Home Ranges of Pronghorn in the Trans-Pecos Region of Texas

S.K. Canon
Division of Range Animal Science, Sul Ross State University, Alpine, TX 79832
F.C. Bryant*
Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Campus Box 218, Kingsville, TX 78363

ABSTRACT

We determined home ranges of pronghorn (*Antilocapra americana*) over a 3-year period in the Trans-Pecos region of Texas. Male pronghorn consistently had smaller ($P<0.05$) home ranges than females; males ($n=8$) and females ($n=28$) averaged 25.1 ± 4.5 (SD) and 42.4 ± 10.1 km^2, respectively. Drought conditions influenced home ranges of females. In 1990, a year of below average precipitation, home ranges of females ($n=36$) during post-fawning (18 Jun to 20 Aug) were larger ($P<0.05$) than female home ranges ($n=36$) during fawning (15 Apr to 17 Jun), averaging 32.5 ± 14.5 and 17.1 ± 8.3 km^2, respectively. During 1991, a year of above average precipitation, female home ranges were similar ($P>0.05$) between fawning and post-fawning periods. Home ranges of females during the fawning season were similar ($P>0.05$) between 1990 and 1991. However, in 1990 females during the post fawning season had larger ($P<0.05$) home ranges than those in 1991, averaging 32.5 ± 14.5 and 20.4 ± 6.2 km^2, respectively. We concluded that pronghorn in the Trans-Pecos require larger home ranges than pronghorn occurring in more optimal habitats of their geographic range, that females require larger home ranges than males, possibly related to greater nutritional demands, and that monthly precipitation, which affects forage quantity and quality, influences home range size for females, particularly during the post-fawning period.

KEYWORDS: *Antilocapra americana*

Limited information is available on home-range sizes of pronghorn. Studies have been conducted in Wyoming (Amstrup, 1978), Montana (Bayless, 1969; Kitchen, 1974), Idaho (Hoskinson and Tester, 1980; Reynolds, 1984), New Mexico (Sanchez, 1993; Clemente et al., 1995), and Arizona (Wright and deVos, 1986). Although these studies make important contributions toward understanding pronghorn home ranges, differences between geographic regions and environmental conditions make specific comparisons between studies ambiguous. Additionally, widespread use of different home range estimators makes direct comparisons difficult (Boulanger

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and White, 1990), further complicating our understanding of why differences occur.

Although the Trans-Pecos region of Texas is important habitat for pronghorn, no home range estimates are available. Thus, we conducted a 3-year study to examine home ranges of pronghorn. Specifically, our objectives were to quantify and compare home range sizes for adult male and female pronghorn in the Trans-Pecos region of Texas.

MATERIALS AND METHODS

The study was conducted in Hudspeth County, Texas, on the Double U Ranch, which is part of the University of Texas Lands System. Topography ranges from gentle to steep hills on the west side bordering the Hueco Mountains to open flats on the east side. Typical rangeland sites include stony hills, clay flats, gypsum flats, and deep uplands (Correll and Johnston, 1970). Annual precipitation of this semi-arid region is about 30 cm, most occurring during late summer. Annual temperatures range from -18 to 38°C. Important vegetation types are yucca (*Yucca elata*) savannahs, grama (*Bouteloua* spp.) grasslands, and creosote bush (*Larrea tridentata*)-tarbush (*Flourensia cernua*) shrublands. Vegetation communities are further characterized by Canon (1993).

On 5 March 1990, we trapped pronghorn with a corral-type trap and applied mortality-sensing, transmitter collars (3-5 year life expectancy) to 50 females and eight males. Females also were marked with numbered ear tags. We used telemetry to obtain general locations of collared individuals, then made visual observations to determine specific locations. We marked each location on U.S. Geological Survey topographic maps. The entire study area was accessible by vehicles; the open terrain easily permitted identification of marked individuals without disturbance. Locations of animals were recorded randomly as other research activities were being conducted during April-August, 1990-92. We obtained additional locations one or two times per month during September-March, 1990-92. Locations only were taken in the day. However, overall home-range estimates are presumed to include night activity areas, based on our knowledge of marked animals.

We converted locations to Universal Transverse Mercator coordinates for computer analyses. No estimates of triangulation error were computed since collared individuals were visually observed and the exact locations were recorded on maps. Location error could only occur by incorrectly plotting or misreading topographic maps. However, less error is likely using our method than using triangulation of unobserved individuals. We used the 90% harmonic mean estimator (Dixon and Chapman, 1980), based on findings presented in Canon (1993), to generate home-range size estimates using the Microcomputer Program for Analysis of Animal Locations software (MCPAAL; Stuwe and Blohowick, 1985).

We combined 1991 and 1992 data for annual home-range size comparisons between male and female pronghorn, due to reduced observations resulting from radio collar failure (up to 90% by the last year of study) and after preliminary analysis (nine animals with $\geq$25 locations each for 1991 and 1992) indicated annual home-range sizes were similar between years.

We separated the summer into two temporal periods, the fawning season and the post-fawning season. The fawning season extended from two weeks prior to the first known fawn birth date to two weeks following the last known fawn birth date (15

Apr to 17 Jun); the post-fawning season was from the end of the fawning season to the time when fawns readily accompany females at 60-120 days of age (late August). We compared the effects of season on female home-range size for 1990 and 1991 only, since insufficient sample size in 1992 and too few observations negated comparisons between 1991 and 1992 to determine if data from both years could be pooled.

We determined overall (3-year) home-range size estimates using only those pronghorn that survived through the study and had ≥ 100 locations. Estimates for 1990 and 1991-92 included only those animals with ≥ 50 locations for each period. Fawning and post-fawning seasonal estimates included only those females with ≥ 15 locations per season. We used t-tests for comparisons of mean home ranges for sex, season, and year variables.

We estimated monthly precipitation by averaging rainfall records from the two closest weather stations, the El Paso East (8 km west) and Cornudas (30 km north) stations (NOAA, 1990-92). We used X^2 analysis to compare annual precipitation during the study (1990-92) to the long term average (1985-92).

RESULTS AND DISCUSSION

Home range estimates across the 3-year study were determined for eight male and 28 female pronghorn (Table 1). Overall, we found home range sizes in male and female pronghorn averaged 25.1 $\pm$ 4.5 (SD) and 42.4 $\pm$ 10.1 km^2, respectively. With the understanding that different estimators yield different home-range sizes, pronghorn in our study appeared to have larger home ranges than those found in seemingly more optimal habitats. In southeastern Idaho, Reynolds (1984) reported mean home-range size of 16 pronghorn as 11.9 $\pm$ 2.1 (SD) km^2 (minimum area method). Additionally, Hoskinson and Tester (1980) found that pronghorn home-range sizes from different areas in southeastern Idaho and southwestern Montana ranged from 13.4 to 71.4 km^2 (minimum area method), averaging about 20 and 23 km^2 during summer and winter, respectively. However, we report smaller home ranges than that found in Arizona (Wright and deVos, 1986). Wright and deVos (1986) attributed large (41 to 1,213 km^2) home-range sizes of the Sonoran pronghorn (*Antilocapra americana sonoriensis*) to limited forage availability.

For 1990 and 1991-92, six males and 22 females were used for gender comparisons (Table 1). Home range was consistently larger for females than for males. In other studies, males had larger home ranges (Wright and deVos, 1986) or both sexes had similar home ranges (Reynolds, 1984; Clemente et al., 1995). In south-central New Mexico, Sanchez (1993) compared mean home range sizes of two adult male and two adult female pronghorn over a 14-month period (two observations per month). His estimates (minimum convex polygon method) were 16.6 and 11.9 km^2 for males and females, respectively, substantially lower (by 34 and 74%, respectively) than home-range sizes we found. Clemente et al. (1995) found water sources were important in determining home-range locations and likely sizes, in which middle points of home ranges were no farther than 3 km from permanent water. However, permanent livestock water sources on our study area were evenly distributed at about 1 per 2.6 km^2 and inclusion of naturally occurring wetlands would further increase water availability.

In our study, gender differences in home-range size may be related to behavior. Based on the high incidence of fawn predation on the study area (Canon, 1993), predator avoidance and escape strategies may have caused females to move greater distances than males. Additionally, nutritional requirements of females during lactation are presumably greater than at any other time. Although more energy is likely expended as home-range size increases, lactation demands on females may require the expansion of their home ranges to find adequate forage, particularly during periods of below average range conditions.

Table 1. Average home range of adult pronghorn by sex and year variables for 1990-92 on the Double U Study Area, Hudspeth County, Texas.

Year	Sex	n†	Home Range‡	
			$\bar{x}$	SD
			----------km^2----------	
1990	Male	6	25.8a§	6.3
	Female	22	39.2b*	9.5
1991-92¶	Male	6	21.9a	2.5
	Female	22	32.9b*	7.7
All years	Male	8	25.1a	4.5
	Female	28	42.4b	10.1

†Number of pronghorn individuals with ≥50 locations were used in yearly comparisons; those with ≥100 locations were used in "all years" comparisons.
‡Home range estimates were calculated using the 90% harmonic mean estimator.
§Values not followed by a common letter for within year comparisons are different ($P<0.05$). Values followed by * are different ($P<0.05$) between years. Data from "all years" were not tested against other years.
¶Data for 1991 and 1992 were combined.

For comparisons between fawning and post-fawning seasons, 36 and 11 females were used during 1990 and 1991, respectively (Table 2). In 1990, mean home range of females was larger ($P<0.05$) in the post-fawning period than was found for females during the fawning period. The trend was similar in 1991 but the difference was not significant ($P>0.05$). Mean home range during the fawning period was similar ($P>0.05$) both years.

Annual precipitation during 1990-92 (34.6, 44.9, and 32.9 cm, respectively) was higher ($X^2=9.5$, df=2, $P<0.05$) than the long term average (29.4 cm; years 1985-92), of which precipitation in 1991 was substantially higher (86% of generated X^2 value). However, monthly precipitation patterns appeared to be a factor in influencing home-range sizes. Drought conditions from September 1989 through June 1990 (Fig. 1) resulted in less favorable habitat conditions. Also, mean home range in females averaged 6.2 km^2 larger ($P<0.05$) in 1990 than in 1991-92. In 1990, females during the post-fawning season had significantly ($P<0.05$) larger home ranges than those during 1991 (Table 2). However, females during the fawning season in both years exhibited nearly identical home-range sizes (Table 2).

Table 2. Home range comparisons of adult female pronghorn during fawning and post-fawning seasons, 1990-91, on the Double U Study Area, Hudspeth County, Texas.

Year	Season†	n‡	Home Range§	
			$\bar{x}$	SD
			----------km²---------	
1990	Fawning	36	17.1a¶	8.3
	Post-fawning	36	32.5b	14.5
1991	Fawning	11	17.2a	9.5
	Post-fawning	11	20.4a*	6.2

†Fawning season is from 15 Apr to 17 Jun; Post-fawning season is from 18 Jun to 20 Aug.
‡Number of pronghorn with ≥15 locations per season.
§Home range estimates were calculated using the 90% harmonic mean estimator.
¶Values not followed by a common letter for within year comparisons are different ($P<0.05$). Values followed by * are different ($P<0.05$) between years.

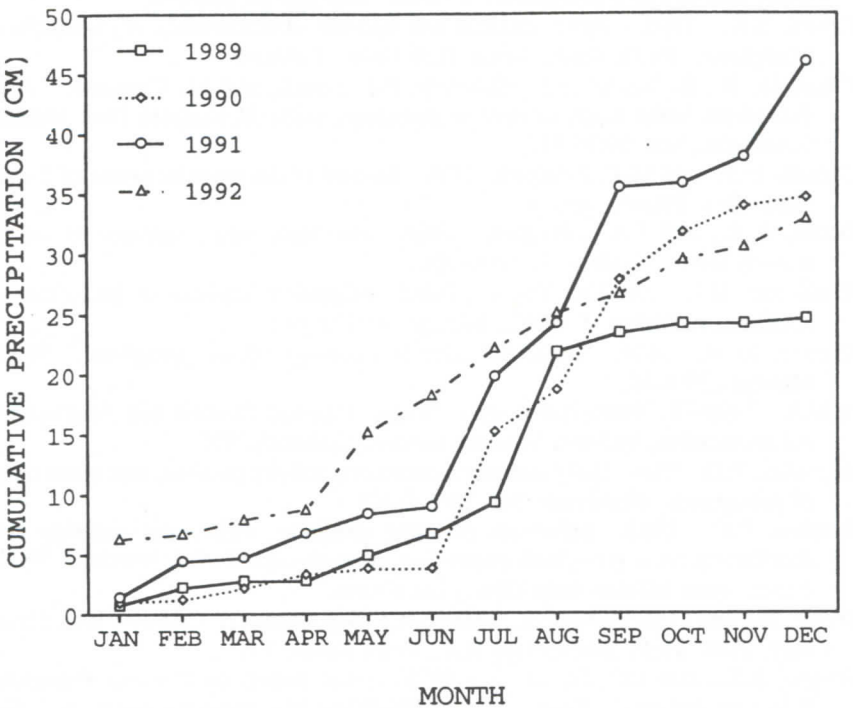

Figure 1. Monthly cumulative precipitation for years 1989-92 on the study area, based on averages from the El Paso East (8 km west) and Cornudas (30 km north) stations.

This suggests that maternal protective instincts may have been the overriding factor affecting sizes of home range during this period, at least until fawns become more mobile. Management strategies must take into account that precipitation rates directly affect forage quantity and quality, which in turn, influences home-range size in pronghorn.

In summary, we found that female pronghorn ranged farther than males. Females during post-fawning had larger home-range sizes than those during fawning, particularly when below average precipitation occurred. Our results suggest that during extended periods of low rainfall, females, particularly during the post-fawning season, must range greater distances to meet their nutritional requirements in the Trans-Pecos region of Texas.

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