Effects of Winter Capture on Wild Turkey Hen Movement in Mississippi

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Abstract: Analyses of movement patterns of free-ranging animals derived via radio-telemetry assumes that capture has no effect on the parameters of interest. To mitigate against potential biases, many researchers will censor locational data for an arbitrary post-capture duration (e.g., 2 weeks). To investigate validity of this assumption, we compared home range size, average inter-location distance, dispersion, and total distance moved between hens captured in a given interval to those captured in previous intervals. Data were from winter-captured hens in Kemper County, Mississippi, 1986–1992. No significant differences were found in any movement parameter. We concluded that, for hens not suffering acute capture-related stress, no substantial bias in movement data occurred within 30 days post-capture.

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Radio-marking of free-ranging animals is an invaluable technique for investigating movements, home range, survival, and reproduction in wild populations. However, telemetric studies require researchers to assume that the investigation process does not affect parameters of interest. For movement studies, it is assumed that capture, marking, and presence of transmitters do not affect the movement of individuals (White and Garrott 1990). To avoid potential biases associated with animal capture, many researchers subjectively assign a post-capture acclimation period; locations taken during this interval are excluded from analyses (White and Garrott 1990).

There is a growing body of literature that suggests that capture and/or marking gallinaceous birds may alter survival and reproduction (e.g., Erikstad 1979, Burger et al. 1991, Weinstein et al. 1995, Miller et al. 1996). Weinstein et al. (1995) reported decreased reproductive success of wild turkeys (*Meleagris gallopavo*) associated with winter capture for a subset of the animals presented here. Nenno and Healy (1979) described behavioral abnormalities of captive wild turkeys associated with radio-transmitters for <8 days after instrumentation. Effects of capture on movements of free-ranging wild turkeys has not been investigated. Therefore, we compared movement parameters 30 days post-capture for hens captured during a specific winter period to those previously captured to determine if, and for how long, capture affected movements.

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Methods

Study Area

The study area was located in east-central (Kemper County) Mississippi. In 1991, 56% of the area was loblolly pine (*Pinus taeda*) plantations, 24% mature pine-hardwood forest, 13% streamside management zones and other hardwood forests, and 7% classified as non-forest (croplands and pastures). Weyerhaeuser Company owned 72% of the area. Management included clearcutting, site preparation, planting pine seedlings, pine release using herbicide application, pre-commercial and commercial thinning, fertilizing, controlled burning, pruning, and a 30- to 35-year rotation. Average plantation size was 26.8 ha (0.5–129.2 ha) (Smith 1988).

Wild Turkey Capture and Telemetry

We captured turkeys from the third week of January until the second week of March, 1986–1992, and from late June to mid-August, 1986–1989. We captured turkeys at permanent bait sites on spur roads in pine plantations using cannon nets (Bailey 1976). We monitored bait sites in the evening to determine use (i.e., presence of droppings, tracks, feathers). Sites used by turkeys for 2 consecutive days were equipped with nets and monitored.

We individually marked captured turkeys with color-coded, numbered cattle ear tags placed patagially (Knowlton et al. 1964). Females were equipped back-pack style with 108-g motion sensitive radio-transmitters (Wildl. Materials, Inc., Carbondale, Ill.). All turkeys were released after processing at the capture site.

We monitored hens with a Telonics, Inc. (Mesa, Ariz.) TR-2 or a Wildlife Materials, Inc. (Carbondale, Ill.) TRX-1000S receiver and a hand-held 3-element yagi directional antenna. We located hens opportunistically post-capture and 3 times daily, 3 times/week during March. Locations were determined by triangulation (Cochran and Lord 1963) from the 2 closest permanent stations (N = 144.)

Data Screening

Because data to be analyzed were not collected for the purpose of examination of post-capture movements, intensive data-screening was necessary. We first classed hens as WINTCAP (hens captured in the winter of a given year) and PREVCAP (hens captured in previous capture periods and not captured during winter of a given year). Because reproductive activities began in early April (Miller et al. 1995), we limited analyses to locations taken prior to 1 April of a given year and only included WINTCAP hens captured prior to 1 March. To avoid potential movement biases associated with hens immediately prior to death, we censored hens not alive, or from whom radio-contact was lost, as of 1 April of a given year.

For all years there were more WINTCAP hens then PREVCAP; therefore, each PREVCAP hen meeting the above criteria was paired with a randomly chosen WINTCAP hen. We chose to pair hens to ensure temporal standardization between classes. For both hens of a pair, locations occurring within 30 days of the capture date of the WINTCAP hen were used for analyses. Pairs containing a hen located <5 times during the 30-day interval also were censored.

No locations were taken during March 1991; therefore, we excluded this year from analysis. Because number of locations/day/hen varied widely among years, we randomly chose 1 location/day/hen for analyses. Because all hens were located on the same schedule beyond 10 days post capture, no time by class interaction bias occurred. Because PREVCAP hens were expected to be older, we assumed no age/movement interaction. To mitigate against this potential bias, sub-adult hens were excluded from analyses.

Data Analysis

For each hen, we calculated mean daily movement (distance between consecutive locations divided by number of days between locations) and distance from first location to all subsequent locations. The 30-day span was sub-divided into 5 6-day intervals. We used 6-day intervals because our telemetry procedure was such that hens were located twice within 6 days. For each hen, values were averaged within intervals.

For each hen, we calculated 100% minimum convex polygon (MCP) home range (Mohr 1947) and average distance between all possible location combinations/hen (Delta) (Conner 1995). Conner (1995) reported that Delta provided a reliable index of locational dispersion that was extremely robust to small sample bias. Because relatively few locations were obtained for WINTCAP hens within 10 days of capture, we used only locations falling within days 10–30 for MCP and Delta. MCP and Delta calculations were performed using HOMERUN (M. Weinstein, unpubl. data). MCP analysis is sensitive to sample size (White and Garrott 1990); therefore, we equated locations within pairs by randomly censoring locations from the individual of a pair with the most locations. Because there were limited numbers of locations/hen, home ranges were used only as relative indices of space use.

We tested for differences in average daily movement and distance from first location between PREVCAP and WINTCAP using multi-response permutation procedures (MRPP) in BLOSSOM (Slauson et al. 1991). We controlled for year and capture date effects by blocking on hen pairs. We excluded pairs of hens for which 1 or both were not relocated within an interval. Because sample sizes varied across intervals, repeated measures analysis was not possible. We used blocked MRPP to test for differences in MCP and Delta. Because sample sizes were small (mean locations per animal per interval was 2.3 for average daily movement and distance from first location calculations and 7.3 for home range and delta calculations) and the cost of type II error high, we chose an alpha of 0.2 for all tests.

Results

We examined 432 locations from 23 pairs of hens (3 in 1987, 16 in 1988, 1 in 1989, 1 in 1990, and 2 in 1992). Because only 4 pairs of hens were available for tests of daily movements and distance from first location within the first 6-day interval, we report only tests of intervals 2–5 (Figs. 1, 2). Classes did not differ ($P > 0.2$) in average daily movement for any interval (Fig. 1). Distance from first location did not differ significantly between classes; however, WINTCAP hens averaged consistently farther from first location (Fig. 2).

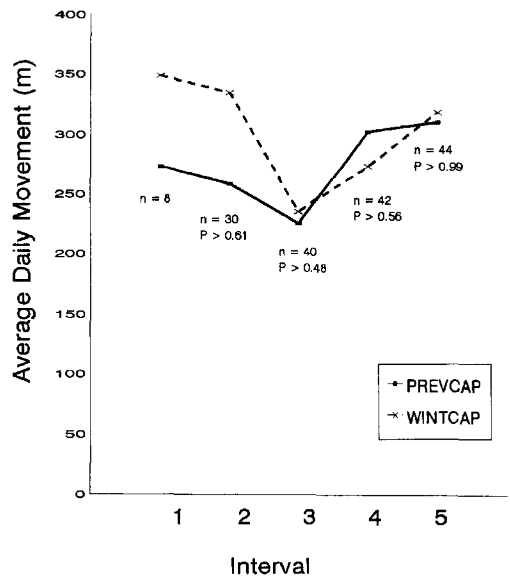

Figure 1. Average wild turkey hen inter-locational distance for a 30-day span of 6-day intervals, Kemper County, Mississippi, 1987–1992. Significance level and combined sample size for a paired multi-response permutation procedure. No testing was conducted for interval 1 because of small sample. WINTCAP = hens captured in a given year, PREVCAP = hens captured in previous periods.

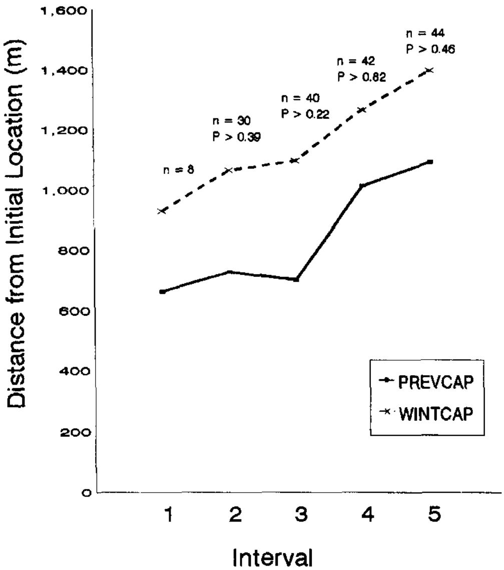

Figure 2. Average wild turkey hen distance from first location for a 30-day span of 6-day intervals, Kemper County, Mississippi, 1987–1992. Significance level and combined sample size for a paired multi-response permutation procedure. No testing was conducted for interval 1 because of small sample. WINTCAP = hens captured in a given year, PREVCAP = hens captured in previous periods.

PREVCAP and WINTCAP did not differ regarding MCP ($\bar{x}$ WINTCAP = 65.4 ha; $\bar{x}$ PREVCAP = 82.2 ha; $P > 0.62$). Excluding the extremely large (489.2 ha) range of a single PREVCAP hen, PREVCAP mean MCP was 63.7 ha, and MCP differed between classes by <2%. Dispersion did not differ between classes ($\bar{x}$ WINTCAP = 767.7 m; $\bar{x}$ PREVCAP = 870.2 m; $P > 0.46$).

Discussion

The liberal alpha level and consistent observed response provide fairly strong evidence that movement data, beginning 6 days post-capture, does not contain serious bias. Our data indicate that the arbitrary 1–2 week acclimation period chosen by most researchers is adequate. However, care should be taken when generalizing these results to other geographical areas. The Kemper county landscape is relatively homogeneous and displaced turkeys may not have to search for suitable habitat. In more heterogeneous systems, the initial displacement associated with capture may result in longer periods of abnormal movements as hens search for suitable habitats.

Although our data suggest that capture does not significantly impact movements of wild turkey hens, we examined only those hens which survived into the reproductive period. Many researchers (McMahon and Johnson 1980, Spraker 1987, Miller et al. 1996) have reported adverse affects of capture on short-term survival. Inclusion of hens suffering acute capture stress likely would have altered our results.

Weinstein et al. (1995) reported diminished reproductive success associated with capture for this area. A potential explanation would be differential energetic requirements caused by disparate movement patterns. These data indicate that this was not the case.

Although there were 122 WINTCAP hens and 77 PREVCAP hens initially in the sample, we were able to use only 46 adult individuals captured prior to 1 March, alive with active transmitters prior to 1 April, and from which we obtained >5 locations in analyses. The resultant low sample size may have prevented us from detecting small movement differences. Additionally, more frequent relocation of individual hens (e.g., once/day/hen) would have provided more accurate estimates and enabled more detailed investigation. We examined types of data available to most researchers conducting telemetric studies and suggest that, rather than relying on an arbitrary period, researchers examine their own data for potential biases. Such examination, even if limited by small samples, provides justification for assuming no bias, or may reflect potential problems requiring further research.

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