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PINE VOLE REINVASION OF AN UNFILLED SUITABLE HABITAT

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Despite years of research aimed at developing ecologically safe and effective methods for controlling pine voles these rodents remain a serious agricultural pest. A large portion of the damage occuring yearly could be avoided through close adherance to the current recommendations. A regular mowing and herbicide program to eliminate rodent cover combined with rodenticides comprise the integrated pest management program currently available. Effective toxicants include a groundspray and various pelleted baits which can be placed in the runways. Repeated mowing of grasses and the use of herbicides are two effective means of reducing or eliminating an existing population, and more importantly in excluding the potential establishment of voles in a new orchard. This is not to suggest that there now exists a panacea for controlling rodents in all orchard habitats. Vertebrate pests are likely to remain a factor for some time and may never be completely conquered.

In our efforts to enhance control methodology, certain questions remain to be answered. Of particular concern is how quickly will an area become repopulated by nearby resident voles after a control procedure has been used. Repopulation of one of these areas can become significant to the grower who has a young orchard planted next to an older pine vole infested block, or the grower who keeps his own orchard mowed and relatively pest free but has a neighboring orchardist who does not. For these reasons the following research was designed to learn more about reinvasion and movements from the surrounding orchard into an area where the resident population had been removed.

In the present study major questions posed were:

1. When do the voles reinvade?
2. Who are the invaders (species age and sex)?
3. Where do they relocate?
4. What were the movements following reestablishment?

Methods and Materials

The study area was an 8-acre orchard block within a larger orchard, which supported a large and persistent population. This surrounding habitat provided the source of animals moving into this suitable but empty habitat. Beginning in the fall of 1980 the 8-acre study area was subjected to extensive rodenticide testing. Following partial population reduction by a variety of rodenticides the remaining population was removed by intensive trapping with snap traps during March of 1981. Live traps were also used during the removal trapping to compare trap success. Following this extensive removal by trapping, vole activity in the study area was then monitored by use of the apple index technique and by live trapping at three week intervals. Vole activity at a tree was determined in this manner by whether or not an

apple slice was chewed 24 hours after being placed in a runway. Beginning in May 1981 live trapping immediately followed each apple index check. Each trapping period lasted 48 hours with 3 or 4 checks per day. One Sherman live trap was placed at each of 213 trees within the study area. All captured animals were marked and released after recording location, sex, age and reproductive condition (Table 1).

Data on vole movements within the recently depopulated area were compared with data collected in a long term field study on vole densities, survivorship and reproduction. The latter undisturbed population served as a control.

Results

Total captures (Table 1) showed a general increase throughout the summer with the exception of the August trap session. The reduced catch in August was probably due to the extreme heat during that period.

TABLE 1. REINVASION BY PINE VOLES OF A DEPOPULATED AREA

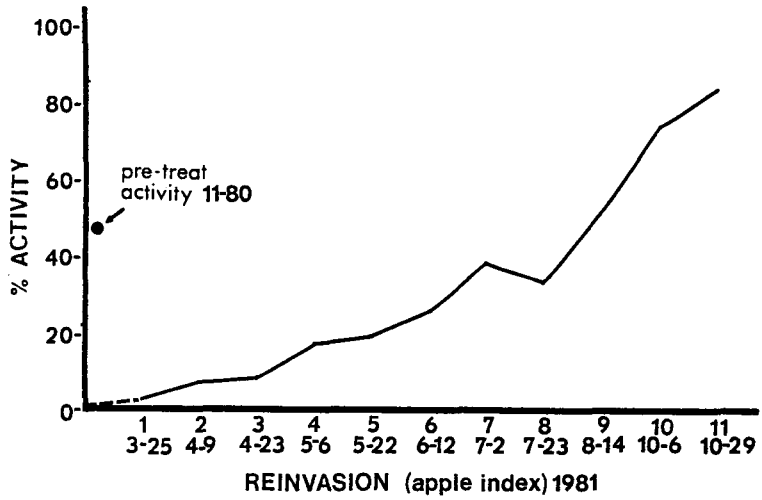
	1981					
	MAY 26-28	JUNE 15-17	JULY 7-9	JULY 27-29	AUGUST 17-19	OCTOBER 29-31
TRAP CHECKS	6	6	8	6	5	7
TOTAL INDIVIDUALS	53	24	18	47	13	96
TOTAL CAPTURES	86	46	32	82	23	113
TOTAL RECAPTURES	18	13	18	15	6	12
INDIVIDUALS WITH MULTIPLE RECAPTURES	5	5	4	8	1	1

Repopulation of the trapped out area began immediately (Table 2). The number of trees showing vole activity was greater one year after the treatments and subsequent trap out than prior to any disturbance of this orchard. Figure 1 indicates the percent active trees within the 8-acre block at 3-week intervals beginning in March 1981. This method of monitoring vole activity at individual apple trees showed a gradual but steady increase which reached an all time high of 83.7 percent in October 1981. Initial activity was 46% in November 1980 prior to any rodenticide treatments. According to the apple slice index the last areas to become repopulated were those that were farthest from the main orchard. These most distant areas included one with a road and a paved parking lot bordering on two sides. A second area was bordered by a field and a swamp on two sides.

TABLE 2. PERCENT ACTIVITY(APPLE INDEX) FOLLOWING SPRING 1981 TRAP-OUT

INDEX	1	2	3	4	5	6	7	8	9	10	11
DATE	3-25	4-9	4-23	5-6	5-22	6-12	7-2	7-23	8-14	10-6	10-29
PERCENT ACTIVE	3.4	7.8	8.2	17.7	20.2	26.1	39.5	33.0	52.3	74.2	83.7

FIG. 1.



Vole densities at individual apple trees were correlated to some degree pre and post trap-out (Figure 2). These data from only 24 trees suggest the importance of previously established vole tunnels. A ready-made habitat with a carrying capacity somewhat established by prior residents is apparent.

There was no significant difference between male and female captures (Figure 3). VanVleck (1968) working with field populations of Microtus pennsylvanicus reported no significant difference between the numbers of each sex caught by snap-traps, but found more females captured when live traps were used.

FIG. 2. VOLE NUMBERS AT INDIVIDUAL TREES PRE- AND POST-REMOVAL

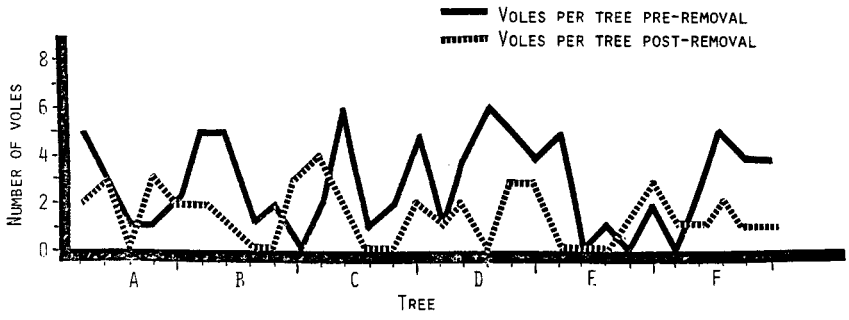
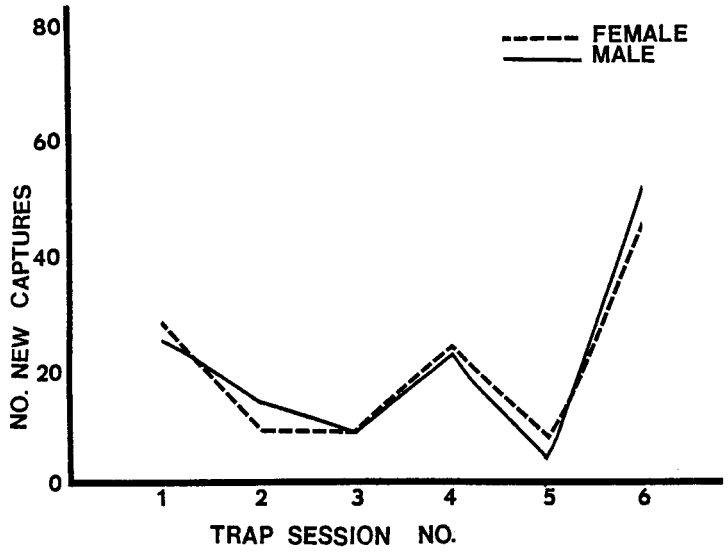


FIG. 3.



Relatively few voles were trapped farther than 1 tree from the site of their original capture (Figure 4). However, these movements were significantly further in the recently depopulated area when compared to the undisturbed population. Stickel (1946) reported a 2:1 sex ratio of males moving farther than females. Conversely, in this study marked females were live trapped at more different stations than were males. Our data show that females moved greater distances than males especially during May and June. There was no significant difference for the summer and fall trap sessions with the exception of August trapping. Trapping success was very poor in August evidently due to the hot weather. All

pregnant and/or lactating females recaptured during the August session were recaptured at their original sites. During June, July and August non-breeding females moved greater distances than pregnant and/or lactating females (Figure 5). These data are consistent with results reported by VanVleck (1968).

FIG. 4. MEAN DISTANCE MOVED WITHIN A ROW IN THE RECENTLY DEPOPULATED AREA.

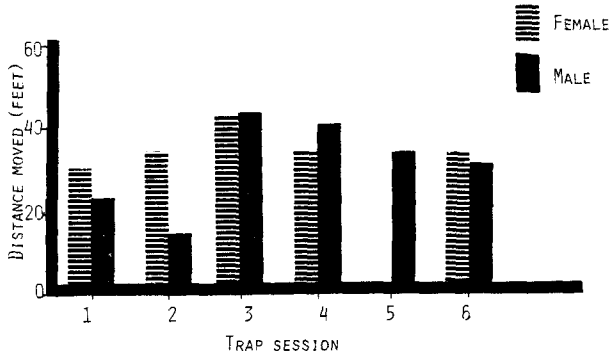
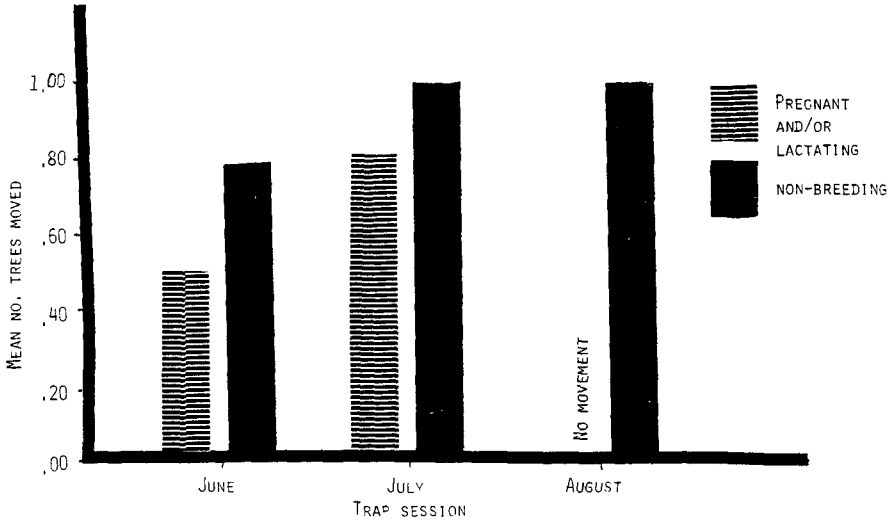


FIG. 5. MEAN DISTANCE MOVED BY PREGNANT AND/OR LACTATING PINE VOLES VS. NON-BREEDING.



Both males and females moved farther within the recently reinvaded area than voles in the undisturbed plot (Figure 6). A possible explanation for these longer movements is that perhaps dispersing voles entering the recently depopulated area encountered other voles at the edges of this area and thus continued to move on to new sites. Figure 7 shows that both males and females were recaptured more often at the same site in the undisturbed plot than voles in the reinvaded plot.

FIG. 6. MEAN DISTANCE MOVED IN DISTURBED OR UNDISTURBED POPULATIONS.

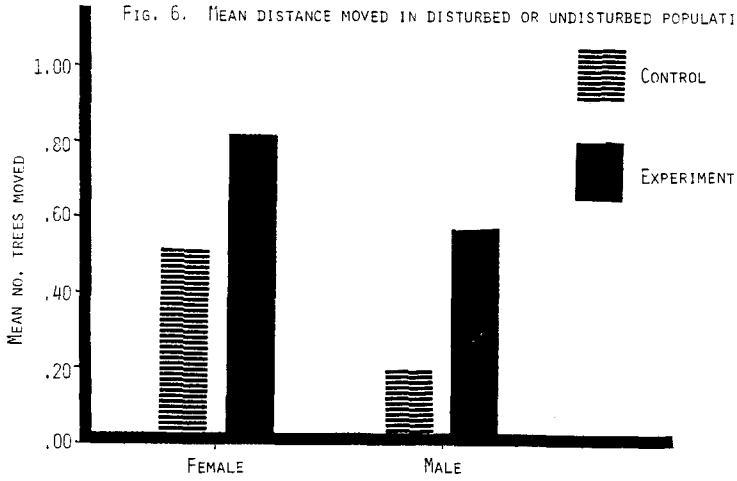
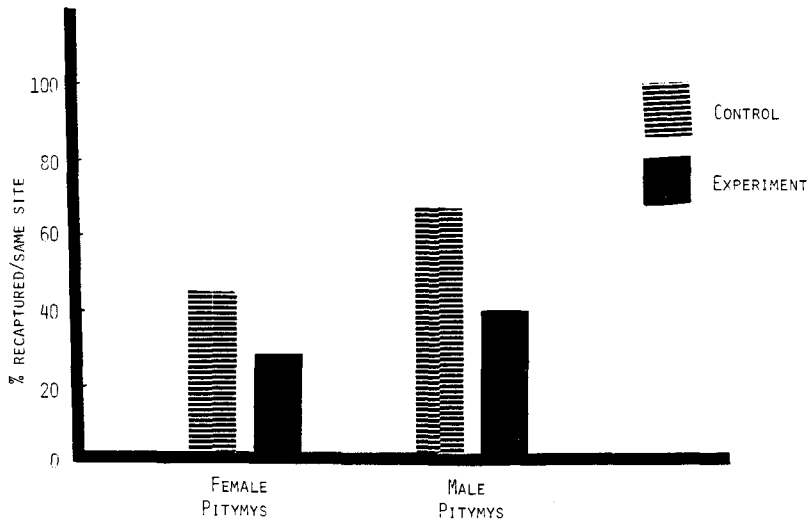


FIG. 7. PINE VOLE SITE TENACITY IN DISTURBED VS. UNDISTURBED POPULATION.



This preliminary study emphasizes the importance of a control treatment covering an entire area incuding the edges to eliminate resulting reinvasion by nearby populations. In this study a peripheral eight-acre section of orchard was controlled by baiting and trapping. Complete coverage of the entire orchard would likely lengthen the reinvasion period because a source of reinvading pine voles from outside of orchard habitat is very uncommon. Data are being gathered from this orchard and others concerning reinvasion under different control conditions. We expect to report more fully on this subject at a later time.

Literature Cited

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VanVleck, P.B. 1963. Microtus movements in relation to depopulated areas. J. Mamm. 49:92-101.