

## A Short-Lived Wonder

Beauty is ephemeral. Life is short. Remember to eat.

These three statements framing human existence could have been uttered by a wise and kindly grandmother or perhaps even by Charles Darwin, the latter in an imaginary self-help column based on his insights from studying nature.

The ecology and life history of one of the most spectacular creatures in our local menagerie—the Luna moth (*Actias luna*)—mirrors the first two observations. With a wingspan of nearly five inches it is among the largest moths in North America and certainly one of the most breathtakingly beautiful. The adults are a heavenly shade of pale green with long tapering hindwings marked by conspicuous

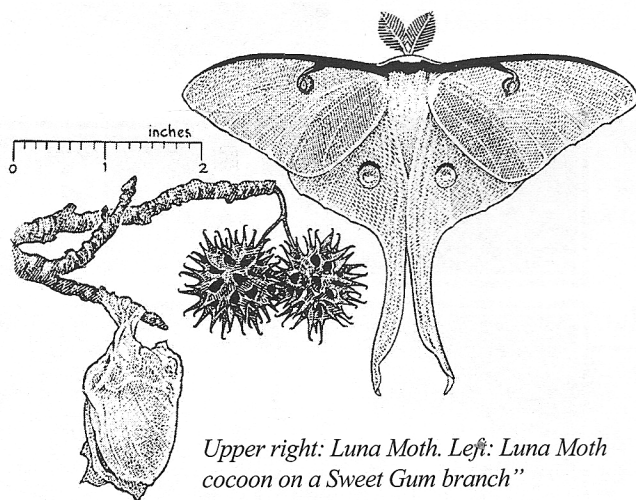
eyespots, shaggy white bodies, red legs, and regal-looking antennae shaped like plumes.

I have only seen this striking moth once while walking on local trails over the past 25 years. If I had switched to nocturnal wanderings and flipped on my headlamp during the months of June and July, when adults are briefly active, perhaps I would have encountered more. The odds are against it, though: both female and male adults flit about the forest for only seven days. No more. It's not even as if after the seventh day they rested. After a week, they croak.

Two curious anomalies of the Luna moth body plan are worth noting. The first dictates the brevity of the moth's life and the second is an attempt to prolong it—even if but for a few days. While natural selection handed out two beautiful pairs of wings and show-stopping “eyespots,” the Luna moth missed the line marked “mouth parts here.” A moth without a mouth. The absence of any eating apparatus is because nutrition is no requirement of an adult Luna moth. They have one, overriding purpose only during their week alive: to find mates and breed. One could say that adult moths live for love and take it to the extreme.

In fact, many adult moth species don't feed as adults, though many do. Even so, long life in an adult butterfly or moth might be measured at best in weeks or, for some, months to a year, but most end up as bat and bird food if they survive to adulthood.

The caterpillars of this species are a different story. They do almost nothing but eat (and poop) in this stage of their metamorphosis. Luna moth caterpillars devour a wide variety of leaves from common tree species—sweet gum (pictured here), but also walnut, hickory, ash, birch, alder, persimmon, sumac, moonflower vine, sycamore, ironwood, hop hornbeam, elm, and willow. Luna moth caterpillars clearly are not picky eaters. And there may be a convenient explanation for that: if the female has only a short time to mate and then lay 200 or so eggs, it is a time-saver if she can deposit them on “host” plants that include many of the more common native tree species in our forests. This is especially helpful, one can imagine, for the female that failed to find a mate until the end of her week on Earth.



Upper right: Luna Moth. Left: Luna Moth cocoon on a Sweet Gum branch”

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The most intriguing physical feature of all, however, is the long streaming tails on the hind wings that can double the moth's length. One explanation for this extravagance might be to better attract mates, but both males and females have them (males largely differ from females in having larger and bushier antennae). A better explanation, shown empirically, (and only recently – 2015!) by a clever scientist, Jesse Barber, is that the long "tails" serve as "bat distractors." Bats, the main predators of the nocturnal adult moths, have tiny eyes, useless for locating moths on the wing; instead, they use highly tuned sonar to find their prey. Many moths have evolved their own mechanisms to jam the sonar of hunting bats, but Luna moths rely instead on the fluttering tails to confuse a bat's sonar; the echolocating bats often grab the tail in their needle-like teeth and not the moth's body as a main course. The bat separates the tail from the rest of the moth, inadvertently allowing the Luna moth to escape. When Barber and his co-workers released moth-hunting bats in dark rooms with Luna moths that had intact normal tails, the bats succeeded only 35% of the time. But when the moths' tails were removed beforehand, the bats caught 81 percent of them. Losing the tail seemed to have no detrimental effect on the moth's aerial maneuvering, but it did prolong its life and thus its chance to breed.

Time is desperately short on the summer stage for the female Luna moth. She mates with the first male she can find (probably not a good life lesson for humans). That aside, the streaming tails are dispensable to the moth; better to confuse and lose these appendage-like pennants to a hungry bat than to lose your head and your chance to pass on your genes to the next generation, something dotting grandmothers hope to see and Darwin saw as the driving force behind everything. — 



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