Mortality of Wild Turkey Poults In Coastal Plain Pine Forests

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Abstract: Identification of poult mortality agents and associated rates are critical to management of wild turkeys (*Meleagris gallopavo silvestris*), particularly in coastal plain pine forests where reported mortality rates are greater than those documented in other environments. We studied rates and specific causes of mortality for wild turkey poults in south Georgia and north Florida from 1988–1993. During the period, 34 of 344 poults from 39 broods survived to 28 days post hatch and yearly mortality rates averaged 90.8% ± 1.8. Predation accounted for 88% of the 106 identified deaths with raccoons (*Procyon lotor*) the leading cause of mortality.

Proc. Annu. Conf. Southeast Assoc. Fish and Wildl. Agencies 49:448–453

Mortality rates of wild turkey poults have been documented for several habitats (Glidden and Austin 1975, Speake 1980, Campo et al. 1984, Vander Haegen et al. 1988) and ranged from 69.8% (Speake et al. 1985) to 80% (Hon et al. 1978). However, poult loss in coastal plain pine forests may be greater than in other environments. Exum et al. (1987), for example, reported poult losses averaging 87.3% for a three year period in south Alabama. Additionally, Sisson et al. (1991) found mortality rates averaging 90% during his study.

Although poult loss rates have been described over a broad geographic area, information concerning specific mortality agents is limited to the Appalachian plateau of north Alabama. In that study, Speake et al. (1985) reported free-ranging dogs (*Canis* sp.) and raccoons accounted for 42% of the poult

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losses. Avian (16%) and reptilian (7%) predation was attributed primarily to broad-winged (*Buteo platypterus*) and red-tailed hawks (*B. jamaicensis*) and gray rat snakes (*Elaphe obsoleta*), respectively. In the southern coastal plain of Alabama, Exum et al. (1987) reported that mammalian and avian predation accounted for 37.9% and 13.8% of mortality, respectively.

Our objectives were to further enumerate the loss rates reported by Sisson et al. (1991) and to identify specific causes of mortality for turkey poults in pyric pinelands of north Florida and south Georgia.

We thank the staff of the Alabama Cooperative Fish and Wildlife Research Unit and Tall Timbers Research, Inc. Field work assistance was provided by F. Buckner, J. Davis, S. Holmes, J. McGuire, K. Nelms, and J. Sholar. We are indebted to the many plantation personnel and owners who cooperated in this study. Funding was provided by the National Wild Turkey Federation, the Georgia and Florida chapters of the Wild Turkey Federation, the Tall Timbers Game Bird Endowment Fund, and the Safari Club of Alabama.

Methods

We conducted the study on 10,178 ha in Grady and Thomas counties, Georgia, and Leon County, Florida. This area lies within the Coastal Plain subregion known as the Tallahassee Red Hills (Brueckheimer 1979). Topography was rolling red clay hills dominated by the Greenville-Magnolia soil association. Approximately 85% of the study area was composed of large, privately-owned hunting plantations managed specifically for northern bobwhite (*Colinus virginianus*). Other land uses included a large dairy farm, industrial forest land, and small private ownerships.

Major habitat types were annually burned pinewoods (38%), hardwoods (26%), forest openings (15%), 1–3 year unburned "roughs" in the pinewoods (8%), planted pines (8%), pine-hardwoods (4%), and areas inhabited by humans (1%). Uplands were dominated by an old field loblolly-shortleaf pine (*Pinus taeda-P. echinata*) community with scattered longleaf pines (*P. palustris*) and a few remnant stands of longleaf and wiregrass (*Aristida stricta*). Nearly a century of prescribed burning has maintained park-like pine uplands for bobwhite quail management and hunting. "Rough" areas occur where fire has been excluded from pine uplands, typically for 1 to 3 years, to provide cover for northern bobwhite. Hardwood stands were generally found in low-lying areas spared from fire. These "hammocks" were composed primarily of beech (*Fagus grandiflora*), southern magnolia (*Magnolia grandiflora*), and spruce pine (*P. glabra*). Forest openings consisted of agricultural fields, old-fields, pastures, and first year stands of planted pines.

Turkey hens were captured using alpha-chloralose treated corn (Williams 1966), fitted with motion-sensitive radio transmitters, and released at or near the capture site. Telemetry locations were obtained using hand-held, 3-element yagi antennas and portable receivers. Hens were monitored ≥3 times per week to determine onset of incubation at which time nests were flagged at a distance (Everett et al. 1980, Holbrook et al. 1987) and monitored daily to determine their fate. We located nests soon after the hen and brood departed and determined number of poults hatched by examining eggshell fragments and membranes (Klett et al. 1986).

From 1990 to 1993, poults were hand-captured when approximately 2 days old during a predawn roost flush, placed in a covered box (Williams and Austin 1988), and fitted with a back-mounted transmitter package (Metzler and Speake 1985, Speake et al. 1985). The package incorporated a latex harness (Godfrey 1970) and a 1.2-g transmitter (Holohil Systems Ltd., Woodlawn, Ontario, Can.) which measured 1.6 × .07 cm with a 16-cm antennae. Transmitters had an effective range of 600 m and a battery life of approximately 28 days. We attempted to place transmitters on one half of the poults present at the time of flushing. Speake et al. (1985) reported no difference in survival rates between instrumented (2.7-g transmitter) and non-instrumented poults. Broods which received transmitters were monitored at least hourly during daylight to detect poult mortality. Locations were taken from concealed areas, typically 100 to 200 m from the brood, to avoid disturbance. When poults became separated from the hen, they were radio-tracked and visually located to determine their fate. Specific mortality causes for non-instrumented broods were determined when the brood and/or the hen was killed at or soon after hatching. Analysis of field sign (e.g., hair, feathers, and tracks) and visual observations of predators were used to determine causes of poult mortality (Speake et al. 1985). Tall Timbers Research Station provided access to museum specimens for aid in predator identification. All broods were flushed at 2 and 4 weeks of age to determine non-instrumented poult mortality. A paired *t*-test was used to compare intrabrood loss rates of instrumented versus non-instrumented poults.

Results

We determined mortality rates for 344 poults hatched in 39 broods. Transmitters were placed on 64 poults in 14 broods; another 54 poults without transmitters from 6 broods furnished information of specific causes of mortality soon after hatching. Mortality rates of instrumented (87.5%; $N = 57$) and non-instrumented (87.0%; $N = 53$) poults in 14 broods did not differ ($P > 0.7$).

Poult loss for the 6-year period was 90.1%; yearly rates (1988 to 1992) averaged 87.9% ± 2.5 at 14 days and 90.8% ± 1.8 at 28 days post hatch. In 1993, hen radio failure resulted in a limited sample size which precluded a yearly estimate. Ninety-six percent of total mortality occurred within 14 days of hatching. Cause of death was determined for 106 poults. Seventy-eight percent of unknown mortality occurred from 1988 to 1990 when poult transmitters were not used. Mammalian, avian, and reptilian predation accounted for 71%, 13%, and 4% of losses, respectively. Exposure, starvation, disease, and hatch defects accounted for the remaining 12% (Table 1).

Table 1. Causes of mortality for wild turkey poults from a coastal plain study area, 1988–1993.

	N	%
Total poults hatched	344	
Total lost	310	
Cause of death		
Unknown	204	66
Determined	106	34
Mammalian predation	75	71
Raccoon	31	
Bobcat	21	
Gray Fox	13	
Coyote	5	
Opossum	2	
Unknown mammal	3	
Avian predation	14	13
Red-shouldered hawk	4	
Red-tailed hawk	2	
Cooper's hawk	2	
Barred owl	2	
Unknown avian	4	
Reptile predation	4	4
Alligator	3	
Corn snake	1	
Other[a]	13	12

[a]Exposure, starvation, disease, hatch defects.

Raccoons (*Procyon lotor*) and bobcats (*Felis rufus*) accounted for 43% and 29% of identified mammalian predation, respectively. The other 28% was by gray foxes (*Urocyon cinereoargenteus*), coyotes (*Canis latrans*), and an opossum (*Didelphis virginianus*). Red-shouldered (*B. lineatus*), red-tailed, and Cooper's hawks (*Accipiter cooperii*) comprised 80% of identified avian predation, and a barred owl (*Strix varia*) the remaining 20%. Reptilian predators included an alligator (*Alligator mississippiensis*) and a corn snake (*E. guttata*).

Discussion and Management Implications

Poult losses averaged 90.8% at 28 days and varied little throughout the study. Glidden and Austin (1975) felt turkey populations could withstand an 80% poult loss and remain stable. Mortality rates in this study indicate a declining turkey population. Our findings and those of Exum et al. (1987), depict higher poult loss rates in coastal plain pine forests than previously reported for other habitats (Glidden and Austin 1975, Hon et al. 1978, Speake 1980, Campo et al. 1984, Speake et al. 1985, Vangilder et al. 1987, Vander Haegen et al. 1988). Ninety-six percent of the mortality occurred within 14 days post-hatch which is consistent with earlier findings (Everett et al. 1980, Campo et al. 1984, Speake et al. 1985, Vangilder et al. 1987). The abrupt mortality decline after 14 days coincides with poult flight attainment and tree roosting (Barwick et al. 1971).

Specific causes of mortality were attributed primarily to predation. Mammalian predation was higher than previously reported (Speake et al. 1985) and responsible for 75 losses of which raccoons accounted for 41.3%. The higher mortality rate and increased instances of mammalian predation observed in this study may be from both spatial and temporal changes in predator abundance. Our study area was dominated by land intensively managed for game, in particular quail. Management practices such as decreased habitat patch size, increased amounts of edge, and increased abundance of food resources including native blackberry (*Rubus* spp.) and plum (*Prunus* spp.), cultivated food plots (e.g., corn (*Zea mays*), chufa (*Cyperus esculentus*)), and the practice of spreading/feeding small grains (e.g., corn) may have maintained an artificially high population of generalist predators (i.e., raccoons) which take advantage of such resources (Johnson 1970, Sanderson 1987, Harris 1988). Temporal changes in meso-mammal predator abundance are influenced by many factors. Initial effects of large carnivore extirpation in the southeast may have been negated first through intensive agricultural practices (i.e., cotton farming) and subsequently through harvest as meso-mammal numbers and pelt prices increased with reforestation. However, furbearer summary data from Georgia and Florida indicate that peak fur sales occurred in the mid-1980s and have decreased markedly since (P. Swiderek, Ga. Dep. Nat. Resour., unpubl. data, G. Spratt and J. Wooding, Fla. Game and Fresh Water Fish Comm., unpubl. data). For example, raccoon fur sales in Georgia peaked in 1984–1985 at 131,904 and declined to 2,886 by 1990–1991 (P. Swiderek, Ga. Dep. Nat. Resour., unpubl. data).

No instance of feral dog predation was detected (Speake et al. 1985) which may be attributed to an intolerance for free-ranging dogs on the managed quail plantations. Results from this study and Speake et al. (1985) implicate hawks as primary avian predators on turkey poults. Resident hawks were feeding and fledging young during the time of poult hatch and at least 3 transmitters were located in hawk nests with fledglings present. Multiple predation was noted in 3 instances where disturbance and predation by 1 species (coyote) led to predation on the same brood by another species (i.e., red-tailed hawk).

Where wild turkeys are an important species for harvest, predation is a serious limiting factor on production. Management should be geared toward enhancing poult survival by maintaining quality brood habitat (Everett et al. 1980, Metzler and Speake 1985) and keeping meso-mammal populations, in particular raccoons, more compatible with turkey reproduction through hunting and trapping.

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