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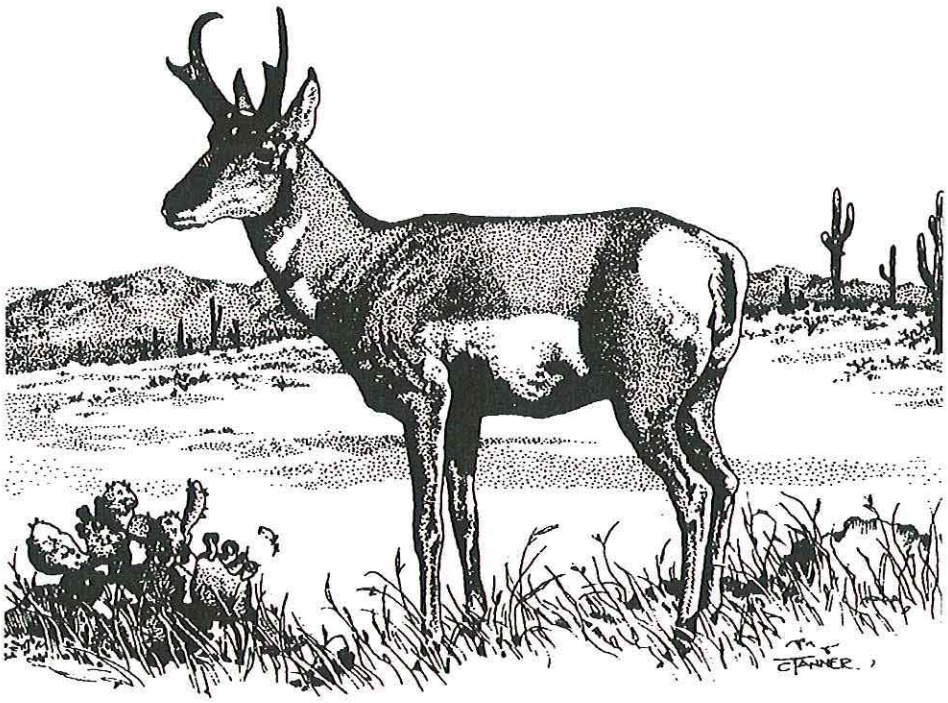
SONORAN PRONGHORN
2004 MEXICO AERIAL SURVEY SUMMARY

Jill L. Bright, Wildlife Specialist
John J. Hervert, Wildlife Program Manager

Region IV, Field Operations Division
Arizona Game and Fish Department



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INTRODUCTION

In Mexico, Sonoran pronghorn (*Antilocapra americana sonoriensis*) historically ranged from the U.S. border south to Kino Bay, and from eastern Baja California, west to near Highway 15. In 1925, Ben Tinker, representing the Permanent Wild Life Protection Fund along the Sonora-Arizona border, counted 595 pronghorn in Sonora (Carr 1974). The Mexican population was estimated between 200-350 in 1981, based on surveys from 1969-1978 (AGFD 1981). The distribution of pronghorn was substantially smaller than reported earlier, and included the areas in and around the Reserva de la Biosfera El Pinacate y Gran Desierto de Altar (El Pinacate), southeast to just north of the road from Caborca to Desemboque. A small, detached population was also found south of this road. Nothing remained of the numerous pronghorn that previously occurred in the Puerto Libertad, Kino Bay and Hermosillo areas (AGFD 1981).

One of the goals of the Sonoran Pronghorn Recovery Team is to monitor the number of pronghorn in Mexico. The first systematic aerial survey was conducted in 1993, and yielded an estimate of 313 pronghorn (Snow 1994). A biennial survey, coinciding with the U.S. range wide survey has taken place since 2000. This survey resulted in a population estimate of 346 in 2000 (Bright and others 2001*a*) and 285 in 2002 (Bright and others 2003). This report summarizes the 2004 survey.

STUDY AREA

Suitable habitat within the current known range of Sonoran pronghorn in Mexico was surveyed. This area was bounded by Highway 2 to the north, the agricultural areas and Highway 37 on the south, the Desierto del Altar in the west and southwest and unsuitable brushy habitat on the east. This area is bisected by Highway 8, effectively separating the pronghorn into two areas (Fig. 1).

West of Highway 8, pronghorn inhabit the area including El Pinacate. Pronghorn inhabit the extensive sand flats and volcanic cinder flats, as well as the loose soil patches interspersed within the lava fields in El Pinacate. Semi-stabilized dunes or medanos,

common in the area on the east side of Highway 8, are recognized as preferred Sonoran pronghorn habitat in Sonora (Castillo 1999). Vegetation is typical of the Sonoran Desert and includes creosotebush (*Larrea tridentata*), bursage (*Ambrosia spp.*), saguaro cactus (*Carnegiea gigantea*), paloverde (*Parkinsonia spp.*), and chollas (*Opuntia spp.).*

Human impacts that have modified the habitat within the range of Sonoran pronghorn in Mexico include small settlements, ranches, cattle grazing and a large mining operation.

METHODS

We used the same methods as previous surveys (Bright and others 2003, 2001*a*). Aerial line transects (Johnson and others 1991) were designed to cover areas of suitable habitat within the known range of pronghorn in Mexico. We partitioned the survey area into blocks that could be flown in a systematic north/south fashion in 2 to 3 hours. Block boundaries were typically lines of latitude or longitude, or mountain ranges, roads or railroads and were delineated on 1:250,000 maps. Using a Global Positioning System, transects were flown every half degree of longitude, or approximately 0.5 miles apart. Observers were located in the right front and left rear seats of each plane. Surveys were conducted early in the morning and in late afternoon to take advantage of optimal light. Flights were flown at an altitude of 200 feet (61 m) above ground level using a radar altimeter and at a speed of 80 knots.

Group size and location were recorded for each observation. Behavior and direction of movement were also documented to aid in eliminating duplicate observations. Group composition was also recorded, if possible, without disturbing the pronghorn.

Population size and 95% confidence intervals were estimated using the sighting probability model (Samuel and Pollock 1981) previously developed for Sonoran pronghorn (Bright and others 2001*b*). This method is based on the probability of seeing different sized groups.

RESULTS

The survey was originally scheduled for December 17 – 20, 2004. During this time, all blocks east of Highway 8 were surveyed (n = 15). However, delays for wind and other time constraints prevented us from surveying the El Pinacate area. This area was surveyed February 7 – 9, 2005 (n = 9 blocks).

We observed 469 pronghorn comprising 85 groups on the survey ($\bar{x}$ group size = 5.5 ± 4.78 SD, Table 1). The largest group was 26 animals, and was seen on the east side of the highway; several single pronghorn were also seen. Pronghorn were seen in 15 blocks (Figure 1). The majority of the pronghorn were seen in the area east of Highway 8, where we observed 439 pronghorn in 74 groups ($\bar{x}$ group size = 5.9 ± 4.93 SD). West of

Highway 8 (including El Pinacate), we observed 30 pronghorn in 11 groups ($\bar{x}$ group size = 2.7 ± 2.05 SD).

Applying the sighting probability model and associated correction factors, our estimate of the total population was 684 (95% CI = 487 – 2251). In the area east of Highway 8, the population estimate was 624 (454 - 2079). West of the highway, the population was estimated at 59 (32 – 171) pronghorn.

Table 1. Number of Sonoran pronghorn and number of groups seen, 2004 Mexico survey.

Pinacate Area			East of Highway 8		
Block	No. Pronghorn	No. Groups	Block	No. Pronghorn	No. Groups
32	5	1	34	70	13
45	1	1	48	0	0
46	9	5	53	13	1
44	10	2	40	11	1
43	0	0	36	35	10
41	0	0	37	37	10
56	0	0	31	144	21
33	1	1	35	85	14
42	4	1	54	0	0
			39	0	0
			38	0	0
			47	26	2
			57	0	0
			58	18	2
			59	0	0
Subtotal	**30**	**11**		**439**	**74**
Totals	**469**	**85**			

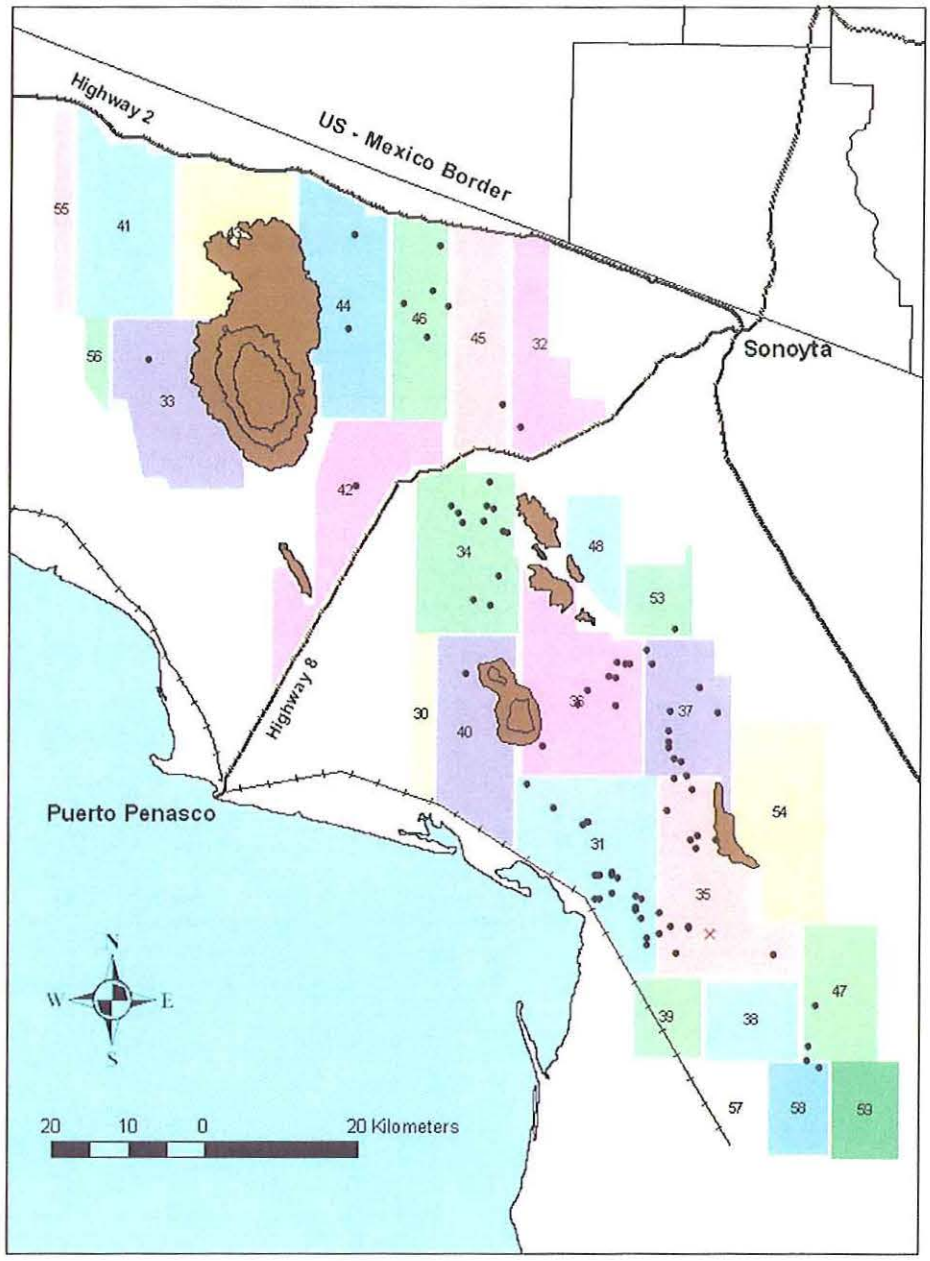

Figure 1. Map of survey blocks and pronghorn groups seen.

DISCUSSION

We use the number of animals observed on transects and the estimated population size to determine the population trend. We are confident the number of animals observed along our standardized flight routes yield defensible population trends for management purposes. The Sonoran pronghorn population in Mexico more than doubled from 2002 to 2004 as evidenced by both the numbers seen on transects and our estimates from each survey (Table 2).

Table 2. Comparison of Sonoran pronghorn surveys in Mexico (1993, 2000 and 2002).

	No. of Pronghorn Seen	No. of Groups Seen	Average Group Size	Population Estimate (95% CI)
Total Survey				
2004	469	85	5.5	684 (487 – 2251)
2002	216	33	6.5	285 (236 – 369)
2000	266	38	7.0	346 (288 – 445)
1993[1]	214	66		414 (317 – 644)
Pinacate Area				
2004[2]	30	11	2.7	59 (32 – 171)
2002	19	4	4.7	25 (21– 33)
2000	17	5	3.4	34 (27 – 48)
1993[1]	51	21		124 (91 – 211)
East of Highway 85				
2004	439	74	5.9	624 (454 – 2079)
2002	197	29	6.8	260 (216 – 335)
2000	249	33	7.5	311 (261 – 397)
1993[1]	163	45		289 (226 – 432)

[1] Survey took place in March.
[2] Survey took place in February 2005.

The subpopulation on the west side of Highway 8, in the area encompassing El Pinacate, increased from an estimate of 25 in 2002 to 59 in 2004. This increase, although substantial, was not statistically significant. This subpopulation is still at a low population level. For pronghorn, the minimum viable population is speculated to be 50 breeding adults (Reed and others 1986, Scott 1990). Populations that drop below minimum viable levels could experience a loss of genetic diversity through inbreeding (Reed and others 1986), lower male viability and reduced female fertility (Samson and others 1985), higher fawn mortality, and may be more greatly influenced by severe weather, disease or random catastrophic events (Reed and others 1986). Efforts to enhance the habitat and aid in the long-term survival of this subpopulation should be investigated.

The estimate for the east side of the highway rose from 260 in 2002 to 624 in 2004, which was a statistically significant increase. This subpopulation appears to be in much better shape than the Pinacate herd. The estimated population size can be useful to managers when ascertaining the impacts of translocation of pronghorn to augment other populations or for captive breeding programs, in either Sonora or Arizona.

Due to a lack of monitoring between the 2 surveys in Mexico, variables such as recruitment and mortality, habitat and weather conditions are unknown. Without data, the causes of any population changes can only be speculated. We suspect good rainfall allowed the population to increase. The U.S. population also increased substantially between 2002 and 2004 (Bright and Hervert 2005).

Conclusions and Recommendations

The current range of Sonoran pronghorn in Mexico is effectively divided by Highway 8 into two areas; the Pinacate region west of the highway and the area east of the highway. Pronghorn in Mexico declined from 2000 to 2002 and then increased in 2004. However, the Pinacate herd's current population estimate of 59 animals is low ((Reed and others 1986, Scott 1990). Maintenance of these 2 populations of Sonoran pronghorn greatly influences the subspecies chances of recovery.

In order to effectively assess the populations in Mexico, data on recruitment, mortality, habitat use and other parameters are necessary. Based on this survey and through cooperation between the U.S. and Mexico, we recommend the following actions:

- Complete another survey in Mexico within the next 2 years to document changes in population numbers;
- Capture up to 5 adult animals from the large population east of Highway 85 for the captive breeding pen in the United States to increase genetic variability in the pen;

- Obtain data on population parameters such as fawn recruitment. Radio collar pronghorn to obtain data on mortality, movement patterns and habitat preferences in order to define strategies of protection and conservation;
- Conduct vegetation studies in the area of Sonoran pronghorn, to determine diet preferences, nutritional quality and food availability;
- Conduct studies of water availability;
- Investigate limiting factors in the Pinacate area and then determine if translocation from the larger herd east of the highway or captive breeding strategies are appropriate;
- Implement an exhaustive campaign of education in the rural communities of the region where Sonoran pronghorn occur and publish material on the importance of the subspecies;
- Continue coordinating recovery efforts and research needs with the Recovery Team, and participate in meetings and training, to ensure concentrated strategies of conservation and protection and interchange of ideas and methodologies.

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