

Summer's Dragons

Some refer to the sultry weather between the July 4th holiday and Labor Day as the dog days of summer. I prefer to call it Panama, when the heat and humidity in the D.C. area make an outdoor excursion feel like stepping into the steam bath of a tropical rainforest. The cicadas are buzzing in the trees and the mosquitoes are swarming close enough for an evening stroller to hear their whine. Maybe it's best to go inside and read a book and wait for the late August breezes before turning to natural history observations.

I am outdoors in D.C.'s Panama because it is the peak time for a favorite pastime of mine—dragonfly watching. The truth is that there are few more remarkable flying creatures in nature than the 3,000-plus species of dragonflies and nearly 3,000



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12-spotted Skimmer Dragonfly (Libellula pulchella)

more species of their more delicate relatives, the damselflies. Panama is a fitting name for the time of year when dragonflies are active because even far from the tropics, they prefer hot and muggy weather to cold and dry conditions.

Aviation engineers, drone pilots, or even those willing to reconsider an innate fear of large flying insects would do well to watch these airborne marvels at work. Consider this: dragonflies can fly in six directions—forward, reverse, up, down, left, and right, and they can hover when necessary. They can reach speeds of 45 miles an hour and typically dart about while flapping their wings only 30 times a minute. To compare, mosquitoes and houseflies are far less efficient, flapping their wings 600 and 1000 times a minute, respectively. Physiologists estimate that, adjusted for the size of the insect and their wings, dragonflies exert 20 times more power in each wing stroke than do other flying arthropods. Imaginary dragons win all the movie and television parts, but dragonflies are the helpful pest exterminators of the natural world. We should celebrate them for their exquisite taste in insects—dragonflies like the 12-spotted skimmer (illustrated here) that patrols the canal along the Potomac feast on mosquitoes and midges. This is a dietary

predilection that starts early. Dragonfly larvae are aquatic and can remain in the larval stage for as long as two or three years. During this period, they devour mosquito larvae clinging just below the surface of the water. They also eat prey larger than themselves, such as tadpoles, fish, and even fellow dragonfly larvae. Fly fishermen and those adept at testing stream water quality will tell you that a healthy dragonfly larvae population, along with stone and caddis fly nymphs, are biological indicators of clean, fast-moving streams.

I have yet to see a report in the scientific literature estimating the daily mosquito intake of the giant dragonflies that lived 300 million years ago. Back in the carboniferous age, dragonflies were as large as sea gulls are today. The prevailing theory to explain how dragonflies achieved such large size points to high levels of atmospheric oxygen, which occurred in concentrations of around 30%, more than twice the level found today. Too much oxygen can be poisonous to organisms; adult dragonflies must regulate O₂ intake by opening or closing holes along the sides of their bodies (known as spiracles). The sensitive larvae are more at risk because they absorb oxygen directly through the skin. One way to decrease the risk of oxygen toxicity would have been to grow bigger, since large larvae would absorb lower percentages of the gas relative to their body size than would small larvae. If an insect or any creature grows larger, then its volume increases relative to its surface area, a fundamental principle in understanding the physiology of much of life on Earth. So monster-sized adult dragonflies became inevitable during this high O₂ era.

Guinness World Records is not done with these creatures. Dragonflies are not just the sprinters of the insect world. The globe skimmer, another species of dragonfly, holds the record for the longest migration of any insect—back and forth across the 11,000 miles of the Indian Ocean from India to Africa and back again. Not to stop there, the globe skimmer cruises at altitude, having been recorded at 6,200 meters in the Himalayas.

Two more natural history sightings have profound implications for the future of life—at least of dragonflies—on Earth. After nuclear testing was completed on Bikini Atoll in the South Pacific in 1958, the globe skimmer was the first dragonfly to resettle there. It is also the only dragonfly species found on Easter Island, one of the most isolated places on Earth, 1,300 hundred miles off the coast of Chile. When I visited Easter Island in 2000, I felt

like I had landed in some post-apocalyptic movie set, with much of the natural forest stripped away, and with a small population of humans of mixed Polynesian and Hispanic heritage, racing their horses across the wind-swept plains. Later I learned that flying along across the island but unobserved by me, was the world-traveller, the globe skimmer in search of prey.

The adult dragonfly has only one major weakness, aside from the short lifespan of two to three months: if it cannot fly, it cannot feed, so severe storms would threaten its survival locally. Nevertheless, dragonflies flourished long before humans appeared, and the observations from remote Easter Island and Bikini Atoll suggest that should humans someday exit the scene, dragonflies will still be here, in numbers, just as they have been for millennia. —