TERRESTRIAL VERTEBRATES OF FANNIN COUNTY, TEXAS

APPROVED:

Gerald A. Raun

Major Professor

Archie W. Loats

Minor Professor

Director of the Department of Biology

Robert B. Toulouse

Dean of the Graduate School

TERRESTRIAL VERTEBRATES OF FANNIN COUNTY, TEXAS

THESIS

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By

Ronald E. McCuller, B. A.
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TABLE OF CONTENTS

LIST OF TABLES

LIST OF ILLUSTRATIONS

CHAPTER I

INTRODUCTION

Statement of Purpose

The regions of northeastern and north-central Texas have been largely neglected with respect to their vertebrate fauna. Particularly large gaps occur in the known ranges of many amphibians, reptiles, and mammals in these areas of Texas.

The purposes of this study were (1) to provide some knowledge of the herptiles and mammals of the area, (2) to clarify the distribution of many of these animals in this section of Texas, and (3) to provide additional ecological information about the area.

Fannin County, which is situated between the north-central area of Texas to the west and the northeastern area to the east, was chosen as the primary study area.

Description of the Study Area

Fannin County lies in the northeastern corner of north-central Texas (Figure 1). It is bounded on the north by Oklahoma, on the south by Hunt and Collin Counties, on the east by Lamar County, and on the west by Grayson County.

Zoogeographically, Fannin County lies in the Texan Biotic Province near the western margin of the Austroriparian

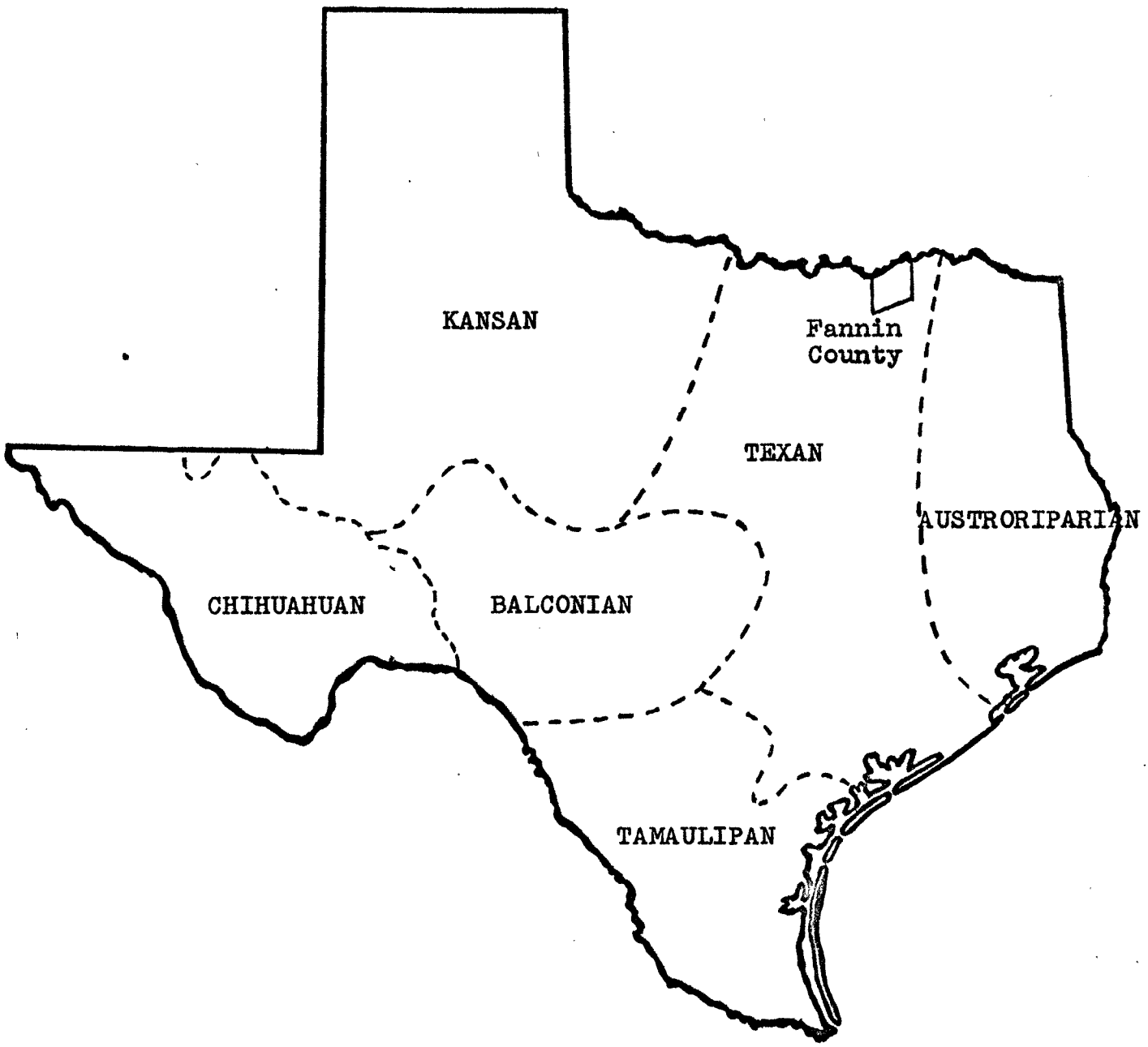

Fig. 1--Biotic provinces of Texas, showing position of Fannin County. Map adapted from Blair (1950).

Biotic Province (Blair, 1950). Since the Texan Province in this area is essentially a transitional zone between more mesic areas to the east and more xeric conditions to the west, the general affinity of the fauna is expected to be eastern.

The topography of the county is largely that of flat or gently rolling plains except where rivers and streams have dissected the land. The presence of many reservoirs in the area has created some low, swampy areas adjacent to the dam-sites. The largest natural waterway is the Red River, on the northern boundary of the county. The Red River valley extends southward over the northern one-third of the county. Most of Fannin County, except the southeastern part, is drained by various tributaries of the Red River. The largest of these streams is Bois d'Arc Creek, which crosses the county from southwest to northeast. In the southeastern portion, a converging network of small streams makes up the headwaters of the North Sulphur River. However, all of the lotic waters in the area except the Red River are intermittent, being dependent on local rainfall for their waters.

Natural surface water is scarce in Fannin County; therefore, many of the mesically adapted vertebrates may be somewhat restricted during excessively dry periods. However, the amount of available surface water has been increased all over the county by the building of many reservoirs and farm ponds. The largest of these reservoirs are Coffee Mill Lake and Lake Crockett in the northeast, Brushy Creek Reservoir in the

northwest, and Lake Fannin in the north. A new reservoir, Timber Creek, has recently been completed but has impounded little water during this study. It is centrally located in the county.

The soil types vary from north to south and these differences have an important influence upon the distribution of many of the vertebrates included in this study. In the north, the alluvial soils of the Red River and the soils of the timber regions prevail. Covering the greater portion of the county, however, are soils typical of the Blackland Prairie. The principal groups of soil series present are described by Frapps and Fudge (1937) as follows:

> Miller-Yahola soils. These are reddish, friable soils. They have a calcareous surface with subsoils lighter than the surface. These soils are the alluvial type found in the north along the Red River.
>
> Kirvin-Norfolk soils. These constitute the major soils of the northern portion of the county. The Kirvin are light brown to grayish, with a red, slowly permeable subsoil. The Norfolk have a gray surface with a yellow subsurface. Subsoil is very permeable and sandy. These are soils of the timbered regions.
>
> Wilson-Crockett soils. These are soils of the timbered areas. They occur in an East to West band across the center of the county. The Crockett soils are brown, black, or spotted, with a reddish, yellowish or gray

mottled subsoil. Wilson soils are black to dark gray, with a dense brown or dark gray subsoil.

Houston-Wilson soils. This soil series is that of the Blackland Prairie and therefore covers most of the county. The Houston soils may be black, dark gray, or ashy black to brown, with yellow, highly calcareous, moderately friable subsoil. The Wilson soils are described with the above series.

The climate of Fannin County was classified by Thornthwaite (1948) as being transitory between humid and moist subhumid, with hot summers and mild winters. The ESSA-Weather Bureau station at Honey Grove in the eastern part of the county records the mean maximum temperature in July as 94 F, and the minimum in January as 33 F. The average date for the first freeze is November 10 and the average date for the last freeze of the year is March 27, giving an average growing season of 228 days per year. Precipitation data are based on the 30-year normal period and rainfall averages 44 inches per year. The greatest amount of precipitation occurs in the late spring and early summer and the least amount occurs in the late summer.

The vegetation of the northern one-third of the county consists of extensions of the Eastern Cross Timbers and the East Texas Timber Country. The typical forest is that of mixed hardwoods, including such trees as post oak, hickory, blackjack oak, hackberry, elm and bois d'arc. However, much

of this land has been cleared for agricultural purposes. In addition, some areas of the Caddo and Panhandle National Grasslands have been replanted in pine in an attempt to demonstrate good land management practices to residents in the area. The majority of the county to the south, except for the waterways, contains the grasslands of the Blackland Prairie. Adjacent to the streams are stands of cottonwood, willow, bois d'arc, and various other trees. Most of the natural prairies have been converted to agricultural use, leaving the natural grasses only along the fence rows and otherwise unusable land. However, large areas of former farmlands in the area have been abandoned and allowed to lie fallow for a number of years, resulting in a gradual return of the natural vegetation.

CHAPTER II

METHODS

Period of Study

This study was begun in October, 1968, and continued through November, 1969. Mammals were collected throughout this period; and collecting of reptiles and amphibians was begun in March, 1969, and extended through October, 1969.

Field Methods

Numerous methods were employed in obtaining records for the vertebrates studied. Most of the smaller mammals were taken with Sherman live traps (3 x 3 x 9 and 5 x 5 x 15 inches), Hav-a-hart live traps (5 x 5 x 18 inches), Victor snap traps, Museum Special snap traps, Macabee gopher traps, and hand collecting. Rolled oats was the most frequently employed bait. Most larger mammals were recorded by finding dead specimens on roads, from sight records, and by obtaining skulls of those killed by local farmers and ranchers. Turtles were collected either by hand or in hoop-type turtle traps. These were made of chicken wire or nylon netting with a funnel on each end. Sardines, fish heads, and various animal products were used as bait. Snakes were collected by hand, with an "L" stick, or drift fence traps. Drift fence traps were used with very little success. They consisted of

hardware cloth made into a rectangular box, having an open funnel at each end. From these ends narrow lengths of hardware cloth were extended, creating a barrier which would lead the animal to the funnel opening. A potato rake was also used for turning ground cover and pinning poisonous species of snakes. Lizards were collected by hand and with the aid of a blowgun made from five-eighths-inch steel tubing and utilizing seedless Thompson grapes as projectiles. All amphibians were collected by hand except for a few frogs which were caught in drift fence traps. Records were made of all animals found dead on highways and those sighted alive. Conversations with long-time residents and the game warden provided some reliable information concerning species present and relative abundance.

Mammals were usually prepared as standard museum skins, but in some cases only skulls were collected. Larger skulls were prepared by boiling in soapy water and smaller skulls and skeletons by utilization of a dermestid beetle colony. Reptiles and amphibians were preserved by injecting the body cavities and appendages with 10 per cent formalin after killing with ether. Snakes and lizards were sexed by everting the male genitalia. This was done by injecting formalin at the base of the tail and applying a steady pressure. The specimens were then hardened in formalin for about 24 hours and then stored in a 40 per cent solution of isopropanol.

All data were initially kept in a field itinerary. Included were species collected, localities, vegetation types, soils, temperatures, and other ecological data. A species catalogue and species account were kept separately for both mammals and herptiles. A specimen number was assigned for each specimen collected. This number, the date, locality, association, other remarks, and, in the case of mammals, total body, tail, hind foot, and ear measurements were recorded. These data were recorded in the specimen catalogue and on a tag attached to the animal. The species account was used to record all records of the species whether an actual specimen was collected or not. This included those captured, sight records, specimens found dead on highways, and reliable records obtained from residents and the game warden.

All prepared specimens are on deposit with the North Texas State University Museum of Zoology, Denton, Texas.

CHAPTER III

RESULTS

Associations

Local variation in vegetational types in Fannin County is largely the result of both natural and man-made forces. As a result of these forces, five associations are recognized on the basis of both edaphic and vegetational factors. These associations, in order of decreasing size in the county, are the Prairie Association, Mixed Hardwoods Association, Juniper Association, Pine-Mixed Hardwoods Association, and the Pine Association.

Prairie Association

This association covers the greater portion of the county. The entire southern two-thirds of Fannin County is part of the northern extension of the Blackland Prairie in Texas. This prairie is, of course, broken up by the waterways and their associated vegetation. In addition, some areas in the timbered regions of the northern part of the county have been cleared of timber and now support grasses and various agricultural crops. Such areas closely resemble prairie, and are therefore included in this association. The typical plants of the prairie are grasses. Many of the principal types present were collected and identified;

others were recorded by Tharp (1939). The most important of the natural grasses of the region include Andropogon gerardi (big bluestem), Andropogon scoparius (little bluestem), Andropogon virginicus (broomsedge bluestem), Andropogon saccharoides (silver bluestem), Sporobolus spp. (dropseed), Bouteloua spp. (gramas), Buchloe dactyloides (buffalo grass), Sorghum halepense (Johnson grass), Paspalum dilataum (dallis grass) and Cynodon dactylon (Bermuda).

Many terrestrial vertebrates were found to be primarily associated with the prairie. Pseudacris streckeri (Strecker's chorus frog), Pseudacris triseriata (striped chorus frog), and Rana areolata (crawfish frog) were taken only in this association and seemed to prefer flooded fields or shallow farm ponds with emergent grasses. Terrapene ornata (ornate box turtle) and Kinosternon subrubrum (Mississippi mud turtle) were also commonly found in the Prairie Association. Snakes typical of this area include Elaphe guttata (plains rat snake), Masticophis flagellum (coachwhip), and Lampropeltis getulus (common kingsnake). Reithrodontomys fulvescens (fulvous harvest mouse), Sigmodon hispidus (cotton rat), and Sylvilagus floridanus (eastern cottontail rabbit) were typical mammals of the association.

Mixed Hardwoods Association

This association is the second largest in the county and occurs in the northern region on alluvial soils of the Red River Valley. Hardwood stands occur to a limited extent in

the southern part of the county along waterways. Quercus stellata (post oak), Quercus marilandica (blackjack oak), Carya texana (Texas Hickory), Celtis laevigata (lowland hackberry), are the dominant trees of this region. However, in some areas Maclura pomifera (bois d'arc) and Ulmus alta (winged elm) are prevalent. Near streams, Populus deltoides (cottonwood) and Salix nigra (black willow) predominate. Other trees identified in the Mixed Hardwoods Association include Sapindus drummondi (soapberry), Quercus macrocarpa (burr oak), Quercus virginiana (live oak), Ulmus americana (American elm), Ulmus crassifolia (cedar elm), Planera aquatica (water elm), and Pinus taeda (loblolly pine).

Forming the layer between the overstory and the forest floor, shrubs such as Rhus typhina (staghorn sumac), Ilex decidua (deciduous holly), Bumelia lanuginosa (wooly buckthorn), Broussonetia papyrifera (paper mulberry), Cornus drummondi (roughleaf dogwood), and Symphoricarpus orbiculatus (coral berry) are found.

On the forest floor are various herbs and some grasses. Grasses, of course, are abundant in forest clearings. The most important of these herbs and grasses are Rhus radicans (poison ivy), Smilax laurifolia (laurel greenbrier), Cocculus carolinus (carolina moonseed), Andropogon spp., Cynodon dactylon, Buchloe dactyloides, and Stipa sp. (needlegrass).

Rana clamitans (bronze frog) and Hyla cinera (green tree frog) were the only anurans that seemed to be restricted to this association. Storeria dekayi (brown snake) and

Coluber constrictor (racer) were found typically in this association also. Terrapene carolina (three-toed box turtle), although collected in other associations seemed to be a part of the typical vertebrate species in hardwood areas. Mammals common in this association were Peromyscus gossypinus (cotton mouse), Sciurus carolinensis (gray squirrel), and Castor canadensis (beaver).

Juniper Association

This association yielded a number of mammals but few reptiles and amphibians. It occurs in the northern part of the county, especially near the reservoirs in the region.

Juniperus virginiana (Virginia juniper) is the principal tree of this association. In some areas, it is in thick stands and is the only tree present. In other areas, Juniperus virginiana is present in abundance, but other trees such as Quercus stellata, Quercus marilandica, Populus deltoides, and Pinus taeda are present in small numbers. Areas of juniper interspersed with Ascyrum sp. (ascyrum) and various grasses including Andropogon spp. are also common.

Coluber constrictor was present in this association. Common mammals include Peromyscus leucopus (white-footed mouse), Perognathus hispidus (hispid pocket mouse), and Neotoma floridana (florida wood rat).

Pine-Mixed Hardwoods Association

The trees of the genus Pinus are present in Fannin County largely as a result of introduction by the U. S. Department of

Agriculture. Plantations have been established on cleared land in northern areas of the county; thus, the Pine-Mixed Hardwoods Association is a subclimax stage resulting from this introduction. This association occurs in regions where the natural hardwoods are returning into areas that have been replanted in pine.

The dominant trees are Pinus taeda, Quercus stellata, Quercus marilandica, and Juniperus virginiana. The few herbs and grasses identified are Rhus typhina (staghorn sumac), Smilax laurifolia, Parthenocissus quinquefolia (Virginia creeper), Andropogon spp. and others.

This relatively unproductive area produced small numbers of any vertebrate species, although some widespread species were collected here. Coluber constrictor and Terrapene carolina were fairly common. Perognathus hispidus, Peromyscus leucopus, and Neotoma floridana were the most common mammals in the association.

Pine Association

Areas in the northern part of Fannin County that have had pine trees recently introduced, still retain this tree as the dominant plant species. This is the smallest and least productive of the associations.

Pinus taeda is the only significant tree in this association, although many young Quercus marilandica are scattered among Rhus radicans and Smilax laurifolia on the forest floor.

Only two herptiles, Thamnophis proximus (western ribbon snake) and Lygosoma laterale (ground skink) were collected from this association. Small mammals found were Peromyscus leucopus and Geomys bursarius (plains pocket gopher). Pitymus pinetorum (pine vole) may be present. None were collected, but runs similar to those described for this species were seen.

Annotated List of Species

Locality data are recorded for a total of 72 species of terrestrial vertebrates, including 41 species of reptiles and amphibians and 31 species of mammals. Ecological data, which was unattainable for some species, are summarized in Table 1. The annotated list includes information noted about each species.

TABLE 1. Degree of association of terrestrial vertebrates to vegetational associations in Fannin County

Species	Associations				
	Prairie	Mixed Hardwoods	Juniper	Pine-Mixed Hardwoods	Pine
AMPHIBIA					
Ambystoma texanum	X				
Acris crepitans	X	X	X		
Hyla versicolor	X	X			
Hyla cinera		X			
Pseudacris streckeri	X	X			
Pseudacris clarki	X				
Pseudacris triseriata	X				

TABLE 1--Continued

Species	Associations				
	Prairie	Mixed Hardwoods	Juniper	Pine-Mixed Hardwoods	Pine
Bufo woodhousei	X	X	X	X	
Rana catesbeiana	X	X	X		
Rana pipiens	X	X			
Rana clamitans		X			
Rana areolata	X				
REPTILIA					
Chelydra serpentina	X	X			
Sternothaerus odoratus		X			
Kinosternon subrubrum	X	X			
Terrapene carolina	X	X			
Terrapene ornata	X				
Graptemys kohni		X			
Chrysemys scripta	X	X			
Sceloporus undulatus		X	X		
Cnemidophorus gularis	X				
Cnemidophorus sexlineatus	X				
Lygosoma laterale		X		X	X
Eumeces fasciatus		X	X		
Coluber constrictor		X	X	X	
Elaphe guttata	X				
Elaphe obsoletus	X	X			
Heterodon platyrhinos		X			
Lampropeltis getulus	X	X			
Masticophis flagellum	X	X			
Natrix ethyrogaster	X	X			
Natrix rhombifera	X	X			
Opheodrys aestivus		X			
Pituophis melanoleucas		X			
Storeria dekayi		X			
Thamnophis proximus	X	X			X
Agkistrodon contortrix	X	X			
Crotalus horridus		X			
MAMMALIA					
Didelphis marsupialis	X	X	X	X	
Scalopus aquaticus	X	X			
Dasypus novemcinctus	X	X		X	
Lepus californicus	X				

TABLE 1--Continued

Species	Associations				
	Prairie	Mixed Hardwoods	Juniper	Pine-Mixed Hardwoods	Pine
Sylvilagus floridanus	X				
Sylvilagus aquaticus		X			
Citellus tridecemlineatus	X				
Sciurus carolinensis		X			
Sciurus niger	X	X	X		
Geomys bursarius	X	X	X	X	
Perognathus hispidus			X	X	
Castor canadensis		X			
Reithrodontomys fulvescens	X				
Peromyscus leucopus			X	X	X
Peromyscus gossypinus		X			
Oryzomys palustris	X	X			
Sigmodon hispidus	X	X	X		
Neotoma floridana		X	X	X	
Pitymys pinetorum			X	X	
Mus musculus	X				
Rattus rattus	X				
Myocastor coypus		X			
Vulpes fulva		X			
Urocyon cinereoargenteus		X			
Canis latrans	X	X			
Procyon lotor		X			
Mustela vison	X	X			
Spilogale putorius	X				
Mephitis mephitis	X	X			
Lynx rufus		X			
Odocoileus virginianus		X		X	
Total	42	51	14	11	4

Salamanders

Ambystoma texanum.--Small-mouthed Salamander. This was the only salamander collected in the county. A single specimen was collected one night in a dry roadside ditch, shortly

before a heavy rain. The ditch was adjacent to a flooded field from which many frogs were also collected.

Anurans

Acris crepitans.--Blanchard's Cricket Frog. This small frog is probably the most common in the county. It was taken from the Prairie, Mixed Hardwoods and Juniper Associations. It was found in nearly all moist situations.

Hyla versicolor c. f. chrysoscelis.--Gray Tree Frog. The Prairie Association produced the only specimens of this anuran. Many were collected in the spring during rains. Normally, this is considered a woodland species, and this occurrence in the prairie is somewhat unusual. Hyla versicolor and Hyla chrysoscelis are morphologically identical, but Ralin (1968) suggested that H. versicolor was the species present in Fannin County.

Hyla cinerea.--Green Tree Frog. A single specimen of this frog was taken. It was found in a low, swampy area of mixed hardwoods.

Pseudacris streckeri.--Strecker's Chorus Frog. This frog was taken in the Prairie and Mixed Hardwoods Associations. It was found in farm ponds and alive on the road during rainy nights in the early and late spring.

Pseudacris clarki.--Spotted Chorus Frog. Flooded fields and shallow farm ponds with grassy margins were the preferred

habitats of this frog. They were collected at night from breeding choruses.

Pseudacris triseriata.--Chorus Frog. This frog was found in the same areas as the spotted chorus frog. Males of both species were often found calling from the same clump of grass at the edge of ponds.

Bufo woodhousei.--Rocky Mountain Toad. This was the most common anuran found in the county. It was found in every association except the Pine. Breeding choruses were common during the spring.

Rana catesbeiana.--Bullfrog. The largest frog collected was of this species. The head-body length was approximately 80 mm. The bullfrog was very common and was found to be associated with nearly all bodies of water. It was collected from the Prairie and Mixed Hardwoods Associations.

Rana pipiens.--Leopard Frog. Specimens of this frog were readily obtainable from any moist area. It was found to be equally abundant in areas of mixed hardwoods and prairie. Many individuals were found under stones and logs some distance from water. Three of these frogs were taken from under a stone in the dry bed of the North Sulphur River.

Rana clamitans.--Bronze Frog. Low, swampy areas of hardwood forest provided the typical habitats for this species. This frog was found in small ponds and under logs and leaf litter in moist areas.

Rana areolata.--Crawfish Frog. This unusual frog was found only in the prairie. Fifteen specimens were taken from a flooded field. Additional specimens were found alive and dead on roads during heavy rains.

Turtles

Chelydra serpentina.--Snapping Turtle. Many specimens of this large turtle were seen alive and dead on the road. One individual was caught in a hoop-type turtle trap set in a small pond in the Mixed Hardwoods Association. Another was taken from a farm pond in the Prairie Association. This individual was noticed because it was feeding on a frog (Rana pipiens) which was struggling to get free. All live snapping turtles collected fought vigorously when picked up.

Sternothaerus odoratus.--Stinkpot. An empty shell was the only evidence of this species found in Fannin County. It was found near Coffee Mill Lake in an area of mixed hardwoods.

Kinosternon subrubrum.--Mississippi Mud Turtle. This turtle was common wherever permanent bodies of water were found. It was taken in turtle traps and alive on the road in both the Prairie and Mixed Hardwoods Associations.

Terrapene carolina.--Three-toed Box Turtle. This was the most common turtle found in the county. It was most common in the timbered areas but was also found in prairies. Apparent intergrades between this species and the ornate box turtle (Terrapene ornata) were found.

Terrapene ornata.--Ornate Box Turtle. In contrast to the three-toed box turtle, the ornate box turtle was found only in the Prairie Association. It was often found on roads in the daytime.

Graptemys kohni.--Mississippi Map Turtle. Two specimens of this turtle, one alive and one shell, were collected. The live specimen was found sunning on Coffee Mill Lake Dam. The shell was found in a swampy area of hardwoods beneath the dam. This is a very secretive turtle and these records provide the first from north-central Texas.

Chrysemys scripta.--Red-eared Turtle. This turtle was apparently very common in Fannin County. Most specimens were taken alive or dead on roads. Individuals were seen sunning around many bodies of water.

Lizards

Sceloporus olivaceus.--Texas Spiny Lizard. This lizard may be present in Fannin County. Only two possible specimens were encountered and neither of these could be caught. These were in the Mixed Hardwoods Association.

Sceloporus undulatus.--Fence Lizard. The wooded regions, and especially trash piles in these areas, proved to be the common habitat of this small lizard.

Eumeces fasciatus.--Five-lined Skink. This skink was most often seen and collected around deserted buildings in woodland areas.

Eumeces septentrionalis.--Prairie Skink. The Fort Worth Children's Museum has a specimen of this species collected north of Bonham, Fannin County, Texas. No ecological information was available for the specimen, and no others were collected during this study.

Lygosoma laterale.--Ground Skink. This small lizard is very common in the woodland areas. It was one of the few vertebrates found in the Pine Association.

Cnemidophorus sexlineatus.--Six-lined Racerunner. This species was seen only in grassy areas associated with the mixed hardwoods. This is probably because of the prevalence of sandy soils in the grassy areas of the northern part of the county, as opposed to the blackland soils in the southern part.

Cnemidophorus gularis.--Spotted Whiptail. This lizard was found in habitats similar to the six-lined racerunner, but is apparently less common than the latter.

Snakes

Coluber constrictor.--Racer. One of the largest snakes collected during this study was an individual of this species. It was taken out of a tree in the Mixed Hardwoods Association. Racers were also recorded from the Pine-Mixed Hardwoods and Juniper Associations. Individuals consistently attempted to escape capture by climbing trees and lying still among the

branches. In this position, the white belly appears much like a tree branch. The racer was found active during daylight hours only. All specimens are of the black variety, typical of the eastern race of the species.

Elaphe guttata.--Great Plains Rat Snake. This snake is locally known as the "chicken snake" because of its habit of engulfing whole chicken eggs. It seemed to be indigenous to the prairie.

Elaphe obsoleta.--Texas Rat Snake. Most individuals of this species were found to be associated with the hardwood forest, but one was found in the Prairie Association. This snake seemed to be primarily active at night but one specimen was collected during daylight hours.

Heterodon platyrhinos.--Eastern Hognose Snake. A single specimen of this snake was collected, although local residents reported it to be fairly common. It is locally referred to as the "spreading adder." The specimen was collected DOR (dead on road) adjacent to mixed hardwoods with some grasses present.

Lampropeltis getulus.--Common King Snake. This snake was found to be common. All specimens, except one, were taken from the Prairie Association. One was taken in the Mixed Hardwoods Association.

Masticophis flagellum--Coachwhip. This species, like the racer, was collected only during the day. One very large specimen was taken, crossing a sandy road in an area of light timber interspersed with grasses. All other specimens were taken from the prairie regions.

Natrix erythrogaster.--Plain-bellied Water Snake. This was probably the most common snake in the county. It was found in almost all aquatic situations. It appears that this species is both diurnal and nocturnal, as specimens were seen and collected both during daylight hours and at night.

Natrix rhombifera.--Diamond-backed Water Snake. This serpent was found in the same habitats as N. erythrogaster, and the two are apparently competitors for food and space.

Opheodrys aestivus.--Rough Green Snake. Only one specimen of this snake was collected. It was taken from a lightly timbered area with many interspersed grasses. The scales were so weakly keeled on the specimen that it was at first mistaken for the smooth green snake (Opheodrys vernalis).

Pituophis melanoleucas.--Bullsnake. No specimens of the bullsnake were obtained from Fannin County; however, a badly decomposed individual was noted in the Mixed Hardwoods Association at the beginning of this study in October, 1968. This species is probably very rare in the region.

Storeria dekayi.--Brown Snake. This small snake was collected from the Mixed Hardwoods Association. A single specimen was picked up crossing Highway 78 north of Bonham.

Thamnophis proximus.--Western Ribbon Snake. This common snake was the only snake collected in the Pine Association. It was most common, however, in the Prairie Association, especially in areas having abundant moisture.

Agkistrodon contortrix.--Copperhead. Copperheads were one of the most frequently encountered snakes in the county. They were common in the woodlands but were also collected from the prairies.

Agkistrodon piscivorus.--Cottonmouth Water Moccasin. Although less common than the water snakes of the genus Natrix, cottonmouths are present in substantial numbers in Fannin County. They seemed to prefer stagnant pools in wooded areas. This snake and Natrix were not observed to be in close association.

Crotalus horridus.--Timber Rattlesnake. Rattlesnakes were reported by most reliable sources to be uncommon in the area. However, several local residents killed a five-foot timber rattler in August, 1968. A photograph of this snake was published in the local newspaper, the Bonham Daily Favorite,

Marsupials

Didelphis marsupialis.--Opossum. This primitive mammal was one of the most common in the area. Many individuals were sighted foraging at night. One of these was shot and examined. It was a female with four young in the pouch. Skulls were collected from specimens found dead on the highway. This species is apparently not limited to any vegetational association.

Insectivores

Scalopus aquaticus.--Eastern Mole. Burrows made by this subterranean mammal are common in the alluvial soils in the northern part of the county. Because of the burrowing habits of the mole, soil type, not vegetation is probably the limiting factor in its distribution.

Edentates

Dasypus novemcinctus.--Nine-banded Armadillo. Vegetation did not seem to limit this animal to any particular locality. This mammal was easily observed and collected. It was observed to be both diurnal and nocturnal. One individual while foraging, ran into the author's foot. It exhibited no fright but simply turned and went in the opposite direction.

Lagomorphs

Lepus californicus.--Jack Rabbit. Although not common, jack rabbits were recorded from sight records and DOR specimens. They were always associated with the prairie region.

Sylvilagus floridanus.--Eastern Cottontail. This rabbit was very common in the Prairie Association. Much crop damage is attributed to this species.

Sylvilagus aquaticus.--Swamp Rabbit. This large rabbit was not as common as S. floridanus, but individuals were seen in the Mixed Hardwoods Association.

Rodents

Citellus tridecemlineatus.--Thirteen-lined Ground Squirrel. This rodent is apparently very rare in Fannin County. Despite investigations of such prime habitats as cemeteries, none of these squirrels were observed. A single burrow opening, believed to belong to this species, was noted at Arledge Cemetery, south of Bonham. Davis (1966) indicated that Fannin County lies to the east of the eastern distribution limit of the thirteen-lined ground squirrel.

Sciurus carolinensis.--Gray Squirrel. Although none of these squirrels were observed, they are actively hunted in Fannin County and are reported by the game warden and others to be common in the closed canopy of the mixed hardwood forests, especially those bordering streams.

Sciurus niger.--Fox Squirrel. This common squirrel was observed primarily in the mixed hardwoods, but one individual was sighted in the prairie near a clump of small trees. Many are killed on the road and all specimens were obtained from these.

Geomys bursarius.--Plains Pocket Gopher. Only one specimen of this species was taken, although burrows were very common in areas of sandy soil. Mounds were noted in four of the five associations. This rodent proved to be difficult to trap because it would consistently fill the traps with sand, rendering them useless.

Perognathus hispidus.--Hispid Pocket Mouse. Soil type is probably the most important factor influencing the distribution of this mouse, since the burrows are dug in the ground. It was found commonly on the alluvial soils near the Red River. Vegetational associations were the Juniper and Mixed Hardwoods.

Castor canadensis.--Beaver. Evidence of beaver was plentiful in the hardwood regions near water. Tracks, fallen trees and stripped bark were used to confirm the presence of beaver in the county. The game warden reported that the highway department had to remove a large tree that had fallen across the road as a result of beaver activity.

Reithrodontomys fulvescens.--Long-tailed Harvest Mouse. This mouse was taken only from the Prairie Association. The presence of the cotton rat (Sigmodon hispidus) in the same habitat made the trapping of the harvest mouse difficult. The cotton rat apparently begins to forage earlier than the harvest mouse. The rats would fill the traps before the harvest mouse began to forage. This situation could be alleviated somewhat by checking trap lines during the night.

Peromyscus leucopus.--White-footed Mouse. This species was taken from the Juniper, Pine-Mixed Hardwoods, and Pine Associations. In view of these woodland habitats, it seems rather strange that this mouse was not taken in the areas of mixed hardwoods.

Peromyscus gossypinus.--Cotton Mouse. A swampy area of mixed hardwoods proved to be a suitable place to trap this large mouse. Ground cover was sparce in these regions, consisting of a few sedges and grasses and debris left by moving water.

Oryzomys palustris.--Rice Rat. A rice rat was taken in the same area as the cotton mouse. It was caught by hand when a nest was disturbed while searching for herptiles. An additional specimen was found dead near a boggy field. Many specimens were taken from moist grasslands in Lamar County, but only the two specimens were found in Fannin County, despite efforts to trap additional specimens.

Sigmodon hispidus.--Hispid Cotton Rat. This is probably the most abundant mammal in the county. Although primarily a prairie species, it was taken in a variety of habitats including the Juniper and Pine-Mixed Hardwoods Associations. However, there was associated grass in these forested habitats.

Neotoma floridana.--Florida Wood Rat. This large rat was common in the wooded areas of juniper, mixed hardwoods, and

pine-mixed hardwoods. It was also trapped near brush piles in a grassy area. Several specimens taken in the fall, 1968, were infested with bot-fly larva in the pectoral and inguinal regions.

Pitymys pinetorum.--Pine vole. Subsurface runways assumed to belong to this species were found in the Pine and Pine-Mixed Hardwoods Associations. Attempts to trap this secretive rodent were unsuccessful. McCarley (personal communication) has recorded the pine vole from adjacent Grayson County.

Mus musculus.--House Mouse. This mouse was taken only from old houses and barns. This type habitat is apparently the most important factor affecting distribution of this mouse. Vegetation is probably of little or no importance in this regard.

Rattus rattus.--Roof Rat. Attempts to trap this elusive human commensal were not successful. A single specimen, an intact skeleton, was taken from the loft of an old barn in the Prairie Association.

Myocastor coypus.--Nutria. This large rodent is very common in Fannin County. Its large numbers could account for the scarcity of the muskrat (Ondatra zibethicus) in the area (the game warden has no records of muskrat from the county). A nutria specimen was taken near the Fannin-Collin County line in

the Prairie Association. This rodent is locally referred to as "coypu."

Carnivores

Vulpes fulva.--Red Fox. The game warden and several residents acknowledged the presence of this carnivore, but indicated that it was much rarer than the gray fox (Urocyon cinereoargenteus). It was reported to have been found in the area around Lake Fannin. The vegetation of this area is largely juniper and pine-mixed hardwoods.

Urocyon cinereoargenteus.--Gray Fox. This fox is more common than the red fox, but it is not present in large numbers. Davis (1966) suggested that large coyote populations in the same area may hold the gray fox population in check. This could be the situation in Fannin County.

Canis latrans.--Coyote. This is probably the largest predator in Fannin County. Reports by the game warden and local residents and the number of specimens recorded indicate that this is a very abundant carnivore in the area. It is relentlessly hunted by farmers and ranchers of the area. Most residents believe these animals to be wolves, although none examined were as large as the red wolf. Gray wolves, if ever present in the area, were probably exterminated before 1900.

Procyon lotor.--Raccoon. This nocturnal mammal was often seen in apparent family groups. It was found to be very

common in Fannin County and was always associated with the Mixed Hardwoods Association.

Mustela vison.--Mink. The game warden reports the mink to be common in the wooded areas along Bois d'Arc Creek. A young male of this species was hit by the author's car at 3:00 A.M. on September 10, 1969, three miles north of McKinney in Collin County. It ran from a cultivated field into the road. Another individual was seen running beside the road at night in the Mixed Hardwoods Association.

Spilogale putorius.--Spotted Skunk. A single specimen of this species was taken. It was found DOR on the night of March 22, 1969, in the Prairie Association.

Mephitis mephitis.--Striped Skunk. This was one of the most common mammals in the area. It was often seen foraging at night. Individuals were found DOR on every trip into the collecting area. This species did not seem to be limited to any particular vegetational cover.

Lynx rufus.--Bobcat. Reports of mountain lions in the area have for the most part, been traced to this species. The bobcat is not as abundant as the coyote, but is not uncommon. A skull was taken from an individual killed by dogs in the wooded areas in northern Fannin County. Many tracks were noted in the swampy area of mixed hardwoods below Coffee Mill Lake Dam.

Artiodactyls

Odocoileus virginianus.--White-tailed Deer. Deer are very abundant in the hardwood forests. Several individuals were sighted and tracks were often seen. The game warden verifies the abundance of this mammal.

CHAPTER IV

DISCUSSION

Range Extensions and Clarifications

Several animals were collected whose previously known ranges did not include Fannin County. Others were found that had not been previously reported from the area, but whose ranges in Texas are considered to extend to or include this region. Unless otherwise stated, references to known ranges refer to range maps and records by Raun and Gelbach (unpublished) for reptiles and amphibians, and by Davis (1966) for mammals. Since little prior work has been done in Fannin County, nearly every species collected is a new county record.

Records exist for Hyla cinera to the east in Red River County and to the south in Dallas County. The record obtained during this study extends the known range of this frog in Texas at least 40 miles to the west and 50 miles north. Hyla versicolor c. f. chrysoscelis had not previously been taken in Fannin or the five counties bordering it. New records from Fannin County help clarify the distribution of this frog. Records of Pseudacris triseriata and Pseudacris streckeri fill in range gaps in their known range. Pseudacris clarki was taken at the eastern limit of its known range. A record from Hunt County (directly south of Fannin) has been the most eastern record in the range. With the exception of a report by

McCarley and Cundiff (1965) of Rana areolata in Red River County, this frog has been reported in Texas only from the southeastern part. The Fannin County records extend the known range approximately 50 miles west of the Red River County record. Rana clamitans was found some 50 miles to the west of the nearest previously recorded locality in Red River County (Bowers, 1966). This helps to fill a large range gap which occurs in central and north-central Texas.

The distributional records for Chelydra serpentina in Texas are somewhat spotty. These records extend the range up to the region of the Red River in north-central Texas. Fannin County records of Kinosternon subrubrum fill in a range gap in north-central Texas. Records for Sternothaerus odoratus are generally lacking from northeastern and north-central Texas. The specimen found during this study helps to fill in a large gap in the known range and is the northwestern-most record available from Texas. Prior to this survey, records for Pseudemys scripta were lacking from the Red River area in north-central Texas. No reliable maps are available for the distribution of Graptemys kohni in Texas. Graptemys pseudogeographica has been reported previously from Grayson County (Brown, 1950; Cagle, 1954). Distributional maps for Terrapene ornata indicate that Fannin County is near the eastern margin of the range in Texas.

There are considerable range gaps for several snakes in this area that the Fannin County records help to fill. These

snakes are Coluber constrictor, Elaphe guttata, Elaphe obsoleta, Heterodon platyrhinos, Masticophis flagellum, Opheodrys aestivus, Storeria dekayi and Thamnophis proximus.

The previously known range of Peromyscus gossypinus in Texas was apparently limited to the southeastern part of the state with only one record, in Bowie County, from the northern part of Texas. Specimens from Fannin County extend this range to the west at least 80 miles. Davis (1966) shows records for Oryzomys palustris only from southeastern Texas. However, McCarley (1952) has found this rat to be present in Bryan County, Oklahoma. This county lies across the Red River from Fannin County. Therefore, the specimens of Oryzomys obtained during this study assist in clarification of the range of this mammal in Texas. The records of Sciurus carolinensis from the county are marginal, as the known range of this mammal reaches its westward limit here. Lepus californicus is recorded in northern Texas as far east as Cooke County. Fannin County records extend this range about 50 miles to the east.

Zoogeographic Relationships

Fannin County, as noted earlier, is located in a large ecotonal area, between the more xeric elements to the west and the more mesic to the east. Therefore, there should be an intermingling of eastern and western forms in the county.

A total of 72 species of vertebrates was recorded in the county. These species may be generally classified as eastern,

western, or widespread. This system of classification is based on the center of species distribution. A total of 44 species (60.4 per cent) is classified as eastern, 9 (12.2 per cent) as western, and 20 (27.4 per cent) as widespread. The county, therefore, seems to have a much greater eastern affinity based on the populations of terrestrial vertebrates collected.

The ectotherms in the county generally include more eastern forms than the endotherms. A total of 90.5 per cent of the reptiles and amphibians were classified as eastern; 4.75 per cent as western; and 4.75 per cent as widespread. Only 45.1 per cent of the mammals were eastern, while 48.39 per cent were widespread and 6.45 per cent were western forms.

Comparisons were made between associations and the following results were obtained. The Mixed Hardwoods Association yielded 70.0 per cent eastern, 24.0 per cent widespread and 6.0 per cent western species. The Prairie Association had 60.5 per cent eastern, 28.0 per cent widespread and 11.5 per cent western. The remaining associations yielded too few specimens for a percentage figure to be meaningful, however, no western forms were collected in these associations. The number of eastern and widespread forms were about equal in these except in the Pine Association where three of the four species were eastern.

It may be concluded from the above figures that (1) Fannin County lies in an ecotonal area with the eastern

influence considerably greater than the western, (2) the ectotherms in the area are largely eastern forms, and (3) the Mixed Hardwoods Association had a more eastern character than the Prairie Association.

Species Not Collected

Many species of terrestrial vertebrates whose known ranges include or come near Fannin County are not accounted for in the annotated check list. Several of these species have been reported from adjacent counties. Unless stated otherwise, records mentioned refer to those recorded by Raun and Gelbach (unpublished) for reptiles and amphibians and Davis (1966) for mammals.

Ambystoma opacum (marbled salamander) has been recorded from Grayson and Lamar Counties. Fannin County lies between these counties, and therefore this salamander probably occurs there. Ambystoma tigrinum (tiger salamander) has very spotty distribution records in Texas. Since it is so widespread, it should occur in Fannin County. Bonn and McCarley (1953) record Notophthalamus viridescens (red-spotted newt) from Grayson County.

Gastrophryne carolinensis (eastern narrow-mouth toad) and Gastrophryne olivacea (plains narrow-mouth toad) have ranges that should include Fannin County; however, neither were found.

Deirochelys reticularia (chicken turtle), Graptemys pseudogeographica, Trionyx spinifer (Texas softshelled turtle), and Trionyx muticus (smooth softshelled turtle), have been

reported from the Lake Texoma area by Bonn and McCarley (1953). Chrysemys concinna (slider) is recorded from Lamar County. None of the above turtles were collected in Fannin County.

Ophisaurus attenuatus (glass lizard), Eumeces laticeps (five-lined skink) and Phrynosoma cornutum (horned lizard) are recorded from the region by Bonn and McCarley (1953), but they are apparently not common. Anolis carolinensis (green anole) has been reported to the east and west of Fannin County, but no adjacent records are available.

Bonn and McCarley (1953) reported Diadophis punctatus (ringneck snake), Tropidoclonion lineatum (lined snake), Virginia striatula (ground snake), and Sistrurus miliarius (pigmy rattler) from the Lake Texoma area. Thamnophis sirtalis (Texas garter snake) has been collected in Denton County. This is apparently the nearest record to Fannin County. Lampropeltis calligaster (prairie kingsnake) and Lampropeltis triangulum (milksnake) seem to be uncommon in the area. Both are reported from Lamar County. Natrix fasciata (broad-banded water snake) and Natrix grahami (Graham's water snake) have large range gaps in this area, but this is assumed to be due to a lack of collecting in the area. Tantilla gracilis (flat-headed snake) is recorded from Grayson County.

No species of shrews were collected from Fannin County. Extensive efforts to find these secretive little mammals were unsuccessful. Fannin County is within the range of Cryptotis

parva (little short-tailed shrew). McCarley (personal communication) has records of this shrew from adjacent Grayson County.

The nearest record of Mustela frenata (long-tailed weasel) in Texas is from Hopkins County, some 50 miles southeast of Fannin. Efforts to establish presence of this carnivore were unsuccessful.

McCarley (personal communication) reports Glaucomys volans (flying squirrel) from Grayson County. Numerous attempts were made to find this unique squirrel in Fannin County. The game warden and other residents do not report any occurrence of the flying squirrel.

Peromyscus maniculatus (deer mouse) was trapped in grasslands in Lamar County to the east of Fannin County, although range maps show the easternmost record in northern Texas to be Cooke County. No specimens of this mouse were taken in Fannin County.

It is assumed that Rattus norvegicus (Norway rat) occurs in the county, although range maps for this species are not available.

Summary

A study of the terrestrial vertebrates of Fannin County was begun in October, 1968, and continued through November, 1969. The main purpose of this study was to help clarify the distribution and ecology of these vertebrates. A total of

72 species of terrestrial vertebrates were recorded in the county. This included 41 species of ectotherms and 31 species of endotherms. Apparent range extensions, range clarifications and marginal records were obtained for a total of 25 species. Twenty-one of these were reptiles and amphibians and four were mammals. Records for the ectotherms collected include five extensions, thirteen clarifications, and two marginal records. For the endotherms, two extensions, one clarification, and one marginal record were obtained. Five vegetational associations were defined in order to determine the relationships of the vertebrates to different vegetational cover. The associations, in order of decreasing size in the county, are the Prairie, Mixed Hardwoods, Juniper, Pine-Mixed Hardwoods, and Pine Associations.

Since Fannin County is on the eastern edge of a large ecotonal area between eastern and western influences, the zoogeographic affinities of the species would be expected to be largely eastern. It was found that this was the case, since 60.4 per cent of the species recorded were eastern forms. In contrast, only 12.2 per cent were western forms and 27.4 per cent were widespread. The ectothermic vertebrates included in this study had a greater percentage (90.5 per cent) of eastern forms than the endothermic (47.0 per cent).

Comparisons between the associations, indicated that the Mixed Hardwoods Association was inherently the most eastern, with the possible exception of the Pine Association, which

yielded too few species for comparison. The hardwoods were found to contain 70 per cent eastern forms. The Prairie Association proved to be less eastern in nature, having only 60.5 per cent eastern forms.

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