNH) during the past quarter-century have helped to elucidate the composition, distribution, and conservation status of the state's Odonata fauna. A growing number of skilled birders/naturalists have also contributed important

distributional records, primarily by photographic means, during the past decade. The current VDCR-DNH rare animal list includes 62 species of Odonata (53 dragonflies, 9 damselflies). This represents a reduction of more than 50% since the first state list was prepared in 1988, reflecting increased knowledge of the status of many species. Clubtails (Gomphidae) account for 40% of the rare species in Virginia. No Odonata species is formally listed as threatened or endangered in Virginia, but several species with globally restricted ranges inhabit the state. Recent on-line resources concerning Virginia Odonata include several private websites, VDCR-DNH's atlas of Virginia's rare Lepidoptera and Odonata <http://www.vararespecies.org>, and most recently, a Virginia Odonata Facebook group.

The Dragonflies and Damselflies (Odonata) of Colorado: an Update. Bill Prather, Inez Prather, David Leatherman, and B.C. Kondratieff, Colorado State University, Fort Collins, Colorado <Boris.Kondratieff@Colostate.edu>. Species of Odonata recorded from Colorado are reviewed. We report 121 species and provide examples of their distributions among the three physiographic provinces recognized for the state: the Great Plains, the mountains, and the western plateaus. Numerous common eastern North American lentic species have probably colonized the state in recent times, with the availability of suitable habitats created mostly by historic irrigated agriculture practices. Additionally, species such as *Orthemis ferruginea* (F.) (Roseate Skimmer) colonize sporadically and recently, typically far-western species such as *Paltothemis lineatipes* Karsch (Red Rock Skimmer) and *Pseudoleon superbus* (Hagen) (Filigree Skimmer) have dispersed into the state. Comments are provided on species previously listed from the state but not confirmed.

Tennessen's Nymph Book: a Status Report. Ken Tennessen, Wautoma, Wisconsin <ktennessen@centurytel.net>. Preparation of a new identification guide to the dragonfly nymphs (Anisoptera) occurring in the United States and Canada is nearing completion. The book is a technical treatise, containing amply illustrated dichotomous keys for identifying the seven families, 72 genera, and 326 species occurring in the region. Each genus is represented by a full habitus drawing of a selected species. Many new characters have been discovered at each taxonomic level, and a few examples of these will be presented; a few previously-used characters that have been found to be unreliable will be discussed also. In addition to the identification keys, each generic account contains a distribution map and further diagnosis. A table containing measurements for each species gives an estimate of size variation; discussion of problematic species within each genus are provided as further diagnoses. A detailed treatment of nymph anatomy and methods for studying dragonfly nymphs and exuviae are included in separate chapters. Deadline for submission of the manuscript to the publisher is 31 December 2017. The book is nearing completion but work on several Corduliidae genera and a number of Libellulidae genera is still in progress: ergo, will I meet the deadline?

Impact of Wind Velocity on Local Flight Dispersal of Dragonflies. Richard S. Groover, George Mason University, Fairfax, Virginia <rgroover@reynolds.edu>. A manipulated field experiment was conducted to test the hypothesis that at some level of wind velocity in the boundary layer, local dispersing dragonflies will fly downwind. Field data was analyzed using Oriana, a directional analysis software. Flight downwind occurred when wind velocity exceeded 5 km/hr in 78% of cases (40 out of 51 individuals). When wind velocity was less than 5 km/hr, direction of flight was in the downwind direction in only 19% of cases (three out of 16 individuals). A revised hypothesis is presented: when wind velocity exceeds 5 km/hr under the environmental conditions tested in this study, dispersal of adult dragonflies of the species tested will be mostly in a downwind direction.

Growth and Ontogenic Change in *Anax walsinghami* (Giant Darner). Ken Tennessen, Wautoma, Wisconsin <ktennessen@centurytel.net>. I raised *Anax walsinghami* from the egg stage to full-grown nymphs in 9.5 months. Eggs were laid in July 2017 and hatched in about two weeks. The hatchlings were put in individual small plastic dishes. I provided the five nymphs I had with very small prey at first, mainly newly-hatched chironomid (midge) larvae. As the nymphs grew, I varied the prey from chironomid larvae to blackworms (*Lumbriculus*), scuds (*Gammarus*), mosquito larvae (Culicidae), plus a few other organisms such as mayfly nymphs as available. The nymphs were subjected to a cold period of six weeks in mid-winter, during which water temperature varied from about 2.2°C to 7°C. The nymphs were able to feed on small scuds above 40–42°C but ate very few scuds at temperatures below that. One male and one female nymph made it to final instar (F-0), the former in 14 molts (15 instars), the latter in 15 molts (16 instars). I preserved each shed exuvia for examination. Data on growth rate of various morphological structures (head width, femur length, cercus length) and ontogenetic changes (increase in number of antennal segments) are provided.

***Rubicundulum*! Oh *Rubicundulum*! Wherefre Art Thou *Rubicundulum*? Michael Blust, Green Mountain College, Poultney, Vermont <blustm@greenmtn.edu>.** When we started pulling together the data for Odonata in Vermont, we ran into the beginner's problem of trying to distinguish *Sympetrum rubicundulum* (Ruby Meadowhawk) from *Sympetrum internum* (Cherry-faced Meadowhawk). We also were trying to confirm species for the state list. Due to the need to examine genitalia for these two species, we ran into two problems: 1. We could not find any *S. rubicundulum* ourselves; and 2. We could not find any confirmable evidence from existing records. Eventually, we decided to expunge the species from the state list. This left a "hole" in the distribution maps for the species. One possible explanation for this hole was that some of the surrounding records were incorrect. As we started investigating records, both recent and historical, from the northeast, the trend was that records were either unconfirmable photos or specimens that turned out to

be *S. internum*. So I decided to go on a search for evidence of the actual range in the Northeastern part of the country. Here I will present the results of that search so far and request anyone who believes they have specimens, or know where there might be specimens, from Vermont, New Hampshire, Maine, Quebec, Nova Scotia, Newfoundland, or Prince Edward Island to contact me.

The *Ophiogomphus mainensis* (Maine Snaketail) Complex in the Appalachian Mountains. T.W. Donnelly, Binghamton, New York <tdonelly@binghamton.edu>. In 1958 I found *Ophiogomphus mainensis* in five counties in western North Carolina. Because this population seemed highly disjunct from the normal range of the species (northern Pennsylvania and northern New Jersey to Maine and eastern Canada), I examined them carefully to see if they were distinct from *mainensis*, but failed to find a convincing difference. In 1987 I described *fastigiatus* as a subspecies of *mainensis*, occurring in a narrow range from West Virginia and central Pennsylvania to southeastern New York and evidently complicated by hybrid specimens (with *mainensis*). At the State College meeting of the DSA a few years ago I presented new evidence on *fastigiatus*, suggesting that it should be raised to species rank, and finding a difference in the immature stage based on reared specimens of *fastigiatus* from near State College. Recently I have re-examined the southern specimens of *mainensis* and found a small, but consistent difference in the male terminal appendages. The epiproct of southern "*mainensis*" are morphologically separable. At the same time, I have found more apparent intergradation within the *mainensis–fastigiatus* populations in Pennsylvania and West Virginia. Probably at present the raising of *fastigiatus* to species status should be delayed in order to better understand the status of these two morphotypes. Present problems now include: 1. the extent of hybridization between *fastigiatus* and *mainensis*; and 2. whether the New River gap has served as an isolating barrier for the southern species of this complex, and whether the southern form should be elevated to species status. Female specimens have not been shown to be useful for this analysis. The subgenital plate changes during emergence and continues to change as the female matures. The occipital horns are highly variable in reared specimens and evidently broken during mating.

Navajo Dragonfly: Symbol of Water, Messenger to the Spirits. Kitty Leaken, Sante Fe, New Mexico <kleaken@gmail.com>. Navajo Dragonfly examines the role of dragonfly in native American art and culture. This article, which was published in Argia's 29th volume, starts with Harvard zoologist Leland Wyman who conducted a survey in 1948 on the Navajo reservation, asking native informants to identify 801 insect specimens and to provide information about them. It was a new field of study, cultural ethnoentomology, that was part of a prevailing rush to document every aspect of native life under the presumption that all tribes would soon be wiped out. To the contrary, the 'vanishing Indians' today thrive in many ways. The dragonfly, a major figure in Navajo creation mythology, ceremony and sandpaintings historically, is featured today in the art and jewelry of many cutting-edge contemporary artists as well as in the folk tales by young storytellers and pictorial weavings by a new generation of weavers. The dragonfly, to the Navajo, is a symbol of pure water and a messenger to the spirit world, a dazzling reminder of the connectedness of all things.

Determining Indicators of Local Species Residency Using Opportunistic Survey Data of Odonata to Inform Conservation. Emily Hjalmarson, Brenda Smith-Patten, Jason Bried, and Michael Patten University of Oklahoma, Norman, Oklahoma <ehjalmarson@ou.edu>. Species occurrence records of dragonflies can answer various important ecological questions, but results differ and are more informative when using data of resident species at a site compared to immigrants. Therefore, collecting physical (exuviae, teneral) or behavioral (pair, ovipositing, etc.) evidence of breeding occurrences is optimal. However, gathering such evidence requires advanced observational and identification skills so relying solely on breeding records yields scarce data. In contrast, adult observations are more numerous and reliably obtained from many sources, causing a dilemma of which data to use. To address this, Bried et al. (Bried, J. et al. 2015. Criteria to infer local species residency in standardized adult dragonfly surveys. Freshwater Science 34(3): 1105–1113) found indicators from adult surveys that predicted exuviae occurrence and therefore residency. We tested their criteria to further examine whether adult surveys predict residency status using teneral presence and other breeding indicators beyond exuviae. We used a larger, multi-year opportunistic dataset of records throughout Oklahoma and examined abundances and observation frequencies for life stages and breeding behavior. Using a similar occupancy modeling framework, we found similar general criteria for our dataset across all species and specific indicator thresholds existing when examining species' groups separately. Our study provides additional evidence that adult opportunistic data can still be informative when questions require knowledge of site-specific residents. Our results can guide future survey protocols; adult observations can remain the primary focus, which broadens the scope of potential observer skill levels (e.g., citizen scientists) while still indirectly ensuring residency is recorded.

Assessment of Larval Odonates and Other Aquatic Insects Inhabiting Passive Abandoned Mine Drainage Remediation Sites. Lane Loya, Justin Merry, Alyssa Bartlebaugh, Jade Canak, Alyssa Rozich, and Gabriella Scott, Saint Francis University, Loretto, Pennsylvania <lloya@francis.edu>. Abandoned mine drainage (AMD), which is a significant pollution problem in coal mining regions of the country, can be remediated by constructing passive-flow wetlands. In addition to protecting streams from harmful AMD effluent, these wetlands provide potentially valuable habitat for aquatic wildlife. The purpose of our research was to compare the community of larval odonates and other insects inhabiting AMD-treatment systems

to those in non-AMD habitats. We sampled aquatic insects by sweep net at seven AMD treatment sites and four control ponds in western Pennsylvania in spring 2016, and assessed them by comparing total number of individuals, family richness, species richness, and species diversity (Shannon Index). We collected over 1,400 aquatic insects from AMD sites during the study, which represents seven orders and 39 families. Larval odonates comprised 62% of the insects sampled from AMD ponds, with Coenagrionidae (71% of odonates) the most common family collected. Libellulidae (14%), Aeshnidae (11%, including larvae of the Comet Darner, *Anax longipes*), Corduliidae (2%), Lestidae (1%) and Gomphidae (<1%) were also found inhabiting AMD sites. Overall, we found that aquatic insect communities in AMD remediation systems compared favorably to those in natural ecosystems, at least for some diversity measures. Total insect number and Shannon values were similar among sites, although control ponds did contain slightly higher species and family richness than AMD ponds. Given that odonates were found at every AMD remediation site sampled in our study, we conclude that the construction of AMD treatment wetlands provides important habitat for these insects.

Sexual Size Dimorphism in Dragonflies in Southeastern Virginia. Jessica Beard and Deborah Waller, Old Dominion University, Norfolk, Virginia <jlbeard@odu.edu>. Dragonflies vary widely in size, both intra- and inter-specifically, and size affects many aspects of their lives, including territoriality in males and fecundity in females. Sexual size dimorphism (SSD) refers to the condition of males and females exhibiting different sizes, and dragonflies and damselflies can show a large range in SSD. In species where there exists a male-biased SSD, this size difference should increase with increasing body size. However, in species with larger females, the SSD should decrease with increasing body size. For dragonflies, there has been some support for this allometric relationship, but it has also not been supported with other studies. In this study, we captured, marked, measured and released several dragonflies in order to record several size parameters. Parameters measured included lengths of total size, abdomen, cerci length, forewing and hindwing lengths and widths, and wet mass. The hypothesis was that territorial species would show the greatest amount of SSD. Sexual size dimorphism was shown to exist based upon a significant difference between males and females from a one-way ANOVA analysis performed on each size parameter for all species.

Results showed that dragonfly males varied significantly among species in all parameters measured, and male-biased SSD was found for some parameters for some of the species. In particular, males and females differed significantly in total size for *Pachydiplax longipennis* (Blue Dasher), *Perithemis tenera* (Eastern Amberwing), and *Libellula vibrans* (Great Blue Skimmer), which are all known territorial species. Also, females of several species had greater forewing and hindwing widths than males, perhaps related to selection for energy conservation in females.

Dragonflies, Habitats, Collecting, and the Shifting Baseline

Hal White, Newark, Delaware <halwhite@udel.edu>

I love to look at Google Earth to find interesting new places to explore for dragonflies. At the same time, I hate to see the way humans have desecrated the landscape. If dragonflies had the life span of humans and could think like humans, they would be distraught seeing the destruction and alteration of their aquatic habitats that has happened and continues to happen.

In colonial times, mill dams on almost every rocky stream in the northeastern United States created mill ponds arranged like stair steps up valleys. Clear-cutting of forests for lumber, fuel, and farmland combined with erosion from poor farm practices soon filled the ponds with silt. Now, with the dams gone, the streams have cut back down through the silt to their original beds, leaving miniature canyons and elevated flood plains. Heavy rain storms on impervious surfaces generate 100-year floods every 10 years. Vernal ponds drained to create fertile farmland have disappeared, being replaced by stagnant farm ponds stocked with fish and surrounded by grass. Stormwater retention basins multiply in the urban and suburban landscapes. Ground water extraction has lowered water tables, shutting off the sources of springs and seeps. And then there are the often invisible insults of nutrients, insecticides, and toxic wastes released into the water supply. All aquatic habitats have been affected by human activity to some extent. Most result in changes in odonate populations and jeopardize the survival of rarer species with narrow habitat preferences.

While great climatic changes have occurred on the order of centuries or millennia, human-related habitat changes in the recent Anthropocene are far more rapid and far outpace those feared from ongoing climate changes. As a child I assumed that things were pretty much as they always were, but I know better now. A field where I used to pick berries is now a wood lot with trees 50 feet tall. My baseline of 60 years ago is different from that of a child walking in those woods today. That baseline shift becomes the new normal. Without documentation of the past, each generation has little appreciation for the changes that have transpired. There is no memory. When I was young, Rachel Carson warned my generation of a Silent Spring resulting from the loss of song birds killed by eating insects poisoned by DDT. While bird populations are well-monitored, insect populations are not. The fact that now there are few insects flying around street lights

in my neighborhood at night and my car's windshield does not have to be cleaned frequently of splattered insects probably is viewed positively by most people, but I worry. I will use the June 2017 Dragonfly Society of the Americas (DSA) Meeting in Staunton, Virginia, as an example of the multiple dimensions of the shifting baseline.

Forty-four years ago in June 1973, I collected dragonflies on Shavers Fork at Cheat Bridge, West Virginia. At an elevation of 3550 feet, Shavers Fork is the highest altitude stream of its size in the eastern United States. My visit there in the isolated mountains was all that I hoped for. There were even spruce trees in the surrounding forest that gave the place a New England feel. Shavers Fork was a beautiful pristine stream flowing over clean rocks and boulders with abundant stream-side vegetation. As might be expected, the dragonflies had northern affinities and I collected some of the many present. The prospect of revisiting the site located two hours west of Staunton along US Route 250 heightened my interest in attending this year's DSA meeting.

To provide some baseline perspective to my first visit to Shavers Fork, 10 years earlier in 1963 the first United States meeting devoted to dragonflies was held at Purdue University. The 40 or so registrants were mostly entomologists and taxonomists who collected specimens. People like Corbet, Westfall, Borror, Donnelly, Flint, and others were there. Virtually all had published articles on odonates. The meeting was held indoors with lots of presentations. No field trips were scheduled. DSA did not exist. A newsletter called Selysia began that year and was published for 25 years. It was essentially the predecessor of ARGIA. Digital photography did not exist.

By contrast, nearly 100 people attended this year's DSA meeting. A few were professional entomologists or taxonomists, but most were more interested in getting into the field and taking high-quality photographs with impressive lenses and digital cameras than in taking specimens and scrutinizing taxonomic details. Many had other serious natural history interests and often had become interested in dragonflies after years of observing birds. Collecting specimens was restricted to a few like myself and perhaps reluctantly tolerated others. The meeting was a grand social event, giving people far and wide the chance to see old friends and exchange observations about the habits and habitats of various species.

Returning to my baseline: As transcribed from my field notebook for 23 June 1973, 10:30 AM to 3:30 PM, I collected or saw the following species of Odonata at Shavers Fork: (Note: Since this is verbatim from my notes, this list used only scientific names, because no odonate "common" names existed in 1973. I have added them in parentheses.)

4 *Cordulegaster diastatops* (Delta-spotted Spiketail), 4 males. Quite common along railroad wherever there was the slightest bit of water.

3 *Gomphus brevis* (Mustached Clubtail), 2 males, 1 female. Perhaps one or two others seen.

8 *Gomphus descriptus* (Harpoon Clubtail), 7 males, 1 female. The most frequent Anisopteran along river.

7 *Ophiogomphus "mainensis"* (Maine Snaketail), 7 males. Frequent on rocks and in grass near small rapids.

1 *Lanthus parvulus* (Northern Pygmy Clubtail), 1 male, only one seen. On rock in small tributary (Blister Run).

Stylogomphus albistylus (Eastern Least Clubtail), A teneral male collected and released.

2 *Helocordulia uhleri* (Uhler's Sundragon), 2 males. A few others seen, mostly in the AM.

4 *Calopteryx amata* (Superb Jewelwing), 2 males and 2 females. Common on stream. The most abundant odonate.

2 *Amphiagrion saucium* (Eastern Red Damsel), 2 males. In damp areas along the railroad.

Ischnura verticalis (Eastern Forktail), seen once.

All species now have been given English names. This list exemplifies the changing baseline of nomenclature and the value of collecting specimens. Since 1973, the following new species have been described that complicate the identifications that I had made for several species: *Cordulegaster bilineata* (Brown Spiketail), *Lanthus vernalis* (Southern Pygmy Clubtail), and *Stylogomphus stigmastylus* (Interior Least Clubtail) were previously classified as the species I collected. Without specimens, it would be impossible to be sure which species I saw. *Gomphus brevis* has been synonymized with *G. adelphus* and renamed *Hylogomphus adelphus*. And my *Ophiogomphus mainensis* specimens that seemed a little different may represent a different subspecies or species, *O. fastigiatus,* as described by Nick Donnelly at the 2017 DSA meeting. *G. descriptus* is now *Phanogomphus descriptus*. Thus, in my list of 10 species, six had nomenclatural changes or taxonomic problems that could be resolved with a specimen, but probably not from a photograph. After examining my *C. diastatops* specimens, I am still reluctant to change their identification to *C. bilineata* because they are black and not brown at all, yet structural characters seem to dictate that conclusion.

I got my chance to revisit Shavers Fork as a post-meeting trip with Jim White, Mike Moore, and Pierre Deviche on 12 June 2017. A day earlier, Chris Hill and Marion Dobbs had visited the site, so we had some idea of what to expect. Thus over the

course of two days there were multiple hours of observation by multiple knowledgeable eyes looking for dragonflies in virtually ideal weather conditions. Many but not all of the same species that I saw in 1973 were seen in 2017, but the abundance was greatly reduced and required persistent searching. In addition, several identifications made through binoculars or photographs were shown to be incorrect after voucher specimens were carefully examined. Collectively, we saw one or two individuals of *Hylogomphus adelphus*, *Ophiogomphus mainensis fastigiatus*, *Phanogomphus descriptus*, and *Helocordulia uhleri*. While there still were *Calopteryx amata* present, their numbers were much less than in 1973. The few additional species seen in 2017, but not in 1973, were widespread common species like *Plathemis lydia* (Common Whitetail), *Libellula pulchella* (Twelve-spotted Skimmer), and *Calopteryx maculata* (Ebony Jewelwing). The rocks in the stream had a coating of brown algae suggesting sediment and some eutrophication not present in 1973.

A look at Google Earth revealed mountain-top strip mining for coal in the watershed with at least one settling pond upstream feeding into Shavers Fork. In addition, a popular ski resort is now at the headwaters of the stream. A brief Google search turned up numerous documents related to logging, coal mining, and road construction in the watershed. One application for a coal mining operation claimed water quality of Shavers Fork would be improved by water released from a settling pond because it would stabilize the temperature and have an adjusted pH of 6.8! It is clear that this remote and unique high altitude stream has suffered many insults over the years. It is also clear that habitat disruption has had a profound impact on the habitat and the populations of dragonflies that live there.

For those who visited Shavers Fork for the first time this year, their memories of the place will be good, having seen several "lifers", but their baseline for reference will be shifted relative to mine. One cannot help but think of the other streams across West Virginia that have been destroyed by mine acid drainage. One can only hope that Shavers Fork will be spared that fate and that somehow the stream can recover from what it is now and reverse changes of the past few decades.

On a positive note, I visited the James River at multiple places during the 2017 DSA meeting and was greatly impressed by the abundance and diversity of dragonflies on such a large and clean river in populated areas of Virginia. Maintaining that gem should be a cause we all can support. But as is evident, there may well be baseline shifts in other realms such as nomenclature, taxonomy, attitudes, and DSA membership. Changes we must live with.

Announcing IODONATA, the Official Facebook Site for the International Odonata Research Institute (IORI)

Announcing a new Odonata specialty Facebook group to cover what most others neglect: IODONATA, the official face book site for the International Odonata Research Institute (IORI) housed within the Florida State Collection of Arthropods (FSCA) in Gainesville, Florida, USA. Since there are numerous sites from around the world already set up for posting images, this site is for: 1. Promoting Odonata-related events (e.g. meetings, seminars, field trips, etc.); 2. Promoting, announcing, and soliciting Odonata books and/or field guides (new or used); 3. Announcing, distributing and/or soliciting Odonata papers and reprints; 4. Soliciting Odonata specimens and/or data for research (no selling allowed); 5. Announcing or soliciting Odonata-related grants, scholarships, job opportunities; 6. Advertising or soliciting Odonata collecting and/or curating supplies; 7. Sharing ideas, theories, field and photo techniques, curating methods, etc. regarding Odonata; and 8. Advertising Odonata jewelry or other items displaying Odonata (only Odonata-related items allowed). Any posting not related to Odonata plus offensive, religious and/or political postings will be removed, and the poster may be banned from the group.

Check out the page at <https://www.facebook.com/groups/125234594765968/>, or by typing "Iodonata" into the search bar in Facebook, and click on the Join button to request entry.

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

Northeast DSA Meeting: a *Somatochlora* Spectacle

Bryan Pfeiffer <bryan@bryanpfeiffer.com>

Ah, the glowing green eyes. The metallic body. The fluid, patrolling flight. If *Somatochlora* (emeralds) are among the great delights in odonatology, then the 2017 meeting of the Northeast chapter of the DSA was purely delightful.

Our setting was the high peaks and lowland peatlands of northern New Hampshire and Vermont from 13–16 July. Our odonate tally for the weekend—70 species—included nine netted *Somatochlora* species, plus a visual encounter with *S. albicincta* (Ringed Emerald).

Other highlights, particularly for our southern participants, included: three *Calopteryx* species, including *C. amata* (Superb Jewelwing); *Aeshna eremita* (Lake Darner); *Stylurus scudderi* (Zebra Clubtail); and all five *Leucorrhinia* (whiteface) species in the region.

This portion of New England has some of the highest *Somatochlora* diversity on the continent, owing in large part to extensive peatlands and sand-bottom ponds where species at the southern edge of their range meet up with cosmopolitan species ranging farther south.

Our prospects began with clouds and rain on our first field day and the first half of our second. (Seasoned DSA members might expect here a reference to the "Donnelly Effect—the hypothesis, now falsified, that rain tends to follow Nick and Ailsa to DSA meetings; Nick and Ailsa, who were in between trips to Vietnam and Trinidad, sadly, couldn't make the meeting, but they remained keenly interested, by email, in our discoveries.) When the skies cleared on Saturday, the *Somatochlora* set sail. Here's our list:

Somatochlora albicincta (Ringed Emerald)
Somatochlora cingulata (Lake Emerald)—sight record
Somatochlora elongata (Ski-tipped Emerald)
Somatochlora forcipata (Forcipate Emerald)
Somatochlora franklini (Delicate Emerald)
Somatochlora kennedyi (Kennedy's Emerald)
Somatochlora minor (Ocellated Emerald)
Somatochlora tenebrosa (Clamp-tipped Emerald)
Somatochlora walshii (Brush-tipped Emerald)
Somatochlora williamsoni (Williamson's Emerald)

Even indoors, during brief presentations, we enjoyed odonate diversity and drama. Hal White offered us a compelling behind-the-scenes look at rivalry, gossip, and virtue among some of the 20th century's legendary odonatologists over the description of a *Williamsonia* (boghaunter) species. Mike Blust updated us on his work re-defining the distribution of *Sympetrum* (meadowhawk) species here in the Northeast, notably the "fake news" on the distribution of *S. rubicundulum* (Ruby Meadowhawk). And Pam Hunt provided an overview of a recent and comprehensive conservation assessment for Odonata in the northeastern U.S. Pam also presented on dragonfly biology and diversity to the general public—a huge turnout—at a local state park on the night we convened.

Attendees at the 2017 Northeast DSA meeting. Photo by Greg Sargeant.

In other DSA news, we're thinking about Massachusetts for the 2018 regional meeting and perhaps New Brunswick for when the Northeast chapter hosts the DSA's annual meeting next in 2021. Oh, by the way, we also had an amazing barbecue supper during our meeting, not to mention spectacular baked goods near our motel in Lancaster, New Hampshire.

Keep up to date on Northeast DSA affairs (including our complete species list for the meeting) at our website at <https://bryanpfeiffer.com/nedsa/>.

Ohio Dragonfly Conference: Odo-Con-17

Jim Lemon <jlem@woh.rr.com>

Nearly 80 Odonata enthusiasts attended Odo-Con-17. The event was held at The Nature Conservancy's Grand River Conservation Campus in the beautiful northeast corner of the state on 23–25 June 2017. This was the formal kickoff for a new statewide (Ohio) survey of Odonata. Presentations were designed to orient and direct participants in the survey. Most attendees were from Ohio, but we also had folks from Pennsylvania, New Jersey, Georgia, and Ontario.

Speakers were Judy Semroc, Giff Beaton, Dave McShaffrey, MaLisa Spring, Shane Myers, Bob Glotzhober, Ian Adams, Jim McCormac, and Jim Lemon. Field trips went to a number of wetland locations in and around Morgan Swamp. Over seventy species were reported, including Tiger Spiketail (*Cordulegaster erronea*), Gray Petaltail (*Tachyopteryx thoreyi*), Racket-tailed Emerald (*Dorocordulia libera*), Rusty Snaketail (*Ophiogomphus rupinsulensis*), and a new area record for Golden-winged Skimmer (*Libellula auripennis*).

Odo-Con-17 and the new Ohio Dragonfly Survey were made possible by sponsorship from Ohio Division of Wildlife, The Nature Conservancy, The Ohio State University, and Ohio Odonata Society.

A good time was had by all. Join us next year for Odo-Con-18 in Hancock County, Ohio on 22–24 June 2018. We hope to find new county records in this understudied region.

Lestes alacer (Plateau Spreadwing), New for Arkansas

Adam Hasik <azhasik@uark.edu> **and Jason Bried** <bried@okstate.edu>, Department of Biological Sciences, University of Arkansas, Fayetteville, Arkansas

The Siepielski lab at the University of Arkansas has documented their second new state record damselfly, the Plateau Spreadwing (*Lestes alacer*). Last year it was *Enallagma dubium* (Burgundy Bluet), collected by several lab members on a research trip in southwestern Arkansas (Bried et al., 2016). The Plateau Spreadwing was found in northwestern Arkansas, exactly one year to the day of the *E. dubium* record. Neither of these species appeared unexpectedly. Plateau Spreadwing had already turned up in several places in Oklahoma near the Arkansas state line (M. A. Patten, University of Oklahoma and Oklahoma Biological Survey, pers. comm., 30 May 2017).

This record occurred on 24 May 2017 near the Lake Wedington Recreation Area in the Ozark National Forest, about 20 km west of Fayetteville, Arkansas and 15 km east of the Arkansas-Oklahoma border. The site is a small man-made permanent pond with limited aquatic vegetation (see photo) and about 1 m maximum water depth. No fish were present in the pond, facilitating high numbers of *Enallagma aspersum* (Azure Bluet), one of four *Enallagma* species adapted to live in fishless waters. Other damselfly adults present at the pond included *Lestes australis* (Southern Spreadwing), *Ischnura posita* (Fragile Forktail), and *I. verticalis* (Eastern Forktail). The pond sits in a 20 ha prairie, along with a half dozen other similar ponds (spaced about 0.5–1 km apart), surrounded by typical Ozarks oak-hickory forest mixed with southern hardwoods and loblolly pine (*Pinus taeda*). The property is cooperatively managed by the U.S. Forest Service, Arkansas Game & Fish Commission, and National

Pond near Fayetteville, Arkansas where *Lestes alacer* (Plateau Spreadiwng) was found in May 2017.

Wild Turkey Federation.

AH found the first individual (OC #463128), under clear and calm conditions with air temperature around 25°C. He then caught two more teneral males the next day (25 May) at the same pond, and JB collected a mature female there the day after that. The presence of tenerals and both sexes suggests a potential breeding population, but there were no further sightings at this pond or at other ponds in the landscape during biweekly visits from middle of May through the beginning of August. Perhaps we found strays blown in from the west following heavy storms around that time, as speculated for very unexpected *Lestes forficula* (Rainpool Spreadwing) occurrences in Mississippi (Bried and Krotzer, 2005). We'll certainly be on the lookout again next year.

According to OdonataCentral, neither the location or the timing of our record is surprising or unusual, but it is currently the northeastern-most record for the species. It is also worth noting that *Lestes* species appear to be very rare in northwestern Arkansas, at least at the permanent lakes and ponds that our lab has been intensively sampling the past two years. Thus, finding *L. alacer* in Arkansas is encouraging from a conservation standpoint, especially when there have been relatively few recent records of the species across neighboring Oklahoma (Patten and Smith-Patten, 2013). May 24th seems to be a lucky day for the Siepielski lab, and we can't wait to see what 24 May 2018 has in store!

Literature Cited

Bried, J.T., and S. Krotzer. 2005. New species records for Mississippi: an expected dragonfly and an unexpected damselfly. Journal of the Mississippi Academy of Sciences 50: 233–234.

Bried, J., D. Moon, K. Strayhorn, J. Senn, and T. Chrietzberg. 2016. *Enallagma dubium* (Burgundy Bluet), new for Arkansas. Argia 28(3): 10.

Patten, M.A., and B.D. Smith-Patten. 2013. Odonata species of special concern for Oklahoma, USA. International Journal of Odonatology 16: 327–350.

New Odonata Records for Panama

Jerrell J. Daigle <jdaigle@nettally.com> **and Bill Mauffray** <iodonata@gmail.com>

We wish to record the following seven Odonata species as new for Panama:

Argia insipida
Erpetogomphus crotalinus
Orthemis schmidti
O. sulphurata
Psaironeura angeloi
P. selvatica
Telebasis garleppi

Psaironeura angeloi. Photo by Jim Johnson.

We thank our friends Cary Kerst, Chris Rasmussen, and Fred Sibley for making our recent trips to Panama fun! We also thank Jim Johnson for his photo of *Psaironeura angeloi*. We hope to complete a list of all known species from Panama in the future.

Photo Submissions for Argia

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

Send your photos as e-mail attachments to <editor@dragonflysocietyamericas.org> (up to 15 Mb), via a file transfer service, GoogleDrive, or Dropbox, **NOT in the body of an e-mail or document!** Photos may be 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.

All Pseudopupils, Great and Small

James S. Walker, Anacortes, Washington <jswphys@aol.com>

The large prominent eyes of a dragonfly, which often have the appearance of exquisitely colored gemstones, are one of its most striking features. On closer inspection, the eyes generally show an array of dark spots that look like the pupils of a vertebrate's eye. The dark spots only look like pupils, however; their origin and behavior are actually quite different, and hence they are referred to as pseudopupils. In this article, we show how pseudopupils are formed, how they move, and how they can sometimes be surprisingly large.

The Origin and Motion of Pseudopupils

Let's start with the basic structure of the dragonfly eye (for additional details, see Walker, 2017). Each compound eye is comprised of thousands of individual eyes, or ommatidia. An individual ommatidium is basically a small eye in itself, with a lens and photoreceptor (rhabdom). This type of compound eye, where each ommatidium acts independently of the others, is referred to as producing apposition (side-by-side) vision. Other insects, often ones that are nocturnal, use superposition vision, in which light is shared by different ommatidia.

Figure 1 shows a schematic of an individual ommatidium, and several packed together, as would be found in a dragonfly eye. Ommatidia are generally packed as close to one another as possible, resulting in a hexagonal or honeycomb lattice (Figure 2).

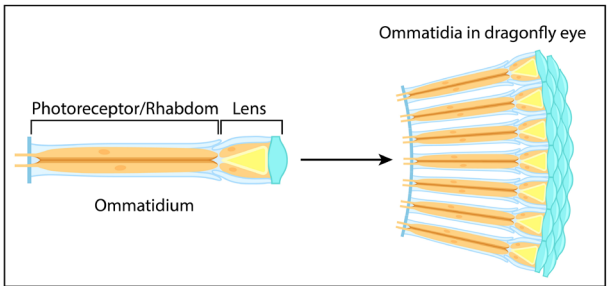


Figure 1. The basic structure of a dragonfly's compound eye.

Figure 2. Hexagonal lattice of ommatidia in the compound eyes of an Autumn Meadowhawk (*Sympetrum vicinum*).

Now that we know the basic structure of a dragonfly eye, the origin of pseudopupils follows in a straightforward way. Figure 3 shows an observer looking at a dragonfly's compound eye. The line of sight of the person goes straight down a particular ommatidium to its base, which absorbs light and is dark. This produces a dark spot at that ommatidium, as well as in a few on either side, giving rise to the pseudopupil. Thus, when we look at a pseudopupil, we are looking straight down the long axis of an ommatidium.

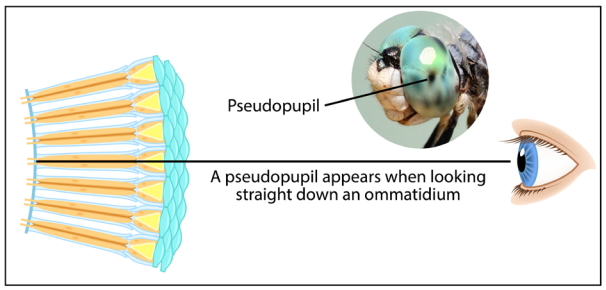


Figure 3. Looking straight into an ommatidium.

With this in mind, it's clear how a pseudopupil will move as one changes vantage point. Figure 4 shows an observer who has changed viewing position and is now looking straight down a different ommatidium; as a result, the pseudopupil is in a different location on the eye. In fact, the pseudopupil seems to be "following" the observer, resulting in a strange feeling of being watched. Of course, the dragonfly is seeing you at all locations at the same time due to its expansive peripheral vision.

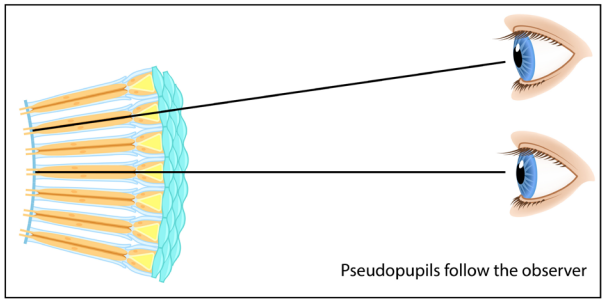


Figure 4. Different viewing points result in different locations of the pseudopupil.

Notice that pseudopupils are not permanent features on the surface of the eye; they constantly shift in position as we move from place to place. In contrast, some odonate eyes have pigments on the eye that form stripes or other patterns. The pigmented features do not change position as the viewing position is changed.

What Big Eyes You Have—The Origin of Giant Pseudopupils

The size of pseudopupils depends on the orientation of neighboring ommatidia. If the direction of one ommatidium is quite different from its neighbors, when we look straight down one ommatidium we are seeing nearby ommatidia from an angle. This means that the dark spot is concentrated near a single ommatidium, and the resulting pseudopupil is small. On the

other hand, if the ommatidia in a region of the eye point in almost the same direction, then when we look down one ommatidium we are looking down other nearby ones as well. This results in a large pseudopupil that covers an extensive area of the eye.

An example of the latter situation (i.e., ommatidia pointing in nearly the same direction) is provided by the dorsal fovea on the eye of a dragonfly. One of the best examples can be seen in the Blue Dasher (*Pachydiplax longipennis*), where the dorsal fovea—the area of the eyes that provides the sharpest vision—can be seen as a dark cap on the top of the eye (Figure 5). The viewpoint in this photo is from the side, not along the line of sight of the dorsal fovea.

Figure 5. The dorsal fovea (dark cap on top of the eye) of a Blue Dasher (*Pachydiplax longipennis*) as viewed from the side.

In Figure 6, we are looking straight down the ommatidia in the dorsal fovea of a Blue Dasher. In this region of the eye, the ommatidia point in almost the same direction, providing sharp vision for the dragonfly. As a result, the pseudopupils on the dorsal fovea are large, and cover a significant fraction of the eye. It's not easy to see this feature, since it requires looking at just the right angle. Being off line even a little will result in a normal-looking eye (i.e., Figure 5).

When you see a dragonfly tilting its head to get a better view of a passing insect, it is orienting its eyes so that the dorsal fovea point at the object of interest. In this case, it is viewing the object with the largest possible pseudopupils.

Secondary and Higher-Order Pseudopupils

When you look at the pseudopupil of a dragonfly, you will often notice several other dark spots nearby. These additional spots can be understood as the result of internal reflections within the ommatidia. An example is shown in Figure 7. As noted above, the primary pseudopupil occurs where you look straight down an ommatidium to the dark rhabdom. The rhabdom can also be seen at an angle to the primary pseudopupil. However, if the angle is just right so that the line of sight sees a reflected image of the rhabdom, which results in a secondary, somewhat fuzzier, pseudopupil.

Figure 6. Giant pseudopupils.

Because ommatidia are packed in a hexagonal lattice, and hence are six-sided, the secondary pseudopupils are in a hexagonal array around the primary pseudopupil. Sometimes the hexagon of secondary pseudopupils is interrupted by the dorsal fovea, where the orientation of ommatidia is different than it is elsewhere in the eye. If the ommatidia were uniform across the eye, the secondary pseudopupils would produce a perfect hexagon. This can often be seen in the eyes of butterflies, which lack dorsal fovea and have uniform ommatidia.

The ommatidia, which act like optical fibers, can also permit multiple reflections along their length. These reflections produce higher-order pseudopupils. In fact, in some cases an entire lattice of dark spots can be observed surrounding the primary pseudopupil. This can give a complex look to the eye, but the basic mechanism is rather simple.

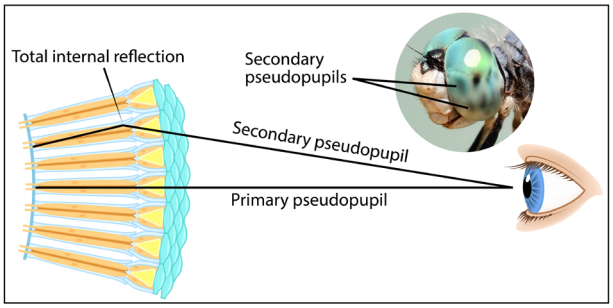


Figure 7. Secondary pseudopupils are produced by internal reflections in the ommatidia.

Acknowledgements

I would like to thank Sabine Deviche for the wonderful illustrations in this article. She can be contacted at <http://devichedesigns.com>. More of her illustrations can be found in my new field guide, Common Dragonflies and Damselflies of the Pacific Coast.

Literature Cited

Walker, J.S. 2017. Common Dragonflies and Damselflies of the Pacific Coast. Cave Art Press, Anacortes, Washington.

Flowering *Liriodendron tulipifera* (Tulip-poplar tree) Attracting Anisopterans

Richard S. Groover, Ph.D., Reynolds Community College, Richmond, Virginia <rgroover@reynolds.edu>

Background

While conducting a survey of dragonflies for the National Park Service, at Gaines' Mill National Battlefield Park (N 37.574°, W 77.293°) in Hanover County, Virginia, several species of Anisoptera were easily captured near a very mature and blooming tulip-poplar (yellow poplar) tree (*Liriodendron tulipifera*).

Methods

The survey and captures occurred on 29 April 2017, at approximately 1100 hours DST. The day was clear and sunny, with 2–4 km/hr wind.

The tulip-poplar tree was ~27 meters tall and in full bloom. Several Anisoptera species were observed flying toward its blooms, then darting away. I describe this dragonfly activity as a strafing, an aerial attack of a target. Several adult dragonfly specimens were collected by sweeping near the lower branches of the tree. It is suspected that the dragonflies were feeding on the Diptera (true flies) and other pollinators that were feeding at the blooms. The tulip-poplar tree blooms in the spring in Virginia and is an important source of nectar and will draw pollinators when the bloom is present (Beck, 1977); no Hymenoptera (wasps/bees) were observed, but Diptera were seen.

The dragonfly specimens were hand-netted, identified, photographed, and released, as required by my collecting permit issued by the National Park Service.

Results

Two species of Anisoptera were collected in about 30 minutes: six *Epiaeschna heros* (Swamp Darner) and 15 *Epitheca cynosura* (Common Baskettail). Other dragonfly species were possibly also present.

Discussion

Collecting dragonflies can often be difficult due to their speed and variable flight patterns. The focused strafing behavior of the two species in this report placed them in a situation that made capture very easy. The implications of what occurred may be more ecologically important.

If the tree blooms draw pollinators, which attracts dragonflies feeding on these smaller insects, this may indicate a feeding behavior of the dragonflies that might occur

Swamp Darner (*Epiaeschna heros*; upper) and Common Baskettail (*Epitheca cynosura*; lower), 29 April 2017.

every year, as long as all of the above conditions occur. If this predator's behavior is repetitive in subsequent years, it may denote an expected characteristic of the dragonflies' natural history. When smaller insects are drawn to a tree like *Liriodendron* when it is bloom, the local dragonflies may be present to feed on the smaller insects as long as the pollinators are attracted to the tree's flowers and these prey are present. Some dragonfly predation may be less of a random act of eating whatever is traveling near where the dragonfly happens to be, as implied in Baird and May (1997), but instead in this case, the predator is actively staying at a location of where much food is available.

The next experiment I will conduct will involve "baiting" for dragonfly arrivals, to draw in insects that might be prey for the dragonflies.

Literature Cited

Baird, J.M. and M.L. May. 1997. Foraging behavior of *Pachydiplax longipennis* (Odonata: Libellulidae). Journal of Insect Behavior. 10: 655–678.

Beck, D.E. 1977. *Liriodendron tulipifera*, Yellow Poplar. <https://www.na.fs.fed.us/pubs/silvics_manual/volume_2/liriodendron/tulipifera.htm>.

LINNAEUS, a Free Dragonfly (Odonata) Database System by Nikolaos Makaris

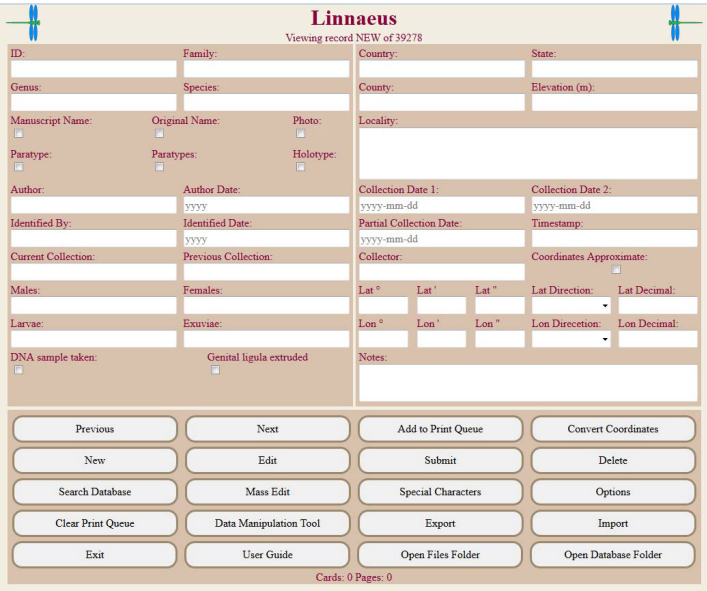
Rosser Garrison, Senior Insect Biosystematist, Plant Pest Diagnostics Branch, California Department of Food & Agriculture, 3294 Meadowview Road, Sacramento, California <r.garrison@cdfa.ca.gov>

This is an announcement for a free download of Linnaeus, an Odonata card and database program similar to an older program that we have been using for many years. The programmer, Niko Makaris, worked closely with us (R.G. and Natalia Ellenrieder) in creating a new Odonata card indexing program. We believe that the program provides a flexible means of printing and storing data on Odonata for curatorial purposes.

The new database system, Linnaeus, allows you to:

- Manage specimen data through an easy to use but powerful database
- Create, edit and print specimen cards in a 3 by 5-inch format (actual color for cards is white)
- Automatically format specimen data for insertion into scientific papers using the DMT (Data Manipulation Tool)
- Easily share data with others with data import/export
- Automatically create Microsoft Excel files of data that can be directly loaded into ArcMap or DiVa-Gis programs
- Allow latitude and longitude to be converted to degree, minutes, seconds or decimal degrees
- Includes a User Guide and online tutorial
- Fewer typing and spelling errors with built-in autocomplete (e.g., typing "ar" causes "*Argia*" to appear as a suggestion)

Once installed, the user enters identified specimens according to one of the classifications available. The program "remembers" species entries allowing for easy entry by typing only part of the genus or species name with the rest of the taxonomy (Family, etc.) automatically filled in. There is also a mass edit command for changing any data or sets of data from one condition to another.



PLEASE NOTE: Linnaeus does not come with a ready installed database. Each individual user will need to construct their own database, including taxonomic entries.

The program is free and can be downloaded at <www.linnaeus.me>. We invite you to check out the tutorial as well as the program itself.

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@dragonflysocietyamericas.org>. A sampling of recent newsworthy Odonata includes:

Collins S.D., J.C. Abbott, and N.E. McIntyre. 2017. Quantifying the degree of bias from using county-scale data in species distribution modeling: can increasing sample size or using county-averaged environmental data reduce distributional overprediction? Ecology and Evolution 7(15): 6012–6022. Citizen-science databases have been used to develop species distribution models (SDMs), although many taxa may be only georeferenced to county. It is tacitly assumed that SDMs built from county-scale data should be less precise than those built with more accurate localities, but the extent of the bias is currently unknown. Our aims in this study were to illustrate the effects of using county-scale data on the spatial extent and accuracy of SDMs relative to true locality data and to compare potential compensatory methods (including increased sample size and using overall county environmental averages rather than point locality environmental data). To do so, we developed SDMs in MaxEnt with PRISM-derived BIOCLIM parameters for 283 and 230 species of odonates (dragonflies and damselflies) and butterflies, respectively, for five subsets from the OdonataCentral and Butterflies and Moths of North America citizen-science databases: (1) a true locality dataset, (2) a corresponding sister dataset of county-centroid coordinates, (3) a dataset where the average environmental conditions within each county were assigned to each record, (4) a 50/50% mix of true localities and county-centroid coordinates, and (5) a 50/50% mix of true localities and records assigned the average environmental conditions within each county. These mixtures allowed us to quantify the degree of bias from county-scale data. Models developed with county centroids overpredicted the extent of suitable habitat by 15% on average compared to true locality models, although larger sample sizes (>100 locality records) reduced this disparity. Assigning county-averaged environmental conditions did not offer consistent improvement, however. Because county-level data are of limited value for developing SDMs except for species that are widespread and well collected or that inhabit regions where small, climatically uniform counties predominate, three means of encouraging more accurate georeferencing in citizen-science databases are provided.

Bried, J. and A.M. Siepelski. 2017. Opportunistic data reveal widespread species turnover in *Enallagma* damselflies at biogeographical scales. Ecography DOI: 10.1111/ecog.03419. An information tradeoff exists between systematic presence/absence surveys and purely opportunistic (presence-only) records for investigating the geography of community structure. Opportunistic species occurrence data may be of relatively limited quality, but typically involves numerous observations and species. Given the quality-quantity tradeoff, what can opportunistic data reveal about spatial patterns in community structure? Here we explore opportunistic data in describing geographic patterns of species composition, using over 4,600 occurrence records of *Enallagma* damselflies in the United States. We tested phylogenetic scale (genus level, *Enallagma* major clades, *Enallagma* subclades) and spatial extent (U.S. vs. watershed regions), hypothesizing that nonrandom structure is more likely at larger spatial extents. We also used three sets of systematic presence/absence surveys as a benchmark for validating opportunistic presence-only records. Null model analysis of matrix coherence and species replacements showed many cases of nonrandom structure and widespread species turnover. This outcome was repeated across spatial and environmental gradients and community composition scenarios. Turnover dominated across the U.S. and two watersheds spanning biogeographic boundaries, but random assemblages were prevalent in a third watershed with limited longitudinal extent. Turnover also pervaded each level of phylogeny. Opportunistic presence-only datasets showed identical patterns as systematic presence/absence datasets. These results indicate that extensive opportunistic data can be used to detect species turnover, especially at geographic scales where range margins are crossed.

Wiederman S.D., J.M. Fabian, J.R. Dunbier and D.C. O'Carroll. 2017. A predictive focus of gain modulation encodes target trajectories in insect vision. DOI: 10.7554/eLife.26478. When a human catches a ball, they estimate future target location based on the current trajectory. How animals, small and large, encode such predictive processes at the single neuron level is unknown. Here we describe small target-selective neurons in predatory dragonflies that exhibit localized enhanced sensitivity for targets displaced to new locations just ahead of the prior path, with suppression elsewhere in the surround. This focused region of gain modulation is driven by predictive mechanisms, with the direction tuning shifting selectively to match the target's prior path. It involves a large local increase in contrast gain which spreads forward after a delay (e.g. an occlusion) and can even transfer between brain hemispheres, predicting trajectories moved towards the visual midline from the other eye. The tractable nature of dragonflies for physiological experiments makes this a useful model for studying the neuronal mechanisms

underlying the brain's remarkable ability to anticipate moving stimuli.

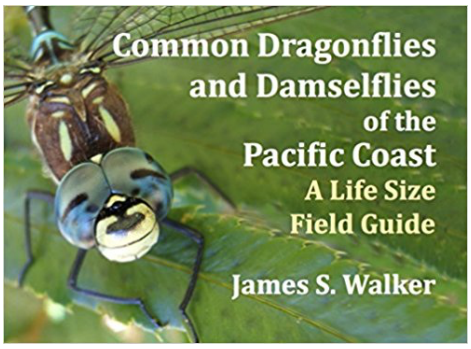
Buczyński, P., A. Szlauer-Łukaszewska, G. Tończyk, and E. Buczyńska. 2017. Groynes: a factor modifying the occurrence of dragonfly larvae (Odonata) on a large lowland river. Marine & Freshwater Research 68(9): 1653–1663. The regulation of rivers and their valleys has had a strong, negative influence on the maintenance of their original biota. Nevertheless, some hydro-engineering works conducted along already regulated rivers may be beneficial, creating habitats for endangered species and assemblages. Such works include the construction of groynes. We analysed this effect on the occurrence of dragonfly larvae along middle and lower stretches of the Oder, where groynes were built over a distance of 306 km, creating an area of uniform habitat. We demonstrated that the presence of groynes increased not only the abundance of dragonfly larvae, but also the species richness and diversity of these insects. Habitats were recreated for assemblages typical of a river with highly diverse habitat conditions, from typically riverine assemblages to those occurring in oxbow lakes, also endangered by regulations. The fauna along the stretches with groynes was richer and more valuable than that along the stretches without groynes, achieving values approaching those obtained from modelled unregulated rivers. This can be put down to greater habitat heterogeneity and groyne-reduced levels of waves produced by ships. The presence of groynes provides the key to the restoration or stabilisation of the populations of certain species and to renaturalisation processes.

New Book Announcements: Alejandro Cordóba Aguilar and Martha Garay, Las libélulas y los caballitos del diablo: un mundo fascinante; James S. Walker, Common Dragonflies and Damselflies of the Pacific Coast

Las libélulas y los caballitos del diablo: un mundo fascinante (Dragonflies and Damselflies: a Fascinating World). A. Cordóba Aguilar y Martha Garay. 2017. Dirección General de Asuntos del Personal Académico, Instituto de Ecología, Universidad Nacional Autónoma de México, 15 pp. ISBN: 978-607-02-9421-1. $20 USD. To order, contact A. Cordóba Aguilar at <acordoba@iecologia.unam.mx>.

This small book is aimed at helping Spanish-speaking children discover more about the world of Odonata. It covers some basics aspects of odonate biology, including diversity issues and threats. The book is in Spanish, with a target audience of children 6–12 years old. The printed version costs $20 USD (includes shipping) and can be ordered from A. Cordóba Aguilar.

Common Dragonflies and Damselflies of the Pacific Coast: a Life Size Field Guide. James S. Walker. 2017. Cave Art Press, paperback, 176 pp. ISBN: 978-1934199268. $16.95 USD.



Summarized from Amazon.com: A field guide to the 60 most common West Coast species of these beautiful and fascinating insects. This book contains a full color, two-page spread on each of the described species. Each spread includes a life-size photo, field identification marks, a range map, flight season chart, and a discussion of habitat and behavior, including the "splash dunk-spin dry" described by Dr. Walker. The book also has descriptions of dragonfly and damselfly anatomy, reproduction, ecology, and tips for observation and photography. An easy-to-use guide for the recreational viewer that also provides enough information to satisfy an advanced observer.

ID Corner : Field Key to *Heteragrion* of Ecuador, by Jerrell J. Daigle; Identifying partly grown nymphs: ontogenic stability in the lengths of the terminal appendages of *Erpetogomphus* and *Ophiogomphus*, by Robert DuBois and Ken Tennessen

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

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

Field Key to *Heteragrion* of Ecuador, by Jerrell J. Daigle < jdaigle@nettally.com>

The following key can be used for photographic or hand determination of male specimens seen or collected alive in Ecuador. Often two to three species will fly together at one time. All photos were taken by Jim Johnson except the red *Heteragrion erythrogastrum* which was taken by Richard C. Hoyer. My thanks to both. The photos are arranged sequentially (1-7) to coincide with species entry in the key.

Key to live males of *Heteragrion* species known from Ecuador

1. Overall coloration reddish or brownish…….....2
   Black and yellow contrasting pattern……..3

2. Red abdomen, NW only.……*H. erythrogastrum*
   Brownish-yellow abdomen, Western only…...…*H. cooki*

3. Large species, 52–60 mm……...……*H. aequatoriale*
   Smaller species, 42–45mm……4

4. Bright green antehumeral stripe……*H. inca*
   Yellow or cream antehumeral stripe.……5

5. Vertex with yellow "butterfly" design, or at least 2–4 yellow spots…….....…*H. angustipenne*
   Vertex black…….....…..……6

6. Eyes black above, olive green below; thorax with 2 wide black lateral stripes……..……*H. bariai*
   Eyes yellow, black rearwards; thorax with 3 wide black lateral stripes……*H. bickorum*

Heteragrion erythrogastrum. Photo by Richard C. Hoyer

Heteragrion cooki. Photo by Jim Johnson.

Heteragrion aequatoriale. Photo by Jim Johnson.

Heteragrion angustipenne. Photo by Jim Johnson.

Heteragrion inca. Photo by Jim Johnson.

Heteragrion bariai. Photo by Jim Johnson.

Heteragrion bickorum. Photo by Jim Johnson.

Identifying partly grown nymphs: ontogenic stability in the lengths of the terminal appendages of *Erpetogomphus* and *Ophiogomphus*, Robert DuBois, Department of Natural Resources, Superior, Wisconsin <robert.dubois@wisconsin.gov> and Ken Tennessen, Wautoma, Wisconsin <ktennessen@centurytel.net>.

The relative lengths of the cerci and paraprocts are used in recent identification keys to separate mature nymphs of two genera of Gomphidae (Clubtails), *Erpetogomphus* Selys (Ringtails) and *Ophiogomphus* Selys (Snaketails)—but do these characters also work for younger nymphs? Nymphs of Anisoptera typically molt about a dozen times on average (Corbet, 2002), with the last four or five instars often being large enough to be retained by many types of collecting gear. However, keys have typically been designed for use only with final instars (full-grown or F-0). This can lead to difficulties when trying to identify late-stage nymphs that are younger than F-0, because body parts sometimes change shape or grow allometrically (grow at different rates) during ontogeny. This means that characters that are diagnostic for F-0 might not be reliable when used on younger nymphs, possibly resulting in incorrect determinations. Yet aquatic workers might try to identify younger nymphs anyway, either intentionally with the hope that the characters used in a key will also apply to earlier instars, or unintentionally when nymphs presumed to be full grown are actually in penultimate or earlier instars.

Until recently, determining the relative instars of nymphs was laborious, often requiring rearing nymphs through multiple instars in captivity unless a worker had considerable prior knowledge of the species involved. However, a method is now available using the ratio of hind wing sheath length (WSL) to maximum head width (HW) to estimate the instar number of individual late-stage nymphs, counting backwards from F-0 (Tennessen, 2016). This advance means that key builders can now consider designing more comprehensive couplets to include up to four preceding instars in addition to F-0. This will not happen right away for all species and genera of odonates because knowledge is lacking about the extent to which diagnostic body parts might or might not change during ontogeny for many groups. But at least we can start heading in that direction! One piece of good news is that for many species and genera, growth of most body parts is probably isometric (relatively stable) meaning that key couplets designed to determine F-0 nymphs might be applicable to younger nymphs as well.

We should say a few words about allometric growth, which refers to the fact that not all body parts of Anisoptera nymphs grow at the same rate (Corbet, 1999; 2002). Allometric growth can cause serious problems in identification, especially when couplets that use allometrically growing body parts are indiscriminately applied to instars for which they were not designed. This includes not only measurements of single structures, but also ratios of measurements of two structures, a technique often used in keys to reduce the variation in the values. When two body parts grow isometrically (at about the same rate) over the range of body sizes of multiple instars, then ratios using their measurements will also be roughly proportional over that range of body sizes. However, ratios that incorporate one or two body parts that grow allometrically will change substantially over a range of body sizes (Daly, 1985) making their validity in taxonomy questionable unless the exact conditions where the ratios apply are specified (Janzon, 1986; McCreadie and Colbo, 1990). Errors so caused should not be assumed to be trivial. For example, Janzon (1986) showed that about 60% of the twenty-four ratios commonly used by hymenopterists were resulting in errors caused by allometry. One way to determine if growth of a body part is allometric or isometric is to calculate its growth ratio (GR), which is the proportionate increase in size of any body part after a molt (Corbet, 1999). For hemimetabolous insects like odonates, GR is usually about 1.26 (Cole, 1980; Corbet, 1999), so a GR that deviates substantially from 1.26 can be taken as evidence of allometric growth.

Keys use a number of categories of characters to identify nymphs including 1) morphologic characters like

the shapes or presence/absence of certain body parts; 2) morphometric characters like the measured dimensions of body parts or pairs of body-part measurements used in ratios; 3) meristic characters, which are countable structures occurring in series like numbers of palpal or premental setae; or 4) mark characters that use colors and patterns. Characters in all of these categories can potentially change during the development of a nymph. In this note we address ontogenic changes in lengths of the terminal appendages that are often used as morphometric characters to separate nymphs of *Erpetogomphus* from those of *Ophiogomphus*. The terminal appendages are comprised of an epiproct, two cerci (singular cercus), and two paraprocts, all of which are part of what is often called the anal pyramid, located at the tip of the abdomen. We also include growth ratio information for selected body parts and give guidance for determining the instar number of these genera.

Methods

For an example of *Erpetogomphus* we examined nymphs of *E. designatus* Hagen in Selys (Eastern Ringtail) and for *Ophiogomphus* we examined nymphs of *O. rupinsulensis* (Walsh) (Rusty Snaketail). We measured head width (HW; widest point across the eyes in dorsal view), metathoracic (hind) wing sheath length (WSL), and calculated WSL/HW ratios to determine the instar number of each nymph or exuvia of our target species. We measured WSL in dorsolateral view from its base at the juncture with the metepimeron to its apex (Tennessen, 2016). We also measured the lengths of a cercus (CL) and epiproct (EL) from base to tip in dorsal view (Figure 1), and the length of a paraproct (PL) in ventral view. We calculated CL/EL and CL/PL ratios of one specimen per instar. We calculated growth ratios (GR) of measured body parts for instars F-0 to F-2, and considered a GR that deviated greatly from 1.26 to be due to allometric growth.

Measurements (to the nearest 0.05 mm) and visual comparisons were made with a stereomicroscope equipped with an ocular micrometer calibrated at 6X and 12X depending on nymph size. After collection, some specimens were preserved immediately in 80% ethanol while others were reared in captivity through various instars, then were preserved. Specimens are housed in the personal collection of KJT in Wautoma, Wisconsin. Specimens examined: *Erpetogomphus designatus*—ARKANSAS, Fulton County, South Fork Spring River, 26 March 2004, coll. K.J. Tennessen; *Ophiogomphus rupinsulensis*—MICHIGAN, Dickinson County, Sturgeon River, 10 May 2003, coll. K.J. Tennessen.

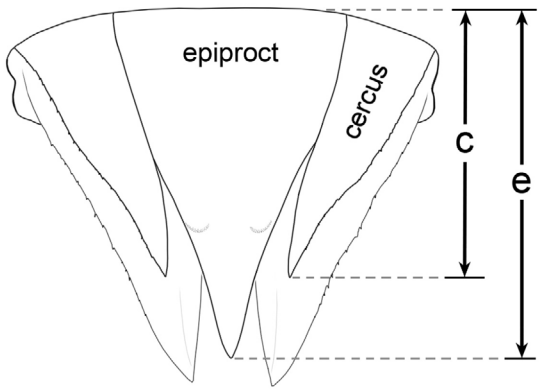


Figure 1. Terminal appendages in dorsal view of an F-0 nymph of *Ophiogomphus rupinsulensis* (Rusty Snaketail) showing how a cercus (c) and the epiproct (e) were measured. Paraprocts are the longer unlabeled structures underneath the cerci.

Results and Discussion

Growth ratio values for HW of both species ranged from 1.21 to 1.35 indicating isometric growth of the head as expected. Growth ratio values for WSL of both species were usually much greater than 1.26 indicating allometric growth of that body part, with a single, presumably atypical exception (GR = 1.26 from F-2 to F-1 for *O. rupinsulensis*; Table 1). Growth ratios for the cerci, epiprocts, and paraprocts of both species ranged from 1.24 to 1.44 indicating isometric growth of all three parts of the anal pyramid (Table 1).

Table 1. Comparison of head width (HW), hind wing sheath length (WSL), WSL/HW ratio, terminal appendage lengths (L), and ratios of cercus L/epiproct L (CL/EL) and cercus L/paraproct L (CL/PL) for nymphs of instars F-0 to F-3 of *Erpetogomphus designatus* and *Ophiogomphus rupinsulensis* (growth ratios in parentheses; nd = no data).

E. designatus

Instar	HW	WSL	WSL/HW	Cercus L	Epiproct L	Paraproct L	CL/EL	CL/PL
F-0	4.95	6.20	**1.25**	1.85	1.85	2.00	**1.00**	**0.93**
	(1.34)	(2.34)		(1.36)	(1.30)	(1.27)		
F-1	3.70	2.65	**0.72**	1.36	1.42	1.58	**0.96**	**0.86**
	(1.32)	(1.26)		(1.33)	(1.35)	(1.37)		
F-2	2.80	1.45	**0.52**	1.02	1.05	1.15	**0.97**	**0.89**
	(1.33)	(2.07)		(1.32)	(1.36)	(1.28)		
F-3	2.10	0.70 (nd)	**0.33**	0.77 (nd)	0.77 (nd)	0.90 (nd)	**1.00**	**0.86**
	(nd)							

O. rupinsulensis

Instar	HW	WSL	WSL/HW	Cercus L	Epiproct L	Paraproct L	CL/EL	CL/PL
F-0	5.80	6.70	**1.16**	1.55	1.90	2.15	**0.82**	**0.72**
	(1.35)	(2.16)		(1.31)	(1.23)	(1.23)		
F-1	4.30	3.10	**0.72**	1.18	1.55	1.75	**0.76**	**0.67**
	(1.21)	(1.68)		(1.24)	(1.24)	(1.25)		
F-2	3.55	1.85	**0.52**	0.95	1.25	1.40	**0.76**	**0.68**
	(1.29)	(2.18)		(1.42)	(1.44)	(1.36)		
F-3	2.75	0.85 (nd)	**0.31**	0.67 (nd)	0.87 (nd)	1.03 (nd)	**0.77**	**0.65**
	(nd)							

The WSL/HW ratios of late-stage instars of *E. designatus* were 1.25 for F-0, 0.72 for F-1, 0.52 for F-2, and 0.33 for F-3 (Table 1). The ratio values of corresponding instars of *O. rupinsulensis* were 1.16, 0.72, 0.52, and 0.31 respectively. These values were consistent with the values for *E. designatus* and the congeneric *Ophiogomphus colubrinus* Selys given by Tennessen (2016).

Measurement ratios of CL/PL ranged from 0.93 to 0.86 for the four instars of E. designatus, and from 0.72 to 0.65 for the four instars of *O. rupinsulensis* (Table 1; Figure 2). These values generally conform to a couplet used to separate these genera in Needham, et al. (2014): "Cerci about as long as paraprocts" for *Erpetogomphus* versus "Cerci about 3/4 as long as paraprocts" for *Ophiogomphus* (p. 124). However, we found it easier to measure the length of the epiproct instead of the paraprocts because the bases of the epiproct and cerci are at, or almost at, the same level in dorsal view. Therefore, we put the 0 of the micrometer in one place and measured both appendages without having to flip the specimens over to measure the paraprocts in ventral view. The CL/EL ratios were similar to the CL/PL ratios (Table 1) and conformed even more closely to a similarly worded couplet that would have readily distinguished the two genera, with no overlap between them, going back as far as instar F-3.

Conclusions and Recommendations

The terminal appendages of nymphs of *Erpetogomphus* from *Ophiogomphus* exhibit relative environmental stability (isometry) during ontogeny, giving them clear potential for use as reliable diagnostic characters for separating nymphs of these genera from F-0 to F-3. The couplet used to separate these genera in Needham et al. (2014) could be made easier to use by replacing the length of a paraproct with the length of the epiproct. The wording we recommend for the couplet is: "Cerci about as long as epiproct" for *Erpetogomphus* versus "Cerci about 3/4 as long as epiproct" for *Ophiogomphus*. However, we first suggest that additional species in these genera be similarly examined, as there likely is more variation in these ratios within these genera than shown here.

Problems occur when workers try to identify partly grown nymphs using keys that do not state the life stage(s) of nymphs for which they were designed. A recent publication that facilitated determination of the relative instar number of late-stage Anisoptera nymphs (Tennessen, 2016) has made inroads into this problem. We suggest

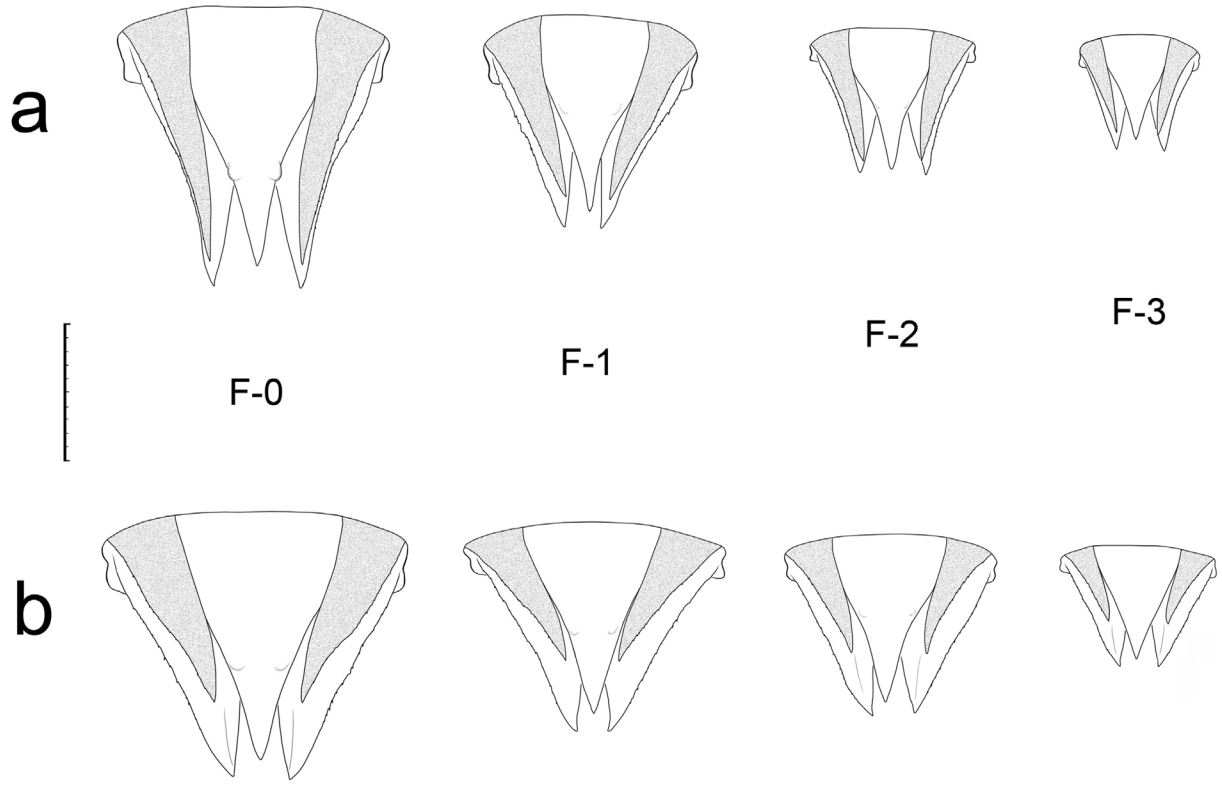


Figure 2. Terminal appendages in dorsal view of nymph instars F-0 through F-3 of (a) *Erpetogomphus designatus,* and (b) *Ophiogomphus rupinsulensis* (cerci are shaded gray).

that whenever feasible, key builders should determine if the couplets they design for use with full-grown nymphs are effective for younger nymphs as well. In any case, they should explicitly state the life stages of nymphs for which their key was designed, and the statement should be placed in or near the key section itself, where it would be most readily noticed.

Acknowledgments

Funding for RBD was provided by the Bureau of Natural Heritage Conservation of the Wisconsin Department of Natural Resources.

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Help Needed With the Carl Cook Odonata Collection

The Carl Cook collection of Odonata, consisting of over 150,000 specimens, is soon to be relocated from Carl's residence in Kentucky to the Florida State Collection of Arthropods (FSCA) in Gainesville, Florida. This is a world-class collection which will be a valuable addition to the FSCA collection.

The International Odonata Research Institute is coordinating this effort, and we are soliciting your donations of any amount that you can afford. The donation is fully tax deductable, since we are a 501(c)(3) organzation, and you will receive a donation letter to file with your taxes. It is estimated that we will need somewhere between $1,800 and $2,000 to cover expenses including truck rental between Gainesville, Florida and Center, Kentucky; motel rooms for at least two nights; gas; packing boxes; and manpower.

Please help with this important effort. Donations can be sent to IORI, 4525 NW 53rd Lane, Gainesville, Florida, 32653. Questions can be directed to me at <iodonata@gmail.com>. Thank you!

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

Cultural Odonatology

DSA members are as diverse as the insect order we all love; we approach Odonata as scientists, educators, naturalists, artists, poets, photographers, essayists, bloggers, and more, with many wearing several of these hats. Cultural Odonatology focuses on different aspects of the human relationship with odonates, showcasing dragonflies in art, architecture, literature, and legend, and may contain original works or discussions of odonates in existing works. If you would like to contribute to this feature, contact the Editor at <editor@dragonflysocietyamericas.org>.

In this instalment, John Deitsch—a newly-joined member of the DSA—puts a slight twist on the theme, with a discussion of the culture of chasing odonates.

Young Birders—a New Generation of Ode-ers, by John Deitsch, Duluth, Georgia <jfdeitsch@yahoo.com>

There is generally a point during a bird-walk when binoculars are focused on something other than birds. The object of attention may be a mammal, a reptile, or an amphibian. However, more and more often it is an insect, especially an odonate.

I have been a birder for over 10 years. Around five years ago, I noticed something different…the ever-patrolling Prince Baskettail (*Epitheca princeps*) in my backyard. It did not take me long after this for me to be hooked on odes. And as time progresses, my obsession with odes increases, rivaling my obsession with birds.

The future of ornithology looks promising, as there is a large community of young birders throughout the United States. However, when I first became fascinated with odes, I didn't see many other young ode enthusiasts (or of any age, for that matter). I have attempted to increase these numbers!

Now, when I am with fellow birders, I point out the odonates that surround us. I post pictures of odes along with birds on my social media pages. The few other young ode-ers out there have been doing the same. The word is spreading. Since I started oding five years ago I have noticed a substantial increase in birders who have, at the least, a passing interest in odes. When I go birding I notice other birders paying attention to the odes that are present. The spread of ode-ing seems most prevalent in young birders.

The benefits of having more ode watchers seem clear. More people watching odes means more sightings being entered into OdonataCentral, which in turn will give a clearer picture of species' distributions and abundance. Birders are a good target group; we are already outside often with cameras and binoculars, we have experience using subtle field marks, and many of us are experienced in submitting sightings to citizen science-driven databases, namely eBird. Imagine if every time a birder went birding and submitted a list into eBird, that same birder also submitted a list into Odonata Central!

The fact that odes are awesome is spreading. I have experienced this firsthand and on social media. After all, what lover of nature could fail to fall in love with odes after watching a Sable Clubtail (*Stenogomphurus rogersi*) patrolling a swift stream or a Halloween Pennant (*Celithemis eponina*) swaying in a summer breeze?

Gateway odonates: Upper: Sable Clubtail (*Stenogomphurus rogersi*); Lower: Halloween Pennant (*Celithemis eponina*). Photos by John Deitsch.

How I Fell Into the Clutches of the Odonata

This feature presents essays from DSA members describing how, when, where, and why they first became interested in Odonata. It also doubles as a fun way for members to find out a little more about each other. If you would like to contribute, write a short essay describing your first forays into the world of Odonata and how it has affected your life since, including your most interesting ode-hunting tale, and send it to the Editor at <editor@dragonflysocietyamericas.org>. Photographs to illustrate the stirring tale are encouraged. Whether 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!

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>, and include a short note describing the photo, location, and event.

Death Trap, by Kathy Biggs <bigsnest@sonic.net> and David Davies <davidmdavies@sbcglobal.net>

Kathy shares with us an unexpected encounter in Lagoon Valley, Vacaville, California, as told to her via e-mail by David Davies:

"I saw one of these Blue-eyed Darners (*Rhionaeschna multicolor*) come in and join some others. I thought it was some kind of mating performance, as they would vibrate their wings every 30 seconds, or so. The sun angles were such that I was totally incapable of seeing the bullfrog eggs, or what was on their surface, which was a sticky solution of clear slime.

I watched the performance for a few minutes and when I returned 30 minutes later, I realized they were in trouble. I was only able to save one of the three, and it was amazingly difficult to get the slime off them, and me.

It turns out that there were so many bullfrogs in the pond that they had essentially slimed an area with eggs and the goo was like gel. Here is the survivor after I cleaned him (above)—the other two were not so lucky (below)."

In a return e-mail, David said that the water wasn't low in the lagoon when he saw this. Kathy wonders: "Has anyone else has seen such a phenomenon? And the two above appear to still have their true life colors…so were they paralyzed, or what? Why were they attracted to area of shiny egg masses? It would have made more sense it if had been females coming in to oviposit! Perhaps, since this occurred during a heat wave in all of California, the males came in to cool down with a 'splash dunk' and then got 'glued' to the frog eggs (bullfrogs are an invasive non-native spe-

cies in California). Sometimes the truth is stranger than fiction!!"

Odonates Never Go Out of Style, by Hal White <halwhite@udel.edu>

Hal was struck by the number of annual DSA meeting attendees in Virginia who were sporting stylish dragonfly attire. He caught these photos of some of the fashion plates present, and wonders whether such a gallery could become a new feature of the annual meeting photos.

Lookin' good, people!

Top Row: Paul Bedell, Virginia; Jerrell Daigle, Florida; Veta Bonnewell, Illinois; Jim Johnson, Washington.
Second Row: Chris Hill, South Carolina; Tony Schoch, Pennsylvania; Steve Valley, Oregon.
Bottom Row: Sally Walker Edwards, Tennessee; Jason Forbes, Massachusetts; Josh Rose, Massachusetts; Jim White, Delaware.

Correction

An alteration to a citation made by the Editor in the article "Remembering Clark Nelson Shiffer" (Argia 29(2): 13–15) was inaccurate. The quotation that starts the article is not from the current journal Science (as was referenced in the article), but from Science 82, a different journal published by AAAS at the time. It was a monthly publication, so the reference section should also include the month of June.

Call for Papers for Bulletin of American Odonatology (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>. Current DSA members can also check out the most recent issue (Collins, S.D. and N.E. McIntyre, Extreme loss of diversity of riverine dragonflies in the northeastern US is predicted in the face of climate change, Volume 12, Issue 2, 2017) online at OdonataCentral <www.odonatacentral.org> via the Publications tab.

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. Literature should be referenced in the article text using author names, not numbers (i.e., "Carlos and Young, 2009; Quill et al., 2011").

Figures

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

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

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

Tables

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

The Dragonfly Society Of The Americas

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

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, Treasurer, 605 9th Avenue, Ottawa, Illinois 61350-4119. For more information on joining DSA, visit <www.dragonflysocietyamericas.org/join>.

Mission of the Dragonfly Society of the Americas

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

Back cover: **(upper)** Stacked image composite head shot of *Ischnura cervula* (Pacific Forktail) male. Photo by Steve Valley. **(lower)** Male Hyacinth Glider (*Miathyria marcella*), Cameron County, Texas, October 2013. Photo by Jim Burns.