

Newsletter of the Wisconsin Dragonfly Society

Wisconsin Odonata News



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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: Incurvate Emerald (*Somatochlora incurvata*) male
By **Ryan J. Chrouser**

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Greetings all,

I hope that this newsletter finds you well in these strange times. For me, the Odonata flight season is more important than ever before. How fortunate we are that we have a hobby that we can still pursue when many other things are in doubt. Following that line of thinking, our annual meeting that was to be held July 10th through the 12th in Ashland County, has been postponed until 2021. In place of the annual meeting, we will be organizing some statewide bioblitz activities to see how many species of Odonata we can find in 2020. Stay tuned to our Facebook group for details.

This is the final year of my current term as the president of the Wisconsin Dragonfly Society. It has been a challenging, but very rewarding experience. I feel we have made significant progress in the last few years as we move the WDS toward a long term, sustainable organization. I have great confidence that our society will continue on our mission to educate, and promote conservation of the Odonata well into the future.

In the past few years, we have built a new website and become a certified non-profit organization. Moving forward we would like to expand our ability to educate and train others in Odonata identification and conservation. We have a great need for more educators within the WDS, and are exploring ways to get more people involved. We have educational kits put together, with nets, field guides, and loupes. We will be working on developing some different electronic presentations to add to those kits. These canned presentations will enable someone to present Odonates to different types of audiences (young children, classrooms, adults, etc.). If you are interested in holding educational talks in your local area, or in any other areas within the state, please reach out to one of our board members. This initiative is the next big step forward for our society.

We have a few changes to your board of directors to note. Jeff Fischer has taken on the vice-president role, and Dan Jackson has taken on the role of treasurer. Many thanks to Dan and Jeff for taking on these duties for us. Matt Berg and Freda Van Den Broek remain on the board as at large members. Thank you Matt and Freda for all you have done, and for your continued involvement in the WDS. Also, Maggie Steinhauer has joined the board as an at large member, replacing Jenn Callaghan. Jenn has moved out of the state, making it difficult to be overly involved in the WDS. I would like to say thank you to Jenn for all her work and involvement with the Wisconsin Dragonfly Society, we will miss her. That being said, we are very excited to have Maggie step into her shoes. Her enthusiasm and educational expertise will be valuable resources for our group.

As a final note, please remember to visit our website and renew your membership if you have not done so already. Your membership dues help us purchase educational supplies for presentations and field trips. It also helps us fund the annual meeting (when we get to have one). Take care. Get out and enjoy the beautiful summer season of Wisconsin. Be kind and considerate to all the citizens and creatures of the Earth. Together we will move forward.

Ryan J. Chrouser

President

Long Life, Long Journey

Ken Tennessen (ktennessen@centurytel.net)

Dragonfly nymphs live a long time, relatively speaking of course. The duration of the nymphal stage is species-dependent and highly variable within the Odonata, from less than two months to as long as five years and possibly longer. In Wisconsin, the majority of odonate species have a one-year or two-year life cycle, typical of temperate climates. My point is, whether development is comparatively rapid or slow, most species of Odonata spend much more time as nymphs than they do as adults.*

For example, let's consider a common lake gomphid in Wisconsin, the Dusky Clubtail (*Phanogomphus spicatus*). This species appears to be semivoltine, that is, it takes two years for it to go from egg to adult. We can assume that adults live for a maximum of about three weeks. So, if the nymph exists in the water for 23 months, this equates to 97% of the insect's entire life span. By comparison, my "nymphal stage" (= birth to 18) is probably less than one-fourth of my life span. That is why I say, long-lived, those nymphs. Admittedly there are exceptions to this generality, especially in tropical species that live in regions with extended dry seasons (under such circumstances, the duration of the adult stage extends for several months).

The other aspect of nymphal life that I view as 'long' is the journey that must be undertaken in order to successfully transform into adulthood. Exactly where nymphs develop is variable within the order, many species living close to shore, such as some libellulids (skimmers) in narrow littoral zones. But there are dragonflies that occupy microhabitats that are not near the water/land interface, such as some Macromiidae (cruisers) and Gomphidae (clubtails), inhabiting large streams and lakes, spending most of their development time far from the bank. In these species, this "off-shore" location means they must crawl considerable distances when emergence time nears. Put yourself in their place – you're a little flat six-legged critter in expansive waters, traversing substrates such as mud, sand and gravel, negotiating obstacles such as rocks, logs, roots and sunken leaves and wood, not to mention strong currents – danger in every crevice, every step.

While for some species emergence occurs after the nymph has barely exited the water, such as the Horned Clubtail (*Arigomphus cornutus*) and the Zebra Clubtail (*Stylurus scudderii*, Fig. 1), for other species, such as the Swift River Cruiser (*Macromia illinoensis*), getting out of the water can be just the beginning of their journey – they can continue to crawl horizontally, sometimes for distances of 10 m or more. Some even crawl vertically up tree trunks for comparable distances (Fig. 2). I have seen exuviae of the Common Baskettail (*Epitheca cynosura*) 5.5 m up a tree that was 10.5 m away from the water! In comparable terms, for me that would be a crawl of about a mile!

What is baffling is that some individuals of a species will travel only a short distance from the water's edge whereas others will travel for many meters. Several questions come to mind, especially regarding species that are positioned far from the water's edge. How do nymphs safely navigate lake/stream bottoms in order to reach an emergence support? What cues do they use for orientation? Is their exposure to predators increased during this journey? What factors determine an individual's distance traveled before emerging? These challenges and others present opportunities to learn more about this enigmatic stage of dragonflies. Let's go look!



Figure 1. Zebra Clubtail (*Stylurus scudderii*) female, emerging at the edge of Plum Creek, Vilas County, Wisconsin (photo by K. J. Tennessen).



Figure 2. *Macromia illinoiensis* exuvia on a tree trunk, Saint John River, New Brunswick (photo by Jim Bell)."

*In a way, dragonfly adults live a long time too. It may not seem so at first when we think about ourselves and how long we live, but just think about how fast they live. They do things at break-neck speed. Vivat Libellulas!



***Gomphaeschna furcillata* found in Waushara County, Wisconsin: a serendipitous new record**

Ken Tennessen (ktennessen@centurytel.net)

The Harlequin Darner (*Gomphaeschna furcillata*) is seldom seen in Wisconsin, being recorded from nine counties in the northern half of the state (Wisconsin Odonata Survey 2020). According to the WOS website, there have been only 23 flight season records of this species in the state. I have kept an eye out for this species in Waushara County where I have resided for the past 15 years, without success. On May 30 of this year, at a small sedge meadow in the Lunch Creek State Natural Area (44.0153°, -89.3077°) I saw what appeared to be a male of *G. furcillata* flying an irregular beat over the sedges. I was unable to get close enough to catch it to make sure of my suspicion. Since then I revisited this site on three occasions but did not see it again.

On June 12, 2020, in early afternoon in Wautoma, as I was tending a flower bed in my yard, I saw a tandem pair of dragonflies fly over my head toward the house. The pair tried to perch on the bare siding but being unable to find a hold they flew past me and down into the grass. As I approached, I saw that they were *G. furcillata*! I was able to pick them up for close inspection, confirming the identification. Waushara County is now the tenth county in the state recorded for this species. Now my question is: where are these dragonflies breeding in the county?

Wisconsin Odonata Survey. 2020.

<http://wiatri.net/inventory/odonata/SpeciesAccounts/SpeciesDetail.cfm?TaxaID=20>. Accessed 13 June 2020.



Harlequin Darner (*Gomphaeschna furcillata*) male

Photo by Dan Jackson

How to Identify a Striped Emerald (Genus *Somatochlora*)

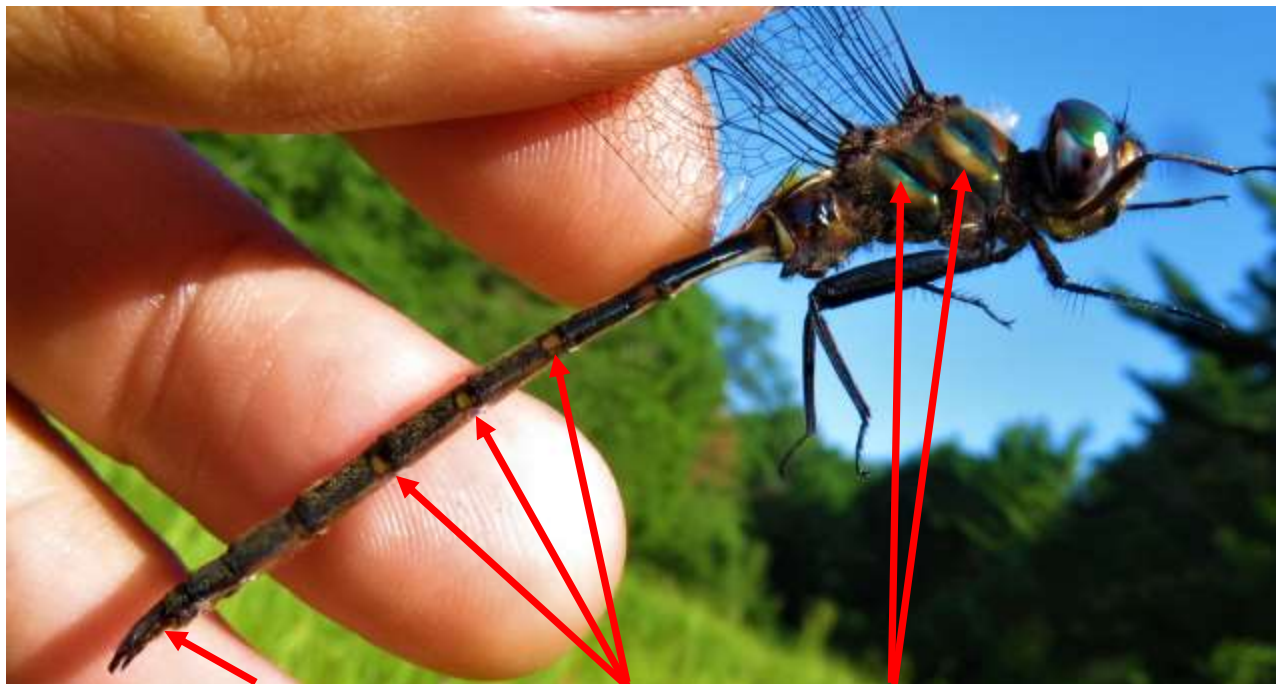
Ryan Chrouser

Photos courtesy of Jeff Fischer www.mndragonfly.info, and Ryan Chrouser

The genus *Somatochlora* is one of the more difficult groups to identify to species in Wisconsin. The reasons for this are many. Certainly one of the biggest challenges is actually getting a good look at one. They very rarely perch, and often fly over trails or small clearings in the woods. You may get only one brief look at it, and then it is gone. That's hardly enough time to get your net on it, or to grab your field guide and review the field marks.

So how to begin to improve your Emerald IDs? First, we must acknowledge that without a specimen in hand, these species are very difficult to ID. Do not be discouraged if a flyby emerald escapes your ID attempt. That happens to even the most experienced of us. If you desire to become more proficient with the subtle field marks of the *Somatochlora*, then netting, examining and releasing is certainly your best option. Photos are also useful tools, and this brief guide should help you target the requisite features for proper identification. Most importantly, be patient, it will likely take you several years to become proficient with *Somatochlora* ID.

Next, we need to determine what field marks are key to the identification for these species. There are three specific areas that I try to focus on when identifying *Somatochlora* species, namely the thoracic markings, the abdominal markings, and the abdominal appendages (including the female ovipositor). The male claspers are usually the best way to determine species, but the females can also be differentiated when comparing all three of these focal areas.



Terminal appendages

Abdominal markings

Thoracic markings

Field Characters for the Identification of *Somatochlora* species (Striped Emeralds)

Now, let's clearly eliminate Wisconsin's two look-alike, but non-*Somatochlora* members of the Corduliidae family. These are the Racket-tailed Emerald (*Dorocordulia libera*) and the American Emerald (*Cordulia shurtleffi*). Both of these species are relatively common (particularly the Racket-tailed) and can be superficially mistaken for *Somatochlora*. They both have brown bodies with a ring at segment two of the abdomen, and they also have the bright green eyes that are characteristic of the *Somatochlora* species. The Racket-tailed Emerald has a distinctly clubbed abdomen, and the ring on abdominal segment two is very wide. None of the *Somatochlora* shares these distinctions. The American Emerald is almost uniformly colored, lacking any pale markings on the thorax and abdomen. The male has a distinctive forked epiproct (below left), while the female (below right) does not have a prominent ovipositor, and has very short cerci, much shorter than any of our more common *Somatochlora*.

Racket-tailed Emerald (*Dorocordulia libera*):



American Emerald (*Cordulia shurtleffi*):



With the look-alikes out of the way, we can now begin to focus on this difficult group. This reference will not cover all *Somatochlora* species found in the state, but will focus on the most commonly encountered species. The first field mark that you want to note when you find a *Somatochlora* is the abdominal appendages. Now, that doesn't necessarily mean that you need to have the specimen in hand to ID it, but you need to make a quick observation. Is it a female or a male, and what type of ovipositor or claspers does it have? The more common species in Wisconsin can actually be broken down into subsets fairly easily with this field mark. If your dragonfly has clamp-type claspers, you have likely found a Hine's or Clamped-tipped Emerald, which are both quite difficult to find, so congratulations! We won't follow this line any further since it is likely that if you find either of these dragonflies, you went looking for them. Instead we will focus on the species that you are more likely to encounter accidentally.

There are eight species left that I would like to focus on. They can be largely divided into two groups: straight male appendages/scoop ovipositors, and hooked male appendages/spout ovipositors. There is one species that somewhat straddles the line in between these groups. The Brush-tipped Emerald male has hooked appendages, while the female has a more scooped ovipositor. The Brush-tipped is actually relatively easily distinguished by the hair on the end of the male's claspers and the by the female's relatively long appendages.

Straight/Scoop Group:



Hooked/Spout Group:



Brush-tipped Emerald:



Other key features of the **Brush-tipped Emerald (*Somatochlora walshii*)** are prominent side thoracic spots; small, but bold, side spots on abdominal segments 5-7; and the abdomen is shorter in comparison to the wings than most other *Somatochlora*. This is a small species as compared to most of the other *Somatochlora*.



Brush-tipped Emerald (*Somatochlora walshii*)

Photo by Ryan Chrouser

Now we get to the tricky stuff. From this point forward, I will include the appendages for ID purposes, but I will also include some other features to assist you. The goal of this article is to give you some direct comparison points between the remaining seven species. Please note that the field guides that are available cover these topics in great detail, and there are some very helpful websites with great macro photos. Specifically, our own Jeff Fischer has a fantastic website with close ups of these features. Most of the photos in this article were taken from Jeff's website. If you get stuck with an ID, it is an excellent resource (www.mndragonfly.info). This article is meant to supplement, rather than replace any of the excellent reference material included in the various guides.

The Straight Scoop

The straight/scoop group contains four species in Wisconsin that can be quite confusing. This group includes the Kennedy's, Incurvate, Forcipate, and Delicate Emeralds. These four species can all occupy similar habitats, adding to the confusion. Please note that for freshly emerged species, the colors can be very bold. In these cases, some of the light markings detailed here can be bolder than they are on a mature specimen. At full maturity, the field marks noted below should be helpful.

Delicate Emerald (*Somatochlora franklini*): This species is very slender and has a long body with comparatively short wings. There is a dark patch at the base of the hind wings, and the female's wings are often tinted brown. This species can often be identified by the very long, slender silhouette in flight; and by the hind wing patches. The male claspers curve in and almost touch. This species has one bold thoracic spot and an abdomen largely lacking side spots. Due to the slender shape and hind wing patch, this is probably the easiest in this group to spot ID.



Left: Delicate Emerald female,
Photo by Ryan Chrouser

Right upper: thorax of male Delicate Emerald,
Photo by Jeff Fischer

Right lower: claspers of male Delicate Emerald,
Photo by Ryan Chrouser

Kennedy's Emerald (*Somatochlora kennedyi*): This species is the most common of this group. Thorax is largely unmarked, with the pale front spot barely visible. The abdomen lacks side spots. The male claspers appear blunter in side profile than Incurvate, and from a dorsal view, they do not curve in as sharply as Incurvate. For females, the appendages are clearly longer than segments 9 and 10 together.



Top left: thorax of male Kennedy's Emerald,
Photo by Jeff Fischer

Bottom left: male Kennedy's Emerald,
Photo by Freda van den Broek

Center top: claspers of male Kennedy's Emerald, side view,
Photo by Jeff Fischer

Center middle: claspers of male Kennedy's Emerald,
Photo by Ryan Chrouser

Center bottom: cerci of female Kennedy's Emerald,
Photo by Jeff Fischer

Far right: abdomen of male Kennedy's Emerald,
Photo by Ryan Chrouser

Incurvate Emerald (*Somatochlora incurvata*): This species has the longest thoracic front spot, but it fades with time, so a close look is needed. Abdominal side spots are distinct, though not as prominent as the Forcipate, on segments 4/5 to 7/8. The dorsal view of the male clasper curves in the most abruptly (sharpest angle) of any species in this group, hence the name. The claspers also appear a little sharper in profile than the Kennedy's. The female has the longest ovipositor of the group, extending to the end of segment 10. Note the scooped shaped ovipositor that is held parallel to the abdomen rather than pointing downward as in the hooked/spout group.



Left upper: thorax of male Incurvate Emerald
Photo by Jeff Fischer

Bottom: abdominal side spots, Incurvate Emerald
Photo by Ryan Chrouser

Right upper: male claspers, Incurvate Emerald
Photo by Jeff Fischer

Right lower: scoop-shaped ovipositor, Incurvate Emerald
Photo by Jeff Fischer

Forcipate Emerald (*Somatochlora forcipata*): This species has two oval thoracic side spots, more bold, but not as long as those of the Incurvate Emerald. The abdominal side spots are also the boldest of this group. They are seen on segments 5-8 in males and 3-7 in females. The male's claspers are distinctly forceps-shaped in side view. The female's ovipositor is about as long as segment nine, not as long as the Incurvate.



Left upper: thoracic side spots, Forcipate Emerald
Photo by Jeff Fischer

Bottom: female Forcipate Emerald
Photo by Ryan Chrouser

Right upper: male claspers, Forcipate Emerald
Photo by Jeff Fischer

Right lower: male claspers, dorsal view, Forcipate Emerald
Photo by Jeff Fischer

Now that we have covered the more likely encountered species in the straight/scoop group, let's move on to the hooked/spout group. There are three species in this group that are the most likely to encounter in Wisconsin. These species are the Williamson's, Ski-tipped, and Ocellated Emeralds.

Hooked/Spout Group

Ocellated Emerald (*Somatochlora minor*): This species is a small emerald, about the same size as Brush-tipped, or even a bit smaller on average. Its most distinct feature is the bold, near round, thoracic side spots. The dorsal view of the claspers shows that they come together at a point, and if you get a good look, there are a couple of small spikes on the outside edge nearer the base of the cerci. The claspers of this species look more delicate from the dorsal view than others in this sub-group. The hook on the male claspers is not terribly pronounced; it only hooks up a very small amount. The female coloration is similar to the male, with the prominent thoracic spots being the most prominent field mark. The cerci of the female are long, and the ovipositor is large, yellowish, and sharp. It is a long irregular triangle from a side view. The abdomen of this species is generally dark, lacking side spots.



Left upper: thoracic side spots, male Ocellated Emerald
Photo by Jeff Fischer

Bottom: female Ocellated Emerald
Photo by Jeff Fischer

Right upper: male claspers, Ocellated Emerald
Photo by Jeff Fischer

Right lower: male claspers, dorsal view, Ocellated Emerald
Photo by Jeff Fischer

Ski-tipped Emerald (*Somatochlora elongata*): The thorax has bold, but much longer stripes than the near circles of the Ocellated Emerald. The male cerci has a very prominent upwards turn at the end, that very much looks like skis. The dorsal male claspers come together more gradually, rather than coming together at a point at the end of the cerci. They are somewhat similar looking to the Williamson's from the dorsal view, but they do not come together at the tip like the Williamson's. The female ovipositor is a very neat triangle, more regular than the Ocellated and Williamson's, and not as long. Again this species does not have prominent abdominal side spots.



Left upper: thoracic side spots, Ski-tipped Emerald
Photo by Ryan Chrouser

Bottom: female Ski-tipped Emerald
Photo by Ryan Chrouser

Right upper: male claspers, Ski-tipped Emerald
Photo by Jeff Fischer

Right lower: female ovipositor, Ski-tipped Emerald
Photo by Ryan Chrouser

Williamson's Emerald (*Somatochlora williamsonia*): This species has long thoracic side spots, but generally they fade more with age, so not as bold as the Ski-tipped. The claspers of the male curve prominently upward and loop back toward the front on top. From dorsal view, the male claspers come together at the tip but are much more robust than the Ocellated Emerald. This species has abdominal side spots, which contrasts with the other hook/spout species treated here. The female's ovipositor is a long spike, and appears darker than the Ocellated. The female also often has yellowish tinted wings.



Left upper: thoracic side spots, Williamson's Emerald
Photo by Jeff Fischer

Bottom: female Williamson's Emerald
Photo by Ryan Chrouser

Right upper: male claspers, Williamson's Emerald
Photo by Freda van den Broek

Right lower: male claspers, dorsal view, Williamson's Emerald
Photo by Jeff Fischer

Identification Tips for Females of Four Difficult Species of Pond Spreadwings (genus *Lestes*)

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Seventeen species of pond spreadwings (*Lestes*) occur in North America, ten of which occur in Wisconsin. During 17 years of vetting photographs for the Wisconsin Odonata Survey (WOS; <http://wiatri.net/inventory/odonata>), I have noticed that females of four species in this genus were frequently the sources of confusion or misidentification by cooperators. This realization prompted me to review, evaluate and seek to improve the characters used in species keys and in most field guides to distinguish adult females of Lyre-tipped Spreadwing (*L. unguiculatus*), Northern Spreadwing (*L. disjunctus*), Slender Spreadwing (*L. rectangularis*), and Southern Spreadwing (*L. australis*) (hereafter called the “difficult group”). The process is ongoing, but I thought I’d share a few pointers now. These ID tips are intended to be used in conjunction with the characters given in field guides, not to replace them, and they should only be applied in Wisconsin because species can vary in appearance across their ranges.

For at least 7 firmly determined females of each species, I scored or measured characters pertaining to the color of the rear of the head, wing tip color and stigma shape, color patterns of the thorax, tarsi color, absolute lengths of abdominal segments 7 and 9 (S7 and S9) and the length of S7 in ratios with S9 and the ovipositor, and the length and color of the ovipositor. I also examined some of the scientific literature about these species, and my own field notes, for behavioral clues. Additionally, I’ve included some information about female Sweetflag Spreadwing (*L. forcipatus*), not because it is difficult to identify, but because the male is hard to distinguish from the male of Southern Spreadwing, and therefore being able to identify the Sweetflag female is useful. Identification of females of other species of pond spreadwings in Wisconsin did not usually present difficulties for cooperators with WOS; therefore, continue to use characters given in field guides by DuBois (2019), Lam (2004), and Paulson (2011) for them.

Species accounts

Lyre-tipped Spreadwing – the female is the smallest within the “difficult group”, with the shortest abdomen and the shortest abdominal segment 7 (S7), which I interpreted in a ratio compared to the length of S9 or to the length of the ovipositor (Table 1; Figure 1). Therefore, it has a shorter, stouter look than others within the group, with S7 being a bit more than half as long as S9 (Figure 2a). A good field character for Lyre-tipped is the coloration of the rear of the head, which has yellow “tabs” that extend laterally to, or nearly to, the eyes (Figure 3a). This character can be seen in

hand with a 10X hand lens but is rarely visible in photographs. All other females in the “difficult group” have the rear of the head black, except for around the neck (Figure 3b). The extended yellow area at the rear of the head could be variable, so be alert for exceptions, but I’ve not seen an exception in Wisconsin. The top of the abdomen has green reflections (usually greener than others within the “difficult group”), so some care is needed not to confuse it with Emerald Spreadwing (*L. dryas*), which has a metallic green thorax that Lyre-tipped lacks and a larger ovipositor. The ventral half of the ovipositor is dark, as is the usual case with Southern and Slender as well (Figure 2a-c); this is in contrast to the overall paler ovipositor of Northern (Figure 2d). The male Lyre-tipped is easily recognized in hand by its boot-shaped paraprocts, so examining associated pairs should clear up any confusion about the identity of the females.

Northern Spreadwing – females are easily confused with others in the “difficult group”, but five character states will set them apart (exceptions are possible, so use a “weight of evidence” approach): 1) the ovipositor is usually paler than all others (Figure 2d), typically limited to a dark longitudinal smudge if present at all, but not entirely black on the ventral half; 2) the stigma is longer relative to its maximum width (usually at least 3 times longer than wide*) (Figure 4a; Table 1); 3) it is the only female in the group that consistently oviposits underwater, usually accompanied by the male; 4) it averages smaller in size, and the flight season is later, than Southern; and 5) S7 is slightly shorter relative to S9, or to the ovipositor, than on Slender (Figure 2c,d). Some females, perhaps andromorphs, will become pruinose as they age, which is not the case with Lyre-tipped, Slender, or Southern.

Slender Spreadwing – the female has a longer abdomen than others in the “difficult group”, with S7 much more than two times longer than S9, usually more than 2.5 times longer (Figure 2c). However, this character can be confusing because the difference between Slender and Northern can be slight with some specimens and not always easily discerned unless actually measured. Bear in mind the following points when identifying Slender: 1) the female oviposits alone, the only female in the “difficult group” to consistently do so; 2) the ventral half of ovipositor is darker and the stigma is shorter relative its width than on Northern (Figure 2c,d; Figure 4a,b), the species with which it is most often confused; 3) the outer surface of the tarsi is paler than on the others, but it can be dark brown and therefore the difference might not be readily apparent; 4) the vein at the tip of the wing is paler than on the other “difficult species” (Figure 4b), but this character is variable and not always evident, depending on lighting and

background color (unfortunately this pale vein is usually more apparent on males, where it is not needed for ID purposes); and 5) the pale shoulder strip is wider than on others species in the difficult group and is often colored gray or light blue. When other species have bluish stripes, they are usually narrower. Associated pairs of Slender tend to be challenging to find.

Southern Spreadwing – the female has no single characteristic that is definitive, other than an extraordinarily early flight period in Wisconsin, but can separated from others in the “difficult group” by a process of elimination. Distinguish it from Lyre-tipped by its larger size, darker overall coloration, and dark rear of the head; from Northern by darker ventral half of the ovipositor, shorter stigma relative to its length (4c), and shorter S7 relative to S9; and from Slender by a much shorter S7 relative to S9, the lack of a pale vein at the tip of the wing, and the lack of pale outer surfaces of the tarsi. Finding associated pairs is particularly useful with this species because the male is readily distinguished from other males in the “difficult group” (not including Sweetflag),

therefore identifying one sex tends to confirm the identity of the other. The male is very similar to the male Sweetflag, with which it is easily confused, but the female Sweetflag is unmistakable (see below). However, note the usual caveat of male pond spreadwings sometimes forming tandem with females of the wrong species. Some specialists have offered an additional distinction between Southern and Northern - the fine teeth on the ventral rim of the ovipositor are longer and more pointed on Southern than on Northern (illustrated by Lam 2004 on pp. 32-33) - but I found this character to be of limited use without having both species to compare under a stereomicroscope.

Sweetflag Spreadwing – note the female’s extraordinarily long ovipositor compared to the other species (Figure 2e). Recognizing this feature is useful when examining tandem pairs.

**P < 0.00001 in a t-test that compared the difference in stigma dimensions between Northern and Slender*

Table 1. Characteristics of females of selected species of *Lestes* in Wisconsin (N = sample size; L = length; W = width; S7 = abdominal segment 7; stigma = fore wing stigma; max = maximum; nd = no data).

Species	N	Abdomen L	S7 L/S9 L	S7L/Ovipositor L	Stigma L/Wmax
<i>L. australis</i>	8	31.6	2.13	1.33	2.70
<i>L. disjunctus</i>	13	29.7	2.31	1.44	3.60
<i>L. rectangularis</i>	10	31.7	2.66	1.67	2.75
<i>L. unguiculatus</i>	7	27.0	1.89	1.17	nd

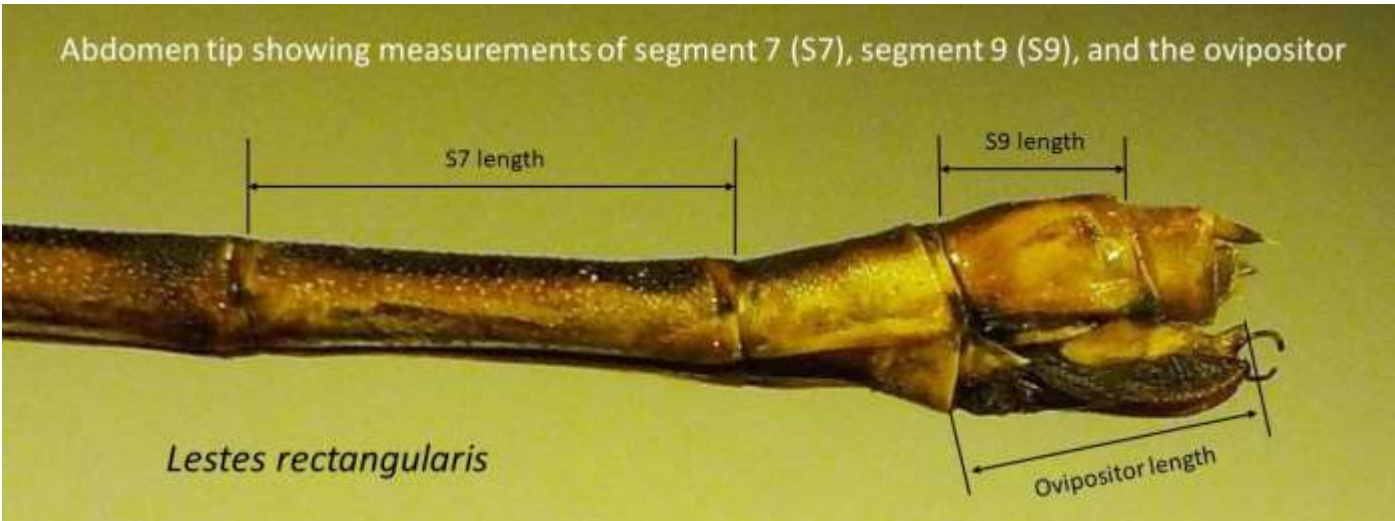


Figure 1 *Lestes rectangularis* abdomen tip showing measurements



Figure 2. A five panel composite of abdomen tips in the following order: a) *L. unguiculatus*, b) *L. australis*, c) *L. rectangularis*, d) *L. disjunctus*, e) *L. forcipatus*.

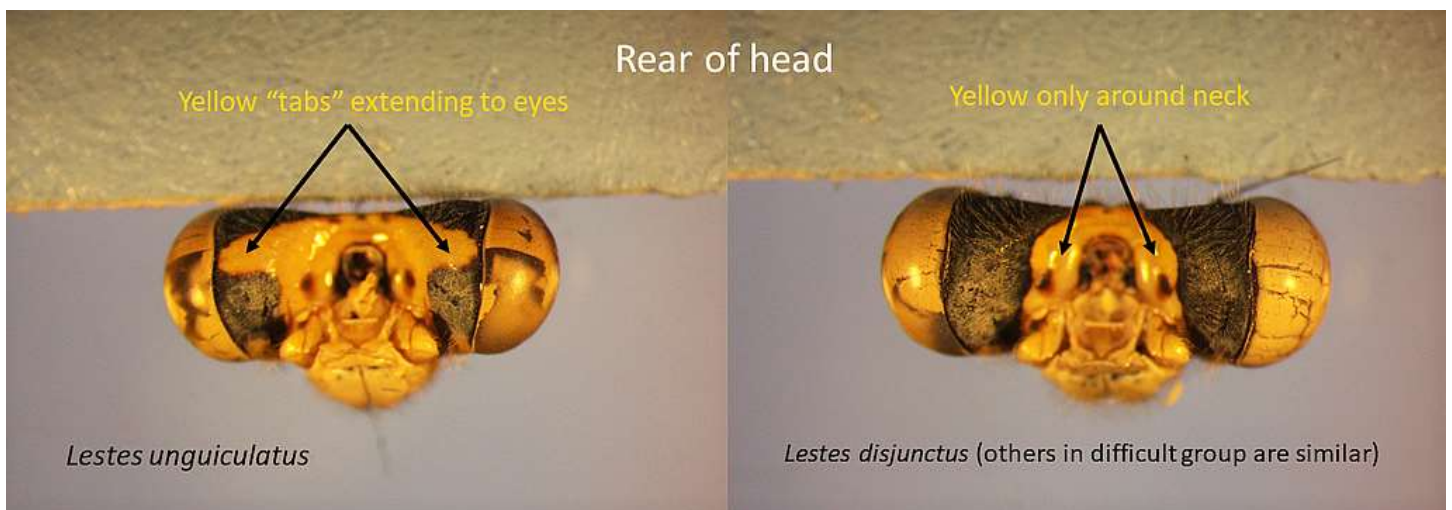


Figure 3. A two panel composite of the rear of the head in the following order: a) *L. unguiculatus* and b) *L. disjunctus*.

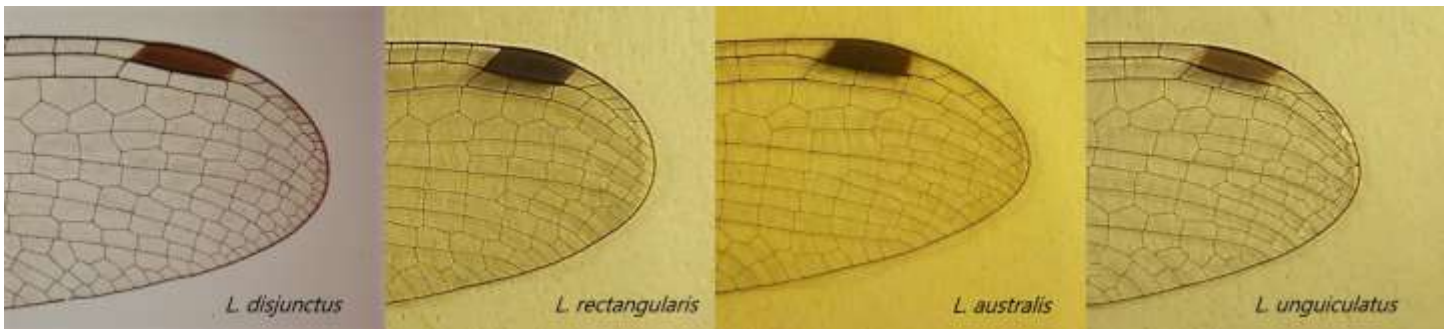


Figure 4. A four-panel composite of wing tips in the following order: a) *L. disjunctus*, b) *L. rectangularis*, c) *L. australis*, d) *L. unguiculatus*. Note the comparatively long, slender stigma of *L. disjunctus*.

Table 2. Summary of morphologic and color patterns, and oviposition behaviors, that can help distinguish female *Lestes* in the “difficult group” in Wisconsin. See species accounts for explanations of terms and exceptions.

Character	Lyre-tipped	Northern	Slender	Southern
Rear of head with yellow “tabs”	Yes	No	No	No
Outer surface of tarsi rather pale	No	No	Often	No
Outer vein at wing tip paler	No	No	Yes	No
Stigma length > 3 times width	No	Yes	No	No
S7 > twice the length of S9	No	Yes	Yes	Yes
S7 > 2.5 times the length of S9	No	Not usually	Usually	No
Ovipositor mostly pale on ventral half	No	Usually	No	No
Some females w/male-like pruinosity	No	Yes	No	No
Often seen in May and early June	No	No	No	Yes
Oviposits underwater in tandem	No	Often	No	No
Oviposits unattended by male	Not usually	Not usually	Yes	Not usually

References

- DuBois, R. 2019. Damselflies of Minnesota, Wisconsin, and Michigan. Kollath+Stensaas Publishers, 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.



A Species on the March – Lilypad Forktail

Kate Redmond

The BugLady's **Bug o' the Week** collection is archived at <http://uwm.edu/field-station/category/bug-of-the-week/>.

Greetings, BugFans,

In mid-July, the BugLady ran into BugFan Freda at an Ozaukee Washington Land Trust property at the west end of Lake Twelve. Lake Twelve is famous because of the presence there of not one, but two rare (in Wisconsin) damselflies – the Slender Bluet and the Lilypad Forktail. The bluet has been on and off of our state radar since 2007; the forktail was first recorded at Lake Twelve in 2017 but has been seen intermittently in Wisconsin since 2010. Freda introduced the BugLady to both species.



Mature male Lilypad Forktail (*Ischnura kellicotti*) Photo by Kate Redmond

A week later, when she was chasing dragonflies at one of her familiar haunts at in Ozaukee County, the BugLady photographed (badly) a suspicious-looking damselfly that turned out to be a mature, female Lilypad Forktail (*Ischnura kellicotti*).

The species, originally called Kellicott's forktail or Kellicott's thin-tail, (taken from an old publication, when we didn't capitalize both names) was first described in Entomological News, Vol 9 (1898). Along with the dancers, bluets and sprites, forktails are in the Narrow-winged/Pond damselfly family Coenagrionidae; "forktail" refers to projections at the tip of the male's abdomen.

The BugLady loves common names. Sure, if you say *Ischnura kellicotti* anyplace in the world, there's only one critter you could be talking about. But common names – bestowed by the people who experience a species where the rubber hits the road - allude to an organism's appearance, taste, toxicity, smell, squishiness, hairiness, prickliness, all of

the above, and much more. Lilypad Forktails are named for their chosen habitat.



Mature female Lilypad Forktail (*Ischnura kellicotti*) Photo by Kate Redmond

They are tied to a single group of plants – water lilies – a habit that is uncommon among Odonates. So attached are they to water lilies that when they perch on one – and they seldom perch anywhere else – the tip of their abdomen is usually bent down to be in contact with it. It's not known whether this contact allows for support or for some kind of predator detection, and several authors speculated that the damselfly uses the bent tip as a springboard when it takes off, *a la* springtails. Their relatively short legs keep them close to the leaves, and their weak flight carries them low, directly from leaf to leaf or from leaf to prey. So attached are they that the female lays eggs into the water lily leaf and the naiad lives clinging to its underside, coming topside only when it's time to emerge as an adult. So attached are they that people who want to see one often must take to canoes or kayaks to get out to the lily pads, or must wade or swim (or, in the case of Lake Twelve, make their way along a partly-submerged pier). So attached are they that people who want to net one find that collecting the whole lily leaf works best.



Juvenile female Lilypad Forktail (*Ischnura kellicotti*) Photo by Kate Redmond

Male forktails and male bluets are often blue and black – forktails may resemble the “*black-type bluets*” whose front and rear are blue, but whose abdomens are mostly black. Lilypad Forktails are small, under 1 ¼”. Like Eastern Forktails, most females start out gloriously red-orange (though some females mimic the blue and black of males), and they fade to slate-blue as they reach reproductive age due to pruinosity - the deposit of “hoary” flakes on various parts of the anatomy. In all stages, they have oversized “eyespots” on the back of the eye. See nice pictures of all the “plumages” here, including a dark teneral with yellow wings and a naiad, <https://www.marylandbiodiversity.com/viewSpecies.php?species=70>. Thanks to BugFan Freda for the face-to-face shot.



Male Lilypad Forktail – note the blue labrum Photo by BugFan Freda

Lilypad Forktail bears more than a passing resemblance to another damselfly called the Skimming Bluet (<https://bugguide.net/node/view/1401924/bgimage>), which also likes lily pads (in fact, when she found the Lilypad Forktail, the BugLady went back and checked all the pictures

of male Skimming Bluets that she had ever taken to make sure they were correctly ID’d. Then we add to the mix the (oxymoronic) Orange Bluet <https://bugguide.net/node/view/429646/bgimage>, a lily pad-sitter that resembles orange female forktails. And the pruinose, older female Lilypad Forktails <https://bugguide.net/node/view/977359/bgimage> that look a lot like pruinose, older female Eastern Forktails <https://bugguide.net/node/view/1536326/bgimage> (hey – if it were easy, it wouldn’t be so much fun, right?). Lilypad Forktails are notably feisty, and they frequently chase Skimming and Orange Bluets.



Mature female Lilypad Forktail (*Ischnura kellicotti*) Photo by Kate Redmond

Females of many species of odonates have an “I’m not in the mood” posture, and it often includes a down-turned abdomen. Female Lilypad Forktails do not have or need such a signal; apparently, their habitual posture is enough and they don’t get hassled!

Lilypad Forktails have an odd range. They are an eastern/southeastern species that, according to Paulson’s *Dragonflies and Damselflies of the East*, is found at lakes and ponds with lots of water lilies in states bordering the Atlantic from the Canadian Maritime Provinces (first record – 2017) to Florida, and then along the Gulf Coast to Texas, with tongues extending north toward the Midwest along the Mississippi River, and with some disjunct populations inland and around the south end of Lake Michigan.

What does it look like when a species goes on the march and expands its range? The BugLady sure wishes that every state had a dragonfly website as lovely and searchable as the Wisconsin Odonata Survey site <http://wiatri.net/inventory/odonata/>. In Wisconsin (and in some of the other states that it has been recorded in), the Lilypad Forktail is a Species of Special Concern, a watch list status based on a specie’s highly limited range and small numbers of populations, as well as on an assortment of threats. In the case of the forktail, it’s not being wiped out here, its numbers are low because it’s attempting to move in from outside the state. Probably.

According to the Odonata Survey, it was first recorded in Walworth County on our southern border in 2010; in Sauk County (south-central) in 2013; in Rock County, also on the Illinois border, in 2014; in Washington County (south-central) in 2017; Washington and Walworth Counties in 2018; and Washington and next-door Ozaukee Counties in 2019. In 2011, 2012, 2015, and 2016 it was not reported.

The BugLady attempted to check the status of the Lilypad Forktail within its given range, which took much longer than it should have. As has been lamented in these pages before, she is “key-word challenged” – things are seldom filed away where she would put them. Plus, state dragonfly lists can be hard to find. And some State Natural Heritage sites (the organizations that track sensitive species) are remarkably hard to navigate (you know who you are) or have lovely interactive pages where you can search lists of sensitive species by county or plant community/region but not by species (ditto). And, a number of states that she investigated apparently either have 100% A-OK insect populations or don’t track insect populations (ditto). One of the states in its range, a state with only one known Lilypad Forktail location, “*does not currently have state threatened and endangered species legislation.*”

Keeping in mind that it’s a small damselfly that is easily mistaken for another small damselfly, what did the BugLady find? An interesting patchwork. In coastal states south of Delaware, it’s not considered common (except, perhaps, for some local populations), but it’s not considered to be in trouble, either. Away from that core range, it’s listed as “*greatest conservation need*” in Maine, Vermont, and Delaware, but “*secure*” just north of Delaware in New Jersey; “*vulnerable*” in Connecticut and in Oklahoma, where one website noted that owners of farm and recreational ponds in Oklahoma often consider water lilies to be a pest plant and eradicate them; “*imperiled*” in Pennsylvania; and “*state endangered*” in Ohio. In other inland states in its range, its population levels are apparently not considered alarming enough to track.

Species advance – two steps forward here, one step forward there, fall back, regroup. With a little help from our friends.

The BugLady

Anyway, keeping in mind that it’s a small damselfly that looks an awful lot like another small damselfly, here are the results.

Canadian Maritime Provinces – first records for New Brunswick in 2017.

Ontario, Canada – first recorded at Point Pelee, Ontario in 2001.

Maine – present, not on Natural Heritage list.

Vermont - species of greatest conservation need.

New Hampshire – reports of the species must be verified by a specimen in-hand.

Rhode Island – present, not on Natural Heritage list.

Connecticut – vulnerable due to a restricted range, relatively few populations, recent and widespread declines, or other factors, making it vulnerable to extirpation.

New York – present before 2005, according to the 2005 to 2009 state dragonfly and damselfly survey; mainly in the southeastern counties.

New Jersey – demonstrably secure.

Delaware – species of “greatest conservation need” list 2015.

Maryland – widely distributed, common on the coastal plain, uncommon elsewhere.

West Virginia – first found in 2009 and only known from one area. West Virginia does not currently have state threatened and endangered species legislation.

Virginia – known from six sites in 1998, not on Natural Heritage list.

North Carolina - spottily distributed over most of the Coastal Plain and the eastern third of the Piedmont; also sparingly in the mountains and foothills. Many gaps in the range. Not on Natural Heritage list.

South Carolina – present, not on Natural Heritage list.

Georgia - not on natural heritage list. Common on the Coastal Plain, rarely found north of it.

Florida – present, not on Natural Heritage list.

Alabama – present in scattered localities, not on Natural Heritage list.

Mississippi – present in the eastern portion of the state, not on Natural Heritage list.

Louisiana – not on Natural Heritage list.

Pennsylvania – imperiled/critically imperiled.

Ohio – state endangered. Found in only one location in 2002 but more, since. In a June, 2019 post on his blog, naturalist Jim McCormac writes that the recent Ohio survey of Odonates showed that *“Several damsels and dragons have staged massive immigrations into Ohio in the past few years, all southern species. They include Blue-faced Meadowhawk, Great Blue Skimmer, Lilypad Forktail and Slaty Skimmer.”*

Kentucky - not on Natural Heritage list.

Tennessee – not on 2015 dragonfly list, but there’s a bugguide.net picture taken in Tennessee in 2012.

Michigan - listed on a 2002 list, but an article from 2017 says it’s present in only a few southern counties. But a write-up of a 1999, record from mid-state *“represents large leap in knowledge of range in state. Previously known only from southern tier of counties.”*

Illinois - Damselflies of Chicagoland (2011) notes that it had been recorded in Illinois in 2008 and 2009 but had not been put on the Illinois list yet.

Indiana – present, not on the Natural Heritage list.

Missouri – on list with no special designation.

Oklahoma – considered vulnerable (watch list) - except for a small population in the center of the state, it’s found only in the southeastern corner of the state. A note mentioned that landowners with farm or recreational ponds consider water lilies to be pests and routinely get rid of them.

Arkansas – disjunct populations but can be locally common.

Texas – present, not on Natural Heritage list.

The BugLady

Resources:

https://scholarworks.iu.edu/dspace/bitstream/handle/2022/13622/24_8+Dragonflies+of+Indiana.pdf;jsessionid=255DEA33B964DFC513F8D211DA6943B6?sequence=1

THE DRAGONFLIES OF INDIANA. BY E. B. WILLIAMSON, BLUFFTON, IND. 1899

KELLCOTTI Williamson (named for David S. Kellicott). *L. kellicotti* Williamson, Ent. News, Vol. IX, p. 209, November 1898; Calvert, 1. c. p. 211. Legs pale and dark. Altogether 30 males and five females of this species have been taken in the State. Of the number, all but two males were taken in a small bay in the southwestern part of Round Lake.

First description of species 1898

<https://books.google.com/books?id=ZpAUAAAAYAAJ&pg=PA209&lpg=PA209&dq=Ischnura+kellicotti&source=bl&ots=UbNBwDM8Kd&sig=ACfU3U3tul3W183C49r1WVEcxd1sb3yDiw&hl=en&sa=X&ved=2ahUKEwiGttGV7IPkAhUHRaOKHdgICZ04HhDoATAGegQICBAB#v=onepage&q&f=false>

Entomological News, Volume 9, American Entomological Society, 1898

Welcome to the Wonderful World of Odes: My Early Experience

Maggie Steinhauer

It all started in the summer of 2018, which was my first true exposure to the world of dragonflies and damselflies. This was then followed by my first full field season leading odonate surveys with the Urban Ecology Center in Milwaukee, WI, during the summer of 2019.

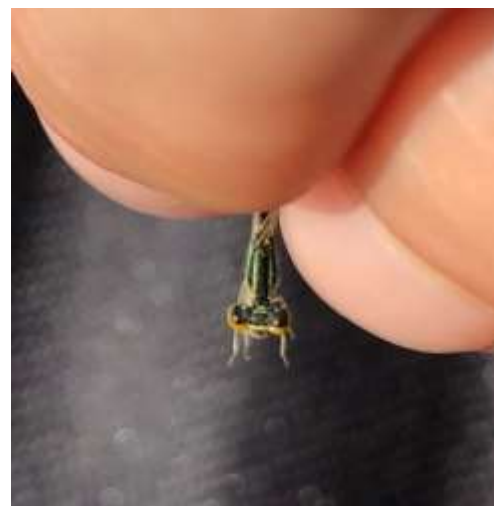
I'm not sure I could pinpoint what it is that is so utterly addictive about seeking out these flying assassins. Perhaps it's the feeling of catching a hearty dragonfly in your net and feeling its powerful wings vibrating against the mesh, or the way it's possible to focus on an assortment of greenery and spot the small, delicate movements of a damselfly dancing among the foliage. Maybe it's the way a Green Darner zones in on prey and tackles it mid-air. I imagine those who are good at badminton might be good at wielding a dragonfly net. Whatever the reason for the captivation, dragon-hunting turns me into a cat, as if my pupils dilate and I am ready to pounce.

After the initial act of catching an individual there's the identification process. I can't get enough of this part. Whether it is an easy ID that can be deciphered from a distance or a difficult ID that requires multiple people with multiple field guides to pick out shapes of particular cells in the wing venation or slight differences in the terminal appendages with 10x magnification, it's all so very intriguing. It is inspiring to see the look on people's faces when they see one of these creatures up close – realizing there's a whole world of beauty and power (and not to mention, color) in a small, and otherwise mostly elusive, insect.

Notably, one of the most exciting finds from these past two summers at the UEC was that of the Citrine Forktail (*Ischnura hastata*) at the Urban Ecology Center's Menomonee Valley branch. The Citrine Forktail is labeled a "most wanted" species in Wisconsin, meaning that we know it exists here (although they are few and far between) and we want to know more about it. This species has been found consecutively the past three years in the Menomonee Valley, and two of those times at "Dragonfly Pond."

I am constantly learning how to identify new-to-me species at this stage in my experience. In the case of last summer's Citrine Forktail, I barely spotted its small body amidst the pond's vegetation, but I knew that it was something different from your average Eastern Forktail. Not only were the colors slightly different, but it was so TINY! With a sweep of my net, I thought I had caught the individual, only to find it had come back empty. My heart sank, but my determination did not. Luckily, a group of volunteers was with me, and one of them (with much better aim, mind you)

was able to successfully net the damsel. We carefully extracted the damsel and examined it with a loupe. Male? Check. Reddish stigma located off the leading edge of the forewing? Check. Eyespots? Check. Abdominal segments eight through ten yellow? Check. Tiny? Check! This was indeed a Citrine Forktail. I was elated – probably appearing a little crazy to those around me, but once you're sucked into the odonate world, I'm sure you can understand this excitement.



Citrine Forktail (*Ischnura hastata*)

Another species that was fun to find was the Shadow Darner (*Aeshna umbrosa*). Personally this was my first non-"Common Green" Darner sighting at the UEC, and it turned out to be the first Shadow Darner to be netted and identified at Riverside Park. On this particular day it was mid-September and quite foggy, with temperatures hovering just over sixty degrees, so I wasn't too hopeful we'd find much on our survey. I hadn't thought of the late season species, or those that even prefer shady (or foggy) environments. Not five minutes into the survey, the volunteer accompanying me netted an individual perched on a rock outside of the pond in front of the building.

Shadow Darners can be mistaken for a similar looking species, the Lance-tipped Darner. These two mosaic darners have wedge-shaped cerci, so distinguishing factors are the size of their abdominal spots as well as the shape of their thoracic striping. The individual we identified was a female. She had very narrow spots on her abdomen and no notch in her anterior thoracic stripe. Shadow Darners also typically have a black outline on the thoracic stripes, while the Lance-tipped Darners do not.



Shadow Darner (*Aeshna umbrosa*)

Photo by Maggie Steinhauer

When entering data later on, I was surprised to see that this had been the first of this species documented at Riverside Park. Another cool data point for the field season! This was especially rewarding on a day that I wasn't expecting to find much. My eyes were reopened to the fact that odes are out and about in all sorts of conditions, and, like the Shadow Darner, there are some species that actually prefer shady conditions or less favorable weather. You never know when you might spot one!

One last highlight I'd like to make for this entry (otherwise I will never stop) is that of the Orange Bluet (*Enallagma signatum*), another first sighting of a damselfly species at one of our branches. Looking back at our data, it appeared that this species had only been found once at Riverside Park back in 2014, so not only was this sighting at Washington Park at a new branch, it was also the first time in five years we had documented an Orange Bluet at any of the UEC sites. Even though the Orange Bluet is not a rare species and is actually quite widespread, it's so exciting to see the richness of species grow as the UEC habitats are improved and revitalized.

This species belongs to the Bluet genus in the Pond Damsel family, which are notoriously difficult to identify (most of them are blue – hence “Bluet—” but there are many different color forms between species, sexes, and ages, and not all are as kindly named to describe their color as the “Orange Bluet”).



Male Orange Bluet (*Enallagma signatum*)

Photo by Dan Jackson

I am really looking forward to developing my expertise, not only in identification, but also on the specifics of each family and species. Where do they like to fly? When do they like to fly? Where would I find the species' nymphs? I can't wait to delve into all things odonate, find more species, and to hopefully document the Citrine Forktail, Shadow Darner, and Orange Bluet again this year. I encourage you to go out and try your hand at photographing dragonflies! Much like birding, it's a great activity to get outside and appreciate wildlife while practicing safe physical distancing.

Helpful Resources:

UEC Odonate Survey Schedule can be found on the research calendar at urbanecologycenter.org

Wisconsin Dragonfly Society: widragonflysociety.org > Learn AND facebook.com/WisconsinDragonflySociety



An Urban Ecology Center survey participant shows an exuvia that she found.

Why the Wacky Wing Whacking?

Freda van den Broek

While check-listing and honing one's identification skills can be tremendous fun, slowing down and taking the time to observe opens the window to a truly fascinating range of odonate behaviors.

One such behavior puzzled me for me the better part of two years before I found any reference to it. I finally encountered a description of it in an article by James S. Walker, in ARGIA - the news journal of the Dragonfly Society of the Americas. The article was entitled "Wing Whacking". (ARGIA 27 (1), 2015)

One afternoon in early October (2013) I noticed a pair of mosaic darners link up, fly in tandem for a short distance, then settle down into the grass beside a pond. I wanted to observe the entire process through to oviposition, so I stalked them as carefully as I could. I sat down in the grass and watched them for a little over 30 minutes. Patience and unobtrusiveness were rewarded with witnessing not only the mating and egg-laying (oviposition) that concluded the process, but also the curious "wing whacking" behavior.

Just a few minutes into the mating process, I noticed that the male raised and lowered his wings over the female a few times, in a very deliberate motion. The wing motion occurred a few times, at almost predictable intervals. It usually followed shortly after the male suddenly arched his abdomen, pulling the female slightly upwards. The male initially used both fore-and hindwings simultaneously. (Photo 1) Later, only the hindwings were engaged. (Photo 2)



Photo 1. Wing whacking with fore- and hindwings

Each time there was wing movement, it was typically between two and four beats. Even though I only managed to capture about six of these 'wing-beatings' in the half hour, I'd estimate that it happened, on average, every two to three minutes.



Photo 2. Wing whacking with the hindwings only

Although the pair made several subtle adjustments to their position while they were in the wheel, they remained on the same perch. At one point the female loosened the hold of her legs on the male's abdomen, but after a wing beating, tightened it again.

After being in the wheel for nearly 30 minutes, the female's abdomen dropped down into a vertical position, uncoupling from the male. The male appeared to try and pull her up again by arching his abdomen. He beat his hindwings a few more times even though she was no longer in the wheel! (Photo 3)

According to James Walker, "wing whacking occurs when a pair of dragonflies is actively mating in the wheel position. The mating process can last several minutes, and can involve a good deal of activity. Sometimes the female appears to become a bit fidgety, and will start to move about. When this happens, the male lifts his abdomen upward a bit, and then

“whacks” the female on either side of her head with his wings. The result of the wing whacking is that the female settles down and mating continues.”



Photo 3. A male Lance-tipped Darner attempts to coax a female back into the wheel position by pulling her upwards and beating with his hindwings.

I’ve observed that the “whacking” can range from a gentle movement like fanning, to a rather jolting blow. The wing beating of the male Lance-tipped Darner (*Aeshna constricta*) in the observation of 2013 was so gentle, that I initially thought the movement had more of a thermoregulatory function. In a pair of Lance-tipped Darners that I observed last year, however, the male was so rough, and the female so noticeably agitated, that their coupling lasted just a few minutes before she broke away. In the case of a pair of California Darners (*Rhionaeschna californica*) and Shadow Darners (*Aeshna umbrosa*), the behavior was more in line with what Walker described, that is, it seemed to follow the agitated movement of the female, and it temporarily subdued her.



Photo 4. Lance-tipped Darners, wing-whacking during windy conditions.

This behavior is not unique to darners – I’ve observed it in Dot-tailed Whitefaces (*Leucorrhinia intacta*) too. On one occasion it seemed to subdue the female, but on another the wings were thrust downward and didn’t make any contact with the female. (Photo 5).



Photo 5. Wing-whacking behavior in Dot-tailed Whitefaces

When I asked an aerodynamicist what the function of the behavior might be, he suggested that the beating of the wings may generate some lift to counteract the drag from the weight of the female. Walker, on the other hand, speculates further that the male may be the one who is fidgeting, “as he conducts the important business of mating and sperm transfer.”

For Walker’s analysis of the frequency of wing whacking and to view a couple of short video clips, visit his blog, The Dragonfly Whisperer, at <http://thedragonflywhisperer.blogspot.com/2015/02/wing-whacking-in-dragonflies.html>. Here you will also find the references to the ARGIA articles that describe the behaviors Walker has dubbed “spin-dry”, “splash-dunk”, “wing grabbing” and “wing pulling”.

MEMBERSHIP MATTERS

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:

Dan Jackson

S2256 County K Road

Chaseburg, WI 54621

Name _____

Address _____

City, State, Postal Code _____

E-mail _____ Share? _____

Check membership category that applies:

Single Member: \$5

Lifetime Single Member: \$50

Sustaining Member: \$15

Lifetime Sustaining Member: \$150

Family Membership: \$7.50

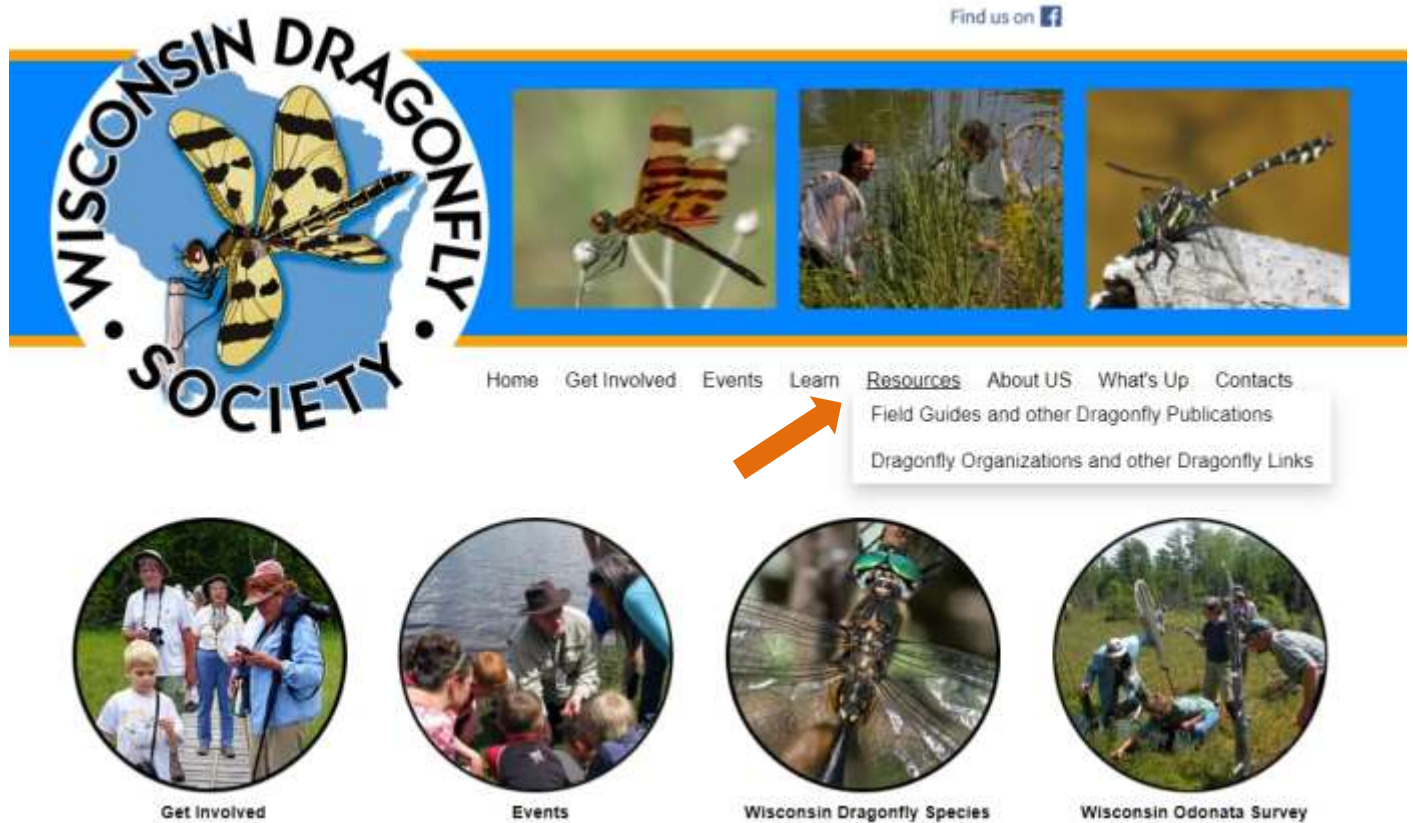
Lifetime Family Membership: \$75.00

Total enclosed \$ _____

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

RESOURCES

Please visit the Wisconsin Dragonfly Society webpage for a list of resources and supplies at www.widragonflysociety.org



Field Guides



Color Guide to Common Dragonflies of Wisconsin
by Kurt and Dorothy Legler
This new version has been expanded to include all WI species of dragonflies. It is available through the University of Wisconsin Adornment Bookstore.



Dragonflies of the Northwoods
by Kurt Mead
This is a great field guide for Wisconsin dragonflies. The third edition contains most of the species found in the state with very few species that are not found in Wisconsin. Its size also makes it very easy to carry in the field.



Damselflies of Minnesota, Wisconsin, and Michigan
by Bob DuBois
Written by Bob DuBois, a founding member of the WDS, this is the most comprehensive guide for damselflies of Minnesota, Wisconsin and Michigan.



Dragonflies and Damselflies of the East
by Dennis Paulson
A great resource for identifying dragonflies, especially out of state specimens. Paulson's companion guide, Dragonflies and Damselflies of the West, is also a must have.



Damselflies of the Northeast
Ed Law
Contains many of the damselfly species in Wisconsin. An excellent companion to Damselflies of the North Woods. Check out Bob DuBois notes on using to book in Wisconsin.



Dragonflies and Damselflies of Northeast Ohio
by Larry Rosche with Judy Semroc and Linda Gilbert
Although this book focuses on dragonflies of Northeast Ohio it contains most of the species found in Wisconsin, especially some of the states southern species that are not covered by the North Woods books.



Stokes Beginner's Guide to Dragonflies
by Blair Nikula, Jackie Sones, Donald and Lillian Stokes
A beginners guide, featuring many of the commonly found species of Wisconsin.



Dragonflies Through Binoculars: A Field Guide to Dragonflies of North America
by Sidney W. Dunkle
One of the first dragonfly field guides. A true pioneer.

Other Field Guides

- *Damselflies of Chicagoland: A Photo Field Guide*, (PDF) version 2, Garrison, M. 2011, 135 pp.
- *Waukegan County Dragonflies and Damselflies*, Tennessee, Ken. 2010, 32 pp. (available from the author: ktennesse@centurytel.net).