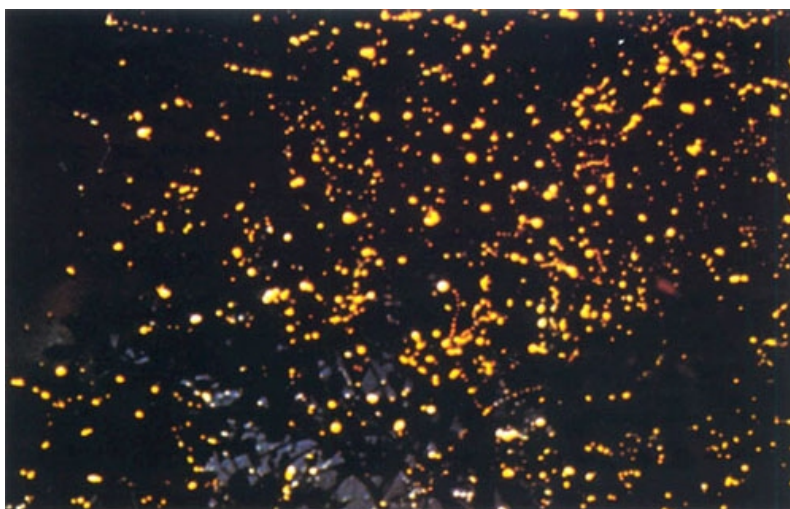


# Fireflies

*Lampyridae*



**Fireflies, also called “glowworms” or “lightning bugs” are actually flying beetles and not true flies.**

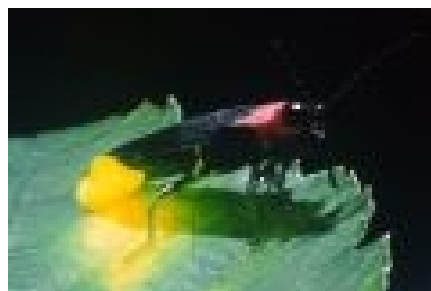
## What are fireflies?

Fireflies are actually beetles!

Fireflies are not really "flies" as entomologists know them, but are beetles in the family Lampyridae. "Flies" have one pair of wings (like houseflies) while all other winged insects have two pairs of wings, or, four wings altogether. In general, when the common names of insects contain the word "fly" as part of a one word common name such as firefly, dragonfly or scorpionfly, the insects are not true flies and belongs to another order of insects. When the word "fly" is hyphenated or follows the first word of an insect common name, it is most likely a true fly (and by definition, has only two wings.)

**Lampyridae** is a family of insects in the beetle order Coleoptera. They are winged beetles, and commonly called **fireflies** or **lightning bugs** for their conspicuous crepuscular use of bioluminescence to attract mates or prey. Fireflies are capable of producing a "cold light", containing no ultraviolet or infrared rays. This chemically-produced light, emitted from the lower abdomen, may be yellow, green, or pale red in color, and has a wavelength from 510 to 670 nanometers.

There are more than 2,000 species of firefly found in temperate and tropical environments around the world. Many species can be found in marshes or in wet, wooded areas where their larvae have abundant sources of food. These larvae can also emit light and are often called "glowworms", particularly in Eurasia. In the Americas, "glow worm" also refers to the related Phengodidae.



*Japanese Firefly - pic courtesy: y. Furukawa*

### Why do fireflies glow ?

Light production in fireflies is due to a type of chemical reaction called bioluminescence. This process occurs in specialised light-emitting organs, usually on a firefly's lower abdomen. The enzyme luciferase acts on luciferin, in the presence of magnesium ions, ATP (adenosene triphosphate), and oxygen to produce light.

The behavioral function of the larval light has received considerable speculation and several plausible theories have been proposed. However, the most generally accepted hypothesis is firefly larvae use their luminescence as a warning signal that communicates to potential predators that they taste bad because they have defensive chemicals in their bodies. These larvae also increase both the intensity and frequency of their glow when disturbed.

Not all firefly species are bioluminescent as adults, but of the species that are, one or both sexes use a species specific flash pattern to attract a member of the opposite sex . These bioluminescent signals can take the form of anything from a continuous glow, to discrete single flashes, to "flash-trains" composed of multi-pulsed flashes.

In most species of North American fireflies, during a certain time of night, males fly about flashing their species specific flash pattern. Females of the same species tend to be perched on vegetation, usually near the ground, and if a flashing male catches a female's fancy, she will respond at a fixed time delay after the last male's flash. A short flash dialogue may ensue between the male and female as the male locates her position and descends to mate. The courtship patterns of Japanese fireflies seem to show many variations of this type of communication system, as well as courtship behaviors that include pheromones as well as photic signals. It is generally assumed that most non-luminous North American fireflies locate mates through the use of pheromones.

Aspects of male flash patterns are also thought to be affected by sexual selection. Female fireflies have been shown to prefer certain characteristics of a male's photic signal (such as increased flash rate) and respond preferentially to males that possess these "sexy" signal components.



*Unidentified species from India, dorsal (left and ventral aspect).*

## Habitat and range

Most firefly larvae are found in rotting wood or other forest litter or on the edges of streams and ponds at night. Some Asian species are fully aquatic (due to the presence of tracheal gills) and live underwater, feeding on aquatic snails. The larvae of several tropical firefly species in the genus *Pyroactomena* are strictly arboreal, feed on arboreal snails and pupate while hanging under living leaves - similar to a butterfly chrysalis.

Adult fireflies are found in the same general habitats as their larvae. Generally speaking, the highest number of firefly species are found in warm, humid areas of the world. Some species, however, are found in very arid regions of the world. In these arid regions, larvae and adults can be readily found following rains. The greatest number of firefly species (highest species diversity) are found in tropical Asia and Central and South America.

## Natural history and behavior

Firefly Larvae are predaceous and have been observed feeding mostly on earthworms, snails and slugs. Larvae can detect a snail or slug slime trail, and follow it to the prey. After locating their future meal, they inject an anesthetic type substance through hollow ducts in the firefly's mandibles into their prey in order to immobilize and eventually digest it. Multiple larvae have also been observed attacking large prey items, such as large earthworms. Other observations suggest larvae sometimes scavenge dead snails, worms and similar organic matter.

Adult Fireflies also have mouth parts suggestive of predation (long sickle-shaped mandibles). Although it is widely known that fireflies of a few species mimic the mates of other species in order to attract and devour them, observations of adults feeding on other prey items are practically non-existent. It is likely however, that adults might feed on plant nectar in order to sustain their energy requirements in the adult stage, which can last several months or longer.

## Aggressive Mimicry

Aggressive mimicry is a phenomenon where one organism (a mimic) tricks another organism (the dupe) into thinking it is another (the model), with the result being a negative outcome for the dupe, as well as the model. In the case of aggressive mimicry in fireflies, mated females that belong to a few species in the genus *Photuris* mimic the female responses of other fireflies in the same area in order to attract males of the mimicked species. When these males are tricked (or duped) into landing near these mimics to mate, they are pounced upon and eaten! Recent evidence also suggests that these female mimics are not only acquiring food but also defensive chemicals from their prey, which they themselves do not produce in large quantities.

*References: Wikipedia, Firefly facts.htm.*