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Nest Box Use By Wild Populations Of White-footed Mice (*Peromyscus leucopus noveboracensis*) In Virginia

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ABSTRACT

A population of white-footed mice on an ll-ha area was studied monthly during 1983-1989 with 600 live-traps and with 254 wooden nest boxes attached to trees. Location, sex, age, body weight, and reproductive condition of individual animals were recorded. Trappability of population animals was greater than 90%. Data from nest boxes were consistent with those obtained via trapping, but rarely did more than 40% of the population occur in the nest boxes. Less than 20% of suckling young recorded in nest boxes were subsequently captured in traps. Use of nest boxes declined to less than l0% of the known population during the summer (May -September). The percentage of the known population in nest boxes was inversely related to the mean minimum monthly environmental temperature. Less than 20% of the population occurred in nest boxes when the monthly mean minimum temperature rose above 8° C.. The data suggest that other nest box techniques, perhaps subterranean nest boxes, will be required to study *Peromyscus leucopus noveboracensis* during the critical mid-summer breeding hiatus (Terman, 1993)

Key Words: White-footed mice, *Peromyscus*, Nest Box

INTRODUCTION

Nest box techniques have been effective in studying the dynamics of *Peromyscus* populations (Goundie and Vessey, 1986; Howard, 1949; Nicholson, l941; Terman, 196l, 1963, l968; Wolff, l986; and Wolff and Durr, l986). In 1968, I urged in the first "Peromyscus Book" (Terman, 1968) that nest box techniques be utilized to gain greater insight into the behavioral ecology of *Peromyscus* populations because they permit access to young in the nest, many of which may never be recorded in traps. In a recent study of population growth and regulation, both nest box and live-trapping data were available for the same area during the same months for several years (Terman, 1993). This is my attempt to utilize nest box techniques to study wild populations of White-footed mice in southeastern Virginia. I present it here for informational purposes and to suggest that, at least in southeastern Virginia, standard nest box techniques, previously successful elsewhere, may need to be modified.

MATERIALS AND METHODS

Study Area

The study area is part of the approximately l5-ha Ecological Study Area of the College of William and Mary, Williamsburg, Virginia, 37° 03′ N, 76° 09′ W, adjacent to the Laboratory of Endocrinology and Population Ecology and has been previously

described in Terman (1993). Within the area, I constructed an 11-ha grid provided with 300 trap stations (600 live-traps) placed at 20-m intervals and 264 wooden nest boxes placed at 20-m intervals on trees approximately equidistant from the four nearest trap stations.

The trapping stations are arranged in 13 columns (A-M) on a compass bearing of NE-SW with 24 rows (1-24) in each column except in column A which contains only 12 rows of trap stations. Two single-capture live-traps (7 x 7.8 x 25.5 cms) were placed within a 2-m radius of each station marker. The sides and top of each trap are made of aluminum and the floor is wooden. Each trap has a gravity-fall aluminum door and lock on one end and 0.6 cm hardware cloth on the opposite end.

The nest boxes, patterned after Nicholson (1941) and Howard (1949) (inside dimensions: 14.5 x 14 x 18 cm.), are made of 12.7 mm. plywood. The ceiling of the nest chamber is plywood allowing approximately 3 cm of air space between the nest chamber roof and the top of the box.

The floor of the nest chamber is made of 0.6 cm hardware cloth and is approximately 3 cm above the wooden floor. There are two entrances (2.5 cm diameter) to the nest chamber of each box. Cotton was placed in each box to serve as bedding. Each box was attached by a wooden ramp to a tree at a height of approximately 1.5 m.

Trapping and Nest Box Procedures

Trapping occurred 3 nights each month from February through November from 1983 through 1989. Sunflower seeds were used as bait until 22 April 1988, after which a mixture of vegetable shortening and peanut butter was used.

Nest box inspections were spaced at irregular intervals from May to October and approximately monthly during the rest of the year.

The use and availability of the nest boxes varied over the study. Only 124 of the eventual 264 nest boxes were available from March 1983 until November 1984. In January 1989, vandals destroyed 111 nest boxes on the study area. It was not possible to get all of these repaired until early 1990 so nest box data for 1989 are not evaluated here.

At each inspection or trapping period, the following data were collected: date, time, weather (cloudy, rain, wind), temperature, traps disturbed (turned over) or sprung, species captured, animal number (individuals numbered by toe clipping) and trap location, sex, age class (adult, young adult, juvenile, young in nest), body weight, and reproductive condition (females: pregnant, lactating, vagina open or closed; males: testes scrotal or non-scrotal). Age classes were based on pelage color with adults brown, young adults molting from gray to brown and juveniles uniform gray.

RESULTS

Population Numbers

Greater than 90% of the mice known to be on the area each month were captured in live traps even though population numbers on the study area varied widely over the seven years of this study (1983-1989) (Terman, 1993).

Nest Box Use

The data on adult or young adult population animals obtained from the nest boxes were generally consistent with those obtained via trapping, although the absolute

numbers recorded were smaller. Nest box use was greatest from November through March of each year. Suckling young were found in the nest boxes most frequently from November through March of each year but less than 20% of them were subsequently captured in traps. Calculation of the mean monthly percentage of adult animals captured in the nest boxes during months when both trapping and nest box inspections occurred showed that only rarely did more than 40% of the known population occur in the nest boxes and this occurred primarily in February and March (Figure l). Typically, during the summer (approximately May through September), less than 10% of the known population was recorded in nest boxes (Figure 1).

Temperature Records

Figure 1 also presents data on the mean + the standard error of monthly minimum temperature during the seven years of this study recorded at a weather station maintained by the National Climatic Data Center within approximately two miles of the study area. Low nest box occupancy (less than 20% of the population) occurred when the monthly mean minimum temperature rose above 8° C. Correlation analysis showed a significant negative correlation ($r = -0.9421$; $P<0.001$) between mean minimum monthly temperatures and the monthly percentage of the known population in nest boxes.

DISCUSSION

Nest box utilization was markedly and consistently reduced during the summer months (April through October, Figure 1) in Southeastern Virginia during the seven years of this study. This decline in nest box use is negatively correlated with temperature increases even under a forest canopy (Terman, 1993). However, other factors may be important such as the high humidity coupled with the high average temperature typical for this time of year in southeastern Virginia. Little information is reported from previous nest box studies on the influence of increased environmental temperature on nest box use. Most attention has focused on the influence of lower environmental temperatures.

Nicholson (194l) used wooden tree boxes and ground boxes to study *P. leucopus noveboracensis* in southern Michigan and gave no indication of significant variation in the use of his nest boxes throughout the year although the number of nest boxes he used was small (64). Goundie and Vessey (1986) used 91 wooden tree boxes on a 2 ha isolated woodlot in Ohio to study *P. leucopus noveboracensis* from January through November, l980. They recorded high use of the boxes and gave no indication of significant seasonal variation. Wolff (1986) and Wolff and Durr (1986) used 60 wooden nest boxes (both tree boxes and boxes placed on the ground) in the Allegheny mountains of southwestern Virginia to study both *P. leucopus noveboracensis* and *P. maniculatus*. The boxes were inspected, however, only from November, 1984 through March 1985, but were not used by the mice during the coldest part of the winter (February).

Some variation in the use of nest boxes related to placement and season of year has been shown in some previous studies of *Peromyscus leucopus noveboracensis*. Nicholson (1941) and Howard (1949) have presented data indicating lesser use of arboreal boxes and greater use of ground level or subterranean boxes during the colder months. Telemetry studies in which animals are traced to their natural nests have

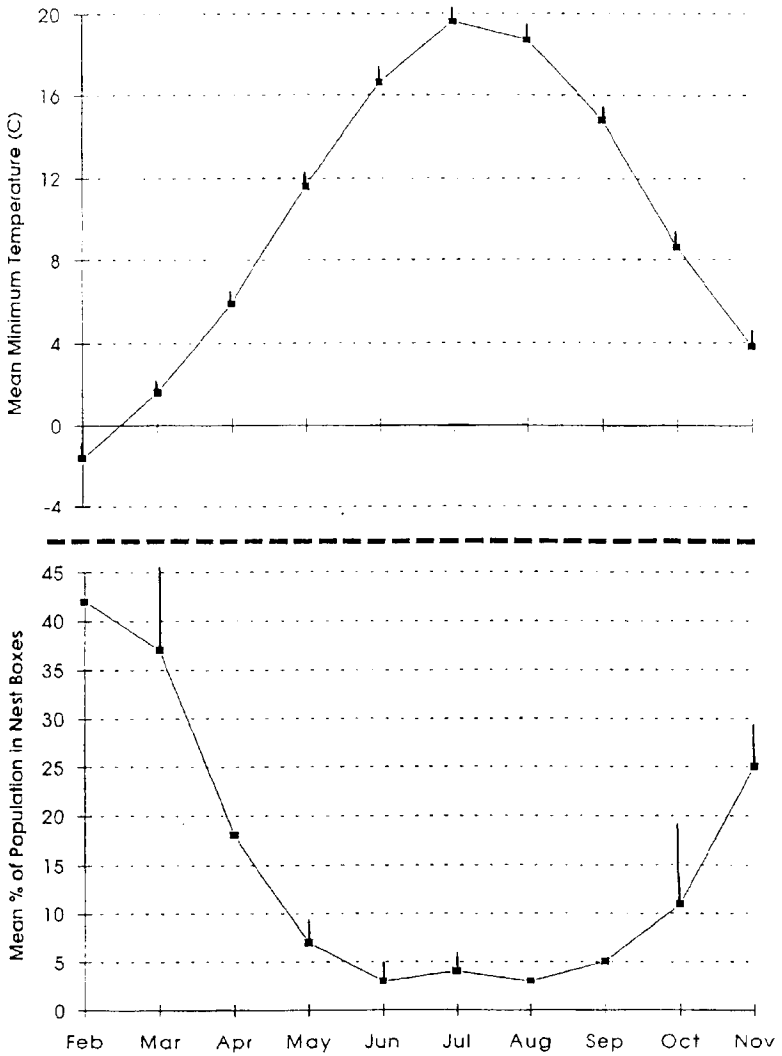

FIGURE 1. The monthly mean minimum temperatures (C) + SE and the monthly mean percentages + SE of the white-footed mouse population in nest boxes during 1983-1989.

shown increased use of subterranean nests compared to arboreal nests during the colder months of the year (Madison, Hill, and Gleason, 1984; Wolff, 1986; Wolff and Durr, 1986; Wolff and Hurlbutt, 1982) Data on differential use of nest boxes during the summer were not definitive and it may be that the negative impact of higher temperature on nest box use is not evident in higher elevations or more northern locations. Nest

box techniques are important for wild population studies of small mammals and additional examination of environmental variables including temperature is needed.

Low use of nest boxes during the summer months is a significant impediment to utilizing them to study the as yet unexplained reproductive hiatus in reproduction described for White-footed mice in southeastern Virginia (Terman, 1993). One possible solution to this problem may be to utilize subterranean nest boxes.

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