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Small mammals at the Field Station

Donald Morzenti
University of Wisconsin-Milwaukee

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SMALL MAMMALS AT THE FIELD STATION

INTRODUCTION Ecological studies of small mammals are undertaken for a variety of reasons. Some investigations are conducted to determine their economic relationship to man, since small mammals directly affect his welfare through transmission of diseases and parasites and through destruction of crops, orchards, and forest seedlings. Much research, however, is basic in nature. The primary objectives of such research are to aid in man's quest for knowledge concerning the distributional and population aspects of small mammals.

During the summer of 1968, an intensive live-trapping program was begun to determine the status of small mammals, primarily mice and shrews, among the various habitats found at the Cedar-Sauk Field Station. Four species of mice, the White-footed Mouse (*Peromyscus leucopus*), the Red-backed Vole (*Clethrionomys gapperi*), the Meadow Vole (*Microtus pennsylvanicus*), and the Meadow Jumping Mouse (*Zapus hudsonius*), and two species of shrews, the Masked Shrew (*Sorex cinereus*), and the Short-tailed Shrew (*Blarina brevicauda*), were found to be representative of this area.

METHODS The procedures used in this study are similar to those set forth by the North American Census of Small Mammals (N.A.C.S.M.) Three permanent transect lines, each one-eighth of a mile apart and bisecting the Field Station property, were utilized. In addition, three temporary transects were established in some of the less extensive habitats. Trapping stations were set up at 50 foot intervals along each of the transects. Three Sherman live traps, baited with peanut butter, were placed within a five foot radius about each station. Each trapping period consisted of 72 hours, commencing at noon on the first day and ending at noon three days later. All permanent

transects were trapped at least three times, while the temporary transects were trapped for one 72-hour period. Traps were checked at sunrise each morning and again in the evening, just prior to sunset, on all occasions. When extreme weather conditions prevailed, traps were checked as frequently as needed in order to prevent mortality. During each trapping period, individual small mammal captures were examined and marked. Information concerning location, time and date of capture, species, age, sex, breeding condition, and parasitism were recorded. Recognition of individuals previously captured in a given trap period was accomplished by marking them with a small amount of durable paint. Also, in order to determine the influence of the environment upon the local distribution of mice and shrews, certain factors, such as vegetation cover and density, litter development, light penetration, and soil moisture were analyzed at each trapping station. Throughout this study a total of 888 animals were live-trapped, representing 35 days of trapping effort which included 6,147 trap nights.

It should be pointed out that the use of trapping as a means of comparing the relative abundance of the same or different species of small mammals in the same or different habitats is at best a very crude technique. There is considerable variability among several factors; species and individual responsiveness, home range sizes, and weather conditions are but a few. Nevertheless, a more feasible technique for studying small mammals has yet to be devised. Considerable caution, however, must be exercised when interpreting data derived from trapping studies.

RESULTS The White-footed Mouse was found to be the most abundant small mammal in all habitats containing trees; i.e., upland hardwoods, swamp hardwoods, bog forest, and forest edge (Table 1). It is one of our most shy and secretive woodland inhabitants, and is seldom seen because of its strict nocturnal habits. Only 2% of the 700 individuals live-trapped were taken during the daylight hours. Data show that the presence of trees or shrubs is an important factor influencing the local distribution of this species. There are highly significant positive correlations between the density and amount of cover in the tree and shrub strata at each trapping station and the number of White-footed Mice captured. Also, this species appears to react negatively to open areas which are characterized by an increased light penetration and a more dense herbaceous or grassy field stratum. Apparently, the occurrence of the White-footed Mouse is not limited to any great extent by the moisture content of the substratum. It was trapped in considerable numbers in the low, moist swamp hardwoods and bog forest. However, peak abundance was reached in the more mesic upland woods.

The climax maple-beech forest appears to be the prime habitat for this species. It is highly adaptive in many respects to its forest environment. Its acute sense of hearing and its large eyes, adapted for night-

time vision, aid in the detection of potential predators. It is quick and agile, and climbs trees quite proficiently. The seeds, fruits, and buds of many of the plants found in the upland hardwood forest are reported to be eaten by the White-footed Mouse. From spring to fall, invertebrates such as beetles, spiders, ants, as well as insect larvae form a substantial part of its diet.

Table 1. Total Capture and Rates of Capture for Each Species of Small Mammal in the Various Habitats During July and August.

	White-footed Mouse		Red-backed Vole		Meadow Vole		Meadow Jumping Mouse		Short-tailed Shrew		Masked Shrew	
Habitat Type	Total Capture	Rate of Capture*	Total Capture	Rate of Capture	Total Capture	Rate of Capture	Total Capture	Rate of Capture	Total Capture	Rate of Capture	Total Capture	Rate of Capture
Upland Hardwoods	386	27.0	1	0.1	0	0.0	1	0.1	4	0.1	0	0.0
Swamp Hardwoods	49	14.0	14	4.0	0	0.0	0	0.0	0	0.0	0	0.0
Bog Forest	45	6.0	30	0.0	1	0.1	2	0.3	0	0.0	3	0.2
Old Field	12	1.0	0	4.0	32	2.6	2	0.2	4	0.1	1	0.1
Forest Edge	56	8.6	7	1.1	3	0.5	2	0.3	4	0.2	0	0.0
Sedge Meadow	2	1.0	0	0.0	14	7.1	0	0.0	2	0.3	2	0.6
Marsh	1	0.3	0	0.0	9	2.6	1	0.3	3	0.3	1	0.2
Total Capture all Habitats	551		52		59		8		17		7	

* Number of individuals trapped per hundred trap nights.

Some reasonably good data concerning the sex ratio, age structure and breeding condition of our White-footed Mouse population throughout the summer and early fall were obtained. The ratio of males to females was 106/100, not differing significantly from the expected Mendelian ratio. As pointed out by Hirth (*Ecology*, 40: 417-425, 1959) and others, the somewhat larger than expected proportion of males present may reflect a sampling bias due to the fact that the home ranges utilized by male White-footed Mice are, on the average, somewhat larger than those of females. As a result, the effective trapping area covered by a line of traps would probably be greater for males. Although the White-footed Mouse breeds continually throughout the warmer months, it is reported to have two periods of peak reproductive activity in the northern portion of its geographic range, which includes southeastern Wisconsin. These occur during

the late spring and again during the late summer or early fall. The trapping data obtained from July through November would tend to substantiate the occurrence of a second breeding peak. A definite trend towards an increasing percentage of juveniles in the population during the months of July (37%), August (42%) and September (53%) was noticed. The greatest percentage of breeding males and females was observed during the month of August.

Also of interest was the distribution of the various age classes of White-footed Mice among the different habitats. During August the percentage of adults captured in various areas was as follows: upland hardwood (28%), swamp hardwoods (22%), bog forest (21%), and forest edge (3%). Each is based upon 23 or more captures. What could account for the noticeable absence of adult White-footed Mice in the forest edge habitat? It is often reported among mammals, especially when crowded conditions exist, that the juvenile or immature individuals in a given population are forced to occupy the marginal or less desirable habitats. Could the observed difference be the result of intraspecific competition?

The Red-backed Vole is a common resident of moist deciduous, coniferous, or mixed wooded areas of the northern United States and Canada. It is readily recognized because of its distinct chestnut red "stripe" extending along the middle of the back from head to tail. At the Field Station it was abundant in both the bog forest and swamp hardwoods, comprising 37% and 22% respectively, of the total small mammal catch in these areas. The number of Red-backed Voles taken per unit trap effort in these two areas was identical (4.0 individuals per 100 trap nights). A moist or wet substratum seems to be an important factor influencing the local distribution of this species. A significant positive relationship was found to exist between the amount of surface moisture and the number of Red-backed Voles captured at a given trapping station. Getz (*Ecology* , 49: 276-285, 1968) reported that the water turnover rate of the Red-backed Vole was 2.2 times as great as that for the White-footed Mouse. Could this be a factor restricting expansion of the Red-backed Vole into less moist habitats? Green vegetation, primarily the leaves and stems, as well as nuts, seeds, fruits and occasional insects comprise the major part of the Red-backed Vole's diet. It has runways and burrows among the uprooted trees, rotting stumps and hummocks which are characteristic of its habitat. It is reported to be chiefly nocturnal, although often active during the day. Out of the 72 individuals live-trapped in this study, 65% were captured at night and 35% were taken during the daylight hours. The Red-backed Vole is quite aggressive while being handled, as compared with the docile White-footed Mouse.

The Meadow Vole, commonly called Meadow Mouse or Field Mouse, is probably familiar to nearly everyone. It is a rather large, heavy set mouse, with dark grayish brown pelage and is usually found in open areas containing grass-like vegetation. This rodent has been of particular interest to ecologists because of the population cycles it is reported to undergo at three to four year intervals. Data obtained reveal the Meadow Vole to be the most abundant small mammal in all habitats at the Field Station which are nearly devoid of tree or shrub cover. The Meadow Voles represented 63%, 70% and 60% of the total small mammal catch in the old field, sedge meadow, and marsh, respectively. The rates of capture (number of individuals per 100 trap nights) of the Meadow Vole in these habitats were 2.6, 7.1, and 2.6 respectively. A definite negative reaction to trapping stations with dense tree and shrub growth was noted. Trapping stations with a well developed field stratum were favored. The grasses, sedges, and weeds which characterize the areas inhabited by the Meadow Vole provide an abundant food supply as well as protection from predators and intense solar radiation. Several species of hawks, especially the Marsh Hawk and the Red-tailed Hawk, and owls take considerable numbers of voles. In addition, several mammalian predators such as skunks, weasels, foxes, and shrews, probably take a heavy toll.

The Meadow Jumping Mouse was found to be present, but in reduced numbers. This medium-sized mouse is readily recognized by its long hind legs and extremely long tail. It has a distinct hopping or frog-like means of locomotion. Indeed, one is apt to mistakenly identify it as a frog which is attempting to escape when it is encountered while walking through dense vegetation. Very little data concerning this small mammal were obtained during this study. Only eight individuals, representing five of the seven habitats studied, were live-trapped. One cannot help but wonder, however, if this hibernating rodent is less susceptible to trapping than most other species. Several Meadow Jumping Mice were observed by this investigator while working in the field. On August 9, 1968, I happened upon a good sized Garter Snake which was in the process of devouring a recently captured Meadow Jumping Mouse. Also, on August 12, a juvenile of this species had accidentally fallen into a basement window well at our Field Station laboratory building.

Limited data were obtained for two species of shrews, the Short-tailed Shrew and the Masked Shrew, which occur at the Field Station. The Short-tailed Shrew somewhat resembles a small Meadow Vole except for its long pointed snout and very short tail. It appears to be a rather non-selective species as the 17 individuals captured were distributed throughout most of the habitats studied. The Masked Shrew, Wisconsin's smallest mammal, weighs less than 0.2 of an ounce. Only seven individuals were live-trapped. All except one were taken in moist areas, i.e., bog forest, sedge meadow and marsh.

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Donald Morzenti
UWM Department of Zoology

A 24-HOUR RADIATION BUDGET AT A HIGH-GRASS MARSH IN EARLY WINTER

INTRODUCTION As with others of the numerous physical factors forming the nonliving environment of terrestrial ecosystems, the upward and downward exchanges of the fluxes of solar (short-wave) and terrestrial (long-wave) radiation often appear in the literature as yearly, seasonal, or monthly averages. Because these tend to present a misleading or incomplete picture of environmental conditions, a 24-hour series of measurements is presented here.

A series of radiation measurements was taken on November 25th and 26th, 1967, at the UWM Cedar-Sauk Field Station (43° 23' N. Lat., 88° 01' W. Long.) to determine the radiation budget at a high-grass marsh in early winter. The marsh in which the measurements were taken is located east of the Field Station laboratory building, occupying a shallow depression which is surrounded by low, wooded hills on the north, south and west, and an elevated roadbed on the east. The ground in the marsh was saturated and unfrozen at the time of the observations and the sedge grass vegetation was three to four feet high, dry, and light in color.

During the observation period, a complete weather system passed over the Field Station. Observations were taken under a variety of sky-cover conditions, from clear to completely overcast and back to clear. They also included periods of light and moderate rain and light snow. The sky was completely overcast from 1430 hours to 2130 hours on November 25th, although initial observations at 1200 hours had been under clear sky conditions. Moderate to light rain fell intermittently between 1430 hours and 1800 hours. Clear sky conditions were observed between 2130 hours on November 25th and 1100 hours on November 26th. From 1100 hours to 1200 hours on the 26th, the sky became overcast again and the observation period ended during a snow-shower. The temperature declined steadily from an initial reading of 9.0 C. (taken 2 meters above the soil surface) to -2.8 C. at 0600 hours on the 26th. After a slight mid-morning increase, it dropped to 0.5 C. at the final reading at noon on the 26th.