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Monitoring a Pronghorn (*Antilocapra americana mexicana*) Population Reintroduced to the North-East of Mexico

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Abstract

The pronghorn (*Antilocapra americana mexicana*), an endemic ruminant species of North America is classified as an endangered species. This study covering three years (1995-1998) was conducted to evaluate the factors determining the success of the re-introduction of pronghorn in the Mexican state of Coahuila. Vegetation characteristics, botanical composition of the pronghorn diet and birth and mortality rates were monitored. One hundred and seventeen vegetation species belonging to 32 different species were identified. Greatest diversity was obtained in the natural grass community (0.77), followed by halophyte grass community (0.74) and rosetophyll shrubs (0.53). Fifty-nine vegetation species were identified in the pronghorn diet and the poisonous plants: *Solanum rostratum* and *Solanum eleagnifolium* were determined in the pronghorn diet all-year round, though percentages consumed varied with season (0.96 % in wet season versus 11.2 % in dry season). Of the total diet consumed by the pronghorns, forbs ranked highest (75 %) while grasses and shrubs were consumed in almost similar quantities (12.5 % of each). Births averaged 0.17 ± 0.075 and 4 and 3 deaths were recorded in 1996 and 1998, respectively. Competition with cattle for grazing would occur under drought conditions. It is concluded that the pronghorn will continue to be endangered despite these translocation programmes. Further studies to evaluate supplementation strategies during critical times, to promote forb development and the dynamics of interaction with other ruminant animal species in the same rangeland, are necessary.

1 Introduction

The pronghorn (*Antilocapra americana mexicana*) is an endemic ruminant species of North America (Treviño, 1978) and is classified as endangered in Mexico (SEMARNAP, 1997). Additionally, this animal species is now included in Appendix 1 of the CITES

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(Convention on International Trade in Endangered Species of Wild Fauna and Flora) (FISH AND WILDLIFE SERVICE, 1992).

The population of pronghorn in Mexico has declined by more than 99 % of its original number. The main reasons for this decline are habitat deterioration and destruction, overgrazing, poaching and the fencing of ranches thus hindering their migratory routes. Fences not only have contributed to the reduction of the population, but also represent an obstacle to future increases in this species (O´GARA AND YOAKUM, 1992).

Because of the extension in the pronghorn's former habitat, the current status of its population and its potential to generate income through hunting fees, it was found necessary to implement programs for the reestablishment of the species. The translocation of animals is a first important step in this program. In 145 reintroduction programs of different wildlife species conducted, only 11.6 % have been successful (BECK et al., 1994). The successful programs have always had a monitoring component after the release of the animals.

In the northeast of Mexico (Figure 1) two reintroduction programs of pronghorns were carried out in the years 1995 and 1998. A total of 70 and 86 pronghorns were respectively introduced during the two periods. These animals released into this area were from New Mexico, U.S.A. The present study was carried out over three years to evaluate the adaptation of the animals released to this site. Death and birth occurrences were recorded. In addition, habitat studies and the determination of botanical composition of the diet were also conducted.

The objective of the study was to evaluate the factors determining the success of reintroduction of pronghorns in the Mexican state of Coahuila. This was evaluated through assessments of :

1. vegetation characteristics in the area,
2. botanical composition of the pronghorn diet and
3. births and mortality rates.

2 Methodology

The study was conducted in the Mexican state of Coahuila situated between 102° 15´ and 102° 37´ West and 28° 15´ and the 28° 33´ North. The area extends some 1 126.61 km^2 (Figure 1).

According to the climatic classification of Garcia (1973), the area corresponds to the dry temperate and dry semiarid climatic region with rains in summer. The annual mean temperature fluctuates between 16°C to 18°C, and the mean annual rainfall is 400 mm.

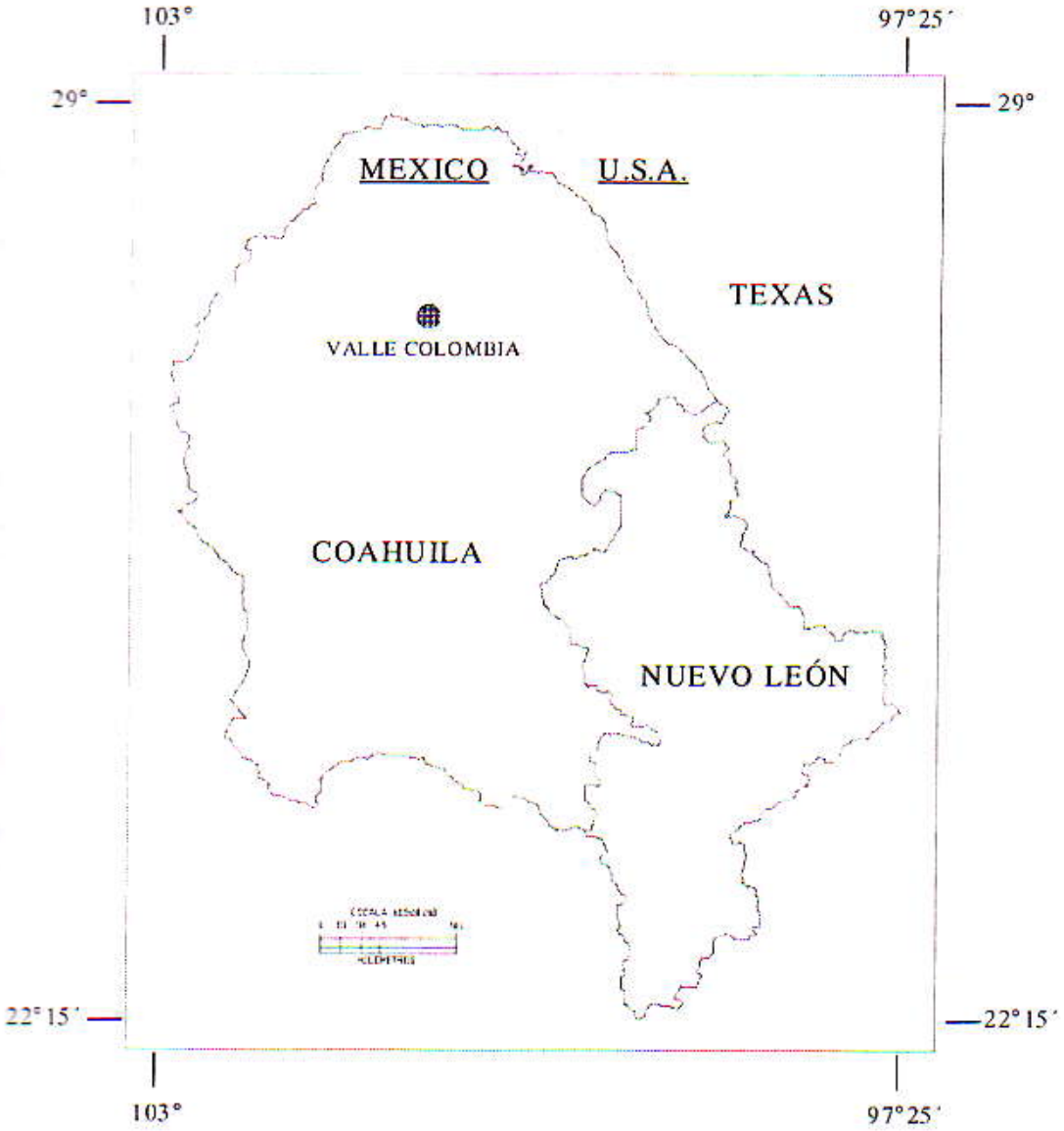


Figure 1: Location of the study area in Coahuila, Mexico

The area is typically represented by three vegetation types: In the lowest section of the valley, grasses dominate the vegetation. In the surrounding mountain ranges bush species are more common, with the area in-between consisting of a gradation variation of grasses and bush species. The mountains elevation fluctuates between 600 and 2 400 meters above sea level (asl) at the peak. The most important potential predators of the pronghorn in the area are coyotes (*Canis latrans*), mountain lions (*Puma conclor*), bobcats (*Lynx rufus*) and black bears (*Ursus americanus*). Other important wildlife species present in the area are mule deers (*Odocoileus hemionus*), white-tailed deers (*Odocoileus virginianus*), collared peccary (*Tayassu tajacu*) and foxes (*Vulpes macrotis*) (MIRANDA AND MARTÍNEZ, 1998).

The economy of the area is based on mining and cattle ranching. The release-area had been devoted to cattle ranching in the last several decades.

Three points were randomly selected in each of the three vegetation types present in the study area. Within points, two kilometers long by 50 meters board transects were established in each of the nine points selected. Each transect was split into 20 sections of 100 meters. In these sections, plots of 25 square meters for the analyses of the bush vegetation were established. In each vegetation's plots, circular plots each with a radius of 30 centimeters were established in order to analyze for forbs and grasses. The number of necessary transects and plots were determined using the equation recommended by Bonham (1989):

$$n = \frac{(t^2)(s^2)}{(\bar{x} - \mu)^2}$$

where n = the number of necessary plots, t, value to tabulate for the Student's t, s^2, variance $\bar{x}$, the mean of the sampled population and μ is the population mean. The number was also corroborated using the minimal area sampling method (Franco et al., 1991). Cover, frequency and dominance were determined. Vegetation species richness was determined using the Simpson Index method (Simpson, 1949):

$$D = \sum_{i=1}^{s} \left\{ \frac{n_i(n_i - 1)}{N(N-1)} \right\}$$

Where D is the diversity index, N is the total number of individuals of all species in the sample, n is the number of individual species i and s is the number of species in the sample. The index varies from 0, for a community in which all individuals belong to the same species, to 1, for a community in which each individual belongs to a different species.

In each season, faecal samples were collected in order to determine the botanical composition using the microhistological analysis method of Peña and Habib (1980). Because fecal samples of pronghorn can be confused with those of white-tailed deer or mule deer, pH determination of the samples according to Murie (1982) and Dietrich et al. (1990) were done in order to identify the pronghorn faecal samples.

From 70 of the pronghorns translocated in 1995, four female pronghorns were equipped with radio collars. The animals were monitored using radio telemetry. Sexes and age groups, births, deaths and general behavior were recorded through observation.

3 Results

One hundred and seventeen vegetation species belonging to 32 different families were identified. The greatest diversity was determined in the natural grass community (0.77) and in the halophyte grass community (0.74). The rosetophyll shrubs presented the lowest diversity (0.53). Fifty-nine vegetation species were identified in the pronghorn

diet. The poisonous plants: *Solanum rostratum* and *Solanum eleagnifolium* were determined in the pronghorn diet all-year around. Percentages of the poisonous plants consumed fluctuated from 0.96 % to 11.2 % in the dry season. In the halophyte grass community, the relative frequency of these species was 65 %, while in the shrub community this was 5 %. In the other vegetation communities, these poisonous species were not present. The average percentage of the diet composition of the pronghorn diet all-year round is shown in Table 1.

The values for cover of the different vegetation communities are presented in Table 2. For the total cover, the types of vegetation could be ranked as rosetophyllus scrubland > microphyllous scrubland > halophyte grassland > natural grassland.

The average pH value of the 118 collected faecal samples was 7.96 ± 0.23. Figure 2 represents the proportion of forbs, grasses and shrubs consumed by the pronghorns in the study area. Forbs ranked highest averaging 70 % while grasses and shrubs were almost eaten in equal quantities (12.5 % of each). The most common forbs species were *Mallow neglecta*, *Croton* sp., *Hyminoxis scaposa*, *Dalea nana*, *Acalipha* sp., *Solanum rostratum* and *Cesquerella gracilis*. The most important shrubs were *Calliandra conferta*, *Dalea greggii* and *Cirsium ochrocentrum*. The dominant grasses were *Bouteloa* sp. and *Muhlenbergia* sp.

The pronghorn groups were always observed in the areas dominated by grasses. They were in groups until June, when the births started. The births extended till late August.

Fifty-three births were registered during the study. The reproductive rate determined in 1995 for 48 females was 0.25. In 1996 and in 1998 the reproductive rate was 0.16 and 0.10, respectively. Four deaths were registered in 1996 and three in 1998. No indications of predation were determined.

Table 1. Average percentage composition of the pronghorn diet year around in northeastern mexico.

SPECIES	COMPOSITION (%)
SHRUBS	
Acacia wrighttii	0.61
Berberis trifoliolata	0.19
Calliandra conferta	2.55
Condalia spatulata	0.87
Cirsium ochrocentrum	1.54
Dalea greggii	2.11
Eysenhardtia polistachya	0.35
Fraxinus greggii	0.78
Leucophyllum texanum	0.97
Opuntia sp.	1.16
TOTAL	**11.14**

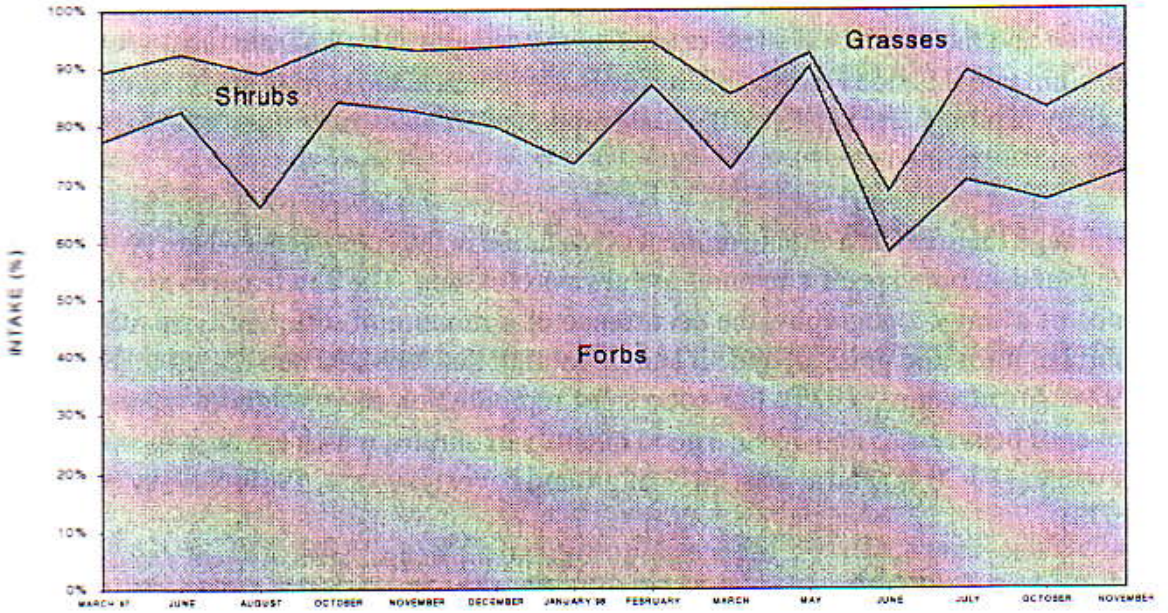
Table 1. -Continued

SPECIES	COMPOSITION (%)
GRASSES	
Bouteloua barbata	3.28
Bouteloua curtipendula	0.49
Bouteloua gracilis	1.05
Bouteloua sp.	1.54
Digitaria californica	0.14
Erioneuron pulchellum	0.00
Muhlenbergia sp.	1.53
TOTAL	**8.03**
FORBS	
Acalipha sp.	4.06
Ambrosia sp.	0.84
Bahia absintifolia	0.67
Cesquerella gracilis	3.83
Croton pottsii	2.00
Croton sp.	7.31
Crypthanta micrantha	0.59
Cheilanthes tomentosa	1.97
Dalea nana	4.45
Dichondra argentea	1.68
Dalea pogonathera	0.14
Euphorbia sp.	0.45
Gailardia multiceps	3.09
Gaura sp.	1.31
Heteroteca sp.	0.31
Hoffmanseggia glauca	0.62
Hyminoxis linearifolia	1.93
Hyminoxis scaposa	5.61
Ibervillea termisecta	0.82
Leucteno sp.	1.31
Malva neglecta	16.66
Notholaena sinnuatha	0.47
Physalis viscosa	0.80
Portulaca mundula	0.80
Psilostrophe gnaphalodes	2.28
Psilostrophe tagetiana	0.52
Ratibidia columnaris	1.00
Ruellia nudiflora	1.55
Sida neomexicana	3.12
Solanum eleagnifolium	1.39
Solanum rostratum	3.84
Sphaeralcea coccinea	2.52
Teucrium cubense	0.44
Teucrium sp.	0.85
Verbena bracteata	0.63
Verbena neomexicana	0.84
Verbesina sp.	0.13
TOTAL	**80.83**

Table 2: Average percentage of cover for the different vegetation types in the Coahuila region of Mexico

Vegetation type	Percentage of forbs cover	Percentage of bush cover	Total percentage cover
Natural grassland	0.66	11.48	12.14
Halophyte grassland	3.57	17.99	21.56
Rosetophyllous scrubland	0.72	32.06	32.78
Microphyllous scrubland	0.22	31.26	31.48

Figure 2: Monthly variation in proportion of forbs, grasses and shrubs consumed by pronghorn in North-eastern Mexico region of Coahuila



4 Discussion and conclusions

A former study carried out in different areas of the Chihuahuan Desert, Mexico, established that the populations of the desert mule deer were the highest in the area where the pronghorn were translocated (13.3 deer km^{-2}). It was also observed in the same study that the range in the area was in the best condition across the different points evaluated (MARTÍNEZ, 1997). Uvalle (1998) determined however for the same area that the condition of the range was at risk and the trend was downwards. The high occurrence of the poisonous plants *Solanum rostratum* and *Solanum eleagnifolium* in the range as well as in the pronghorns' diet confirm this observation. The presence of these species in the rangeland is usually an indicator of a poor condition of the range.

In different studies carried out in the United States with different pronghorn populations, the birth rate has always been positively related to rainfall (TREVIÑO, 1978). In 1998, an extreme drought occurred in the study area. Cattle were forced to visit the shrub communities in order to get some green forage. It is highly probable that the drought af-

fected the reproductive rate of the pronghorn population. In a range in good condition cattle do not compete with pronghorn, since cattle eat generally grasses while pronghorns depend on mostly forbs and bushes. However when the nutritional resources are limited, competition could be an important factor between these two species (BOLEN AND ROBINSON, 1995).

Hailey et al. (1966) studied the adaptation of a translocated pronghorn population in Texas. An extreme drought and the overgrazing of cattle forced the antelopes to consume a high proportion of shrubs in their diets. One of these shrubs was *Fluorencia cernua*, which is a poisonous species. 83 % of the dead animals showed typical *F. cernua* injuries. Additionally, 3 of 4 pregnant females showed foetal absorption. The failure of the translocation was attributed to the toxicity problem related to the consumption of *F. cernua* and the nutritional stress caused by the drought. Results from the present study are similar to this study carried out in Texas. However, in the current study, symptoms of toxicity in pronghorns related to the consumption of *Solanum rostratum* or S. *elagnifolium* were not examined.

Although there exists a certain amount of variation in the ecosystems where pronghorns are found, certain specific features are always common. The key features are the existence of a wavy topography, the occurrence of a mixture of different types of forages (shrubs, forbs and grasses) and an annual rainfall between 230 and 350 mm (YOAKUM, 1974; AUTHENRIETH, 1978). For successful reproduction the pronghorn needs a forbs cover of between 25 and 30 %, a good quantity of shrubs, which are an important food in winter (10-20 %) and at least 50 % of ground cover (BAYLESS, 1969; SUNDSTROM et al., 1973).

The different groups of pronghorns were always observed in the natural grass community and in the halophyte grass community. In these areas the aerial cover was 12.3 % and 21.5 % respectively.

In order to facilitate the movements of the antelope groups, the ranchers have increased the height of the lowest strand of the fences to an approximate height of 40 cm. The concentrations of tracks in these areas demonstrate its efficiency.

The reproductive rate of the pronghorn as determined in the present study is considered low. Translocation in this case was therefore not successful. The drought period and the condition of the rangeland might have caused nutritional stress. This is confirmed by the high occurrence and consumption of the Solanum species. However it is possible that other causes like predation through coyotes or mountain lions could have been responsible for the situation.

5 Recommendations

It is necessary to define the nutritional quality of the pronghorn diet in the study area. These studies should focus on the determination of the quality of the diet, especially the energy and protein concentration during the different periods of the year.

It is also necessary to implement range management practices that promote higher presence of forbs. The use of fire, as well as the use of mechanical treatments like acreador is recommended. The construction of boards in order to promote the retention of water can also be a viable alternative.

The supplementation strategies of the pronghorns during the most critical times should be investigated in order to alleviate the nutritional stress to the animals. Further studies on the determination of carrying capacity of the range for cattle, deer and antelope should be carried out. A reduction of the current grazing pressure of cattle and deer in the area is recommended and the management plan of the area should include all possible interaction effects among the different species of animals that utilize the vegetation in the area.

Zur Wiedereingliederung der Gabelantilope (*Antilocarpra americana mexicana*) im Nordosten von Mexiko

Zusammenfassung

Die Pronghorn Antilope, auch Gabelantilope genannt (*Antilocarpra americana mexicana*), ist ein in Nordamerika beheimateter Wiederkäuer und in seiner Art bedroht. Die vorliegende Untersuchung, die sich über einen dreijährigen Zeitraum (1996 - 1998) erstreckte, wurde durchgeführt, um zu evaluieren, ob die Wiedereingliederung der oben näher bezeichneten Antilopenart in Coahuila / Mexico erfolgreich war. Besonderheiten der Vegetation, botanische Zusammensetzung der Pronghorn-Diät sowie die Geburtsrate und Kälbersterblichkeit wurde ermittelt. Einhundertundsiebzehn Pflanzenarten, die zu 32 verschiedenen Spezies gehören, wurden identifiziert. Neunundfünfzig Pflanzenarten wurden bestimmt als Futterpflanzen für Pronghorn Antilopen und es wurde festgestellt, daß die Giftpflanzen *Solanum rostratum* und *Solanum eleagnifolium* das ganze Jahr über Bestandteil der Futterration dieser Gabelantilope sind, wobei der Anteil dieser Komponenten im Jahresablauf unterschiedlich ist (in der Regenzeit zu 0,96% und in der Trockenzeit zu 11,2%). Bezogen auf die Gesamtration werden Kräuter am meisten aufgenommen (zu 75%), während Gräser und Büsche in einer Größenordnung von jeweils etwa 12,5% gefressen werden. Die Geburtsrate betrug im Durchschnitt 0,17 +/- 0,075, während an gestorbenen Kälbern 1996 vier und 1998 drei Tiere gezählt wurden. Eine Konkurrenz um Weidefläche mit Rindern wurde beobachtet während der Trockenzeit. Es wird gefolgert, daß die Gabelantilope trotz der Wiedereingliederungs-programme auch weiterhin eine bedrohte Tierart ist. Weitere Untersuchungen zur Auswertung

bestimmter Aktivitäten während kritischer Vegetationszeiten, zur Unterstützung der Kräutervegetation und zur Dynamik der Wechselwirkungen zwischen Gabelantilopen und Wiederkäuern, die auf gleichen Weideflächen gehalten werden, sind notwendig.

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