

Moles, Shrews, Mice

and more

RESEARCHERS
FOCUS IN ON
NEW HAMPSHIRE'S
MANY SMALL
MAMMALS





by
ELLEN
SNYDER

Small mammals – those weighing less than six ounces – are a surprisingly diverse group. In New England, they include mice, voles, bog lemmings, flying squirrels, chipmunks, moles and shrews. Researchers study small mammals because they are common, widespread, diverse, easily handled and reproduce often.

My father, Dana Snyder, was one of those researchers. In the 1960s, when I was just four years old, he began a long-term study of the ecology of the eastern chipmunk in the Green Mountains of southern Vermont. Our summer camping trips to his study site infused me with a fondness for small mammals, especially chipmunks.

Chipmunks are one of those small mammals that both entertain and annoy. Colorful in their brown and white stripes, they are lively and active during the day. When startled, they emit a high-pitched “chip” before darting off to a hideout; their low *chuck, chuck, chuck* is a common summer sound in our woods. They can stuff huge numbers of seeds into their cheek pouches. Despite their prevalence, chipmunks live solitary lives and are highly territorial. In winter, they take a long nap, waking occasionally to eat stored seeds or emerge above ground on a warm winter day.

When I was in elementary school, my dad brought home an orphaned flying squirrel. We were enthralled with its large, dark eyes and soft fur. It would curl up in my shirt pocket, and I took it to school for show-and-tell. Flying squirrels are unique among mammals, with a loose flap of skin along their sides that allows them to glide between trees. New Hampshire is home to both northern and southern flying squirrels.

Many people think that any smallish mammal is a mouse, but there are striking differences. A few simple clues can help you tell these small rodents and insectivores apart. Mice have big ears and eyes, and a long tail. Voles and bog lemmings have short, round ears and a snub nose. Shrews have a pointed nose, small eyes and teeth tipped in a reddish pigment. Moles have huge front claws, inconspicuous eyes and ears, and short tails. The next time your cat drops something on your doorstep, you may realize that it’s not necessarily a mouse!

The Truffle Connection

On the forested northeastern slopes of the Bartlett Experimental Forest in the White Mountain National Forest, long-term, intensive field studies are uncovering new facets of the small mammal community.

“The most common species are deer mice and white-footed mice, red-backed voles, woodland jumping mice, masked shrews and short-tailed shrews,” said Mariko Yamasaki, a Wildlife Biologist with the U.S. Forest Service.

In all, 22 small mammal species occur there, including six species of shrews. “Although populations vary year to year, small mammals are important prey for coyotes, foxes, bobcats, weasels, hawks and owls – anything bigger than them,” said Yamasaki.

The curious-looking star-nosed mole has highly sensitive nerve endings that it uses to detect prey in muddy wetlands. Moles get a bad rap for creating tunnels and ridges in our lawns, but they feed on destructive grubs and aerate the soil.

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Ryan Stephens, a PhD student at the University of New Hampshire, is digging into other fascinating interactions among small mammals, fungi and trees at the Bartlett Forest. In the hidden underground world, mycorrhizal fungi form symbiotic relationships with tree roots, enabling trees to take nutrients up from the soil more efficiently, in exchange for carbohydrates. Truffles are the underground fruiting bodies of certain fungi, and they offer a rich and abundant food source for small mammals during the summer and fall.

“Truffle-producing mycorrhizal fungi rely especially on small mammals for spore dispersal,” said Stephens. “They detect volatile compounds released by mature truffles buried in the soil, dig them up, eat the fleshy, potato-like truffle along with microscopic spores, and then pass the spores through their feces.” Stephens has identified spores of more than 24 different kinds of truffle-producing fungi in fecal pellets collected in his live traps.

“The variety of truffles eaten varies considerably among species,” said Stephens, “which suggests that a diverse small mammal community is important to fungal diversity in our forests.” Although these are not the truffles favored in European cuisine, they are suited to small mammals just fine, and together they play a major role in maintaining healthy forests.

Taming of the Shrew

Shrews are everywhere, but often unseen. You may hear their squeaks before you see them nosing about in the leaf litter. They are busy day and night year-round, their nose constantly twitching in search of food to satisfy their high metabolic rate. Shrews are extremely territorial and fight each other a lot, even to the point of biting off each other’s toes. At the Bartlett Forest, Stephens captured one shrew that was missing eight toes; more than half those older than one year were missing at least one toe.



(Clockwise from top left) Truffles – the underground fruiting spores of certain fungi – are a valuable food source for small mammals, which in turn spread their spores, promoting healthy forests. A rare sight, two territorial shrews square off. An owl pellet reveals the bones of a small mammal (owls swallow their food whole and regurgitate the undigested parts). A hungry American kestrel captures a meadow vole.

The short-tailed shrew is the largest and the one most people have seen, either dead or alive. It is often killed, but left intact, by predators because of its strong musky odor. Since owls can't smell, their pellets often contain a lot of shrew bones. The short-tailed shrew is unique in having a modified salivary gland that contains a neurotoxin, which it injects to paralyze small prey or kill mice and voles. It uses echolocation – emitting high-pitched sounds – to move through its habitat.

Much Ado About Moles

Moles are uniquely evolved for life underground: they have broad front feet with large claws for digging tunnels, no external ears, pinhead-size eyes, and soft thick fur that sheds soil easily. Moles are much maligned for creating shallow tunnels, ridges and dirt mounds in our lawns. However, they feed on earthworms, as well as insects like grubs that might otherwise prey on garden plants; their tunneling helps to aerate the soil.

The star-nosed mole is a strange-looking creature, with 22 fleshy tentacles around its nose. It is found around wet areas and is an active swimmer. The “star-nose” has highly sensitive nerve endings, allowing the mole to detect small prey in the muddy soils of wetlands and making it the fastest forager of any mammal.

Predictor of Lyme

Researchers at the Cary Institute of Ecosystem Studies in Millbrook, New York, are exploring complex interactions among small mammals, deer populations, acorn crops, gypsy moths, blacklegged ticks and Lyme disease in oak forests. A key conclusion of their long-term studies is that forest fragmentation and loss of biodiversity leads to a higher density of mice infected with the Lyme bacterium, which results in more people infected with the disease.

White-footed mice are abundant, produce large litters multiple times a year, and are easily accessible to crawling ticks. In oak forests, acorns are a key food for mice as well as deer; good acorn crops result in even more mice the next year. When deer move into oak forests in fall to feed, they often carry blacklegged ticks, which transmit Lyme disease. The adult ticks drop off to



White-footed mice are prolific breeders and the main culprit for transmitting the Lyme bacterium to ticks.

the forest floor, where they overwinter. The following spring, females lay eggs that hatch into larvae that are not infected with the Lyme bacterium. The tiny larval ticks search for a blood meal from a passing animal – often a mouse, which is the most likely host to transmit the Lyme bacterium to a feeding tick. When infected larval ticks molt, the now-infected nymphs are at the stage at which most people become infected with Lyme disease if bitten.

“The curious thing is that mice do not catch Lyme disease, although they are the most prominent host of the bacteria,” said Richard Ostfeld, a lead researcher at the Cary Institute.

“As oak forests are fragmented by development, the diversity of small mammals and predators declines, while deer numbers often increase,” said Ostfeld. “A more diverse small mammal community would reduce the chance that a tick encounters a white-footed mouse. Although many people think that tick numbers are tightly linked to deer numbers, our long-term data show that population size of white-footed mice is a much better predictor of tick numbers.”

Welcome Diversity

Winter is coming. I think about the woodland jumping mouse curled up in a tight ball in its burrow, hibernating until late spring. I wonder how many white-footed mice are scouting out my house for a warm winter refuge. I appreciate and welcome the diversity of small mammals in our state – mice and voles, shrews and moles, chipmunks and flying squirrels – knowing the far-reaching implications of their presence to healthy forests and human health.

Ellen Snyder lives in Newmarket, N.H., and is the owner of Ibis Wildlife Consulting.

KEEPING COMMON SPECIES COMMON

Small mammals are among the many animals targeted for conservation in the New Hampshire Wildlife Action Plan under actions designed to “keep common species common” – the seldom talked-about second goal of the Plan. Five small mammals are listed as Species of Greatest Conservation Need, and one goal is to learn more about their distribution and abundance. Some, like northern and southern bog lemmings, are notoriously hard to survey. Others listed are the rock vole, the American water shrew and the long-tailed shrew.