National Quail Symposium Proceedings

Volume 4 Article 18

2000

Survival Rates of Northern Bobwhite Chicks in South-Central Iowa

Willie J. Suchy
Iowa Department of Natural Resources

Ronald J. Munkel
Iowa Department of Natural Resources

SURVIVAL RATES OF NORTHERN BOBWHITE CHICKS IN SOUTH-CENTRAL IOWA

Willie J. Suchy
Iowa Department of Natural Resources, Chariton Research Station, Chariton, IA 50049

Ronald J. Munkel
Iowa Department of Natural Resources, Chariton Research Station, Chariton, IA 50049

ABSTRACT

We estimated survival rates for radio-tagged northern bobwhite quail chicks (*Colinus virginianus*) in south-central Iowa from 1986 to 1988. Survival rates and survival functions were calculated for chicks from broods raised by females, broods raised by males and from broods that did not have an adult associated with them. Survival functions differed between broods with hens and those without adults. Predators accounted for almost all of the observed mortality.

Citation: Suchy, W. J., and R. J. Munkel. 2000. Survival rates of northern bobwhite chicks in south-central Iowa. Pages 82–84 *in* L.A. Brennan, W.E. Palmer, L.W. Burger, Jr., and T.L. Pruden (eds.). Quail IV: Proceedings of the Fourth National Quail Symposium. Tall Timbers Research Station, Tallahassee, FL.

INTRODUCTION

The advent of sub-miniature radio-telemetry makes it possible to collect demographic information unattainable by earlier methods. In a companion study we monitored 190 northern bobwhites through the nesting season from 1984–1988 and found that 11% of the clutches were produced by hens that laid and incubated a second clutch (Suchy and Munkel 1993). In most instances where this happened, the hen had left her first brood 19 to 25 days after hatching, became associated with a male, and then laid and incubated a second clutch of eggs. Suchy and Munkel (1993) also found that males incubated and raised 16% of all clutches produced. An obvious question that needed to be answered was: How well do chicks survive after the hen abandons her brood?

The objective of this study was to estimate chick survival rates from the period beginning 21 days after hatch, the time period when hens typically abandoned their broods to renest. We also tested if chick survival rates are lower when the hen abandons the brood to renest or when the chicks are brooded by a male.

METHODS

We captured bobwhite chicks using a 3 meter × 3 meter hoop net by locating radio-marked adults with broods at night. We then attached radio-transmitters and numbered leg bands on from 2 to 6 chicks from each brood and released the birds. Necklace style transmitters (<1 gram, Holohill, Ltd., London Ontario) were attached by spreading the loop over a hollow tube, inserting the bird's head into the tube and carefully rolling the loop off onto the bird's neck. Birds were located daily using truck-mounted and hand-held Yagi antennas. Radio-marked chicks were followed daily until their transmitters failed (usually after approximately 4 to 5 weeks). Chicks that did not successfully re-associate with their brood were excluded from analysis. An attempt was made to determine the proximate cause of death (Dumke and Pils 1973) when a mortality occurred.

Survival Rates

We calculated survival rates using the staggered entry technique (Pollock et al. 1989a,b) to produce Kaplan-Meier survival estimates (Kaplan and Meier 1958). Cause-specific mortality rates (Heisey and Fuller 1985) were calculated for all chicks combined. This assumes that daily survival rates are constant within the sampling period. Other assumptions required for this analysis are that radio-marked birds are selected randomly from the population, survival rates are independent, left-censored birds had similar rates, censoring was random, and trapping and tagging did not affect survival. Chicks were entered into the analysis based upon their age at capture.

Birds were right-censored if their fate was unknown due to radio failure. Log-rank tests were used to compare survival distributions between chicks from broods raised by females, males, and from broods that were abandoned. Z-tests were used to determine if survival estimates differed among these groups.

RESULTS

We captured 81 chicks from 1986–1988. Nine chicks were excluded because they slipped off their transmitter or failed to return to their brood. Analysis was performed on data from 41 chicks (from 9 broods) where the hen remained with the brood for the whole period, 11 chicks (from 3 broods) where the hen aban-

Table 1. Survival estimates for radio-marked northern bobwhite chicks from 21 to 59 days of age in south-central Iowa, 1986–88.

Type of brood	Number of broods	Number of individuals	Survival	SE
Female	9	41	0.817	0.083
Abandoned	3	11	0.729	0.165
Male	7	20	0.804	0.134
Combined	19	72	0.806	0.063

doned the brood and laid a second nest, and 20 chicks (from 6 broods that were cared for solely by males). The chicks captured from the broods where the hen abandoned the brood were captured 1–5 days before the hen abandoned them and were 17–20 days of age when captured. This made them 21 to 24 days old when they were abandoned. The chicks captured from broods headed by males were 18 to 25 days of age when captured and those from broods with hens were 18–28 days of age.

We estimated chick survival from 21 days to 56 days of age (Table 1) for the 3 groups of chicks. Survival estimates did not differ between chicks from broods headed by hens and those from broods that were abandoned ($Z = 0.477$, $P = 0.636$) but the survival functions (Figure 1) were different ($\chi^2 = 6.30$, $P = 0.012$). Survival estimates for chicks from broods headed by males were similar to those from broods led by females ($Z = 0.080$, $P = 0.937$) and the survival functions were similar ($\chi^2 = 2.29$, $P = 0.131$). Survival estimates ($Z = 0.350$, $P = 0.729$) and survival functions ($\chi^2 = 0.47$, $P = 0.495$) were similar for chicks from broods led by males and chicks from broods that were abandoned.

Pooling all chicks produced a survival function in which mortality occurred at a fairly constant rate. The cause-specific mortality rates for the period were 0.140 for mammalian predation ($n = 5$, SE = 0.058), 0.056 for avian predation (n = 2, SE = 0.039) and 0.028 for unknown causes (n = 1, SE = 0.028).

DISCUSSION

Our estimate was 81% (95% confidence interval of ±12%) survival from age 21 days to 56 days for chicks. Survival rates for chicks from broods that were abandoned were lower during the first week after abandonment than for chicks from broods led by adults. However, the estimated survival rate by the end of the period was similar to chicks from the other broods. Chicks from broods led by males experienced the same level of mortality as chicks from broods led by females.

Because of the small size of the chicks, we did not attempt to monitor them for survival at ages younger than 17 days. We did not notice any large difference in the number of chicks in broods we captured compared to the number of eggs that were hatched by the adult; however, we did not try to make complete counts when we captured the broods. If survival is constant during this period we could extrapolate our

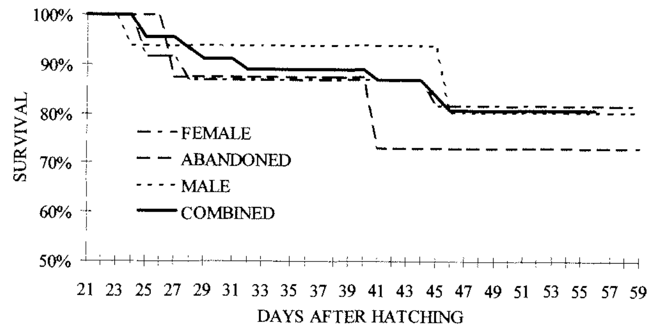

Fig. 1. Survival curves for northern bobwhite chicks in south-central Iowa from broods headed by females, males, no adult and for all chicks combined, 1986–88.

findings to estimate survival from hatching to age 3 months. For all chicks combined this would produce a survival estimate of 52%.

All of our estimates assume that the transmitters did not adversely affect survival. Although carrying a transmitter potentially lowered survival rates, we observed anecdotal evidence that overall survival of these birds was similar to other radio-marked adults in the concurrent study. We recaptured 3 birds during trapping activities that were captured as chicks and became right censured during the study. We also recovered 2 birds that were captured as chicks and were killed during the hunting season. Apparently none of these birds exhibited any ill effects from the radios. One of these birds was recovered a year and 3 months after it had been captured.

MANAGEMENT IMPLICATIONS

It appears that chicks are able to survive on their own after they reach approximately 3 weeks of age under the conditions tested in this study. This allows hens to renest and raise a second brood within a single nesting season. Given the low survival of adults (Burger et al. 1995, Suchy and Munkel, *this volume*) this contribution to the reproductive effort may be an important part of the ability of bobwhites to recover from low population levels.

ACKNOWLEDGMENTS

We thank J. Tellen and numerous other people who worked long hours collecting data; J. Wooley, B. Rybarczyk and J. Kienzler for initiating the project, D. Garner for comments, and especially B. Fistler whose dedication in the field made this project a success.

LITERATURE CITED

Burger, L.W., Jr., T.V. Dailey, E.W. Kurzejeski, and M.R. Ryan. 1995. Survival and cause-specific mortality of northern bobwhite in Missouri. Journal of Wildlife Management 59: 401–410.

Dumke, R.T., and C.M. Pils. 1973. Mortality of radio-tagged pheasants on the Waterloo Wildlife Area. Wisconsin Department of Natural Resources Technical Bulletin 72, Madison.

Heisey, D.M., and T.K. Fuller. 1985. Evaluation of survival and cause-specific mortality rates using telemetry data. Journal of Wildlife Management 49:668–674.

Kaplan, E.L., and P. Meier. 1958. Non-parametric estimation from incomplete observation. Journal of American Statistical Association 53:457–481.

Pollock, K.H., C.T. Moore, W.R. Davidson, F.E. Kellogg, and G. L. Doster. 1989*a*. Survival rates of bobwhite quail based on band recovery analysis. Journal of Wildlife Management 53:1–6.

Pollock, K.H., S.R. Winterstein, C.M. Bunck, and P.D. Curtis. 1989*b*. Survival analysis in telemetry studies: the staggered entry approach. Journal of Wildlife Management 53:7–14.

Suchy, W.J., and R.J. Munkel. 1993. Breeding strategies of the northern bobwhite in marginal habitat. National Quail Symposium Proceedings 3:69–73.