

Winter Tough, Summer Savvy

A butterfly that sails through snowflakes? Sure. And polar bears climb papaya trees, parrots perch on icebergs, and shelducks nest in the Sahara.

The Nature Center's own mourning cloak butterfly, one inch front to back with a four-inch wingspan, is a sap-sucking, noise-making, Methuselah of a butterfly, a chocolate-and-vanilla surprise package of talents and adaptations, winter flight included.

While its scientific name *Nymphalis antiopa* conjures a beautiful Greek forest nymph to symbolize this woodland species, the butterfly's common name unveils a darker dimension, linking its shroud-like appearance with wings outspread on the bleak bark of a tree to black funeral mantles worn to honor the dead. Mourning cloaks are widespread flexible fliers; habitat-friendly insects, they range through parks, backyards, and deciduous forests to water courses throughout North America. Displaying a distinctive gliding flight pulsed by strong wingbeats, mourning cloaks live, pupate, mature, and die from the high Arctic tundra line to the mountains of Mexico and into northern South America. Europe to eastern Siberia and Japan are *N. antiopa* territories, too. In 1977, mourning cloaks were reported in 16 counties of New Mexico.

20° Below. So?

Among the 185 butterfly species found in North America (4,500 worldwide), mourning cloak adults raise the curtain in the annual springtime show of butterflies in flight. The reason is simple but remarkable: Whereas other butterfly species overwinter as eggs, larvae, or pupae, mourning cloaks, along with a few other angelwings, are exquisitely adapted to overwinter as sexually immature adults.

Temperatures may dip to 20° and even 30° below, but the mourning cloak, sustained by summer-sipped sugars and tree sap converted to fat, remains snug from October to March under loose tree bark, leaf litter, or between logs in a pile of firewood. Melanin-rich upper wings and body are velvety maroon to dark brown and hairy, factors that promote heat collection and retention. Scales are filled with air and have body struts inside, making them effective absorbers of the sun's heat. To prevent the formation of ice in body tissues, *N. antiopa* builds antifreeze chemicals as fall cools to winter, gradually secreting more and more sugary glucose and alcohols including ethylene glycol and glycerol throughout its body. When the chill is iciest, the mourning cloak endures, frozen alive.

Late winter days grow warm; tree sap, the mourning cloak's favorite food, begins to run. Time for a metabolic warm-up.

Shivering and vibrating wings with a clicking sound, a butterfly raises its body temperature 15° to 20° higher than the outside air in just a few minutes. Broad, darkly pigmented wings will reach 115° in 60 seconds as the butterfly basks under a noonday sun, intensifying the warm-up. Minimum flight temperature is 65°.

Overwintering as a flying adult is an effective tactic for quick reproduction and avoidance of some predators. But if attacked while basking, the mourning cloak has another trick: It plays dead. Picked up and thrown, it will drop to the ground without flexing a muscle and lie there like a dead leaf or wood chip, a particularly realistic pose if the butterfly lands with wings folded to show cryptic dark grey underwings, lined in black with white margins speckled in black. Overwintering also allows the mourning cloak to get the jump on reproduction. In southern parts of its range, *N. antiopa* may hit the accelerator on

metamorphosis, producing two or more broods in a year. In colder climes, hibernation mourning-cloak style is a thrifty, versatile adaptation that provides *N. antiopa* with a lifespan of ten months or more, the longest of any North American butterfly.

...and Baby Makes 250

Out, about, and on the lookout, a male mourning cloak chooses a sunny perch to search for a mate. Scanning his chosen territory with huge compound eyes containing 20,000 facets, he's nearsighted but capable of

color vision in the UV and infrared ranges.* Knobbed antennae containing sensing cells to detect vibrations, sounds, chemical stimulæ, and those enticing pheromones, wave and tremble in the breeze.

While on the hunt for a female entering his territory, a male will charge intruding competitors, even chasing off pigeons. Once a potential partner is detected, the male darts out and beats his wings in wide sweeps seven times a second, forcing her down to a perch or the ground. (If she's already mated, her abdomen arches high, declaring "I'm already taken"). Coupling takes time – up to two hours. After the contents of his sperm packet have fertilized her beautiful, geodesic-shaped eggs, the packet itself dissolves to become part of them.

*The wing and body colors of some butterfly species that appear the same in both sexes in visible light, like those of the mourning cloak, appear dimorphic in these wave lengths, making them important for sex selection.



Mourning cloak *Nymphalis antiopa*



Search and scent are now the female's mission. Hackberry, birch, elm, willow, and poplar trees — including aspen, balsam poplar, and cottonwood — are all in her search image viewfinder. Walking on her

four middle and back legs (she belongs to the Nymphalidae or brushfoot family with forelegs reduced to clawless pads), she'll land repeatedly, checking out possibilities with her proboscis and the tips of her tasting feet. Her chosen tree branch will be encircled by a compact egg cluster; job done, the female dies. Mourning cloak caterpillars hatch to the first instar, or skin-shedding stage, in just two weeks; after eating their eggshells (and perhaps snacking on a few of their unhatched siblings), larvae fatten up on leaves through the next month of caterpillarhood.

Larvae to Pupae: Troop to Soup

Black with white speckles, predator-thwarting bristles, and a row of red spots down the back, mourning cloak caterpillars are voracious groupie feeders — college kids at a post-game pizza/beer party. Larvae line up heads together at the edge of leaves; if disturbed by a loud noise, they'll interrupt non-stop feeding and mount a group response, rising as one and shaking. Called spring elm caterpillars, a munching cohort can disfigure a tree in short order.

Since growth from tiny to nearly two inches inside an inelastic husk of chitin requires skin-splitting, caterpillars go through four instars to get there; enzymes digest and recycle old skin into new each time. Before the fourth instar, a caterpillar group moves away from its former site, grown noticeable to predators for the droppings below. At the new site, members of the group each pick a branch overhang to receive a silk attachment pad. Then comes the last molt; in a day, a pupa emerges, attached to the pad by a hook-like thread. Chrysalis time!

What's it like inside a mourning cloak's dark yellow chrysalis? Often misunderstood as a resting time, the chrysalis stage for all butterflies is in fact an active arena of change. It's not, as some believe, a caterpillar/butterfly cross but a soup with some adult structures attached at edges of the pupa case. The same biochemical changes that direct development of adult tissues order destruction of larval ones. And for the mourning cloak, pupation is exceptionally fast: Whereas other butterfly pupae may dilly-dally for six months or more, mourning cloak adults emerge in just two to three weeks, eclosing all together for speedy mating. While they pupate, a disturbed cohort of gregarious pupae can bang their drums loudly, slamming their hind ends one after the other, against their support structures to scare off predators. Still, in all stages of life, mourning cloaks are eaten by many: Mites, flies, and wasps lay eggs in *N. antiopa* eggs; bugs beetles, hornets, birds, amphibians, and reptiles eat caterpillars; and dragonflies, mantises, amphibians, reptiles, and mammals take adults.

Full Circle, Adult to Adult

Eclosed into adulthood in late spring, then greeting the world with a quick defensive squirt of bright red back end

meconium, this winter-adapted butterfly faces the challenge of overheating. In the morning cool, uncoiling its tightly wound proboscis for a drink or two is pleasant and comfortable (a mourning cloak can get drunk on a sugary liquid, including the prickly pear fruit of New



Mexico, that has fermented in the sun) but it soon will move from sunny fields to shadier areas, folding wings to minimize heat absorption. Nighttime wakes up the butterfly for further feeding that can last till 10 p.m. Estivation, or hiding out in hollow trees by day, is the next step, with brief but frequent flower forays to fatten up for winter — perhaps inside the bark of a bosque cottonwood. Life continues till the next spring; ten long months.

A beautiful conundrum is the mourning cloak: Out in winter, secret in spring, quick to change, and long in lifespan. Come, butterfly, and sip with us!

Two caterpillars watch a butterfly flying overhead. One says to the other, "You'll never get me up in one of those things."

Sources: Matthew Douglas. *The Lives of Butterflies*. Ann Arbor: University of Michigan Press, 1986; Paul Opler and George Krizek. *Butterflies East of the Great Plains: An Illustrated Natural History*. Baltimore: Johns Hopkins Press, 1984; Robert M. Pyle. *The Audubon Handbook for Butterfly Watchers*. New York: Charles Scribner's Sons, 1984; Robert Pyle. *National Audubon Society Field Guide to North American Butterflies*. New York: Chanticleer Press, 1981; James A. Scott. *The Butterflies of North America: A Natural History and Field Guide*. Stanford: Stanford University Press, 1986; <http://doorbell.net/luke/a052899.htm>; <http://www.psu.edu/dept/nkbiology/naturetrail/speciespages/mourningcloak.htm>; http://sierrapotomac.org/W_Needham/MourningCloak_060319.htm

- Jean Mason