Photinus pyralis, Big Dipper Firefly
(Coleoptera: Lampyridae)

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Description

Adult big dipper fireflies are small, elongated beetles three-eighths to three-fifths of an inch (9 to 15mm) in length, soft in texture and densely covered by small hairs. They have large eyes, black wing covers (elytra) with yellow margins and large pronota (top surface of thorax) extending over their heads. The color pattern on the pronotum is variable, but the center is always pink with a black center dot. The light-producing organs differ between sexes. Males possess these organs on two segments, females on one.

Distinguishing adult big dipper fireflies from other species based on external appearance in the same genus, Photinus, is complicated by color and size variations within populations. Dissection is required for confident species identifications. However, in the wild, male big dipper fireflies can be easily identified through the species-specific flash pattern and flight path, which forms a distinct J-shaped courtship flash. This flash is also the basis of the common name.

Big dipper firefly larvae are small, six-legged, elongated insects with distinct body segments, each armed with a flat dorsal plate. They have small heads, short antennae and two light-producing organs on the abdomen. Species identification of larvae requires rearing them to adults. The pupae of Photinus resemble a pale white version of the adult with the wings folded onto the sides of their bodies.

Life Cycle

Fireflies undergo complete metamorphosis, with a life cycle consisting of four developmental stages: egg, larva, pupa and adult. Photinus females lay small, round eggs about one-thirtieth of an inch (0.8 mm) in diameter in moist crevices. The eggs glow slightly when first laid, but this fades over time before hatching within 18 to 25 days. Larvae are nocturnal, solitary predators inhabiting a variety of moist habitats. They feed on soft-bodied invertebrates, such as snails and worms. Photinus larvae spend much of their time concealed in organic matter or underground and construct cells from organic matter in which to molt or pupate. Larval Photinus can be found throughout the year, and the larval stage may require one to two years to complete. Like most fireflies, Photinus pupae glow, and the light intensifies when disturbed. Pupae require nine to 15 days to mature depending on temperature. As adult emergence (eclosion) approaches, the luminescence of the Photinus pupae fades, and the body takes on the color of the adult.

Adult big dipper fireflies have reduced mouthparts and do not feed, relying on fat reserves stored during the larval stage to sustain all their adult activities. Throughout summer, male and female big dipper fireflies engage in a flash pattern courtship display that is specific to each species. The initiation of flashing is dependent on the light environment. In dark woodlands, males may begin flashing as early as 20 minutes before sunset. In open fields, they can begin flashing as late as 11 minutes after sunset, continuing for about 90 minutes. Male fireflies fly in U-shaped arcs, flashing at
intervals that produce the J-shaped light path. Female big dipper fireflies identify males through their flash patterns while remaining stationary on low vegetation. They signal to a preferred mate using a single flash. Flash patterns vary among males, and females seem to prefer those with the longest duration flashes.

Ecology and Management

The big dipper firefly is the most common firefly species in the eastern U.S., occurring in large numbers in moist habitats. The range of big dipper fireflies extends from southern Texas all the way to southern New York and west to Kansas and Nebraska with isolated records further west. Larvae require wet meadows and woodlands or areas along margins of lakes and streams for development.

All fireflies store toxic chemicals called lucibufagins that render them unpalatable to predators, and they advertise this chemical defense to potential predators in the form of bioluminescence in all four life stages. The chemical defense provided by lucibufagins and bioluminescent warnings does not protect big dipper fireflies from specialized predators and parasitoids. Female fireflies belonging to the genus Photuris and known as “femme fatale fireflies” specialize in luring and devouring male big dipper fireflies and those of other species, acquiring both nutrition and lucibufagins from its victim. Phorid fly species in the genus Apocephalus are known parasitoids of Photinus adults, including big dipper fireflies.

Artificial outdoor lighting severely disrupts courtship communication of fireflies, preventing successful reproduction. Bright, broad spectrum outdoor lighting virtually eliminates fireflies from an area. Low intensity lighting in the red end of the spectrum is less disruptive. Fireflies are only one of many animal species that are adversely impacted by light pollution. Large scale community action is often required to mitigate light pollution impacts and restore suitable breeding habitats for fireflies.

References


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