Evaluation of Bias in the Proportion of White-tailed Deer Fawns Sighted from Helicopters

Joseph B. Sullivan, *Caesar Kleberg Wildlife Research Institute, Texas A&I University, Kingsville, TX 78363*

Charles A. DeYoung, *Caesar Kleberg Wildlife Research Institute, Texas A&I University, Kingsville, TX 78363*

Samuel L. Beasom, *Caesar Kleberg Wildlife Research Institute, Texas A&I University, Kingsville, TX 78363*

James R. Heffelfinger, *Caesar Kleberg Wildlife Research Institute, Texas A&I University, Kingsville, TX 78363*

Steven P. Coughlin, *Caesar Kleberg Wildlife Research Institute, Texas A&I University, Kingsville, TX 78363*

Mickey W. Hellickson, *Caesar Kleberg Wildlife Research Institute, Texas A&I University, Kingsville, TX 78363*

Abstract: We marked fawns and adult white-tailed deer (*Odocoileus virginianus*) on 2 south Texas areas during 1986–88. Deer sighted on repeated helicopter flights were evaluated to determine if the age ratio of sightings matched the known ratio of marked fawns-to-adults in the populations. There was a trend toward undercounting fawns on each area.

Proc. Annu. Conf. Southeast. Assoc. Fish and Wildl. Agencies 44:202–205

Helicopters are used to gather population data on white-tailed deer in habitats with relatively low and open woody cover (DeYoung 1985, Bartmann et al. 1986, Beasom et al. 1986). Whereas density estimates from helicopters are conservative (DeYoung et al. 1989*a*, White et al. 1989), Leon et. al. (1987) found no age or sex bias in adult deer encountered from helicopters. This finding was of considerable value in assessing sex ratios and other estimates of population composition made from helicopters. Although adult deer may be encountered at random, classifications of them by observers may be biased. For example, DeYoung et al. (1989*b*) found that on some flights, observers were biased in classifying males into groups ($\leq$3.5 versus $\geq$4.5 years old.

The proportion of fawns surviving to fall is frequently used to index recruitment

(Brothers and Ray 1975:63). However, no evaluation has been made of bias in the proportion of fawns sighted during helicopter surveys. Our objective was to compare the frequency of sightings of marked fawns versus marked older deer on 2 south Texas study areas to test the null hypothesis that the proportion of fawns sighted was unbiased.

The Neva and Wesley West Foundation, P. H. Welder, the Rob and Bessie Welder Wildlife Foundation (Contrib. No. 365), and the Caesar Kleberg Foundation for Wildlife Conservation funded the study. We thank the many people who aided in capturing, marking, and counting deer.

Methods

The south Texas study sites were an 8,500-ha portion of the Faith Ranch 40 km southwest of Carrizo Springs and a 6,500-ha portion of the Camaron Ranch 45 km southwest of Freer. Study areas were dominated by thorn-scrub brush generally <3 m high with about 50% canopy coverage.

On the Camaron Ranch, deer (4 fawns, 56 adults in 1986; 9 fawns, 19 adults in 1987; 12 fawns, 30 adults in 1988) were captured in September or October using a helicopter and drive net (Beasom et al. 1980, DeYoung 1988). Corresponding samples on the Faith Ranch were 12 fawns, 49 adults; 12 fawns, 32 adults; and 7 fawns, 14 adults for 1986, 1987, and 1988, respectively.

All deer received radio-transmitter collars wrapped with patterns of white, gray, red, orange, blue, or black tape for individual recognition. Each adult deer additionally received a colored cattle tag in each ear. Most fawns received ear tags (76%), but some did not (24%) because they were judged too small. The ear tags supplemented the collars in providing individual recognition. After marking, deer were released at the capture site.

Marked deer were individually identified when encountered during 4 or 5 complete-coverage helicopter surveys (DeYoung 1985) on each study area each year. Flight speed was about 56 km/hour and altitude about 23 m. Flights were conducted after deer had been marked each year and were done during October or early November. Two observers tallied deer, and the pilot sometimes pointed out deer that otherwise would have been overlooked. When a marked deer was encountered, the pilot left the transect line and flew close enough to the animal for the observers to read the markers. Only deer freshly marked in the same year as the helicopter flight were considered in the study. Marked deer surviving from previous years were disregarded when encountered because their markers were occasionally difficult to read. In cases of repeat sightings of the same individual on the same flight, only 1 sighting was counted for this study.

To help ensure that marked deer were actually available to be counted on the study areas (which were not surrounded by deer-proof fencing) we used telemetry from a fixed-wing airplane. Every 2–4 weeks during the 3-year study, the airplane was flown slowly around the boundary of each study area to determine whether each radio-collared deer was alive and in or out of the study area. Deer that were

determined to be in the study area >50 % of the telemetry flights were included in the study. This resulted in the exclusion of 8 deer (all adults) from the Camaron Ranch and 14 deer (2 fawns, 12 adults) from the Faith Ranch.

Chi-square goodness-of-fit tests with continuity corrections were used to evaluate null hypotheses that the proportion of fawns in the marked deer available equaled the proportion of fawns in the marked deer sightings. Data for the 4 or 5 flights on each study area each year were pooled because sightings of marked deer were low for individual flights. Thus, we conducted 1 Chi-square test/study area/year. We also conducted Chi-square tests for the data pooled by ranch, pooled across the entire study, and for ear-tagged fawns versus fawns without ear tags.

Results and Discussion

The proportions of marked fawns sighted on helicopter surveys were generally lower than the proportions in the marked populations (Table 1). The proportion of fawns differed from expected on the Camaron Ranch in 1987 ($P = 0.031$) and on the Faith Ranch in 1986 ($P = 0.011$). The pooled data revealed that the proportion of fawns did not differ from expected on the Camaron ($P = 0.066$) or Faith ($P = 0.238$). Nevertheless, the proportion of fawns differed from expected ($P = 0.040$) when the data were pooled across ranches and years.

Table 1. Individually marked fawns and older deer present in the population compared to resightings of marked individuals during helicopter surveys, Camaron and Faith ranches, south Texas, 1986–1988.

Area and Year	Animal type	Marked animals present		Marked animals sighted		
		Number	Proportion	Number	Proportion	χ^2
Cameron						
1986	Fawn	4	0.07	4	0.05	
	Older	55	0.93	82	0.95	0.62
1987	Fawn	9	0.35	1	0.07	
	Older	17	0.65	13	0.93	4.67
1988	Fawn	12	0.32	17	0.32	
	Older	25	0.68	35	0.68	0.00
1986–88	Fawn	25	0.20	22	0.14	
	Older	97	0.80	130	0.86	3.38
Faith						
1986	Fawn	11	0.21	4	0.07	
	Older	42	0.79	53	0.93	6.54
1987	Fawn	11	0.27	20	0.31	
	Older	30	0.73	44	0.69	0.64
1988	Fawn	7	0.37	7	0.29	
	Older	12	0.63	17	0.71	0.61
1986–88	Fawn	29	0.26	31	0.21	
	Older	84	0.74	114	0.79	1.40
Both	Fawn	54	0.23	53	0.18	
	Older	181	0.77	244	0.82	4.42

A possible reason for undercounting fawns versus older deer could be that some of the fawns did not receive ear tags, whereas all adults did. Thus, fawns without ear tags could have been less visible. However, the proportion of tagged and untagged fawns sighted did not differ on the Camaron ($P = 0.805$), Faith ($P = 0.523$), or in the pooled data from both ranches ($P = 0.808$).

Another obvious reason for undercounting fawns is their smaller size relative to older deer. Although no evaluations were done, we believe that we usually saw the deer (all were running) before seeing the markers on the animal. Therefore, if one must see the deer before sighting the marker, it is reasonable to expect that smaller deer would be more likely overlooked.

Most managers make only a single helicopter flight each year rather than the repeated flights we conducted. Thus, it would be best to evaluate the data on an individual-flight basis. However, we judged that sample sizes of marked deer sighted were too small to evaluate by individual flight. Nonetheless, this study has demonstrated that there is a trend toward undercounting fawns in fall flights such as we conducted. Thus managers should assume that they are obtaining a biased count of fawns.

Literature Cited

Bartmann, R. M., G. C. White, L. H. Carpenter, and R. A. Garrott. 1986. Accuracy of helicopter counts of mule deer in pinyon-juniper woodland. Wildl. Soc. Bul. 14:356–363.

Beasom, S. L., W. Evans, and L. Temple. 1980. The drive net for capturing western big game. J. Wildl. Manage. 44:478–480.

———, F. G. Leon III, and D. R. Synatzske. 1986. Accuracy and precision of counting white-tailed deer with helicopters at different sampling intensities. Wildl. Soc. Bul. 14:364–368.

Brothers, A. and M. E. Ray, Jr. 1975. Producing quality whitetails. Fiesta Publ. Co., Laredo, Texas. 244pp.

DeYoung, C. A. 1985. Accuracy of helicopter surveys of deer in south Texas. Wildl. Soc. Bul. 13:146–149.

———. 1988. Comparison of net-gun and drive-net capture for white-tailed deer. Wildl. Soc. Bul. 16:318–320.

———, F. S. Guthery, S. L. Beasom, S. P. Coughlin, and J. R. Heffelfinger. 1989*a*. Improving estimates of white-tailed deer abundance from helicopter surveys. Wildl. Soc. Bul. 17:275–279.

———, J. R. Heffelfinger, S. L. Beasom, and S. P. Coughlin. 1989*b*. Classifying male white-tailed deer from a helicopter. Proc. Annu. Conf. Southeast. Assoc. Fish and Wildl. Agencies 43: 292–296.

Leon, F. G. III, C. A. DeYoung, and S. L. Beasom. 1987. Bias in age and sex composition of white-tailed deer observed from helicopters. Wildl. Soc. Bul. 15:426–429.

White, G. C., R. M. Bartmann, L. H. Carpenter, and R. A. Garrott. 1989. Evaluation of aerial line transects for estimating mule deer densities. J. Wildl. Manage. 53:625–635.