

Dragonflies & Damselflies

General information

- scientists have named about 6,500 species of dragonflies that exist today.
- in North America, there are around 450 species of identified dragonflies.
- dragonflies are everywhere there's fresh water and are found on every continent except Antarctica.
- dragonflies and damselflies are members of the order *Odonata*; the suborders are *Anisoptera* (dragonflies) and *Zygoptera* (damselflies); the term *dragonfly* is often applied to both
- as with birds, adult dragonflies are usually colored more brightly than juveniles
- temperature affects behavior in a variety of ways
 - ... on cold days, many dragonflies bask by holding their bodies perpendicular to the sun's rays, and species that do not usually perch on flat surfaces may do so to bask
 - ... on cold days, many species become wary and fly for cover at the least disturbance
 - ... on hot days, some Clubtails and Skimmers raise the abdomen; the warmer the temperature, the higher the abdomen is elevated, like the needle on a gauge. The raised abdomen reduces the body surface exposed to the sun
 - ... some Darners can change body coloration to aid temperature control

Adult anatomy

- Like all insects, dragonflies have an external skeleton, or exoskeleton, which is a collection of hard plates made of chitin that are connected to one another by narrow, flexible membranes; the body is divided into three parts: head, thorax, and abdomen
- The **head** is a sensory processing center
 - ... there are two large compound eyes and three small simple eyes called *ocelli*.
 - ... dragonflies see all the colors we see, plus ultraviolet light and polarized light; they can detect the flickering of light at twice the rate that we can
 - ... a comb of flat bristles on each front leg is used to brush dust and water off of the eyes
 - ... the lower jaw is sharply serrated to help seize prey; the "toothy" jaw is what gives them the name *Odonata*, from the Greek meaning "toothed ones"
 - ... dragonflies catch most prey with their jaws; they can capture larger prey by grabbing it with their front legs and stuffing it into their jaws
 - ... dragonflies drink by flopping into the water three times; they use the same flopping behavior for cooling and cleaning
 - ... The pair of antennae are very small and inconspicuous. Because of their minute size, dragonflies probably have a poor sense of smell; the antennae may function as airspeed sensors
 - ... dragonflies are apparently deaf and do not respond to sound
- The **thorax** is the power center
 - ... there are three pairs of legs and two pairs of wings attached; each pair of wings can beat independently of the other.
 - ... wings are a double layer of membrane with veins in between; the veins transport hemolymph, the dragonfly equivalent of blood, and serve as air ducts and nerve conduits; the veins also strengthen and stiffen the wings
 - ... each leg consists of several segments: the longest is the thigh; the lower leg is the tibia, and each leg ends in two claws; in flight, the front legs are folded up behind the head and the back two pairs are folded lengthwise parallel to the body

Dragonflies & Damselflies

- The **abdomen** is the food and sex center
 - ... the abdomen consists of 10 segments of varying size
 - ... in females, the abdomen contains an ovipositor, or egg-laying device (while dragonflies do not sting, occasionally a female Darner will try to lay an egg with a painful jab into the leg of someone wading in the water)

Mating & egg laying

- the Amberwing is the only North American dragonfly known to have a courtship where the female has a choice whether or not to accept a male; with others, it just happens
- the male curls the tip of his abdomen to take a sperm packet from segment 9 of his abdomen and move it to a chamber between segments 2 and 3
- generally, the male flies above the female and grasps her head and thorax with his legs; then he curves his abdomen to grasp the top rear part of her head; he then releases his legs and the pair is now in **tandem**
- then while he holds the female by the neck with special claspers, the female bends her abdomen to pick up the packet using the tip of her abdomen; this is the **wheel position**, and can last from a couple of seconds in some species to more than an hour in others.
- one mating usually provides a female with a lifetime sperm supply; however, there is “sperm competition”
 - ... the penis of the male dragonfly is highly modified and can scoop out or push to the side any sperm already present in a female; most of the time spent in mating usually involves the removal of sperm rather than insertion.
 - ... males of some Skimmers and the Green Darner retain the female in tandem after mating and travel with her while she lays her eggs
 - ... in some other Skimmers, the male perches or hovers above the female as she lays her eggs and drives away any other male that tries to mate with her
- females of different species have different techniques
 - ... a few Darners have egg-laying device that has blades and is used to insert eggs into the soil; most Darners use the blades to insert eggs into plant tissue; in either instance, the female is vulnerable to predation because she is stationary
 - ... females with spoutlike ovipositors hover or fly slowly while poking eggs into mud or algae mats
 - ... most Skimmers use flying contact egg laying where the female dips the abdominal tip to the water surface while hovering or flying

Diet

- adult dragonflies eat only insects, and only live ones; they are opportunistic and eat whatever happens to be flying around at the moment
- dragonflies can be cannibalistic, but usually only when other prey isn't easily available
- dragonflies typically eat 10-15 percent of their own weight in prey each day; however, if the food is there, they'll keep eating
- juvenile dragonflies often eat butterflies and moths
- almost all prey is eaten head first
- dragonflies sometimes eat caterpillars (almost insects) that dangle in midair on their “webs”

Dragonflies & Damselflies

Hunting

- dragonflies use two primary strategies for hunting:
 - ... *hawking* – catching insects in flight in midair (most common)
 - ... *gleaning* – hovering briefly above vegetation to take small insects on plant stems or leaves
- Darners tend to hawk, but most dragonflies can do either; damselflies are usually gleaners
- Hawking dragonflies often make systematic patrols in food-rich areas; they fly back and forth, retracing the same path; small insects are eaten on the wing while they return to the same perch to eat larger prey
- hunting dragonflies can also be classified as either perchers or fliers
 - ... clubtails, skimmers, and damselflies are usually perchers – they find a tall perch with a good view, like a grass stem or dead weed stalk, and sit there scanning for prey (often turning their heads watching the air traffic); when they find the right size prey within range, they dart out, grab the prey, and quickly return to the perch to eat
 - ... darners, spiketails, cruisers, and emeralds are usually fliers – on a good flying day (warm, no rain), they fly for hours, catching insects in midair and swallowing them while continuing on

Life cycle

- EGG
 - ... eggs are laid on or near water, or in a place that will fill with rainwater
 - ... eggs hatch as soon as five days in temporary pool breeders to as long as several months for others that must survive a cold winter or long dry season
- LARVA
 - ... the brown or green aquatic larvae are called *nymphs* or *naiads*
 - ... nymphs have enlarged and clawed lower lips that can shoot out in 1/100 second to as much as 1/3 the body length to capture prey; nymphs are the top carnivores in fresh water where there aren't fish
 - ... nymphs breathe through gills (located internally in the abdomen of dragonflies, externally on feather-like appendages at the rear of damselflies); dragonflies breathe in and out of their anus, and when water is forced out under pressure, the larvae become jet propelled
 - ... a nymph grows by molting its skin between 8 and 17 times, depending on the species
 - ... the time spent as a nymph ranges from a month to as much as 8 years, depending on the species and temperature
 - ... a few days before becoming adult, nymphs cannot capture prey and do not eat; in many species the nymphs move to the surface of the water and begin to breathe air
 - ... at night (Clubtails may do it during the day), the nymph climbs out of the water and hooks its claws into a support; the dragonfly swallows air and the resulting pressure splits the larval skin; as it continues to swallow air, it rises out of the larval skin
 - ... after the legs have hardened, the wings are inflated; at dawn, it takes off, fully grown; little winged dragonflies do not grow into big winged dragonflies
- ADULT
 - ... a pre-reproductive adult is a juvenile, a period that lasts from a week to month, depending on the species, temperature, and food supply
 - ... the adult life span ranges from about a month to around nine months, depending on the species

Dragonflies & Damselflies

Differences between dragonflies & damselflies

Perching:

- Damselflies hold their wings together and over their backs, butterfly-style.
- Dragonflies lack the anatomical “hinges” to fold their wings back; they spread them out when at rest, moth-style.

Eyes:

- Damselfly eyes are at the sides of the head, bulging out, and are noticeably apart from each other
- Dragonfly eyes are large and so close to each other that they touch or almost seem to touch

Bodies:

- Damselflies tend to have small, thin bodies
- Dragonflies tend to have large, stocky bodies

Flight:

- Damselflies are weak, aimless fliers whose pattern seems to flutter or float in the air
- Dragonflies are strong, fast fliers whose pattern seems directed and purposeful

Nymphs

- Damselfly nymphs have external gills located on the tip of the abdomen -- three feather-like extensions that look like a tiny rooster's tail.
- Dragonfly nymphs lack these feather-like extensions; instead, the nymph's body ends in three short spines. The gills are hidden inside the abdomen.
- As with the adults, damselfly nymphs are smaller and thinner than dragonfly nymphs

References:

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