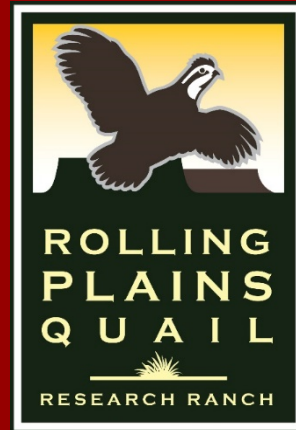
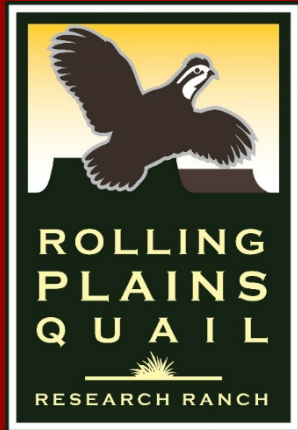


EVALUATION OF POPULATION INDICES AND ESTIMATORS FOR SCALED QUAIL IN THE ROLLING PLAINS OF TEXAS



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Introduction

- One of 4 species occurring in Texas
- Various techniques used to monitor scaled quail
 - Spring Cock Counts
 - ~~Fall Covey Call Counts~~
 - Helicopter Counts
 - Mark-recapture
 - Band-recovery
 - ~~Roadside Counts~~



Study Area

- Rolling Plains Quail Research Ranch (RPQRR)
- 1,780 ha
- 56 cm PZ
- Bobwhites and scaled quail sympatric
- Low density area (~ 0.5 birds / ha)
- 2012- No birds seen, caught



Objectives

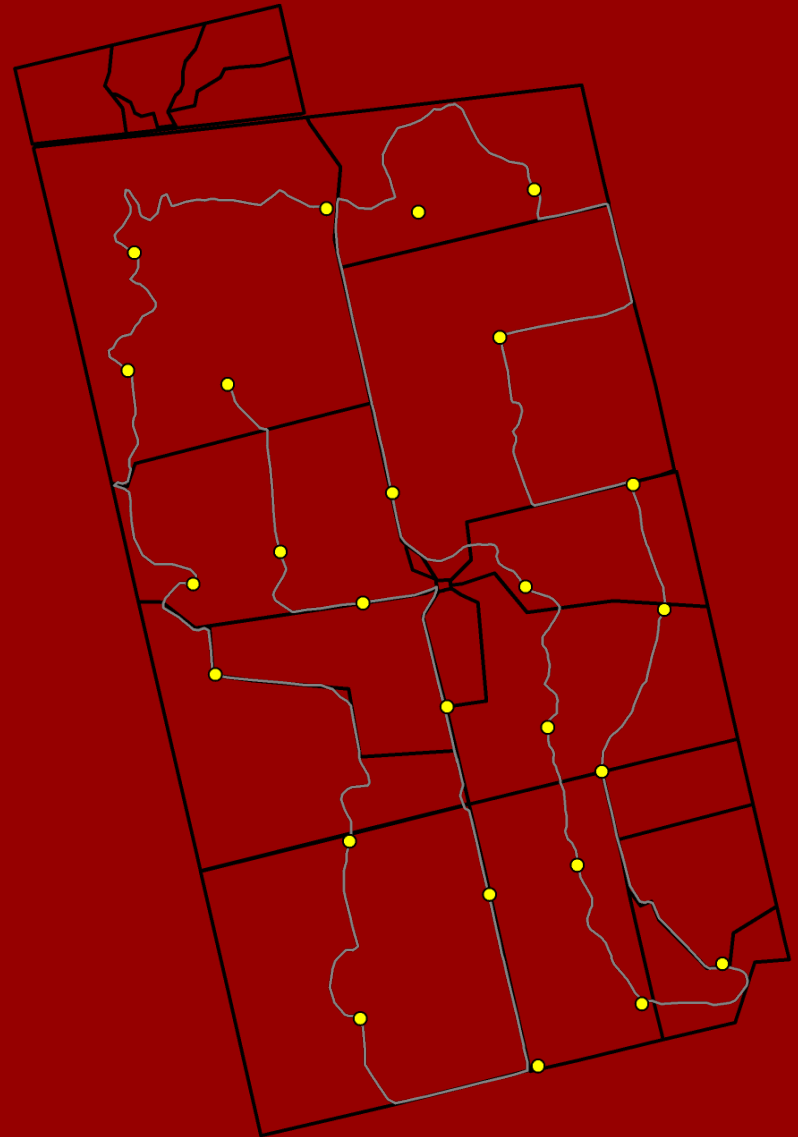
- Evaluate Cock Call Counts
- Helicopter Surveys
- Mark-Recapture
 - Intrinsic (AGE, SEX) and Extrinsic (TEMP, AMPM) Covariates
- Band Recovery (2016 hunting)



Methods

Cock Call Counts

- 15 May – 15 July (2009 – 2016)
- 25 listening stations
- ~600 m spacing
- Sunrise to ~ 1.5 hrs post sunrise
- Multiple observers
- 5 minute stops
- Routes alternated
- Mean count of “squawks”



Methods

Mark-Recapture

- November – December
- $n = 296$ trap sites annually
- Quadrants
- 5 occasions / trap site
- Program MARK
 - Huggins Random Effects
 - Delta Method

No.	Model
1	AGE
2	SEX
3	TEMP
4	AMPM
5	AGE + SEX
6	TEMP + AGE
7	TEMP + SEX
8	TEMP +AMPM
9	AMPM + AGE
10	AMPM + SEX
11	AGE + SEX + AGE*SEX
12	TEMP + AMPM + AGE
13	TEMP + AMPM + SEX
14	TEMP + AMPM + TEMP*AMPM
15	TEMP + AMPM + TEMP*AMPM + SEX
16	TEMP + AMPM + TEMP*AMPM + AGE
17	TEMP + AMPM + TEMP*AMPM + AGE + SEX
18	TEMP + AMPM + TEMP*AMPM + AGE + SEX + AGE*SEX

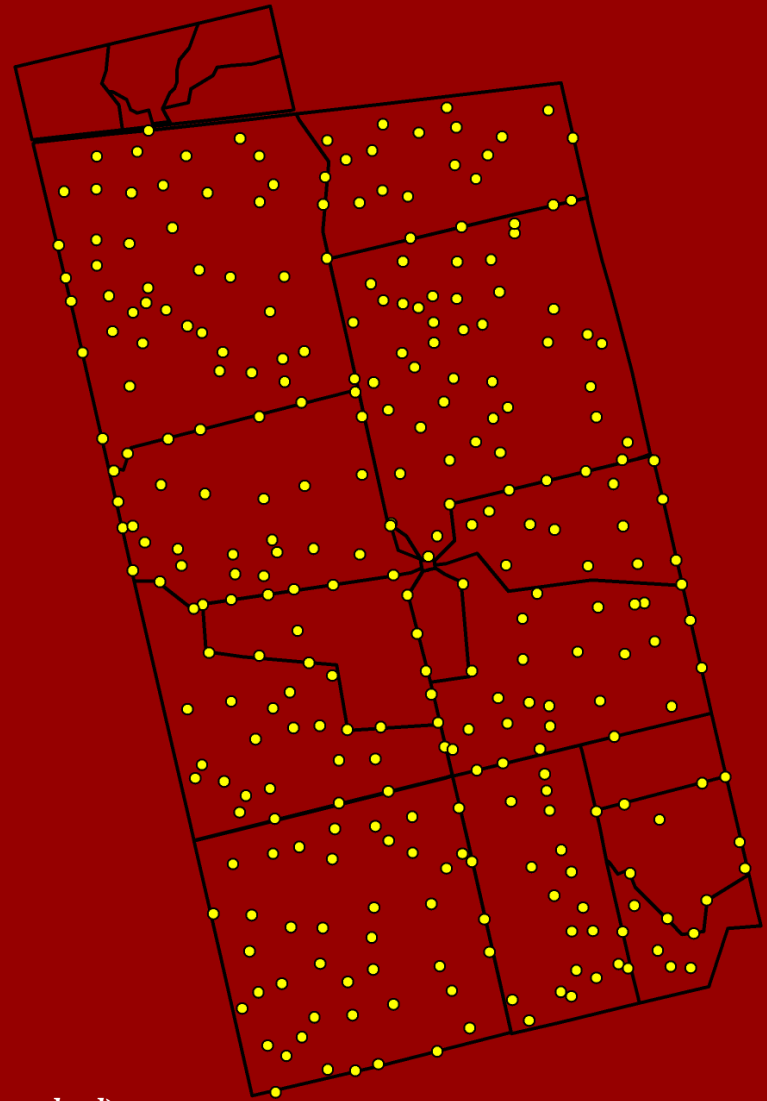
Methods

Band Recovery (2016 hunting)

- Double – sampling techniques
- Harvest initiated immediately following trapping
- Chapman estimator (Chapman 1951, Pollock 1990)

$$\hat{N} = \frac{(MKP + 1) (Shot + 1)}{(Banded + 1)} - 1$$

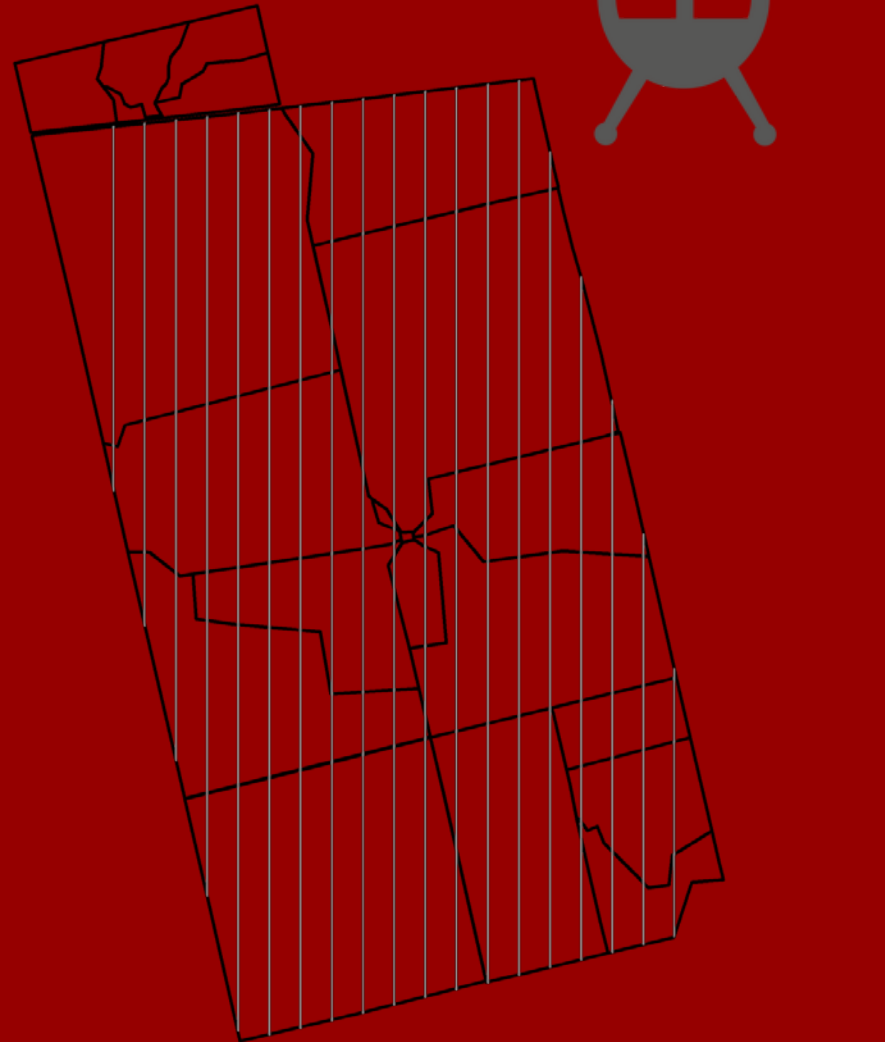
$$\widehat{var}\hat{N} = \frac{(MKP + 1) (Shot + 1) (MKP - Banded) (Shot - Banded)}{(Banded + 1)^2 (Banded + 2)}$$



Methods

Helicopter Surveys

- 2009 – 2016
- Raven R-44
- 8-m altitude
- 40 kph
- 90-km survey effort annually
- 3 observers and pilot
- Modified System for Electronic Surveys (MSES)

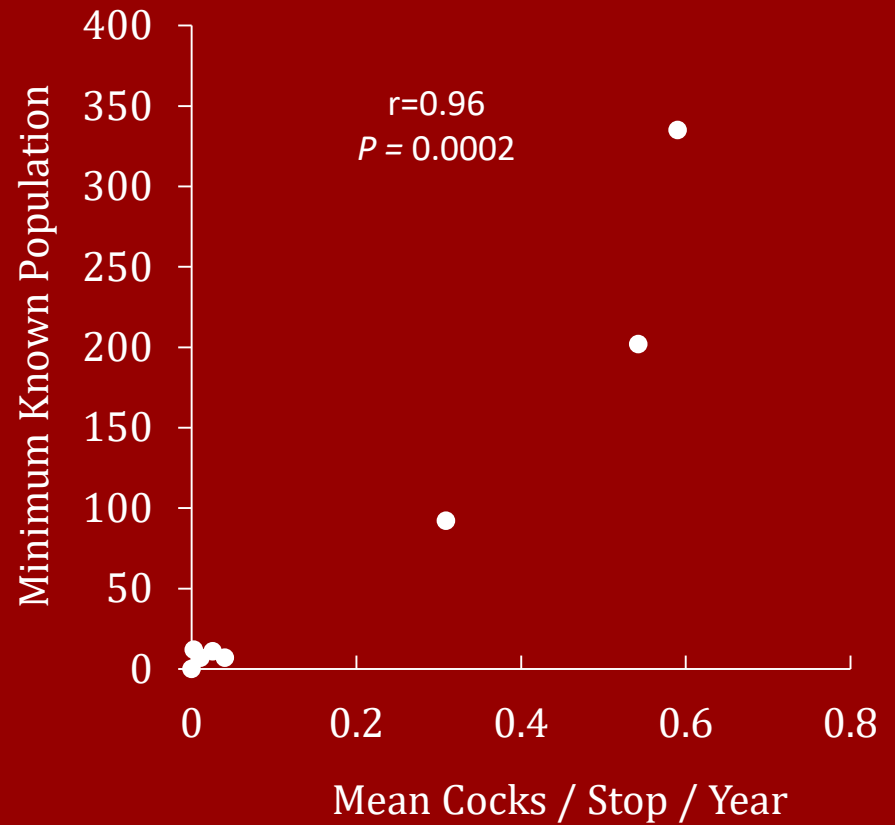


Results- Cock Counts

Highly correlated

However,

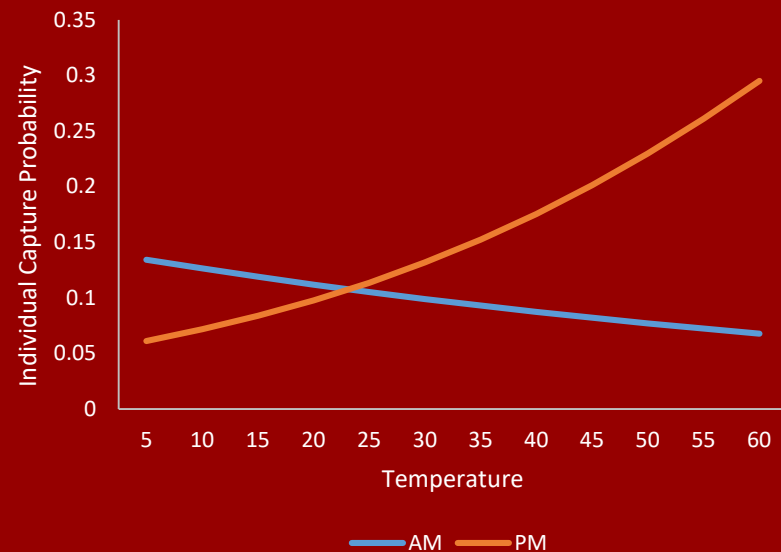
- Note *scale* of independent variable
- Few males typically heard (< 4 /stop)



Results- Mark-recapture

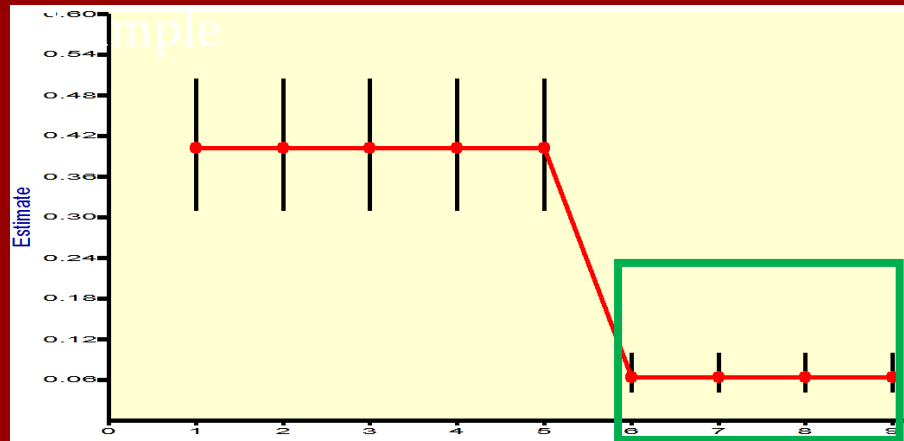
- Time Response
- Behavioral response
- AMPM response (2 of 4 removed, SE)
- Age and Sex effects- betas bound by 0
- Mean individual capture probabilities were 0.27, 0.33, and 0.18 for 2014, 2015, and 2016, respectively.

	2016			
	1	2	3	4
Model (ΔAIC_c)	Mb	Mtb	Mb	M0+ TEMP + AMPM + TEMP*AMPM
	MbRE (0.0)	Mtbh2 (0.0)	Mb + AGE (0.26)	M0+ TEMP + AMPM + TEMP*AMPM + AGE (1.73)
	-	-	Mb + AGE + SEX (0.95)	Mt (1.92)

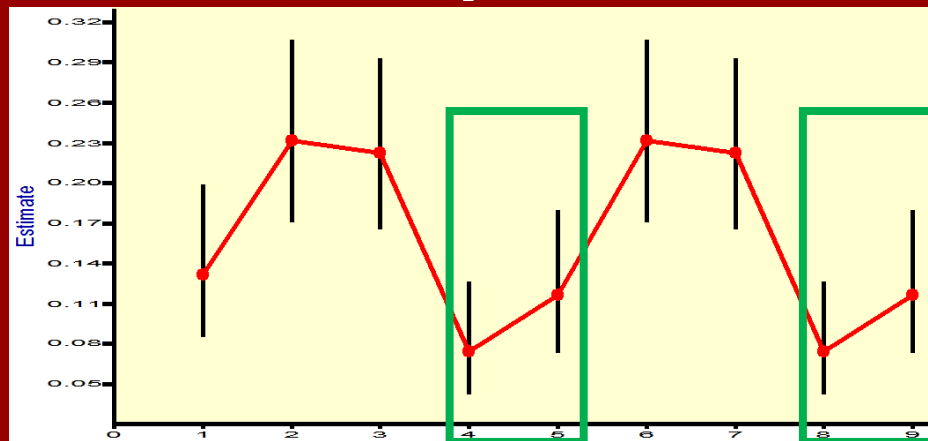


Results- Mark-recapture

Behavior Response



TEMP, AMPM Example

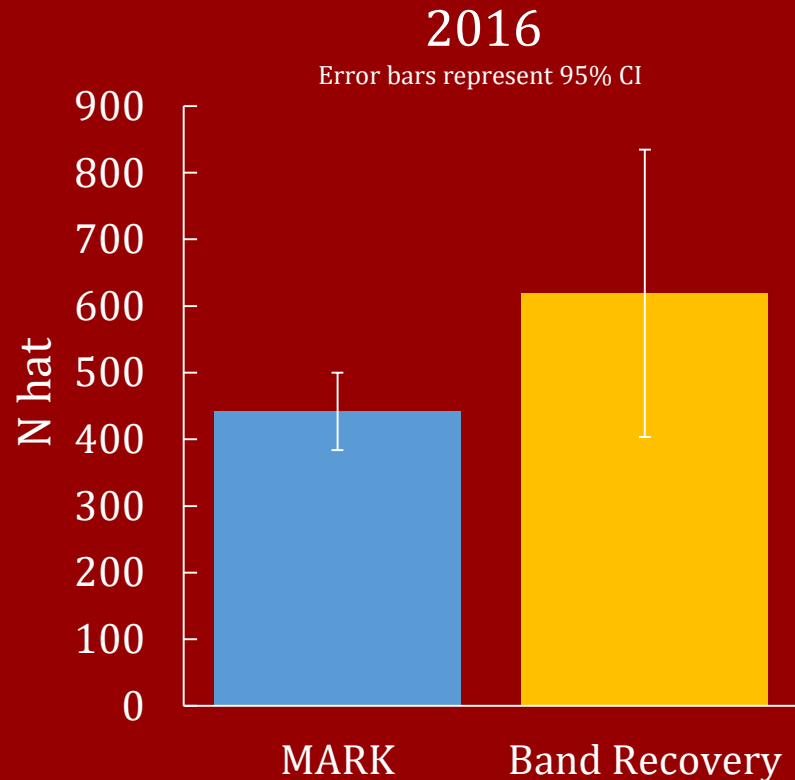


Results- Band Recovery

Statistically similar
estimates

But,

- Few scaled quail harvested ($n = 23$)
- 12/23 banded



Results- Helicopter Surveys

- 0 coveys seen before 2016
- 6 coveys (48 individuals) seen in January 2016
- 1 covey (9 individuals) seen in January 2017
- Too few detections for distance sampling

Year	November MKP	November MARK
2009	7	.
2010	7	.
2011	12	.
2012	0	.
2013	11	.
2014	92	98
2015	202	274
2016	335	461

Discussion

- Scaled quail were not prolific callers
 - < 4 birds / stop
 - < 4 calls / bird
- Temperature variation, AMPM
- Double sampling (band recovery) typically higher estimates than mark-recapture (O'Brien et al. 1985)
- Small samples



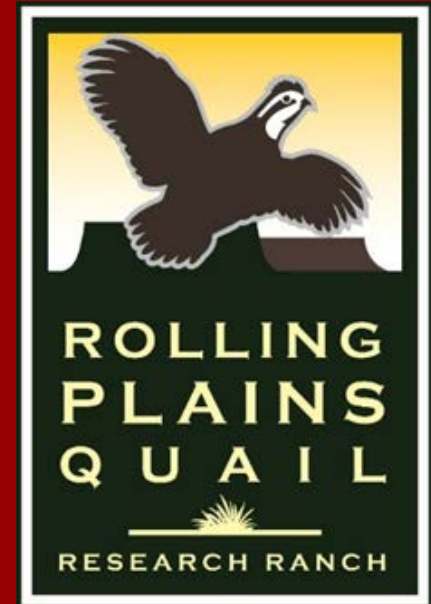
Discussion

- Detection probabilities from helicopters likely differ from bobwhites
 - Failed to detect
- or
- Failed to distinguish species



Acknowledgments

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Questions

