The Outside Story

The Winter Lives of Salamanders

By Jenna O'del

Necturus maculosus

In the cold October air, my classmates and I gathered around the square oak board placed on the ground more than a year earlier. Carefully, we lifted it and peered underneath. Against the dark brown soil, two shiny lines caught our attention: salamanders.

Both were Eastern red-backed salamanders (*Plethodon cinereus*), the most abundant salamander species in the Northeast. One had the classic red stripe running down its back; the other was a less common lead morph, sporting a speckled black back without the stripe. If you look under logs in a forest during much of the year, you're likely to find red-backed salamanders sheltering between nighttime forays to hunt mites, ants, and other small prey.

Coverboards, like the one we lifted to find these two salamanders, replicate natural habitat and allow researchers to collect data on various species. In the fall of 2019, I was part of a wildlife monitoring class at the University of New Hampshire, working under Professor Jennifer Purrenhage to study the seasonal movements of terrestrial salamanders. Every week, a few of us would check under the coverboards.

Salamanders are most conspicuous in early spring, when a number of terrestrial species migrate en masse on rainy nights, moving through the forest and, all too often, crossing roads to access breeding pools. Yet terrestrial salamanders have other, less spectacular seasonal movements, including summer and fall migrations, and those that are vertical, up and down in the earth. All salamanders are ectotherms, meaning their body temperature fluctuates with the local air or soil temperature. As amphibians, they also are at constant risk of desiccation. Heat regulation and access to water are key to their survival.

In summer, as trees leaf out and ground dries, many salamanders move downward, where the temperature is cooler and soil moisture keeps them hydrated. They resurface in autumn, as rains replenish soil moisture. By mid-November, however, the spaces beneath the boards were empty. The salamanders had disappeared.

As winter approaches, salamanders once more must adapt – to the most challenging season of all. Many terrestrial salamanders head underground for the coldest months. In addition to red-backed salamanders, this group includes four-toed salamanders, so named for only four toes on each hind foot, red efts (the

juvenile form of eastern newts), and members of the mole salamander (*Ambystoma*) genus: the aptly named spotted salamander, Jefferson salamander, and the blue-spotted salamander.

To survive, these species must migrate below the frost line, which, depending on air temperatures and the presence of insulating snow, can be more than 5 feet down. Deep in the earth, they'll settle in, their bodies staying just above the freezing point and soil moisture keeping them from drying out.

Not all salamanders take shelter in the ground, however. The adult eastern newt overwinters in bodies of water, which may be as big as Lake Champlain or as small as a stream. There, the newts will remain active, even if ice forms on the water. They often congregate near seepages, "where groundwater comes through the surface," explained Jim Andrews, coordinator of the Vermont Reptile and Amphibian Atlas. These upwellings provide additional protection from freezing and greater dissolved oxygen content. Andrews has received reports from cross-country skiers who witnessed "literally hundreds of newts" gathering where groundwater kept ponds from freezing.

The salamander most active in our region during winter is the little-seen but spectacular mudpuppy (*Necturus maculosus*). "We get reports here [in Vermont]…from ice fishermen that catch them on ice fishing baits," Andrews said, also noting mudpuppies have come up in trawls in the Great Lakes. Mudpuppies, a foot or more long, are famous for their external red gills that look like excessive ear hair. These gills reflect mudpuppies' status as fully aquatic amphibians, and they efficiently harvest oxygen from the water. In highly oxygenated winter habitats – for example, rivers that remain open to the air – mudpuppies are more active in winter than in summer, because cold water holds more oxygen and predaceous fish are less active.

There's yet a third group of salamanders, a happy medium between terrestrial and aquatic salamanders, which depend on the relative warmth of stream water to keep body temperatures just above freezing. The northern two-lined salamander (*Eurycea bislineata*), with dark brown stripes, will often hide in saturated soil under rocks and logs on stream edges. And the reddish-brown northern dusky salamander (*Desmognathus fuscus*) will usually seek out mucky and mossy seepage areas during winter.

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