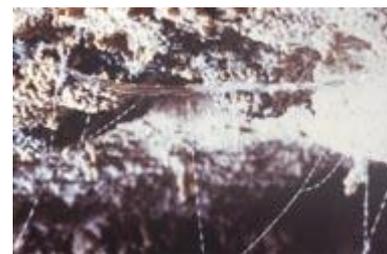


All about Glowworms...

Glowworms are the larval stage in the life of an insect called the fungus gnat. Just as maggots grow into common houseflies, glowworms grow to become fungus gnats, which are similar to mosquitoes. Although they are most spectacular in caves, glowworms are also quite common outside - they can be found wherever conditions are damp, food is in good supply and there is an overhanging wall. Similar glowworms can also be found in the south-east of Australia. The scientific name of the New Zealand species is *Arachnocampa luminosa*.



The famous light...

The New Zealand glowworm is one of many creatures that naturally produce light (bioluminescence). The light of the glowworm larvae is given off by small tubes ending around the glowworms anus, as a byproduct of excretion. A reaction takes place between an enzyme called luciferase and other chemicals, with the blue-green light given off as a result.

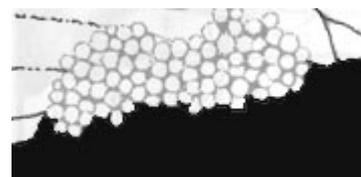
The light is used to attract insects lost in the dark, which the glowworm catches and eats. If a glowworm is hungry its light will shine a little brighter and is even more effective! When the female glowworm becomes an adult the light is used to attract males for mating.

Life Cycle

Four stages are involved in the life cycle of the glowworm; the egg changes to larva, then to pupa, and finally to the adult flies (which lays more eggs). The entire cycle takes 10-11 months to complete, most of which is spent in the larval stage. Although glowworms can be found at all stages of the cycle at any time, more eggs are hatched into larvae during winter than any other time.

Eggs (3 weeks)

The eggs are laid by the adult, and hatch into larvae about three weeks later. They are creamy-brown balls, less than a millimetre across, and are sticky enough to hang onto walls, overhangs and cave ceilings.



Larvae (6-9 months)

The larva is the most familiar form of the fungus gnat. Starting a few millimetres long, it slowly grows to the shape and size of a matchstick - after which it is ready to turn into a pupa (usually 6-9 months, depending on the availability of food). However, the glowworm can survive for long periods without eating.



Because the other stages don't feed, the larva must store enough energy to nourish the later stages of the life cycle (and the eggs of the next generation if it is a female).

The glowworm, or fungus gnat, displays a bright blue light throughout the larval stage.

Pupae (2 weeks)

The pupal stage is like the cocoon stage of a moth's life, as the simple body of the larva is changed into the complex adult. The larva first rearranges its sticky threads into a circular protecting barrier, then hangs in the middle of the circle and encases itself in a pupal "skin". A little less than two weeks later it emerges as an adult gnat.



During this metamorphosis it becomes possible, for the first time, to distinguish between the sexes. Both shine blue lights occasionally, but the male light eventually turns off, while the female light gets stronger towards the end of the pupation. By the time she breaks out of her transparent cocoon several male adults can be waiting to mate with the emerging female.

Adults (2-3 days)

The adult fungus gnat wriggles out of the pupal skin and spends its first few hours drying, until it is able to fly. It has no mouth, cannot feed and therefore only lives a few days. During this time mating takes place to ensure the survival of the species. Shortly after mating, the female starts laying her eggs, usually in several clumps of 40-50. As they are only laid one at a time,

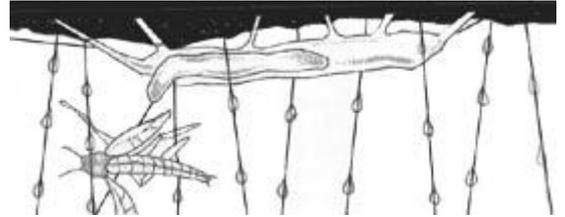


egg-laying can take a whole day, after which the female dies.

The female (about 13mm long) is generally larger than the male (about 11mm long). Adults found in caves are also larger than those found in the bush. They can only fly a couple of metres at a time, making a very faint buzzing sound, and showing their lights occasionally.

Feeding...

The larva is the only stage of life at which the species eats - as an adult it has no mouth. To feed, the glowworm hangs down dozens of sticky threads which are used to trap any insects that fly towards the light.



When an insect is caught in the threads the glowworm can sense the vibrations and hauls in its victim. When the thread has been pulled up the glowworm bites the insect and kills it, then either sucks out the juices or eats the entire body. A lot of time is spent repairing and cleaning the threads.

Glowworm prey includes midges, mayflies, and caddis flies. In caves the insects breed on the mud banks beside streams, or fly in accidentally. Adult glowworms are occasionally caught and eaten as well!

Surviving...

Several species feed off the glowworm, including cave harvestmen (similar to spiders) which are attracted to the light and will eat glowworms at every stage of life. Fungi commonly infect the larvae and pupae - spreading over them to give a fluffy white appearance. If food is scarce and the glowworms live too close together, they cannibalise each other - hence the regular spacing between the lights. The physical environment can also affect the population. For example, flooding washes away any glowworms low on cave walls, while the atmosphere must be quite moist (at least 90% saturated with water) to prevent the glowworm from drying out.

