

The Pleistocene Amphibians and Reptiles of Texas

by J. Alan Holman

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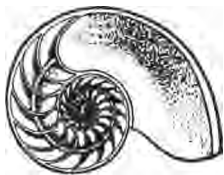
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INTRODUCTION!

New methods and approaches to the study of the vertebrates of the Pleistocene have completely revitalized the field in the past few years. Whereas previously the only reports available concerned a few of the larger mammals, today, due to the development of techniques of collecting microvertebrate fossils, the smaller vertebrates are being intensively studied, and the emphasis is on faunal analysis rather than on the description of individual taxa. The Pleistocene deposits of Texas have been rather intensively studied by workers from Midwestern University, Southern Methodist University, the University of Texas, Michigan State University, and the University of Michigan. Since published reports of fossil vertebrates from the several Pleistocene localities are scattered, there is a need to summarize, and in some cases compare and reinterpret, these findings.

PLEISTOCENE LOCALITIES IN TEXAS

There are practically no published accounts before the late 1950's for the Pleistocene herpetology of Texas except for reports of turtles and alligators. Most of these early records (Hay, 1924) are from scattered localities which have little stratigraphic information. These fossils were gathered mainly as the result of sporadic collecting by various individuals.

With the advent of techniques of collecting microvertebrate fossils, as outlined in the now classic paper of Hibbard (1949), the systematic study of the Pleistocene fossils of Texas began. The faunal approach is now paramount, with the emphasis being on evolutionary, ecological, climatological, zoogeographical, and stratigraphic interpretations. Moreover, a more reliable method of determining age of some of these deposits is now possible through the use of Carbon-14 dating techniques.

Because new material is being continuously unearthed and new Carbon-14 dates are becoming available, and because stratigraphic and faunal evidences are being continuously reevaluated, the age of several of the sites discussed have been interpreted differently by dif-

¹Contribution, in part, from the Department of Geology and the Department of Zoology, Michigan State University.

ferent authors. With regard to interpretations as to age in the following list of herpetological localities, I have followed those authors that I consider to be most intimately acquainted with the sites involved. The term "herpetofaunal locality" implies, in most cases, that at least several species were reported. All of these herpetofaunal localities are shown in Figure 1.

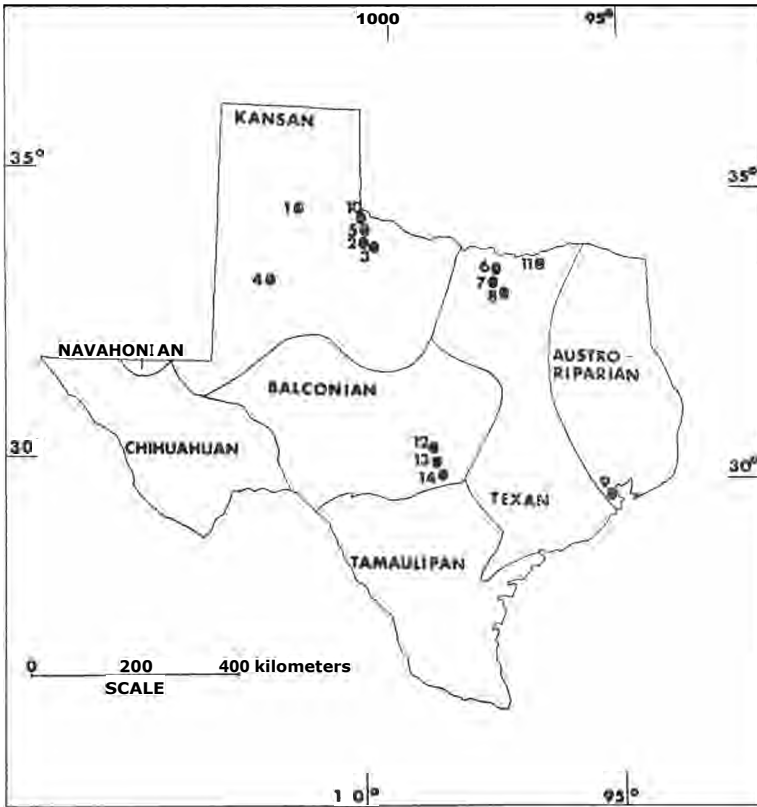


Figure 1. General location of Pleistocene herpetofaunal localities and biotic provinces (Blair, 1950) of Texas. LATE KANSAN: (1) Rock Creek local fauna, (2) Gilliland local fauna, (3) Vera faunule; ILLINOIAN: (4) Slaton local fauna; SANGAMON: (5) Easley Ranch local fauna, (6) Clear Creek local fauna, (7) Lewisville site, (8) Moore Pit local fauna, (9) Sims Bayou local fauna; LATE WISCONSIN: (10) Groesbeck Creek local fauna, (11) Ben Franklin local fauna, (12) Miller's Cave, (13) Cave Without a Name, (14) Friesenhahn Cave.

Late Kansan Herpetofaunal Localities. These localities occur in the Seymour formation of Knox and Briscoe counties. The age designations are based on stratigraphic relationships and faunal resemblances to other deposits (Hibbard and Dalquest, 1966). Localities cited in the present paper are: Gilliland local fauna, Knox County; Rock Creek local fauna, Briscoe County; and the Vera faunule (a member of the Cudahy fauna of southwestern Kansas), Knox County. The Vera faunule lies stratigraphically higher (just below the Pearlette ash) than the other Late Kansan faunas listed above.

Illinoian Herpetofaunal Localities. The only important herpetofauna from Texas assigned to this age is from the Slaton local fauna of Lubbock County. Dalquest (1967) believes the deposit is Illinoian, because the mammalian fauna resemble Illinoian local faunas in Kansas and in Oklahoma. At least one other author (Taylor, 1965) has assigned the Slaton local fauna to the Sangamon.

Sangamon Herpetofaunal Localities. Several river terrace deposits in northeastern and north-central Texas and a deposit near Houston, are thought to be of the Sangamon interglacial age, although in some instances these local faunas have been assigned to the Early Wisconsin, or to an interstadial within the Wisconsin (Slaughter and McClure, 1965, Slaughter, 1967, and Taylor, 1965). I am following Slaughter (1968) in designating the following deposits as Sangamon: Clear Creek local fauna, Denton County; Easley Ranch local fauna, Foard County; Lewisville site, Denton County; Moore Pit local fauna, Dallas County; and Sims Bayou local fauna, Harris County.

Late Wisconsin Herpetofaunal Localities. Late Wisconsin deposits occur in northeastern, northern central Texas, and in the limestone caverns of the Balconian biotic province of southern Texas. The following list of Late Wisconsin sites includes, after each site, the reference from which the age designation was taken: Ben Franklin local fauna, Delta County (Slaughter and Hoover, 1963); Cave Without a Name, Kendall County (Lundelius, 1967); Friesenhahn Cave, Bexar County (Milstead, 1967); Groesbeck Creek local fauna, Hardeman County (Dalquest, 1965); Miller's Cave, Llano County (Holman, 1966a). Several Carbon-14 dates have been published for these localities and are cited in the literature.

Other Pleistocene Localities. This list represents the Pleistocene localities cited in the text of this paper, but from which only one or

two species have been reported. None of these localities is shown in Figure 1. The following list includes, after each site, the reference from which the age designation was taken: Aftonian?: Cita Canyon Tule County (Auffenberg, 1962b). Yarmouth: Locality undesignated, Lubbock County (Milstead, 1967). Illinoian: Pittbridge, Brazos County (Gehlbach, 1965). Sangamon: Mt. Berry, Archer County (Milstead, 1967); Locality undesignated, Henderson County (Milstead, 1967). Wisconsin: Ingleside, San Patricio County; San Diego, Duval County (Milstead, 1967). Late Wisconsin: Austin, Travis County; Dallas Pits, Dallas County; Foster Ranch, Travis County; Kincaid site, Uvalde County; Locality undesignated, Bee County; Longhorn Caverns, Burnet County (Milstead, 1967); Mobeetie, Wheeler County (Auffenberg, 1962a); Pilot Knob, Travis County; Pittbridge, Brazos County (Milstead, 1967).

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ANNOTATED LIST

Following is an annotated list of the Pleistocene amphibians and reptiles of Texas with the exception of a few tortoises which are presently being restudied and revised. A dagger before a name indicates an extinct subspecies or species.

Several differences in nomenclature exist between some of the literature and the present paper. These are listed below, with the names used in the present paper found on the right hand side.

- Scaphiopus burteri* = *Scaphiopus hollbrooki burteri*
Bufo cornpactilis = *Bufo speciosus*
Chrysemys belli = *Chrysemys picta belli*
Pseudemys bisornata = *Pseudemys scripta bisornata*
Testudo cam pester = *Geochelone cam pester*
Testudo wilsoni = *Geochelone wilsoni*

Testudo crassiscutata = *Geochelone crassiscutata*
Testudo laticauda = *Gopherus laticauda*
Amyda emoryi = *Trionyx spinifer emoryi*
Cnemidophorus sacki gularis = *Cnemidophorus gularis*
Natrix sipedon confluens = *Natrix fasciata confluens*
Thamnophis sauritus proximus = *Thamnophis proximus*
Coluber flagellum = *Masticophis flagellum*
Coluber taeniatus = *Masticophis taeniatus*
Pituophis catenifer sayi = *Pituophis melanoleucus sayi*
Lampropeltis doliata = *Lampropeltis triangulum*

Class AMPHIBIA

Order CAUDATA

Family AMBYSTOMATIDAE

Ambystoma texanum (Matthes)

Localities. SANGAMON: Clear Creek local fauna, Denton County (Holman, 1963); Sims Bayou local fauna, Harris County (Holman, 1965b, Slaughter and McClure, 1965). LATE WISCONSIN: Groesbeck Creek local fauna, Hardeman County (Holman, 1964).

Remarks. The record of *A. texanum* from the Groesbeck Creek local fauna, Hardeman County, a locality which lies well within the Kansan biotic province (Blair, 1950) is of interest. Today, the westernmost limits of the distribution of *A. texanum* are in the Texan biotic province about 100 miles east of Hardeman County.

Ambystoma tigrinum (Green)

Localities. LATE KANSAN: Vera faunule, Knox County (Hibbard and Dalquest, 1966). ILLINOIAN: Slaton local fauna, Lubbock County (Holman, 1969a). LATE WISCONSIN: Ben Franklin local fauna, Delta County (Holman, 1963); Miller's Cave, Llano County (Holman, 1966a).

Remarks. Neotenic Pleistocene populations of *A. tigrinum* have not as yet been reported from Texas as they have been in Kansas (Tihen, 1942).

Ambystoma sp. indet.

Localities. SANGAMON: Easley Ranch local fauna, Foard County (Holman, 1962).

Remarks. This record is based on vertebrae that are too fragmentary for specific identification, but I suspect that they represent *A. tigrinum*.

Family AMPHIUMIDAE

Amphiuma means Garden

Localities. SANGAMON: Sims Bayou local fauna, Harris County (Holman, 1965b, Slaughter and McClure, 1965).

Remarks. This is only the second fossil record of this monotypic family. The only other record is from the Late Pleistocene of Vero, Florida (Weigel, 1962). The absence of this large, easily identified form from deposits earlier than the Sangamon is surprising.

Family PLETHODONTIDAE

Plethodon glutinosus (Green)

Localities. LATE WISCONSIN: Cave Without a Name, Kendall County (Holman, 1969b).

Remarks. Today, an isolated population, *P. g. albagula*, is confined to the Balconian biotic province of Texas, including Kendall County (Highton, 1962). Another Recent subspecies, *P. g. glutinosus*, occurs in scattered localities in eastern Texas. The fossil *P. glutinosus* was represented by hundreds of bones, but its subspecific relationships were not determined.

Order SALIENTIA

Family PELOBATIDAE

Scaphiopus sp. indet.

Localities. LATE WISCONSIN: Friesenhahn Cave, Bexar County (Mecham, 1959).

Remarks. Only two bones are known, but their size indicates that either *S. couchi* or *S. holbrooki hurteri* is represented.

Family LEPTODACTYLIDAE

Eleutherodactylus augusti Duges

Localities. LATE WISCONSIN: Friesenhahn Cave, Bexar County (Mecham, 1959).

Remarks. This fossil is said to be quite large and to suggest a frog that would fall within the upper size limit of the Recent subspecies in the area, *Eleutherodactylus angusti latrans*. This species is a cavernicolous form that is characteristic of the Balconian biotic province today.

Syrrophobus marnocki Cope

Localities. LATE KANSAN: Vera faunule, Knox County (Tihen, 1960, Hibbard and Dalquest, 1966). SANGAMON: Easley Ranch local fauna, Foard County (Lynch, 1964).

Remarks. Both of these records are from sites that lie well within the Kansan biotic province today. *Syrrophobus marnocki* is a species that is now a common cavernicolous form in the Balconian biotic province, and ranges into the Chihuahuan biotic province in the mountains (Blair, 1950). Thus, the fossils are far north of their present-day range. Both the Vera faunule record and the Easley Ranch local fauna record are based on a single ilium.

Family BUFONIDAE

Bufo speciosus Girard or *Bufo cognatus* Say

Localities. ILLINOIAN: Slaton local fauna, Lubbock County (Holman, 1969a). LATE WISCONSIN: Friesenhahn Cave, Bexar County (Mecham, 1959); Groesbeck Creek local fauna, Hardeman County (Holman, 1964).

Remarks. These two species have been consistently difficult to separate on the basis of the fossil elements recovered. The Friesenhahn Cave specimen was listed as "*Bufo cognatus* Say?", and it was pointed out that the fossil might be either *B. speciosus* or *B. cognatus*, or the ancestor of both species.

Bufo woodhousei bexarensis Mecham

Localities. LATE WISCONSIN: Friesenhahn Cave, Bexar County (Mecham, 1959, Tihen, 1962).

Remarks. This extinct subspecies is much larger than the Recent subspecies *B. w. woodhousei* and is known only from the above site.

Bufo woodhousei ssp. indet.

Localities. ILLINOIAN: Slaton local fauna, Lubbock County (Hol-

man, 1969a). SANGAMON: Clear Creek local fauna, Denton County (Holman, 1963); Easley Ranch local fauna, Foard County (Holman, 1962).

Remarks. These fossils were not assigned to subspecies, but they are smaller than *B. w. bexarensis*.

Bufo sp. indet.

Localities. LATE KANSAN: Vera faunule, Knox County (Hibbard and Dalquest, 1966).

Family Hylidae

Acris crepitans Baird

Localities. LATE KANSAN: Vera faunule, Knox County (Chantell, 1966, Hibbard and Dalquest, 1966). ILLINOIAN: Slaton local fauna, Lubbock County (Holman, 1969a). SANGAMON: Clear Creek local fauna, Denton County (Holman, 1963); Easley Ranch local fauna, Foard County (Holman, 1962). LATE WISCONSIN: Groesbeck Creek local fauna, Hardeman County (Holman, 1964, Lynch, 1966).

Remarks. The bones of *A. crepitans* are very difficult to distinguish from those of the southeastern form *A. gryllus*.

Hyla versicolor Le Conte

Localities. SANGAMON: Easley Ranch local fauna, Foard County (Lynch, 1964).

Remarks. Another fragmentary ilium (Lynch, 1966, Fig. 1a) from the Late Wisconsin of the Groesbeck local fauna, Hardeman County, Texas, was described as new, but this specimen resembles a Recent young *Hyla versicolor* ilium so closely that I choose to include it tentatively with *H. versicolor* until more Holocene and fossil material becomes available.

Pseudacris clarki (Baird)

Localities. ILLINOIAN: Slaton local fauna, Lubbock County (Holman, 1969a). SANGAMON: Easley Ranch local fauna (Lynch, 1964).

Pseudacris streckeri Wright and Wright

Localities. LATE WISCONSIN: Groesbeck Creek local fauna, Hardeman County (Lynch, 1966); Miller's Cave, Llano County (Holman, 1966a).

Remarks. The Groesbeck Creek site is 60 or 70 miles west of the western limits of the present distribution of *P. streckeri* in Texas.

Family BREVICIPITIDAE

Gastrophryne olivacea (**Hallowell**)

Localities. SANGAMON: Clear Creek local fauna, Denton County (Holman, 1963).

Family RANIDAE

Rana catesbeiana **Shaw**

Localities. LATE WISCONSIN: Ben Franklin local fauna, Delta County (Holman, 1963); Miller's Cave, Llano County (Holman, 1966a, Patton, 1963).

Rana pipiens **Schreber**

Localities. ILLINOIAN: Slaton local fauna, Lubbock County (Holman, 1969a). SANGAMON: Clear Creek local fauna, Denton County (Holman, 1963); Easley Ranch local fauna, Foard County (Holman, 1962); Sims Bayou local fauna (Holman, 1965b). LATE WISCONSIN: Friesenhahn Cave, Bexar County (Mecham, 1959); Groesbeck Creek local fauna, Hardeman County (Holman, 1964); Miller's Cave, Llano County (Holman, 1966a).

Remarks. This frog is the most abundant anuran at many of these localities.

Rana **sp. indet.**

Localities. LATE KANSAN: Vera faunule, Knox County (Hibbard and Dalquest, 1966). LATE WISCONSIN: Cave Without a Name, Kendall County (Holman, 1969b); Friesenhahn Cave, Bexar County (Mecham, 1959); Miller's Cave, Llano County (Holman, 1966a, Patton, 1963).

Class REPTILIA

Order CHELONIA

Family CHELYDRIDAE

Chelydra serpentina (**Linnaeus**)

Localities. LATE WISCONSIN: Groesbeck Creek local fauna, Hardeman County (Holman, 1964).

Family Kinosternidae

Sternotherus odoratus (Latreille)

Localities. SANGAMON: Clear Creek local fauna, Denton County (Holman, 1963).

Remarks. The fossil site is near the westernmost limits of the present distribution of this species in Texas.

Family EMYDIDAE

†*Terrapene carolina putnami* (Hay)

Localities. YARMOUTH: Locality undesignated, Lubbock County (Milstead, 1967).

Remarks. This fossil represents a large extinct subspecies of box turtle whose nearest living relative may be *Terrapene carolina major* of the Gulf Coast of the United States.

†*Terrapene carolina putnami* (Hay) × *T. c. triunguis* (Agassiz)

Localities. Pleistocene undesignated: Equus beds, Atacosa County (Milstead, 1965). SANGAMON: Lewisville site, Denton County; Locality undesignated, Henderson County; Mt. Berry, Archer County (Milstead, 1967). WISCONSIN: Ingleside, San Patricio County; San Diego, Duval County (Milstead, 1967). LATE WISCONSIN: Austin, Travis County (Milstead, 1965 and 1967); Cave Without a Name, Kendall County; Dallas Pitts, Dallas County; Foster Ranch, Travis County; Friesenhahn Cave Bexar County; Kincaid site, Uvalde County; Locality undesignated, Bee County; Pilot Knob, Travis County; Pitts Bridge (probably the same as Pittbridge, Hay, 1924, Fig. 4 and text pp. 244–245), Brazos County (Milstead, 1967).

Remarks. The fossils from the above localities are considered to represent specimens that are temporally intermediate between the extinct subspecies *T. c. putnami* and the Holocene subspecies *T. c. triunguis* which occurs in eastern Texas today. Many of the above localities lie west of the range of *T. carolina triunguis* in Texas (Milstead, 1967, Fig. 3). Many of these specimens represent large, even huge, box turtles. One specimen from the Lewisville site literally dwarfs Recent adult *T. c. putnami*, being about eight times the bulk of living specimens (Holman, 1966b).

Terra pene carolina triunguis (Agassiz)

Localities. SANGAMON: Sims Bayou local fauna, Harris County (McClure and Milstead, 1967).

Remarks. This is a strange occurrence, rather inconsistent with the above evidence. One would expect a Sangamon box turtle of the species *T. carolina* from the Texas Gulf Coast to show *T. c. putnami* characteristics.

Terra pene carolina **ssp. indet.**

Localities. ILLINOIAN: Slaton local fauna, Lubbock County (Dalquest, 1967, Holman, 1969a). SANGAMON: Clear Creek local fauna, Denton County (Holman, 1963); Moore Pit local fauna, Dallas County (Slaughter, 1966).

Terra pene ornata Agassiz

Localities. SANGAMON: Clear Creek local fauna, Denton County (Holman, 1963).

Remarks. These fossil elements represent a turtle that is somewhat larger than Recent *T. ornata*. An extinct subspecies, *T. o. longin-sulae* (Hay), is known from the Aftonian of Meade County, Kansas (Milstead, 1967), but the Texas material is not complete enough for subspecific identification. The lack of records of Pleistocene *T. ornata*, a species that is both widespread and common in Texas today, is odd, especially considering the widespread Pleistocene occurrence of *T. carolina*. There is still much to be learned about Pleistocene box turtles in Texas.

Terra pene **sp. indet.**

Localities. LATE KANSAN: Gilliland local fauna, Knox County (Preston, 1966, Hibbard and Dalquest, 1966). SANGAMON: Groesbeck Creek local fauna, Hardeman County (Holman, 1964); Sims Bayou local fauna, Harris County (Holman, 1965b).

Graptemys geographica (Le Sueur)

Localities. SANGAMON: Moore Pit local fauna, Dallas County (Slaughter, 1966). WISCONSIN: Near Trinity River, Henderson County (Gehlbach, 1965).

Remarks. This turtle now occurs to the northeast of the fossil localities, the nearest records being in southern central Arkansas.

?*Chrysemys picta belli* (Gray)

Localities. EARLY PLEISTOCENE: Pittbridge, Brazos County (Hay, 1924).

Remarks. This material is from some collections made along the Brazos River at Pittbridge near Bryan, Texas. Hay (1924) listed "*Chrysemys belli*" from the Pittbridge locality. Gehlbach (1965) cited this record as "*Chrysemys picta*," but incorrectly indicated the fossil as coming from Burleson County, across the river from Pittbridge.

I regard this record of the western painted turtle as doubtful. Today, the only painted turtles found in Texas live in the western part of the state, and represent the western painted turtle, *C. p. belli*. But the painted turtles that presently occur much nearer the fossil site to the north and to the east (although not in Texas) are the southern painted turtle, *C. p. dorsalis* (Agassiz).

†*Pseudemys scripta bisornata* (Cope)

Localities. PLEISTOCENE undesignated: Locality undesignated, Atascosa County (Preston, 1966). LATE KANSAN: Gilliland local fauna, Knox County (Preston, 1966, Hibbard and Dalquest, 1966).

Remarks. This extinct subspecies has been studied recently by Preston (1966). It has a greater shell-thickness than Holocene subspecies of *P. scripta*.

Pseudemys scripta ssp. indet.

Localities. SANGAMON: Clear Creek local fauna, Denton County (Holman, 1963); Sims Bayou local fauna, Harris County (Holman, 1965b).

Remarks. Two forms from the Sour Lake Pleistocene deposits of Hardin County, Texas, *Trachemys petrolei* (Leidy) and *T. trulla* Hay (Hay, 1908 and 1924) probably represent subspecies of *P. scripta* and are included here. In fact, Preston (1966) states that *T. petrolei* has features which are identical to *P. s. scripta* of Recent times.

Pseudemys sp. indet.

Localities. LATE WISCONSIN: Groesbeck Creek local fauna, Harde-
man County (Holman, 1964).

Remarks. It is not known which species this fossil represents.

Family TESTUDINIDAE

f*Geochelone* (*Hesperotestudo*) *campester* (Hay)

Localities. LATE KANSAN: Rock Creek local fauna, Briscoe County (Hibbard and Dalquest, 1966).

Remarks. The fossil species of land tortoises *Geochelone* (formerly *Testudo*) and *Gopherus* are being revised at present, evidently in a series of short publications rather than in a single monograph, and undoubtedly several of the older names that appear in the literature concerning the Pleistocene of Texas (Hay, 1908 and 1924) will become synonyms. Moreover, some of the fossils listed as *Testudo* (*Geochelone*) may be *Gopherus*, for positive generic identification of many of the earlier described forms is still not possible (Auffenberg, 1962a). Therefore, so as not to add to the confusion regarding these fossil tortoises, only those records of *Geochelone* and *Gopherus* that are based on recent studies and that cite specific data as to locality and age will be listed here.

The large land tortoises of the genus *Geochelone* are important fossil finds because it must be assumed that they lived chiefly in areas of frost-free environments (Hibbard, 1960). In his study of Florida tortoises, Auffenberg (1963) recognizes two fossil subgenera within the genus *Geochelone*, each with its own separate evolutionary history in the Cenozoic. Both of these subgenera are present in the Pleistocene of Texas. The Pleistocene forms of the subgenus *Caudochelys* are giant forms with relatively smooth shells and lacking a supracaudal buckler. The Pleistocene forms of the subgenus *Hesperotestudo* are much smaller, with rough shells, and with a curious supracaudal buckler.

Some of the Pleistocene tortoises of the genus *Gopherus* were also quite large, reaching a shell length of 3 feet (Auffenberg, 1962a). Evidently, the non-burrowing forms of *Gopherus* as well as all of the species of *Geochelone* were unable to stand the freezing temperatures that accompanied the onset of our modern climate.

The Rock Creek local fauna tortoise listed above was cited as "*Geochelone campester?*". I am following Auffenberg (1962a, p. 26) in the subgeneric designation of this fossil.

Geochelone (*Hesperotestudo*) *johnstoni* Auffenberg

Localities. LATE KANSAN: Gilliland local fauna, Knox County (Hib-

bard and Dalquest, 1966). AFTONIAN ? : Cita Canyon, Tule County (Auffenberg, 1962b).

*f**Geochelone (Hesperotestudo) wilsoni* (Milstead)

Localities. LATE WISCONSIN: Friesenhahn Cave, Bexar County (Auffenberg, 1962b, Milstead, 1956).

Remarks. To my knowledge this is the only record of *Geochelone* from a Late Wisconsin deposit in Texas.

Geochelone (Caudochebys) cf. crassiscutata (Leidy)

Localities. SANGAMON: Moore Pit local fauna, Dallas County (Slaughter, 1966).

†*Geochelone* sp. indet.

Localities. LATE KANSAN: Gilliland local fauna, Knox County (Hibbard, 1960, Hibbard and Dalquest, 1966, Preston, 1966). SANGAMON: Clear Creek local fauna, Denton County (Holman, 1963); Easley Ranch local fauna, Foard County (Holman, 1962); Sims Bayou local fauna, Harris County (Holman, 1965b).

Remarks. Some of the material from the Sangamon sites is rather fragmentary and the possibility exists that some of it might represent *Gopherus*. The material from the Gilliland local fauna contains the remains of a giant tortoise with a shell 41/2 to 6 feet in length. Thus, a member of the subgenus *Caudochebys*, possibly a giant form similar to *G. crassiscutata*, is represented.

*f**Gopherus hexagonata* (Cope)

Localities. LATE KANSAN: Rock Creek local fauna, Briscoe County; Gilliland local fauna, Knox County (Hibbard and Dalquest, 1966). WISCONSIN: Ingleside, San Patricio County (Auffenberg, 1962a). LATE WISCONSIN: Near Mobeetie, Wheeler County (Auffenberg, 1962a).

*f**Gopherus laticauda* (Cope)

Localities. LATE KANSAN: Rock Creek local fauna, Briscoe County (Hibbard and Dalquest, 1966).

Remarks. I shall follow Auffenberg and Milstead (1965) who designated this species as a member of the genus *Gopherus* rather than *Geochelone*.

***Gopherus* sp. indet.**

Localities. LATE KANSAN: Gilliland local fauna, Knox County (Preston, 1966). SANGAMON: Easley Ranch local fauna, Foard County (Holman, 1962).

Remarks. The Gilliland local fauna tortoise was listed as "*Gopherus* near *polyphemus*" because the fossil was more similar to *G. polyphemus* than to other Recent species of the genus.

Family TRIONYCHIDAE***Trionyx spinifer* Le Sueur**

Localities. EARLY PLEISTOCENE: Pittbridge, Brazos County (Hay, 1924). LATE KANSAN: Gilliland local fauna, Knox County (Preston, 1966, Hibbard and Dalquest, 1966).

Remarks. The Pittbridge fossil was listed by Hay as "*Amyda emoryi*"²², thus indicating that Hay saw similarity between the fossil and the subspecies *Trionyx spinifer emoryi* (Agassiz) that occurs in the area today.

***Trionyx* sp. indet.**

Localities. SANGAMON: Clear Creek local fauna, Denton County (Holman, 1963); Moore Pit local fauna, Dallas County (Slaughter, 1966); Sims Bayou local fauna, Harris County (Holman, 1965b).

Order CROCODILIA**Family ALLIGATORIDAE*****Alligator mississippiensis* Daudin**

Localities. PLEISTOCENE undesignated: River Terrace at Waco, McLennan County (Hay, 1924). ILLINOIAN: Slaton local fauna, Lubbock County (Holman, 1969a). SANGAMON: Moore Pit local fauna, Dallas County (Slaughter, 1966); Sims Bayou local fauna, Harris County (Holman, 1965b).

Remarks. The Waco fossil was cited as "*Alligator mississippiensis*"²². The Slaton local fauna site is well north of the range of the alligator in Texas today.

***Alligator* sp. indet**

Localities. LATE KANSAN: Gilliland local fauna, Knox County (Hibbard and Dalquest, 1966).

Remarks. The Gilliland local fauna site is far north of the present occurrence of the alligator in Texas.

Order SAURIA

Family IGUANIDAE

Crotaphytus collaris (Say)

Localities. ILLINOIAN: Slaton local fauna, Lubbock County (Holman, 1969a). LATE WISCONSIN: Cave Without a Name, Kendall County (Holman, 1969b); Friesenhahn Cave, Bexar County (Mecham, 1959); Groesbeck Creek local fauna, Hardeman County (Holman, 1964); Miller's Cave, Llano County (Holman, 1966a).

Holbrookia texana (Troschel)

Localities. LATE WISCONSIN: Cave Without a Name, Kendall County (Holman, 1969b).

Holbrookia sp. indet.

Localities. ILLINOIAN: Slaton local fauna, Lubbock County (Holman, 1969a). SANGAMON: Easley Ranch local fauna, Foard County (Holman, 1962).

Remarks. The Slaton local fauna fossil appears to represent either *H. lacerata*, *H. maculata*, or *H. propinqua*, but not *H. texana*.

Sceloporus variabilis Wiegmann

Localities. LATE WISCONSIN: Cave Without a Name, Kendall County (Holman, 1969b).

Remarks. *Sceloporus variabilis* is common today in the Tamaulipan biotic province south of the Balcones escarpment. Axtell (1968, in *litt.*) has seen this species about six miles north of Helotes and suspects that they occur along Cibolo Creek at the northern edge of Bexar County and that these records are at about the northern edge of the range periphery of the species.

Sceloporus poinsetti Baird and Girard

Localities. LATE WISCONSIN: Cave Without a Name, Kendall County (Holman, 1969b).

Remarks. The species is common in the area today, especially near

limestone ledges. Axtell (1968, in *litt.*) is surprised that *S. olivaceus*, a form that is very common in the area today, did not occur in the Cave Without a Name fossil fauna. He suggests the slight possibility that *S. olivaceus* has been migrating northward in Texas.

Sceloporus undulatus (**Latreille**)

Localities. ILLINOIAN: Slaton local fauna, Lubbock County (**Holman**, 1969a). LATE WISCONSIN: Cave Without a Name, Kendall County (Holman, 1969b).

Sceloporus **sp. indet.**

Localities. LATE WISCONSIN: Miller's Cave, Llano County (Holman, 1966a, Patton, 1963).

Phrynosoma cornutum (**Harlan**)

Localities. ILLINOIAN: Slaton local fauna, Lubbock County (Holman, 1969a). LATE WISCONSIN: Cave Without a Name, Kendall County (Holman, 1969b).

Family ANGUIDAE

Ophisaurus **sp. indet.**

Localities. SANGAMON: Clear Creek local fauna, Denton County (Holman, 1963).

Remarks. Certain diagnostic processes were missing on the fossils, but Etheridge (1963, in *litt.*) thinks that the species represented is probably *O. attenuatus* (Baird).

Family TEIDAE

Cnemidophorus cf. gularis **Baird and Girard**

Localities. SANGAMON: Clear Creek local fauna, Denton County (Holman, 1963).

Cnemidophorus sexlineatus (**Linnaeus**)

Localities. LATE WISCONSIN: Miller's Cave, Llano County (Holman, 1966a).

Remarks. Today, this species reaches the western limits of its distribution in the area of the fossil locality. It is not typical of the Balconian biotic province.

Cnemidophorus sp. indet.

Localities. LATE WISCONSIN: Cave Without a Name, Kendall County (Holman, 1969b).

Remarks. This material was so fragmentary that a specific identification was not attempted, although the size of the fossils was similar to that of both *C. gularis* and *C. sexlineatus*.

Family SCINCIDAE

Eumeces tetragrammus (Baird)

Localities. LATE WISCONSIN: Cave Without a Name, Kendall County (Holman, 1969b).

Remarks. At present this species does not occur in the area of the fossil locality, but it is characteristic of the Tamaulipan biotic province to the south. Axtell (1968, *in litt.*) informs me that *E. tetragrammus* may be a subspecies of *E. brevilineatus* Cope, a form that is found in Kendall County today.

Eumeces obsoletus (Baird and Girard)

Localities. LATE WISCONSIN: Cave Without a Name, Kendall County (Holman, 1969b); Miller's Cave, Llano County (Holman, 1966a).

Order SERPENTES

Family COLUBRIDAE

Natrix erythrogaster (Forster)

Localities. ILLINOIAN: Slaton local fauna, Lubbock County (Holman, 1969a).

Natrix ?erythrogaster (Forster) or *Natrix ?fasciata* (Linnaeus)

Localities. LATE WISCONSIN: Cave Without a Name, Kendall County (Hill, 1966); Groesbeck Creek local fauna, Hardeman County (Holman, 1964).

Remarks. These records are based on fossil vertebrae, and it is very difficult to distinguish the vertebrae of the two species. But *N. sipedon* is definitely not represented by this material.

Natrix sp. indet.

Localities. SANGAMON: Sims Bayou local fauna, Harris County (Holman, 1965b).

Storeria cf. dekeyi (Holbrook)

Localities. SANGAMON: Easley Ranch local fauna, Foard County (Holman, 1962).

Remarks. Identification was based mainly on geographic grounds. The fossil locality is near the western limits of the range of the species in Texas today.

Thamnophis ?marcianus (Baird and Girard) or
Thamnophis ?radix (Baird and Girard)

Localities. LATE KANSAN: Vera faunule, Knox County (Holman, 1965a). LATE WISCONSIN: Groesbeck Creek local fauna, Hardeman County (Holman, 1964).

Remarks. The two species are difficult, if not impossible, to tell apart on the basis of the fossils recovered.

Thamnophis proximus (Say)

Localities. ILLINOIAN: Slaton local fauna, Lubbock County (Holman, 1969a). SANGAMON: Clear Creek local fauna, Denton County (Holman, 1963); Easley Ranch local fauna, Foard County (Holman, 1962). LATE WISCONSIN: Cave Without a Name, Kendall County (Hill, 1966); Groesbeck Creek local fauna, Hardeman County (Holman, 1964); Miller's Cave, Llano County (Holman, 1966a, Patton, 1963).

Thamnophis sirtalis (Linnaeus)

Localities. SANGAMON: Easley Ranch local fauna, Foard County (Holman, 1962). LATE WISCONSIN: Cave Without a Name, Kendall County (Hill, 1966).

Remarks. This species reaches the western limits of its distribution at about the level of both of these fossil sites. *Thamnophis sirtalis* is not a characteristic Balconian species.

Thamnophis sp. indet.

Localities. SANGAMON: Easley Ranch local fauna, Foard County (Holman, 1962). LATE WISCONSIN: Ben Franklin local fauna, Delta County (Holman, 1963).

Tropidoclonion lineatum (Hallowell)

Localities. LATE KANSAN: Vera faunule, Knox County (Holman, 1965a).

Remarks. The westward extent of the range of this species ends a few miles east of the fossil locality today, but at higher and lower latitudes the range extends a little west of Knox County, Texas.

***Haldea striatula* (Linnaeus)**

Localities. SANGAMON: Clear Creek local fauna, Denton County (Holman, 1963).

***Heterodon platyrhinos* Latreille**

Localities. SANGAMON: Sims Bayou local fauna, Harris County (Holman, 1965b). LATE WISCONSIN: Cave Without a Name, Kendall County (Hill, 1966).

***Heterodon nasicus* Baird and Girard**

Localities. LATE KANSAN: Vera faunule, Knox County (Holman, 1965a). SANGAMON: Clear Creek local fauna, Denton County (Holman, 1963). LATE WISCONSIN: Cave Without a Name, Kendall County (Hill, 1966); Groesbeck Creek local fauna, Hardeman County (Holman, 1964).

***Heterodon* sp. indet.**

Localities. SANGAMON: Easley Ranch local fauna, Foard County (Holman, 1962).

***Diadophis punctatus* (Linnaeus)**

Localities. LATE WISCONSIN: Cave Without a Name, Kendall County (Hill, 1966).

***Coluber constrictor* Linnaeus**

Localities. SANGAMON: Moore Pit local fauna, Dallas County (Slaughter, 1966). LATE WISCONSIN: Cave Without a Name, Kendall County (Hill, 1966).

Remarks. Several authors have found the vertebrae of the racers and whipsnakes difficult to separate. Nevertheless, Hill (1966) points out characters that he believes will separate *Coluber constrictor* from *Masticophis flagellum* and *M. taeniatus* in most cases.

***Masticophis ?flagellum* (Shaw) or *Masticophis ?taeniatus* (Hallowell)**

Localities. LATE WISCONSIN: Cave Without a Name, Kendall County (Hill, 1966); Miller's Cave, Llano County (Holman, 1966a).

Remarks. These two species are quite difficult or impossible to distinguish on the basis of elements recovered.

?*Coluber* or ?*Masticophis*

Localities. ILLINOIAN: Slaton local fauna, Lubbock County (Holman, 1969a). SANGAMON: Clear Creek local fauna, Denton County (Holman, 1963); Easley Ranch local fauna, Foard County (Holman, 1962); Sims Bayou local fauna, Harris County (Holman, 1965b). LATE WISCONSIN: Ben Franklin local fauna, Delta County (Holman, 1963); Groesbeck Creek local fauna, Hardeman County (Holman, 1964).

***Opheodrys aestivus* (Linnaeus)**

Localities. SANGAMON: Clear Creek local fauna, Denton County (Holman, 1963); Easley Ranch local fauna, Foard County (Holman, 1962). LATE WISCONSIN: Miller's Cave, Llano County (Holman, 1966a).

***Opheodrys* sp. indet.**

Localities. LATE WISCONSIN: Cave Without a Name, Kendall County (Hill, 1966); Miller's Cave, Llano County (Holman, 1966a, Patton, 1963).

?*Drymarchon* sp. indet.

Localities. PLEISTOCENE undesignated: Barrow pit just north of Garza-Little Elk Dam, Denton County (Harrington, 1953).

Remarks. This material was sent to Dr. W. F. Foshag of the Smithsonian Institution who reported it was very similar to *Drymarchon*. Dr. Harrington (1962, in *litt.*) informs me that he is not aware of the whereabouts of this fossil. If indeed this fossil does represent *Drymarchon*, a warmer climate is indicated for the area at the time of the deposition of bones, for the genus has the northernmost limits of its distribution in the northern part of the Tamaulipan biotic province today. But it seems very possible that the resemblance between the fossil and *Drymarchon* was only a general one.

***Elaphe guttata* (Linnaeus)**

Localities. LATE WISCONSIN: Cave Without a Name, Kendall County (Hill, 1966).

***Elaphe* sp. indet.**

Localities. LATE WISCONSIN: Miller's Cave, Llano County (Holman, 1966a).

Elaphe or *Pituophis*

Localities. LATE WISCONSIN: Miller's Cave, Llano County (Holman, 1966a, Patton, 1963).

Arizona elegans Kennicott

Localities. SANGAMON: Clear Creek local fauna, Denton County (Holman, 1963). LATE WISCONSIN: Groesbeck Creek local fauna, Hardeman County (Holman, 1964); Miller's Cave, Llano County (Holman, 1966a).

Remarks. The Clear Creek fossil site is a few miles east of the easternmost limits of the range of the species today.

Pituophis melanoleucus sayi (Blainville)

Localities. LATE WISCONSIN: Cave Without a Name, Kendall County (Hill, 1966).

Remarks. These fossils are identical to Holocene examples of *P. melanoleucus sayi*.

Pituophis melanoleucus **ssp. indet.**

Localities. LATE WISCONSIN: Friesenhahn Cave, Bexar County (Mecham, 1959).

Lampropeltis calligaster (Harlan)

Localities. LATE WISCONSIN: Cave Without a Name, Kendall County (Hill, 1966); Miller's Cave, Llano County (Holman, 1966a, Patton, 1963).

Remarks. Both of these fossil localities are caves within the Balconian biotic province, but today the range of this species lies to the east of this province.

Lampropeltis getulus (Linnaeus)

Localities. ILLINOIAN: Slaton local fauna, Lubbock County (Holman, 1969a). LATE WISCONSIN: Cave Without a Name, Kendall County (Hill, 1966); Groesbeck Creek local fauna (Holman, 1964).

Lampropeltis triangulum (Lacepede)

Localities. SANGAMON: Clear Creek local fauna, Denton County

(Holman, 1963). LATE WISCONSIN: Cave Without a Name, Kendall County (Hill, 1966); Groesbeck Creek local fauna, Hardeman County (Holman, 1964); Miller's Cave, Llano County (Holman, 1966a).

Rhinocheilus lecontei **Baird and Girard**

Localities. ILLINOIAN: Slaton local fauna, Lubbock County (Holman, 1969a). LATE WISCONSIN: Cave Without a Name, Kendall County (Hill, 1966).

Tantilla **sp. indet.**

Localities. LATE WISCONSIN: Cave Without a Name, Kendall County (Hill, 1966); Miller's Cave, Llano County (Holman, 1966a, Patton, 1963).

Family **ELAPIDAE**

Micrurus fulvius (Linnaeus)

Localities. LATE WISCONSIN: Cave Without a Name, Kendall County (Hill, 1966).

Family **CROTALIDAE**

Agkistrodon contortrix (Linnaeus)

Localities. LATE WISCONSIN: Cave Without a Name, Kendall County (Hill, 1966); Groesbeck Creek local fauna, Hardeman County (Holman, 1964).

Agkistrodon piscivorus (Lacepede)

Localities. SANGAMON: Clear Creek local fauna, Denton County (Holman, 1963). LATE WISCONSIN: Cave Without a Name, Kendall County (Hill, 1966).

Crotalus atrox **Baird and Girard**

Localities. PLEISTOCENE undesignated: Cave near Bulvarde, Bexar County (Hay, 1924). ILLINOIAN: Slaton local fauna, Lubbock County (Holman, 1969a). LATE WISCONSIN: Friesenhahn Cave, Bexar County (Mecham, 1959); Miller's Cave, Llano County (Holman, 1966a).

Crotalus **sp. indet.**

Localities. SANGAMON: Clear Creek local fauna, Denton County (Holman, 1963); Sims Bayou local fauna, Harris County (Holman,

1965b). LATE WISCONSIN: Cave Without a Name, Kendall County (Hill, 1966); Groesbeck Creek local fauna, Hardeman County (Holman, 1964); Miller's Cave, Llano County (Holman, 1966a, Patton, 1963).

DISCUSSION

With the exception of the non-burrowing tortoises, large and small, that became extinct before that nebulous and arbitrary boundary that separates the late Wisconsin from the early Holocene, the species of amphibians and reptiles that occur in Texas today appear to have been present in the Pleistocene. Nevertheless, there are evidences of gigantism, of evolution at the subspecific level, and of shifts of range correlated with climatic changes. These shifts in range, in general, appear to be rather large in the earlier Pleistocene deposits, and more subtle, but equally as interesting, in the late Pleistocene. In the following paragraphs, the amphibians and reptiles of the Pleistocene of Texas are arranged on the basis of their stratigraphic occurrence.

Aftonian. The only Aftonian record for an amphibian or reptile from Texas that I am aware of is that of *fGeochelone johnstoni*, and this age designation is questionable (Auffenberg, 1962b). *Geochelone (Hesperotestudo) johnstoni* is a small tortoise.

Late Kansan. The late Kansan amphibians and reptiles of Texas are from the Seymour formation of Knox and Briscoe counties. The following forms have been listed: *Ambystoma tigrinum*, *Syrrhophus marnocki*, *Bufo* sp., *Acris crepitans*, *Rana* sp., *Terra pene* sp., †*Pseudemys scripta bisornata*, *fGeochelone cam pester*, †*Geochelone johnstoni*, *fGeochelone* sp., †*Gopherus hexagonata*, †*Gopherus laticauda*, ?†*Gopherus* sp., *Trionyx spinifer*, *Alligator* sp., *Thamnophis marcianus* or *radix*, *Tropidoclonion lineatum*, and *Heterodon nasicus*. These forms indicate that weather conditions in this part of Texas were much milder than they are today. In fact, Hibbard and Dalquest (1966), in reference to these late Kansan sites, state: "The climate at the time this fauna lived is considered to have been frost free, mesothermal, moist, subhumid and of the maritime type." Forms indicating this milder climate are the tortoises *Geochelone* and *Gopherus*; and *Syrrhophus marnocki* and *Alligator* sp., forms that were far north of their range in Texas today. Other than the tortoises, there are no extinct species recognized, but the thick-shelled pond slider, *Pseudemys scripta bisornata*, is an extinct subspecies.

Yarmouth. To my knowledge, the only valid published record of a Yarmouth amphibian or reptile from Texas is that of the box turtle, *fT errapene carolina putnami*, an extinct subspecies. One would assume that this turtle might indicate a milder, moister climate for Lubbock County, Texas, for the nearest living relative of the turtle is supposedly *T. c. major*, a form that frequents the Gulf Coast of the United States at present.

Illinoian. The only Illinoian herpetofauna known from Texas is the Slaton local fauna of Lubbock County. Species from this locality are: *Ambystoma tigrinum*, *Bufo speciosus* or *cognatus*, *Bufo woodhousei*, *Acris crepitans*, *Pseudacris clarki*, *Rana pipiens*, *Terrapene carolina*, *Alligator mississippiensis*, *Crotaphytus collaris*, *Holbrookia* sp., *Sceloporus undulatus*, *Phrynosoma cornutum*, *Natrix erythrogaster*, *Thamnophis proximus*, *Coluber* or *Masticophis*, *Lampropeltis getulus*, *Rhinocheilus lecontei*, and *Crotalus atrox*.

This is a very interesting fauna. The fossil locality lies well within the Kansan biotic province and all the amphibians and reptiles identified from the deposit are characteristic of the Kansan biotic province, with the exception of the large box turtle (*Terrapene carolina*) and the alligator which occur in biotic provinces to the east and to the south of the deposit today. Dalquest (1967) attributes the presence of these two forms to the fact that the deposit may represent the early Illinoian when winters were milder than at present. Mammalian indicators of a mild winter climate are present at Slaton, but there are also mammals that are identical to forms that live in the area today and that are characteristic of the Kansan biotic province.

Sangamon. The Sangamon deposits of Texas (considered by some authors to represent the early Wisconsin or an interstadial period within the Wisconsin) are found mainly along the river terraces of northeastern and northern central Texas, with the exception of the Sims Bayou local fauna of Houston. The list of Pleistocene amphibians and reptiles from localities that are considered to represent the Sangamon age is as follows: *Ambystoma texanum*, *Ambystoma* sp., *Amphiuma* means, *Syrhophus marnocki*, *Bufo woodhousei*, *Acris crepitans*, *Hyla versicolor*, *Pseudacris clarki*, *Gastrophryne olivacea*, *Rana pipiens*, *Sternotherus odoratus*, *fTerrapene carolina putnami* x *T. c. triunguis*, *Terrapene carolina triunguis*, *Terrapene ornata*, *Terrapene* sp., *Graptemys geographica*, *Pseudemys scripta*, *fGeochelone crassiscutata*, *fGeochelone* sp., *?fGopherus* sp., *Trionyx* sp., *Alligator mississippiensis*, *Holbrookia* sp., *Ophisaurus* sp., *Cnemidophorus gularis*,

Storeria dekayi, *Thamnophis proximus*, *Thamnophis sirtalis*, *Thamnophis* sp., *Haldea striatula*, *Heterodon platyrhinos*, *Heterodon nasicus*, *Heterodon* sp., *Coluber constrictor*, *Coluber* or *Masticophis*, *Ophedrys aestivus*, *Arizona elegans*, *Lampropeltis triangulum*, *Agkistrodon piscivorus*, *Crotalus* sp.

The Sangamon list, even more than the Illinoian list, comprises a mosaic of forms containing mainly species now living in the areas of the fossil deposits, but with extinct tortoises, *Geochelone* and *Gopherus*, and eastern and southern intrusive forms appearing in sites in northern Texas: *Syrrophus marnocki* (fossil locality in Kansan biotic province, present range in biotic provinces to the east), and *Terrapene carolina putnami* x *T. c. triunguis* (several fossil localities west of present range of species). Oddly enough, one form, *Arizona elegans* (fossil in Denton County), is slightly east of its range in Texas today; and another species, *Graptemys geographica* (fossil in Dallas County), is southwest of its present range.

Slaughter has suggested (personal communication) that these Sangamon localities represent a time of more equitable climate throughout the year. In other words, a mild winter would account for the southern forms and the tortoises, while cool, moist summers would account for the northern and eastern forms. This interpretation would also be in line with the mammalian evidence.

No extinct subspecies (other than the box turtles, which are thought to be temporal intergrade forms) and no extinct species (other than the tortoises) have been reported from these Sangamon sites. But the huge size of some of these box turtles is striking; and the fact that *Terrapene carolina triunguis* is present at the Sims Bayou site at Houston rather than a box turtle showing *T. c. putnami* influences is problematic.

Wisconsin. These sites were referred to the Wisconsin, although the stage within the Wisconsin was not indicated. But it is presumed that the time represented is earlier than late Wisconsin. Species from these sites are: *fTerrapene carolina putnami* x *T. c. triunguis*, *Graptemys geographica*, and *tGopherus hexagonata*. The record of *Graptemys geographica* from Henderson County is southwest of the present range of the species.

Late Wisconsin. Late Wisconsin localities are in the northeastern, the northern central, and the Balconian regions. The following amphibians and reptiles have been reported from these sites: *Ambystoma texanum*, *Ambystoma tigrinum*, *Plethodon glutinosus*, *Scaphio pus* sp., *Eleutherodactylus augusti*, *Bufo speciosus* or *cognatus*, *tBufo wood-*

housei bexarensis, *Acris crepitans*, *Pseudacris streckeri*, *Rana catesbeiana*, *Rana pipiens*, *Rana* sp., *Chelydra serpentina*, *Terrapene carolina putnami* x *T. c. triunguis*, *Pseudemys* sp., *Geochelone wilsoni*, *Gopherus hexagonata*, *Crotaphytus collaris*, *Holbrookia texana*, *Sceloporus variabilis*, *Sceloporus poinsetti*, *Sceloporus undulatus*, *Sceloporus* sp., *Phrynosoma cornutum*, *Cnemidophorus sexlineatus*, *Cnemidophorus* sp., *Eumeces tetragrammus*, *Eumeces obsoletus*, *Thamnophis marcianus* or *radix*, *Thamnophis proximus*, *Thamnophis sirtalis*, *Thamnophis* sp., *Heterodon platyrhinos*, *H. nasicus*, *Diadophis punctatus*, *Coluber constrictor*, *Masticophis flagellum* or *taeniatus*, *Coluber* or *Masticophis*, *Opheodrys aestivus*, *Opheodrys* sp., *Elaphe guttata*, *Elaphe* sp., *Elaphe* or *Pituophis*, *Arizona elegans*, *Pituophis melanoleucus sayi*, *Lampropeltis calligaster*, *Lampropeltis getulus*, *Lampropeltis triangulum*, *Rhinocheilus lecontei*, *Tantilla* sp., *Micrurus fulvius*, *Agkistrodon contortrix*, *Agkistrodon piscivorus*, *Crotalus atrox*, and *Crotalus* sp.

The giant tortoises of the Genus *Geochelone* appear to have become extinct by late Wisconsin times in Texas, with only the small form, *Geochelone wilsoni* surviving. But evidently, one large tortoise, *Gopherus hexagonata*, a species with a shell nearly a meter long, also persisted. Again, the fauna is quite similar to that found in Texas today, but there is herpetological evidence that winters were somewhat milder; and because of the presence of some eastern amphibians and reptiles and northern mammals (Patton, 1963), there is evidence that summers may have been cooler and moister. Amphibians and reptiles that indicate milder winters and/or moister summers are: *Ambystoma texanum* (fossil locality in Kansan biotic province; present range in biotic provinces to the east), *Terrapene carolina putnami* x *T. c. triunguis* (several fossil localities west of the present range of species), *Geochelone wilsoni*, *Gopherus hexagonata*, *Sceloporus variabilis* (fossil locality in Balconian biotic province; present range in Tamaulipan biotic province), *Eumeces tetragrammus* (fossil locality in Balconian biotic province; present range in Tamaulipan biotic province), *Thamnophis sirtalis* (fossil locality in Balconian biotic province; present range in biotic provinces to the east of the fossil locality), *Lampropeltis calligaster* (fossil locality in Balconian biotic province; present range in biotic provinces to the east of the fossil locality).

The only extinct herpetological species recognized here are those of the tortoises *Geochelone* and *Gopherus*. One extinct subspecies, the large toad, *Bufo woodhousei bexarensis*, is known from a single late Wisconsin deposit.

SUMMARY

1. With the exception of extinct species of the two fossil tortoise genera *Geochelone* and *Gopherus*, there is no conclusive evidence that any other known Pleistocene amphibians and reptiles from Texas represent extinct species.
2. Extinct subspecies are known from the late Kansan (*Pseudemys scripta bisornata*), Yarmouth (*Terrapene carolina putnami*), and from the late Wisconsin (*Bufo woodhousei bexarensis*).
3. Forms that supposedly represent temporal intergrades between two subspecies of box turtles are widespread, and are known from Sangamon, Wisconsin, and late Wisconsin deposits. Some of these turtles (*Terrapene carolina putnami* x *T. c. triunguis*) were huge.
4. At least by Illinoian times and possibly by late Kansan times, the herpetofauna of Texas, in general, appears to conform to the distributional patterns as outlined by Blair (1950).
5. Several intrusive forms from the east and from the south, and at least one northern form, as well as the presence of large non-burrowing tortoises, indicate that until Recent times the winters in Texas were milder and the summers moister and perhaps cooler. This thesis is in line with the mammalian evidence.
6. Evidently, with the onset of our modern climate, the last of the fossil tortoises became extinct and some of the smaller herpetological species withdrew to the east and to the south.

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