






COMPARISON OF SURVIVAL FOR RADIO-TAGGED VERSUS UNMARKED NORTHERN BOBWHITE




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October 19th, 2011, 12:20 PM
Room 160 PBB



USE OF RADIO-TELEMETRY

- Radio telemetry frequently used in wildlife research
 - Document survival/mortality
 - Monitor movement and habitat use
- What is radio-telemetry?
- Use of telemetry in quail research
 - Pollock et al. 1989, Burger et al. 1995, Dixon et al. 1996, Taylor et al. 2000, Holt et al. 2006, Seckinger et al. 2008, etc.



ARE WE RADIO-HANDICAPPING?

KEY ASSUMPTION: Use of radio transmitters does not influence parameters of interest

- Potential to influence marked individuals
 - Change in movement and behavior
 - Negative effects on survival
- ISSUE: Can we trust survival estimates?



PREVIOUS RESEARCH

- Research suggesting no radio-handicapping effect
 - Mueller et al. 1988
 - Observed no statistical difference in mortality between marked vs. unmarked birds
 - Based on changes in covey size
 - Palmer et al. 2007
 - Gender and time shown to be more influential on survival
 - Terhune et al. 2007
 - Site, time and sex shown to be more influential on survival
 - Suggested that 83% of estimated survival rates were unreasonable

Justification:

- Research within Central Hardwoods Conservation Region is lacking
- No evaluation of radio-handicapping among a marginal landscape
- Need to assess radio-handicapping effects during the breeding season and outside the hunting season

Objectives:




1. Determine if radiomarking significantly influences survival
 - Among the breeding and non-breeding season
2. Compare survival rates of radiomarked versus banded only birds

STUDY AREA

The map displays the Peabody Wildlife Management Area (WMA) divided into several units. Two units are highlighted with orange callouts: the Sinclair Unit, which is 1,470 hectares, and the Ken Unit, which is 1,853 hectares. The map also features a north arrow and a scale bar indicating distances up to 7,000 meters.



METHODS

- **Trapping**
 - Use of Stoddard funnel traps (Stoddard 1931)
 - All birds double banded
 - Birds fitted with necklace-style collars (<6.5 grams)
 - Birds ≥ 120 grams and availability of collars
 - Maintained 120 total traps
 - Sex, age, condition, and weight noted
 - Birds opportunistically recaptured during trapping

METHODS

- **Survival Estimates**
 - Assessed from capture-recapture efforts
 - Estimate survival for banded-only and radiomarked birds
- **Periodic Estimates**
 - July 23rd - November 11th, 2010 (112 capture days)
 - Capture period included a portion of both breeding and non-breeding seasons

ANALYSIS

- **Program Mark**
 - Cormack-Jolly-Seber model used to estimate survival
 - Assessed a list of *a priori* candidate models ($\Delta AIC_c \leq 3$ for significance)
 - Temporal effect
 - Gender effect
 - Radiocollar effect
 - Data set adjusted to help remove any age/gender related biases between radiocollared and banded-only sample
- **Delta method**
 - Used to expand daily survival rates over time to estimate periodic survival

RESULTS

- Total of 436 birds captured over 112 days
 - 278 males, 158 females
 - 15.5% trapping success
- 118 birds fitted with radiocollars, all others were banded-only
- 82 birds recaptured during trapping period

Table 1: Summary of northern bobwhites used in estimating survival

	Banded-Only	Radiomarked
Male	25	25
Female	16	16
Juvenile	30	30
Adult	11	11
Total Birds	41	41

AIC MODELS

Table 2. Model selection statistics from the Cormack-Jolly-Seber model in Program MARK estimating survival (ϕ) and recapture probability (p) of northern bobwhites on Peabody WMA, Ohio and Muhlenberg Counties, Kentucky, USA, July 23 - November 11, 2010

Model	AIC _c	AAIC _c	AIC _c weights	Model likelihood	Parameters	Deviance
$\phi_{radio} P_{\cdot}$	1903.7615	0	0.6536	1	3	1897.6883
$\phi_{\cdot} p_{\cdot}$	1904.5258	0.7643	0.14867	0.6824	2	1900.4893
$\phi_{\cdot} P_{radio}$	1906.3104	2.5489	0.06091	0.2796	3	1900.2372
$\phi_{radio} P_{radio}$	1906.5562	2.7947	0.05387	0.2473	3	1900.483
$\phi_{\cdot} P_{radio} P_{\cdot}$	1907.3632	3.6017	0.03598	0.1651	5	1897.1792

★Note: Only one insignificant model is shown. Four others were dropped from the table based on AIC weights

SURVIVAL ESTIMATES

- Survival estimates derived from best approximating model: $\phi_{radio} P_{\cdot}$
- Daily survival expanded using the delta method to estimate periodical survival

Figure 1: Survival estimates and standard errors of banded only and radiocollared bobwhites on Peabody WMA (July 23rd-November 11th, 2010).

Group	Estimated Survival
Banded Only	~0.15
Radiocollared	~0.40

DISCUSSION

- No evidence of increased mortality on Peabody WMA
- Best approximating model included radio effect on survival
 - Radiomarked birds – higher estimated survival
- Banded only birds – much lower survival estimate but fell within radiomarked birds' survival confidence bounds
- Suggests no negative bias associated with use of radiocollars



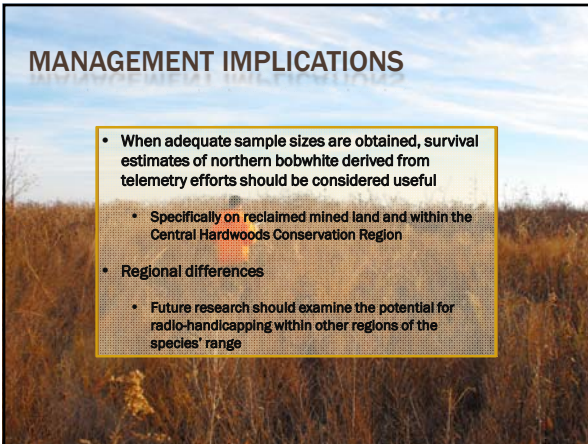
DISCUSSION



- Survival estimates
 - 39.9% - Radiomarked birds
 - 14.1% - Banded only birds
- Why not statistically different?
 - Low recapture rate – 7% for the 112 day period
 - Perhaps an overdispersion of data
 - Variance inflation factor not obtainable
- Other potential influential factors?
 - Need to incorporate models that test age and weight related effects on survival – future direction!

MANAGEMENT IMPLICATIONS

- When adequate sample sizes are obtained, survival estimates of northern bobwhite derived from telemetry efforts should be considered useful
 - Specifically on reclaimed mined land and within the Central Hardwoods Conservation Region
- Regional differences
 - Future research should examine the potential for radio-handicapping within other regions of the species' range



ACKNOWLEDGEMENTS

Kentucky Department of Fish and Wildlife Resources

The University of Tennessee – Knoxville
Department of Forestry, Wildlife, and Fisheries

Quail Forever

Field Technicians

Co-authors:
Ashley Unger
Dr. Patrick Keyser
Dr. Craig Harper
Dr. Joseph Clark
John Morgan



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