account of two squirrels co-operating in building a leaf nest.

Copulation occurs following intense mating bouts in which males compete for access to an estrous female; the sexes separate soon after copulation (Thompson 1977). Because the female did not exhibit the enlarged vulva indicative of estrus, we do not believe this nest-building behavior related to breeding activity.

**Literature Cited**


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**Occurrence of the Northern Bog Lemming, *Synaptomys borealis*, in the Northeastern United States**

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Three new specimens of the Northern Bog Lemming (*Synaptomys borealis*) from Maine and one misidentified record from New Hampshire are reported here. This brings the total specimens of *S. borealis* for the northeastern United States to seven. The species is not restricted to scarce alpine habitat in this region nor is it unable to coexist with related microtine species. Reasons for its rarity remain obscure.

**Key Words:** Northern Bog Lemming, *Synaptomys borealis*, rarity, Maine, New Hampshire.

The Northern Bog Lemming, *Synaptomys borealis*, is rare in mammal collections in the United States. In the northeastern U.S. only three *Synaptomys borealis* specimens had been recorded prior to the work reported here. The first specimen in the U.S. was collected in 1898 near the base of Mt. Washington, Coos County, New Hampshire (Preble 1899). This is the type for the subspecies *S. b. sphagnicola*. Two more specimens were collected in 1902 from the alpine zone of Mt. Katahdin, Piscataquis County, Maine (Dutcher 1903). Nine subspecies have been described throughout this species’ range in Canada and the northern U.S. (Hall and Kelson 1981; Banfield 1974).

This paper reports the occurrence of three new *S. b. sphagnicola* specimens collected in Maine in 1985 and documents a fourth specimen from New Hampshire which had been misidentified. New information on habitat and small mammal associates is included.

We collected three new specimens of Northern Bog Lemming in two separate localities within Baxter State Park, Piscataquis County, Maine. The first location was on the alpine tableland of Mt. Katahdin at 1375 meters elevation (69°00'W, 45°53'N). The second location was at the western border of the park...
in a stand of Spruce-Budworm killed spruce and fir trees at 400 meters elevation. We based identification primarily on the enamel patterns of the lower molar teeth as in Howell (1927). All of our specimens were compared with both skins and skulls of S. borealis and S. cooperi (Southern Bog Lemming) at the Museum of Comparative Zoology, Harvard University.

At the high elevation site 39 Sherman live traps and 36 pit traps (66 mm diameter by 120 mm deep) were set for three nights (18–20 July 1985). The traps were set in an open area of alpine sedge meadow below a running spring named Caribou Springs, and at the edge of dense Krummholz habitat surrounding the open meadow. This spring was the precise place where Dutcher (1903) had collected the two specimens in 1902. The sedge meadow habitat was dominated by sedge (Carex spp.), sphagnum moss, lichen (Cetraria nivalis) and dwarf shrubs (Salix uva-ursi and Betula glandulosa). The Krummholz consisted of Black Spruce (Picea mariana), Balsalm Fir (Abies balsamifera), and dwarf birch (Betula minor and B. glandulosa).

The second collecting site was approximately 9.1 km away from Caribou Springs and separated by a valley and range of mountains 1000 to 1250 m high. The habitat and small mammals of this area were studied in 1982 and described by Clough (1987). The understory at this site was dominated by fir, spruce, Mountain Ash (Sorbus americana) and Paper Birch (Betula papyrifera) up to 2 m high. The shrub and ground layers consisted of dense growth of raspberry (Rubus sp.), ferns, some grass, and sedge and sphagnum moss in scattered damp places. Many downed tree trunks, some of which were old and moss-covered, criss-crossed the ground. All canopy trees were dead. Most of the ground was dry in July and August.

Results and Discussion

In the Mt. Katahdin alpine site, two S. borealis were captured in the sedge meadow habitat: an immature female and a pregnant female with four embryos. Both were captured in pitfall traps. The other small mammals collected here were Microtus pennsylvanicus (Meadow Vole) (2), Clethrionomys gapperi (Southern Red-backed Vole) (1), Peromyscus maniculatus (Deer Mouse) (4), Blarina brevicauda (Short-tailed Shrew) (1), and Sorex cinereus (Masked Shrew) (9). Additional trapping efforts in two wet grass meadows at elevations of 890 m (40 TN) and 855 m (50 TN) on Mt. Katahdin yielded no bog lemmings. A trap night (TN) is one trap set for 24 hours.

In the low elevation spruce-fir forest site during 1982 no S. borealis were caught with 360 TN, although 72 other small mammals were captured. Two separate trapping efforts occurred here in 1985: 4–6 July (135 TN, Longworth live traps), and 7–11 August (300 TN, snap traps). No S. borealis were captured in July. One immature male S. borealis was captured on 11 August in a stand of spruce and fir in which every canopy tree was dead from defoliation by Spruce Budworm. Other small mammals collected were Microtus chrotorhinus (Yellow-nosed Vole) (2), M. pennsylvanicus (4), Clethrionomys gapperi (46), Peromyscus maniculatus (6), and Sorex cinereus (17).

During our investigations of U.S. records of S. borealis we learned of a museum specimen that was apparently misidentified (T. French, personal communication). G. C. C. borrowed this specimen of skin and skull (Number 2748) from the Montshire Museum of Science, Hanover, New Hampshire, and compared it with other S. borealis specimens. It was obviously another S. borealis. This adult female had been collected on 11 October 1958 by T. Peterson on Mt. Moosilauke, Grafton County, New Hampshire, at an elevation of 1160 m.

There are now seven recorded specimens of S. borealis from four locations in Maine and New Hampshire. The reasons for the rarity of this species are not clear. Two possible hypotheses are 1) that their required habitat is scarce, and 2) that they cannot coexist with closely related small mammals. Neither hypothesis is supported by our observations. The Northern Bog Lemming is not restricted to scarce alpine tundra habitat in the northeast but is known to live at elevations from 400 m to 1375 m, and in habitats including alpine sedge meadow, Krummholz, spruce-fir forest with dense herbaceous and mossy understory, and in wet meadow and mossy stream sides (Preble 1898). They have been found to occur in rich assemblages of small mammal species including two and three other microtine rodents. In the Caribou Springs locations they have been found after an interval of 83 years.

Elsewhere in the U.S., the species is recorded from Minnesota, Montana, Idaho, and Washington. In all these states, however, it occurs only in the northern portions and is described as "elusive," "rare and local," or occurring in "small, semi-isolated or isolated pockets" (Wright 1950; G. Nordquist, personal communication; D. Genter, personal communication). The species is also known from a variety habitats and elevations in the northwest (Wilson et al. 1980). Even in Canada, which constitutes the primary range, S. borealis specimens, especially the eastern forms, are "among the rarest of mammals" in collections (Anderson and Rand 1943; Banfield 1974; Peterson 1966).
Further study of the distribution, ecology, and reproductive biology of this species would be helpful in the understanding of rarity, an important natural phenomenon.

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