Other Fires — Other Flies

The Luminescence of Fireflies — Not

I. Introducing Phengodid Glowworms

Millions of insects live in darkness. They lurk beneath bark and fallen leaves, underground and under refrigerators. In large part they do so to avoid reflecting light and being seen. The American cockroach is a too-familiar example. The long antennae and flattened body mark it as an animal that gets along by its senses of touch and smell while living under something in the gloom. A hidden life for so small and fragile a creature makes sense. To venture out only at night, to be invisible, is protection against the appetites that relish cockroaches and other sheltering creepers.

Therefore, it is interesting when a boldly colored insect, such as a butterfly, appears to be designed to be seen. We must assume that this self-advertising is due to something very important in the life of the advertiser. Luminescent insects are the ultimate in the obvious. Far from trying to avoid reflecting light, they actually emit it! By breaching the night they become the most conspicuous of things, lights in darkness. First, we wonder at their beauty and then we wonder why it should exist.

Beauty is an opinion. But for me, of all the lovely shining things, the glowworms of the family Phengodidae are the most marvelous. These glowworms are actually the juveniles and adult females of a beetle and relatives of the fireflies. They are long cylindrical creatures, small-headed, with a sleek, occasionally plump appearance. Phengodid glowworms are not often encountered. A pioneer of bioluminescence studies, Princeton professor E. Newton Harvey, noted that he had seen only four living specimens of North American species in twenty-five years. Very rarely someone locates a concentration of them. A friend [sw] once discovered a depression in a meadow that held dozens of young larvae crawling among the blades of grass. Another [jl] came across a species in the jungles of Colombia that was in the unusual "habitat" of tree branches. But, most phengodid glowworms spend most of their time under stones, under fallen trees (logs), or underground. If you wish to see a phengodid you must put considerable trust in luck or put considerable effort into the search (a California naturalist, the late Darwin Tiemann, once dug for 50 hours to find a single larva of the Western Banded Glowworm, *Zarhipus integripennis*). The effort is rewarded once the insect is in hand, for these often huge (up to 70 mm) animals are speckled and striped with a score or more of soft green lights, its movements traced in rippling light.

Looking for phengodids can be almost as memorable as the insect itself. I recall one stormy Florida night when a flashlight shone into a flood water caused it to boil with leeches, and flashlights pointed up illuminated treetrunks plastered with thousands of earthworms. They were climbing to escape drowning in the soaking mud and were joined by other luckless subterrainean creatures. Here and there marooned on humps of ground, pale rare firefly larvae glimmered.

A male *Phengodes nigromaculata,* attracted by a perfume (pheromone) and flying above an adult female would see this patern of "landing strip" lights upon her back and sides.

A luminous centipede, captured in a cranny by a larger relative, flashed a bright white light in its death struggle. And the greatest cause for celebration were two phengodid glowworms found huddled on stumps.

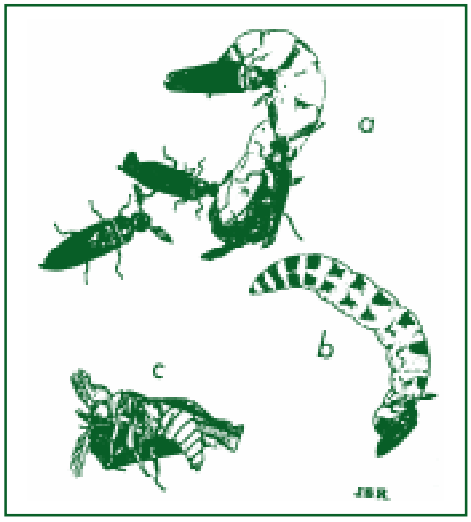
The flood, by forcing up the luminous underworld, revealed the surprising fact that we tread over sunken constellations scattered through the earth. While phengodids are the most spectacular, other glowing organisms live underfoot. Besides the centipedes and firefly larvae, there are luminous springtails (insectan Order Collembola), click beetle larvae (family Elateridae), millipedes, and earthworms, all that spend at least part of their lives buried underground or in rotting wood.

Why do phengodids and these others shine in a solid, totally non-transparent environment? It seems at first to be like trying to shout in a vacuum. The difficulty in answering such a question is compounded by the difficulty of making observations in nature. What habitat could be less available to humans? It is not much easier to follow the natural lives of insects under an inch of soil than it is to watch the doings of abyssal shrimp under a mile of seawater. But no observation platform can dive submarine-like beneath a willow thicket!

Phengodid are representative of another puzzling phenomenon, that of female neotony, the continuance of the larval body plan into adulthood. Like Peter Pan, female phengodids appear never to grow up. Their reproductive organs mature, but they maintain their "childhood" forms and grow only larger — quite a bit larger compared to their males. While the female design is for a wingless exterior, decked with lights and stretched over a stuffing of eggs, the male juvenile completes his metamorphosis (transformation) into a specialized and unusual adult beetle. He bears short wing-covers (elytra, *el'-ih-truh*), and his large, feathery antennae wave over a pair of sharp, sickle-shaped jaws (mandibles). In his short, wild life, he is designed to find females, kill sexual rivals, and mount huge glowing mates. He will not feed, other than to sip moisture from leaves, and he dies a few days after growing up.

Before looking into one explanation for the phengodid peculiarity of subterrainean light, let me introduce our North American phengodid fauna. [js]

(to be continued)



Science fiction titles "Jurassic Sex" or "Attraction By a 50-Foot Female" might capture the flavor of love in phengodid beetles. Males fight to the death (c) for a chance to mate with enormously larger females (b). Drawing by John Randall from a book published by Academic Press.