Northern bobwhite (*Colinus virginianus*)
home range sizes and movements
in South Texas

Katherine S. Miller¹, Fidel Hernández,
Leonard A. Brennan, Randy DeYoung, and X. Ben Wu

¹California Department of Fish and Wildlife,
katherine.miller@wildlife.ca.gov
The northern bobwhite
(*Colinus virginianus*)

Home range:
- <30 ha

Northern bobwhite movements

• <10 km

• > 100 km
Movement and gene flow

- South Texas: weak genetic structure
- $\theta_{ST} = 0.037$, Wehland 2006
- $F_{ST} = 0.015$, Miller 2014
- Gene flow, dispersal $\rightarrow$ weak genetic structure
- What compels northern bobwhites to move long distances?
Social behavior, age, gender

- Winter coveys → source of mates.
- Uneven sex ratios, agonistic behavior (Lehmann 1984:50).
- Some birds move farther in search of mates.

- HY ♂
- Stoddard 1931
- Smith et al. 1982
- Townsend et al. 2003
Rainfall, vegetation, or both?

Tri et al. 2012
Hypotheses

1. HY ♂ larger home ranges, longer movements.
2. Dispersal more likely during dry years.
3. Normal years: home ranges in grassland and mesquite (*Prosopis glandulosa*).
   Dry years: home ranges in mesquite.
Study area

Encino Division, King Ranch, Brooks County, South Texas

Gradient of woody cover (honey mesquite, granjeño, *Celtis pallida*; huisache, *Acacia smallii*; live oak, *Quercus virginiana*):

- Cuates (1240 ha) 10%
- Loba (1379 ha) 25%
- N. Viboras (1966 ha) 30%
South Texas Quail Research Project

- 10-year period
- >150 g, neck-loop radio transmitter (Shields et al. 1982).
- locations 3 x/ week
- All times of day
- Locations to ~3 m.
Methods

2000-2006 data, removed:
• depredations (Terhune et al. 2006).
• <20 locations (Haines et al. 2006, Brooke et al. 2015, Peters et al. 2015).

• Core area 50%
• Home range 100%
• fixed kernel density
Linear movements

Mean movement rate

• Locations taken within 1 week

Distance between consecutive locations
Days between consecutive locations

• Average

Maximum distance moved

• Longest distance between consecutive locations
Weather (Palmer Modified Drought Index, PMDI)

• dry (PMDI < -2.0).
• normal (PMDI -1.99–1.99).
• moist (PMDI > 2.0).

Core areas, home ranges, distances
• Annual
• Breeding (1 March–30 August)
• Nonbreeding (1 November–28 February)
### TX Ecological Land Classification Project

<table>
<thead>
<tr>
<th>Sandy mesquite savanna</th>
<th>little bluestem</th>
<th><em>Schizachyrium scoparium</em></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>coastal bermudagrass</td>
<td><em>Cynodon dactylon</em></td>
</tr>
<tr>
<td></td>
<td>Lehmann lovegrass</td>
<td><em>Eragrostis lehmanniana</em></td>
</tr>
<tr>
<td>Deep sand Grassland</td>
<td>gulfdune paspalum</td>
<td><em>Paspalum monostachyym</em></td>
</tr>
<tr>
<td></td>
<td>tanglehead</td>
<td><em>Heteropogon contortus</em></td>
</tr>
<tr>
<td></td>
<td>partridge pea</td>
<td><em>Chamaecrista fasciculate</em></td>
</tr>
<tr>
<td></td>
<td>honey mesquite</td>
<td><em>Prosopis glandulosa</em></td>
</tr>
<tr>
<td>Salty prairie</td>
<td>Gulf cordgrass</td>
<td><em>Spartina spartinae</em></td>
</tr>
</tbody>
</table>

- TPWD, Missouri Resource Assessment Partnership (Elliot 2011).
- Kruskal-Wallis, R v. 3.3.1 (R Core Team 2016). ± SE
Results

- 293 northern bobwhites
- Core area = 3.40 ± 0.09 ha
- Home range = 14.76 ± 0.36 ha
- Movement rate = 52.54 ± 0.87 m
- Max. distance moved = 666.23 ± 36.91 m
- > 400 m: 131 birds, 44.9%.
- > 1.6 km: 18 birds, 6.1%. Of those, AHY ♀ = 3
- Longest distance moved = 6.6 km, SY ♀
Age, Gender, and Pasture Effects

\[ X^2_{3, 289} = 25.16, \ P = 0.009 \]
Weather Effects

\[ X^2_{2, 450} = 6.11, P = 0.047 \]

\[ X^2_{2, 450} = 7.35, P = 0.025 \]

\[ W_{193} = 8,199, P < 0.001 \]

\[ W_{193} = 7.35, P = 0.025 \]
Weather Effects

\[ \chi^2_{2, 308} = 39.47, \ P < 0.001 \]

\[ \chi^2_{2, 308} = 12.67, \ P = 0.005 \]

\[ \chi^2_{2, 308} = 7.23, \ P = 0.027 \]

- Normal Summer: 90
- Moist Summer: 139
- Normal Winter: 5
- Moist Winter: 86
Weather and Plant Community Effects

$X^2_{5, 439} = 15.28, \ P = 0.009$
Age, Gender, and Pasture Effects

• H1: HY ♂'s larger home range, longer movement.
• AHY ♂'s had shorter mean movement rates but larger home ranges than HY ♂'s.
Age, Gender, and Pasture Effects

- AHY ♀s lowest mean movement rate
- Longest movement: SY ♀ (6.6 km). Nest failure?
- Cuates, 52 days, Loba. 12 eggs.
- Urban (1972): hen moved > 2 km after nest destroyed.
Age, Gender, and Pasture Effects

- Regardless of age, gender, or pasture, home ranges were small and movements were short.
- Contiguous landscape.

(TX Ecological Land Classification Project, MoRAP and TPWD)
Weather effects

• H2: Dispersal in dry years
• Adequate rainfall: sufficient food, cover
• Larger home ranges, shorter movements in normal years.
• Previous research: shifts in home range size and movements with precipitation.
• Liberati and Gates 2012: longer movements in a dry summer.
• DeVos and Mueller 1993: larger home ranges in a dry summer.
Weather and Plant Community effects

• H3: Plant Community Type in dry, normal, wet years. Normal years: all 3 plant communities, dry years: mesquite.
• Dry years: sandy mesquite savanna, salty prairie.
• Not in deep sand grassland. More cover?
Management Implications

• Small home ranges, movements (<18 ha, <1 km)
• Critical habitat: bare ground, forbs, woody cover.
• Small percentage (6%) of birds made relatively long movements (>1.6 km).
• Corridors: Gene flow, population structure in South Texas.
• For these long-distance movers, contiguous habitat and corridors are important.
Acknowledgments

- Team of biologists - South Texas Quail Research Project
- Elliott and Adelle Bottom Fellowship in Quail Research
- Mr. René Barrientos
- South Texas Chapter of The Quail Coalition
- Amanda Whitaker Memorial Scholarship in Wildlife Management
- CKWRI Quail Associates
- Phillip M. Plant Graduate Scholarship
Questions?
18 birds.
Movement rate = for HY birds and AHY ♂ ($\chi^2_{2, 15} = 2.81$, $P = 0.246$).

AHY ♀ comprised 16% (n = 3).