

Dragons and Damsels

On a summer eve, swarms of dragonflies enthrall, inspire further study of a fascinating insect.



Identifying dragonflies can be challenging. Often the sexes look different like the golden-winged skimmer (male on left, female on right). About two inches long, the male appears reddish-orange and the female exhibits more yellow hues. Both have brown thoraxes. It favors grassy ponds and often perches on nearby vegetation.

J. Morton Galetto, CU Maurice River

A few years ago in Mid-August I was trying to find out where the purple martins were feeding before they assembled to stage in great numbers at dusk among the common reeds on the Maurice. That year they were roosting south of the Mauricetown Causeway Bridge. When I got to Noble Street just west of the Mauricetown Firehall.

between US Silica's mining ponds, I was met with a staggering number of darners (one of a number of large dragonflies). They were making passes over the road in the thousands. They would pass perpendicularly rather low to the road and then rise above the trees. This created a roller-coaster-type effect. It was truly a feeding frenzy. The mixed flock included various-sized dragonflies but the large darners really stole the show. It was mesmerizing.

I thought I would find the martins around such a large congregation of dragonflies since they are one of their favorite prey species. But alas, I did not. The two species do have one commonality: both martins and dragonflies will catch and eat their food only in flight.

I remembered once reading that biomechanics studied dragonflies to experiment with aircraft, hoping to make something as maneuverable and efficient as the dragonfly. It can fly straight up and down, hover, and even mate on the wing. Its ability is unsurpassed when it comes to moving through the air.

The CIA museum in Washington has on display an early spy device that they made during the cold war, c 1970: a robotic dragonfly darner. This was the

first of many insect robotic spy devices. Popular Mechanics (Feb.18, 2020) covered the release of mechanical drawings by the CIA, for the first time in 50 years, showing the details of the "insectohopter." Retroreflectors or tiny beads mirror laser light, causing vibrations that can be analyzed to extract sound from that light: a microphone. This is how the CIA eavesdropped.

Back to the swarm. Christine Goforth at the North Carolina Museum of Natural Sciences has been studying swarm behavior, when hordes of dragonflies congregate, feeding on small prey insects. She heads a citizen science activity called "The Dragonfly Swarm Project." They have found dozens, millions, even billions flying in a group, especially during migration. Individuals clock in at 30 mph! Migrating groups can fly in flights 50 - 100 feet above the ground and in such numbers as to be picked up by radar.

Migration normally occurs in August and September. Two groups of dragonflies are migrators in North America: the darners and the skimmers; and 16 species comprise these groups. In the adult form most dragonflies live for only 2-4 weeks, while migrating species may live for a few months. Their larval stage, or

nymph or naiad – is the longest part of their life cycle, lasting a month to five years depending on the species and habitat conditions. The larvae climb out of the water on emergent vegetation (partly-aquatic submerged plants) to molt or metamorphose into the flying adult. The shed exoskeleton or exuviae often stays on the vegetation as an empty cast. This shedding process takes place 8-17 times before the full metamorphosis, and it requires a few days to a few weeks for their body to become firm and develop its true colors once more. Adults then lay their eggs on the water and the lifecycle begins again (Stokes).

Scientists have attached miniature transmitters to darners, and have discovered that green darners from NJ traveled every third day, averaging 7.5 miles. One individual logged a 100-miles in one day! A species called globe skimmer has the longest flight of any insect in migration: 11,000 miles across the Indian Ocean and back (Smithsonian Mag).

Dragonflies and damselflies are of the order 'Odonata'. Neither is a fly; they also have six legs and three body parts: head, thorax, and abdomen; but while flies have two wings, dragonflies have two sets of two. The word dragon is used to describe them because of

their toothed jaws. Odonata derives from the Greek 'odon;' essentially 'tooth.'

Damselflies rest with their wings primarily together, but dragonflies perch with wings open and spread horizontally. Damselflies will eat prey on surfaces of vegetation. Most dragonflies' eyes touch but damselflies' eyes are clearly separated. Their life cycles are very similar.



This ebony jewelwing is obelisking (tail pointed skyward) to avoid overheating. Note the damselfly perches with wings closed vs. open like a dragonfly. Also, its eyes are clearly separated unlike the dragonfly's eyes.

Dragonflies' eyes take up nearly all of the head; their heads can be moved 180° side to side, and 40° up and down. Their compound eyes are six-sided units, and there is an additional of three smaller simple eyes used to detect subtler motion, called ocelli. They are deadly hunters eating greenheads, strawberry flies, gnats, midges, and mosquitos; one species is even known to eat hummingbirds. Consuming these insects makes them of great value to people. In larva stages they eat mosquitos, tadpoles, fish, other larvae, and other dragonflies. They do not attack people, but if held they can bite.

(Please scroll down)



This frontal view shows the huge compound eyes and three smaller eyes called ocelli. The compound eyes give the insect a 360° view. The ocelli anchored by the vertex and detect subtler motion.



This blue dasher shows clearly how the dragonfly's head is predominated by its compound eyes.



Side view of blue dasher.

There are about 5,000 species of dragonflies, with 435 species found in North America. From fossil records we know they have existed for around 300 million years, predating dinosaurs. Some fossils reveal it to be the largest insect ever to exist. Called "meganeuropsis," it was discovered in France in 1880 in the form of various specimens measuring 5-24 inches. Some scientists believe they achieved these sizes during the Paleozoic era because of higher oxygen levels.

Of NJ's 180 species of dragonflies and damselflies, 30 are at risk of extirpation. Development pressures, habitat, and water quality affect their

reproductive success and impact
species less tolerant of degradation.

The months or years that they spend as larvae in the water allow them to bioaccumulate toxins. In August CU volunteers will collect nymphs for mercury analysis as part of a national water and habitat quality study at the University of ME, in partnership with the US Geological Service, Schoodic Institute, and the National Park Service.

Backyard ponds help dragonfly populations and they are valued predators on pest species; sometimes they are referred to as 'mosquito hawks.'

My experience on Noble Street was not unique. I have seen large assemblages of dragonflies hunting. But the way they almost seemed to roll over the trees and road is forever etched in my mind.

*Sources: Field Guide to Dragonflies and Damselflies of NJ, A. Barlow, D. Golden, and Jim Bagma
Beginner's Guide to Dragonflies, Stokes
Popular Mechanics, February 2020
Smithsonian Magazine*

Photos by author

*Join Us...
Be a Citizen Scientist*

You can volunteer as a citizen scientist. Join us to gather specimens for a nationwide study on mercury contamination being conducted at over 60 different National Parks and Wild and Scenic Rivers.

In 2020 for the sixth consecutive year, the Maurice River has been selected as a sampling site. This outdoor opportunity will take place on August 18, 19, and 29. E-mail Karla.Rossini@CUMauriceRiver.org for more information.



Slaty skimmer (libellula incesta)- female