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The Effects of Human Presence on the Texas Tortoise (Gopherus berlandieri) in Southern Texas and Northern Mexico

Brooks R. Thode

ABSTRACT

This paper describes the various impacts that threaten the survival of the Texas Tortoise (Gopherus berlandieri) population. The study was conducted during the months of June, July, and August in Southern Texas and Northern Mexico. Results show that the fast growing human population, and agricultural influences are creating a "fringed" population that remains healthy only along the outer borders of the Rio Grande Valley. As human population and agriculture continue to spread, the Texas Tortoise population becomes increasingly threatened.

Keywords: *Gopherus berlandieri, Texas Tortoise, Rio Grande Valley, Human impacts, threatened species*

INTRODUCTION

Gopherus berlandieri, otherwise known as the Texas tortoise, is one of only four species of the genus Gopherus in North America. All are very closely related and are of four distinct, separate regions. (e.g., Breen 1974, Pritchard 1979, Barker 1987). Unfortunately for the Texas tortoise, it's range is centrally located in the Rio Grande Valley, one of the fastest growing population and agricultural centers in Texas. Because of its rich soils and open land, the Rio Grande Valley has in recent years been transformed from pristine brushland to agricultural farms and urbanization. This loss of natural brushland has left many species, including the tortoise, with little habitat for survival. Because of this, the tortoise population has steadily declined, and is now considered a threatened species as listed under the Texas Fish and Wildlife guidelines (e.g., Jahrsdoerfer, Leslie Jr. 1988, Wilkerson 1996, U.S. F. W. 1998, Barker 1998). In this paper, I describe the factors endangering Gopherus berlandieri, and discuss solutions to the situations through conservation and education.

MATERIALS AND METHODS

Data was collected from a total of 35 field specimens of Gopherus berlandieri. All data descriptions of the Rio Grande Valley and Northern Mexico, including floral and faunal descriptions, human impacts, and recent changes in native flora and fauna were conducted through extensive literature search, communication with professionals with expertise on the subject, and field research. (e.g. Breen 1974, Barker 1998, Tremper 1998, Esque, Oldemeyer 1994). Most data collection of specimens and habitat was performed through capture and observation. Various instruments were used to successfully collect needed data. A Metric tape measure was used for measuring the carapace length of each specimen, shell size is important for determining age and health of individuals. After collecting data from each specimen they are then marked with white marking paint on the hind scute near the tail. This is necessary to prevent the recording of the same individual twice. Also used in this study was a 35 mm camera and film for identification and observational recordings, an odometer used for locational reference, outdoor thermometer, and wooden stakes and kite string used for setting up a grid search in the field.

This study was conducted during June, July, and August of 1998 in three separate localities within the Rio Grande Valley, and Northern Coahuila, Mexico. In all three localities, the following factors were kept similar: distance and area measured, time of day and length of time for data collection. All other factors varied with each locality and were recorded accordingly. All observations were compared and contrasted.

Field specimens were collected in either of two methods. Road collection was performed by vehicle at an average speed of 20 mph for a 10-mile stretch and back again. Field collection was set up with a marked off section of 2,500 sq. yards. This "grid" was divided into five parallel paths with dimensions: 10 yds x 50 yds. All grid corners were marked with wooden stakes (18 in all), and connected with kite string. Each parallel path was examined with careful inspection of shrubs, cactus, and other refuges for tortoise specimens.

Time of collection was important for peak tortoise activity and optimal recording and observation. Literature research revealed the peak time for tortoise movement to be in the mornings (8am to 10am) and evenings (6:30pm to 8:30pm). Specimen collection was performed for the duration of both 2-hour periods.

Upon each capture of specimens, the date, time of day, sex, carapace length, and any unique observations were recorded. Length was measured to the nearest 1mm using a metric tape measure. Sex identification was made possible through observation of individual characteristics. Males can be distinguished from females by the presence of a depression in the underneath plastron, longer gular scute extensions, longer tails, and larger chin glands. If needed, shell color can also be deterministic of sex, as males display a gray hue while females exhibit a

brownish hue. Any tortoises under 12 cm were difficult to sex therefore were labeled as “juveniles.” Breen (1974) and Barker (1987) further describe these sexing procedures.

RESULTS

In conducting my research, I found that most of my needed data could be collected through observation alone. It was very evident that each locality possessed its' own unique, yet detrimental, factors to the local tortoise population. Maverick County, for instance, contained a very high number of game ranches that are bordered with restrictive fencing which is buried into the ground and reaches eight feet in height. The fence spacing is so small that only the smallest of juveniles can pass freely to other plots of land. The problem with these fences is they separate and isolate a population that is already threatened, thereby restricting the gene pool, eventually causing a "bottleneck" effect. In Starr and Hidalgo counties, upon observation, it is obvious that agriculture has nearly wiped out the tortoise population. Both counties virtually have little or no natural brushland to speak of. The few remaining specimens live on borrowed time as highway traffic and food shortage increase. Highway traffic has a profound effect on the species. I am sure that thousands of tortoises are killed each year by automobiles, and I suspect the high number of fatalities is the result of the correlation between tortoise movement and traffic rush hours. The peak period of day for tortoise movement is early morning and early evening to avoid the heat of the day. Unfortunately, this is generally the peak period of travel to and from work, or by travelers also avoiding the heat.

Observations of habitat, vegetation, and of 35 live and 2 dead tortoise specimens showed that populations are greatly effected and threatened by habitat destruction, encroaching human population and development. Population size appears to coordinate with differences in habitat and development which successfully correlates with my original hypothesis.

Coahuila, Mexico showed a significant amount of pristine brushland and undisturbed habitat along with the highest density of Gopherus berlandieri among the three studied localities. Maverick County had the second most significant presence of brushland and undisturbed habitat. Incidentally, the second largest population was recorded in the same locale. Starr and Hidalgo counties consisted of virtually no brushland or undisturbed habitat. Rather this studied area was composed of agriculture and urban development. This locale accordingly had the lowest population density within the study. A dead specimen was also recorded in both of the two most developed localities. (Table 1). This data shows that the tortoise population is larger and presumably healthier on the borders of the Rio Grande Valley rather than the center of the valley, and previous center of the species population. Data reveals that a healthy population still exists South of the Rio Grande River in Northern Mexico, but the Mexican people are also slowly populating and farming the fertile lands. Results also suggest that their is a higher percentage of adult males. I suspect that this may be true as females may have a tendency to wander when looking for nesting sites and killed by traffic, etc.

Table 1. Comparison of recorded specimen numbers between three separate localities. Starr, Hidalgo counties representing least amount of individuals. Coahuila, Mex. Representing largest amount of individuals.

LOCALITY	MALES	FEMALES	JUV.	TOTAL
STARR HIDALGO	2	0	0	2
MAVERICK COUNTY	7	4	1	12
COAHUILA MEXICO	11	9	1	21
TOTAL	20	13	2	35

DISCUSSION

Habitat destruction, urbanization, land development, and agricultural farming clearly have profound effects on the Gopherus berlandieri species, as well as other species native to the Lower Rio Grande Valley of Texas. Human population increases, and associated urban expansion has resulted in the increase of brush clearing and pollution. Industrialization has polluted lands and degraded water supplies. Brushland habitats have been converted to farms and ranches with herbicides, pesticides, mechanical clearing, and fire. Since the 1920's, more than 95 % of the original native brushland in the Lower Rio Grande Valley has been converted to agricultural or urban use. Along the Rio Grande below Falcon Dam, 99% of the land has been cleared for agriculture and development. Agricultural pesticides are used year-round, and drift and overspray from aerial applications enters all local ecosystems including National Wildlife Refuge Lands. These tracts of land are particularly susceptible because most have agricultural land on 3-4 sides (Table 2).

Table 2. Commonly used pesticides in the LRGV that enter all local ecosystems and threaten wildlife, including Gopherus berlandieri (adapted from Jahrsdoerfer, 1988).

Organochlorine insecticides		**Herbicides**
Aldrin	Lindane	2,4-D
Chlordane	Methoxychlor	2,4-DB
Chlorobenzilate	Mirex	2,4,5-T
DDT (DDE, DDD)	Strobane	Ametryn
Endosulfan	Toxaphene	Dichlorprop
Heptachlor		EPTC

Kelthane Glyphosate
Terbacil

Human population here in the Lower Rio Grande continues to skyrocket with exponential growth (see Table 3). In fact, this is one of the fastest growing areas in the country with two counties, other than the three studied, listed in the top ten in the nation. (e.g. Jahrsdoerfer; Leslie, Jr. 1988).

Table 3. Comparison of population by county from 1990 to 1998. All counties illustrate a tremendous growth rate over eight years (adapted from U.S. Census Bureau).

	1990	**1998**
Hidalgo	383, 500	522,204
Starr	36, 378	48,131
Maverick	40,518	55,906

My research suggests that the tortoise species continues to thrive in healthy populations on the outer fringes of human development. Unfortunately, as the human presence continues to spread, these isolated tortoise populations become increasingly threatened. This species, and others alike, can serve as indicators of larger environmental problems that may have major adverse effects on humans. Currently the Texas tortoise, as well as other native species, is in danger of becoming an "orphan species" (i.e., those on the brink of extinction because their natural habitats are destroyed; Temple 1981). Preservation of the tortoise, and other species, ensures protection of any anthropocentric values that they may possess but that research has not yet revealed. Plant and animal communities of the Lower Rio Grande Valley are unique in the United States, and worthy of intensive conservation efforts. The need for preservation is imperative and the extreme value of all tangible results is clear.

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CONTACTS

U.S. Fish and Wildlife Service, Southwest Regional Office, P.O. Box 1306, Albuquerque, NM 87103

David Barker, Vida Preciosa Inc., Boerne, TX.

Rio Grande Soil Conservation, P.O. Box 316, Marfa, TX, 79843

Ron Tremper, Center for Reptile and Amphibian Propagation. Boerne, Tx.

U.S. Geological Survey, Eros Data Center Customer Service, Sioux Falls, SD 57198

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