Newsletter of the Wisconsin Dragonfly Society

Wisconsin Odonata News

Vol.7 Issue 1

Spring, 2019

Fostering the appreciation, study and enjoyment of Wisconsin's dragonflies and damselflies and the aquatic habitats on which they depend.




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Cover photo: Southern Spreadwing *(Lestes australis)* male
By **Dan Jackson**

Wisconsin Dragonfly Society

Board Members

Greetings! I hope this newsletter finds you well and ready to get out and find some dragonflies and damselflies in 2019. As I type this, it is snowing in Eau Claire. This should come as no surprise, as we are only a couple of inches short of the winter snowfall record for my county. This is a record I will take no pleasure in breaking. The positive I take from this challenging winter is that I have never been more excited for spring and dragonfly hunting! So get your nets and cameras ready, spring is on the way!

We had a very good year in 2018 moving the WDS forward. We obtained our 501c3 status as a non-profit, created our new website, and developed some plans to further our education goals in Wisconsin. I cannot thank the members of the board of directors enough for their efforts in accomplishing these goals!

As far as the website goes, I encourage all of you to check it out if you have not already done so. It is loaded with great information. It also has a calendar that we will be using to communicate all our events throughout the year. Please note that our annual meeting is scheduled from June 7th to the 9th! Our website also features a blog that I am committed to using more this year as a place to update you all on things happening within the WDS at large, and the interesting things I am finding throughout the summer.

Moving forward, your board of directors recognizes the need to train more people to teach others about Odonata, and to assist our surveyors in building confidence in their ability to identify species in the field. Last year we purchased material to put together some educational kits to enable people to get out and give presentations. These kits contain nets, loupes, a field guide, and some other literature. Our next step is to set up a train the trainer program. If you are interested in a train the trainer type of class, please contact one of us on the board.

We hope that these efforts will increase the number of people who are willing to submit their Odonata observations to the WOS. Following this initiative, I would like to develop a longer-term survey plan for the state. I envision having a county or regional coordinator in each area of the state to facilitate surveys and the exploration of interesting habitats. This does not mean that this coordinator would have to complete every survey in their area. The coordinator would get to know some of the people near them that are interested in Odonata, and then help guide them to exploring some new habitats and filling in gaps in under-surveyed counties. If this sounds interesting to you, I could use some help. I will be starting a sub-committee of the board of directors to develop this plan. If you are interested in helping me get this developed and off the ground, please contact me directly. You don't have to be a member of the board to participate on a sub-committee, and at this phase, I really just need to get a plan organized. It could largely be started by bouncing ideas around through email.

Spring looms on the horizon, and my arms must abandon the shovel to pick up the net. I will have to take some practice swings to see if I still remember how to use it. I hope to see many of you at the annual meeting and that you all soon get out and enjoy some warmer weather. The skies will soon be filled with insects instead of snowflakes and I cannot wait!

Ryan J. Chrouser

President

2018 Data Reveiw

Ryan Chrouser

Reviewing data submitted to the Wisconsin Odonata Survey (WOS) from the prior field season is a favorite winter activity of mine. I would like to share a little of what I review. First and foremost, to all who submitted records in 2018 (Table 1), thank you! Your time and enthusiasm for Odonata is greatly appreciated and we value all that you do.

Our number of observations per year continues to rise (Chart 1). The raw data shows that we have a handful of very dedicated surveyors in parts of our great state. The data also indicates that the number of counties surveyed decreased (from 58 in 2017, to 51 in 2018). So we still have more room to grow our survey efforts in some of our under surveyed counties. This is something I would like to focus on (see the letter from the president for details). If you would like to see how many species have been reported in your county, or in the counties near you, check out the WOS website to see the list for each county. There are many opportunities throughout the state to get out and find some new county records!

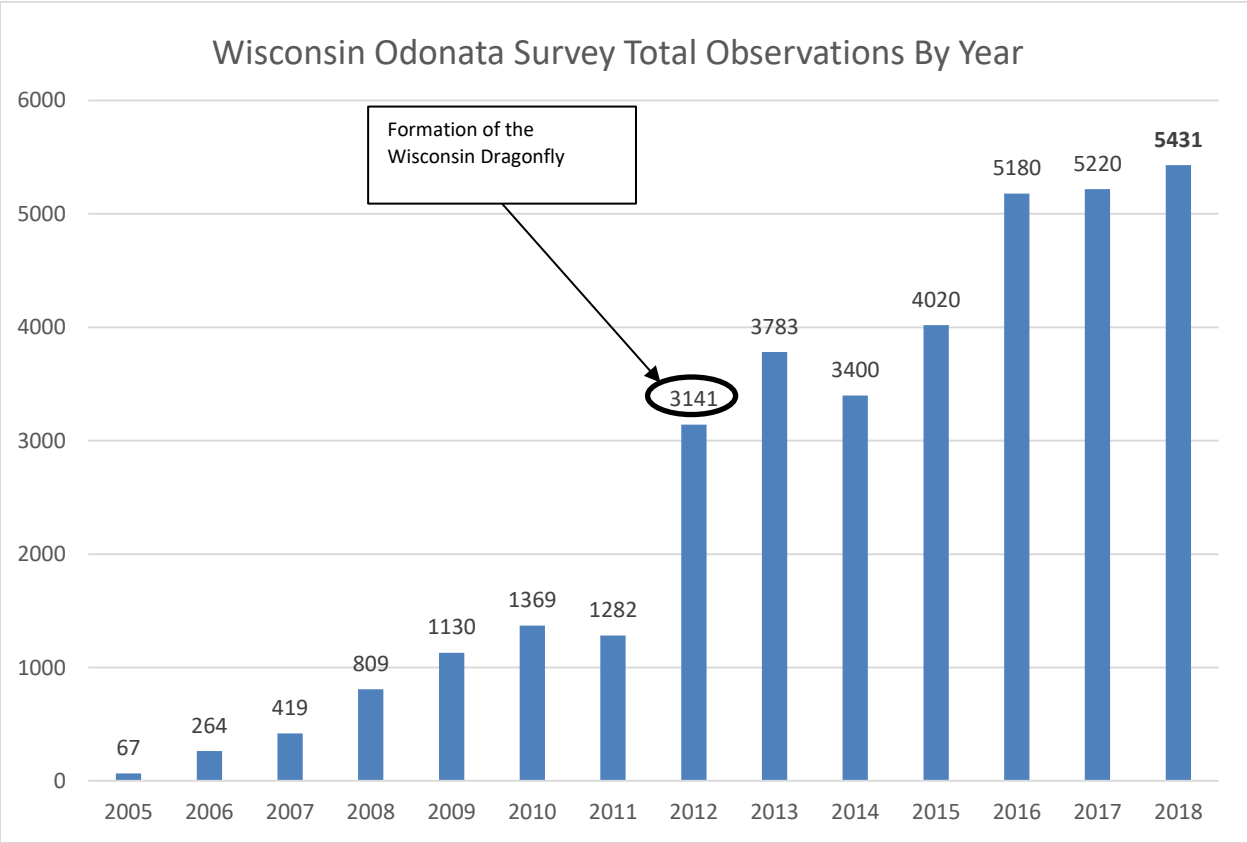
I also like to look at some of the oddities and rarities that we find every year. Table 2 lists some of the interesting things that we found in 2018. The species on this list are identified as "Most-Wanted" species for Wisconsin on the WOS. One of the interesting trends that we observed in 2018 was the influx of some migratory species in Wisconsin, likely driven by some strong southerly winds pushing migrants up farther north than normal. Certainly, the numbers of Black and Red Saddlebags were much higher in my neck of the woods than I have seen before. We also reported a few records of Striped Saddlebags, which is quite rare in Wisconsin. Personally, my most interesting find of the year was a trio of Comet Darners in Eau Claire. This is well north and west of their normal range. My sighting did follow a couple days of very strong southerly winds, which fits nicely with the "southern migrants pushing north" narrative. I will be watching my pond closely to see if there was any successful reproduction. I can't wait to see what we find in 2019!

Table 1 - 2018 WOS Contributors

Jennifer Ambrose	Maureen Gross	Jason Nickels
Mary Backus*	Mike Gruenke	Kerstyn Perrett
Andrew Badje	Douglas Hall	Debra Rade
Sarah Besadny*	Patrick Heyn	Kate Redmond
Ryan Brady	Kurt Huebner	Mike Reese
Valerie Burns	Michael Huebschen	Kelly Sauvage Angel*
Jennifer Callaghan	Dan Jackson	Don Shoonenberg*
Ben Campbell*	Bob Jacobson	Joseph Sommerfeld
Aaron Carlson	Jim Kinderman	Edgar Spalding
Ryan Chrouser	Brad Kolhoff*	Freda van den Broek
John Crase*	Maxwell Kotelnicki*	Lori Widmann
John Dixon	Karl Legler	Matthew Willert*
Cynthia Donegan	Lennie Lichter	Roger Zimmermann
Robert DuBois	Carol Mankiewicz	
Ann Graf	Olaf Nelson	

**New contributor in 2018*

Chart 1 - WDS Number of Species Observed by Year



Comet Darner (*Anax longipes)*
Photo by Ryan Chrouser

Table 2 - "Most-wanted Odes 2018

Species	County
Subarctic Darner	Price
Comet Darner	Eau Claire, Kenosha
Swamp Darner	Waukesha
Harlequin Darner	Marathon, Iron, Sawyer
Blue-eyed Darner	Eau Claire, LaCrosse, Pierce, Chippewa, Monroe
Spatterdock Darner	Ozaukee, Marathon
Springwater Dancer	Iowa
Blue-ringed Dancer	Walworth, Waukesha
Subarctic Bluet	Ashland
River Bluet	Vernon
Azure Bluet	Eau Claire, Adams, LaCrosse, Ozaukee, Waukesha, Dane, Jackson, Waushara, Marathon, Columbia, Milwaukee, Walworth,
Double-striped Bluet	Ozaukee, Waukesha
Slender Bluet	Waukesha, Monroe
Citrine Forktail	Milwaukee
Lilypad Forktail	Walworth, Waukesha
Sphagnum Sprite	Jackson, Price, Waushara
Incurvate Emerald	Eau Claire
Ringed Boghaunter	Wood, Eau Claire
Jade Clubtail	Waukesha, Grant, Milwaukee
Unicorn Clubtail	Waukesha Milwaukee, Ozaukee
Sioux Snaketail	Eau Claire, Chippewa
Great Spreadwing	Milwaukee, Waukesha, Dane
Striped Saddlebags	LaCrosse, Ozaukee, Kenosha
Carolina Saddlebags	Ozaukee
Royal River Cruiser	Grant

Subarctic Darner (*Aeshna subarctica)* Photo by Dan Jackson

We Need Your Help to Learn More about These Damselflies

Robert DuBois
Wisconsin Department of Natural Resources, Superior, WI <robert.dubois@wisconsin.gov>

In this note I'm highlighting four species of Wisconsin's damselflies which have significant information needs. Learning more about any of them is not going to be easy, but I know some of you are up for a challenge! So, if that describes you, please read on.

Southern Spreadwing (*Lestes australis*) – The male of this primarily southern, early-season spreadwing looks much like several other pond spreadwings (genus *Lestes*), especially Sweetflag Spreadwing (*L. forcipatus*) and Northern Spreadwing (*L. disjunctus*). Because of the great physical similarity of these three species, records of the Southern Spreadwing have long been badly confused with those of the other two species. The situation has improved somewhat in the last 15 years with the appearance of field guides, but the distribution, habitat needs, and some basic aspects of the life history of Southern Spreadwing in Wisconsin remain poorly known. Wisconsin is at the northern edge of its known range.

Southern Spreadwing (*Lestes australis*) male Photo by Dan Jackson

The primary need for help is to determine if the Southern Spreadwing breeds successfully in Wisconsin or if it is a vagrant. No tenerals, nymphs, or exuviae have ever been found in Wisconsin despite numerous searches at several sites where adults were not uncommon. Although pond spreadwings are not known to be migratory, many odonates are capable of dispersing widely, and squirrelly things can happen at the edges of a species range. It is possible, therefore, that in early spring Southern Spreadwings disperse northward into our state from breeding areas to the south. Alternatively, it is also possible that the species does breed successfully here, but that searches for evidence of breeding have not been sufficiently exhaustive to document it. So, please consider helping this year to resolve this question once and for all. If you would like to help, you will have to learn how to identify this species (see companion article in this issue) and begin looking for it in late May in shallow, preferably fishless, ponds and marshes. Once you have found a site where mature adults are present in the spring, you could return to that site the following spring, just before the anticipated time of emergence, to collect and rear some *Lestes* nymphs. If some of the nymphs you rear emerge into Southern Spreadwings, then we will have preliminary evidence that it does indeed have a resident population in Wisconsin. By the way, if you do successfully rear any Southern Spreadwings from nymphs collected in Wisconsin, please preserve and retain an associated teneral and exuvia for me! A few sites are known where adults have been found on successive years; if you would like to know the locations, please contact me at robert.dubois@wisconsin.gov.

Blue Ringed Dancers (*Argia sedula*) Photo by Dan Jackson

Blue-ringed Dancer (*Argia sedula*) - This beautiful damselfly, common in rivers of the southern half of the United States, was first discovered in Wisconsin by a visitor in 2014. Subsequent surveys found a robust population in a roughly 20-mile reach of the Bark River in Waukesha and Jefferson counties, where it remains well-established, but surveys in nearby rivers did not find any additional populations (DuBois et al. 2016). However, in July 2018, a new breeding population was found in a short section of a creek in the Mukwonago River Watershed in Walworth County. Despite this recent increase in knowledge, we still don't know just how rare this species is in Wisconsin. This is because damselflies have historically been undersurveyed in our

southern counties where many streams have never been adequately surveyed for them, and the Blue-ringed Dancer can be confused with several species of black-type American bluets (genus *Enallagma*). It is perhaps most often confused with the Stream Bluet (*E. exsulans*), from which it differs in having a darker-looking thorax with a thicker, black shoulder stripe that is notched at the upper end, and an abdomen tip with 3 segments that are all pale blue on top. (Stream Bluet has only one segment [S9] that is entirely pale blue on top). As usual, the diagnostic character for identification is the clasper shape at the abdomen tip seen in side view. The need for help this coming summer (July is prime time) is to look for the Blue-ringed Dancer in more streams and rivers in the southeastern counties. And don't forget to bring your net, hand lens, and field guide!

Vernal Bluet (*Enallagma vernale*) – The status of this blue-type bluet in Wisconsin is uncertain because both sexes look very much like the Northern Bluet (*Enallagma annexum*, formerly *E. cyathigerum*), and therefore, observations have historically been confused with, and lumped together with, that species. In a companion note in this issue (see page 16) I summarize the problems involved with identifying the Vernal Bluet, its unsettled systematic status, some of the interesting aspects of its life history, and I describe the problems it poses for citizen science. Although its status as a valid species is not firmly settled, most experts regard it as such, and we should be doing more to identify it and to understand its ecology and habitat. In overlapping parts of their ranges, the Vernal Bluet is thought to have a very early flight period and to inhabit lakes, ponds and slow streams, often with fish, whereas the Northern Bluet is thought to have a slightly later flight period and to inhabit ponds and shallow wetlands that lack fish. In Wisconsin, however, they have occasionally been found in the same habitats at the same times. We don't have enough data to say much more than that. Although the problems with the Vernal Bluet are rife, we really should stop ignoring it. So, please consider how you might become part of the solution.

Alkali Bluet (*Enallagma clausum*) – This intermediate-type bluet inhabits alkaline lakes and ponds in most of its range in the Intermountain West, but curiously, at eastern edge of range, which for the most part is here in the Upper Midwest, it is found primarily along the shorelines of very large lakes of about average water chemistry. In Wisconsin we have found it only along the shoreline of the western tip of Lake Superior in Douglas and Bayfield counties (DuBois et al. 2004). But is that it? After all, we do have some other very large inland lakes in Wisconsin, the largest of which is Lake Winnebago, but there are also other big ones, and of course, part of the western shoreline of Lake Michigan. How far east along the Lake Superior shore does the range of the Alkali Bluet extend? Into Ashland County or even Iron County? The shorelines of these large waterbodies are typically not brimming with odonates and so have not received much survey attention. So, if you find yourself by one of these big lakes this summer, please give the shoreline vegetation a look, and after sorting through all those Tule Bluets (*E. carunculatum*) and Orange Bluets (*E. signatum*), who knows what else you might find.

References

DuBois, R., Kline, J., Van den Broek, F., Jackson, D., and S. Nanz. 2016. *Argia sedula* (Blue-ringed Dancer), new to Wisconsin. Argia 28(4): 9-11.

DuBois, R. B., Pleski, J. M., Smith, W. A., Epstein, E. J., and K. Mead. 2004. First records for *Aeshna sitchensis* (Odonata: Aeshnidae) and *Enallagma clausum* (Odonata: Coenagrionidae), and a northwestern record for the state-endangered *Somatochlora incurvata* (Odonata: Corduliidae) in Wisconsin. The Great Lakes Entomologist 37: 126-130.

Tips for Learning to Identify the Southern Spreadwing – It'll be Worth it!

Robert DuBois
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The Southern Spreadwing (*Lestes australis*) is an interesting, enigmatic, and apparently uncommon species in Wisconsin. It is enigmatic, at least in part, because it's been devilishly difficult to identify. The root of the problem is that the males of this primarily southern species look very much like the males of several closely related species, especially Sweetflag Spreadwing (*L. forcipatus*) and Northern Spreadwing (*L. disjunctus*) (hereafter I'll refer to this group as the 3 amigos).

The identity of male pond spreadwings is usually easier to confirm (by examining structural body parts) than the identity of females, therefore males have been the sex most focused on for identification. Because of the physical similarity of the adult males of the 3 amigos (the imagoes of the amigos?!), observations of the Southern Spreadwing have been badly confused with, and mistaken for, those of the other two species ever since people first began observing spreadwings in our state. And the bad news gets worse – in Wisconsin the 3 amigos are all found in roughly the same kinds of habitats – typically shallow ponds and marshes that usually lack fish. Elsewhere in the range of the Southern it can also be found in lakes and slow streams, but I have not found it in those kinds of habitats here. Not surprisingly, our understanding of the distribution, habitat needs, and even some basic elements of the life history of the Southern Spreadwing in Wisconsin are all a bit shaky. Learning anything about a species necessarily begins with learning how to identify it correctly and consistently. We sure need to do that with the 3 amigos!

By way of some background, males of the three amigos can usually be distinguished under magnification, and sometimes in good close-up photographs, but it's not always easy, nor always certain. Here is an overview of some of the more reliable ways to do it. Bear in mind that you should always prefer structural shapes of body parts over color patterns, if you have access to good magnification. The first step in the ID process goes like this: there are two "teeth" on the inner side of each cercus (aka upper clasper) that you can see in top view, the shapes of which will help you identify the males.

In the Northern Spreadwing, these two teeth are roughly the same size and shape, which allows you to distinguish that species rather easily. In Southern and Sweetflag spreadwings the two teeth on a cercus are not the same shape – the tooth nearer the tip of the cercus is noticeably blunter and less pointed than the tooth nearer the base. Also, the teeth are further apart on Sweetflag and Southern than they are on Northern. Please check the illustrations in at least one of the references (Donnelly 2003; DuBois 2019, Lam 2004, Paulson 2011, Westfall and May 2006). Of course, you will eventually run into some specimens in which this character appears to be intermediate; it wouldn't be any fun without that, right?

Southern Spreadwing (*Lestes australis*) Photo by Dan Jackson

Northern Spreadwing (*Lestes disjunctus* Photo by Dan Jackson

Sweetflag Spreadwing (*Lestes forcipatus*) male Photo by Dan Jackson

Unfortunately, though, the cerci of males of Sweetflag and Southern spreadwings are nearly identical, so that character alone won't usually work. For them you need help from the females (more on that below).

Many other characters can be looked at to separate males of these species, including some color-pattern and body pruinosity differences, and a few other body-part shape differences, most notably with the paraprocts (lower claspers, also seen in top view; Donnelly 2003), but these differences are for the most part either very slight or probably not constant throughout the ranges of the three species. Several, though, are worth mentioning for specimens in Wisconsin. One helpful "tell" for mature males is the usual presence of pruinosity on the entire upper surface of abdominal segment 2 on Northern Spreadwing; Southern Spreadwing is usually pruinose only on the sides of that segment, not on top; and Sweetflag Spreadwing usually has pruinosity only on about 2/3rds of the top of that segment, the rest being shiny. This character might not work throughout the entire ranges of the 3 amigos, but in Wisconsin, it seems pretty good with mature males.

Next, Southern spreadwing typically has dark marks at the ends of each of the mid-abdominal segments that contrast sharply with the light areas next to them (seen in side- or oblique-view). These dark marks can appear as bands or rings and are often visible to the naked eye and in good photographs; these contrasting marks are not as pronounced on Northern and are usually not quite as pronounced on Sweetflag. Also, male Sweetflag Spreadwings usually have a black dot on the lower edge of the thorax that is lacking on the other two amigos, but sometimes the dot is partly obscured by pruinosity and it can be hard to see. Do study all the differences mentioned in the references. It can't hurt (I sort of wanted to insert a smiley face here), and as you get better at identifying tough spreadwings you'll want to know about these differences.

Whew! Now that we've got all of that out of the way, I want to point out a couple of simple ideas that will help you greatly as you begin to learn to identify the Southern Spreadwing here, at the northern edge of its range. There are two major keys to getting started: 1) look early in the flight season, and 2) look at the females in associated pairs (pairs in wheel, in tandem, or laying eggs). You will want to look early in the season because the Southern Spreadwing has a very early flight period that peaks in late May and early June (assuming a thermally near-average spring), which is before the other two amigos really get going in mid- to late-June. You might even want to stop looking for Southern Spreadwings after about the first two weeks of June. Looking for it early in the season will help you rule out most Northern Spreadwings, which don't usually begin to emerge until late June, but to be safe you should still look at the cerci of the males to strengthen your reasons for ruling out Northern. The early flight season is such a strong clue that any spreadwing you see in late May is likely to be Southern. Most of our other spreadwing species can have some early-emerging individuals, but they are not usually out before early June, and they are unlikely to be confused with the 3 amigos because of substantial differences in size, coloration, and shapes of the cerci at the abdomen tip. An early spreadwing often found in the same habitats as Southern is Amber-winged (*L. eurinus*), but it is large and distinctively marked, and so is easily identified.

Sweetflag Spreadwing (*Lestes forcipatus*) female Photo by Dan Jackson

You will want to look at females in associated pairs because doing so will help you rule out Sweetflag Spreadwing, which is the species most often confused with Southern. Female Sweetflag has a very long ovipositor (egg-laying structure) that you will come to recognize with a little experience (check it out in one of the damselfly field guides in the references). Seeing that long ovipositor will allow you to rule out Southern and Northern; not seeing it will allow you to rule out Sweetflag. Coloration of the ovipositor can also help to separate females of Northern from the other two species. The lower (ventral) half of the ovipositor of Northern is usually all or mostly pale, whereas the lower halves of the ovipositors of the other two species are usually all or mostly black. Although female damselflies will sometimes form tandem with males of the wrong species, usually they do get it right, so identifying one sex tends to reinforce the identity of the other (Lam 2004). Whenever possible, try to find more than one associated pair. If you find just one pair, they could be mismatched (two species that have erroneously formed tandem, technically called interspecific tandem) even though the chances of that happening are small. But if you find several pairs, and they are all telling you the same story, then the odds are nearly certain that you will be correctly identifying both sexes.

In sum, the least painful way to begin to get comfortable with identifying the Southern Spreadwing is to follow the process outlined here:

1). Begin looking around shallow, fishless ponds and marshes during the last week of May and stop looking after about the first two weeks of June. This alone will help you rule out most Northern Spreadwings, but you will still have to look at the cerci, segment 2 pruinosity, and abdominal color patterns of

the males, and the color of the ovipositor of the females, to help rule out Northern.

2). Look for multiple, associated pairs to greatly help rule out the Sweetflag Spreadwing due to the female's very long ovipositor, and the mostly pale lower half of the ovipositor of the Northern Spreadwing will help rule out that species as well.

3). Instead of just taking photographs and later wondering "what species of spreadwing is this," consider netting a few at each site and examining them with a hand lens. You can then let them go if you wish, but this hands-on process will help you learn to recognize these species.

4). Further increase your identification skills by studying the color patterns, pruinosity patterns, and various body-part shapes and dimensions mentioned in field guides, in Donnelly (2003) and in dichotomous keys (e.g. Westfall and May 2006). Having access to a stereomicroscope and decent light source will be a tremendous help to the highly motivated.

Soon you will be well-positioned to help with the unraveling of some of the mysteries with the Southern Spreadwing in Wisconsin!

Acknowledgments

I greatly appreciate some helpful review comments from Dan Jackson and Ken Tennessen that have improved this note. The Bureau of Natural Heritage Conservation of the WDNR funded this research.

References

Donnelly, N. 2003. *Lestes disjunctus*, *forcipatus*, and *australis*: a confusing complex of North American damselflies. Argia 15(3): 10-13.

DuBois, R. 2019. Damselflies of Minnesota, Wisconsin & Michigan. Kollath+Stensaas Publishing, Duluth, MN.

Lam, E. 2004. Damselflies of the Northeast. Biodiversity Books, Forest Hills, NY.

Paulson, D. 2011. Dragonflies and damselflies of the East. Princeton University Press, Princeton, NJ.

Westfall, M. and M. May. 2006, Damselflies of North America. Scientific Publishers, Gainesville, FL.

Southern Spreadwing (*Lestes australis)*

Sweetflag Spreadwing (*Lestes forcipatus)*

Exoskeletons (In the Closet Too)

Ken Tennessen

We learned in high school biology that insects do not have backbones. That quotidian yet pertinent fact is something we all may remember. To revisit, the insect body, as in all arthropods, is supported and protected by an outer **exoskeleton**. An exoskeleton is not homologous to the vertebrate skeleton (bone develops from embryonic mesoderm, exoskeleton from ectoderm); rather, it is a living, multi-layered outer covering[1]. Besides giving the insect body its shape, an exoskeleton serves many critical functions (much as the skin of vertebrates does), including 1) preventing water loss and enhancing respiration, 2) providing a sensory surface, 3) providing a surface for colors and patterns (camouflage, signaling, etc.), 4) producing exocrine glands, and 5) serving as attachment points for muscles.

I would like to expand on the last point, that muscles are attached to the inside of the insect exoskeleton. My reason for this article is to dispel any misconception about the exoskeleton being merely a hollow tube holding all the squishy stuff inside, despite what may appear on your windshield on a warm summer night. Insects, depending on the group, have a few hundred to a few thousand muscles (Triplehorn & Johnson 2005); comparatively, the human body has around 600–800 (depending on who is doing the counting). I don't know how many muscles are inside dragonflies, but as in other insects, many (maybe most) of their muscles attach to the body wall.

So what's the exoskeleton like on the inside? The inside of the dragonfly exoskeleton is similar to that of most insects, in both adult and nymph stages— it is an "**endoskeleton**." What does this look like? The inner wall of the integument has a variety of hardened (sclerotized) evaginations that extend into the body cavity; these apophyses are known as **apodemes**. These structures vary from stiff to slightly flexible; they strengthen and brace the body wall at key points but also act as anchors upon which muscles are attached. For example, the head contains a truss-like formation, known as the **tentorium** (Fig. 1). The tentorium reinforces the head capsule and serves as anchor for many of the muscles inside the head including the powerful mouthparts; its structure was described and illustrated in detail by Lew (1933).

Throughout the thoracic segments (including the legs) and the abdomen, there are apodemes also, in the form of plates, rods and ridges which strengthen the body wall and/or serve as muscle attachment points. The endoskeleton of each group of insects has evolved specifically to accommodate a muscular system that effects the movements needed for survival. To sum it up, interior skeletal structure provides the framework for the muscles to perform all the amazing behavioral feats we see dragonflies do.

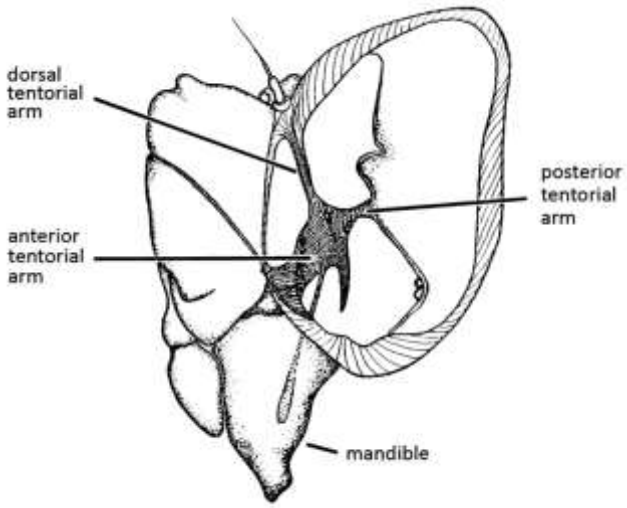


Figure 1. Longitudinal section of an adult dragonfly head (facing left) showing part of the endoskeleton containing the tentorial arms (adapted from Lew 1933).

Because dragonfly nymphs have to molt numerous times in order to grow and then emerge to the adult stage, we might ask "What happens to muscle attachments during molting from one instar to another, or prior to adult emergence?" The physiology of the process is complicated, and it may differ according to muscle group, but according to Chapman (1971), it appears that muscle connections with the new cuticle are formed at the same time as the old ones are broken, so that attachments on the cuticle are maintained during molting, at least for some muscles. This allows the nymph to move during a molt and the adult to metamorphose.

Incidentally, you can see the endoskeleton of dragonflies for yourself without sacrificing any live individuals; go out and find exuviae along a stream or around a pond, or check for dead adults along roads, on car grills or in spider webs and carefully dissect them (best to put them in 70% alcohol first and then put them under a microscope). I have so many exuviae that I converted a closet in my house into a collection depository, hence the title of this note.

[1] The insect exoskeleton is often described as rigid; that is generally true of individual segments, but insect bodies are flexible in areas where they need to be. Watch a dragonfly or mantis turn its head to check you out if you get close. Watch a dragonfly curve its abdomen for cleaning or mating. For a stunning demonstration, grasp a living bee or wasp by the thorax with forceps (firmly but as gently as possible) and see how it can twist and turn its abdomen in attempts to sting what is holding it.

References

Chapman, R. F. 1971. *The Insects: Structure and Function*. 2nd edtion. American Elsevier Publishing Company, New York. 819 pp.

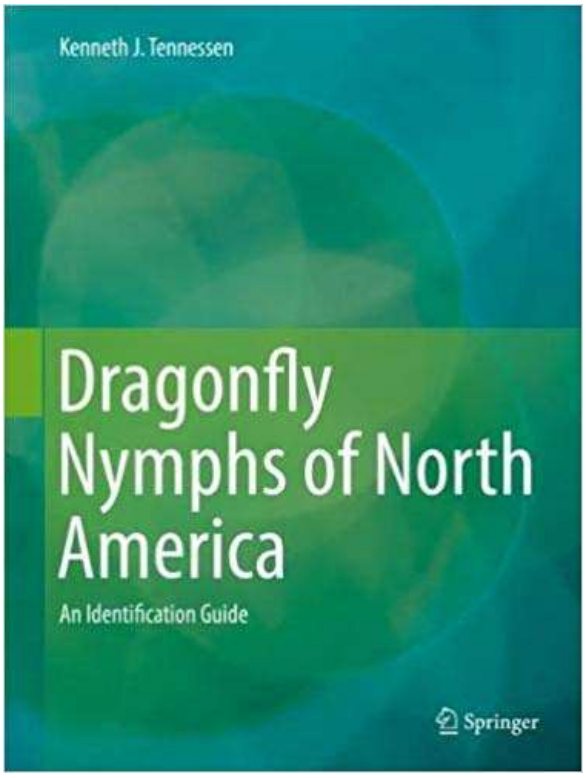
Lew, G. T. W. 1933. Head characters of Odonata with special reference to the development of the compound eyes. Entomologica Americana 14(2):41–97.

Triplehorn, C. A., and N. F. Johnson. 2005. *Borror and DeLong's Introduction to the Study of Insects*. Thomson Brooks/Cole, Belmont, California. 864 pp.

New Book Announcement

Ken Tennessen's **Dragonfly Nymphs of North America: An Identification Guide** can now be ordered from the publisher, Springer, at https://www.springer.com/us/book/9783319977751 and from Amazon.

The print version is expected to ship around mid-April, but the e-book is already available for previewing and downloading.



The Power of Observing

Ami Thompson

They had all died. That was the most surprising discovery of my research so far. It was late in the winter of 2017-2018 and my field team had chainsawed through 20 inches of ice to collect the overwintering Common Green Darner nymphs below. As soon as we pulled out the ice blocks we saw the bodies of Common Green Darners rising up on the bubbles released from the disturbed pond sediment. The smell of sulfur was strong. When we swooped in the water we collected more dead common greens, and when we looked at the bottom of ice blocks there were dead Common Green Darners frozen inside. They must have floated up as they decomposed and were encased as the ice thickened from the top down. This was a clearly a winter kill event.

Photo by Scott Dodds

This observation brings up a myriad of questions. What caused this winter kill event (harsh winter conditions maybe)? Did all the odonates die (no, we observed living skimmers and spreadwings…)? Why are Common Green Darners seemingly more vulnerable to winter kills (maybe because they are more tropically evolved or because they are generalists and don't have special cold endurance adaptations...)? What impact will this have on the pond ecology in spring (will the absence of the large predacious nymphs let the prey species become more abundant)? What are the benefit and cost trade-offs for migrating vs. overwintering Common Green Darners (being killed over the winter is certainly a serious risk…)?

My observational PhD research data is doing its job by generating all these questions however it won't be able to answer them. The things I've observed about the growth and phenology of Common Green Darners, at Crow-Hassan Park Reserve in central Minnesota over the past three years hint at potential answers, but we won't know for sure until experimental research is conducted. Experiments are carefully designed and methodically conducted with the purpose of answering a specific question in a way that isolates the variables involved. For example, the sulfur smell in my research ponds suggests the water had become anoxic. An experiment could be set up to test the effects of low oxygen (the "predictor variable" if you'd like to tap into your middle school science memories) on Common Green Darner mortality (the "response variable"). This would likely be set up in a lab, maybe with a bunch of tanks calibrated to have water with a range of dissolved oxygen levels and then scientists could observe and record how long common green darners survived in each tank before they died - making sure to keep all the other variables (like amount of food and water temperature) constant.

Comprehensive foundational observational work has already been done for many mammals, birds, and game fish but odonatology is still a fertile unexplored playground for observational naturalists who revel in the messy, gritty, rewarding, complicated, and surprising world of freshwater ecology. It feels truly fantastic to be outside in the water dip netting, collecting, observing patterns and letting those thoughts weave new questions in my mind. Frankly, it's a good thing it's fun because it's also a heck of a lot of work and couldn't be accomplished without the help of many. More than 40 volunteers and undergraduates have helped me collect nearly 6,000 nymphs and over 9,000 exuviae over three years. Very few of those people will become academic researchers but all of them are citizen scientists.

One of the best things about observational research is that gives citizen scientists, like Wisconsin Dragonfly Society members, an incredible opportunity to contribute to scientific knowledge. Most observational data collection doesn't require fancy equipment, access to a lab, or statistical acumen; just a human with a good deal of curiosity and dedication to getting to know a special place. You can volunteer for an academic researcher like me, take part in survey organized by WDS, or go out and independently record your own observations. Whichever path you choose please feel empowered to share and publish your experiences and results in newsletters, journals, at conferences, or through emails with other scientists. Science, like art, is a process that is rewarding in itself and is strengthened by the sharing of results and constructive discussion. Your research doesn't have to be national-art-gallery-caliber to be displayed and discussed; it benefits the entire scientific community whenever someone publishes their work. You just might

inspire someone new to go get their feet wet and discover the power and joy of observing.

Note: I've been deeply ensconced in writing my dissertation this winter so when Freda asked me to write an article for the WDS newsletter I was grateful for the opportunity to switch gears. I wanted to share some thoughts about the process and culture of scientific research which have been clunking around in my mind. I will be following my own advice and publishing my dissertation this fall as a whole document through the University of Minnesota and hopefully also as a few different articles in scientific journals. If you'd like to talk to me more about common green darner phenology, nymph growth and development, or about participating in scientific research please catch me at a WDS or Minnesota Dragonfly Society event sometime this summer.

Ami Thompson, with Curt Oien and Mitch Haag
Photos by Scott Dodds

Let's Start Talking about the Vernal Bluet

Robert DuBois
Wisconsin Department of Natural Resources, Superior, WI <robert.dubois@wisconsin.gov>

Did you know that there is a totally cool damselfly in Wisconsin that we have been ignoring? That's right, the Vernal Bluet (*Enallagma vernale*) is a blue-type bluet that is fascinating, evolutionarily important, and vexingly confusing, all at the same time. The confusing part has to do with how difficult it is to identify, which can hardly be overstated, and questions about whether it is a valid species, just a subspecies of the very similar Northern Bluet (*Enallagma annexum*, formerly *E. cyathigerum*), or not even deserving of subspecific rank. The males are very hard to separate from males of the Northern Bluet and the females aren't any easier.

Males can supposedly be distinguished by some tiny, highly variable, and inadequately defined features of the cerci, but there are many intermediate forms, presumably hybrids (intergrades). However, both Tennessen (1998) and May (1998) questioned the wisdom of assuming the intermediate forms to be hybrids; to my knowledge, this issue still has not been fully resolved. Donnelly (2003) noted that some of the early illustrations of the cerci of the males were incorrect, which adds further confusion. Females can allegedly be determined by the positioning of the medial ridges (laminae) on top of the synthorax (Gloyd 1943; Walker 1953; Westfall and May 2006). However, Donnelly (1989) found no distinction between the two forms in this character. My preliminary results align with those of Donnelly (1989); most of the female Northern Bluets in the collection I manage - those that were taken in copula with Northern Bluet males - have medial ridges at angles that do not concord with the couplet given in the most recent key (Westfall and May 2006).

Walker (1953) thought the nymphs of Vernal Bluet were distinguishable from those of both Northern Bluet and Boreal Bluet (*E. boreale*) based on characteristics of the caudal gill tracheae and setae on various body parts. Tennessen (2005) verified the differences reported by Walker and found an additional character to separate them. However, the most recent key does not try to separate Vernal nymphs from Northern nymphs (Westfall and May 2006), and McPeek (1998), who has done much work with the nymphs of the three species, claimed that Vernal Bluet nymphs are indistinguishable in morphology (form) from those of Boreal Bluet, although very different in behavior (more on that below). Sibley (2011) found that adult Vernal Bluets in central New York state averaged substantially larger in size than Northern Bluets, but according to Walker (1953) they averaged smaller. And, so it goes.

The range, and sometimes the habitat and flight period, of Vernal Bluet overlaps with those of the Northern Bluet and Boreal Bluet, at least in Wisconsin, but further east the preferred habitat of Vernal Bluet usually differs from the other two species (Donnelly 1989). However, Pilon and colleagues in Quebec (cited by Donnelly 1989) did not report any differences in habitat between Vernal and Northern bluets.

In the decades after Gloyd's (1943) description of the Vernal Bluet, it was not widely accepted as a valid species (Garrison 1984; Donnelly 1989). In the first edition of Damselflies of North America, Westfall and May (1996) followed Donnelly (1989) in considering the Vernal Bluet to be only subspecifically distinct from the Northern Bluet, though "with some reservations" based on the complete overlap of their geographic ranges, evidence of intergradation, and habitat differences. Indeed, May (1997) noted that because the two forms co-occur over much of their ranges, they are not subspecies in the usual sense.

More recently, the consensus of opinion among geneticists and other experts has swung in the direction of Vernal Bluet being considered a valid species. In 1998, Donnelly questioned his earlier recommendation and was ready to accept Vernal Bluet as a valid species. In their revised edition of Damselflies of North America, Westfall and May (2006) also switched their position to provisionally regard the Vernal Bluet as a valid species "despite remaining questions about its morphological and genetic distinctiveness." Donnelly (2001) theorized that because of man's extensive modification of the landscape, the two species might "mongrelize" in the Northeast and lose their identities.

The first damselfly field guides for regions within the range of the Vernal Bluet did not recognize it as a valid species (Carpenter 1997; Nikula, Loose, and Burne 2003; Lam 2004; DuBois 2005); in my case, the decision was partially due to the difficulty in separating the two forms morphologically and in not knowing how to give guidance regarding the plethora of presumed intergrades. In my recent update (DuBois 2019) I did not change my treatment of Vernal Bluet because virtually nothing we know about it has changed since 2005. I still don't know how to give guidance on identifying it or how to deal with the intermediate forms, and the remaining questions about its morphological distinctiveness have not been adequately addressed. This does not necessarily mean that I disagree that it is a valid species: I simply don't pretend to know what is going on with the Vernal Bluet across its range, except that our taxonomic constructs seem to be struggling to categorize whatever it is. As a field guide author, I have trouble justifying treating it differently now than I did earlier.

The fascinating and evolutionarily important aspects of the Vernal Bluet have to do with its presumed recent splitting away from the Northern Bluet. In a recent email to me, geneticist Mark McPeek, who considers the Vernal Bluet to be a valid species (McPeek 1998), shared the thought that the Vernal Bluet is "… probably the coolest and most interesting *Enallagma* evolutionarily. The morphological and behavioral relationships strongly imply that it is the only back-shift in habitat (from "dragonfly" lakes to "fish" lakes) that exists today." The basic idea, simplified a bit, is that members of the genus of American Bluets (*Enallagma*) are thought to have originated in lakes with fish, and by "fish" it is meant centrarchid fishes like sunfishes (genus *Lepomis*) and largemouth bass (*Micropterus salmoides*), as the top predators (these are called "fish lakes"). However, the progenitor species of Northern, Boreal, and Vernal bluets shifted adaptively to the predation regime present in waters without those fishes, which usually have dragonfly nymphs as top predators (these are called "dragonfly lakes"). This adaptive shift included changes in both the morphology (presumably) and behavior of the nymphs.

When adapted to waters without fish, nymphs tend to swim away from attacking predators, which works out well if the predators are dragonfly nymphs, but not so well if the predators are fish (Stoks et al. 2003). Nymphs adapted to waters with fish tend to reduce their movements and foraging activity when threatened by fish predators. So, after the ancestor of the Northern Bluet moved from waters with fish and evolved to live successfully in waters without fish (dragonfly lakes), a speciation event produced the present Northern Bluet and Boreal Bluet (Turgeon et al. 2005). Then, it is thought that the Vernal Bluet was derived from the Northern Bluet as a result of a secondary reinvasion of the ancestral fish-lake habitat of the genus (Stoks et al. 2005).

Interestingly, when the progenitor species of *Enallagma* shifted from fish-lake to dragonfly-lake habitats, the nymphs evidently lost the ability to recognize fish as predators as evidenced by their greater movement and feeding in the presence of fish (Stoks et al. 2003). Therefore, selection was required to alter the behavior of Vernal Bluet nymphs back to that needed to survive in lakes with centrarchid fishes (the back-switch alluded to by McPeek). In sum, the Vernal Bluet appears to be an evolutionarily fascinating element of our biodiversity, but it is also a devilishly difficult one to identify without advanced tools, and perhaps even with them.

So, where does the Vernal Bluet quandary leave us as citizen scientists? We are in the uncomfortable position of having in our midst an interesting and evolutionarily important entity - one that is probably a valid species - and we have been blissfully ignoring it (well, the ignoring of it was done under my watch – you are not to blame). What can you do to help? If I knew of an easy answer to that question I would have written this note long ago. The hard (and incomplete) answer is that the Vernal Bluet isn't going away, and it is too important to keep ignoring. We need to at least start talking about it. Ultimately, we will have to learn how to identify it, and how to classify the intermediates. Clearly, I don't have all the answers. I doubt that Vernal and Northern bluets can be reliably and consistently distinguished in the field with a hand lens. Identifying them will realistically require netting specimens and examining them with a dissecting microscope.

I know that most citizen scientists don't carry nets, much less have ready access to stereomicroscopes. Dealing with the Vernal Bluet therefore looks like an impossible mountain to climb, but we shouldn't be comfortable ignoring it any longer. Citizen scientists (like you) have been known to surprise the "experts" with the quality of their work. So, I won't underestimate the capabilities of anyone reading this note. Maybe more of you will start carrying nets and hand lenses when you head into the field. Maybe some of you will purchase a student-level stereomicroscope, or you will find where to get access to one. If so, the best resources now available to try to identify the Vernal Bluet are the illustrations, images, and descriptions given by Donnelly (1989, 1998); Lam (2004); Westfall and May (2006); and Paulson (2011). I'm hoping some of you will familiarize yourselves with them. Be forewarned that these references might be confusing to interpret, at least initially, and their conclusions might not be entirely correct. I plan to keep studying the 150 or so specimens (both species combined) in the collection I manage, and I will try to construct a workable system for identifying the two species, and the intermediate forms, in Wisconsin. If I succeed, you'll be the first to know. Until then, let's keep talking.

Northern Bluet (*Enallagma annexum*) Photo by Dan Jackson

Acknowledgments

I greatly appreciate some helpful review comments from Ken Tennessen. The Bureau of Natural Heritage Conservation of the Wisconsin Department of Natural Resources funded this research.

References

Carpenter, V. 1997. Dragonflies and damselflies of Cape Cod (2nd ed.). Cape Cod Museum of Natural History, Natural History Series No. 4, Brewster, MA.

Donnelly, T. W. 1989. The status of *Enallagma cyathigerum* (Charp.) and *E. vernale* Gloyd in south-central New York (Zygoptera: Coenagrionidae). Odonatologica 18(4): 373-378.

Donnelly, N. 1998. *Enallagma cyathigerum* and *vernale*: species, subspecies, hybrids, all of the above, or none of the above? You be the judge. Argia 10(1): 20-22.

Donnelly, N. 2001. Taxonomic problems with North American Odonata species – a last appeal for information. Argia 13(2): 5-7.

Donnelly, N. 2003. Common name for *Enallagma vernale*. Argia 15(3): 17.

DuBois, B. 2005. Damselflies of the North Woods. Kollath+Stensaas Publishers, Duluth, MN.

DuBois, R. In press. Damselflies of Minnesota, Wisconsin, and Michigan. Kollath+Stensaas Publishers, Duluth, MN.

Garrison, R. W. 1984. Revision of the genus *Enallagma* in the United States west of the Rocky Mountains, and identification of certain larvae by discriminant analysis. University of California Publications in Entomology 105: 1-129.

Gloyd, L. K. 1943. *Enallagma vernale*, a new species of Odonata from Michigan. Occasional Papers of the Museum of Zoology, University of Michigan 479: 1-8.

Lam, E. 2004. Damselflies of the Northeast. Biodiversity Books, Westchester, NY.

May, M. L. 1997. The status of some species of *Enallagma* (Odonata: Zygoptera: Coenagrionidae). Entomological News 108(2): 77-91.

May, M. 1998. Comments on *Enallagma* problems. Argia 10(1): 24.

McPeek, M. 1998. Comments on *Enallagma cyathigerum* and *vernale*. Argia 10(1): 22-23.

Nikula, B., Loose, J. L., and M. R. Burne. 2003. A field guide to the dragonflies and damselflies of Massachusetts. Natural Heritage & Endangered Species Program, Massachusetts Division of Fisheries & Wildlife, Westborough, MA.

Paulson, D. 2011. Dragonflies and damselflies of the East. Princeton University Press, Princeton, NJ.

Sibley, F. C. 2011. Comments on *Enallagma annexum* (Northern Bluet) and *vernale* (Vernal Bluet) in Upstate New York. Argia 23(4): 9-10.

Stoks, R., McPeek, M. A., and J. L. Mitchell. 2003. Evolution of prey behavior in response to changes in predation regime: damselflies in fish and dragonfly lakes. Evolution 57(3): 574-585.

Stoks, R., Nystrom, J. L., May, M. L., and M. A. McPeek. 2005. Parallel evolution in ecological and reproductive traits to produce cryptic damselfly species across the Holarctic. Evolution 59(9): 1976-1988.

Tennessen, K. 1998. Will the real *Enallagma vernale* please stand out? Argia 10(1): 23-24.

Tennessen, K. J. 2005. The larvae of *Enallagma davisi* Westfall and *E. recurvatum* Davis (Odonata: Coenagrionidae). Journal of the New York Entomological Society 113(3-4): 205-211.

Turgeon, J., Stoks, R., Thum, R. A., Brown, J. M., and M. A. McPeek. 2005. Simultaneous quaternary radiations of three damselfly clades across the Holarctic. American Naturalist 165(4): E78-E107.

Walker, E. M. 1953. The Odonata of Canada and Alaska, Volume I. University of Toronto Press, London, Ontario.

Westfall, M. J. and M. L. May. 1996. Damselflies of North America. Scientific Publishers, Gainesville, FL.

Westfall, M. J. and M. L. May.2006. Damselflies of North America (revised edition). Scientific Publishers, Gainesville, FL.

Rare Striped Saddlebags at Forest Beach Migratory Preserve

Kate Redmond

With thanks to *The BugLady* for permission to reprint this article.

Greetings, BugFans,

(This episode may look familiar to you if you read the newsletter of the Western Great Lakes Bird and Bat Observatory, where it appeared earlier in fall. Forest Beach Migratory Preserve is a property of the Ozaukee Washington Land Trust. If you don't support these two fine organizations, please consider it).

It should come as no surprise to seasoned BugFans to hear that the BugLady and her camera spend a fair amount of time in the warmer months cruising for dragonflies and damselflies.

One of her haunts is Forest Beach Migratory Preserve, a reclaimed golf course in Ozaukee County that was created to be a resting and refueling place for migrating birds and a productive habitat for breeding species. It turns out that what's good for the birds is good for Odonates, too. Scroll down to "*Rare Dragonfly at FBMP*" https://us1.campaign-archive.com/?u=77bf270ce9f3dbbe587874a0c&id=162a98c2ef. A number of rare dragonflies and damselflies have found their way to Forest Beach, so it's on the radar of dragonfly enthusiasts; with more eyes on the place, it's only a matter of time before new species are discovered (that's called the Patagonia Picnic Table Effect) (Google it). Eight of the forty-two (so far) species on the property list are considered rare visitors to Wisconsin.

Striped Saddlebags (*Tramea calverti)* Photo by Kate Redmond

Saddlebags are called saddlebags because of the pigmented area on the wings on either side of the abdomen. Red, Black, and Carolina Saddlebags are in the "*broadsaddle*" group, because their irregularly-shaped "saddles" are wide. Black Saddlebags (also pictured here) are common at Forest Beach from mid-summer on; Red Saddlebags are a little less common; and Carolina Saddlebags, rare visitors to Wisconsin from the eastern and southeastern US, are spotted at Forest Beach fairly regularly.

Fall is an exciting time to be at Forest Beach, because the big guys – the darners and saddlebags – rule. On September 11, 2018 the BugLady photographed (and initially misidentified – thanks BugFan Freda) a fourth saddlebags at the Preserve, a Striped Saddlebags (*Tramea calverti*). Two weeks later she found another one, a different individual!

Striped Saddlebags, named for the conspicuous markings on the thorax, are in the "*narrowsaddle*" group because the smooth-edged "saddles" don't extend very far into their wings. They're a tropical species that are "*vagrants*" or "*accidentals*" here – not regular migrants (only about 15 species of dragonflies are migratory), but unpredictable wanderers. As a result, they're a "Most Wanted" species among dragonfly-watchers in Wisconsin and elsewhere. There are small, resident populations in far South Florida and along the US-Mexico border, but they're more at home through Central and South America, the Galapagos, and the Bahamas. Striped Saddlebags wander farther north than other narrowsaddle saddlebags do.

See a really nice set of pictures at http://azdragonfly.org/species/striped-saddlebags.

As vagrants, Striped Saddlebags have some big flight years and other years when they mostly stay home, but when they do travel, it's not uncommon for them to travel in small groups. A huge flight occurred in 2010, when Striped Saddlebags appeared in Michigan, Minnesota, Ontario, and New Jersey - an article on the Cape May (NJ) Observatory's "View from the Cape" BlogSpot described the area as "*Swimming in Striped Saddlebags*" (https://cmboviewfromthecape.blogspot.com/2010/09/swimming-in-striped-saddlebags.html) (and clearly, there was some hanky-panky going on - https://bugguide.net/node/view/467584/bgimage). There were widespread sightings again in 2012.

The Wisconsin Odonata Survey website (http://wiatri.net/inventory/odonata/) lists a total of 19 Striped Saddlebags sightings since their first records in 2012, when it was seen in five counties. Of the 19 sightings, 14 are from four southwestern counties along the Mississippi. Along with the individuals seen at Forest Beach in

2018, Striped Saddlebagswere recorded Kenosha County in early September and in La Crosse County in late September.

The life cycle of a Striped Saddlebags mirrors that of other saddlebags. Males and females fly in tandem over suitable wetlands (shallow, open, fishless ponds with lots of floating vegetation); he releases her to drop down to the surface to deposit a few eggs, but afterward she returns to him and he re-fastens his claspers on the back of her head as they look for another spot. This prevents her from being pirated by another male.

The young dragonflies (naiads) live under water, feeding on any aquatic invertebrates that they can tackle. Mature naiads crawl out of the water, often under cover of darkness in order to avoid predators, rest, and then split the back of their exoskeleton and pull their body out. When their wings are fully extended and hardened, they are ready for flight.

Both male and female Striped Saddlebags were present at Forest Beach in the fall of 2018. Are there naiads waiting for the water to warm in 2019, or would these tropical dragonflies be too cold-sensitive to survive under the ice? Stay tuned.

Meantime, if you see a saddlebags with red saddles, look twice.

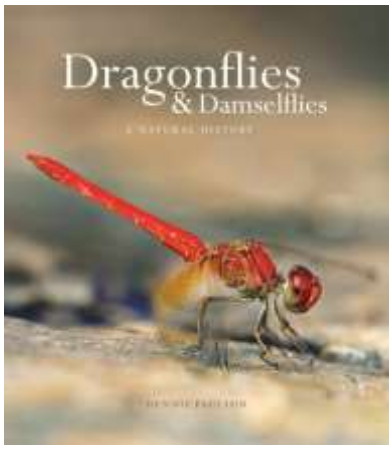
The BugLady

As the *BugLady*, Kate Redmond's mission statement is "Less stepping on bugs." She hopes that people will be wowed by the beauty and intricacy of bugs. She's happiest when she's taking pictures, preferably in a wetland.

See the Bug o 'the Week archives at http://uwm.edu/field-station/category/bug-of-the-week/

New Book Announcement

Dennis Paulson's beautiful book **Dragonflies and Damselflies: A Natural History** is now available from Princeton University Press at https://press.princeton.edu/titles/13344.html and from Amazon.



"Combining expert text and excellent color photographs, this is a must-have guide to these remarkable insects.

- A lavishly illustrated, comprehensive, and accessible natural history that reveals the beauty and diversity of one of the world's oldest and most popular insect groups
- Offers a complete guide to the evolution, life cycles, biology, anatomy, behavior, and habitats of dragonflies and damselflies
- Introduces the 39 families of dragonflies and damselflies through exemplary species accounts
- Features tips on field observation and lab research, and information on threats and conservation

Dennis Paulson is one of the world's leading experts on dragonflies and damselflies and has watched and photographed his favorite insect on every continent. He is the author of the major field guides to North American species, *Dragonflies of the West* and *Dragonflies of the East* (both Princeton), and has written more than fifty scientific papers on the group. Now retired from his position as the director of the Salter Museum of Natural History at the University of Puget Sound, he lives in Seattle."

Follow the above link for the full publisher's description.

Training for Trainers

Jennifer Callaghan

Although spring is (almost) upon us, many of us here at Wisconsin Dragonfly Society are looking forward to warmer weather and the emergence of odonates! In fact, in preparation for the 2019 field season just around the corner, we are looking for several volunteers interested in becoming WDS education ambassadors.

Specifically, we are looking for folks willing to play the part of community odonate trainers. These trainers would be provided with an electronic educational odonate presentation, a presentation script, educational supplements, and odonate monitoring supplies. Additionally, they would be provided training and mentoring from WDS members to gain the confidence to be able to teach other members of the public about odonates and conducting odonate surveys.

Please contact Jennifer Callaghan at jenncallaghan@gmail.com if this is of interest to you. Prior expertise is not necessary. We're seeking adventurous volunteers who enjoy learning and teaching others about amazingly cool critters!

Spatterdock Darner (*Rhionaeschna mutata)* – a new record for Marathon County in 2018, photographed by Roger Zimmermann

Wisconsin Dragonfly Society

2019 Annual Meeting, June7th - 9th

Interstate Park in Polk County

Join us as we search for interesting Odonata along the scenic St. Croix River! We will be searching for St. Croix Snaketails and their cousins in the clubtail family, and many other species that populate the north woods. This will be our first ever joint meeting with our friends from the Minnesota Dragonfly Society! See you there!

Minnesota Dragonfly Society

Our base of operations will be the St. Croix Falls Public Library.

Friday - We will meet at the library at 5:00PM for an intro to Odonata class. We will follow that with a hunt for Stygian and Smoky Shadowdragons.

Saturday – The annual business meeting will begin at 8:30AM followed by various field trips. In the evening we will have a cookout!

Sunday – We will have some morning field trips before we bid farewell.

Wisconsin Dragonfly Society (WDS) Membership Application

Membership in the WDS is open to any person in any state.

The WDS dues are as follows: $5 annual individual member; $15 annual individual sustaining member; $50 lifetime individual member; $150 lifetime individual sustaining membership; $7.50 annual family membership; $75 lifetime family membership.

Members must opt-in before WDS will share their e-mail address or other contact information with other members of WDS.

Send check or money order to:

Matt Berg

572 N. Day Rd

St Croix Falls, WI 54024

Name _____

Address _____

City, State, Postal Code _____

E-mail _____ Share? _____

Check membership category that applies:

Single Member: $5 ☐

Sustaining Member: $15 ☐

Family Membership: $7.50 ☐

Lifetime Single Member: $50 ☐

Lifetime Sustaining Member: $150 ☐

Lifetime Family Membership: $75.00 ☐

Total enclosed $ _____

For a downloadable version of this form, see http://widragonflysociety.org/pdf/MembershipApp.pdf

Recommended Reading

ARGIA

The News Journal of the Dragonfly Society of the Americas

TABLE OF CONTENTS – Last Quarter Edition

https://www.odonatacentral.org/index.

Membership in the Dragonfly Society of the Americas (DSA)

Membership in DSA is open to anyone in any country. Your fees help us advance the discovery, conservation and knowledge of Odonata. Annual benefits include:

- Electronic subscriptions to the DSA's quarterly news magazine, Argia, and to our peer-reviewed scientific journal, the Bulletin of American Odonatology (BAO).
- Full access to the DSA website, including archived editions of Argia and BAO.
- Fee discounts at DSA annual meetings (members $35, non-members $50).
- Eligibility to vote in DSA elections and to run for a seat on the DSA Executive Committee.
- Eligibility to apply for our grants program to fund research and help offset meeting fees.

If you are interested in becoming a member click here to join.

RESOURCES

Links

http://wiatri.net/inventory/odonata/WDS/Images/WDS_ConstitutionBylaws.pdf - Wisconsin Dragonfly Society constitution and by-laws

http://wiatri.net/inventory/odonata/WDS/Images/WDS_Brochure.pdf - printable brochure of the WDS.

http://wiatri.net/inventory/Odonata/ - resource for citizen participation.

http://wiatri.net/inventory/Odonata/Resources.cfm - list of resources from Bob DuBois.

http://www.facebook.com/groups/wisconsindragonflysociety/ - our group on Facebook - it's a joy to see these contributions from many people and our members helping them identify their odes.

www.facebook.com/WisconsinDragonflySociety/photos stream - our Facebook page photos. You can go to this link even if you are not a Facebook member.

http://bryanpfeiffer.com/2013/12/31/the-year-in-flight/#gallery/4056/264/0 - Bryan Pfeiffer is a blogger who enjoys dragonflies as well as birds. This slide show has several beautiful pictures of odonates. "Follow" him and you'll get lots of good reporting on the habits of the Odonata.

http://bryanpfeiffer.com/2014/01/09/surviving-the-polar-vortex/ - an amazing story of the early collecting by Philip Powell Calvert in Costa Rica.

http://bryanpfeiffer.com/ - the home page of Bryan Pfeiffer's website – many great photos here and news of GLOM, etc.

http://www.odonatacentral.org/ - OdonataCentral hosts the official website of the Dragonfly Society of the Americas. The journals *Argia* and the *Bulletin of American Odonatology* are online and searchable.

Supplies

Nets, vials, pins, etc. can be purchased from BioQuip Products, Inc., website: http://www.bioquip.com

Collecting envelopes can be acquired on-line from: see tab for Books and Supplies, Envelopes http://www.iodonata.net/

RESOURCES

Recommended Guide Books

· Burton, Paul. 2010. ***Common Dragonflies of Northern Door County****:* Stonehill Publishing; Ephraim, Wisconsin. (Available from www.doorcountybooks.com)

· Legler K., D. Legler, and D. Westover. 2013. ***Color Guide to Dragonflies of Wisconsin***: Edition 5.1; Karl Legler, Sauk City, Wisconsin. This new version has been expanded to include all WI species of dragonflies; available from http://uwarboretum.org/bookstore/

· Lam, Ed. 2004. ***Damselflies of the Northeast*****:** Biodiversity Books; Forest Hill; New York. 96 pp. (Note: very useful for WI, having all but one of our species.) http://www.edlam.net/book.html

· DuBois, R. 2018. ***Damselflies of Minnesota, Wisconsin & Michigan:*** First Edition. Kollath-Stensaas Publishing; Duluth, Minnesota. 154 pp. (Second Edition anticipated in May 2019!)

· Mead, K. 2017. ***Dragonflies of the North Woods***: 3rd Edition. Kollath-Stensaas Publishing; Duluth, Minnesota. 272 pp. http://www.dragonfliesofthenorthwoods.com

· Paulson, D. 2012. ***Dragonflies and Damselflies of the East***: Princeton University Press, Princeton, NJ. (This is the most complete reference for eastern North America).

· Garrison, M. 2011. ***Damselflies of Chicagoland: A Photo Field Guide***, version 2, 135 pp. (Free PDF down-load). http://fieldguides.fieldmuseum.org/guides/guide/388

· Rosche, L., J. Semroc, L. Gilbert. 2008. ***Dragonflies and Damselflies of Northeast Ohio***: 2nd Edition. Cleveland Museum of Natural History, Ohio, 300 pp. http://www.ddneo.info

· Tennessen, Ken. 2010. ***Waushara County Dragonflies and Damselflies****:* 32 pp. (Available from the author: ktennessen@centurytel.net).

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