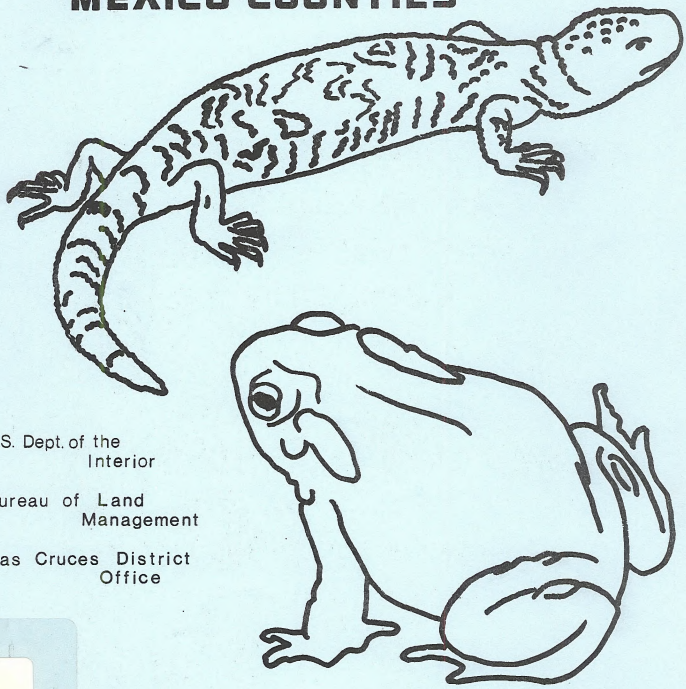
ENDANGERED AMPHIBIANS AND REPTILES OF SEVEN SOUTHWESTERN NEW MEXICO COUNTIES



U.S. Dept. of the Interior

Bureau of Land Management

Las Cruces District Office

ENDANGERED AMPHIBIANS AND REPTILES OF SEVEN SOUTHWESTERN NEW MEXICO COUNTIES

SCOTT C. BELFIT

LAS CRUCES DISTRICT OFFICE

UNITED STATES BUREAU OF LAND MANAGEMENT

LAS CRUCES, NEW MEXICO

CONTENTS

PREFACE

In wildlife management programs conducted by state and federal agencies, there is an increasing demand for highly specific information. This study makes available a large volume of field data for all endangered species of reptiles and amphibians from the following New Mexico counties: Grant, Hidalgo, Otero, Luna, Doña Ana, Sierra, and Lincoln.

I expect this work to benefit individuals working on basic research problems with reptiles and amphibians. It may be used to identify potential study sites and make readily known the availability of preserved specimens for systematic studies.

I hope that this work will lead to similar studies involving the other classes of vertebrates. Eventually, such knowledge as is acquired can be coordinated with land form, soil and vegetation surveys. Hopefully, the end result will be the maximal protection of a rich natural diversity.

Las Cruces, New Mexico

July, 1978

ACKNOWLEDGEMENTS

This survey was initiated and supported by Kirby K. Kline of the United States Bureau of Land Management. The work has been funded by the B.L.M. in conjunction with the Work Study Program at New Mexico State University.

I am deeply indebted to Bill McMahan for his constant encouragement and technical assistance in developing this system of analysis.

Gary McVicker has assisted me with his extensive knowledge of ecology and distribution of snakes. I wish to also acknowledge two close friends for their enthusiasm and companionship in the field. K. Bruce Jones helped with many of the ecological problems. Andy Price was of great assistance with taxonomic problems and the literature search.

Gilbert G. Valencia, a draftsman for the U.S.B.L.M. patiently compiled the locality data and "spot plotted" the distributions.

I also wish to thank the numerous museum collections and individuals that contributed the locality data which serves as the basis for this study. Their abbreviations and addresses follow:

CONTRIBUTING MUSEUMS

AMNH
American Museum of Natural History
Central Park West at 79th Street
New York, New York 10024

Belfit, Scott C., personal records

CAS,CAS-SU
California Academy of Sciences
Golden Gate Park
San Francisco, California 94118

ENMU
Natural History Museum
Eastern New Mexico University
Portales, New Mexico 88130

FMNH
Field Museum of Natural History
Division of Amphibians and Reptiles
Roosevelt Road at Lake Shore Drive
Chicago, Illinois 60605

KU
Division of Herpetology
Museum of Natural History
University of Kansas
Lawrence, Kansas 66045

LACM
Section of Herpetology
Natural History Museum of Los Angeles County
Los Angeles, California 90007

McVicker, Gary, personal collection

MALB
Museum of Arid Lands Biology
Department of Biological Sciences
University of Texas at El Paso
El Paso, Texas 79986

MVZ
Museum of Vertebrate Zoology
University of California
Berkeley, California 94720

NMSU
Department of Biology
New Mexico State University
Las Cruces, New Mexico 88003

Price, Andrew H., personal collection

SRS
Southwest Research Station
Portal, Arizona 85632

TNHC
Texas Natural History Collection
Texas Memorial Museum
University of Texas at Austin
Austin, Texas 78705

UAZ
Department of Ecology and Evolutionary Biology
University of Arizona
Tucson, Arizona 85721

UCM
University of Colorado Museum
Boulder, Colorado 80302

UMMZ
Museum of Zoology
University of Michigan
Ann Arbor, Michigan 48104

UNM
Museum of Southwestern Biology
University of New Mexico
Albuquerque, New Mexico 87106

USNM
Natural Museum of Natural History
Smithsonian Institution
Washington, D. C. 20560

WNMU
Herpetology Collection
Western New Mexico University
Silver City, New Mexico 88061

INTRODUCTION

A study of reptiles and amphibians is presented in order to demonstrate a system of inventory and analysis which can be readily applied in land management decisions. Locality data for all species of reptiles and amphibians known to occur in seven counties of southwestern New Mexico have been cataloged phylogenetically by family and subdivided by county. This data source is available to the public through the United States Bureau of Land Management District Office in Las Cruces, New Mexico. The endangered species were selected for this presentation because they offer a wide taxonomic selection, because of their relative importance in present management procedures and because of their relative importance in present management procedures and because of the need to limit the volume of this work. I hope that this selection will not imply that these species are of any greater significance than others to the various ecosystems.

Locality data were gathered by three methods. First, an extensive literature search was conducted mainly through the library at New Mexico State University in Las Cruces, NM. Second, catalog records were acquired from the major U. S. museums with significant holdings from the study area. In most cases, the specimens were not examined, so I cannot vouch for the validity of the identifications. Also it should be noted that a literature reference and a museum locality may refer to the same animal. Finally, data from personal collections have been added. Some of these specimens have been deposited in the museum at NMSU in Las Cruces.

Geographic coordinates have been interpreted from the locality data for mapping purposes. A researcher wishing to locate a particular specimen can find the museum number of that specimen in the data file at the Las Cruces District Office of the United States BLM. This may be necessary to avoid

confusion between the original locality data and the Range, Township and Section coordinates that have been assigned.

FAMILY BUFONIDAE

These, the true toads, have warty, dry skin with horizontally elliptical pupils and distinct paratoid glands. The presence of the paratoid gland will distinguish this family from other anurans and the nature of it will help in identification of individual species. These toads have two tubercles on the bottom side of each hind foot and one may resemble the "spade" of the Pelobatids. Bufonids "hop" whereas Hylids and Ranids "leap". Also, members of the family Ranidae have moist skin, lack the paratoid gland, and have well-developed webbing on the hind feet.

Bufonids have a nearly worldwide distribution. Members of this family are adapted to a wide variety of environmental conditions including swamp, desert, and brackish water. Only 1 genus (Bufo) occurs in North America.

The dry skin and water conserving excretory system adapt many of these species to a dry terrestrial existence. The paratoid gland and warts emit poison onto the surface of the skin which is a defense mechanism against predation.

The northern Bufonids breed annually in the spring. In the desert southwest as with the Pelobatids, breeding is more opportunistic, depending upon rains. This condition has selected for accelerated larval development in many desert anurans forced to cope with breeding in temporary rain pools. The eggs are deposited in gelatinous strings except for Bufo punctatus. This species deposits its eggs individually with a sticky substance on the surface which may cause large numbers to adhere as a film on the pond's bottom.

Bufo alvarius - Colorado River toad

ELEVATION: The elevation range of this species (Stebbins, 1966) is sea level to above 4,000 feet. In New Mexico, this Bufonid is restricted to the Gila River drainage and the extreme western part of the state. Locality records within our study area indicate an elevation range of between 4,128 and 5,300 feet.

SOILS: They are most commonly found in the moist alluvium along the Gila River. They may be found near stock tanks, irrigated fields, and irrigation ditches (Stebbins, 1962). Soil moisture seems to be the major limiting edaphic factor.

VEGETATION: This toad may occur in the creosote bush and mesquite communities in some parts of its range (Stebbins, 1966). In the Gila drainage, they inhabit a variety of riparian woodland communities including willow-alder, live oak-hackberry, and sycamore dominated communities. Many specimens collected in the vicinity of Rodeo, New Mexico have been found in plant communities composed of Agave, Ephedra, Prosopis, Salsola, Yucca, Gutierrezia, and a variety of grasses (Cole, 1962). A specimen collected in the Peloncillo Mts. was taken from a meadow surrounded by Pine-Oak-Juniper Woodland (Cole, 1962). King (1932) describes the species as common around farms and gardens near Tucson, Arizona.

WATER: This semi-aquatic species is normally found near permanent streams, stock tanks, or irrigation ditches (Wright and Wright, 1942). In California, the range of this species has been extended by the development of irrigation (Stebbins, 1962). Rain or humid conditions will initiate activity in the species. Long strings of eggs are laid in temporary or permanent ponds and streams.

PREDATORS: A strong toxin is produced by the paratoid glands on the dorsal surface which functions in defense against predators. The powerful bufotenins can cause paralysis or even death in domestic dogs (Wright, 1966). The raccoon, Procyon lotor, has been observed preying upon the species by turning them over, opening up the abdominal cavity, and eating the muscle and entrails (Wright, 1966). This predator, at least, has developed a technique of avoiding the toad's toxic defense. It has not been determined whether or not any of the other potential predators have developed techniques of feeding on this toad. Mephitis mephitis (the striped skunk) would seem to be a potential predator of Bufo alvarius as their ranges overlap and they prefer similar habitat. The skunk readily eats other Bufonids, but even when hungry, will avoid this species (Hanson & Vial, 1956).

PREY: In Arizona, this species has been described as significant in controlling crop pests, such as fruit beetles and grasshoppers (King, 1932). The same author also names spiders and small lizards as part of its diet. A stomach content analysis performed on 5 individuals found snails, a spade-foot toad, spiders, bugs, wasps, termites, solpugids, and a variety of other invertebrates (Cole, 1962). Cole (1962) also comments on the ability of these toads to cope with a wide variety of toxins produced by their prey.

MANAGEMENT: The habitat of this species at the present time seems secure. The development of spring boxes and maintenance of stock tanks and wildlife watering units are beneficial. Any proposed action for the Gila drainage could affect breeding of the species. Damming would inundate habitat and phreatophyte control would result in siltation which may inhibit egg development.

LOCALITIES:

I. Hidalgo County: T.34S., R.22 W., Guadalupe Canyon, WNMU (2), UNM (2);

T.33S., R. 21 W., 3 mi. W. Cloverdale Store, UNM (1); T.28S., R. 21 W., Rodeo Tavern, Rodeo AMNH (1); 3 mi. N. Rodeo on U.S. 80, Cole (1); 1.1 mi. W., 0.9 mi. N. Rodeo on State Line Road, Cole (1); T.28S., R. 22 W., 1.1 mi. W., 1.3 mi. S. Rodeo, AMNH (1); T.26S., R. 21 W., 12.9 mi. N. Rodeo on Rt. 80, AMNH (1); T. 32S., R. 22 W., 200 yds. east of AZ/NM state line on Geronimo Trail, 12 mi. N. of NM/Mexico border, Cole (1).

I. Bufo alvarius

5 0 5 10 15 20 STATUTE miles

5 0 5 10 15 20 25 30 Kilometers

CONTOUR INTERVAL 200 FEET
WITH SUPPLEMENTARY CONTOURS AT 100 FOOT INTERVALS

FAMILY PLETHODONTIDAE

This family is referred to as lungless salamanders. The lack of lungs probably is the result of evolution in fast running streams which are highly oxygenated. Cutaneous and buccopharyngeal modes of respiration are sufficient for the needs of these species. Physical characteristics consist of clusters of large numbers of teeth at the rear of the roof of the mouth, presence of a naso-labial groove, and 4 toes on the front feet with 4 or 5 toes on the hind feet. Lungless salamanders are widely distributed over North America. They occupy a wide variety of terrestrial and aquatic habitats including forest humus, caves, river banks, brooks, and well seepages. The males deposit a sperm capsule which is picked up by the females' cloaca. This capsule fertilizes the ova internally and eggs are deposited on land. Some species brood the eggs. All of the western species are terrestrial and do not possess an aquatic larval stage. The young look like tiny adults in form, but color patterns may differ. Aneides hardyi (Sacramento Mountain Salamander) is the only representative of this family within the study area.

Aneides hardyi - Sacramento Mountain salamander

ELEVATION: The locality data available indicates that this species occurs from 8,500 to 11,000 feet in Otero County and 8,400 to 10,200 feet in Lincoln County. They prefer north and east facing slopes.

SOILS AND SUBSTRATE: This species is normally found under dead logs, stones, and ground litter (Wake, 1965). Stebbins (1962) describes two specific microhabitats. The first was a cavity under the bark of a Douglas fir tree. The surface was damp. The second was a talus rock slide near a road cut. The rock slide was associated with soil and vegetation. Johnston and Shad (1959) state that this salamander can be found in the center of large fir logs which are in an advanced state of decay. The availability of such logs may limit population density even in habitat which appears otherwise favorable. Eggs are deposited in small cavities within the rotting moist or wet logs (see Schwartz, 1955; Lowe, 1950; Stebbins, 1954). However, data on sex and age ratios compiled by Johnston and Shad (1959) may suggest that some eggs are laid underground and that juveniles could be primarily fossorial.

VEGETATION: A study site used by Johnston and Shad (1959) in Otero County consisted of either pure stands of Picea englemanni (Englemann spruce) or mixed stand of P. englemanni, Pseudotsuga taxifolia (Douglas fir) and Abies spp. (fir); Quercus gambelii (Gamble's oak) was also present in the habitat. They inhabit the spruce-alpine fir communities of the Boreal forest and the White fir--Douglas fir communities of the temperate forests. Lowe (1950) described the vegetation in which a nest was discovered. It consisted of Douglas fir and Acer glabrum (dwarf maple) on a steep north-facing slope. Schwartz (1955) described their habitat as composed of Pseudotsuga taxifolia, Picea pungeris (blue spruce) and Pinus ponderosa (yellow pine).

WATER: Humidity controls the activity period of this species. They are most commonly collected during the summer after July and the onset of summer rains. The weather around Cloudcroft is extremely humid and overcast during July and August.

PREDATORS: There are no known predators on this species. Johnston and Shad (1959) wrote "one garter snake (Thamnophis) was collected within the habitat of the salamander in three years."

PREY: This species will take a wide variety of invertebrate prey. They seem only limited by prey size. In the rotting logs and forest debris, there exists an almost unlimited food supply for this species. Johnston and Shad (1959) reported findings on stomach content analyses of 16 individuals. According to their results, Hymenoptera (ants), Coleoptera (adult and larval beetles), Arachnida (spiders), and Acarina (mites) composed most of their food. According to Kenneth Norris and Charles Lowe, Jr. (in Stebbins, 1962), the following animals were found associated with the habitat of this salamander: camel crickets, tenebrionid and carabid beetles, ants, termites, sowbugs, centipedes, millipedes, and earthworms. There is evidence (Johnston and Shad, 1959) that females may not actively forage outside the nesting cavity while guarding a nest. The same workers fed captives Drosophila melanogaster (fruit flies).

PARASITES: Johnston and Shad (1959) found that most specimens examined for parasites were infested with two species of nematodes (Oswaldocruzia sp. and Thelandros sp.). They believe these parasites to be benign.

MANAGEMENT: At the present time, all of the known localities occur on Forest Service land. There is some BLM land east and north of Tularosa which may provide suitable habitat, but these areas have not been extensively collected.

The genus Aneides is composed of five disjunct species all of which occur within the United States. The group is associated with the Arcto-Tertiary flora (Lowe, 1950) and, therefore, is very important as a research tool for studying zoogeography

Due to its endemic distribution, relatively low population, and importance to research, it is hoped that this species will be maximally protected. Habitat disturbance in the form of lumbering or clearing the forest floor should be prevented in the vicinty of the known localities. Other surface disturbance such as off-road vehicle use, and various recreational activities should be restricted during July and August when the species is likely to be at the surface, breeding, and vulnerable. Deadfall Douglas fir should in all cases be left in place.

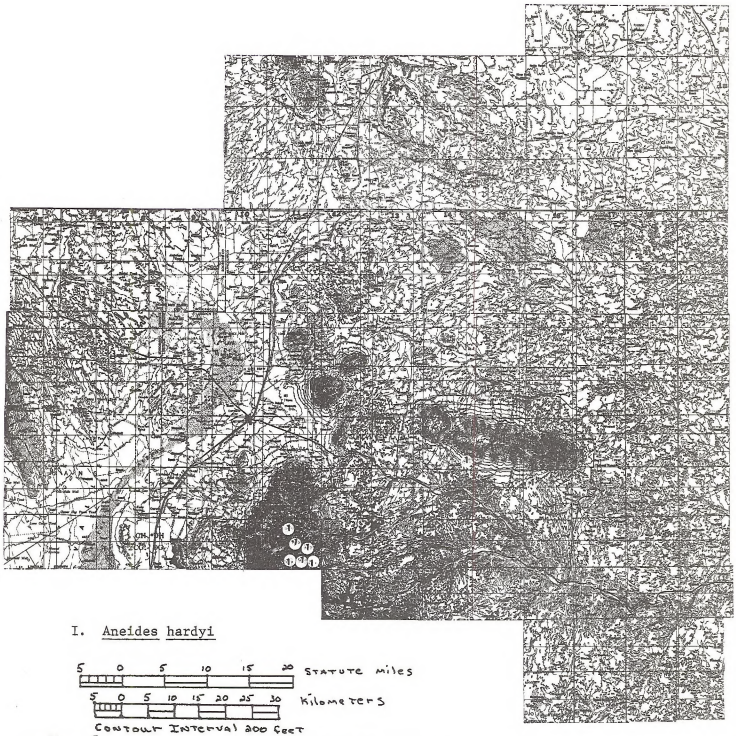
It is hoped that further research will be conducted into the natural history and zoogeography of this species.

LOCALITIES:

I. Lincoln County: T. 10S., R. 11E., 5 mi. W. Alto, WNMU (3), UNM (22); 1.5 mi. SW Monjeau Lookout, MVZ (27); 0.5 SW Monjeau Lookout, KU (2); North Slope Sierra Blanca, KU (26); 5.5 mi. by Rd. to Sierra Blanca Peak, MALB (2); T. 9S., R. 16E., Pierce Canyon Pass, UNM (27); T. 8S., R. 14E., 10 mi. E., 5 mi. N. Capitan, UNM (18); Summit Spring, MVZ (47).

II. Otero County: T. 15S., R. 12E., 4 mi. NE Cloudcroft, NMSU (10); 2 mi. N., 2 mi. E. Cloudcroft, NMSU (5); Wofford Lookout Rd., 2.5 NE Cloudcroft, NMSU (7); 4 mi. NE Cloudcroft, NMSU (12); Wofford Lookout, KU (25), UNM (2); T. 15S., R. 13E., 6 mi. NE Cloudcroft, NMSU (2), MVZ (17); T. 16S., R. 12E., 1/2 to 3/4 mi. E. Cloudcroft, FMNH (3), AMNH (1); 1.5 mi. E. Cloudcroft, AMNH (1); 1.5 mi. E. Cloudcroft, AMNH (5); 2 mi. E. Cloudcroft, TNHC (6);

1.9 mi. E. Cloudcroft, UAZ (76); 1.5 mi. S. Cloudcroft, LACM (14); T. 18S., R. 12E., Hubbell Canyon, UNM (2); Hay Canyon, 10 mi. W. Sacramento, LACM (2); T. 17S., R. 11E., 9 mi. S. Cloudcroft, ENMU (1); Buff Springs, LACM (1).



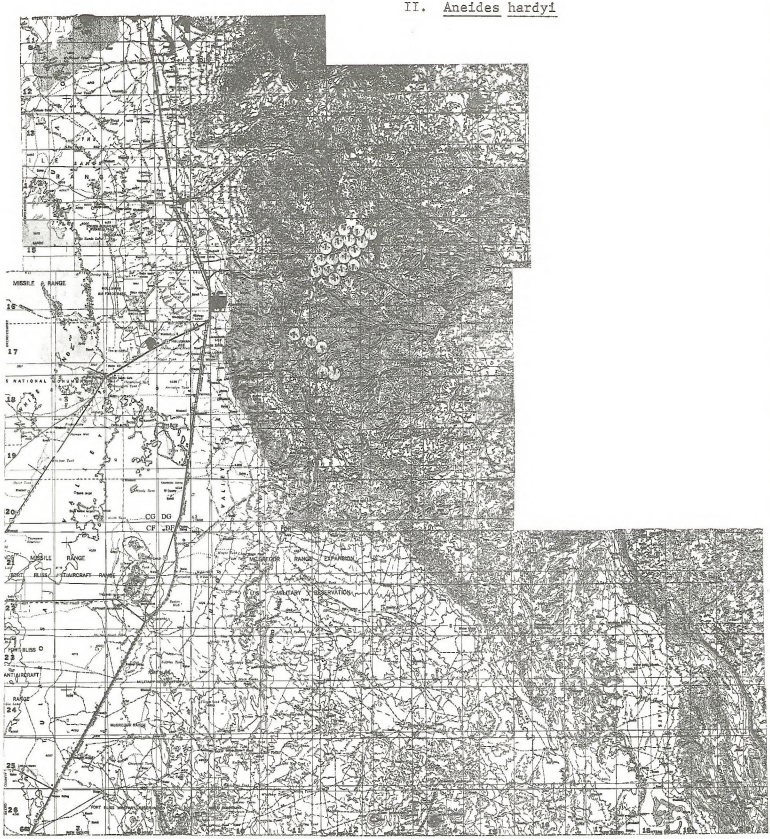
I. Aneides hardyi

5 0 5 10 15 20 STATUTE MILES

5 0 5 10 15 20 25 30 KILOMETERS

CONTOUR INTERVAL 200 FEET
WITH SUPPLEMENTARY CONTOURS AT 100 FOOT INTERVALS

II. Aneides hardyi



CONTOUR INTERVAL 200 FEET
WITH SUPPLEMENTARY CONTOURS AT 100 FOOT INTERVALS

FAMILY HELODERMATIDAE

The two species of Helodermatidae are the only known species of poisonous lizards in the world. The skin is covered with large, rounded, beadlike scales underlain with bony osteoderms. The body is very stocky with a large, flat head, thick well-developed limbs, and a stout tail. This tail is constricted at the base, blunt-ended, and probably functions as a fat storage organ. Well-fed captives have a thick, awkward-looking tail. The grooves on the anterior surface of the teeth may act as ducts for the secretion of the venom glands which are located at the sides of the lower jaws.

The family is known only from the southwestern U.S. and Mexico. Heloderma suspectum (Gila monster) occurs in the area of concern. They most commonly inhabit the foothills and lower elevations of mountains, though they have been sighted in arroyos and washes on the desert floor. They seem to be restricted to more mesic sites.

Clutches of about five leathery eggs are laid in captivity. Very little is known of the reproductive habits of these reptiles in nature.

Heloderma suspectum - Gila monster

ELEVATION: The Gila monster is normally found in the medium elevation range. In southwestern New Mexico, they are most commonly reported from the foothills of the mountain ranges. Yet they are known to occur at lower elevations elsewhere if vegetative and soil conditions are adequate. Jackson (1976) reported a sight record for this species at 4,800 feet. This locality (7 mi. N. Lordsburg) has only 2% slope. The elevation range for the species in New Mexico runs from 4,000-4,900 feet.

SOILS AND SUBSTRATE: The soil mixture preferred by this species consists of a relatively coarse gravelly conglomerate. They have been reported in areas of loam and sand. The form and texture of the soil is important to the distribution of this lizard as it does burrow. These animals are good climbers and may be found in rough, rocky terrain (U.S. BLM, 1975). They are also reported from sandy washes and arroyos (Stebbins, 1954).

VEGETATION: This species has been found in plowed fields (Campbell, 1976), yucca-grassland association (Koster, 1951), and creosote-yucca desert. They may also get up into dwarf oak-pinyon association (Koster, 1951) in some portions of the study area. This is a disturbed area dominated by Quercus gambeli (Gambel's oak) and Pinus edulis (pinyon pine). Another suitable vegetative type would be the woodland formation defined as the community between upper elevation forests and the grasslands. It is characterized by small communities of Pinus spp. (pine), Juniperus spp. (juniper), and Quercus spp. (oak). These communities are increasing their range in marginal grassland areas due to overgrazing. Available habitat for the Gila monster may be expanding. The rock strewn slopes of Granite Gap, a well-known locality, are vegetated with Acacia conodricta (white-thorn), Dasylirion wheeleri (sotol), Quercus spp. (oak) and Opuntia

(prickly pear cactus) (U.S. BLM, 1975). Another reference in the same document records the species as associated with Monus microphylla (Texas-mulberry), Panthenium incanum (mariola), Brikellia spp. (brickellbush), and Prosopis julifora (mesquite). This refers to a locality in the vicinity of Stein's Peak.

WATER: This species does not appear to be dependent upon a permanently available water source. Leonard Moore reported observing a juvenile Gila monster emerging during a rain shower and lapping up rainwater from moist granite for 20 minutes (U.S. BLM, 1975). The species may be capable of storing water for long periods of time.

PREDATORS: Gila monsters are rarely preyed upon, due to the effectiveness of their poison mechanism. Occasional predators may be Buteo jamaicensis (red-tailed hawk), Falco mexicanus (prairie falcon), and Taxidea taxus (badger). A stomach content analysis of Crotalus molossus (black-tailed rattlesnake) revealed a Gila monster (Campbell, 1976).

PREY: Stahnke (1950) lists nestling rabbits and rodents, and reptile eggs as the main food source. They will also take the eggs of ground or rock nesting birds. This species, due to its awkward size, is probably not a very effective predator upon active reptiles, mammals, or birds. Instead, the species is most likely to raid nests and rely upon the fat storage capabilities of the tail for future energy requirements (Stahnke. 1950). Stomach content analysis (Shaw, 1948) revealed juvenile Citellus tereticaudus (round-tailed ground squirrel) and 9 unidentified reptile eggs. The same author noted that most of the stomachs checked were empty. Gila monsters will also prey upon hurt or sick animals. They may be able to trap an occasional adult mouse if it becomes trapped in a burrow or rock crevice. This would slow survival between nesting seasons of their primary

food sources. In general, they may be considered opportunistic feeders. They are known to scavenge flesh from dead animals. LaPointe (pers. comm.) has suggested the checking of dead ungulates as a collecting technique.

MANAGEMENT: This species is relatively rare in New Mexico as well as in other parts of its range and locally cannot withstand the heavy collecting pressure currently being applied to it. The unusual appearance combined with the popularity of the species have made it highly desired by the pet trade. Habitat which is easily reached by road is heavily collected. Granite Gap (Hidalgo County) is an example. Other remote areas with limited access, such as the foothills of the Peloncillo Mountains, are probably unaffected by collecting.

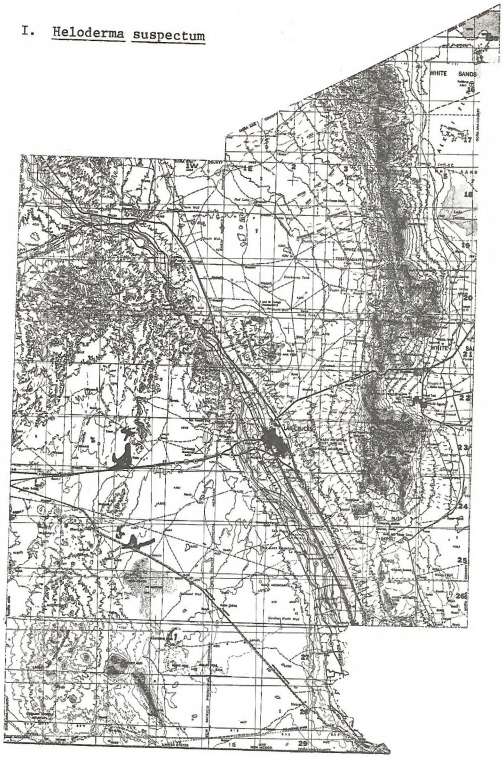
LOCALITIES:

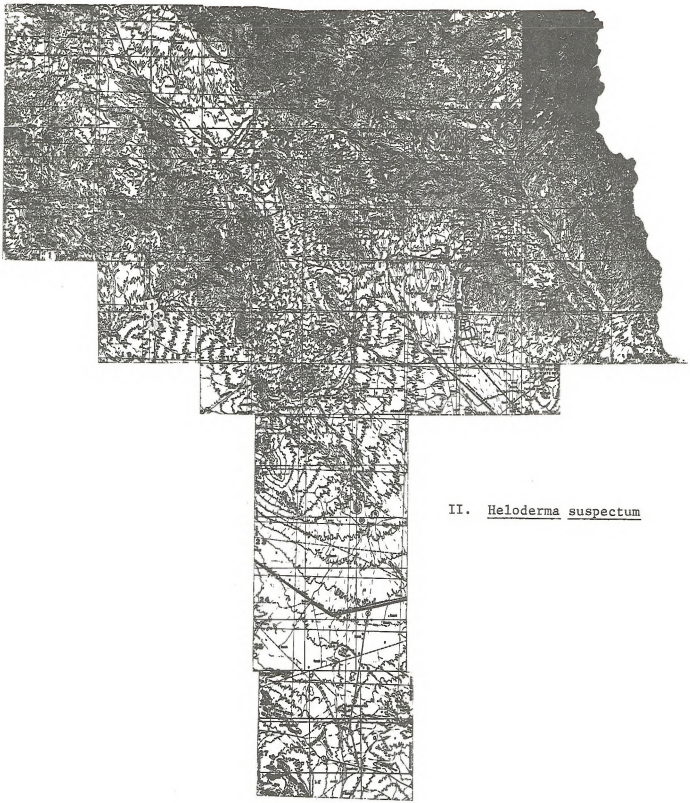
I. Dona Ana County: T. 27S., R. 1W., Kilbourne Hole, NMSU (1).

II. Grant County: T. 18S., R. 14W., Silver City, UNM (1), AMNH (1); T. 19S., R. 18W., Redrock, Stebbins (1), Campbell (1), WNMU (1), UNM (3), LACM (1); T. 17S., R. 21W., Steeple Rock, NMSU (1).

III. Hidalgo County: T. 24S., R. 21W.,: McGree Mine, 21 mi. SW of Lordsburg, Stebbins (1); 6 mi. SW of Steins, Peloncillo Mountains, Campbell (1); 3.5 mi. south of Road Forks, NMSU (1); T. 25S., R. 21W., Granite Gap, NMSU (1), Campbell (3), U.S. BLM (2); T. 21S., R. 20W., 15 mi. NW of Lordsburg, Stebbins (1); T. 26S., R. 22W., San Simon Cienega, UNM (1); T. 28S., R. 21W., 1 mi. N. of Rodeo, SRS (1); T. 34S., R. 22W., Guadalupe Canyon, Campbell (1); I-10 near Road Forks, NMSU (1).

I. Heloderma suspectum



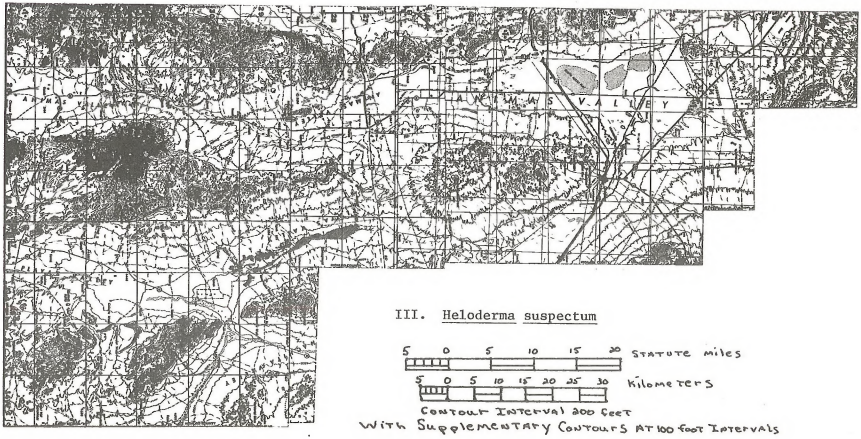


II. Heloderma suspectum

5 0 5 10 15 20 STATUTE miles

5 0 5 10 15 20 25 30 kilometers

CONTOUR INTERVAL 200 FEET
WITH SUPPLEMENTARY CONTOURS AT 100 FOOT INTERVALS



III. Heloderma suspectum

5 0 5 10 15 20 STATUTE MILES

5 0 5 10 15 20 25 30 KILOMETERS

CONTOUR INTERVAL 200 FEET
WITH SUPPLEMENTARY CONTOURS AT 100 FOOT INTERVALS

FAMILY IGUANIDAE

This is the most diverse saurian family found in the Americas. The scalation may be granular, spiny, smooth, or keeled, but the family is usually lacking in osteoderms. Many species have the extraordinary ability to expand the surface area of certain parts of their bodies into a threatening size. These expanded areas may take the form of cranial crests, fringes, and gular pouches. This ability has its evolutionary origins in thermoregulatory adaptations though in modern forms it undoubtedly functions in the performing of defensive and territorial displays. The eyes have well-developed lids and the pupils are round. They normally have four legs and 3 to 5 longitudinal keels on the underside of the toes.

Iguanid diversity is strongest in the New World with a few species occurring in Madagascar and a couple of Pacific islands. They occupy a wide variety of habitats ranging from marine to desert. This is one of the most abundant and varied reptile groups found within the study area. Their significance to the functioning of the desert ecosystem is enormous. In serving as prey, they effectively transform energy from insects into a form more readily available to the higher vertebrate predators. Their role in controlling the populations of potentially damaging pests cannot be overstated. They also possess value as study animals in basic research and as indicators of environmental quality.

Fertilization is accomplished by means of an everted male hemipenis. Most species are oviparous, and deposit their eggs in organic debris.

Sceloporus scalaris - bunchgrass lizard

STATUS: See Smith (1937) and Thomas and Dixon (1976) for taxonomy and distribution of this species.

ELEVATION: Stebbins (1966) states that the species normally occurs above 6,000 feet, but will range as low as 4,300 feet. In isolated mountain ranges of Arizona, this species has been collected between 8,000 and 9,500 feet (Stebbins, 1954). Anderson (1962) reports collecting gravid females at 8,500 feet in two localities in Mexico. A collection from the unusually low elevation of 5,200 feet has been reported by Dixon and Medica (1965). This collection was made in Hidalgo County. This species probably reaches over 7,000 feet within our study area.

SOIL AND SUBSTRATE: This lizard is reported from relatively open sites where surface litter is sparse. Anderson (1962) reports collecting the species from under logs and boards near an abandoned lumber mill. The same author notes that a female was observed guarding a nest which consisted of a 1" diameter hole recently plugged with soil. The soil was found to be moist and the hole depth about 2". Suitable soil moisture and texture may be limiting for the species.

VEGETATION: A specimen taken in the State of Morelos, Mexico inhabited open plains (Davis and Smith, 1953). A specimen collected in our study area (Dixon and Medica, 1965) was found in the Animas Valley in a dense stand of Sporobolis airoides (alkali sacaton). In the literature, the species is most commonly associated with bunchgrass meadows of the mountains (Stebbins, 1954; Smith, 1946). Anderson (1962) discusses the possible adaptive value of this species' cryptic coloration in this type of habitat. These meadows consist of canopy openings in coniferous forest. They may prefer open, sunny patches on south facing slopes (Lowe, 1964).

WATER: Egg deposition of this species is restricted to the onset of summer rains (Anderson, 1962). Kauffeld (in Smith, 1946) found this lizard sunning after a rainstorm. Although the range of this lizard is not restricted by permanent standing water, a moist microclime seems to be preferred.

PREDATORS: This species seems well adapted to avoiding predators with its cryptic coloration and habit of taking refuge in dense bunchgrass. Some possible avian predators in various parts of its range are as follows: Geococcyx californianus (roadrunner), Buteo jamaicensis (red-tailed hawk), Accipiter cooperii (Cooper's hawk), and Falco sparverius (kestrel). Bassariscus astutus (ringtail), Spilogale gracilis (western spotted skunk), and Conepatus mesoleucus (hog-nosed skunk) are possible mammalian predators found in the Animas Mountains (Findley et. al., 1975).

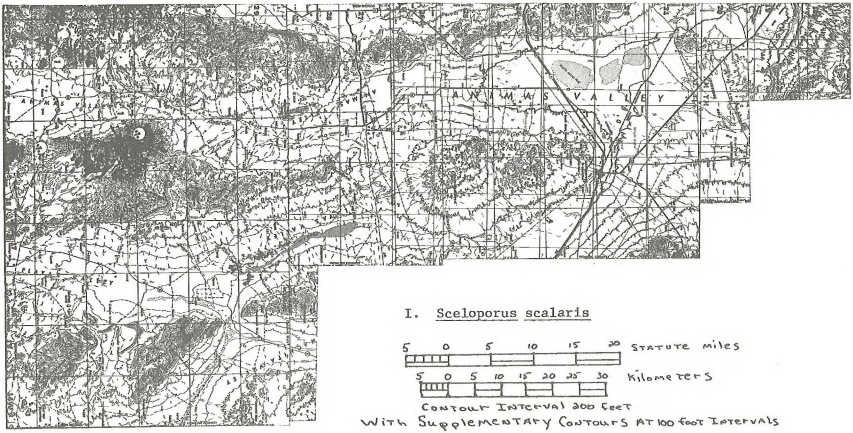
PREY: This lizard feeds upon a wide variety of invertebrate prey, depending upon seasonal availability and prey size. Stebbins (1954) lists spiders, beetles, ants, hemipterans, and lepidopterous larvae as food items. Where local populations are high, this species may be important for insect control and for transforming energy tied up in insects into a form available to higher trophic levels.

MANAGEMENT: Overgrazing of habitat is detrimental to the species. Grazing pressure on bunchgrass communities should be carefully monitored to insure that the density and composition of the various grasses are maintained in a form acceptable to this and other species of wildlife. As the Animas Mountains are relatively inaccessible to the public, pressures by off-road vehicles and other recreational activities are insignificant. Yet, with development, the human pressure on the area may increase in the future.

LOCALITIES:

I. Hidalgo County: T.33S., R. 21 W., 2 mi. N. of Cloverdale Store, UNM

(1); T. 33S., R. 20 W., 10.2 mi. NE of Cloverdale, NMSU (1); T. 31S., R. 19 W., upper Animas Mountains, Stebbins (1); T. 33S., R. 19 W., 10 mi. E. of Cloverdale, Stebbins (1).



I. Sceloporus scalaris

5 0 5 10 15 20 STATUTE miles

5 0 5 10 15 20 25 30 Kilometers

CONTOUR INTERVAL 200 FEET
WITH SUPPLEMENTARY CONTOURS AT 100 FOOT INTERVALS

FAMILY SCINCIDAE

These heavy-bodied lizards have a coating of smooth, uniform scales reinforced with osteoderms. Only the scales on the head are enlarged. The appendages are often absent or greatly reduced as an adaptation to fossorial existence. In comparison to the other families of lizards, skinks tend to be stouter, especially in the tail and neck.

Skinks occupy every continent, except Antarctica. They are more widely distributed than any other family. Africa, Australia, and the Pacific Islands have the greatest diversity. In the Americas, they range from Canada to Central America. Within our study area, only the genus Eumeces is represented.

Most skinks are fossorial and/or secretive. They are commonly found in forest leaf litter, under boards and tin roofing, or within rotten logs. The habitat is normally moist with some form of permanent available moisture; in the desert Southwest, they are often associated with riparian vegetation at higher elevations.

Males during the breeding season assume a reddish or orange coloration on the head which indicates sexual activity. Skinks are oviporous and may lay up to 10 eggs. These are usually deposited in damp, loose earth or leaf litter. It is common to find a female guarding her clutch of eggs which demonstrates a degree of parental care.

Eumeces callicephalus - mountain skink

ELEVATION: The southwestern United States is the northern limit of distribution for the species. In this area, Eumeces callicephalus has a disjunct distribution being confined to high elevation communities. In Sinaloa, Mexico, the species occupies the low elevation coastal plain (Stebbins, 1966). In Arizona, this species is reported from 4,000 ft. and 6,400 ft. (Stebbins, 1954). In our study area, the species is only known from Guadalupe Canyon (4,400 to 4,800 ft.)

SOILS AND SUBSTRATE: This species, as with most skinks, is fossorial and dependent upon relatively loose, loamy, moist soil types. Stebbins (1954) described a collection made from under loose rock on top of a large granite boulder. The same author describes finding this species within loose rocks. They may also be found under rotting logs on the forest floor (Lowe, 1964). In reference to a specimen collected northwest of Guadalajara, Mexico, Campbell and Simmons (1961) wrote, "She was coiled around three eggs in a small depression beneath a rock on a grassy road shoulder." The soils of Guadalupe Canyon are volcanic in origin. The hillsides are continually eroding which leaves a thin, rocky layer on the slopes and a deep aggregation of various particle sizes on the canyon floor (U.S.B.L.M., 1969). It seems likely that this skink would prefer the latter soil type for egg deposition when both the soil depth and moisture conditions are noted.

VEGETATION: In one locality in Arizona, they inhabit an oak-filled ravine (Stebbins, 1954). Stebbins (1966) names oak and pine habitats for the species. In southern Arizona, this skink is confined to the Upper Sonoran Life-Zone. They inhabit evergreen and deciduous woodlands as well as pure stands of Pinus ponderosa (yellow pine). Lowe (1964) gives a complete vegetative description of the Woodland and Transition Life-Zones in which

this species may be found. In Guadalupe Canyon, the stream bed is dominated by Populus fremontii (fremont cottonwood) and Platanus wrightii (sycamore). Other conspicuous components of the vegetation are Juniperus monosperma (oneseed juniper), Baccharis glutinosa (seep-willow), Celtis reticulata (net leaf hackberry), and Quercus arizonica (Arizona oak). The surrounding slopes and ravines are commonly vegetated with more xeric plants, such as Prosopis juliflora (mesquite), and Acacia constricta (whitethorn). U.S.B.L.M. (1969) gives a detailed description of the vegetation.

WATER: This species is normally found in canyons or near springs with permanent or intermittent water. It prefers a moist microhabitat. Zweifel (1962) observed egg development under wet and dry conditions, presented data suggestive of the importance of moisture for the species, and concluded that a lack of moisture may prevent egg hatching.

PREDATORS: A specimen from Mazatlan found by Passara and Smith (in Zweifel, 1962) was excavated by a bulldozer. The same operation yielded members of the genera Hypsiglena (night snakes) and Leptodeira (annulated snakes). Species of both genera are potential predators on fossorial lizards. Feeding habits and habitat preference of the omnivorous Conepatus leuconotus (hognose skunk) indicate that the species may prey upon the mountain skink.

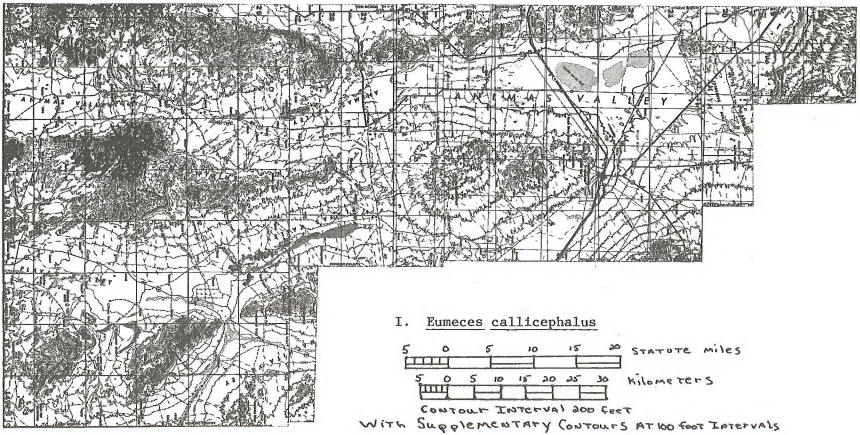
PREY: Stebbins (1954) reported that a spider and winged insect have been found in one individual.

MANAGEMENT: Off-road vehicle use would be particularly detrimental to this fossorial species. Dams designed for flood control would alter soil moisture conditions and may be detrimental to the species. Any proposed action or development in Guadalupe Canyon should be avoided due to the occurrence there of Eumeces callicephalus and other species exotic to New Mexico. See

U.S.B.L.M. (1969) for further management considerations on Guadalupe Canyon.

LOCALITIES:

I. Hidalgo Co: T.34S., R. 21 W., Guadalupe Canyon, KU (2), Stebbins (1).


I. Eumeces callicephalus
5 0 5 10 15 20 STATUTE miles
5 0 5 10 15 20 25 30 kilometers
CONTOUR INTERVAL 200 FEET
WITH SUPPLEMENTARY CONTOURS AT 100 FOOT INTERVALS

FAMILY TEIDAE

Whiptails have a long and slender body with a long, gradually tapering tail. The head is broad behind the eyes, covered with symmetrical plates, and slopes toward the snout. Most species have well-developed legs and toes and are active diurnal predators. Some South American species are fossorial with reduced limbs. The dorsal surface of the body is covered with granules or tiny scales giving an iridescent appearance in bright sunlight. The dorsal surface of the tail is rough in comparison as it is covered with keeled scales.

Teids are found only in the New World. They reach their greatest diversity in South America and only 1 genus (Cnemidophorus) is found in North America.

Members of the genus Cnemidophorus inhabit a wide variety of ecological communities. Some are open scrub desert species while others are restricted to riparian vegetation. All are diurnal and capable of surviving in extremely high environmental temperatures. They are commonly seen prowling with characteristic jerky movements from bush to bush during the hottest part of the day.

Several parthenogenetic or all-female species inhabit the study area. Fertilization of the females by males is bypassed and all-female clones result. This reproductive phenomenon is the subject of extensive research. Teids are mainly oviparous.

Cnemidophorus burti stictogrammus - Sonora whiptail

STATUS: In the past, there has been a great deal of confusion about the taxonomic status of this subspecies. It has often been confused with Cnemidophorus exsanguis (Smith, 1946). Dr. Robert L. Bezy (pers. comm.) stated that Lowe (1956) was the first to give this form separate taxonomic status (C. stictogrammus). Duellman and Zweifel (1962) gave this form its present name of C. burti stictogrammus. See Lowe et al. (1970) and Duellman and Zweifel (1962) for more information on the taxonomy of this species.

ELEVATION: Stebbins (1966) gives a range of sea level to 4,500 feet. Lowe (1956) describes a locality in the Santa Catalina Mts. of Arizona with a 3,000 to 3,500 foot elevation range. In our study area, the species is only known from Guadalupe Canyon (4,400 to 4,800 feet). This whiptail is known from the Gila River in eastern Arizona and may be expected to occur in extreme western New Mexico (elevation: 3,700 feet) (Wright, pers. comm).

SOIL AND SUBSTRATE: See U.S.B.L.M. (1969) for a brief soil description of Guadalupe Canyon.

VEGETATION: Lowe (1956), in reference to the species in the Santa Catalina Mts., wrote, "the habitat is Riparian Woodland comprised of Cottonwood, Willow, Sycamore, Ash, and Walnut bordered on the Canyon sides by Palo Verde-Sahuaro Desert climax of this area." This species has a large home-range and is locally common in Guadalupe Canyon (Wright, pers. comm.) Therefore, it can be expected to be found in association with most of the vegetative types found within the canyon and proximate arroyos. See the habitat description for Eumeces callicephalus and Masticophis flagellum cingulum and USBLM (1969) for a description of these types.

WATER: The species is normally found near permanent or intermittent streams

(Stebbins, 1966). In desert areas, it is restricted to mesic arroyos.

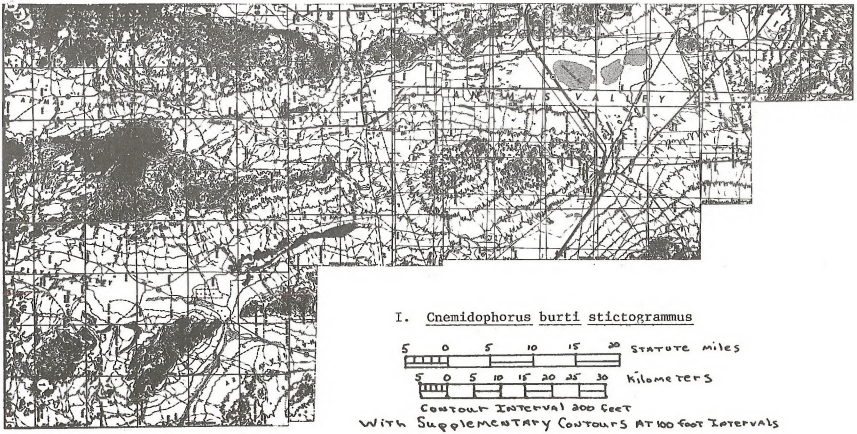
PREDATORS: Any of the reptile eating avian or mammalian diurnal predators mentioned for Masticophis flagellum cingulum may be considered potential predators here. Masticophis flagellum cingulum may also eat these lizards.

PREY: According to Dr. John W. Wright (pers. comm.), this lizard is an active forager on any insect prey of suitable size though there is a preference for termites.

MANAGEMENT: Hopefully, more complete studies on the ecology of this species will be conducted in Guadalupe Canyon. Habitat preservation is the key to management of the unique Guadalupe Canyon fauna. See USBLM (1969) for specific suggestions on management of this area.

LOCALITIES:

I. Hidalgo Co.: T. 34S., R. 22W., Guadalupe Canyon, UNM(2), KU(1), Wright (1).


I. Cnemidophorus burti stictogrammus
5 0 5 10 15 20 STATUTE miles
5 0 5 10 15 20 25 30 kilometers
CONTOUR INTERVAL 200 FEET
WITH SUPPLEMENTARY CONTOURS AT 100 FOOT INTERVALS

CLASS REPTILIA ORDER SQUAMATA SUBORDER SERPENTES

FAMILY COLUBRIDAE

Colubrids are presently the most successful family of snakes in the world and play a significant role in the food webs of most terrestrial and fresh water aquatic ecosystems. Colubrids and vipers play an important role in rodent control in the southwestern United States. A large Pituophis melanoleucus (bullsnake) may consume five mice weekly. For this reason, snakes have wide reaching effects on range and grassland conditions, and may limit the spread of rodent-borne disease.

The lack of a pair of anteriorly located fangs distinguish these snakes from the vipers. They possess ventral scutes and large head scales. The scales can be either smooth or keeled. There are several species which mimic the coral snakes (Family Elapidae). They can be distinguished from the coral snake by the fact that red banding never touches yellow banding.

Colubrids have a worldwide distribution and are the most diverse family of snakes on all continents, except Australia. This family contains the largest number of species of any reptile or amphibian family within the study area.

It is impossible to generalize on the habitat of this ubiquitous family. Desert-dwelling, aquatic, arboreal and fossorial species are known.

Both oviparous and ovoviviparous species occur. Reproductive habits are highly variable. Some species will protect their eggs.

Elaphe subocularis - trans-Pecos ratsnake

ELEVATION: Lewis (1950) describes collecting this species on the eastern slope of the Organ Mountains at an elevation of 4100 ft. Other records indicate an elevation range between 1,500 and 5,000 ft. One specimen (Wright and Wright, 1957) was collected at 4,000 ft. in McKilligan's Canyon of the Franklin Mountains. Other locality records from within the study area indicate an elevation range between 4,000 and 5,300 ft.

SOILS AND SUBSTRATE: Lewis (1950) describes the edaphic conditions favorable to the species as coarse alluvial sand and gravel. He also states that they are absent on the hardpan desert surface. The alluvial fans of loose, fine sand are considered favorable to the species depending upon vegetative type. Milstead et. al (in Wright and Wright, 1957) state that rocky areas are preferred.

VEGETATION: The vegetation occurring on the lower eastern slope of the Organ Mountains is described as yucca-mesquite-ephedra grassland (Lewis, 1950). This vegetation is discontinuous with intervening areas of creosote-bush. The preferred habitat seems to exclude the latter. Atriplex canescens (four-wing saltbush) is also abundant in their habitat. Since a relatively large number of specimens have been taken along the Rio Grande River on the road between Las Cruces and Hatch, as well as in the vicinity of Elephant Butte Dam, a phreatophyte vegetation type seems favorable to the species. This species may also occur in playas or desert scrub.

WATER: Though most records for this species occur in the vicinity of permanent or intermittent water, their range does not seem limited by it (see map). The locality data may be biased by concentration of collecting, especially in areas such as Elephant Butte Dam.

FOOD WEB:

PREDATORS: This species is probably preyed upon occasionally by a variety

of animals such as Taxidea taxus (badger), Conepatus leuconotus (hognose skunk), and Circus cyaneus (marsh hawk).

PREY: The diet consists primarily of rodents which are killed by constriction. Ground feeding birds, such as Sturnella neglecta (western meadowlark) and bats, may also be taken occasionally. Juveniles feed on lizards and a variety of invertebrates.

OTHER CONSIDERATIONS: Rodent prey, such as Dipodomys spp. (kangaroo rats), Perognathus spp. (pocket mice), and Peromyscus spp. (deer mice), are primarily seed-eaters and high populations of these species may cause vegetation changes in certain areas. High populations of rodents may represent the largest portion of the vertebrate biomass within a certain area and, therefore, may exert a greater impact on range conditions than cattle or game ungulates. Burt and Grossenheider (1964) report the removal of 12 pounds of seed from one den of Dipodomys spectabilis (banner-tailed kangaroo rat). A breakdown of preferred food for each rodent species is available (Martin et al., 1951).

MANAGEMENT: This docile species is popular in the pet trade and in zoos. Though the species is relatively common in some parts of Texas, it should be protected from commercial collecting within this B.L.M. district. Public awareness should be drawn to the economic significance of all large rodent-eating colubrid snakes.

LOCALITIES:

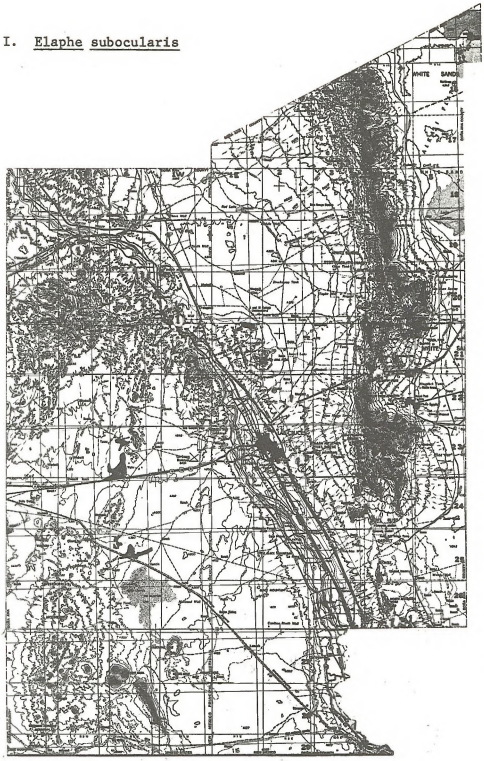
I. Dona Ana Co.: T. 20 S., R. 1 W., 4.5 mi. N. Radium Springs, NMSU (1); 6.1 mi. N. I-25 exit at Radium Springs, Highway 85, NMSU (1); T. 19 S., R. 3 W., 1 mi. S. Hatch on U. S. 85, NMSU (1); T.20S., R.2W., 8.1 mi. N. I-25 exit

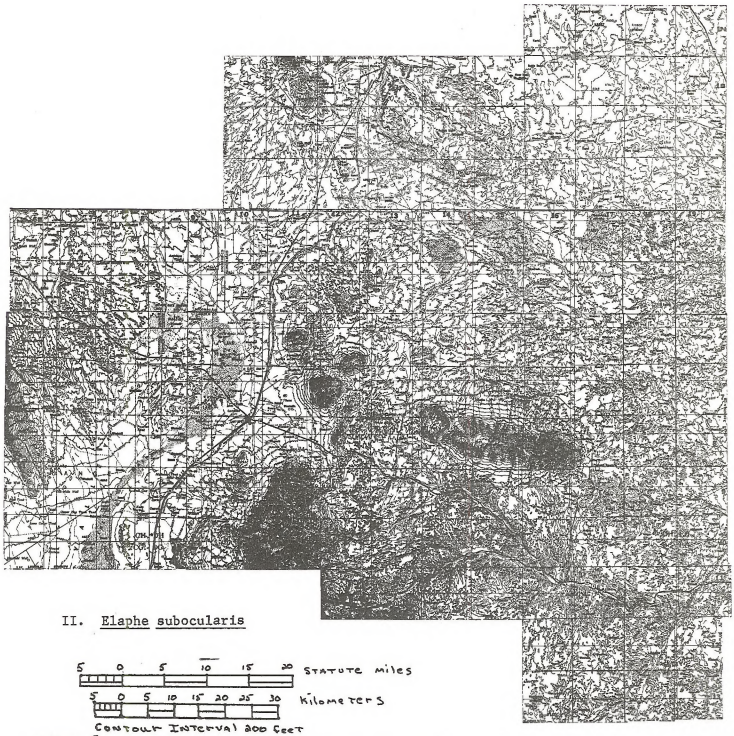
at Radium Springs, Highway 85, NMSU (1); T.22S., R.4E, San Augustin Pass, east slope, Wright and Wright (1); T.22S., R.2E., 2 mi. NE of Las Cruces, NMSU (1); T.23S., R.2E., west side of Tortugas Mt., NMSU (1); T.26S., R.4E., Franklin Mts., on N.M. 404 on El Paso Gas Line near crest of road, MALB (1); 2 mi. from junction with White Sands Highway, MALB (1).

II. Lincoln Co: T.7S., R. 10W., 5 mi. W., 4 mi. N. of Carrizozo, UNM (1).

III. Sierra Co.: T.13S., R.3W., 8 mi. E. of Elephant Butte Dam-Engle Road Junction, UNM (1); T.13S., R.4W., State Road 52, 3 mi. E. of Elephant Butte Dam, UNM (1); 2 mi. E. of Elephant Butte Dam, LACM (2); Elephant Butte Dam, NMSU (1).

I. Elaphe subocularis





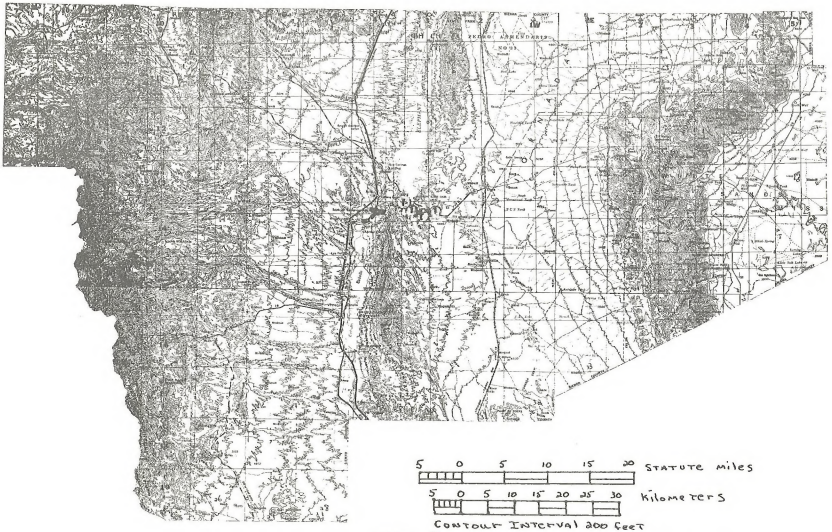
II. Elaphe subocularis

5 0 5 10 15 20 STATUTE Miles

5 0 5 10 15 20 25 30 Kilometers

CONTOUR INTERVAL 200 FEET
WITH SUPPLEMENTARY CONTOURS AT 100 FOOT INTERVALS

III. Elaphe subocularis



Lampropeltis pyromelana pyromelana - Arizona mountain kingsnake

ELEVATION: The species, L. pyromelana, is found between 2,800 to 9,100 feet (Stebbins, 1966). In the study area, it is found at the relatively high elevation range of 3,900 to 6,700 feet as indicated by available locality data.

SOILS: A specimen collected in the Huachuca Mountains of Arizona was found on slate gray rocks in damp soil (Wright and Wright, 1957). The soils of their preferred habitat tend to be high in leaf litter and other organic content. Dead logs and branches often cover the surface. Indian Creek Canyon, a known locality for the species in the Animas Mountains, is steep sided with numerous rock outcrops. They are often found in the vicinity of talus slopes.

VEGETATION: This snake is found in the more mesic vegetative communities of mountain ranges in southwestern New Mexico. The canyon effect which is important for the more mesic plant communities also determines the disjunct distribution of this snake. Wright and Wright (1957) describe the habitat as coniferous forest, chaparral woodland, and pinyon-sycamore-walnut associations. The species ranges through the vegetative shifts from mixed conifer forest of Douglas fir-ponderosa pine communities through the lower elevation class of coniferous woodland.

WATER: Moist conditions seem to be the major limiting factor in the distribution of this species. They are most active on cloudy days and under humid conditions. They are normally found in the vicinity of a permanent or intermittent water source.

PREDATORS: This species may occasionally be taken by the omnivorous Nasua nasua (coati). The only record for the state of this rare mammal is from

Pine Canyon in the Animas Mountains (Findley et. al., 1975). This canyon consists of suitable habitat for the Sonora mountain kingsnake. Conepatus mesoleucus (hog-nosed skunk) is known from Animas Peak (Findley et. al., 1975) which is also inhabited by the kingsnake. Other predators such as Canis latrans (coyote), Buteo abbreviatus (zone-tailed hawk), and Buteo jamaicensis (red-tailed hawk) may prey upon this species.

PREY: The stomach of one specimen collected in the Huachuca Mountains contained an adult Sceloporus jarrovi (Stebbins, 1954). They probably feed on a variety of snakes, frogs, and small mammals.

MANAGEMENT: Although commercial and private collecting exerts pressure on local populations of this species, the lack of suitable habitat is the major factor in limiting the species' range. Grazing pressures, phreatophyte control, ORV use, and all other usage factors should be closely monitored for effects upon critical habitat. The preferred habitat of this species overlaps the preferred habitat of numerous other rare and endangered species (see other species accounts) and should be considered as another factor in determining land usage priorities in these areas (see distribution maps).

LOCALITIES:

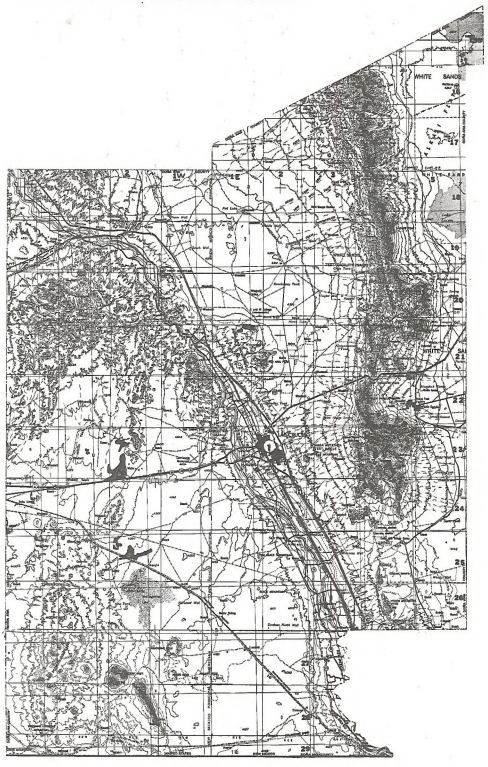
I. Dona Ana Co.: T. 23S., R. 2E., Las Cruces (probably shipping point), USNM (?).

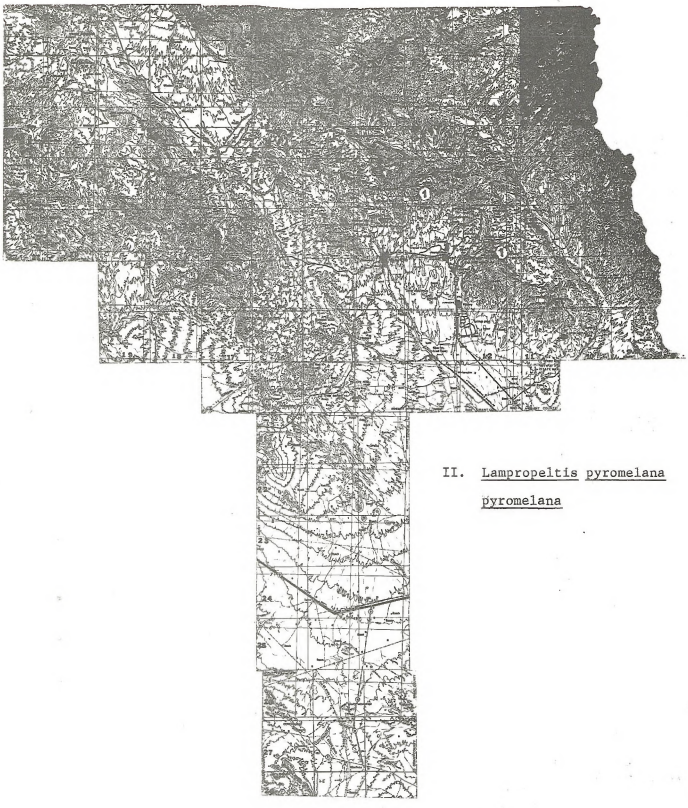
II. Grant Co.: T. 16S., R. 13W., 8 mi. N. of Pinos Altos, UMMZ (1); T. 17S., R. 12W., 6 mi. NE of Bayard, WNMU (1).

III. Hidalgo Co.: T. 31S., R. 19W., AMNH (1); Indian Creek Canyon, Animas Mts., NMSU (1), MALB (1), McVicker (1); T. 33S., R. 21W., Cloverdale Picnic Grounds, UNM (3); T. 31S., R. 15W., Big Hatchet Mts., LACM (1); T. 32S., R. 18W., Walnut Wells, AMNH (1).

IV. Sierra Co.: T. 11S., R. 8W., 1.6 mi. W. of Chloride, Price (1).

I. Lampropeltis pyromelana pyromelana



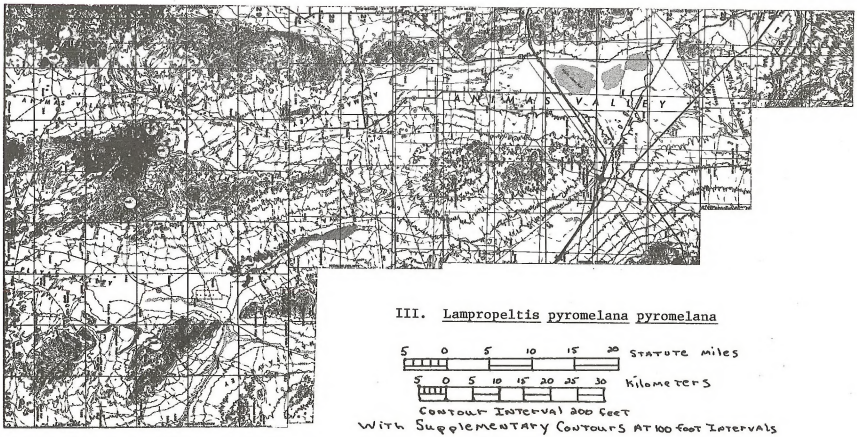


II. Lampropeltis pyromelana pyromelana

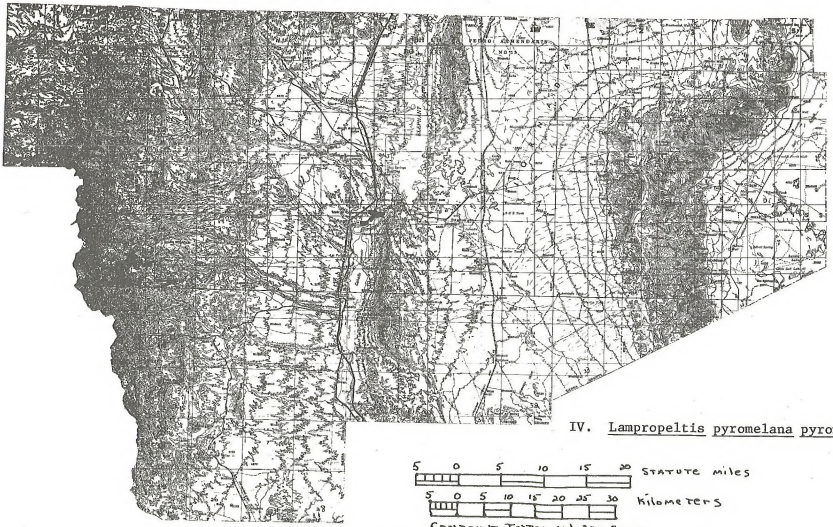
5 0 5 10 15 20 STATUTE MILES

5 0 5 10 15 20 25 30 KILOMETERS

CONTOUR INTERVAL 200 FEET
WITH SUPPLEMENTARY CONTOURS AT 100 FOOT INTERVALS



III. Lampropeltis pyromelana pyromelana



IV. Lampropeltis pyromelana pyromelana

Masticophis flagellum cingulum - Sonora coachwhip

ELEVATION: This distinct subspecies is found only in the extreme southwestern portion of the study area. In New Mexico it seems restricted to the area around Guadalupe Canyon from 4,300 to 4,700 feet. The subspecies probably reaches a lower elevation in the Mexican portion of its range.

SOILS: This snake frequents sandy washes, canyon bottoms and areas of loamy sand. The canyon's soils are of a volcanic origin (U.S. BLM, 1969). This snake is not a burrower but will readily dive into rodent burrows (Ortenburger, 1928).

VEGETATION: As with other whipsnakes and racers, these snakes are excellent climbers and will take refuge in bushes and shrubs when alarmed. They prefer a mesquite-cholla form of vegetation but may also occur along the edge of a water course. The vegetation here consists of a fringe of Baccharis glutinosa (seepwillow) with relatively open stands of the co-dominants Populus fremontii (cottonwood) and Platanus wrightii (sycamore). In other areas there are dense stands of Celtis reticulata (netleaf hackberry) and Quercus arizonica (oak). The ravine alluvium is covered with a variety of shrub species such as Prosopis juliflora (mesquite), Acacia constricta (white thorn), and Xanthocephalum sorethrae (broom snake weed) (USBLM, 1969). This shrubby area may be considered the optimum habitat for the subspecies. The surrounding hillsides also offer cover in the form of Quercus spp. (shrub oak), Juniperus spp. (juniper), and Rhus trilobata (sumac). This vegetative community is more xeric than the streamside areas and can also be considered suitable habitat for the subspecies.

WATER: This snake is relatively xeric and will avoid rain or wet areas when possible (Ortenburger, 1928). They are well adapted to dry conditions though they may avoid activity during the hot parts of the day.

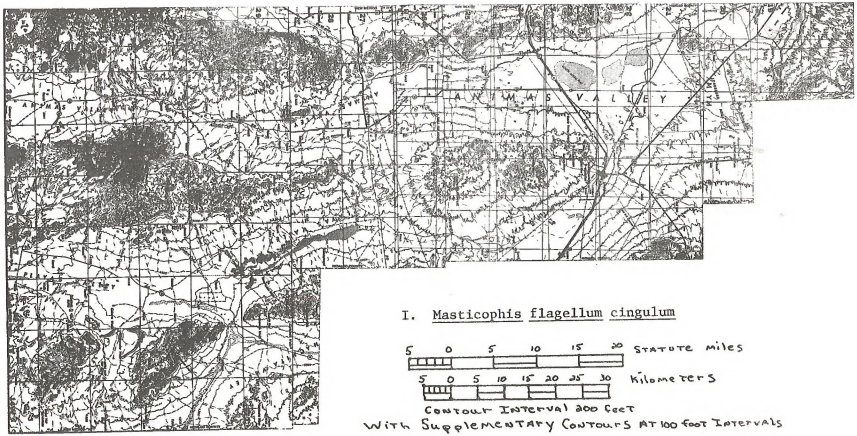
PREDATORS: This subspecies due to its relatively small population size is not preyed upon by any one species consistently but rather is an occasional food source for a wide variety of predators. The following are examples of potential predators; Falco mexicanus (prairie falcon), Falco femoralis (aplomado falcon), and Buteo jamaicensis (red-tailed hawk).

PREY: Wright and Wright (1957) list mice, lizards and young birds as food items. Ortenburger (1928) reports witnessing an individual of a closely related subspecies M. f. piceus swallowing a rattlesnake. Further stomach content analyses revealed several species of lizards including Crotaphytus wislizeni (leopard lizard) and Urosaurus ornatus (tree lizard). Little is known of the natural history of the juveniles but they probably feed upon a variety of insects and small lizards.

MANAGEMENT: This subspecies predominantly occurs in Mexico with a small peripheral population extending into the Guadalupe Canyon area of southwestern New Mexico and southeastern Arizona. This extremely limited range indicates the need for habitat preservation in order to maintain this subspecies as part of the state's fauna. There is an erroneous assumption that because an animal is widely distributed in Mexico it is safe from extinction. In Mexico, habitat destruction may go on at a faster rate than in the United States due to greater economic pressures and less stringent conservation practices for non-game species. As with most if not all endangered species, habitat preservation is the key to managing this animal.

LOCALITIES:

I. Hidalgo Co.: T. 34S., R. 22W., extreme southwestern portion of Guadalupe Canyon, Stebbins (1).



I. Masticophis flagellum cingulum

5 0 5 10 15 20 STATUTE miles

5 0 5 10 15 20 25 30 Kilometers

CONTOUR INTERVAL 200 FEET

WITH SUPPLEMENTARY CONTOURS AT 100 FOOT INTERVALS

Thamnophis rufipunctatus - narrow headed garter snake

ELEVATION: Wright and Wright (1957) give 2,000 - 6,000 feet as the elevation range for the species.

SOILS: This snake is not a burrower and hence not limited by soil type. They are commonly found basking on water smoothed rocks in or near gravelly or sandy stream beds. When alarmed they will dive to the bottom for protection among the rocks. They may also utilize burrows under rocks at the streams edge.

VEGETATION: Since these snakes inhabit a wide range of elevations they follow an elevational gradation of community types including the ecotone areas. At lower elevations they inhabit the pinon-juniper communities which consist of the dominants Pinus edulis (pinon pine), Juniperus monosperma (juniper), and J. deppeana (Alligator bark Juniper). This animal may occur in the Oak-Pine communities which are defined as disturbed areas consisting of Quercus gambelii (gambel's oak), Pinus ponderosa (ponderosa pine), and P. edulis (pinon pine). The species also inhabits ponderosa pine communities which are temperate forests dominated by Pinus ponderosa and a variety of oaks and grasses. The vegetational shifts which occur along the mountain streams inhabited by Thamnophis rufipunctatus result from a variety of interrelated ecological factors such as elevation, edaphic conditions, slope and directional exposure. The species is described as inhabiting streams banked with cottonwoods (Stebbins, 1954). Wright and Wright (1957) list mesquite-grassland as a favorable habitat. Fleharty (1967) describes a rocky locality sparsely vegetated with Vitis arizonicus (Oregon grape), Clematis (clematis), Opuntia spp. (prickly pear) and various grasses.

WATER: Most species of the genus Thamnophis are terrestrial under humid conditions and highly aquatic under xeric conditions. All species of this genus found within our study area are highly aquatic. Thamnophis rufipunctatus prefers the quiet pools of fast moving mountain streams. The water in the pools of the Gila river (inhabited by this species) is clear of sediment except after storms and is highly oxygenated.

PREDATORS: This species provides an occasional food source for a variety of predators which frequent stream banks. Some possible mammalian predators would be Conepatus leuconotus (hognose skunk), Mephitis macroura (hooded skunk), Procyon lotor (raccoon), and Bassariscus astutus (ringtail). Some possible avian predators are Ardea herodias (great blue heron), Circus cyaneus (marsh hawk), and Lanius ludovicianus (loggerhead shrike).

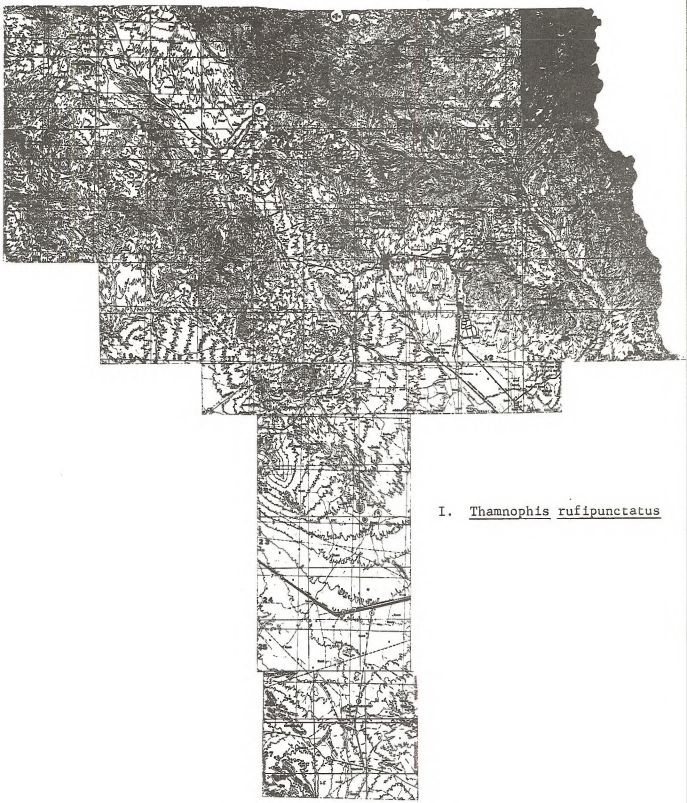
PREY: Wright and Wright (1957) state that toads are the main food item. Stebbins (1966) lists fish, frogs, tadpoles, and salamanders as possible food items. Fleharty (1967) reports that the species feeds primarily upon Lepomis cyanellus (green sunfish) and Salmo gairdneri (rainbow trout) in the vicinity of Wall Lake in Catron Co. The availability of fish prey may vary seasonally.

MANAGEMENT: Preservation of the riparian habitat utilized by this species is the only method capable of maintaining the species within the state. The amount of suitable habitat is limited and the pressures exerted on it by man's activities are extensive. Agricultural development, heavy grazing pressure, phreatophyte control, damming and lumbering could all have deleterious effects upon the riparian habitat required by this and many other endangered species.

LOCALITIES:

I. Grant Co.: XSX Ranch, east fork of the Gila River, Stebbins (1); T.21S., R. 14W., ± 1 mile upstream from The Meadows, Gila River middle fork, Gila Wilderness Area, McVicker, (1); T. 18S., R. 18W., near the mouth of Middle Box, USBLM (1); Turkey Creek, above Hot Springs, Gila National Forest, NMSU (1).

II. Hidalgo Co.: T. 19S., R. 21W., Gila River, 5 miles E. of Virden, NMSU (1); T. 19S., R. 20W., Gila River, at the mouth of Cottonwood Canyon, NMSU (1).

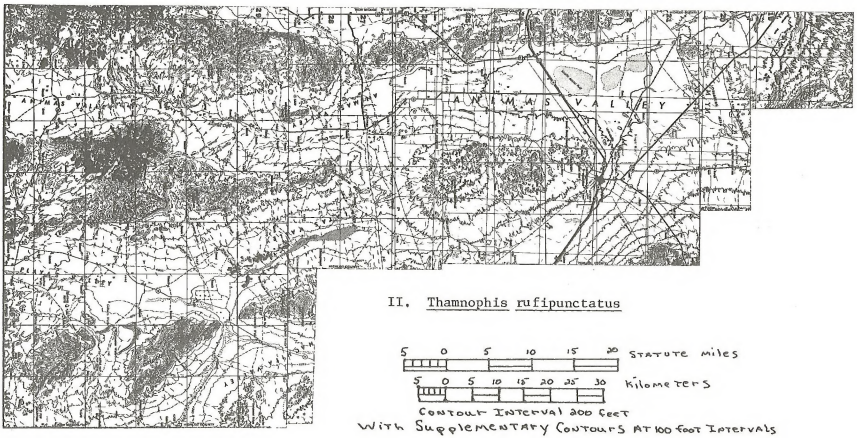


I. Thamnophis rufipunctatus

5 0 5 10 15 20 STATUTE MILES

5 0 5 10 15 20 25 30 KILOMETERS

CONTOUR INTERVAL 200 FEET
WITH SUPPLEMENTARY CONTOURS AT 100 FOOT INTERVALS



II. Thamnophis rufipunctatus

5 0 5 10 15 20 STATUTE Miles

5 0 5 10 15 20 25 30 Kilometers

CONTOUR INTERVAL 200 FEET
With Supplementary Contours at 100 foot Intervals

Trimorphodon biscutatus - lyre snake

STATUS: Two distinct subspecies of Trimorphodon biscutatus inhabit our study area. T. b. lambda (Sonora lyre snake) is presently known from Hidalgo Co. and T. b. vilkinsoni (Texas lyre snake) is known from Luna, Dona Ana, and Sierra Counties. It is important to note that the former represents a peripheral extension of the Sonoran Desert fauna (Gehlbach, 1958) while the latter occurs in the Chihuahuan Desert formation. See Gehlbach (1971) for a thorough discussion of the taxonomic status of the species.

ELEVATION: Wright and Wright (1957) give an elevation range of sea level to 5,000 feet for T. b. lambda. One specimen was collected at 4,800 feet in Catron Co., New Mexico (Gehlbach, 1958). Another specimen from the Pascoe Ranch of the Guadalupe Mts. (Hidalgo Co.) was collected at 5,300 feet. The data available indicates that this subspecies ranges between 4,200 and 5,300 feet in Hidalgo Co. T. b. vilkinsoni has been reported from between 4,000 and 5,000 feet (Wright and Wright, 1957). Two specimens were collected in the Big Bend area of Texas at 3,040 feet and 5,400 feet, respectively (Degenhardt and Steele, 1957). Another specimen was collected at 5,500 feet near the base of the Organ Mts. (Medica, 1965). Within our study area, this subspecies has been collected between 4,200 and 5,500 feet.

SOIL AND SUBSTRATE: The species seems to be limited to rocky areas. Harris (1959) describes a capture site for T. b. lambda as a moderately rocky arroyo on a south facing slope. The same subspecies has been reported from gravelly desert hills (Gehlbach, 1958), a crevice in a rock cliff (Stebbins, 1954), and rocky canyons (Lowe, 1964). T. b. vilkinsoni has been collected within the Pennsylvania series of limestone on the east slope of the Franklin

Mts. by Crimmins (in Wright and Wright, 1957). This form has also been taken in a stream bed surrounded by rough rocky terrain (Wright and Wright, 1957). Other records include bare ground near an adobe house (Degenhardt and Steele, 1957), a mining cabin (Jones and Findley, 1963), and on gravelly soil under granite rock (Medica, 1965).

VEGETATION: Lowe (1964) states that T. b. lambda will occur in desert, grassland, evergreen woodland and ponderosa pine forest. A locality described by Gehlbach (1958) consists of desert grassland occupied by Prosopis (mesquite), Juniperus (juniper), Yucca (yuccas) and Opuntia (prickly pear). Within the study area, T. b. vilkinsoni is known mainly from sites with sparse grass cover, Prosopis (mesquite), Larrea tridentata (creosote), Fouquieria splendens (ocotillo), and Opuntia (prickly pear).

WATER: The distribution of the species does not seem to be limited to close proximity to permanent water. There is some evidence that T. b. vilkinsoni is more active during cloudy or wet conditions (Jones, B., pers. comm.; Medica, 1965; Degenhardt and Steele, 1957.).

PREDATORS: This species is probably taken occasionally by a wide variety of avian and mammalian predators which occupy the same habitats.

PREY: Ditmars (in Wright and Wright, 1957) states that T. b. lambda feeds on lizards, small snakes and batrachians. Harris (1959) observed this subspecies attempting to eat an individual Perognathus intermedius (rock pocket mouse), which was caught in a museum special. Stomach content analyses have revealed Sceloporus clarki (Clark's spiny lizard) (Gehlbach, 1958) and Sceloporus undulatus (eastern fence lizard) (Stebbins, 1954) as food items. T. b. vilkinsoni prefers lizards when offered a variety of food items in captivity (Degenhardt and Steele, 1957).

MANAGEMENT: As relatively little is known of the natural history of this species, it is hoped that more research will be conducted in the future. Much of the potentially suitable habitat for T. biscutatus is at present relatively unmolested. Mining or surface disturbance of rock formations should be restricted at the known localities for this species.

LOCALITIES:

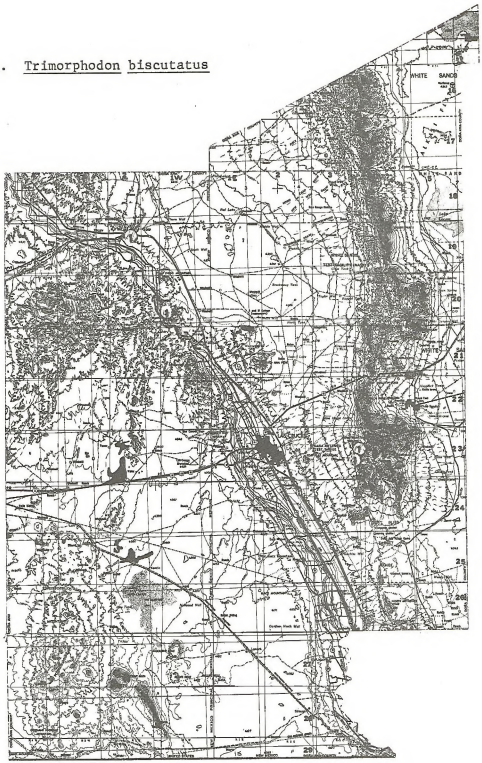
I. Dona Ana Co.: T. 23 S., R. 3 E., Cuevas Rock, 11 mi. E. and 1 mi. S. of Las Cruces, LACM (1); T. 21 S., R. 1 W., 5.2 mi. N. of Radium Springs on Rt. 85, NMSU (1), Radium Springs, NMSU (1); T. 19 S., R. 3 W., 1/2 mi. E. of Rincon, LACM (1).

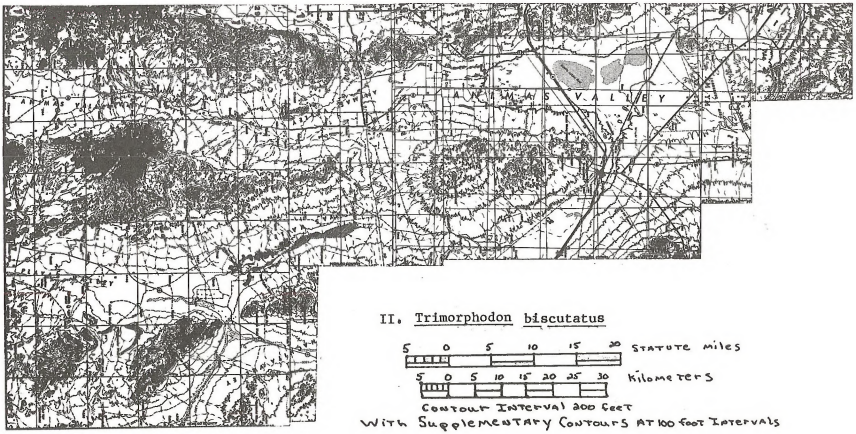
II. Hidalgo Co.: T. 34 S., R. 21 W., Guadalupe Mts., UNM (1); T. 34 S., R. 22 W., Guadalupe Canyon, 1.2 mi. E. of the Arizona-New Mexico border, UAZ (1); T. 29 S., R. 21 W., Miller Ranch, 7 mi. S. and 2 mi. E. of Rodeo, AMNH (1); T. 28 S., R. 21 W., Rodeo, MVZ (1); T. 25 S., R. 20 W., Granite Gap, NMSU (1).

III. Luna Co.: T. 27 S., R. 8 W., east side of the southernmost peak of the Tres Hermanas Mts., 26 mi. S. and 4 mi W. of Deming, UNM (1); 5.7 mi. N. and 1.7 mi. W. of Columbus, LACM (1).

IV. Sierra Co.: T. 13 S., R. 18 W., Engle Exit Rd., 2.3 mi. E. Elephant Butte Dam, UNM (3), Elephant Butte Park between Main and Auxiliary Dams, UNM (1), 1 mi. E. Elephant Butte, LACM (3); T. 16 S., R. 7 W., 3 mi. E. of Hillsboro, UNM (1).

I. Trimorphodon biscutatus





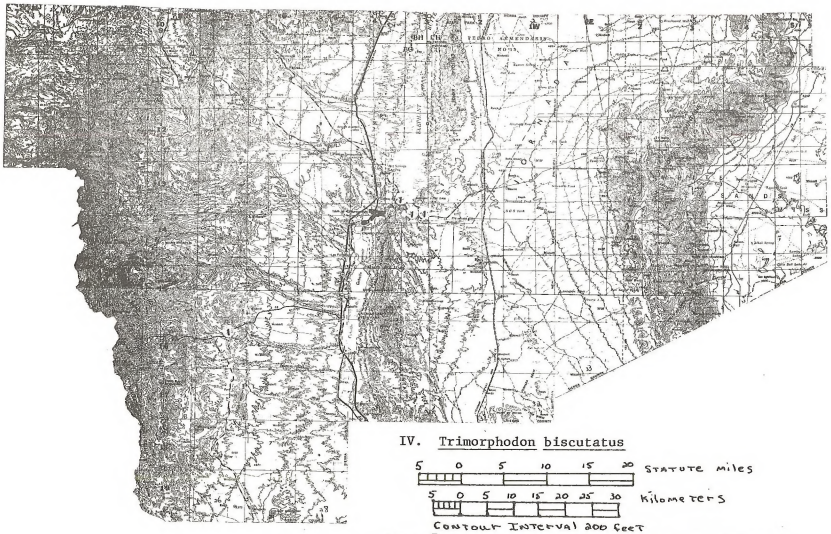
II. Trimorphodon biscutatus

III. Trimorphodon biscutatus

5 0 5 10 15 20 STATUTE MILES

5 0 5 10 15 20 25 30 KILOMETERS

CONTOUR INTERVAL 200 FEET
WITH SUPPLEMENTARY CONTOURS AT 100 FOOT INTERVALS



IV. Trimorphodon biscutatus

5 0 5 10 15 20 STATUTE MILES

5 0 5 10 15 20 25 30 KILOMETERS

CONTOUR INTERVAL 200 FEET
WITH SUPPLEMENTARY CONTOURS AT 100 FOOT INTERVALS

FAMILY ELAPIDAE

These highly venomous snakes have hollow permanently erect fangs located near the front of the mouth. Only 1 species, Micruroides euryxanthus (Arizona coral snake) occurs within the area of study. It can be distinguished from members of all other families by a unique color pattern. They are brightly colored with alternating rings of red, yellow, and black with red bands in contact with yellow bands. These bands encircle the body. The scales are smooth and ventral scutes are present.

Elapids are found in Africa, Asia, and the Americas. They are the dominant family of snakes in Australia. The family includes such deadly species as kraits, cobras, and tiger snakes. Only two genera, Micrurus and Micruroides, are found in North America.

These snakes occur in a wide variety of terrestrial and aquatic communities. The Arizona coral snake is found normally in loose sand and in a variety of vegetation types.

Most species are oviparous. As with many secretive fossorial reptiles, little is known of the reproductive habits of the coral snakes.

Micruroides euryxanthus - Arizona coral snake

ELEVATION: Wright and Wright (1957) state that the species is normally found between 3,000 and 4,000 feet and possibly from between 500 and 5,000 feet. Lowe (1964) states that the species extends up to 5,000 ft. in Arizona. In Hidalgo Co., the species has been taken between 4,455 and 5,200 feet. In Grant Co., it has been taken between 4,551 and 5,647 feet.

SOIL AND SUBSTRATE: One specimen taken in the vicinity of New Kino, Sonora, Mexico was found in loose sand at sea level. Lowe (1964) writes that they are found in a variety of soils from loose sand to rocky rubble. The species is largely fossorial and a suitable digging medium may be an important limiting factor for the species.

VEGETATION: The Sonoran Desert formation extends into western New Mexico where it forms a complex ecotone with the Chihuahua Desert formation (Lowe, 1955). The presence of Micruroides euryxanthus (a component of the Sonoran Desert fauna) in New Mexico is attributed to this ecotone. In Arizona, this species inhabits desert, grassland, and lower woodlands (Lowe, 1964). Stebbins (1966) indicates that it inhabits thorn scrub, brushland, woodland, and farmland. In New Mexico, they have been taken from desert flats, chaparral, and mountain riparian vegetation types.

WATER: There is some indication that this species is active during overcast days after rains (Stebbins, 1966). It has been found in the vicinity of permanent water, but it is not a requirement. Soil moisture may be an important factor in the activity of this fossorial species.

PREDATORS: There is evidence that this and other species of coral snakes may serve as models of Mertensian mimicry (Smith, 1975). This would require that potential predators possess an innate aversion to the color pattern exhibited by this highly venomous species as well as by their mimics, such as

Lampropeltis pyromelana. It is not known if any predators will prey upon the Arizona coral snake.

PREY: In captivity, the Arizona coral snake has been fed Xantusia vigilis (Arizona night lizard) and Anniella p. pulchra (silvery legless lizards) (Lowe 1948). In nature, the species probably feeds upon a variety of lizards and small snakes (Wright and Wright, 1957). Tantilla spp. (black-headed snakes), Leptotyphlops spp. (worm snakes), and Gyalopion canum (western hook-nosed snake) are probable food items. One individual kept at the San Diego Zoological Garden fed upon 5 species of lizards, and 4 species of small snakes (Shaw, 1971).

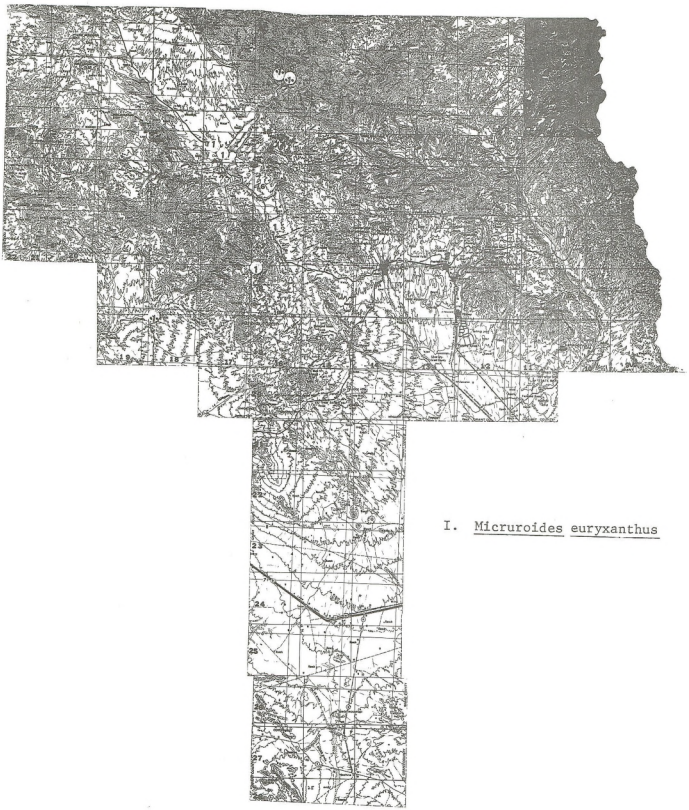
MANAGEMENT: Except for the properties of the venom and feeding habits, very little is known about this snake. Hopefully, in the future more research will be conducted in order to elucidate the factors determining its critical habitat. Any observation of this species (or any of the other species mentioned in this report) from within our study area should be reported to the Las Cruces office of the B.L.M. All reports should include date of collection, collector's name, precise locality, and any ecological observations, such as weather, vegetation, etc. A positive identification is essential for data to be significant. All specimens collected should be reported to the New Mexico Game and Fish Department in Santa Fe, New Mexico, and deposited in a major museum collection such as N.M.S.U. or U.N.M.

LOCALITIES:

I. Grant Co.: T. 15S., R. 17W., Cliff, WNMU (1); 1.9 mi. N. of Cliff, Highway 180, UAZ (1); T. 18S., R. 16W., head of Saddle Rock Canyon, WNMU (1); T. 17S., R. 16W., Blacksmith Canyon, LACM (1); T. 14S., R. 16W., mouth of Turkey Creek Canyon, 11 mi. NE of Cliff, Stebbins (1), Woodin (1); T. 19S.,

R. 18W., Redrock Game Area, McVicker (?).

II. Hidalgo Co.: T. 30S., R. 18W., 3 mi. W. of Winkler Ranch at the SE foot of Gillespie Peak, AMNH (1); T. 24S., R. 21W., 17 mi. W. of Lordsburg, UNM (1); T. 30S., R. 21W., Miller Ranch, 7 mi. S. and 2 mi. E. of Rodeo, AMNH (1).

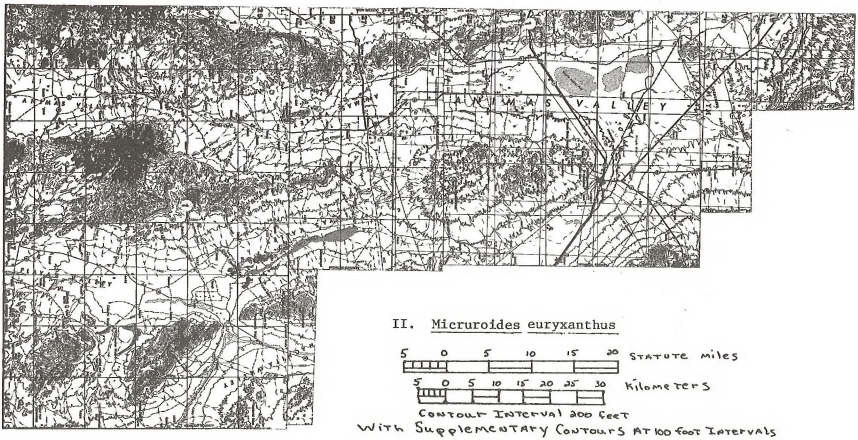


I. Micruroides euryxanthus

5 0 5 10 15 20 STATUTE miles

5 0 5 10 15 20 25 30 Kilometers

Contour Interval 200 feet
With Supplementary Contours at 100 foot Intervals



II. Micruroides euryxanthus

FAMILY VIPERIDAE - vipers

This discussion is confined to the subfamily Crotalinae (pit vipers) because all New World vipers belong to this taxon.

Pit vipers are considered the most highly evolved of the Reptiles. They possess heat-sensitive pits between the eyes and nostrils which are effective in locating warm-blooded prey. The venom injection system is highly advanced in these snakes. Hollow, retractable, sheathed fangs are located anteriorly on the upper jaw. Upon striking, these fangs can be thrust forward. Many species seem to have voluntary control of venom injection. Bites without a resulting toxic reaction are common from copperheads and many of the rattlesnakes. In our study area, there are only two genera of vipers (Crotalus and Sistrurus). Both of these are rattlesnakes with well-formed rattles. Many large colubrids will rattle their tails in dry leaves or brush with a resulting sound very similar to that emitted by rattlesnakes.

Pit vipers are found from Canada through South America. They also occur in Europe and Asia.

They occupy a wide variety of habitats from swamps to desert.

They are ovoviviparous.

Crotalus scutulatus scutulatus - Mohave rattlesnake

ELEVATION: Locality records from within our study area indicate that this species ranges in elevation from 4,128 to 4,400 feet. Stebbins (1966) states that the species occurs from sea level to 8,000 feet. Other elevation reports are 2,000-4,500 feet (Wright and Wright, 1957), and up to 6,800 feet (Klauber, 1972).

SOILS: Neither soil nor substrate appears to be a limiting factor for this species. Within our study area, they are often found on sandy, gravelly desert floor. They may occur on alluvium of coarse gravel and firmly packed sands (Klauber, 1972). They are known to occupy the burrows of Dipodomys spp. (kangaroo rats) and Neotoma spp. (packrats). In the lower elevations of the Peloncillo Mountains, this snake inhabits the sandy washes of canyon bottoms.

VEGETATION: This snake occupies a wide variety of vegetation types throughout its U.S. range. In the vicinity of Kingman, Arizona, this snake is abundant in the bushy plains (Klauber, 1972). Klauber (1972) also reports the species to be found in the following community types: mesquite-creosote-cacti, Joshua tree forests, mesquite riparian, rocky hills, and mesquite grassland. They are often found under mesquite and creosote bushes (Wright and Wright, 1957). They have been collected in the area of the Cienega de San Simon (UNM) which is a marsh fringed with cattails and other phreatophytes. The American Museum of Natural History holds a specimen from Post Office Canyon in the Peloncillo Mts. The vegetation here consists of white oak and Apache plume (Moir). Moir describes the vegetation type as an open canopied woodland with trees widely spaced along a wash. He also notes rabbitbrush, seepwillow, and soapberry as associated with this type. The wash is bordered by Oak savannah

(open encinal) and shrubsteppe. Two individuals were observed on the road in the vicinity of Rodeo. This area is creosote scrub with yucca.

WATER: This species is well adapted to arid conditions and its distribution is not limited by permanently available water.

PREDATORS: Among the mammals within our study area, Taxidea taxus (badger), Canis latrans (coyote), Pecari angulatus (peccary), and Bassariscus astutus (ringtail) may occasionally prey upon the Mohave rattler. Potential avian predators for our area are Aquila chrysaltos (golden eagle), Buteo jamaicensis (red-tailed hawk), and Geococcyx californianus (roadrunner). Lampropeltis getulus (kingsnake) is known to occur in the same area as the Mohave rattler. The kingsnake is well known as a predator upon other snakes.

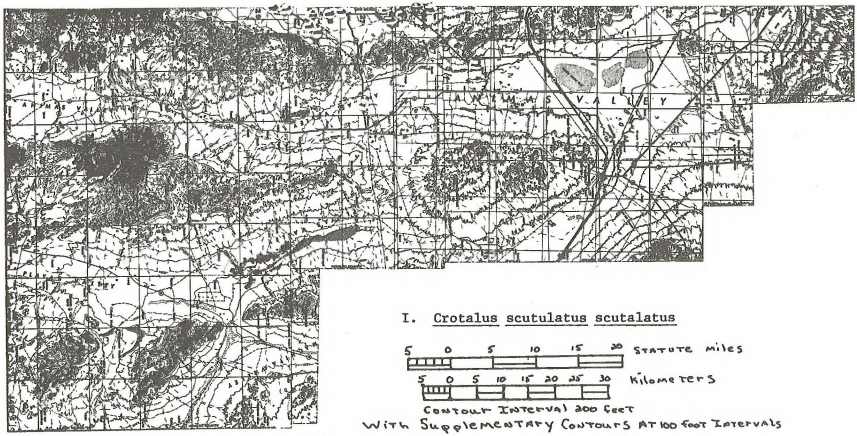
PREY: This species feeds primarily on rodents. Members of the following genera occur within its range: Peromyscus (deer mice), Reithrodontomys (harvest mice), Dipodomys (kangaroo rats), Perognathus (pocket mice), and Neotoma (woodrats). Klauber (1972) lists centipedes, insects, lizards, and rodents as prey for the species. Klauber also states that C. M. Bogert observed one of these species eating a Dipodomys (kangaroo rat).

MANAGEMENT: This subspecies is peripheral in New Mexico and, therefore, the populations are relatively small. In residential areas, all rattlesnakes must be controlled for safety reasons. Because of their importance in rodent control, they should not be molested in remote areas.

LOCALITIES:

I. Hidalgo Co.: T. 25S., R. 21W., 6.1 mi. S. of Road Forks, AMNH (1); T. 26S., R. 22W., San Simon Cienega, UMMZ (1), Belfit (1); 13 mi. N. of Rodeo, UNM (1); T. 27S., R. 21W., 4.9 mi. N. of the junction of State Road 9 with U.S. 80 on 80, Belfit (1); 6.3 mi. N. of Rodeo, UNM (1); T. 27S., R. 20W.,

3 mi. W. of Animas, KU (1); 12.1 mi. NE of Rodeo, UAZ (1); T. 28S., R. 21W., 5 mi. N. of Rodeo, UNM (1); 2 mi. N. of Rodeo, Belfit (1); 1 mi. N. of Rodeo, UNM (1); 3.4 mi. NE of Rodeo, UAZ (1); 4.0 mi. N. of Arizona St. Line on U.S. 80, NMSU (1); T. 29S., R. 21W., 8 mi. S. of Rodeo, SRS (1).


A N A M A S V A L L E Y
I. Crotalus scutulatus scutalatus
5 0 5 10 15 20 STATUTE miles
5 0 5 10 15 20 25 30 Kilometers
Contour Interval 200 feet
With Supplementary Contours at 100 foot Intervals

Crotalus viridis cerberus - Arizona black rattlesnake

STATUS: The distribution of this subspecies of the prairie rattlesnake is poorly known from within our study area. At the time of this work there are only 2 recorded localities. This subspecies is locally common in various mountain habitats of Arizona.

ELEVATION: In Arizona, this rattler is known only from high elevations in the mountains. Klauber (1972) lists locality records from between 8-10,000 feet. The same author also states that in the southern portions of the snake's range, the elevation requirements are higher.

SOILS AND SUBSTRATE: Insufficient data exists to generalize on soil preferance for this subspecies.

VEGETATION: Wright & Wright (1957) name chaparral woodland as a known habitat. In our study area, many more localities must be found before the vegetative preferances of this snake can be determined. The two known localities are from riparian situations.

WATER: The water requirements are not understood for our area. Both known localities are in the vicinity of the Gila drainage.

PREDATORS: Crotalus viridis cerberus may serve as an occasional prey item for various mammals and raptors.

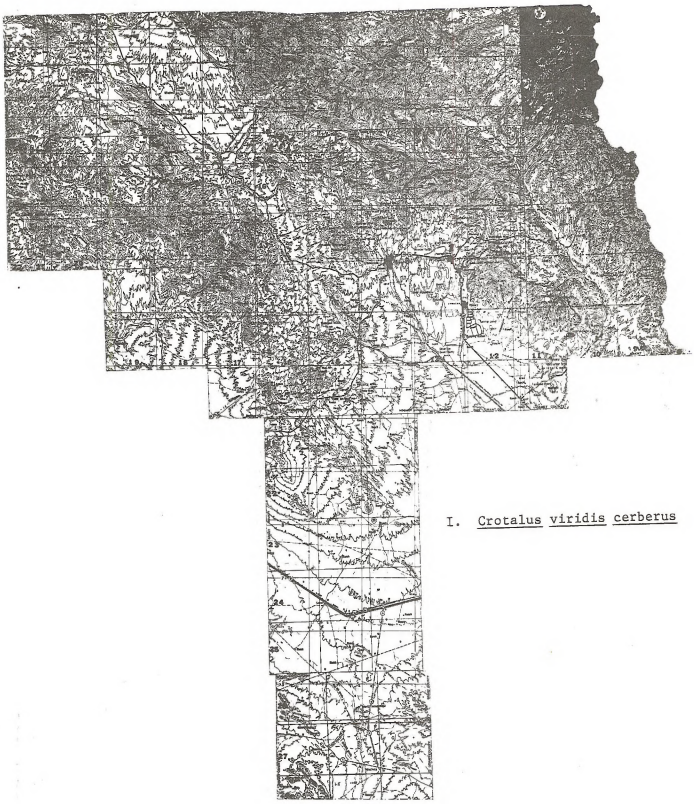
PREY: Klauber (1972) lists Sialia mexicana (blue bird), Mimus polyglottas leucopterus (western mocking bird), Dendroica (Arizona warblers) and various mammals as known food items. He also reports that lizards are probably the major food source for the young.

MANAGEMENT: The known localities for this subspecies should be monitored and protected from major human disturbances.

LOCALITIES:

I. Grant Co.: T. 13S., R. 16W., 1 mi. above Turnbo Canyon junction with Mogollon Creek, Gila National Forest, Mello (1).

II. Hidalgo Co.: T. 18S., R. 21W., Steeple Rock, Klauber (1).



I. Crotalus viridis cerberus

Crotalus willardi obscurus - New Mexican ridge-nosed rattlesnake

ELEVATION: In Indian Creek Canyon, this species normally occurs between 6,600 and 7,000 feet though occasionally they are found at higher or lower elevations (McVicker, pers. comm.). The locality records available indicate an elevational range from between 5,400 and 7,200 feet. The lower limit may represent an individual displaced by flooding (McVicker, pers. comm.). Elevation and slope effect are mainly responsible for determining the vegetation type which in turn controls dispersion of this rattlesnake. This species has also been listed as occuring between 6,200 feet and 8,000 feet (Harris and Simmons, 1976).

SOILS AND SUBSTRATE: Most specimens have been collected within a narrow strip extending up Indian Creek or Bear Creek Canyons. They are either found in the washes or around the proximal rocky talus slopes. The rock outcrops are a favorable habitat (Harris and Simmons, 1976; Bogert and Degenhardt, 1961). They are often found in the dead leaf litter of the canyon slopes. They are most abundant in mesic microhabitats shaded from the sun during the hot part of the day (Harris and Simmons, 1976).

VEGETATION: This subspecies seems to be restricted to the pine-oak woodland belt of the Animas Mountains. This belt is bordered at lower elevations by Oak Woodland and Chaparral and above by Ponderosa Pine forests (Lowe, 1964). Bogert and Degenhardt (1961) describe the vegetative community as composed of the following species: Juniperus deppiana (alligator juniper), Pinus cembroides (pinon pine), P. leiophylla (Chihuahua pine), Quercus reticulata (netleaf oak), Q. gambelii (Gambel oak), and Q. hypoleucoides (silverleaf oak). On the occasional exposed sites grasses such as Sporobolus (sacaton) and

Aristida (threeawn) will occur. According to Kauffeld (in Harris and Simmons, 1976) Populus sp. (cottonwood), Platanus wrightii (Arizona sycamore) and Arctostaphylos pungens (manzanita) are also components at 5,500'. At higher elevations, the same authors list Q. gambelii (Gambel oak) Cercocarpus breviflorus (mountain mahogany), Pinus flexilis (limber pine), and Psuedotsuga taxifolia (Douglas fir). In the Animas Mountains, the Alamohuecos and Peloncillos, there is pine-oak woodland which may be suitable habitat for this subspecies but from which no records are presently available.

WATER: The vegetative preferance of the species indicates a relatively high humidity requirement in its microclime, Four specimens were found following summer rains (Bogert and Degenhardt, 1961). The activity of this subspecies seems to be determined by both thermoregulatory and osmoregulatory requirements.

PREDATORS: Lampropeltis pyromelana (Sonora mountain kingsnake) occurs in the same habitat as this rattlesnake and probably occasionally feeds upon it. Mephitis mephitis (striped skunk) is also found in the vicinity of Animas Peak (Findley et. al., 1975) and may prey upon the ridge-nosed rattlesnake. Other possible predators in the area are Lynx rufus (bobcat), and Buteo jamaicensis (red-tailed hawk). Findley et. al. (1975) list Dicotyles tajacu (peccary) in Bear Canyon which is one of the known localities for C. w. obscurus. Though snakes are not as important a food source for peccaries as is commonly believed (Knipe, 1964), they are accasionally taken by them (Klauber, 1972).

PREY: According to Klauber (1972) lizards are probably a significant food source for the ridge-nosed rattlesnake. The same author lists Sceloporus j. jarrovi (Yarrow's spiny lizard), Gerrhonotus kingi (alligator lizard),

a warbler, and mammal remains as known food items in nature. He also reports on captive snakes eating Hypsiglena (night snake) and white mice. Some rodents known to occur in Indian Creek Canyon are Peromyscus boylii (brush mouse), Reithrodontomys megalotis (western harvest mouse), Perognathus intermedius (rock pocket mouse) and Dipodomys merriami (Merriam's kangaroo rat) (Findley et. al., 1975). Some lizards known to occur in Indian Creek Canyon are Sceloporus clarki (Clark's spiny lizard), S. undulatus (eastern fence lizard) and Urosaurus ornatus (tree lizard) (museum records). Any of the above species may be considered potential prey for the ridge-nosed rattlesnake.

MANAGEMENT: Crotalus willardi obscurus is one of five disjunct subspecies found in the United States and Mexico. These animals are restricted to disjunct pine-oak refugia and therefore offer significant insight into the speciation of isolated populations. Harris and Simmons (1976) discuss the paleogeography and evolution of the species. The implications are enormous for the potential of this group of isolated subspecies to yield a wealth of information on the climatological and paleogeographic history of their habitat. The morphological and ecological characteristics of these isolated populations are an important research tool for probing gene-flow and its historical implications on vegetative shifts. For further reading see Harris and Simmons, 1976; Bogert and Degenhardt, 1961; and Tidwell, et. al., 1972.

Due to its highly restricted range, the subspecies inhabiting our study area is very fragile. In the past, this snake has been subjected to heavy collecting for both commercial and legitimate purposes. The limited population size implies the importance of maximum gene flow to maintain adaptive potential necessary to cope with future environmental change.

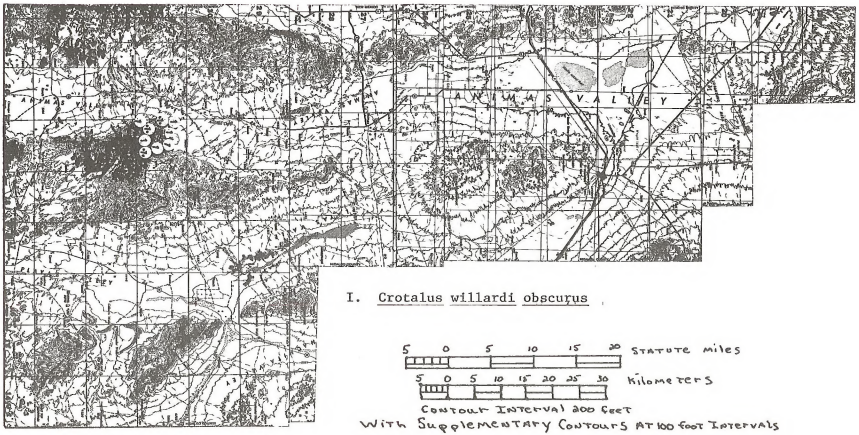
At present, the subspecies is listed by the state of New Mexico as endangered. Also the Pruett-Wray Cattle Company which owns the Animas Mountains has restricted access to the subspecies' habitat; therefore, the population now seems reasonably secure.

Harris and Simmons (1976) identified the following potential problems for the future: sulfer dioxide emissions from the copper reduction plant (Playas Valley); population pressure from employees of the above plant in the form of hunting and "off road" vehicle use; renewed commercial collecting. Overgrazing may also cause habitat destruction in the future. The protection of this snake should be of high priority. The land status should be watched and if detrimental changes are imminent, the Bureau of Land Management should seek to purchase and protect the area.

There is the possibility that other populations of this subspecies may be found in the future within the study area. If they are, they should be reported to the Bureau of Land Management and any collections should be deposited in the museums at either New Mexico State University or the University of New Mexico.

LOCALITIES:

I. Hidalgo Co.: T. 31S., R. 19W., Indian Creek Canyon, UNM (5), WNMU (1); Animas Peak, UNM (2), AMNH (2), McVicker (4); Upper End of Indian Creek Canyon, Stebbins (1), McVicker (1), LACM (1); Bear Creek Canyon, Harris and Simmons (1).



I. Crotalus willardi obscurus

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Bufo alvarius
Colorado river toad)

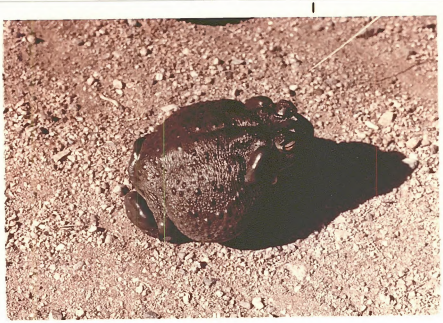


Photo taken at Sonora Desert Museum, Tucson

Heloderma suspectum

Defense posture,
Photo by Gary McVicker,

Granite Gap, N,M,
This well known locality for the Gila monster is a popular collecting site.

Elaphe subocularis
(Trans-Pecos rat snake)

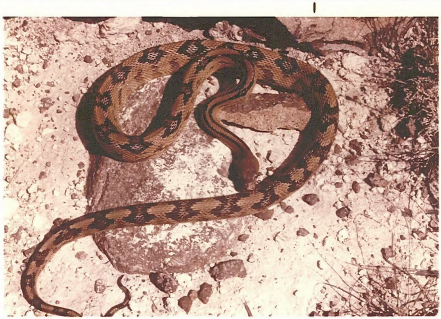


Photo by Kenneth E Holmes
Brewster County, Texas

Several specimens of the trans-Pecos rat snake have been collected in this area. Photo taken near the Rio Grande just north of Radium Springs

Lampropeltis pyromelana
(Sonora mountain kingsnake)

Photo taken at Sonora Desert Museum, Tucson

Trimorphodon biscutatus lambda
(Sonora lyre snake)

Photo taken at the Sonora Desert Museum, Tucson.

Granite Gap, N.M. A juvenile Sonora
lyre snake has been collected at this locality.

Trimorphodon biscutatus vilkinsoni
(Texas lyre snake)

Collected by Bruce Jones near the site shown below.
Photo by Gary McVicker.

Five miles north of Radium Springs.
Note the rocky slope.

Micruroides euryxanthus
(Arizona coral snake)

Note the posture of hiding the head by the stone and raising the coiled tail. This snake also emitted a "popping" sound from the vent.

Post Office Canyon, Pelencillo Mountains. The Arizona Coral Snake has been collected in this area.

Crotalus scutulatus
(Mojave rattlesnake)

Note the relative size of the white and black bands on the tail. Collected at the locality shown below.

Mesquite habitat in the vicinity of San Simon Cienega

Crotalus viridis cerberus
(Arizona black rattlesnake)

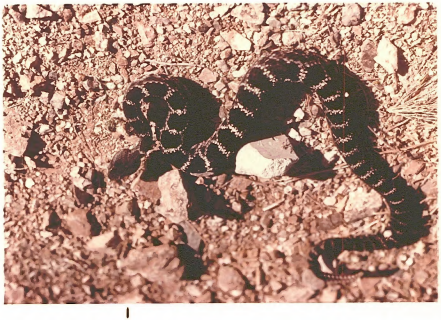
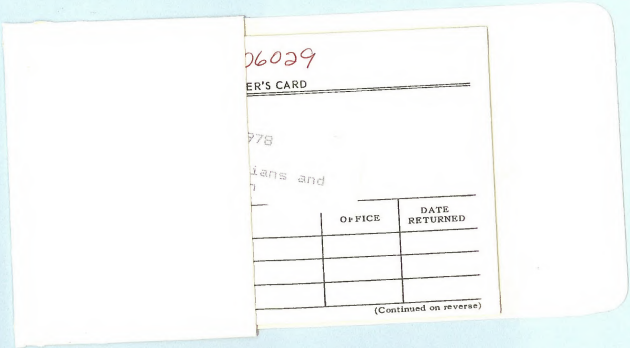


Photo taken at the Sonora Desert Museum, Tucson



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