

DRAGONFLIES

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Focus on Biodiversity

Why focus on biodiversity. In her book, *Silent Spring*, Rachel Carson alerted the public and government regulators to the importance of protecting complex biological communities. The inter-relationship and interdependency of organisms is critical to ecological balance and human survival. With broad spectrum pesticide use, and indiscriminate poisoning with systemic pesticides, an ecological imbalance is created, sacrificing the benefits of nature and escalating pest problems.

In its aquatic stage of life, when they are living in the water, dragonflies eat mosquito larvae, thus playing an integral role in an ecological-based approach to mosquito management.

Immature dragonflies (nymphs) live in water. The nymphs of some dragonfly species may live in aquatic environments as long as five years before becoming adults. Though their six legs cannot walk very well, they allow nymphs to perch on large rocks and cross stones when in search of prey. Nymphs propel themselves rapidly through the underwater landscape, using a jet-like ejection of water from their bodies. Such impressive speed allows nymphs to consume all kinds of small underwater creatures. The nymph's enormous mouthparts, being scoop-like, encompass the majority of the lower half of the nymph's head. The nymph's body is between one-quarter to two-and-a-half-inches long and molts several times before its final molt into adulthood.

Dragonfly adults are voracious aerial predators. With wrap-around compound eyes composed of up to 30,000 facets (ommatidia) transmitting ten thousand angles all at once, they are able to reach target insects in midair more than 95 percent of the time. Research suggests that dragonflies may be the most effective hunters in the animal kingdom.

The aerial acrobatics necessary for seemingly tireless hunting require neurons to select one moving target from a frenzy of possibilities, and the dragonfly does not disappoint. Its brain retains the retinal image of the target prey even as the target gets closer. The combination of incredible neuro-capacity, retinal retrieval, and wrap-around eyes allows the dragonfly to track a moving target, calculate a trajectory to intercept that target, and subtly adjust its flight path as needed.

Mating pairs fly together, in tandem, resembling well-choreographed dancers.

Dragonfly females usually fly low over the water, depositing eggs on logs, aquatic plants, or directly on the watery surface covered loosely in floating vegetation. In late summer, eggs are laid in warm freshwater, such as ponds, slow-moving tributaries, or marshy areas where the waters are less turbulent.

Once dragonfly eggs hatch, the emerging nymphs will develop and feed as long as food is available within the surrounding aquatic environment.



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Thus, aquatic environments provide suitable habitat for an impressive range of insect and animal species, offering countless examples of harmonious coexistence and interdependence.

ANCIENT LINEAGE AND SPECIES ORDER

Dating to the Carboniferous period, some 300 million years ago, dragonfly ancestors had wingspans the length of one human arm. Primordial Earth's atmosphere was high in oxygen, enabling insects, animals, and assorted mega-fauna to grow to enormous sizes as compared to today's standards.

The dragonfly's order, *Odonata*, meaning "toothed ones," is not a very species-rich group, encompassing only some 7,000 species worldwide (its species list includes the related damselflies, which, unlike dragonflies, can fold their wings back against their bodies). This list of 7,000 species is low when compared with hundreds of thousands of beetle and butterfly species—many of which may share, at least temporarily, the same aquatic ecosystems as dragonflies.

ECOLOGICAL ROLE, HUNTING AND HABITAT

Nymphs are commonly found near bunched aquatic vegetation, reeds, grasses, and submerged tree roots where they lie in wait for prey. When a potential meal swims or ambles by, the nymph's extendable jaws flash outward to snatch and draw in the food.

Conversely, the four transparent, exceptionally flexible wings of adults are attached to the thorax by distinct muscle groups. Each wing, though rigidly projecting outward on the body, can be maneuvered independently, aiding the dragonfly's extraordinary range of flight options. Dragonfly mandibles are notably serrated, enabling them to crush prey, easing digestion and allowing for swift consumption.

Dragonfly adults can migrate across regions to maximize breeding opportunities. This allows adults flexibility in finding warm, fresh waterbodies in which to safely lay their eggs. The migration of some dragonfly species spans vast distances each year—for instance, swarms of green darner dragonflies (North America's most common dragonfly) migrate each fall and spring between the northern U.S. and southern Mexico.

FROM PREDATOR TO PREY

In addition to their respective role as predators, dragonfly adults and nymphs alike play an additional role as important food sources for other living species, such as fish, larger aquatic insectivores, and birds able to hunt underwater, including the Great Blue Heron. In this way, dragonflies, and the species that rely on them, encompass a broader ecosystem, all elements interwoven and dependent upon the health of their surroundings. When the interconnections of an ecosystem are disturbed, when a species is displaced, when a food source or familiar habitat becomes contaminated, support for a sustainable living system falls apart.

Quick Facts

- Dragonflies spend up to 5 years (most often 1–2 years) as underwater nymphs.
- They cannot hear well, and their stubby antennae are of little use for smelling or detecting pheromonal flirtations. However, dragonflies have amazing eyesight and this makes them expert fliers, able to hover, dive, fly backwards and upside down, pivot 365 degrees, and reach speeds of 30 miles per hour.
- Both as flying adults and as aquatic nymphs, dragonflies are important mosquito predators, as their ceaseless search for food routinely regulates the insect's numbers.
- Dragonfly nymphs prey on the aquatic developmental stages of target insects, including the larvae of mosquitoes, mayflies, midges, and other small insects. They will also prey on tadpoles and small fish. In some instances, nymphs might even snatch prey from the claw of a crayfish.



Dragonfly eating mosquito