POPULATION DYNAMICS OF PLAIN CHACHALACAS IN THE LOWER RIO GRANDE VALLEY

A Thesis

by

ADAN GABRIEL GANDARIA

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

December 2009

Major Subject: Wildlife and Fisheries Sciences

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Approved by:

Co-Chairs of Committee,	Roel R. Lopez
	Louis A. Harveson
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ABSTRACT

Population Dynamics of Plain Chachalacas in the Lower Rio Grande Valley.

(December 2009)

Adan Gabriel Gandaria, B. S., Sul Ross State University

Co-Chairs of Advisory Committee: Dr. Roel R. Lopez
Dr. Louis A. Harveson

The Lower Rio Grande Valley (LRGV) of Texas is an ecologically diverse region in the United States and marks the northern most extension for many tropical species of plants and animals. Since the early 1900s, 95% of the native Tamaulipan brushlands have been cleared due to agricultural practices and urban development. The plain chachalaca (*Ortalis vetula*) is a medium sized bird endemic to the native brushlands of the LRGV.

In 2003, I trapped and radio-tagged 29 birds (16 males, 13 females) to evaluate the effects of fragmentation on the population dynamics (i.e., survival, mortality, and movements) of this brushland species. My study objectives were to estimate (1) seasonal survival of chachalacas by sex, and (2) ranges, core areas, and movements using radio telemetry.

Mammalian predation (43%, $n = 6$) and unknown (43%, $n = 6$) deaths accounted for the majority of mortality observed. I found no difference ($P > 0.05$) in estimated 8-month survival (December 2003-July 2004) between males ($S = 0.364$, $SE = 0.132$) and females ($S = 0.405$, $SE = 0.153$). In comparing seasonal survival for all birds (males and females combined), I observed a difference ($P < 0.05$) in survival between the nesting ($S = 0.414$, $SE = 0.103$) and breeding seasons ($S = 0.917$, $SE = 0.079$). Female ranges ($\bar{x} = 117$ ha,

range = 42–177 ha) and core areas ($\bar{x}$ = 23 ha, range = 5–46 ha) during the nesting season were larger than male ranges ($\bar{x}$ = 41 ha, range = 31–46 ha) and core areas ($\bar{x}$ =10 ha, range = 7–14 ha) during the same period. During the breeding season, female ranges ($\bar{x}$ = 59 ha, range = 10–188 ha) and core areas ($\bar{x}$ = 9 ha, range = 2–33 ha) were similar to male ranges ($\bar{x}$ = 48 ha, range = 4–130 ha) and core areas ($\bar{x}$ = 9 ha, range = 1–23 ha).

Mean distances between seasons were similar for both sexes (females, nesting, $\bar{x}$ = 486, breeding, $\bar{x}$ = 345; males, nesting, $\bar{x}$ = 184, breeding, $\bar{x}$ = 292), though females distances generally were greater. Dispersal defined as movement off the Santa Ana National Wildlife Refuge was observed for 3 birds. In 2 cases, a radio-tagged female and male were observed crossing the Rio Grande River (approximately 100-m wide) to habitat in Mexico.

Study results suggested mammalian predation may limit the growth of chachalaca populations. Though land use changes such as agricultural, uses may not directly limit chachalaca populations in providing cover and food, concentration of populations in remnant native brushlands may serve as ecological “sinks” to the species. Greater range and movement data observed in my study may be attributed to suboptimal habitat (i.e., increased fragmentation) for plain chachalacas.

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1. INTRODUCTION

The Lower Rio Grande Valley (LRGV) of Texas is an ecologically diverse region in the United States and marks the northernmost extension for many tropical species of plants and animals (Blair 1950, Lonard et al. 1991). The combination of climate, geology, and vegetation has resulted in tremendous biological diversity; more than 500 vertebrate species and 170 woody species are found in this region (Jahrsdoerfer and Leslie 1988, Judd et al. 2002). Tamaulipan brushlands are characterized by thorny and dense vegetation that provide food and cover to a great diversity of wildlife species. The U.S. Fish and Wildlife Service (USFWS) recognize the presence of 11 biotic communities within the Tamaulipan brushlands of South Texas used to describe the natural associations of organisms within their environment (Jahrsdoerfer and Leslie 1988, USFWS 1997).

Habitat loss is of primary concern in the conservation of many rare and sensitive plant and animal species, and, with continued economic growth in the LRGV, further habitat fragmentation and degradation of remaining habitat patches is likely (Jahrsdoerfer and Leslie 1988). Fragmentation and habitat degradation pose an obvious threat to the ecological functioning of the Tamaulipan brushland ecosystem. Remaining vegetation patches are scattered "islands" surrounded by a matrix of agriculture and developed land, which limit the dispersal and survival of many native wildlife species (Jahrsdoerfer and Leslie 1988). Current conservation efforts by USFWS and other

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conservation agencies such as Texas Parks Wildlife Department (TPWD) include the purchase and restoration of native brushlands and the identification and protection of wildlife corridors to link habitat patches in this fragmented landscape (Jahrsdoerfer and Leslie 1988, USFWS1997). Minimum patch size requirements and/or corridor characteristics (width/length) needed by many wildlife species are largely unknown, and likely will vary between species.

The plain chachalaca (*Ortalis vetula*) is a medium-sized bird endemic to the Tamaulipan brushlands of the LRGV (Jahrsdoerfer and Leslie 1988, Peterson 2000). Unlike most temperate-zone galliforms, chachalacas are largely arboreal thriving in the thorny thickets and scrublands of the region (Peterson 2000). The plain chachalaca has received little scientific attention with the last comprehensive study having been completed nearly 30 years ago (Marion 1974). Surprisingly, little data about the demographics of this species (i.e., survival, reproduction, dispersal, movements/ranges, and density) are available (Peterson 2000). Such information is important in the successful management of plain chachalacas (e.g., setting hunting bag limits, determining minimum habitat patch size, distance between patches, etc.), particularly within fragmented landscapes. Thus, my study objectives were to estimate (1) seasonal survival of chachalacas by sex, and (2) ranges, core areas, and movements using radio telemetry.

2. STUDY AREA

The Lower Rio Grande Valley National Wildlife Refuge (LRGVNWR) is comprised of 135 tracts totaling approximately 31,566 ha distributed over the entire Lower Rio Grande Valley. These native brushland tracts are surrounded by human-dominated land uses including agricultural lands, roads/highways, and urban development. My study was conducted within the largest management unit of LRGVNWR, the Santa Ana National Wildlife Refuge (SANWR, 826 ha, Fig. 1) located 11 km south of Alamo, Texas, on FM 907 and 0.5 km east on U.S. Highway 281. The plant community of SANWR is generally classified as a bottomland hardwood site on relatively moist, fertile soil, throughout which stands of sugar hackberry (*Celtis laevigata*), cedar elm (*Ulmus crassifolia*), and Mexican ash (*Fraxinus berlandierana*) mixed within a mesquite (*Prospopis glandulosa*)-granjeno (*Celtis pallida*) association (Blair 1950).

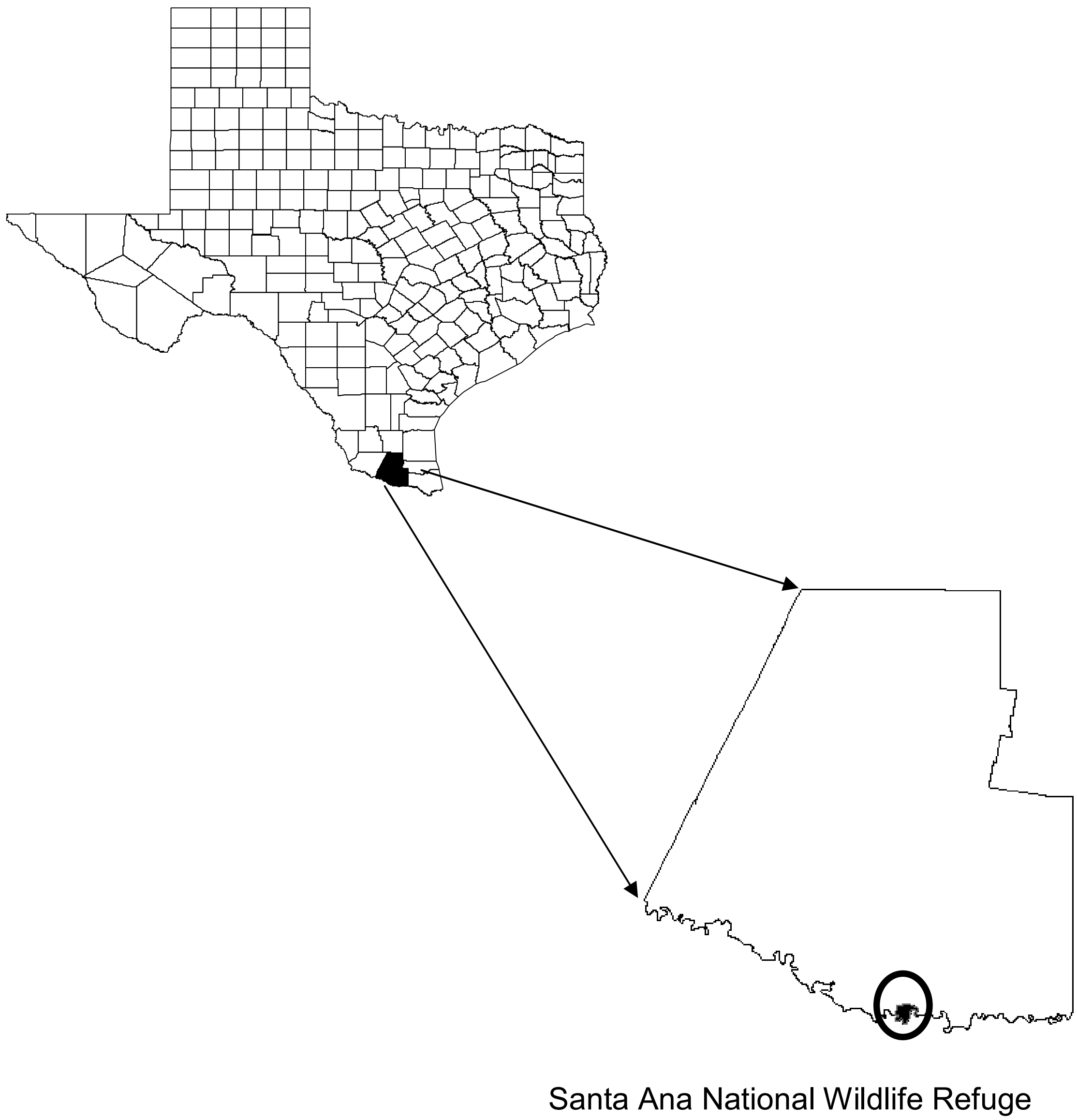

Figure 1. Study area of radio-tagged plain chacalacas at the Santa Ana National Wildlife Refuge, Alamo, Texas, 2004.

3. METHODS

3.1 Trapping and Radio-tagging

Birds were trapped using drop nets (Silvy et al. 1990) and walk-in traps (Marion 1974, Balda 1989) during the fall and winter when food availability was limited. Chopped cabbage and chicken scratch (i.e., cracked corn and milo) were used to bait birds into traps. On availability, cherry tomatoes also were used for bait. After capture, I attached a battery-powered mortality-sensitive radio transmitter (150–152 MHz, 20–30 g, Advanced Telemetry Systems, Inc. Isanti, Minn.) and color leg bands to each bird. Trapped birds not required in my radio sample were marked with color leg bands only. Sex, age (e.g., adult, juvenile), and weight (g) were recorded at the time of capture (Marion 1974, Balda 1989). Sex of live birds was determined by checking for the presence of a trachea loop between the ventral musculature of the breast, and cloacal examination (Marion 1974, Marion 1977). Size differences can be an indicator of age and may be used when juveniles are less the 4–5 months old (e.g., summer and fall season) (Marion 1974, Marion 1977). All trapping and handling was in accordance with Texas A&M University's Animal Care and Use Committee.

3.2 Radio Telemetry

Radio-tagged chachalacas were monitored 2–4 times per week throughout the duration of study via homing (White and Garrott 1990). Detected mortality signals were immediately located and animals necropsied. Telemetry locations were entered into ArcView GIS (Version 3.2, Redlands CA.) and Microsoft Excel for further data analysis.

3.3 Data Analysis

I used a Kaplan-Meier estimator modified for staggered entry to calculate seasonal survival by sex (Pollock et al. 1989). I defined season for chachalacas as breeding (December–March) and nesting (April–July) (Peterson 2000). Survival estimates were based on an 8-month period beginning on 1 December 2003 and ending on 31 July 2004. I also calculated ranges (95% probability area) and core areas (50% probability area) for radio-tagged chacalacas using a fixed-kernel home-range estimator (Worton 1989, Seaman et al. 1998, Seaman et al. 1999) with the animal movement extension in ArcView 3.3 (Hooge and Eichenlaub 1999). I used calculation of the smoothing parameter (kernel width) as described by Silverman (1986) in generating kernel range estimates. I also estimated maximum and mean daily movements for radio-tagged birds in addition to noting dispersal (defined as movement off the SANWR complex). Like survival estimates, range and core area estimates and movements were calculated by seasons (i.e., breeding and nesting).

4. RESULTS

4.1 Survival

I captured and radio-tagged 29 chachalacas (16 males, 13 females) in my study. Fourteen birds (females, n = 6; males, n = 8) died during the study period (December 2003–July 2004). I censored 12 birds (females, n = 6; males, n = 6) due to transmitter failure or loss of radio harness. Mammalian predation (43%, n = 6) and unknown (43%, n = 6) deaths accounted for the majority of mortality observed. The remainder of observed mortality included avian predators (14%, n = 2). In most instances, bobcats (*Lynx rufus*) were believed to have caused the majority of mammalian mortality due to their frequent observations near trap sites.

I found no difference (P > 0.05) in estimated 8-month survival (December 2003–July 2004) between males (S = 0.364, SE = 0.132, n = 16) and females (S = 0.405, SE = 0.153, n = 13). In comparing seasonal survival for females, I found no difference between the nesting (S = 0.486, SE = 0.161, n = 13) and breeding seasons (S = 0.833, SE = 0.152, n = 6) (Fig. 2). In comparing seasonal survival for males, I observed a difference in survival between the nesting (S = 0.364, SE = 0.137, n = 16) and breeding seasons (S =1.00, SE = 0.0, n = 6) (Fig. 2). Finally, in comparing seasonal survival for all birds (i.e., sexes combined), I observed a difference in survival between the nesting (S = 0.414, SE = 0.103, n = 29) and breeding seasons (S = 0.917, SE = 0.079, n = 12) (Fig. 2).

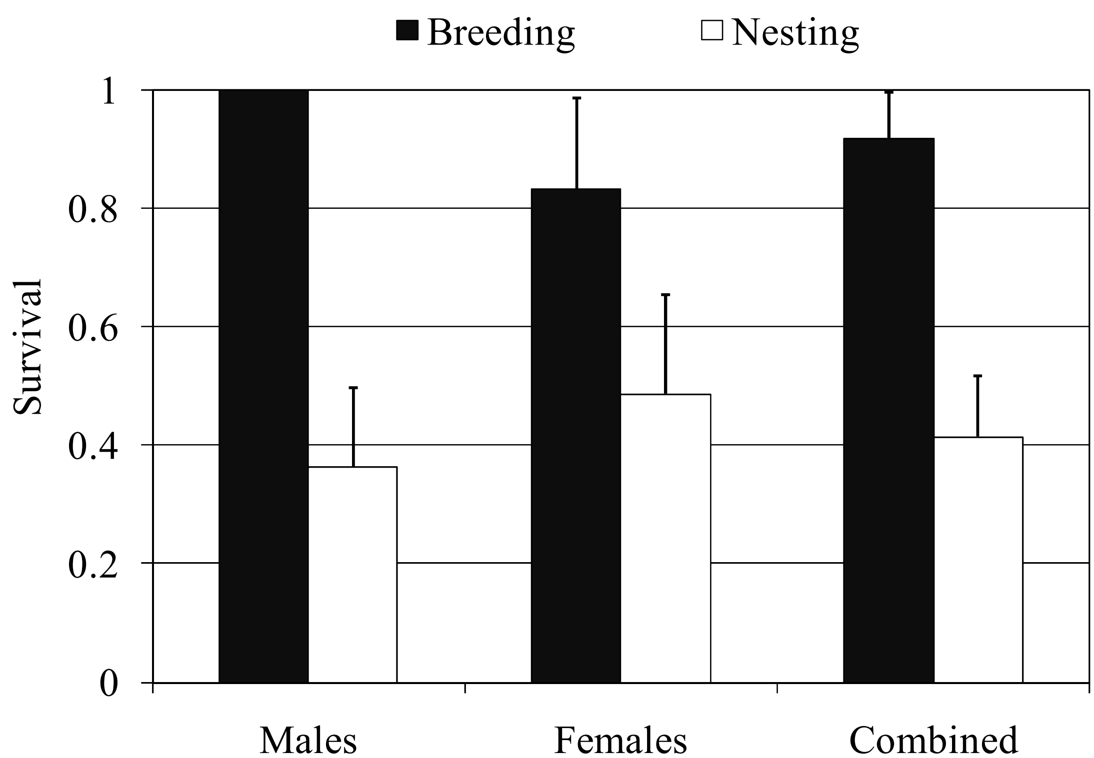

Figure 2. Seasonal survival for radio-tagged plain chachalacas by sex and season (breeding, December–March; nesting, April–July), Santa Ana National Wildlife Refuge, Alamo, Texas, 2004.

4.2 Ranges

I estimated ranges (95% probability area) and core areas (50% probability area) for 29 radio-tagged plain chachalacas (female, n = 13; male, n = 16) by season. The average number of locations used in calculating range estimates was 20 (SD = 8, range 10–39). Season was an important factor in describing ranges, core areas, and movements for radio-tagged chachalacas. In general, female ranges ($\bar{x}$ = 117 ha, range = 42–177 ha) and core areas ($\bar{x}$ = 23 ha, range = 5–46 ha) during the nesting season were larger than male ranges ($\bar{x}$ = 41 ha, range = 31–46 ha) and core areas ($\bar{x}$ = 10 ha, range = 7–14 ha) during the same period (Table 1, Fig. 3). During the breeding season, female ranges ($\bar{x}$ = 59 ha, range = 10–188 ha) and core areas ($\bar{x}$ = 9 ha, range = 2–33 ha) were similar to male ranges ($\bar{x}$ = 48 ha, range = 4–130 ha) and core areas ($\bar{x}$ = 9 ha, range = 1–23 ha) (Table 1, Fig. 3).

4.3 Movements

Maximum distances observed during the breeding season were 849 m and 1,552 m for females and males, respectively (Table 1). Maximum distances observed during the nesting season were 1,563 m and 795 m for females and males, respectively (Table 1). Mean distances between seasons were similar for both sexes (females, nesting, $\bar{x}$ = 486, breeding, $\bar{x}$ = 345; males, nesting, $\bar{x}$ = 184, breeding, $\bar{x}$ = 292; Table 1), though females distances generally were greater. Dispersal defined as movement off the SANWR complex was observed for 3 birds on several occasions. In 2 cases, a radio-tagged female and male were observed crossing the Rio Grande River (approximately

100 m) to habitat in Mexico. Crossing of non-vegetative tracts of land (e.g., agricultural land, <100 m wide) do not appear to limit the movements of plain chachalacas.

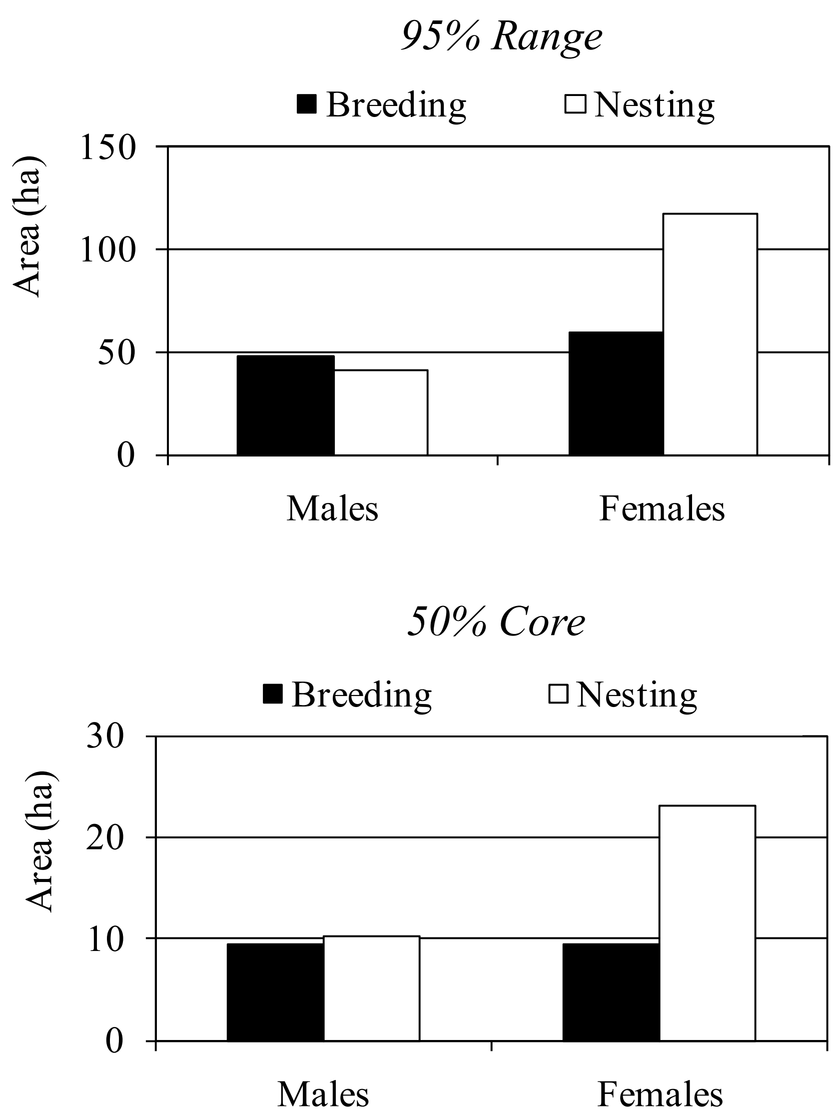

Figure 3. Seasonal ranges (95% probability area) and core areas (50% probability area) for radio-tagged plain chachalacas by sex and season (breeding, December–March; nesting, April–July), Santa Ana National Wildlife Refuge, Alamo, Texas, 2004.

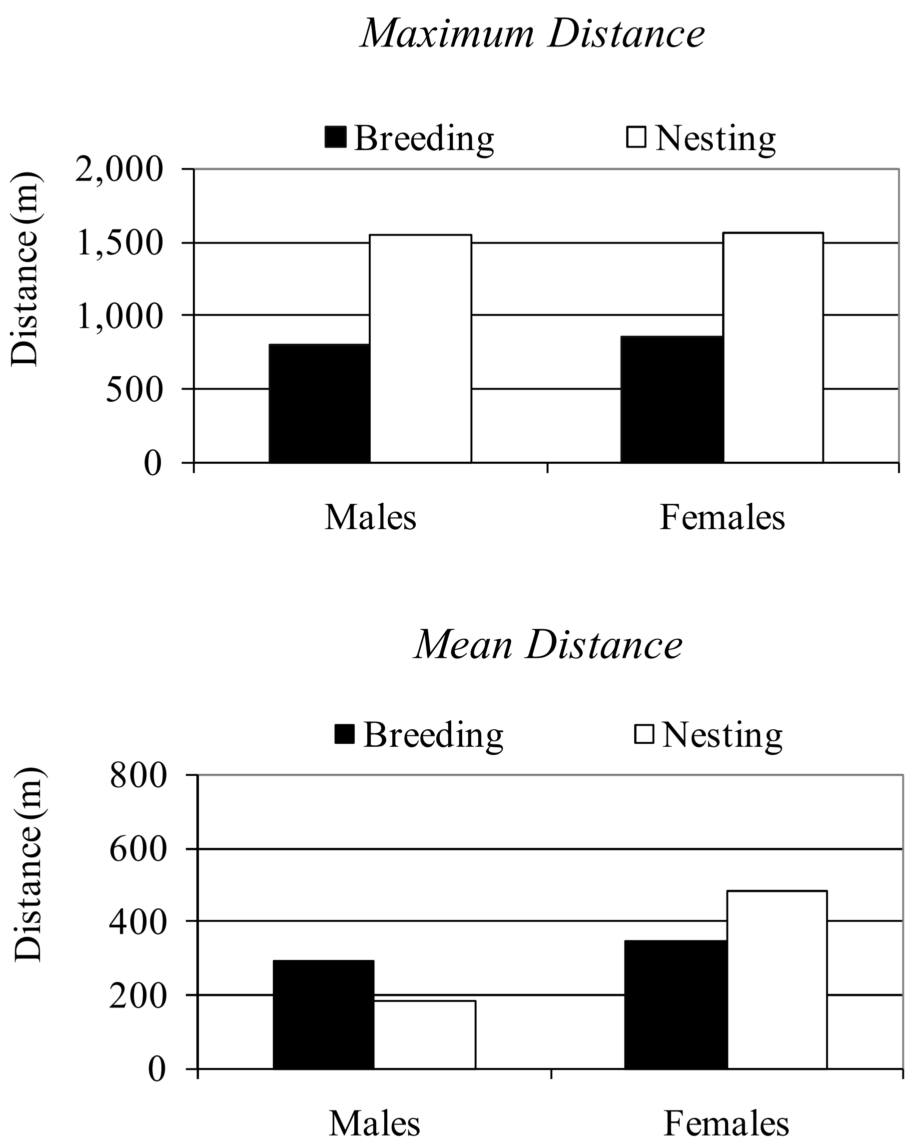

Figure 4. Seasonal maximum and mean distances (m) moved for radio-tagged plain chachalacas by sex and season (breeding, December–March; nesting, April–July), Santa Ana National Wildlife Refuge, Alamo, Texas, 2004.

Table 1. Seasonal ranges (95% and 50% probability areas) and distances (m) for radio-tagged plain chachalacas by sex and season (breeding, December–March; nesting, April–July), Santa Ana National Wildlife Refuge, Alamo, Texas, 2004.

Parameter Estimate Sex	Season	*n*	Mean	SE
Maximum Distance				
Female	nesting	3	1,563	807
Male	nesting	4	795	166
Female	breeding	5	849	207
Male	breeding	4	1,552	616
Mean Distance				
Female	nesting	3	486	157
Male	nesting	4	184	27
Female	breeding	5	345	72
Male	breeding	4	292	72
95% Area				
Female	nesting	3	117	40
Male	nesting	4	41	2
Female	breeding	5	59	33
Male	breeding	4	48	28
50% Area				
Female	nesting	3	23	12
Male	nesting	4	10	1
Female	breeding	5	9	6
Male	breeding	4	9	5

5. DISCUSSION

5.1 Survival

From incidental recaptures, it is known that chachalacas can have a long life span in the wild (Marion and Fleetwood 1974.). Results from my study, however, do not suggest a long life span for chachalacas. I observed high mammalian predation (43%) for radio-tagged birds. There are no previous telemetry studies of plain chachalacas to allow comparison of estimates; however, other studies on galliformes have reported high mortality due to mammalian predation (e.g., Palmer et al. 1993, Vangilder and Kurzejeski 1995, Lockwood et al. 2005). Field evidence suggested bobcats were a primary predator for radio-tagged chachalacas. I found survival was lowest for both males and females during the nesting season. Other studies of galliformes (e.g., Speake et al. 1969, Hagen 2003, Lyons et al. 2009) report low survival during the peak nesting season due to incubation and post-hatching behavior (i.e., greatest risk to predation), particularly for females. This likely was the case for birds in my study.

5.2 Ranges

No previous studies have been conducted to estimate plain chachalaca ranges within their historic range (Peterson 2000). Balda (1989) attempted to study ranges and movements of this species transplanted in San Patricio County, Texas, well north of historic range (>240 km). Mean home ranges (minimum convex polygon) of 6 males and 11 females were 6.4 ha ± 1.2 and 4.0 ha ± 0.9 *SD*, respectively (range 1.2–11.3; Balda 1989). I observed much larger ranges (>6 times) than those reported in previous studies. Female ranges were larger during the nesting season, which may coincide with dispersal to find and construct nests. Maximum and mean distances observed for female chachalacas supports this premise (Fig. 4).

5.3 Movements

Dispersal and movements are poorly understood for plain chachalacas (Peterson 2000). Marion (1974) reported maximum distances for the majority (79%) of resident populations to be <0.4 km. I observed maximum distances >1.5 km and 0.7 km during the nesting season and breeding season, respectively, for both sexes. Both maximum and mean distances were greater during the nesting season for females. This may coincide with nesting behavior to find and construct nests typical among galliformes (e.g., Vangilder and Kurzejeski 1995). For males, mean distances observed were greater during the breeding season compared to movements during the nesting season.

It has been hypothesized that dispersal is probably restricted because of species' limited flying ability (Marion 1974). Dispersal defined as movement off the SANWR complex was observed for 3 birds on several occasions. In 2 cases, a radio-tagged female and male were observed crossing the Rio Grande River (approximately 100 m wide) to habitat in Mexico. Plain chachalacas appear to be more adaptable to changes in land use (e.g., agricultural lands). Unlike other cracids, plain chachalacas thrive in thickets and brushland that often follow clearing of tropical forests (Midence 1997, Peterson 2000). In my study, non-vegetative tracts of land did not appear to limit the movements of plain chachalacas as previously believed.

6. CONCLUSIONS

Prior to my study, only 1 comprehensive ecological study had been completed on plain chachalacas in the LRGV (Marion 1974). Study results suggest that mammalian predation may limit the growth of chachalaca populations. Though land use changes such as agricultural uses may not directly limit chachalaca populations in providing cover and food, concentration of populations in remnant native brushlands may serve as ecological “sinks” (Pulliam 1988) to the species. Greater range and movement data observed in my study may be attributed to suboptimal habitat (i.e., increased fragmentation) for plain chachalacas.

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