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# COLONIZATION OF AN ABANDONED ORCHARD BY PINE VOLES (MICROTUS PINETORUM)

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Habitat selection by pine voles (Microtus pinetorum) has been attributed to cover density (Goertz, 1971; Paul, 1970) soil condition (Benton, 1955; Fisher and Anthony, 1980), and food resources (Noffsinger, 1976; Paul, 1970). Goertz (1971) reported that pine voles were distributed in diverse habitats, but there was a close correlation with height and diversity of grass. Miller and Getz (1969) found populations in sloping upland woods, Benton (1955) in dry woods, and Paul (1970) in hardwood slopes with a close correlation between distribution and amount of ground cover. Soil type has been examined by Benton (1955) and Fisher and Anthony (1980) and they have shown that pine voles are associated with light soils containing moderate layers of humus. These factors are important to reduce predation, moderate the effect of rain and temperatures, and permit the excavation of fossorial nests and tunnels.

Noffsinger (1976) has demonstrated that the amount of digestible energy and availability of food sources were important factors affecting birth and death rates of pine voles when abandoned and maintained orchards were compared. Behavioral characteristics of pine voles have been associated with decreased meadow vole density as pine voles appear to be a more aggressive species (Smith, 1975). Paul (1970) has shown that pine voles appear to replace meadow voles when they are sympatric in favorable habitats. Trapping and telemetry methods indicate that pine voles have low dispersal capacity and home ranges 100 $m^2$ or less in size (Gettle, 1975).

All these reports are from established pine vole populations and not from the initial colonizing event and subsequent development of a local population. Therefore, this research project is directed at understanding what site qualities permit pine vole colonization in areas where they have been historically absent, but where its competitor, the meadow vole (Microtus pennsylvanicus), is common.

## METHODS AND MATERIALS

In an isolated abandoned orchard in Montgomery County Virginia, which contained an established meadow vole population, two grids (0.25 hectare in size) were established in June 1980. Each grid consisted of four tree rows (10 trees per row) and 5 aisle rows with 94 and 102 trapsites per grid. The grids were

separated by 35 meters of continuous habitat and were trapped monthly (7000 trap nights to date). Aisle rows had large Sherman traps 5 meters apart and tree rows had 2 small Sherman traps at each tree site. Traps were baited with crimped oats and apples and were placed in vole runs. All tree traps were dug into runs and covered with tar paper.

Meadow vole and white footed mice (Peromyscus leucopus) populations were monitored throughout the study while pine vole populations were monitored after the release of 94 pine voles (47 male, 47 female) in September. Two pairs were released at each tree on the central portion of the control grid. All trapped animals were ear tagged, toe clipped, sexed, measured (total length and body length), and reproductive condition recorded (teats, vagina, and testes). All trap and recapture data was recorded on grid maps to note the areas of overlap and movement patterns within the population. Population densities for all species were calculated by a modified Lincoln index and MNKA both before and after pine vole introduction. Pine voles were originally released on one grid (control) but subsequent movement patterns lead to their establishment on the other grid (experimental).

## RESULTS AND DISCUSSION

Meadow vole population estimates were 71 per 0.25 hectares on the control grid and 30 per 0.25 hectare prior to the introduction of pine voles. White footed mouse population densities varied between 10 and 25 per 0.25 hectare throughout the sample period. After the introduction of 97 pine voles to the control grid, a marked decline of meadow voles occurred reducing the density to 41 per 0.25 hectare. The experimental grid showed no decline in density and as these are paired grids the density changes on the control grid are attributable to the presense of the pine voles. By the November trapping period meadow vole density on the control grid recovered to 75 per 0.25 hectare. Between the introduction (September 20) and the November assay, pine vole density declined from 94 to 14 per 0.25 hectares on the control grid. The experimental grid density of meadow voles increased from 30 in October to 51 in November. Pine voles initially colonized the experimental grid (from the control grid) in October and continued to colonize through December reaching a stable density of 30 per 0.25 hectare. From November to December the densities of meadow voles on both grids exhibited a normal winter decline to a stable over-winter density between 30 and 40 per 0.25 hectare. Of the original pine vole introduction, 34% are known to be alive with 5 new unmarked animals caught since the October introduction. By backdating, based on size and weight, these were born on the grids in late October, early November and early January.

Pine voles were primarily located on the experimental grid with 58% of captures on tree rows, which is not satistically

different ($X^2$=0.72) from random. The general movement of pine voles from the site of release was from the control to the lower half of the experimental grid. Trap recapture data indicates that pine voles showed a strong preference for that habitat section. Meadow voles shifted in distribution both on the control and experimental grids. The center of meadow vole distribution prior to pine vole introduction on the control grid was located between trapsites 7 and 12 on all rows but following the introduction meadow vole's shifted to occupy the range between trap site one and seven.

Both microtine species co-occurred at less than 3% of the trap sites during any sample interval and over the September-March sample period less than 16% co-occurred on the experimental and less than 10% co-occurred on the control. On each grid 25% or less than 25 sites failed to capture any Microtus sps. but often caught white footed mice. On the high density, experimental grid, 34 sites caught only meadow voles, while 21 sites caught only pine voles. On the control grid 50 sites were meadow voles while 7 sites caught only pine voles. Other species co-occurring on these grids wereshorttail shrew (Blarina brevicauda), eastern chipmunk (Tamias striatus), eastern cottontail (Sylvilagus floridanus), least weasel (Mustela nivalis), and common opossum (Didelphis marsupialis).

Smith indicated pine voles were dominant to meadow voles in behavioral tests and our data indicate that an interaction does occur which results in a partial redistribution of meadow voles. Pine voles could colonize the site in the presence of a well established competitor and the historical lack of pine voles at the site is probably due to distributional problems. Over the snowfree extremely cold winter both species were reduced in total numbers with the pine voles reaching a critical low density. Analysis of site factors important to colonization and persistence on the site is currently being evaluated.

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