Final Report

An Inventory of *Microtus chrotorrhinus* in Northeastern Minnesota

Contract From:

Section of Wildlife - Nongame Division

Minnesota Department of Natural Resources

To:

University of Minnesota

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I. Introduction

The range of Microtus chrotorrhinus, the rock vole, extends from Minnesota east to the Atlantic coast and from Nova Scotia south through the Appalachian mountains. Three subspecies of the rock vole have been identified. Microtus chrotorrhinus chrotorrhinus (Slides 1-3) occurs in eastern Canada and the United States and extends west to Ontario and Northern Minnesota. Early reports of rock vole populations in Minnesota include one colony in St. Louis County, recorded in 1921, and two populations from Cook County, recorded in 1973 and 1976. In 1980, an investigation was conducted to locate additional populations of the species in Minnesota. Four sites in Cook County were investigated, three of which produced rock voles and one of which produced another microtine rodent, Synaptomys cooperi, the southern bog lemming. This species has been reported to occur in association with Microtus chrotorrhinus (Kirkland, 1977; Timm et al., 1977). Further studies on the distribution of M. chrotorrhinus were undertaken in 1981 at two new locations in Cook County. One site is located at S 1/2, S. 21, and N 1/2, S. 28, T. 63 N, R. 2 E., on federal, Superior National Forest land. This site is designated "F.S. Rd. 1382 Site". The second site, NW 1/4, SE 1/4, SW 1/4, S. 24, T. 62 N, R 4 W is on state land, adjacent to the federally-owned, Crescent Lake Campground. This site is designated "F.S. Rd. 165 Site".

II. F.S. Road 1382 Site

Site Description

This federally-owned site is an extensive, exposed boulder field surrounded by a predominantly black spruce (Picea mariana)-balsam fir (Abies balsamea) forest. Forest Service Road 1382 divides the boulder field, with the major exposed portion to the east of the road. An area of transitional vegetation occurs at the periphery of the exposed boulders. The width of this transitional area varies, but is most extensive to the west of the road. Surrounding the transitional area, at a slightly higher elevation, is an upland forest community, most of which has recently been logged. Some portions of the cut area were replanted with jack pine (Pinus banksiana) in 1963. An occasional jack pine is also found in the boulder field. In addition, a few tamarack (Larix laricina) and white pine (Pinus strobus) occur in the boulder area. Light-tolerant tree species such as balsam poplar (Populus balsamifera) and paper birch (Betula papyrifera) occur along the periphery of the spruce-fir forest and in openings created by numerous deadfalls within the forest. Shrubs are scattered, occurring in areas of open canopy. These are primarily hazel (Corylus cornuta) and alder (Alnus sp.). Predominant forbs on the site include: bunchberry (Cornus canadensis), bush honeysuckle (Diervilla lonicera), clintonia (Clintonia borealis), twinflower (Linnaea borealis), wild lily of the valley (Maianthemum canadense), and blueberry (Vaccinium spp.). In areas where the canopy is open, raspberry (Rubus spp.), sedges, twinflower, bunchberry, dogwood (Cornus sp.), wild sar-

saparilla (Aralia nudicaulis), and ferns were observed. With the exception of the area of exposed boulders, the ground is covered by mosses, lichens and club mosses (Lycopodium spp.). Standing water was observed occasionally in crevasses between adjacent boulders.

Methods

The west side of the area was selected for trapping. This location rose more gently away from the exposed boulder area and contained considerably more ground vegetation. A grid of 40 stations at 8 m intervals was established in a pattern conforming to the shape of the boulder field. During the first evening of the three-day trap period, 25 traps (a combination of commercial mouse and Museum Special snap-traps) were set and baited with peanut butter. An additional 15 traps were used (for a total of 40) on the second and third evenings. Traps were checked, baited and re-set daily. Trap location and species was recorded for each animal trapped. All specimens were frozen for later examination. Photographs of the area were taken (Slides 4-7). After checking the trap lines on the third day, traps and station markers were removed from the site.

Trapping Results

Twenty-two animals were trapped during the 105 trap-night period for a 20.95% trapping success. Capture totals for each species and the percentage of total catch represented by each species are shown in Table 1. Some traps (8.6%) were tripped or without bait, likely due

to the activity of chipmunks and red squirrels, both of which were observed in the area. One trap contained a partially-consumed animal, suggesting that shrews, though not trapped, may also inhabit the area. Unidentified bird feathers were found in one trap. Two Microtus chrotorrhinus were trapped at the site. These animals were caught in traps approximately 35 m apart. These were the only animals captured at these two stations during the entire trapping period. Microhabitat at the two stations varied considerably but both were located on peripheral trap lines and were characterized by sparse herbaceous vegetation.

Table 1. Small mammal capture data for F.S. Road 1382.

Species	Number Trapped	% of Capture
Microtus chrotorrhinus	2	9.1
Clethrionomys gapperi	14	63.6
Peromyscus maniculatus gracilis	5	22.7
Napaeozapus insignis	1	4.5

Discussion

This site is comparable in many respects to others inhabited by rock voles. Mosses and lichens cover the forest floor and forbs typical of other sites (bunchberry, blueberry, honeysuckle, clintonia and twinflower) are abundant here. As at all sites trapped by the investigator in 1980, standing water was present. An exposed boulder area surrounded by transitional forest of predominantly black spruce

and fir also characterized all previous sites. Open areas at this, as well as most other sites, have been created by deadfalls which provide enough light for a sparse vegetative layer and occasional light-tolerant tree or shrub growth. The diversity of coniferous species is greater at this site than at other sites trapped, with five species represented (tamarack, white pine, jack pine, fir, and black spruce).

The percentage of Microtus chrotorrhinus captured and the ratio of the number of Clethrionomys gapperi to the number of Microtus chrotorrhinus are considerably lower than averages computed from the 1980 data (9.1% and 7:1 in 1981 compared to 17% and 3:1 in 1980). It is not known whether this variation in relative abundance of M. chrotorrhinus reflects species-specific, year-to-year variation in density or is a function of relatively small sample sizes. One Napaeozapus insignis, not found by the investigator at any of the previously-trapped sites, was captured. Other investigators (Timm, 1974; Timm et al., 1977; Kirkland and Knipe, 1979) have reported this species in association with Microtus chrotorrhinus (Slide 8).

The practice by loggers of excluding spruce bogs while clear-cutting in this area may be important in regard to management of rock vole habitat. This practice protects rock vole habitat (Slide 9). Clearcutting the surrounding area permits light penetration around the periphery of the spruce area, necessary for the production of an herbaceous layer adequate to support small mammal populations. In addition, the wind barrier which the upland forest had previously provided is eliminated, increasing the incidence of windfalls within the spruce

forest. This allows additional light to penetrate, initiating herbaceous regeneration and redevelopment of spruce.

III. F.S. Road 165 Site

Site Description

This site is located on state-owned property, adjacent to the U.S. Forest Service campground at Crescent Lake. The area is predominantly a black spruce forest with several white pine and occasional cedar (Thuja occidentalis), quaking aspen (Populus tremuloides), and white birch. Numerous birch and pine deadfalls, often covered by mosses and lichens, are present. The openings created by the falling of these trees allow light penetration for support of shrub growth, primarily hazel and mountain maple (Acer spicatum). Herbaceous ground cover includes honeysuckle (Lonicera spp.), blueberry, bunchberry, twinflower, wild sarsaparilla, clintonia, wild lily of the valley, bracket fern (Pteridium aquilinum), bush honeysuckle, and labrador tea (Ledum groenlandicum). The ground cover consists of mosses, lichens and club mosses (Lycopodium spp.). Evidence of soil development was observed in areas of leaf litter accumulation. Boulders, mostly moss- and lichen-covered, are scattered over the forest floor. No flowing or standing water was observed. Dried silt and clay covering the ground and litter layer, however, indicated that some areas had recently been covered by standing water. Particularly noteworthy at this location is the evidence of fire on dead, standing, white pine.

Methods

The grid established at this site consisted of 45 trap stations at 8 m intervals. One trap (commercial mouse or Museum Special snap-traps) was placed at each station. Each was positioned in front of a small mammal runway, under a log, or between rock crevasses, all within 1 m of the station marker. Each trap was set and baited with peanut butter. Traps were checked, re-baited and re-set the following two evenings. After checking the traps on the third day, traps and station markers were removed. Species and trap location was recorded for each animal trapped. Specimens were frozen for later examination. Specific information was recorded for individual stations where Microtus chrotorrhinus were trapped. Photographs of the site were taken (Slides 10-12).

Trapping Results

During a 135 trap-night period, 33 animals were captured. (Table 2.) This represents a 24.4% trap success rate. In addition, 23% of the traps were closed or without bait throughout the trap period. Red squirrels and chipmunks were observed at the site and probably were the vandals of bait on the grid.

Two M. chrotorrhinus were trapped on the grid at stations approximately 11 m apart. Clethrionomys gapperi was also trapped at one of the stations, indicating a potentially close spatial relationship between these species. Both traps were placed in similar

microhabitats which were characterized by a partially open canopy and extensive moss and lichen coverage. Forbs common to both stations include: bunchberry, clintonia, bush honeysuckle, blueberry, and willow (Salix sp.) saplings which shaded the forest floor.

Table 2. Small mammal capture data for F.S. Road 165 Site.

Species	Number Trapped	% of Capture
Microtus chrotorrhinus	2	6.1
Clethrionomys gapperi	18	54.5
Peromyscus maniculatus gracilis	10	30.3
Blarina brevicauda	3	9.1

Discussion

Vegetation at this site is similar to that at other sites investigated, and is characterized by a mature black spruce forest with sparse ground vegetation and a dense layer of moss and lichen. Although there is no exposed boulder field at the site, the area is scattered with boulders, many as large as five feet in diameter. Exposed boulder fields and boulder fields in various stages of ecological succession occur in the surrounding area. As much as 20 miles along F.S. Roads 165 and 153 may be considered potential rock vole habitat. Ownership of these areas is state, federal and private.

Several features of this site appear to be unique in terms of rock vole habitat. Most important is the evidence of a severe (but not recent) fire in the area. This suggests that forest fire may

initiate regeneration of rock vole habitats. It appears that this area was once white pine rather than spruce forest; apparently a significant habitat and microclimate change has occurred here in the past. Although no standing or running water was observed, there was evidence that pools of surface water have recently existed at the site. It is also possible that subterranean water may be found under boulders that, at this site, are largely covered by moss, litter and soil.

Numbers and percentages of animals captured at this site are similar to those encountered at the F.S. Road 1382 site described above. (Two Microtus chrotorrhinus represented 6.1% of the animals trapped. The ratio of Clethrionomys gapperi to Microtus chrotorrhinus was 9:1.) As mentioned previously, these ratios differ considerably from those observed in 1980, but site-to-site variation throughout the two-year study was apparent.

IV. Summary

Trapping in Cook County during 1980 and 1981 has led to the discovery of five new Microtus chrotorrhinus colonies, increasing the number of rock vole populations reported in Minnesota to eight. It is anticipated that additional populations exist in Cook County and, based on similarities in glacial geology, also in northern Lake and St. Louis counties.

The habitat of the recently-discovered populations is similar to that reported by previous investigators (Timm, 1974; Buech, et al., 1977; Kirkland and Knipe, 1979; and others). It is characterized by a

partially-open canopy of primarily spruce and fir, with a sparse to dense vegetational layer and a thick, moss and lichen ground cover. At all sites investigated by the contractor in 1980-1981, boulders represented an important component of the landscape. High relative humidities (measured in 1980) and evidence of standing or running water was observed at all sites.

Evidence of disturbance by fire and from logging was noted at the sites investigated in 1981. It has been suggested (Martell and Radvanyi, 1977; Kirkland, 1977; Buech et al., 1977) that rock voles occur in higher densities in disturbed areas than in mature forests. This may be an important consideration in terms of the management of habitat for rock voles.

SLIDE DESCRIPTIONS

1) Microtus chrotorrhinus

2) Microtus chrotorrhinus

3) Microtus chrotorrhinus

4) Federal site, F.S. Rd. 1382. Dense moss cover, many runways under boulders and logs.

5) Federal site, F.S. Rd. 1382. Small area of partially exposed boulders - mostly lichen covered, area included in grid.

6) Federal site, F.S. Rd. 1382. Ground vegetation and forbs. Shows abundance of bunchberry, moss and club moss.

7) Federal site, F.S. Rd. 1382. Shows ground vegetation, mostly moss, club moss and herbs (primarily bunchberry and wild sarsaparilla).

8) Shows M. chrotorrhinus and associated species: Clethrionomys gapperi, Napaeozapus insignis, Eutamius minimus, Tamius striatus, Blarina brevicauda, Sorex cinereus, Peromyscus maniculatus gracilis.

9) Federal site, F.S. Rd. 1382. Clearcut area, spruce forest in background which has not been cut.

10) State site, F.S. Rd. 165. Large moss covered boulders, some light penetration, scattered forbs and shrubs.

11) State site, F.S. Rd. 165. Light penetration with scattered forbs; shows dead, standing, burnt white pine.

12) State site, F.S. Rd. 165. Shows immensity of some boulders. Leaf litter extensive - little ground vegetation or forbs.

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ADDENDUM

TRAPPING DATES

Federal "F.S. Rd 1382" Site

September 8 - September 11

Microtus chrotorrhinus (2) trapped on

September 11, 1981

State "F.S. Rd. 165" site

September 8 - September 11

Microtus chrotorrhinus trapped on

September 9, 1981 (1)

September 10, 1981 (1)