

Observation of Bioluminescence in *Pyrophorus pellucens*

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Bioluminescence in the order Coleoptera is witnessed in a member of the family Elateridae, *Pyrophorus pellucens*. This click beetle sports two greenish photogenic organs on the hind corners of the pronotum, as well as orange areas on the first abdominal segment (seen only when the creature is in flight). Light is produced by these organs when a nerve impulse triggers a reaction between a substance called luciferin and the enzyme luciferinase in the presence of adenosine triphosphate and magnesium ions. Three motives for use of bioluminescence have been set forth: general illumination, luring prey (and sometimes predators), and attracting mates. While illumination might prove useful in nighttime feeding, a phytophagous insect has no need to lure prey; my observations lead me to conclude that *Pyrophorus pellucens* uses light in defensive as well as mating behavior.

I watched the beetles between the hours of seven and midnight at three sites: the southern trail to the stream, the trail west to Massacre, and the trail leading north to Mount Joy. I found them only in the vicinity of fairly dense vegetation...never in open spaces where they might be easy prey to bats. They were as often seen on the ground as in the air unless an overabundance of rain preceded. Wet conditions drove them to the trees, and they seemed unusually inactive on nights when the moon waxed bright. Rather than observe passively, I took an active role in exploring their behavior. Walking the trails, I was able to closely observe the animals, whether on the ground or in flight.

My first encounter with *Pyrophorus* revealed what seemed to me to be a scare tactic. Shining a flashlight into the brush near the stream, I noticed two eyes reflecting the light. Supposing them to belong to a spider of very unfriendly proportions, I approached with care only to find that it was a beetle. Use of false eyes to repel predators is a well-known mode of defense among prey animals such as the Caribbean Buckeye butterfly. Similarly, another beetle volunteered itself as a model, landing obligingly on the stage at the guest house. Its first tactic was to play dead, but upon being turned onto its back it clicked, lit up and fled. It began to fade as it ran, then when further agitated, relit and took flight. Yet another night as I investigated Mount Joy, I watched a glowing beetle light within the lower branches of a cluster of shrubs and fade. Taking up a large palm leaf, I gave the brush a sound beating and was rewarded when the bug lit up and flew away with all possible speed. The same reaction was exhibited by another beetle which paused in a clump of lemon grass. I feel that in instances such as these, *Pyrophorus pellucens* makes use of its photogenic ability to discourage enemies. This suspicion is further augmented by the observation that the beetles rarely (and very briefly) fade when they are on the ground, where they are most vulnerable to the likes of the voracious mountain chicken; whereas while in flight or perched above ground they will often extinguish their lights...sometimes for minutes.

My support of the theory concerning mating behavior is based on somewhat vague evidence. However, I noticed that on Mount Joy, the beetles gathered on two stands of trees just south of the old dormitory where they blinked about between branches or landed and often put out their lights. No mating was observed, but at three sites (the rocky path past the giant fig tree and a small tree near the Bee House, as well as in the brush on Mount Joy) I saw

a strange interaction between three pairs of beetles. In each pair, one was stationary, dimly glowing on a low tree branch; the other flew in a batlike fashion close by, flickering its lights in a manner perceptible only at a very close range. The outcome of this display is uncertain; twice the blinkers landed nearby and snuffed their lights, the third simply flew away. Still, spastic blinking was not seen in lone beetles, whether on the ground or in flight.

These observations, while hardly lending concrete proof, do point to defensive or interspecific behavior. Further study of the strange pair interaction or flight behavior may unearth more profound insight into *Pyrophorus pellucens*' use of bioluminescence.

References

Borror, Donald J., Norman F. Johnson, and Charles A. Triplehorn. An Introduction to the Study of Insects. 6th ed. Saunders College, Ft. Worth: 1989. pp. 84-85.