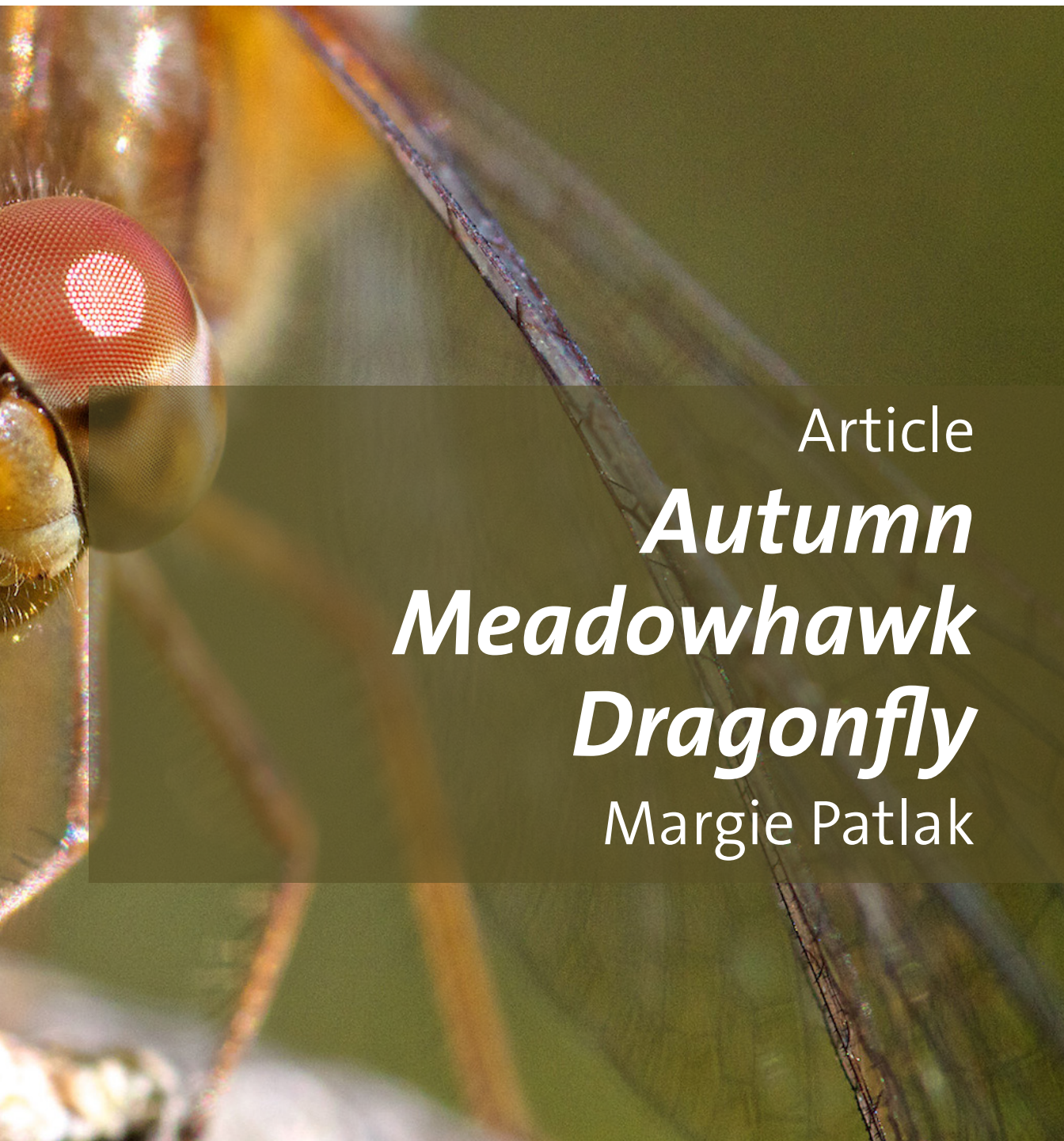




Autumn Meadowhawk (*Sympetrum vicinum*) Dragonfly - Female
Photo: David Marvin, 2015 | Flickr cc



Article

*Autumn
Meadowhawk
Dragonfly*

Margie Patlak

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It's early November and there's a golden glow in the bay, the low light illuminating the tawny grasses and amber seaweed, and silvering the puffs of marsh goldenrod seed heads. Without any flowers to feed on, there are no bumblebees and few other insects flying around my backyard despite unusually warm temperatures in the sixties.

But there's one striking exception—the Autumn Meadowhawk.

Many of these small carmine-colored dragonflies are zipping around, sunlight shimmering their translucent wings. I follow one until it stops to rest and am surprised to discover it's not one Autumn Meadowhawk, but two attached! One is lined up behind the other, and both pairs of large chestnut-colored-eyes stare at me, hexagonal glints in each. I knew mating dragonflies often fly together, the tip of one abdomen attached to that of the other. I've seen the wheel or, more appropriate, heart shapes these dragonflies form while sperm transfers into the female's sperm storage sac she uses to fertilize her eggs. But these two Autumn Meadowhawks are lined up in tandem. Why?

I discover that after mating, the male Autumn Meadowhawk dragonfly continues to use his special claspers at the end of his body to grasp the female by the neck. Fitted

together in this funny way, they fly to a body of water where the male dips the female in repeatedly to lay her eggs. Although it sounds like doting co-parenting, this male companionship while the female lays her eggs is actually a competitive act to ensure no other males come along to mate with the female and deposit their sperm in her sperm pouch. Many male dragonflies have some behavior or specialized features to outcompete the sperm of others, given that often the female mates more than once before laying her eggs. In some dragonfly species, the male's penis sports lobes that expand during mating to first pack down any sperm that preceded it into the sperm pouch before depositing theirs on top. Or they are shaped like a bristle brush that they use to scrape out other male's sperm. Both remarkable designs boost the likelihood that the last one in will score a fertilization.

The males of Autumn Meadowhawks instead use the strategy of guarding their sperm by holding onto the females they mated long after copulation, sometimes until nightfall, creating what the entomologist Gilbert Waldbauer called "living chastity belts." He noted in his book *Insects Through the Seasons* that the walking stick holds the insect record for such prolonged intercourse. "The small male—as little as one-quarter



Meadowhawks mating | Photo: Gary Yankech, 2014 | Flickr cc

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the length of the female—may perch on the back of his gigantic mate’s abdomen and remain in copula with her for as long as seventy-nine days,” he wrote. That’s nearly three months--almost an entire season! Talk about being proprietary.

Some species of fruit flies have another surprising strategy to outcompete males in the fertilization game—supersized sperm. Although men can obsess on the size of their penises, for these fruit flies it’s the size of their sperm that seems to matter more. One species has sperm as long as 7 cm, which considering its tiny size, is the equivalent of human sperm measuring the

length of a tennis court, Jonathan Balcombe pointed out in his book *Superfly*. Much of its length is in its tail, which forms tangles that block subsequent male sperm from fertilizing an egg. The diminutive fruit fly actually holds the record of having the largest sperm cells of any known organism. Who would have known?

We don’t see dragonflies for most of their lives because they reside for as long as 5 years as nymphs underwater in ponds and other water bodies. Still recognizably dragonfly-like with its big bowl eyes, a nymph lacks wings and a long tail but darts around using jet propulsion created by



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Photo: David Marvin, 2022 | Flickr cc

sucking up water and then rapidly squirting it out through its anus. The dragonfly nymph's rear end has another important purpose—breathing--as its gills are located in its rectum. The nymph can quickly nab its aquatic prey with an amazing toothed retractable jaw like the shovel of a front loader tractor. In a mere millisecond, this appendage jabs out and then retracts to scoop up tadpoles and other prey. Bam!

Overnight the dragonfly nymph transitions from water to air, swimming to flight. While clutching a reed, stick or something else to keep it out of water, its back skin (which is really its skeleton) splits open and

out comes a compressed dragonfly, gulping its first breaths of air while it waits for its wings and torso to expand and its new skin to harden. Imagine undergoing such a transformation, swimming one day and flying the next!

I marvel at the dramatic life cycle of dragonflies—a life cycle so unlike ours. But I first came to appreciate dragonflies years ago when I was a young damsel in distress and they came to my rescue. Immersed in the middle of a pothole marsh, my upper body was marinated in sweat while muck painted the lower. Cicadas rattled above, heat and humidity warped the distant view.



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I struggled to ignore all bodily discomforts and focus on my master's thesis research, which required me to identify the plants brushing my legs. Pothole marshes serve as vital food depots for cranes and other migratory birds and stand out in all the squared off fields of grain and grasses in the Midwest. Unfortunately, I stood out and served as a food depot for the mosquitoes swarming around me, feasting on my blood!

Outnumbered, I couldn't stave off their itchy, annoying, and highly distracting bites with my futile swatting. But then I heard the dim clatter of dozens of fluttering wings, so unlike the whining drone of mosquitoes.

I looked up and saw not a bird or a plane, but a full-fledged squadron of dragonflies! Zipping in with large fractal iridescent wings and cartoonish bulging eyes, they snatched one mosquito after another out of the air—bam!--like superheroes in comic books. With their astonishing 95 percent kill rate, in the blink of an eye the dragonflies rid the marsh of all the mosquitoes that had been plaguing me for the past hour; saving the day, as they say, and from then on became my heroes for life, my best friends forever. Obsessing over them, I collected anything with their images, from shirts to mugs to earrings. Now I collect dragonfly facts



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while trying to understand how they had so quickly cleared the marsh of mosquitoes.

The more I learn about dragonflies, the more they astonish me. One of the first winged insects to evolve, they were around before dinosaurs, back before the continents split up and started to drift apart, taking the dragonflies with them. Dragonflies watched the dinosaurs sink into the ground, destined to become fossils, while they kept going. Like many animals when the world was young, they were bigger... much bigger. Back then, dragonflies had wingspans of more than two feet!

Because evolution has perfected dragonflies' eyesight over more than 300,000 years, it matches their fast-flying prey. Their bloated eyes, comprising most of their head, have 24,000 facets, enabling them to see in every direction except behind. These eyes capture 200 images a second. (Our eyes capture a paltry 60.) This fast-snapping-camera vision lets dragonflies experience time differently than we. They see life in slower motion so they can react more quickly -in 30 milliseconds--to things we never notice.

Dragonflies also see a more colorful world. We only see color combinations of



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red, blue and green, due to having only three different types of light-sensing proteins called opsins in our eyes. But dragonflies can have ten times as many opsins.

With their four independent wings, dragonflies can move in any direction in space--sideways, forwards, backwards, upwards and downwards. And, like a helicopter, they can hover in a single spot in the air for a minute or more.

With all these feats of movement, dragonflies can ambush unsuspecting flying insects from any direction. Their legs gather and point upward to create a death basket

that scoops up prey in flight. They are not only agile, but fast—they can zip about at more than 35 miles per hour. That speed is due in part to the intricate and prominent veining of their wings that not only underscores their iridescent beauty, but makes the wings incredibly stiff and strong, enabling them to pull more distance with each wingbeat. Those veins are also equipped with more than 3,000 sensors for airflow and strain on the wing that help dragonflies fine-tune their flight. Engineers have modeled these flight dynamics in making a working robot, as you can read about



Dragonfly sitting on green plant
Photo: Skyler Ewing, 2020 | Pexels cc

in the companion article “How to Build a Dragonfly”.

Dragonflies need strong wings because some migrate south over a thousand miles each fall. In between India and East Africa, the Globe Skimmer dragonfly has clocked more than 10,000 miles each year. Here in the northeastern United States where I live, green darner dragonflies and various species of skimmer dragonflies fly all the way down to the tropics each year. Mass movements of Autumn Meadowhawk dragonflies also occur in the Northeast in the fall, although scientists have yet to document any major southward migration of them.

Dragonflies’ migratory journeys are terribly tiring. They often have to rest motionless during brief stopovers or stay in one spot until their muscles warm up for flying. Many don’t survive. They litter the ground with their chitinous carcasses when days start to grow cold. One fall day while out walking with a friend, I spotted an Autumn Meadowhawk dragonfly on the road. Wanting to bring it back to adorn my desk, I picked it up and carefully cupped it in my hand during our walk, but ten minutes later it jolted me with its movement. The dragonfly wasn’t dead, but merely resting or warming up! I opened my palm and let it flutter away, wishing it a safe journey. ×



Margie Patlak is a science and nature writer whose memoir *More Than Meets the Eye: Exploring Nature and Loss on the Coast of Maine* was given an "Outstanding Book" award by the American Society of Journalists and Authors in 2022. She is currently writing a book about insects, from which this article is adapted.

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