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Front cover: Male *Erpetogomphus elaphe* photographed along the side of a small stream in subtropical moist forest and coffee farms at El Limo, El Salvador. Photo by D. Danforth.

2012 Northeast Regional DSA Meeting and Great Lakes Odonata Meeting— Sault Ste. Marie, Ontario 6–8 July

Colin Jones <colin.jones@ontario.ca>, **Bryan Pfeiffer** <bryan@dailywing.net> and **Bob DuBois** <robert.dubois@wisconsin.gov>

The 2012 Northeast Regional Meeting of the Dragonfly Society of the Americas will be combined with the annual Great Lakes Odonata Meeting (GLOM) and will be held in Sault Ste. Marie, Ontario from Friday evening, 6 July to Sunday, 8 July. A block of 20 non-smoking rooms with two double beds have been reserved at the Super 8 (184 Great Northern Rd, Hwy 17 North, Sault Ste Marie) at \$85/night (plus 13% tax) for the nights of 6, 7 and 8 July. Each room also contains a mini-fridge and the hotel offers a free continental-style breakfast. These rooms will be held until 1 June provided the block is not filled. To reserve your room, call the motel directly at 1-705-254-6441 and mention the “Dragonfly Society”. For anyone arriving early or staying later, they will honor the same rate.

Other nearby hotels include: Comfort Inn (333 Great Northern Road, Sault Ste. Marie, Tel: 705-759-8000); Comfort Suites and Conference Centre (229 Great Northern Road, Sault Ste. Marie, Tel: 705-942-2500); Algoma’s Water Tower Inn (360 Great Northern Road, Sault Ste. Marie, Tel: 705-949-8111); and, for the budget-minded there are three options: Catalina Motel (259 Great Northern Road, Tel: 705-945-9260); Skyline Motel (232 Great Northern Road, Tel: 705-942-1240); and the Northlander Motel (243 Great Northern Road, Tel: 705-254-6452).

For those considering camping, there is a KOA campground in Sault Ste. Marie, <<http://www.koa.com/camp/sault-ste-marie/>>, and Glenview Cottages (just north of

the city) also offers campsites, <<http://www.glenviewcottages.com/>>.

If participants do not want to drive all the way to Sault Ste. Marie they could fly to the Sault Ste Marie Airport, Ontario, <<http://www.saultairport.com>>, or the Chippewa County International Airport, Sault Saint Marie, Michigan, <<http://www.airciu.com>>, and rent a car or make other transportation arrangements to get to the Super 8. Keep in mind that participants from the US will require a valid passport.

There are many excellent locations around Sault Ste. Marie that should provide different habitats (both sandy-bottomed and cobble-bottomed rivers, lakes, ponds, peatlands) for exploration. Although some of the major rivers in the area, such as the Goulais and Batchewana, are relatively well known from an Odonata perspective, much of the surrounding area has had little to no coverage and this meeting will certainly add a wealth of knowledge to our understanding of the biodiversity of this beautiful part of Ontario.

Species of interest that we expect to encounter include Subarctic Bluet (*Coenagrion interrogatum*), Ocellated Darner (*Boyeria grafiana*), several species of *Somatochlora* including, among others, Lake Emerald (*S. cingulata*), Delicate Emerald (*S. franklini*) and Ocellated Emerald (*S. minor*). The rivers in this area are great for snaketails (*Ophiogomphus*) including Extra-striped (*O. anomalous*),

continued next page...

Calendar of Events

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

Event	Date	Location	Contact
DSA Annual Meeting	4–6 May 2012	Florence, South Carolina	< http://web.me.com/ecurlew/DSA_2012/ >
DSA Southeast Meeting	8–10 June 2012	Columbia, Tennessee	Steve Krotzer < rskrotze@southernco.com >
Ohio Odonata Society	23 June 2012	Oak Openings, Ohio	Bob Glotzhober < bglotzhober@ohiohistory.org >
European Congress on Odon.	2–6 July 2012	Belgrade, Serbia	< ecoo2012@nhmbeo.rs >
DSA Northeast Meeting	6–8 July 2012	Sault St. Marie, Ontario	B. Pfeiffer < bryan@dailywing.net >
CalOdes Dragonfly Blitz	3–5 Aug. 2012	Del Norte Co., California	Kathy Biggs < bigsnest@sonic.net >



continued from previous page...

Boreal (*O. colubrinus*), Rusty (*O. rupinsulensis*) and possibly Riffle (*O. carolus*).

The details of a post-meeting trip further north (possibly to Manitowadge—260 miles/420 km north from Sault Ste. Marie) are still being worked on but target species could include early *Aeshna* including Sedge Darner (*Aeshna juncea*), Ringed Emerald (*Somatochlora albicincta*), Broad-tailed Shadowdragon (*Neurocordulia michaeli*) and possibly Canada Whiteface (*Leucorrhinia patricia*). Chances are also good that somebody may get Ontario's first Quebec Emerald (*Somatochlora brevicincta*)—long overdue!

A website providing information on registration, accommodation, meeting schedule, regional information, and species lists for various locations will be posted by mid-March at: <<http://www.wingsenvironmental.com/nedsa2012/>>.

Organizers: Colin Jones, Bryan Pfeiffer and Bob DuBois



Final 2011 Treasurer's Report

Jerrell J. Daigle, DSA treasurer <jdaigle@netally.com>

We began the 2011 year with a balance forward of \$22,018.58. Our year ending balance is \$23,140.51. The minimum level for filing IRS tax forms has been raised to \$50,000 annually, so we do not have to worry about exceeding the old \$25,000 level. Currently, we have a DSA membership of about 400. Income and expenses were lower in 2011 due to the new cost structure of available cheaper electronic versions of ARGIA. Our expenses were for printing issues of 2011 ARGIA, annual meeting expenses, computer storage space, and none for the 2011 Donnelly fellowship. In addition, we established a fee-free account with another bank for non-USA members as our current bank is now charging extra fees for processing checks from overseas members.

Sympetrum ambiguum (Odonata: Libellulidae) to be removed from the Minnesota list of Odonata

Scott King, Northfield, MN <nfldkings@gmail.com> and **Dr. Oliver S. Flint, Jr.**, Curator Emeritus, Neuropteroids, Department of Entomology, National Museum of Natural History, Smithsonian Institution, Washington, DC <flinto@si.edu>

One of the longest standing and most ambiguous Odonata records for the state of Minnesota has to be that of the Blue-faced Meadowhawk (*Sympetrum ambiguum*). Charles Branch Wilson, in July and August 1907, joined Paul Bartsch on his survey of the pearl mussel industry and mussel fauna of the Mississippi River for the Bureau of Fisheries, collecting at their many stops dragonflies and damselflies. Wilson reported finding *Sympetrum albifrons* (an early synonym of *S. ambiguum*) at Reed's Landing on 18 July 1907: "both sexes were captured in the tall weeds along the edge of the woods: they seemed to prefer shady spots." However, as it turns out, his identification was in error. Even more unfortunate, this error was then propagated as fact through every subsequent publication touching upon the Odonata of Minnesota and/or the genus *Sympetrum*.

Based on that false record, Lee Miller, Charles Hamrum, and Myron Anderson, as part of their early 1960s survey of *Sympetrum* in Minnesota, made a purposeful effort to collect along the Mississippi River only to report that this "previously reported species, *ambiguum*, was not found in this study." More recently, I know that Robert DuBois, Kurt Mead, and I (no doubt there have been others as well) have all, on separate occasions, zeroed in on Reed's

Landing with the hope of substantiating that early record from 1907. No one has ever found it.

Eventually, it seemed prudent to check the material itself... if it could be located. As luck would have it Charles Branch Wilson deposited his collection in the National Museum of Natural History, Smithsonian Institution. Curator emeritus Oliver Flint, loving a good mystery, agreed to look for it. Here's what Oliver reported: "I was able to get out to Silver Hill end of last week and looked for *S. ambiguum*—nothing under that name. We then searched by locality and came up with *S. obtrusum*, which was the one. It is labeled Neuroptera of the Mississippi Valley, Reed's Landing, Minn 7-18-1907, *Sympetrum albifrons*, [female sign]. The ID has a line through it and below written *obtrusum* RPC IX 1916 [RPC= R.P. Currie]. I fully agree with that determination. There are no further examples. There is another one with the same locality data but with original ID of *S. vicinum*, which was changed to *scoticum*, then to *danae*—with which I agree. Apparently this record was not published!"

I think it's easy to understand how this mistake occurred. Given that the name in use at the time was "*albifrons*,"

which literally translates to “white-faced,” it was bound to be confusedly applied to living meadowhawks with white faces. One only wonders how often this mistake might have been made.

Given the historic and current distributions of this species (the nearest populations are from southern Iowa several hundred miles south of Minnesota) and given there are no proven records for this species in the state (despite numerous attempts) we feel that *Sympetrum ambiguum* should be expunged from the list of Minnesota Odonata.

Note: There is a second dot map record (OC #251082) for Winona County, Minnesota, for which we can find no source in the literature. It is my opinion that this is an error in transmission of the original error, or possibly an error in transcribing a record from Winona Lake in Indiana, which exists in the literature. This record has now been set as unconfirmed on OdonataCentral. The original record (OC #251081) has been changed to *S. obtrusum*, with a note explaining the decision.

Marshlands Conservancy, Rye, New York

Walter Chadwick, Bronxville, NY <mrcnaturally@optonline.net>


Marshlands Conservancy is a Westchester County Park with a variety of habitats. Woodlands, a meadow, pond and the largest salt marsh in Westchester County comprise this parkland located at the western end of Long Island Sound in Rye, New York. Salt marshes are a disappearing habitat and provide food and shelter for a variety of animals including odonates. In June 2011 the park naturalist asked if I would conduct surveys of odonates in the park. Naturally I said yes and conducted surveys on four different dates: 15 June, 10 July, 2 August, and 31 August.

Thirteen species of odonates were observed with *Erythrodiplax bernice* (Seaside Dragonlet) being the most numerous with a high on 10 July of about eighty. *Plathemis lydia* (Common Whitetail) and *Tramea lacerata* (Black Saddlebags) were frequently observed. On 2 August, a newcomer who wanted to try his hand at catching and releasing dragonflies accompanied me. Permission was obtained from the naturalist and three species were caught and released (see starred species on list). This is a great way for newcomers to examine odonate anatomy.

Hurricane Irene came through in August and flooded the marsh and only three species were observed on 31 August. The surveys will be continued in the coming years as the naturalist would like a comprehensive list so visitors would know what odonates are found in the park.

Note: The *Sympetrum danae* record turned up by this search is the southernmost record for this species in Minnesota, a good find.

References

- Donnelly, T.W. 2004. Distribution of North American Odonata. Part II: Macromiidae, Corduliidae and Libellulidae. Bulletin of American Odonatology 8(1): 1–32.
- Miller, L.A., C.L. Hamrum, and M.A. Anderson. 1964. Identification and Distribution of *Sympetrum* in Minnesota (Libellulidae, Odonata). Proceedings of the Minnesota Academy of Science 31(2): 116–120.
- Wilson, C.B. 1909. Dragonflies of the Mississippi Valley Collected During the Pearl Mussel Investigations on the Mississippi River, July and August, 1907. Proc. U. S. Nat. Mus. 36: 653–671. 

In December 2011 the Westchester County Executive proposed budget would have eliminated all Westchester County naturalists and closed the six nature centers. Vigorous opposition from the Westchester Audubon chapters, other environmental organizations and the public stopped this and the naturalists and centers are still here. We need to be vigilant in our efforts to protect open space.

Odonates Observed

- Slender Spreadwing (*Lestes rectangularis*)
- Familiar Bluet (*Enallagma civile*)
- Fragile Forktail (*Ischnura posita*)
- Common Green Darner (*Anax junius*)
- Seaside Dragonlet (*Erythrodiplax bernice*)*
- Widow Skimmer (*Libellula luctuosa*)
- Twelve-spotted Skimmer (*Libellula pulchella*)*
- Great Blue Skimmer (*Libellula vibrans*)
- Blue Dasher (*Pachydiplax longipennis*)
- Common Whitetail (*Plathemis lydia*)
- Spot-winged Glider (*Pantala hymenaea*)
- Carolina Saddlebags (*Tramea carolina*)
- Black Saddlebags (*Tramea lacerata*)* 

A Quest for the Nymph of *Leptobasis lucifer*

Ken Tennessen <ktennessen@centurytel.net>

This time Jerrell Daigle, Steve Krotzer and I were making it a priority. In the past we had made a few meager attempts at getting the nymph of *Leptobasis lucifer* (Donnelly), the Lucifer Swampdamsel, in southern Florida. This rare species was first reported for the United States by Dennis Paulson based on a male he photographed in Fakahatchee Strand, Collier County, Florida in 2000 (ARGIA 12[1]: 12); he subsequently discovered it at Corkscrew Swamp Sanctuary. Several times, with only spotty knowledge of the flight season, we had gone at the wrong time of year or were not in the right place.

Based on additional observations on adults over the past few years, we decided that going in early December to a specific cypress dome in Corkscrew Swamp would be the best time and place to find nymphs and rear them. We made the necessary arrangements with Mike Knight and the Audubon Society for permission to go into the swamp. Although striking out again was in the back of our minds, our biggest worry was how were we to tell *Leptobasis* nymphs from nymphs of at least three species of *Ischnura* breeding in the cypress domes??

Mike pulled up in his swamp buggy (Fig. 1) mid-morning, 7 December 2011; it was a gorgeous day. We said “Aye” and away we rode to the cypress swamp. The plan was to sample for nymphs first, then look for adults. We found the small aquatic plant *Lycopus rubellus* (or Taperleaf Water Horehound), in which Jerrell had seen a female oviposit in 2010, scattered amongst other aquatic plants. We got to work with our dip nets. Early on, we found a few *Ischnura* nymphs (*I. hastata*, *I. posita* and *I. prognata* occur here), judging by the banded eyes and dark transverse bands on the caudal gills. Shortly however, we picked up a more slender species with only one pale band on the eyes and unpigmented gills, a female of which had the tips of the gonapophyses extending beyond the apex of the tenth abdominal segment—this had to be *Leptobasis*!

We continued our dip netting when from deep in the swamp Jerrell hollered that he saw an adult male. Steve and I stayed true to priority and kept on dredging. We probably got one damselfly nymph per 10–20 dip net samples; after several hours of collecting, we got about eight that we thought were *Leptobasis*. Other species of



Figure 1. Mike Knight (in driver's seat), Jerrell Daigle (left) and Ken Tennessen (center) getting ready to head for the cypress dome in Corkscrew Swamp Sanctuary. Photo by Steve Krotzer.

Odonata in the habitat along with the *Leptobasis* were nymphs of *Lestes tenuatus* (about F-2 and F-3), the three *Ischnura* species, *Pachydiplax longipennis* (very common), *Nasiaeschna pentacantha*, and *Anax* (uncommon, early stadia, not sure of species). We saw a couple more adult males of *L. lucifer* that morning, but we had gone into the swamp without our cameras. No big deal, we thought, as we were pretty satisfied that we had a couple of nymphs close to emergence, and we intended on going back that afternoon, cameras in hand.




Figure 2. Mature female of *Leptobasis lucifer* in cypress dome in Corkscrew Swamp Sanctuary. Photo by Ken Tennessen.

At noon we bounced back to the Visitor Center for a light lunch, then back to the cypress dome to photograph *L. lucifer* adults. We all saw a fair number of females, some young, some mature (Fig. 2). But there was not a male in plain sight, although Jerrell saw one fly up into a cypress tree. It seemed quite possible that male reproductive activity was over for the day, and they had gone to roost. If we had known this, we would have postponed nymph collecting to the afternoon.

Several days after our field excursion, a male of *L. lucifer* emerged, and several days after that a female emerged. Based

on these positive associations plus several preserved specimens, we plan to describe the nymph. Of the eight described *Leptobasis* species, this find represents only the second species ever discovered in the nymph stage in this genus.

I thank Jerrell and Steve for helping make this trip possible and for being great “compañeros.” I gratefully appreciate the assistance and ecological information provided by Mike Knight and also acknowledge the Audubon Society for allowing us access to the cypress swamp. 

Oh! Mama Mia!

Jerrell J. Daigle <jdaigle@nettally.com>

The quest for *Leptobasis lucifer* (Lucifer Swampdamsel) continues! Ken Tennesen, Bill Mauffray, and myself joined Frederico Lencioni from São Paulo, Brazil for a collecting trip for south Florida odonates. We met in Miami the last week of January 2012 and promptly headed out for Corkscrew Audubon Sanctuary in Immokalee to look for *L. lucifer*. We were delightfully surprised when Fred and Peggy Sibley joined us there for a couple of days.

The next day, we went to the Sanctuary where we met Mike Knight, our host. A reporter and photographer from the Fort Myers newspaper who covered our search for the famous *L. lucifer* joined us. Please check out the link to read the article and see the photos of the intrepid explorers in action!

We were successful in finding a few mature adults in the virgin cypress domes and we were all able to get photos. Frederico, or Fred for short, was particularly pleased, as he does not see *Leptobasis* in his neck of the woods. In addition, we found some *Lestes tenuatus* (Blue-striped Spreadwing) and *Gynacantha nervosa* (Twilight Darner). That is not all. We found some fresh Florida panther scats, so we had to be on the alert!

The next day, we went to the Fakahatchee Strand Preserve State Park at Copeland, which is just south of Immokalee. Heading south just a little bit down the road from where Dennis Paulson got the first specimen of *Leptobasis* (= *Chrysobasis*) *lucifer*, we found several mature specimens and lots of young *L. tenuatus*. Not much of anything else



as it is still wintertime, but the temperatures were in the 80s and we had sunny weather.


Later, that week, we went back to Miami. Along the way and in the Miami area, we collected *Enallagma pollutum* (Florida Bluet), *E. cardenium* (Purple Bluet), *Nehalennia pallidula* (Everglades Sprite), *Neoerythromma cultellatum* (Caribbean Yellowface, at Tropical Park), and *Crocothemis servilia* (Scarlet Skimmer). On Key Largo, we found *N. pallidula*, *Erythrodiplax umbrata* (Band-winged Dragonlet), rare *Liguus* tree snails, roseate spoonbills, and wood storks.

Down on Stock Island, we stopped at the Key West Tropical Botanical Garden to check out their new dragonfly pond. The manager graciously allowed us to collect a couple specimens for the record. We found mostly *Orthemis schmidtii*

with its scarlet red abdomen, pink *Orthemis ferruginea* (Roseate Skimmer), and lots of *Tramea insularis* (Antillean Saddlebags). The staff had built rock platforms where one could set up tripods and photograph the dragonflies as they zipped by the shoreline of the limestone pond.

On the way back, we went to the National Key Deer Refuge on Big Pine Key to see if we could find *Nehalennia minuta* (Tropical Sprite). I have not seen it since Fred Sibley and I found it common just before Hurricane Wilma hit with its four foot saltwater storm surge. Alas, we did not find it at any of the known locations. I am

convinced it is extirpated from the island and the United States. However, it is still common in Central America and the Greater Antilles.

All in all, we had a great time, especially with the skull sessions at night with beer and pistachios! Frederico took many photographs with his new camera, found many fossils, and we all had a great time at the best Italian restaurant ever, Mama Mia's, in Florida City! If you are ever in the area, you must simply have dinner here! If you have any questions about the sites we visited, please let us know. We can't wait to do this again! 

An odd (hybrid?) bluet from the Chattooga River

Chris Hill, Conway, South Carolina, <chill@coastal.edu>

With the DSA annual meeting in South Carolina approaching, and the post-meeting trip happening at the Chattooga River on the South Carolina/Georgia border, I thought I would bring to the attention of ARGIA readers an unusual bluet I collected at the Chattooga on 11 June 2011 (Fig. 1). Long and slender dark except for a bluish S9 and part of S8, and with dull (pruinose?) blue sides to the thorax and vaguely darker lateral stripe, it had two tear-shaped “eye spots” and lacked an occipital bar. I did not recognize it in the field when I saw it in a streamside bush on the South Carolina side, near the Rt. 76 bridge. I collected the individual, and on closer inspection and with references at hand, I still could not place it, and experts to whom I sent photos agreed it was not a good match for any species that might be expected.

The Chattooga is a swift, clear, sunlit rock-and-gravel river that supports an odonate fauna unique in this region, including *Gomphus viridifrons* (Green-faced Clubtail), *Ophiogomphus edmundo* (Edmund's Snaketail), probably *Ophiogomphus howei* (Pygmy Snaketail; exuviae finds have not yet been confirmed by capture of an adult), *Macromia margarita* (Mountain Cruiser) and *Boyeria grafiana* (Ocellated Darner). In this habitat, *Enallagma exsulans* (Stream Bluet) might be the most expected bluet taxon, and in some ways, the long slender dark appearance recalled *E. weewa* (Blackwater Bluet; though the habitat couldn't be “wronger” for *E. weewa*). However, inspection of the terminal appendages showed that the paraprocts were not a good match for either taxon (Fig. 2), and again, were not a good match for any North American bluet.

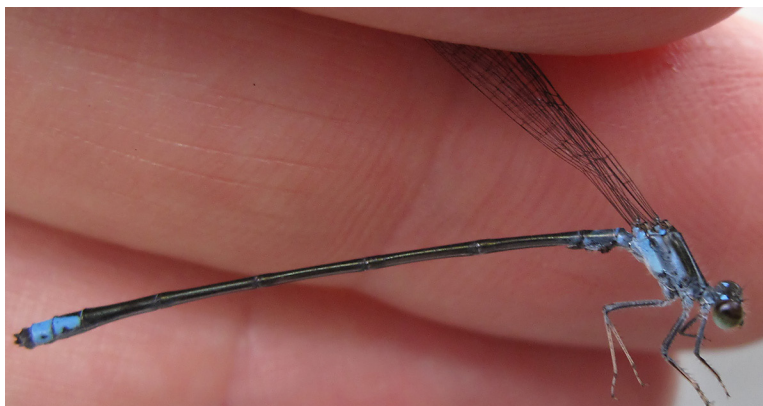


Figure 1. *Enallagma* sp. captured 11 June 2011 at the Chattooga River, Oconee County, South Carolina. Photo by Chris Hill.



Figure 2. Comparison of terminal appendages of the odd bluet (top) and *Enallagma weewa* (bottom). Photo by Chris Hill.

At this point the story could end—a random oddball or a hybrid—except that on seeing the photos, Marion Dobbs checked her photo archives and found a photo taken at the same site almost exactly three years previously (Fig 3). That photo is a near-perfect match for the color pattern of the individual I collected. So at this point we have a river where bluets of any kind are very infrequent, and the two documented individuals I know of 1) do not match any known taxon and 2) do match each other.


I removed one leg from the specimen I collected and gave it to a researcher constructing a phylogeny of eastern *Enallagma*, but no results are available yet from that analysis. Since the analysis focuses on mitochondrial genes (M. Callahan, pers. comm.), it is possible that if the mystery bluet is a hybrid, the DNA will identify one of the parents, the mother.

I am interested in any observations of *Enallagma* from the Chattooga River, past, present or future.



Figure 3. *Enallagma* sp. photographed 14 June 2008 at the Chattooga River. Photo by Marion Dobbs.

Acknowledgements

Dennis Paulson, Steve Krotzer, Giff Beaton, Marion Krotzer and Ed Lam all discussed the identification of this individual with me. Boris Kondratieff provided access to comparative material from the Colorado State University's C.P. Gillette Museum of Arthropod Diversity specimens. Thanks, everyone. 

Odonata of the Municipality of Metapán, Department of Santa Ana, El Salvador

Rich Bailowitz <raberg2@q.com>; Robert A. Behrstock <rbehrstock@cox.net>; Doug Danforth <danforthdg@aol.com>

Introduction

Through a series of good fortunes, we were able to make a trip to northern El Salvador during August of 2011, as participants in what might best be called an insect expedition. We were lured, in part, by numerous photos of insects taken by Silvia Figueroa, our friend and trip organizer, during the early months of 2011. We and Silvia were accompanied by grasshopper expert Hugh Rowell and his wife, Lauren, who joined us from Switzerland. Silvia's family owns a home in the town of Metapán, about two hours north of San Salvador, as well as several sizeable parcels of property within 20 km of Metapán. From 23–29 August 2011, we were given free rein to sample and photograph on the Figueroa properties as well as on those of various friends and relatives.

Of all the countries in Central America, El Salvador is the smallest and least visited by North American naturalists. The low level of nature tourism is related to several issues including the country's size, limited tourism infrastructure (focused mainly on beaches and nightlife), the few signifi-

cant natural areas or archeological zones that are open to the general public, the absence of endemic birds (as bird tours are generally the vanguard of nature tourism), and, perhaps, the country's turbulent political history.

The first summary of El Salvador's Odonata was presented by Gloyd (1981) and included 18 species in the collections of the California Academy of Sciences and the University of Michigan. Collecting trips made by Fred G. Thompson and Dennis Paulson during 1964, 1966, and 1967 were summarized by Paulson (1984). Förster (2001) listed 81 species for the country. Four additional species were added by Paulson (2011), bringing the country total to 85. Photographs by Silvia Figueroa taken prior to our trip and on 18 November 2011, added two additional species from the municipality of Metapán, and they are included below. Of the 73 species we encountered, nearly all were photographed and many were collected (see list below). Note that species listed as photographed were confirmed in-hand, whether they were collected or not. Photographic documentation is in the collections of Behrstock and Danforth. Voucher specimens are in the collections of

Bailowitz, R.W. Garrison, and permitting authorities in El Salvador.

The town of Metapán (elevation c. 470 m) is located in Santa Ana, the northwestern-most of the country's 14 departments. Temperatures are warm, with nearly all of the rainfall occurring between May and October. Near Metapán are extensive forests of oak, pine, and sweetgum with widespread cultivation of coffee. This habitat seemed to represent "subtropical moist forest" or "low montane wet forest" (Holdridge, 1967). Much of the region is volcanic tableland that abuts the borders of Guatemala and Honduras, but there are extensive deposits of limestone that support quarrying activities for building block and the production of cement. Besides mining, the countryside has been extensively modified by ranching and farming. Nonetheless, we had no trouble finding attractive sites that were populated by diverse assemblages of Odonata and other insects. Habitats we investigated included flooded forest, small ephemeral ponds, shores of large permanent lakes, forest streams, spring-fed water holes, banks of large streams, and backwaters of slow-moving rivers. Elevations for the sites we visited extended from just below 400 m at La Apuzunga to more than 1300 m at the coffee plantation.

Sites Visited

- 1) Hacienda Los Puentes, c. 14 km W Metapán, N 14.3308° W 089.5550°, 442 m. 24 August, 26 August. Agricultural land with pastures, woodland, small lakes and ponds covered with water hyacinth, marshland, and rainpools.
- 2) El Limo, Shade grown Coffee Farm, c. 15 km N Metapán, N 14.4111° W 089.4079°, c. 1,300 m. 23 and 28 August. Moist foothill forest with small and mid-sized rocky streams through shade-grown coffee plantation.
- 3) La Apuzunga, Lava Field, c. 18 km S Metapán, N 14.2249° W 089.4659°, 122 m. 25 August. Road through forested lava field with sparse understory, blue-water springs, and rocky river edge.
- 4) San Diego La Barra National Park, c. 10 km SW Metapán, N 14.3035° W 089.5443°, 432 m. 26 and 29 August. Deciduous forest standing in shallow pools and muddy understory, adjacent river backwaters.
- 5) Hacienda Sandoval, c. 7 km NNW Metapán, N 14.3607° W 089.4689°, 516 m. 27 August. Small streams through forest remnants, and adjacent cornfields and hedgerows.
- 6) Hacienda Los Puentes, river channel at the Guatemalan border, c. 15 km W Metapán, N 14.2504° W 089.5767°, 490 m. 26 August. Rocky stream in flood stage, and adjacent forest remnants.
- 7) Shore of Lago de Güija (the country's largest natural lake), 8 km WSW Metapán, N 14.3009° W 089.5390°,

435 m. 29 August. Edge of large lake with water hyacinth and emergent vegetation in both shaded and sunlit sections.

- 8) Road ford crossing at Santa Rosa, 3 km NNW Metapán, N 14.3400° W 089.4654°, 463 m. Small stream in open pasture land just outside of town.

Species List

(New country records boldfaced; S = Specimen; P = Photographed)

CALOPTERYGIDAE

Hetaerina americana, 8: A few were perching low along the water. (S/P)

Hetaerina capitalis, 2: Common perching over rushing streams and away from water sometimes high in shrubs. (P)

Hetaerina cruentata, 2, 5: At site 2, shared the habitat with larger *H. capitalis*, along forested streams. (P)

Hetaerina occisa, 5, 6: Uncommon; a few perched over water on streamside weeds and shrubs. (P)

Hetaerina titia, 3, 4, 6, 8: Males perched over the water on overhanging plants; females away from water in forest clearings. (P)

LESTIDAE

Archilestes grandis, 2, 5: At shaded sites along heavily forested streams. (P)

Lestes sigma, 5: One female photographed in shrubby growth along shaded woodland road. (P)

Lestes tenuatus, 1, 5: Terrestrial and emergent aquatic vegetation at pond edges. (S/P)

PLATYSTICTIDAE

Palaemnema angelina, 2: One of several species with dark wing tips. Males and females perched on low plants at forested hillsides above small shaded streams. (S)



Palaemnema angelina male perching in the understory of sub-tropical moist forest bordering a small stream. Photo by D. Danforth.

PROTONEURIDAE

Neoneura amelia, 1, 3, 4: Found over open water between water hyacinth patches and along shaded pools in streams. (S/P)

Protoneura cara, 5: Pairs and single males along a forested stream edge. (P)

COENAGRIONIDAE

Acanthagrion quadratum, 1, 5, 7: Emergent vegetation at pond edges. (S/P)

Apanisagrion lais, 2: A single individual taken along a dirt road in moist, hilly forest. (S)

Argia anceps, 5: Quite common at stream margins perching on rocks and boulders as well as gravel shoreline. (S/P)

Argia n. sp. nr *extranea*, 2: Stream margin in moist, foothill forest. Earlier reports of *A. extranea* in El Salvador almost certainly refer to this undescribed taxon (pers comm. R.W. Garrison). (S/P)

Argia oculata, 2, 5: Sunny trail edge at woodland margin. (P)

Argia oenea, 1, 5: On cobbles and vegetation at the margins of small streams. (S/P)

Argia pocomana, 2: Males perched on vegetation and rocks along shaded small streams; females on sunlit patches along trails. (S/P)

Argia pulla, 1, 3, 4, 5: Vegetation at pond margins (mainly males) and road edge in forest understory. (S/P)

Argia tezpi, 1, 3, 4, 5, 6: Locally, the most widely distributed *Argia*; seen along streams, rivers, trails in woodland, and in pastures, some with thoracic stripes cream to red. (P)

Argia translata, 3: Males perched on plants overhanging stream. (P)

Enallagma novaehispaniae, 1, 3, 5: A few along stream margins. (P)

Ischnura capreolus, 1: Pond edges and vegetated pools with standing water. (S/P)

Ischnura ramburii, 1, 3, 4: Widespread in marshy habitats, one was photographed in a city garden surrounded by homes and businesses. (P)

Leptobasis vacillans, 1, 4: Temporary ponds with shrubby



Argia pocomana. El Limo; male found along a small stream in sub-tropical moist forest. Photo by D. Danforth.

margins. (P)

Neoerythromma cultellatum, 1, 3, 7: Pond edges. (S/P)

Telebasis digiticollis, 1, 4, 7: Most common *Telebasis* in water hyacinth-covered waters. (S/P)

Telebasis filiola, 1: Scattered individuals in water hyacinth clusters. (S/P)

Telebasis isthmica, 7: A few seen with the more common digiticollis in clumps of water hyacinth. (S/P)

Telebasis salva, 1, 3: Small numbers along open rain pool edges and ponds. (P)

AESHNIDAE

Coryphaeschna adnexa, 1, 4, 7: In a variety of habitats including sunny woodland margins. (S/P)

Gynacantha mexicana, 4: One individual was roosting in dense, viny forest understory. (S/P)

Gynacantha nervosa, 2: A single individual photographed by S. Figueroa in November 2011.

Triacanthagyna septima, 4: Several were roosting in dense, viny forest understory. (S/P)

GOMPHIDAE

Epigomphus westfalli, 2: Several seen flying along montane streams and perching on streamside vegetation. (S/P)

Erpetogomphus bothrops, 5: Males patrolled a shallow rocky stream while females perched away from water in a shrubby pasture. (P)

Erpetogomphus elaphe, 2: Several perching on boulders



Triacanthagyna septima (Pale-green Darner). La Barra-one of several immature individuals perching in understory of flooded forest. Photo by D. Danforth.



Epigomphus westfalli. El Limo; male perched along a higher stream in the sub-tropical moist forest. Photo by D. Danforth.

and rocks along the main stream. (S/P)

Phyllogomphoides duodentatus, 2: A lone male patrolled a sunny stretch of a rocky stream perching on the gravel shoreline. (S/P)

Phyllogomphoides pugnifer, 3, 5: Mostly away from water at sunny forest margins. A few were inspecting the edges of pools along streams. (S/P)

LIBELLULIDAE

Anatya guttata, 1, 3, 4, 5: In small numbers, mostly away from water. (S/P)

Brachymesia herbida, 7, 8: Fairly common perching away from water on shrubs in pastureland. (P)

Brechmorhoga rapax, 2: Stream margin in moist, wooded hills. (P)

Brechmorhoga tepeaca, 2: A few cruising streams at higher elevations in coffee plantation. (P)

Brechmorhoga vivax, 2, 6: Males patrolled short beats along the larger streams perching on streamside plants. (P)

Cannaphila insularis, 1: Female photographed by S. Figueroa prior to our visit.

Dythemis sterilis, 1, 3, 4, 5: A few males defending territories along pond edges. (P)

Elasmothemis cannacioides, 3: Occasional solitary individuals seen perching over the water at pond edges actively pursuing other dragonflies. (S/P)

Erythemis attala, 3, 7: Mostly over vegetated ponds; one at a sunny opening in the forest. (P)

Erythemis baematogastra, 1: Several seen and photographed along the edges of water hyacinth-covered ponds. (P)

Erythemis peruviana, 1, 3, 7: Locally quite common, mostly females or immature males. Territorial males were active over water hyacinth-covered ponds; females



Phyllogomphoides pugnifer. La Apuzunga; male perched along a path bordering ponds and streams in tropical deciduous forest. Photo by D. Danforth.

were seen away from water, often perching near the ground in pastureland. (P)

Erythemis plebeja, 1, 4, 5: Common around ponds. (P)

Erythemis vesiculosa, 1, 4: Occasional at ponds. (P)

Erythrodiplax fervida, 4: A few immatures perching in cornfield and along shrubby edge of a large river. (S/P)

Erythrodiplax funerea, 1, 3, 4, 5: Widespread and common, especially around temporary rain pools. (P)

Macrothemis inequiunguis, 5: One female along a path next to a shaded stream. (P)

Macrothemis inacuta, 1, 3: Several, mostly in open second-growth forest. (Examined in hand)

Macrothemis pseudimitans, 5: A few in sunny clearing along a tiny stream and coursing along a path between a cornfield and a shaded stream. (P)

Miathyria marcella, 1, 3, 4, 5, 6, 7, 8: Commonly seen even away from water hyacinths, joining in feeding swarms over roads and pastures. (P)

Micrathyria aequalis, 1, 4, 5: Males held territories along pond margins; females found in weedy areas away from water. (P)

Micrathyria didyma, 1, 4: Individual females perching in the afternoon shade. (S/P)

Micrathyria bagenii, 5: One perched on a low shrub at water's edge, one specimen away from water. (P)

Orthemis discolor, 1, 3, 4, 5: Widespread and not confined to shade. (S/P)

Orthemis ferruginea, 1, 3, 4, 5, 7: Common and widespread. (P)

Orthemis levis, 1, 3: Females perched high in shrubs in early morning, males regularly at water's edge perching on low vegetation. (P)

Pantala flavescens, 7: A few in mid-afternoon. (Sight record)

Perithemis domitia, 1, 3, 7: Females seen in open pasture-



Orthemis levis. Hacienda los Puentes; male perched along border of water hyacinth covered pond in pastureland. Photo by D. Danforth.

- land, males along semi-shaded pond margins. (P)
- Perithemis mooma*, 1, 3, 4: Vegetation at pond edges and weedy growth nearby. (P)
- Pseudoleon superbus*, 3: Two individuals on a disturbed, sandy area near the river's edge. (P)
- Rhodopygia hinei*, 3, 5: A singleton at each site. One male perched far from shore at a large pond was quite active chasing other dragonflies. The other perched high in a tree along a shaded path. (P)
- Tauriphila australis*, 1, 5: Some over water hyacinth; others perching away from water on shrubs. (P)
- Tauriphila azteca*, 1: A few seen flying long beats over water hyacinth; one was collected. (S/P)
- Tholymis citrina*, 4: A few noted during the day roosting in grasses, weeds, and dense, shaded forest understory. (P)
- Tramea abdominalis*, 3: One perched over a small pond was photographed. (P)
- Tramea calverti*, 1, 7: Occasional individuals perching high on shrubs, one at flooded lake. (P)
- Uracis imbuta*, 5: One individual photographed perching on low shrubs along a road just above a gravelly stream crossing. (P)

Discussion


Our list (30 zygopterans and 45 anisopterans), includes two species recently photographed by Figueroa, plus 73 species recorded during our week's stay. The genera contributing the largest number of species were: *Argia* (8), *Hetaerina* (5), *Erythemis* (5), and *Telebasis* (4). Nearly all of the species we encountered are widespread in Middle America and our records fill expected gaps. *Epigomphus westfalli* is known from Nicaragua; we extend its range

westward and it should be looked for in the intervening region of Honduras. *Brechmorhoga tepeaca* has been recorded in Mexico and Belize; we extend its range south and east across Guatemala. We add 24 new species (6 zygopterans and 18 anisopterans) to the list for El Salvador, which now stands at 107. In comparison, the larger, more frequently visited, and biologically better-known country of Costa Rica supports 268 species, while Guatemala and Panama are home to more than 200 species each. The municipality of Metapán is a relatively small portion of the country. By collecting during other months, especially at the end of the rainy season, and extending the field work to other departments, many additional species could be added to the country total. Time spent in coastal areas, El Imposible Nature Preserve, the highlands of Montecristo National Park and other locations both southward and eastward would prove fruitful. We suggest a reasonable estimate of 150 species for the country.

Acknowledgments

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Guyana Days: Collecting in the Northern Guyana Shield

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Introduction

South America hosts amazing diversity. The Smithsonian Institution has run an exploration program documenting the biodiversity of the Guyana Shield (BDG; Venezuela, Guyana, French Guyana, Suriname, and Brazil) since 1983. Historically, the BDG program has focused on mammals (primarily done by Mark Engstrom and Burton Lim), birds (such as the remarkable reference, “A Field Checklist of the Birds of Guyana” by Michael J. Braun, Davis W. Finch, Mark B. Robbins, and Brian K. Schmidt), and plants, (e.g., “Checklist of the Plants of the Guianas” now in its second edition, edited by J. Boggan, V. Funk, C. Kelloff, M. Hoff, G. Cremers, & C. Feuillet). We recently began exploring the Odonata of the Guyana Shield.

The Odonata of French Guyana has been documented (e.g., Fleck, 2003), as have odes from Venezuela (e.g., DeMarmels, 1983, 1991, 1993, 1998, 1999) and Brazil (e.g., Calvert, 1948; Ferreira-Perquetti et al., 2003; Costa et al., 2010; Pinto & Einicker, 2010). In the twentieth century, several dragonfly and damselfly taxa from British Guyana may have been included in faunal surveys but no comprehensive study of British Guyana has been undertaken since Calvert (1948b; and it was not comprehensive but rather focused on Odonata from Bartica, Guyana). Indeed, distribution maps for many species show ranges surrounding, but not including Guyana, due to what is almost surely sampling-bias (Garrison et al., 2006).

We first traveled to Guyana to collect odes in July 2011, and followed up that trip with a second visit in January 2012. Our goal for working in the Guyana Shield is to document the biodiversity of odes in the country, knowing that this will take several years (an exciting prospect)!

General Habitat

The northern and coastal section of Guyana is covered in rainforest; although simply referring to it as rainforest would not be truly descriptive of the habitat. There is quite a bit of heterogeneity to the terrestrial landscape. The hilly land is a mosaic of upland and lowland rainforest, dotted with swampy regions, as well as active and abandoned farmland.

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Melissa Sanchez-Herrera and our Guyanese volunteers Sheri-Ann Ashanti, Celena, and Sheneeza.

Much of the lowland rainforest is in the primary successional stage with large trees towering 24 to 30 meters above the forest floor. The lowlands also have standing water in some areas, which create islands of swamp surrounded by thick jungle. The uplands are considerably dryer and have less of a jungle feel. The soil is largely composed of sand throughout the coastal regions. When the effect of the porous soil works in concert with elevation, the higher regions display more xeric characteristics, despite the regular rain.

Although Guyana is largely uninhabited, the coastal areas do have a significant population of people. Despite the lack of nutrient and water holding ability of the soil much of the populated land is dedicated to slash and burn farming. Although this is obviously ecologically undesirable, it does provide feeding habitat for odonates that we can easily access and exploit for collection.

CEIBA Biological Station

On these first two trips we visited CEIBA Biological Station, Linden Highway, Madewini. CEIBA is a biological field station, situated on primarily farmland and secondary growth forest. There are several tributaries nearby, as well as a spring, allowing for great opportunities to observe female oviposition and male territoriality in Odonata. Aeshnidae hawk over fields, Gomphidae patrol



Ian Biazzo and Manpreet Kaur Kohli collecting on a tributary of the Demerara River.

small creeks, *Zenithoptera* perch on branches overhead and elusive helicopter damselflies have been occasionally spotted near the entrance to a deep swath of primary forest.

Epiphytic bromeliads are a common feature of the forest strata in many tropical rainforest habitats. In this regard, Northern Guyana is not atypical. However, what is atypical is the stark absence of odonate larvae present within. We have dissected dozens of these aquatic microcosms and have discovered a fauna of beetle and fly larvae, various cockroaches, tarantula and other spiders, but no aquatic predators, including damsel larvae. It is no surprise then that we have had little luck catching adult Psuedostigmatids in the same areas. Psuedostigmatid damselflies are specialized for oviposition in bromeliads and tree holes. As a result, searching for larvae in these microhabitats should yield significant catch, as has been shown in other similar habitats (Srivastava, 2006; pers. obs.; Fincke, 2006). As we continue to sample the shield, we hope to get a better idea of the distribution of these damsels across the country, and come to a better

understanding of where they are more or less abundant. We've collected (or spotted) *Mecistogaster*, but have not yet seen *Megaloprepus* or other members of this family, and then only as adults (no larvae have yet been found).

Demerara River and Santa Mission

West of CEIBA is a tributary of the Demerara River which leads to the Amerindian Village of Santa Mission. The tributary is surrounded by forest that is either intact or cut down by people who have converted it to farmland. As you travel deeper down the tributary the landscape opens up into wide grassy and shrubby meadows. All along the tributary is a fine place for catching unique damselflies and dragonflies. In fact, some of our most difficult hunting occurs while floating down the river on our small boat.

Catching dragonflies on the river takes a great deal of patience and dexterity. One will usually have but one chance to get close to them before they fly away. The first swipe of the net is likely your only chance to catch the ode, so one better be a good aim. The larger dragonflies on the Demerara Tributary were mostly found perching on branches that hang over the water. These were usually not so difficult to catch as we had the forward trajectory of the boat adding to our swing speed. However, the job was difficult when we encountered dragonflies that fly up and down the river at high speeds. We tracked them from about 20 meters away in order to be ready for them. Everyone stretched their necks following the tiny insect across the cacophony of leaves and branches. Even with up to seven net wielding entomologists in a boat, chances were slim that these rapid river fliers would be caught. This is magnified by the fact that these larger species are a rare sight in the heat of the day. In fact,



Sorting bromeliad samples, looking for larvae. Joseph Evangelista, Dominic Evangelista, Ian Biazzo, Paul Franden, Jessica Ware and our Guyanese volunteers Sheri-Ann Ashanti, Celena, Zafiniah and Sheneeza.

we have found that maybe the best time for catching them is when the sun is going down. The dragonflies at this time (mostly Corduliidae, Libellulidae and Aeshnidae) would fly back and forth over the same general area to feed on the insects emerging at twilight. We've found that collecting in Guyana requires the longest net, the highest reach, and pure luck that the dragonfly is directly above you at the moment you swing your arms.

Species list: what we collected

Our sampling is biased, in that J.W. was especially focused on catching Libelluloidea, and M.S.H. was actively searching for Zygoptera. M.K.K. tried several methods to collect Aeshnidae, from mist nets in fields (which yielded one specimen) and hand-made weights on twine, which she threw into the air to attract adults. We hope that seasonal and environmental biodiversity differences will become apparent over our future years of sampling.

Anisoptera

AESHNIDAE

Coryphaeschna sp.
Gynacantha sp.

LIBELLULIDAE

Dythemis sp.
Diastatops intensa
Erythemis vesiculosa
Erythemis peruviana
Erythemis sp.
Elasmothemis sp.
Erythrodiplax umbrata
Erythrodiplax fervida
Erythrodiplax sp.
Miathyria simplex
Orthemis sp.
Pantala flavescens
Perithemis sp.
Zenithoptera sp.

Zygoptera

COENAGRIONIDAE

Acanthagrion sp.
Aeloagrion dorsale
Telebasis demarara
Ischnura sp.
Leptobasis sp.

We wish to warmly thank the members of the CEIBA research team, especially Joyce Wade. Thanks also to Karen Redden for all of her guidance about working in Guyana. Thanks also to our boat driver, Rakesh Bybye, who was an excellent swing with a net on the boat and to Mrs. Chanasue for organizing our trip(s). We can't wait to get back to Guyana!

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Archilestes grandis (Great Spreadwing) and *Sympetrum rubicundulum* (Ruby Meadowhawk), Two New Records for Montana

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Archilestes grandis (Great Spreadwing): During a visit to the Little Bighorn River south of Crow Agency in Big Horn County on 2 September 2011, I captured one male *A. grandis* (OC# 332803).

When first spotted from some 15 feet away, perched low in some vegetation near the stream, I recognized immediately that it was a spreadwing, and more than twice the size of any that I had seen previously in Montana. Assuming that it was most likely *A. grandis*, and coupled with the fact that it could be a new record for the state, you can imagine my nervousness as I approached cautiously. The capture went off without a hitch, and in retrospect it turned out to be a good thing, because it was the only individual found during the three hours that I explored the area.

The Little Bighorn River at this location is a fair-sized, semi-clear stream with a moderate flow. The vegetation along the river is predominantly cottonwood and sand bar willow. In areas, the sandy stream banks are lined by grasses and small amounts of rush. During my visit I found the stream level to be surprisingly high for this late in the season, and very few exposed gravel bars were present. Of the nine odonate species detected in the area on this date, *Hetaerina americana* (American Rubyspot) was by far the most common, virtually omnipresent and more abundant than I have observed anywhere else in Montana.

Although this record represents the furthest north that *A. grandis* has ever been documented, it is not all that far removed from the known range, and one species which I, and others, had expected to possibly occur in southeast Montana (Miller & Gustafson, 1996). The nearest known records are from Teton County, Wyoming to the southwest (Molnar & Lavigne, 1979) and Custer County, South Dakota to the southeast (Donnelly, 2004a).

A look at the dates from other nearby records indicate that *A. grandis* probably



Archilestes grandis (Great Spreadwing), male. Little Bighorn River, Big Horn Co., Montana. 2 September 2011

has a fairly late flight season this far north (Abbott, 2012). With the exception of the above September date, my visits to the region thus far have only been during the month of July. Further investigations later in the season may find this species to be present at other streams in the southeast portion of the state.

Sympetrum rubicundulum (Ruby Meadowhawk): On 15 July 2011, Bob Martinka and I visited a few locations north of Forsyth in Rosebud County. While sampling an



Sympetrum rubicundulum (Ruby Meadowhawk), male. Shallow reservoir north of Forsyth, Rosebud Co., Montana. 26 July 2011

area near a shallow, marshy reservoir along Dry Creek, Bob captured an immature male *Sympetrum* and asked for my opinion as to its identification. Upon examination of the individual, I noticed immediately the orange color in the basal half of the wings, and after noting that it was not *S. semicinctum* (Band-winged Meadowhawk), I expressed my excitement to Bob that he may have just captured Montana's first Ruby Meadowhawk. A close look at the hamules reinforced my conclusions, and I set about photographing and collecting the specimen (OC# 330468).


While doing such, Bob captured another immature *Sympetrum*, also with orange colored wing bases, and this time a female. Knowing that *S. internum* (Cherry-faced Meadowhawk) females will often show color in the wings; I examined the subgenital plate and determined that it too was another Ruby Meadowhawk. Late in the day, and with many more stops scheduled during the trip, Bob and I departed the area.

On 26 July 2011, I returned to this same location and found quite a bit more meadowhawk activity than what was seen just 11 days prior. Despite the increased number of *Sympetrum* species in the area, I was only able to locate two *S. rubicundulum* specimens, one mature pair. Of the six *Sympetrum* species observed in the area on the 26th, *S. rubicundulum* was by far the least common.

As was the case with *Archilestes grandis*, this too was a species which was thought to possibly occur in Montana

(Miller & Gustafson, 1996). This recent finding, coupled with the known range of the species, to the south and east of Rosebud County, indicate that *S. rubicundulum* should occur in at least a few other southeast counties (Abbott, 2012; Donnelly, 2004b).

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Intergeneric copulation between *Sympetrum obtrusum* and *Leucorrhinia hudsonica*

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On 6 August 2011, as part of an annual odonates weekend sponsored by the Tahoe Institute for Natural Science, we joined Don Harriman for a visit to Grass Lake in El Dorado County, California. There are two Grass Lakes in El Dorado County, but the one most familiar to odonate enthusiasts, and the one referred to here, is the one at Luther Pass along Highway 89. This Grass Lake is a small body of open water, surrounded by the largest *Sphagnum* bog in California. It is also a quaking bog with a number of boreal plants unusual in the Sierra Nevada and a diverse marshland that is inundated to various depths depending on the time of year and preceding winter snowpack. The 2010–2011 winter brought a very deep snowpack to the area, and at the time of our visit almost the entire meadow was still holding standing water of at least a few inches, unusual for August.

We arrived at approximately 10 AM, and found the vegetation at the parking area to be swarming with roosting teneral meadowhawks, primarily *Sympetrum pallipes* (Striped Meadowhawk) and to a lesser extent, *S. obtrusum* (White-faced Meadowhawk). Making our way into the higher marsh we soon noted many of the expected odonates, and after about three hours we relocated to the lower marsh, which holds more open water, but is also more exposed to the day's rising breezes. Across the two marshes we found good numbers of *Lestes disjunctus* and *dryas* (Northern and Emerald Spreadwings), several *Coenagrion resolutum* (Taiga Bluet), *Enallagma annexum/boreale* (Northern/Boreal Bluets), and both *Ischnura perparva* and *cervula* (Western and Pacific Forktails).

Dragonflies dominated our attention, however, and we were looking specifically for *Leucorrhinia*. Two different



Fig. 1. Male *Leucorrhinia hudsonica* (Hudsonian Whiteface).

sized *Aeshna* spp. (mosaic darners) were flying, but we were unable to determine which species. We noted many *Somatochlora semicircularis* (Mountain Emerald; including pairs in tandem or wheel), a few male *Leucorrhinia glacialis* (Crimson-ringed Whiteface), many dozens of *L. hudsonica* (Hudsonian Whiteface; including several pairs in tandem or wheel), a few young male *Sympetrum danae* (Black Meadowhawk), many hundreds (possibly thousands) of *S. obtrusum* (many dozens of pairs in tandem or wheel), a few *S. pallipes* on the vegetation along the edge of the meadow, at least one *Libellula pulchella* (Twelve-spotted Skimmer), and many *L. quadrimaculata* (Four-spotted Skimmer).

Over the course of the day, we made several observations regarding Hudsonian Whiteface that are worth noting. First, every female we saw was an andromorph or red form. Second, we each noted a few males with greatly reduced marking on the abdomen, typically only showing two conspicuous spots, on abdominal segments 6–7 (Fig. 1). Manolis (2003) warns of inconspicuous abdominal spotting in this species, and Johnson (2008) has found strongly reduced and even lacking abdominal spotting in this species in the Oregon Cascades. As Johnson (2008) pointed out, this poses a considerable identification problem in places where *Leucorrhinia proxima* (Belted Whiteface) might occur, as both species have a single row of cells between the radial sector and radial plane. Observers should anticipate the possibility of spotless Hudsonian Whitefaces

in the Sierra Nevada and northern California, and any extralimital observations of Belted Whiteface in this region should include careful examination of abdominal appendages.

Our most interesting observation occurred in the lower marsh, beginning approximately 2:20 PM, when we stumbled across an odd-looking pair of dragonflies in wheel formation, perched on the vegetation. We immediately recognized that it was a male White-faced Meadowhawk with a red-form female Hudsonian Whiteface and spent the next 10 minutes attempting to photograph the pair (Fig. 2). Occasionally we would inadvertently disturb the pair and they would fly a few meters before resting on the vegetation again. After 10

minutes, they separated and flew off in different directions.

Heterospecific pairings among Odonata are not particularly rare. Corbet (1999) summarizes 175 male–female heterospecific connections among the Odonata, and Miller and Fincke (2004) provide details and references for 111 heterospecific matings for male North American and European damselflies. These reviews found that pairings across different genera, but within the same family, represented approximately 29–30% of all heterospecific pairings. However, actual copulation only was observed in approximately 28% of those pairings (Miller & Fincke 2004). This number may be slightly higher for Anisoptera,



Fig. 2. Male *Sympetrum obtrusum* (White-faced Meadowhawk) in copula with a red-form female *Leucorrhinia hudsonica* (Hudsonian Whiteface).

most commonly among calopterygids and libellulids (Utzeri & Belfiore, 1990; Corbet, 1999), but intergeneric copulation remains a rarely observed phenomenon, and prolonged copulation, especially so.


We have reviewed the literature and believe that this represents only the second documented report of *Sympetrum* pairing with *Leucorrhinia*, following Eda's (1980) report of attempted copulation between a male *Leucorrhinia dubia orientalis* and female *Sympetrum danae*. Interestingly, *Sympetrum* accounts for a full 38% of Corbet's (1999) records of heterospecific linkages among Anisoptera. This may be a simple probabilistic result of the very high densities that *Sympetrum* achieves, not uncommonly with large numbers of several species flying in the same habitats at the same time. Additionally, the prevalence of records for heterospecific pairings in some taxa may be the result of intensive study within those groups (e.g. Singer, 1990 for *Leucorrhinia*).

It is perhaps worth pointing out that the female of this pair was an andromorph. Johnson (1975) hypothesized that female polymorphism was a mechanism of reproductive isolation, and that andromorph females were less likely to attract the sexual advances of males of other species. However, with two species as visually distinct as these two, this likely had little bearing on this mismatch. We would also like to point out that this observation was made in the afternoon, when Miller and Fincke (2004) found male *Enallagma* were less likely to make such mis-

takes, apparently due to a more even operational sex ratio.

We would like to thank to K. Biggs, J. Johnson, T. Manolis, D. Paulson, and K. Tennessen for their helpful discussion and encouragement with this note.

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Celithemis elisa (Calico Pennant) Point Count Continues—Season 7

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Summer 2011 marked the seventh consecutive season of our monitoring *Celithemis elisa* (Calico Pennant), and the species continues to amaze us with the phenomenal numbers that emerge from our simple farm pond. Over these seven years we have counted well over 32,000 teneral and would like to think we are getting a handle on the behavior of this species, but they continue to surprise us.

Rain or shine we circle the pond every day between 0800 and 1000, their peak emergence hours. Although they continue to emerge throughout the day we count only the one time, knowing the end result will be a much higher number than what we report.

Thus far we have learned that the larvae leave the water in a great surge

at the beginning of the emergence period regardless of weather conditions. Rain, heat, cold, wind, drought... ..nothing stops them. The first surge typically falls in the first or second week of June and lasts about five days. Numbers plummet for the rest of the season but are then consistent except in occasional minor surges.

Table 1. Summary of *Celithemis elisa* (Calico Pennant) emergence over seven seasons. Never think you have these things figured out. Just when it started to look like the phenomenal emergence was beginning to settle down, voila!

Year	Season Total	Peak Period	Peak Percent of Total	Total Emergence Period
2005	2,455	7–11 June	83% (2,028)	>62 Days
2006	10,944	5–9 June	47% (5,169)	63 Days
2007	6,497	1–6 June	75% (4,892)	61 Days
2008	8,237	8–12 June	76% (6,244)	64 Days
2009	1,505	6–10 June	15% (229)	68 Days
2010	642	31 May–4 June	43% (277)	82 Days
2011	1993	1 June–7 June	58% (1,152)	51 Days

Data sometimes seem to play tricks on long term monitoring projects. For instance, every season the first surge amounts to a very large percentage of the final total, anywhere from 43% to 83%; except in 2009 when the percentage was very low (15%). We have no explanation.

Most years we have observed thousands throughout the emergence period. Not in 2010, when the warm weather gave them a longer emergence period, but the numbers were at an all time low. No explanation there either, but we are glad we did not base a study on the data gathered from only that one season.

Because of their strict adherence to their circadian rhythm in early June, weather does not appear to be a factor in any of our observations, so we strive on. Besides focusing on the impressive primary surge of emergence we are also watching the smaller surges that pop up now and then throughout the season. A very intriguing behavior technique they exhibit is to emerge in clusters around the pond, as if the eggs of a single batch all stayed together throughout the entire larval life cycle.

While doing the counts we are privileged to observe behavior by other pond inhabitants as well. This year a

Red-winged Blackbird discovered the bounty held within thick clumps of vegetation and enjoyed crashing around in the dense sedges, flushing and snapping up teneral. He spent so much time patrolling and stuffing himself that he eventually left a flattened trail! Not to mention throwing off our counts by eating the data points.

Previous season recaps can be found in:

Gregoire, S. and J., 2007. *Celithemis elisa* (Calico Pennant) Emergence Period in the Fingerlakes Highlands of New York State. ARGIA 19(1): 10–11.
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 _____. 2010. Monitoring *Celithemis elisa* (Calico Pennant) Emergence, the Sixth Season. ARGIA 22(4): 21.



Splash-Dunking Gone Bad: The Sticking Frequency

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There are many aspects of the recently described splash-dunk/spin-dry behavior in dragonflies (Walker, 2011) that are of interest. In this paper I concentrate on what happens when splash-dunking goes awry and a dragonfly gets stuck in the water. To put this phenomenon in context, I start with a brief overview of some of the general features of splash-dunking and spin-drying.

The Frequency of Splash-Dunking

Splash-dunking is a fairly common event at Cranberry Lake in Anacortes, Washington, where my wife Betsy and I do most of our observing. Though the rate of splash-dunking varies from day to day, as one might expect, on a typical day a splash-dunk event is observed every 5 to 10 minutes.

Figure 1 shows data recorded at Cranberry Lake during the 2011 dragonfly season. The upper set of data points shows the clear decrease in temperature during the season.

The lower set of data points show the splash-dunk rate in dunks per hour. The average dunk rate is 6 dunks per hour, and the maximum rate is 12 dunks per hour. Though the temperature drops about 20° F during the observation period, the average dunk rate is essentially unchanged.

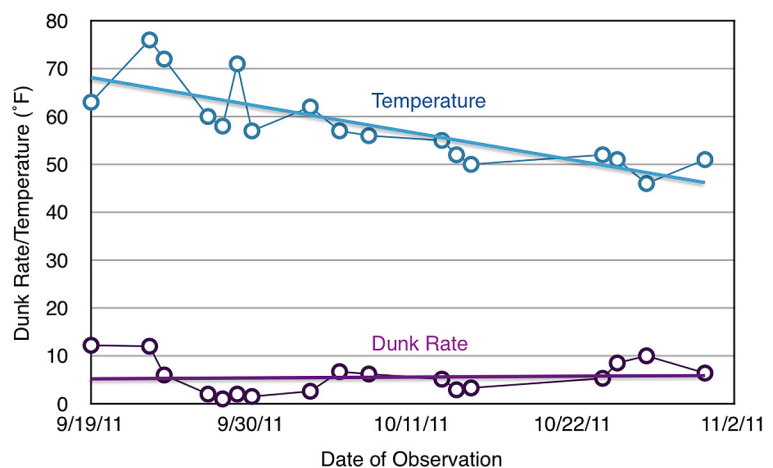


Figure 1. Temperature (upper data) and dunk rate (lower data) versus date of observation. The straight lines show the trends in the data; namely, a clear decrease for the temperature and no significant change for the dunk rate.

The Dragon Splash

When people see one of my slow-motion videos of darners slamming into the water during a splash-dunk (Walker, YouTube), they invariably remark on the intensity of the splash, and wonder how the wings survive such an impact. The fact that the wings hit the water with some force is illustrated by the shape and size of the splash that is produced.

Figure 2 shows a head-on view of a splash produced by a splash-dunking darter. The darners flying when this picture was taken were primarily Paddle-tailed Darners (*Aeshna palmata*), though a few Shadow Darners (*A. umbrosa*) were seen as well. When viewed from this angle the shape and symmetry of the splash becomes apparent. The image shown here is a frame capture from a slow-motion video, and hence of low resolution. Still, it shows the key features of what I like to call the “dragon splash.” Notice the tri-lobed structure of the dragon splash, with a central component produced by the impact of the body, and symmetric side splashes from the wings impacting the water.



Figure 2. The tri-lobed “dragon splash” produced by a darter impacting the water. Dragonflies typically splash-dunk 1 to 6 times in succession, each time producing an impressive splash.

Dunk Time

When darners perform a splash-dunk, they don't dilly-dally in the water. They generally pop right back out in less than half a second. The number of dunks observed for a variety of time intervals is shown in Figure 3. The bar labeled “0.325” corresponds to times between 0.325 s and 0.349 s, the bar labeled “0.350” corresponds to times between 0.350 s and 0.374 s, and so on for the other bars. The average time it takes for a dragonfly to emerge from the water after a splash-dunk is 0.383 s.

with the intermediate moment of inertia is not stable. In the case of a dragonfly, the axis of rotation through the wings—which is the axis of the spin-dry motion—is the one with the intermediate moment of inertia. As a result, the spin-dry motion is inherently unstable. In fact, dragonflies pulling out of their spin-dry are often observed to be “wobbling” as they complete their last spin, a sign that the instability is affecting their rotation.

Spin-Dry Parameters

After doing 1 to 6 splash-dunks, a dragonfly rises well above the water and does a spin-dry, which usually consists of 5 rotations and lasts about 0.44 s. Rotation rates have been observed as low as 760 rpm and as high as 1,600 rpm. The average rotation rate for our observations is 1,014 rpm.

When Splash-Dunking Goes Wrong

Life doesn't always work out as planned. For splash-dunking dragonflies, this means that sometimes they don't make it back out of the water. If they can't become airborne again in half a second or less, they just aren't going to make it at all. The result is generally death by drowning, though predation may play a small role as well.

There's a good reason extended spins with many more than 5 rotations are not observed. A complex object in three dimensions—like the body of a dragonfly—has three independent axes of rotation, each of which has its own moment of inertia. Rotation about the axes with the maximum and minimum moments of inertia is stable, but rotation about the axis

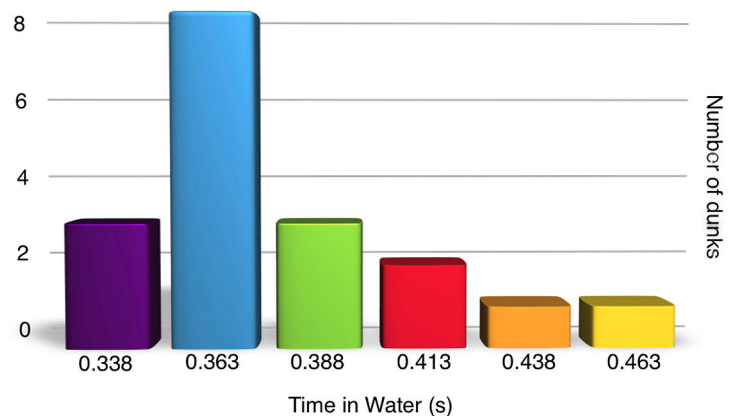


Figure 3. Number of dunks versus time spent in the water. The first bar is for times from 0.325 s to 0.349 s, the second bar for times between 0.350 s and 0.374 s, and so on.

Figure 4 shows a male Paddle-tailed Darner (*A. palmata*) that hit the water about 50 yards from shore and promptly became stuck. We refer to this as a “sticking event.” All sticking events we observed occurred on the first splash-dunk, all happened with air temperatures below 65° F, and all were irreversible.

It’s difficult to watch these gutsy animals struggling to free themselves from the water after getting stuck. They try so hard, come so close to escaping, and continue to struggle for such a long time. The individual shown in Figure 4 struggled for several minutes until—surprisingly—it “paddled” its way to shore right in front of me. I took the opportunity to rescue it and place it on a bush in the sun. After several minutes of drying out it took wing, apparently no worse for wear. I couldn’t help wondering if it would splash-dunk again.



Figure 4. A male Paddle-tailed Darner (*A. palmata*) struggling to escape the water after a splash-dunk that didn’t go well. At this point the darner is close to shore, after struggling for several minutes, and its wing beats are weak. Just after getting stuck its struggles were much more vigorous, several times getting the dragonfly to the verge of escape.

We observed the first sticking event on 19 September 2011, after having observed 90 successful splash-dunks starting back on the 4th of July. As the season progressed, and the temperature dropped, the sticking frequency increased to higher and higher levels. At the end of the season, when the temperature had dropped into the upper 40s, the sticking frequency was a full 25%—one in four splash-dunks resulted in death. The close inverse correlation between temperature and sticking frequency is shown in Figure 5.

The same kind of behavior was seen in the fall of 2010, before we started collecting data. I remember going to Cranberry Lake one day in late October 2010 when the temperature was below 50° F. I would say as many as 10 darners were stuck in the water and trying to escape at any one time. It was depressing to see them struggling, knowing their efforts were futile.

In Figure 6 we plot sticking frequency as a function of temperature. Notice the nice fit to an exponential decay with increasing temperature. Another way to state this is that as temperature is decreased, the rate of increase in the sticking frequency is roughly proportional to the value of the sticking frequency. In this sense, the sharp rise in sticking frequency seen in Figure 5 is an indication of the dragonflies “hitting the wall” when it comes to their low-temperature flight capabilities.

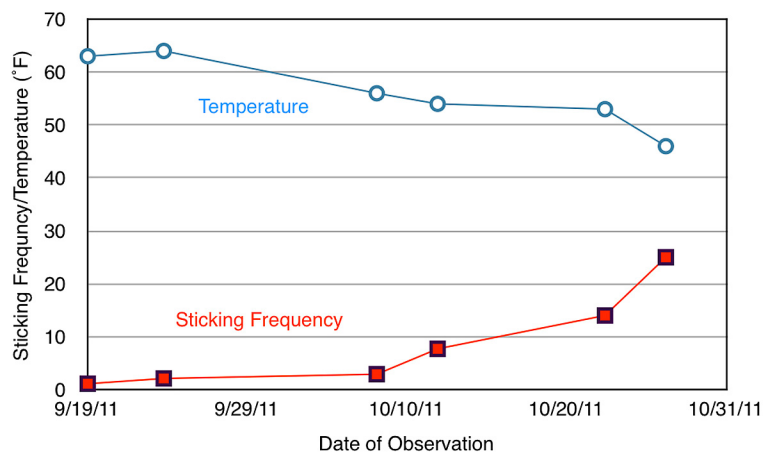


Figure 5. Temperature (upper data) and sticking frequency (lower data) as a function of the date of observation. The inverse correlation between temperature and sticking frequency is evident.

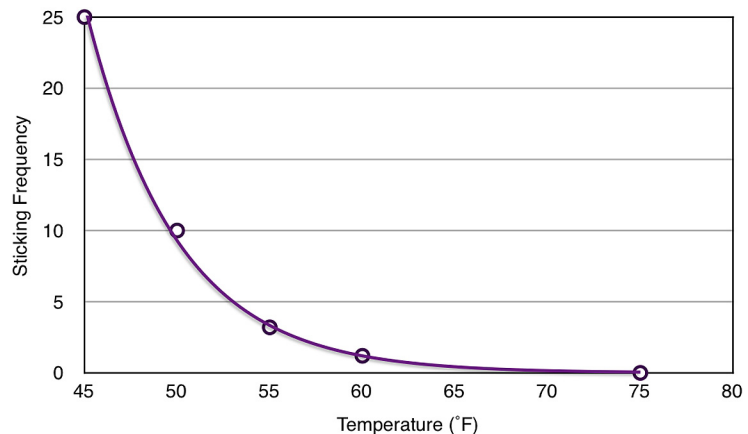


Figure 6. Sticking frequency as a function of temperature. The drop-off with increasing temperature is roughly exponential.

Minimum Flight Temperature

Our observations at Cranberry Lake show that dragonflies like the Paddle-tailed Darner (*A. palmata*) can fly at ambient temperatures as low as 44° F. This is in sharp contrast to a minimum flight temperature of 57.2° F reported for aeshnids (including *A. palmata*) in Alaska (Sformo & Doak, 2006). In any case, it's clear that flight at such low temperatures is pushing the envelope when it comes to a dragonfly maintaining the elevated thoracic temperature necessary for the flight muscles to operate efficiently. Sformo and Doak report thoracic operating temperatures in *A. palmata* of about 97° F.

It's difficult enough for a dragonfly to maintain the necessary high thoracic temperature when the surrounding air temperature is below 50° F, but the situation becomes much worse when the dragonfly splash-dunks into water. Even though the water temperature was the same as the air temperature at Cranberry Lake (within ±1° F), water drains thermal energy away from a dragonfly at a much higher rate than air. Specifically, Newton's law of cooling states that the rate of transfer of thermal energy is proportional to both the temperature difference and the thermal conductivity (Walker, 2010). Noting that the thermal conductivity of water is about 23 times greater than that of air, it's clear that a dragonfly will lose thermal energy rapidly when it is in contact with cool water. Though a number of studies have addressed thermoregulation in dragonflies at high-temperature extremes (May, 1976; May, 1995), less attention has been paid to low-temperature performance, and so far none seem to consider cooling due to contact with water.

Finally, one might wonder whether the increase in sticking frequency with decreasing temperature could be caused by an increase in the surface tension of water, making it harder for the dragonfly to escape (Kuntz, 2012). While this may be a contributing factor, the surface tension increases uniformly by only about 2% over the same temperature range where the sticking frequency increases sharply by over 20%. It seems the most important factor determining the sticking frequency is maintaining the thorax at operating temperature.

A Swarm of Meadowhawks


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When I read Dennis Paulson's interesting account of a mass gathering of baskettails in a recent issue of ARGIA (Paulson, 2011a), I had no idea I would soon experience something similar—though on a much smaller scale. After the experience

Summary

The sticking frequency of splash-dunking dragonflies shows a strong inverse correlation to ambient temperature. In fact, dragonflies engaging in the splash-dunk/spin-dry behavior when temperatures are less than 50° F are at significant risk of becoming stuck in the water—which is lethal.

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Request for *Orthemis* Specimens

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I am looking for specimens of the following *Orthemis* species: *O. ambirufa*, *O. anthracina*, *O. harpago*, *O. coracina*, and *O. regalis*, for DNA work. If you have any specimens to loan, I would really appreciate it. The specimens have to be less than 10 years old and only one leg will be taken. Let me know if you have any questions. Thank you very much!

In my case, the dragonflies involved were Autumn Meadowhawks (*S. vicinum*). These friendly dragonflies like to land on people, as shown in Figure 1.

Autumn Meadowhawks are a common sight at Cranberry Lake in Anacortes, Washington late in the season. They are well described by a famous haiku:

Red dragonfly on my shoulder,
Calls me his friend.
Autumn has arrived.

I've often had them "on my shoulder," but last autumn I had them covering my entire body—literally from head to toe. Here's what happened.

I went to Cranberry Lake on 9 November 2011 to observe the dragonfly activity. The weather was sunny and calm, with an air temperature of 57° F. On other similar days I would observe about a dozen Autumn Meadowhawks and half a dozen Shadow Darners (*Aeshna umbrosa*). On this day, however, I immediately realized something was different—there were so many Autumn Meadowhawks on the gravel walking path that I had to choose my steps carefully to keep from stepping on any of them.

I walked to some bushes near the shore to see if any darners were perched there, but as soon as I stood still for a moment the meadowhawks began to gather on me. It felt like a scene from Hitchcock's movie, *The Birds*. They were landing all over me in a frenzy. I took some pictures showing the ones perched from my waist down, as in Figure 2, but as I took those pictures I could feel them perched on my arms, my upper body, my head, even on my face. The pictures show over 30 on my lower body, and I would estimate there were 50 or more on my body as a whole. I've had several Autumn Meadowhawks land on me before, but never anything like this.

After taking a few pictures I looked up and saw that the air was "full" of them flying in all directions, hooking up in tandem or attempting to hook up. It was similar to a mass flight of winged ants or termites. A few darners were flying too, picking off individual meadowhawks, and also pairs in tandem, and heading for the bushes or trees to enjoy their catch. It was quite a scene. It's hard to estimate the number of meadowhawks, but it must have been in the several hundreds.

I decided to go home and bring my wife Betsy to see this phenomenon. As I walked



Figure 1. My wife Betsy Walker experiences a red dragonfly on the shoulder, and a second one on her hat. Both are male Autumn Meadowhawks (*S. vicinum*), the friendliest dragonfly we know.

back to the car the meadowhawks went along for the ride on my body. The car was a considerable distance away, and in the shade, but there were still a dozen or more dragonflies on me when I got there. I had to "shoo" them away to keep them from getting into the car with me—though one managed to do so anyway.

When Betsy and I returned a few minutes later, the activity level was a bit lower, though still intense. We marveled at the meadowhawks that seemed to be everywhere we looked, including all over us. Along the shore we observed an egg-laying frenzy, with intense competition for prime



Figure 2. A gathering of Autumn Meadowhawks (*S. vicinum*) at Cranberry Lake in Anacortes, Wa on 9 November 2011. The ones pictured on my lower body are only half the story—they covered me from head to toe.


sites. As a result of the competition, many meadowhawks were getting knocked into the water where they became stuck. We ended up rescuing a dozen or more.

As we watched the egg-laying activity, the shadows of the afternoon (it was about 2:00 PM at this point) began to lengthen. We expected to see the meadowhawks moving along the shore to stay in the sunlit areas, but at one point—quite suddenly—we noticed that the egg laying had ceased, and the air was now clear of meadowhawks. It was almost as if someone had flipped a switch. We're not sure what the signal for stopping activity was—it wasn't evident to us—but the meadowhawks seemed to respond en masse.

We returned the next several days, but each time the activity was completely normal again, with just a dozen or so meadowhawks along the shore. The

mass behavior seen on 9 November was a short-lived phenomenon, but one we're happy to have experienced.

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2012 Nick and Ailsa Donnelly Fellowship Awarded

Fredy Palacino has been awarded a Nick and Ailsa Donnelly Fellowship to attend the 2012 DSA annual meeting in Florence, South Carolina. Congratulations Fredy!

A Student in the Making?

Ken Tennesen <ktennessen@centurytel.net>

My five-year-old granddaughter came into my study early Christmas Eve morning. I was peering through my microscope, thinking I could finish drawing the secondary genitalia of a *Micrathyria* male that didn't quite fit the species I initially thought it was, this in the quiet time before anyone else got up (typically I draw when I need to compare details of species in question). Pink blanket in hand, she piped up, "Papa Ken, what are you drawing?" [I wanted to be "Grandfather" but have come to accept her pet name for me]. Taken by surprise, I turned and whispered "Good Morning. I'm drawing a small part of a dragonfly that will help me figure out what species it is." Of course, she wanted to see, so I slid my paper in front of her. "That's not very good, Papa Ken."

I picked up my plain pen and ink drawing, my critic too, and went over to the computer. I scanned the drawing then bundled her up in "Pinky" before zooming in on the finished part of the drawing—the hamule and anterior lamina. Our conversation then went something like this:

"See those small dark teeth on the tip of the hamule?" I asked.

She nodded. "Uh huh. But what colors are those parts?"

"Mostly tan, but darker around the edges."

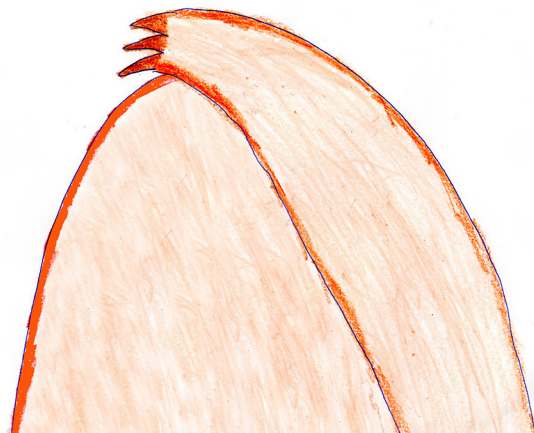
"Kind of brown?"

"Yes, light brown. Around the edge."


"Can I draw them?"

She slid off my lap. I gave her a piece of blank paper and pencil. She stood by my desk, tippy-toed, little bare feet on the cold hardwood floor. Within a minute she'd rendered quite closely the shapes on the computer screen. "This is how it should look," she asserted, then headed downstairs for her box of crayons. Obediently I followed. A few minutes later it was done (see figure below). And I saw a detail I hadn't noticed before—the hamule did not surpass the anterior lamina.

Some of you might be wondering, as did I when I started, why write this little story for the pages of ARGIA? I have this to offer. First of all, if you really want to see something, draw and compare. And, I think there are times that we



just need to take a moment to listen and to watch what's unfolding before our eyes; we might learn something, even from one who supposedly knows less than we do about a particular topic. Secondly, I have been thinking about what to do with my library, the bulk of which consists of books and reprints on Odonata, when the time comes that I can no longer study dragonflies. Maybe, just maybe, there is someone who will be interested. Why not dream one's efforts will be perpetuated? And lastly, in light of Dennis Paulson's article in the last issue of ARGIA [23(4): 14–17] in which he espoused the values of biological collections, another budding taxonomist who pays attention to detail would surely be a welcome thing. I will encourage her and hope, but not push.

The two of us have moved on, at present drawing unicorns and zombies. Oh, that *Micrathyria* I started this story with? Well, who knows, a few more drawings are needed, but it's looking more and more like a new species. 

Book Review

Dragonflies and Damselflies of the East, by Dennis Paulson. 2011. Princeton University Press, 576 pp., 5½ × 8½ inches, 675 color photos. 350 line illus. 333 maps. ISBN: 9780691122830. (paperback) \$29.95.

Reviewed by **Mark O'Brien**, Museum of Zoology, The University of Michigan, Ann Arbor, MI 48109 <mfo-brien@gmail.com>

For many years, Odonatologists “toiled” in relative obscurity. Oh, we knew that dragonflies and damselflies were really fascinating, but with few books other than Needham and Westfall and the 3 volumes of Odonata of Canada and Alaska, it appeared that identifying Odes required arcane knowledge and a fascination for wing venation. That has all changed for the better over the past 20 years. The Ode community has grown tremendously, and as a result, we have had benefited from the publication of many nice regional guides, as well as more comprehensive volumes. It's hard to have a successful guide without an audience, so as the guides get better, the audience benefits and grows, and interest in the Odonata has never been larger than it is now.

With that bit of background, I am pleased to review Dennis Paulson's latest comprehensive guide that will certainly be the most-carried Odonata book in the coming years.

I truly believe that if there is such a thing as the “must-have” book, *Dragonflies and Damselflies of the East* is it. Paulson has paid attention to the shortcomings of some

Hot off the “presses”—except this book isn't printed with presses!

Just as ARGIA went to press, Kathy Biggs published her new eGuide: **Dragonflies of California and the Greater Southwest, A Beginner's Guide**


She felt that with the availability of eBooks, people will use their electronic devices such as eReaders, note-pads and smart phones when in the field, and they will no longer want to have to carry multiple books in their vehicle or backpack. Therefore this book is only being published as an eBook. It will be available thru Amazon.com only until June at <<http://www.amazon.com/dp/B007HSS1F4>>; thereafter it will be available through her website and elsite. A review will appear in the next issue of ARGIA.

previous comprehensive guides, and has incorporated some very useful features and additional information that makes this book the best yet. It contains all 336 species of Odonata that have been found in eastern North America. Not just dragons or just damsels, but all Odonata. That means one book for everything. It has excellent full-color photographs that are large enough to see coloration and patterns that are important, as well as line drawings of genitalia of males and females where they are important to separate out species. I have used a lot of identification manuals, and I find that the inclusion of line drawings of claspers and subgenital plates, etc., are actually more useful than most photographs. One can simplify the important features in a drawing and it does make identification much easier. Therefore, that is an excellent addition to this book, especially when grouped on pages where appropriate. I also really like his introductory chapter on morphology, with its well-labeled and clear images.

The maps are also well-done with range approximations that are based on data from OdonataCentral and from the dot-maps project that was published by Nick Donnelly in the Bulletin of American Odonatology. The maps are just large enough to give the reader a good idea of the species' ranges. Some of the changes in outlier dots and recent range extensions are not seen in these maps, but that's where regional guides or atlases are still very relevant and necessary.

Dragonflies and Damselflies of the East is well organized, and I really appreciate the effort and arguments that Den-

nis Paulson makes for the collecting of vouchers and the value of collections. These aspects are rarely emphasized in field guides, and we cannot advance the science of the group without collections. In addition, his explanation of the methods used for preservation, study, and photography are well-done. The species accounts are very informational with reference to similar species when appropriate. The natural history summaries for genera are excellent, and valuable information for any Ode enthusiast. I like the presentation and the format of the book, and I really have nothing but praise for it. It is printed on glossy paper, so be careful in the field. The text is densely packed on the pages, and at 538 pages, that is quite understandable. Nobody wants to lug a 750-page book around. At the suggested retail price of \$29.95, this book is such a bargain, that it might be good to buy a couple of them. There is also an e-book version, which I have not seen, but it would probably be very useful on a color e-book-reader in the field such as the Kindle Fire or Nook Color. I doubt that most people want to carry an Apple iPad into the field.

In short, if you are going to buy any book to identify Odonata in eastern North America, *Dragonflies and Damselflies of the East* is that book. 


New Book

Wetland Restoration and Conservation: A technical guide by Thomas R. Biebighauser has just been published. This book reveals practices used to restore over 1,400 wetlands in 18 states and two Canadian provinces, answering questions asked by the thousands of professionals and landowners who have taken the hands-on wetland restoration workshops he has instructed across North America. Discover how to build a wetland that looks and functions as a natural ecosystem for a fraction of the cost of required mitigation projects. Learn how to repair wetlands that have failed, and how unattractive eroding farm ponds can be transformed into beautiful self-sustaining wetland habitats. Dragonflies are mentioned on no less than 12 of the 186 pages in this book. The book is available from www.thewetlandtrust.org/wetlandrestoration for the low introductory price of \$15.50 including postage.

Photos Needed

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

DSA is on Facebook

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

ARGIA and BAO Submission Guidelines

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

Articles

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

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

Figures

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

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

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

Tables

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

The Dragonfly Society Of The Americas

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

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

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

Membership in the Dragonfly Society of the Americas

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

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Back cover: (upper) Rough Green Snake (*Opheodrys aestivus*) eating a Blue Dasher (*Pachydiplax longipennis*) at the Colleyville Nature Center in Tarrant County, Texas. Photo by Brian Gooding. **(lower)** White-belted Ringtail (*Erpetogomphus compositus*) photographed during the CalOdes Dragonfly Blitz in September 2011. Photo by Ron Oriti.

