Moths

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Moths versus Butterflies

Butterflies and moths both belong to the same order of animals, the lepidoptera. Even though moths are much more common than butterflies, people always refer to butterflies when speaking about this group. In fact almost 95 % of all the lepidoptera are moths. The subdivision is based on differences in lifestyle between butterflies and moths. The most obvious difference is that butterflies are active during the daytime and moths during the night-time. Also most butterflies are more colorful, and butterflies rest with their wings held vertically above their bodies, while moths rest with theirs spread horizontally.

Fatal Attraction

In Costa Rica, if you light a candle at night, you'll be sure to send a moth or two to its death. They seem charmed by your candle, your headlights or your campfire (even if it leads to their untimely demise). But why are moths attracted to light at night? To answer this, we need to know about phototaxis. Phototaxis is an organism's automatic movement toward or away from light. Cockroaches are an example of a negatively phototactic organism. You've probably noticed how they scurry back into dark corners and crevices when you illuminate their late-night snacking party in your kitchen. Moths are positively phototactic. The strength of the light also influences the movement of the wings of a phototactic insect. When the light from a distant source, for instance moonlight in equal intensity reaches both the eyes of an insect, it flies in a straight line with both the wings moving in the same way. But if the light source is closer, for instance a bulb or a candle flame, it is perceived more strongly by one eye than by the other. As a result the wing on one side tends to move faster making the insect fly towards the light source in circles or spirals.

Some types of moths are known to migrate, and it's possible that the night sky gives them navigational clues. A moth's up-down orientation might depend in part on the brightness of the sky relative to the ground. Some lepidopterists (moth and butterfly scientists)suggest that moths use the moon as a primary reference point and have the ability to calibrate their flight paths as the Earth's rotation causes the moon to move across the sky. (There is even evidence to support the theory that migrating moths have an internal geomagnetic compass system to guide them in the right direction.) So a moth's attraction to an artificial light or to a fire could be related to orientation, and lead to disorientation -- the moth wasn't "expecting" to actually get to "the moon" (the light source) or to be able to fly above it, so confusion results.

It's also possible that moths have an escape-route mechanism related to light. Imagine disturbing a bush-full of moths at night -- they all fly up and out of the bush, toward the sky. To a moth in danger, flying toward the light (which is usually in the sky, or at least upward) tends to be a more advantageous response than flying toward darkness (which is usually downward).

Moths are more sensitive to some wavelengths of light -- ultraviolet, for example -- than they are to others. A white light will attract more moths than a yellow light. Yellow is a wavelength moths don't respond to.

The Color of Sound

Unlike butterflies, many moths have ears. These ears are connected to nerve cells, tuned to the usual range of bat frequencies (40 kHz). These ears make it possible for moths to detect bats over a distance of 30 meters. Moths with ears hear bats before bats can detect their presence. If a bat is detected, some moths just change their flight direction, while others close their wings and drop to the ground. The moth ears appear to be quite effective -- research suggests they reduce the success rate of bats by approximately 50% in comparison with moths without ears.

There are also moths which can produce sounds themselves. People used to believe that these sounds were used to confuse bats, so that the true echo was mistaken by the bats. Today the opinion is that these sounds are used as warning sounds, to make clear that those moths are distasteful to predators. The sounds produced by those moths act in the same way as "warning coloration" does to visual predators.

Pairing Lycaena phlaeas moths

The Smell of Sex

While butterflies can use wing patterns and acrobatics for courtship, moths have a more romantic approach, suited to the night. They use pheromones -- scents. The antennae of moths are quite variable, and the antennae of male moths are often well developed. They contain sense organs which can detect the species specific pheromones produced by a receptive female.