A Multitude of MOTHS

Small and gray, grand and garish ... moths of all kinds thrive in New Hampshire's rare pine barrens habitat

It's just after midnight on a balmy night in April. We're in the pine barrens forest of Pine River State Forest in Ossipee, trying to stay awake. It's pitch dark, except for the headlamp on Jeff Lougee's head and the weird blue glow of a black light illuminating a small sheet hanging between two trees.

Lougee is a stewardship ecologist for The Nature Conservancy's New Hampshire chapter and he's here, in the midst of pitch pines, scrub oaks and low sweet blueberry, determined to collect moths. He's spent the past four hours watching the sheet, waiting for moths.

By Eric Aldrich

When a dark gray moth finally flutters onto the sheet and settles for a moment, Lougee carefully scoops it up with a Mason jar and quickly screws on the lid. "Looks like a pine pinyon moth," he says. "You can tell by these little back markings on the forewing. In New Hampshire, this moth is only found in the pitch pine forests of Carroll County."

On this night, Lougee collected only five specimens — a very slow night of "mothing." By comparison, a warm, moonless night in summer in the pine barrens will yield as many as 200 moth specimens. Those moths are among an estimated 2,500 moth species in New Hampshire, 11,000 species in North America and 110,000 species in the world. By contrast, there are only 28,000 species of butterflies worldwide (mostly in the tropics) and fewer than 1,000 species in the U.S. and Canada.

From Plain to Gorgeous

Many moths, like the one Lougee just collected, are fairly nondescript — entomologists jokingly call them LGMs or Little Gray Moths. But many are quite distinctive and colorful. You've surely admired some of the glamorous celebrities of the moth world, like the cecropia moth, with its fuzzy reddish-brown body, orange and white markings and distinctive eye spots on the wings. In the spring, maybe you've seen the rosy maple moth, with its bright pink and yellow wings. And of course, there's the luna moth, the grand diva of moths.

"Some of them are outstandingly beautiful," says Donald S. Chandler, a professor of zoology at the University of New Hampshire. "Some of them are big and

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Jeff Lougee of The Nature Conservancy sometimes collects as many as 200 moth specimens in a single night.

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beautiful, like the luna moth. And some of them are tiny and delicate and colorful."

The most beautiful, if you ask Chandler, are the so-called micros — so small you could fit four or five of them on a penny. Under a microscope, their splendor shines. Bands of gold or silver. Patches of iridescent blue. Very delicate, brilliant and little understood. In fact, many entomologists don't bother collecting them; they're too fragile, too hard to identify and too hard to prepare for collections.


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Three micro moths on a dime.

As curator of UNH's insect collection, Chandler has tediously identified and mounted hundreds of moths. Within the collection's 700,000 insect specimens — from beetles to flies — are some 2,000 moth species. These are *moths*, mind you, *not butterflies*, which occupy a much smaller number of nearby drawers.

Better understanding of moths will lead to better habitat management.

Moth or Butterfly?

While there's no foolproof rule for distinguishing moths and butterflies, both members of the order *Lepidoptera*, here are some clues:

- Moths tend to rest with wings flat, while butterflies, with some exceptions, rest with wings folded upwards over their back.
- Moths tend to be nocturnal or dusk/dawn flyers, while most butterflies fly during the day.
- All moths have a bristle or bunch of bristles, called a frenulum, locking the forewing and hindwing together; butterflies don't have this feature.
- Most moths have tapering, feathery or hairlike antennae. Butterflies have a knob at the tip of the antennae.


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Cecropia moth


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Painted lady butterfly

From Egg to Moth

Butterflies and moths share a fairly similar life history. Both go through four stages: egg, pupa, larva (or caterpillar) and adult. On reaching its larval stage, a moth caterpillar will find a quiet place where it will make the transition to an adult. Some species spin a silk cocoon attached to a branch. Others make the transition underground, or go inside a folded leaf. Inside, the caterpillar becomes a pupa and its body transforms into a sort of soup. Its metamorphosis into a moth can take days, weeks or even months, depending on the species.

Once emerged, the adult moth has four wings: two on top called forewings and two "hind" wings underneath. Most adult moths live only two weeks or so; others a few days or a few months. And while some will eat during this time, others will not, focusing instead on reproducing and avoiding predators. Once the female lays eggs, there's little else for her to do.

Much of the moth's role in the ecosystem — especially among New Hampshire's species — is to eat, according to UNH's Don Chandler. Only a few species here are pollinators. Most fill their ecological purpose as caterpillars ... eating and eating. They're like little gardeners, he says. Eating leaves and other pieces of plants stimulates plants to grow. Other moth caterpillars help recycle the soil by eating detritus.

Habitats and Moths

You can find moths virtually anywhere in New Hampshire. Different habitats produce different moths, in both abundance and diversity. Oak forests, for instance, have a relatively huge variety of species and abundance of individual moths. Chandler has collected certain moths in the Seabrook sand dunes and others in silver maple flood plain forests near Dalton. He's collected 232 species in Spruce Hole kettle bog near Durham.

Some of the rarest moth species in the state are found in the remnant pine barrens, such as those in the Concord and Ossipee areas. According to Dale Schweitzer, a New Jersey-based moth and butterfly expert with The Nature Conservancy, pine barrens (like those found from Maine through the Mid-Atlantic states) "are *the* habitat for global and regional moth rarities. Pitch pine/scrub oak barrens are the place to look. There's no other habitat that comes close to having the rarities."

In the Concord pine barrens, which is habitat for the endangered Karner blue butterfly, Chandler has collected some 578 moth species. N.H. Fish and Game has also done scientific monitor-

ing of moths, according to Celine Goulet, a biologist with the Department's Nongame and Endangered Wildlife Program. Better understanding of all the moths and butterflies in this distinctive habitat will lead to better management, Goulet said. And that may ultimately prevent common moths from becoming uncommon and rare moths from vanishing altogether.

Managing Moth Habitats

The same is true for the Ossipee pine barrens. In the summer of 2002, University of Vermont graduate students Claire Dacey and Jonathan Kart took an intensive look at the Ossipee, with Dacey looking at the habitat and vegetation and Kart looking at the moths. The project was organized and sponsored by The Nature Conservancy, which has protected 2,000 acres in the Ossipee pine barrens since 1988. Seven hundred acres of that are classic pitch pine/scrub oak habitat.

That summer, Kart collected more than 2,500 individual moths, comprising 246 species. Of those, six species he collected are considered rare. They have strange and exotic names, such as *Zanclognatha martha* and *Glena cognataria*. Since Kart's initial work, the Conservancy's Jeff Lougee has done the follow-up collecting, gathering moths at times and places that Kart couldn't.

Thousands of years ago, after the last Ice Age, pitch pines and scrub oaks sprouted from the sandy plains of what's now Ossipee, Freedom, Madison, Tamworth and surrounding towns. What has long been part of that ecosystem is fire. Pitch pines thrive in fire-prone ecosystems because their seeds can rapidly colonize and germinate in soils exposed by fire. And fire rejuvenates the soil, clearing the way for the next growth of low-sweet blueberries and scrub oak. Fire keeps the distinctive scattered openings of the pitch pine/scrub oak ecosystem.

But there hasn't been a good burn in the Ossipee Pine Barrens for more than 50 years. Understandably so: there are homes and businesses throughout this ecosystem. The Nature Conservancy is preparing to carefully restore fire to this ecosystem starting in 2005. The plans are painstakingly detailed and involve measuring fuel loads, creating fire breaks and devising plans for controlled burns.

"Fire will essentially go through and remove old, dead scrub oak and replace it with fresh, young growth," Lougee said. "It's that new growth that the caterpillars feed on. The sheer quantity and quality of the scrub oak goes up dramatically. Fire and mechanical treatment also open up the canopy. The additional solar energy helps the caterpillars. So, after fire, there's more food, better food and better habitat. What's good for the caterpillars is good for the moths." And in the long run, what's good for the moths is good for the special natural communities that sustain them. WJ

Know Your Moths

Moths come in many families or groups, but most belong to just a few. There are the silk moths *(Saturnidae)* — medium to big moths, most of which do not feed as adults. Good examples are the luna moth or the io moth.

Then there are the sphinx moths *(Sphingidae)*, which are probably the easiest to recognize. They're medium to large and have long bodies. They're also fast fliers; some hover and feed from flowers. Good examples are the five-spotted hawk moth, the laurel moth and the hummingbird moth.

Another big group is the *Arctiidae*, which includes tiger moths. Some have bright colors, a warning sign to birds that they're distasteful. And there are the owlet moths *(Noctuidae)*. This is the biggest family, with nearly 3,000 species in North America. Most are nocturnal, like miniature owls. Many have a triangular shape, such as the common oak moth.

There are a few others. For instance, even the casual moth observer will recognize *Lasiocampids*, which include the tent caterpillar moths. There are the tussock moths *(Lymantriidae)*, which includes the notorious gypsy moth; you may remember a horrendous outbreak of their caterpillars in New Hampshire in the early 1980s. Needless to say, these prolific invaders do not require any special habitat protections.


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Luna moth


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Hummingbird moth


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Common oak moth


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Banded tussock moth


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Gypsy moth caterpillar