

PLEISTOCENE FOSSIL TURTLES FROM AGUASCALIENTES, STATE OF AGUASCALIENTES

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ABSTRACT

Remains of fossil turtles of middle Pleistocene age from two ravines southeast of the City of Aguascalientes, State of Aguascalientes, Mexico, include an extant subspecies, *Kinosternon scorpioides integrum*, and at least four species belonging to the Subfamily Testudininae. The latter include *Gopherus auffenbergi*, previously described; an additional new species, *Gopherus pargensis*; an extant species, *Gopherus flavomarginatus*; and fragments referable to the Genus *Geochelone*.

RESUMEN

En este trabajo se describen y comentan las tortugas del Pleistoceno medio, procedentes de dos cañadas ubicadas al sureste de la Ciudad de Aguascalientes, Aguascalientes, México. Comprenden la subespecie viviente *Kinosternon scorpioides integrum* y, por lo menos, cuatro especies de la Subfamilia Testudininae. De estas últimas, *Gopherus auffenbergi* ha sido descrita con anterioridad. Se registran además *Gopherus pargensis* sp. nova, la especie viviente *Gopherus flavomarginatus* y *Geochelone* sp.

INTRODUCTION

Two small ravines southeast of the City of Aguascalientes, State of Aguascalientes, Mexico, have cut their courses through the middle Pleistocene continental deposits correlated with the Tacubaya Formation of the Valley of Mexico, and the sediments exposed have yielded abundant fossils of mammals and some reptiles (Mooser, 1959; 1972). The vertebrates constitute the Cedazo local fauna. Sympatry of closely related species is striking in the fauna. Seven kinds of horses, four kinds of camels and four kinds of prongbucks have been reported (Mooser and Dalquest, 1975).

There are few records of fossil turtles from Mexico, and most of these are fragmentary remains, not identifiable to species. The reptiles of the Cedazo local fauna include a mud turtle and four kinds of land tortoises that lived sympatrically when these sediments were accumulating. One species, *Gopherus auffenbergi*, has previously been described (Mooser, 1972). The presence of the other forms is verified hereafter. Measurements are in millimeters and catalogue numbers are provisional because the specimens will be deposited in the State Museum of Aguascalientes.

SYSTEMATIC PALEONTOLOGY

Kinosternon scorpioides integrum LeConte

Material.- Fragment of carapace and nearly complete plastron (FC 505).

Locality and age.- San Francisco Ravine, 4 km SE City of Aguascalientes, Ags., Mexico; Cedazo local fauna, middle Pleistocene age.

Description.- The remains are of an adult individual. The carapace portion includes seven anterior peripherals with attached incomplete nuchal and incomplete pleurals, and two isolated posterior peripherals. On the peripherals

the sulcus of the ninth marginal lamina is conspicuously higher than that of the eighth (Figure 1).

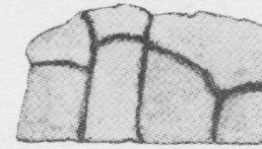


Figure 1.- *Kinosternon integrum* (FC 505). Posterior peripherals with sulcus of ninth marginal lamina conspicuously higher than sulcus of eighth marginal lamina (x 1).

The plastron is nearly complete (Figure 2). The entoplastron is lacking; the gular sulcus curves outward; the humeropectoral sulcus is slightly curved and projects anteriorly; the inter-pectoral sulcus is short; the anterior hinge is straight; the hyo-hyoplastral suture crosses the plastron as a straight line from bridge to bridge; the posterior hinge is slightly curved and inclined in an anterior direction; the femoro-anal sulcus is slightly curved and projects posteriorly; the xiphiplastron is long and wide with a tiny notch on its posterior projection. Part of the right bridge is preserved and it is long and narrow.

Remarks.- This is the first record of *Kinosternon integrum* from the middle Pleistocene of Mexico. Two species of *Kinosternon* live today in the State of Aguascalientes: *K. integrum* and *K. hirtipes*. *K. integrum* differs from *K. hirtipes* as follows: carapace more highly vaulted; hind portion of carapace slightly depressed laterally and keeled dorsally; bridge long and narrow; inter-pectoral sulcus usually short; posterior hinge curved and inclined in anterior direction; xiphiplastron with a tiny notch on its posterior projection, wide and long, and closing the carapace tightly; ninth marginal lamina conspicuously higher than in *K. hirtipes*.

Gopherus flavomarginatus Legler (Figures 3 and 4)

Material.- Complete plastron with attached posterior

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peripherals of carapace from bridge to bridge, and nearly complete post-cranial skeleton (FC 507).

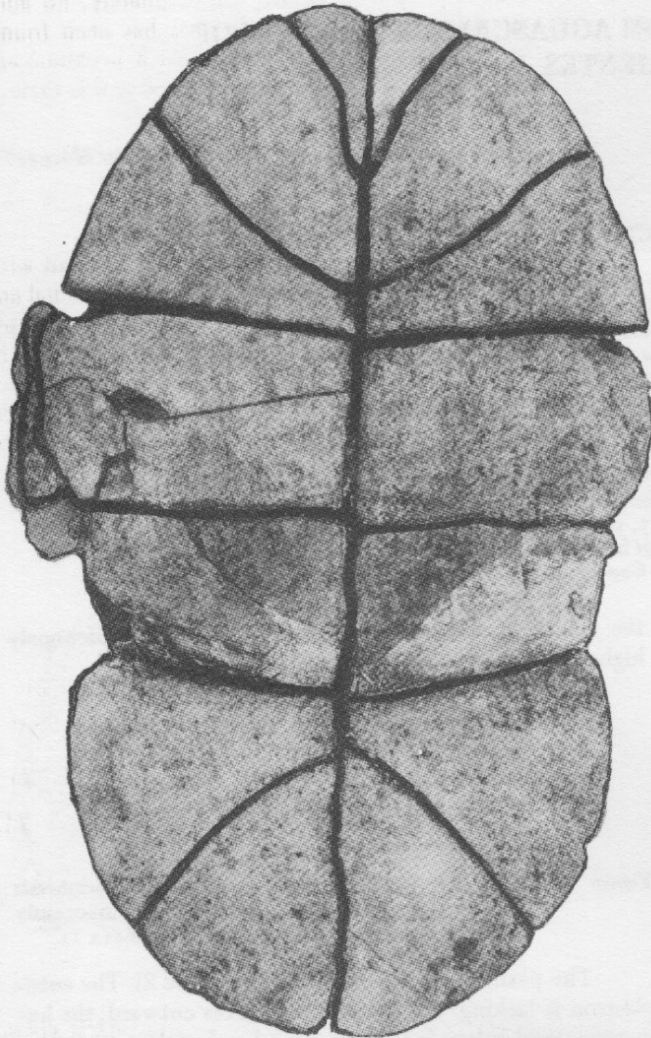


Figure 2.- *Kinosternon integrum* (FC 505). Plastron, ventral view (x 1).

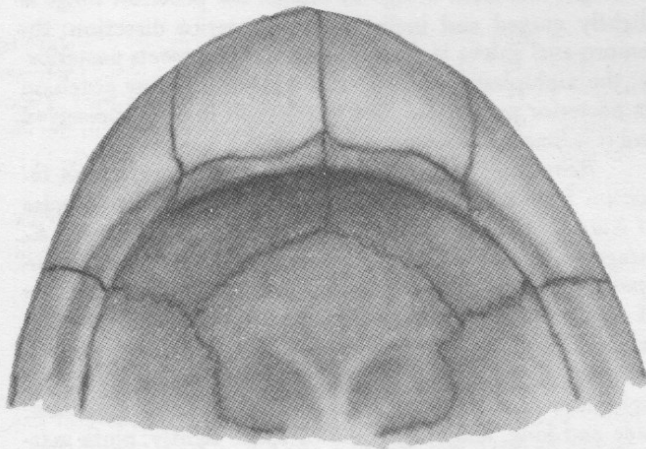


Figure 3.- *Gopherus flavomarginatus* (FC 507). Fragment of anterior part of plastron with entoplastron, dorsal view (x 1/2).

Tentatively referred material.- Incomplete anterior plastron (FC 508); fragment of right side of anterior plastron (FC 509); isolated complete entoplastron (FC 510).

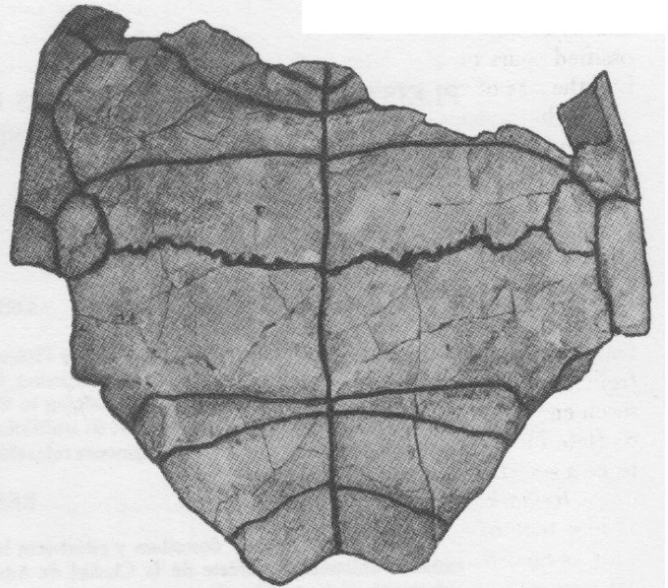


Figure 4.- *Gopherus flavomarginatus* (FC 507). Fragment of plastron, ventral view (x 1/3).

Locality and age.- Cedazo Ravine, 2 km SE City of Aguascalientes, Ags., Mexico; Cedazo local fauna; middle Pleistocene age.

Description.- The plastron (FC 507) is from an aged male specimen. The posterior peripherals at the inguinal notch flare outward slightly. The pygal is wedge-shaped, its distal end concave.

The epiplastron and entoplastron have not been removed from the matrix to preserve the articulated carpal elements which lie on top of them. Epiplastron, entoplastron and hyoplastron lie level, in the plane of the posterior part of the plastron, and not sharply bent dorsally, as they are in modern specimens of the species. The anterior part of the plastron is parabolic in form, without notch or indentation on the anterior projection (Figure 3). These differences from modern specimens may be partly the result of post-mortem distortion and partly the result of the advanced age of the individual. The epiplastral lip is deeply excavated internally. The entoplastron is more or less pentagonal. The epihyoplastral suture projects anteriorly. The inter-pectoral sulcus is short. The humero-pectoral sulcus is slightly curved in an anterior direction. The abdomino-pectoral sulcus is slightly arched and inclined in a posterior direction. The hyo-hyoplastral suture is irregular and heavily denticulated. The abdomino-femoral sulcus is straight but sharply curved posteriorly at the distal end. The hyo-xi-plastral suture does not enter the abdomino-femoral sulcus. The xiplastral projection is broadly furcated (Figure 4).

The bones of the post-cranial skeleton are of large size as compared with a modern skeleton of *G. flavomarginatus* from Santa Rosa, Coahuila, Mexico; the size probably is an indication that the fossil specimen had reached maximum growth. The humerus measures: length, 75; midshaft diameter, 15. The femora measure: length, 89; midshaft diameter, 16 x 14. The carpus has 4 subradial elements: carpal 1, radiale + mediale 2, proximal centrale, and intermedium, and 3 subulnar elements (intermedium, ulnare, and carpal 5). The five carpals articulate with five metacarp-

pals, to each of which a phalanx is fused. The legs were heavily armored with dermal ossicles. The hind legs had two ossified spurs on the outer surface of the thighs, one about half the size of the other.

The incomplete anterior part of plastron (FC 508) is broken at the epihyoplastral suture. The posterior half of the entoplastron is complete. It is rounded, slightly pointed at the end. FC 510 is a complete entoplastron, more or less pentagonal in shape, and without a gular sulcus.

Among the specimens, the differences in shape of the entoplastra are interpreted as sexual dimorphism. The entoplastron with the posterior part rounded is probably from a female and the pentagonal entoplastra without gular sulci from males. Brattstrom (1961) reported that four out of seven entoplastrons of *G. agassizi* from Gypsum Cave, Nevada (late Pleistocene) had no gular sulci and considered this to be a sex character of males.

Remarks.- The carpal formula of the fossil specimen is like that of *Gopherus flavomarginatus* and *G. polyphemus* as recorded by Auffenberg (1966). Carapace and skeletal elements of a large male *G. flavomarginatus* from Santa Rosa, Coahuila, Mexico, were prepared and a carapace and complete skeleton of *G. polyphemus* was obtained for direct comparison. The sulci and sutures of the plastra of the fossil specimen and recent *G. flavomarginatus* are almost identical. Since the fossil tortoise had ossified spurs on the thigh (Legler, 1959) which are absent in *G. polyphemus*, the fossil specimen was identified as *G. flavomarginatus* Legler. This is the first record of *G. flavomarginatus* from the middle Pleistocene of Mexico.

Gopherus pargensis new species

Holotype.- Fragment of the left side of the posterior part of a carapace (TMM 41536-29), consisting of the seventh, eighth, ninth, and tenth peripherals with attached incomplete pleurals.

Type locality and age.- San Francisco Ravine, 4 km SE City of Aguascalientes, Ags., Mexico; Cedazo local fauna; middle Pleistocene age.

Etymology.- *Parga*, the name of a ranch on the south side of the ravine, close to the site where the specimen was found.

Distribution.- Known only from the type locality.

Diagnosis.- A *Gopherus* whose pleural-peripheral suture has a vaulted aspect; sulcus of lateral laminae crosses pleural-peripheral suture to middle of peripherals.

Description.- The holotype (Figure 5) is a fragment of a carapace, posterior to the inguinal notch. The proximal ends of the peripherals are irregularly rounded, giving the pleural-peripheral suture a vaulted aspect. The pleurals are alternately expanded at their proximal or distal ends. The fragment of the fifth pleural is anomalous; it does not reach the pleural-peripheral suture. The sixth extends from the middle of peripheral seven to the center of peripheral nine. Pleural seven is very small at its distal end. The sulcus is ridged, crossing the pleural-peripheral suture to the middle of the peripherals. The peripherals flare outward very slightly.

Remarks.- In most tortoises, the costal-marginal sulci coincide with or overlie the pleural-peripheral sutures, thus forming a conspicuous pleural-peripheral suture. In *Gopherus pargensis* the pleural-peripheral suture and the distal sul-

cus of the laminae are widely separated. This position of the costomarginal sulcus is a striking character, as is the vaulted pleural-peripheral suture. Unfortunately, no additional material referable to *G. pargensis* has been found. The pleurals, alternately expanded at their proximal and distal ends, and the high vaulted carapace, place this tortoise in the genus *Gopherus*.

Geochelone sp.
(Figure 6)

A carapace (FC 511), depressed, distorted and without plastron, belongs to the genus *Geochelone*. Nuchal and neurals are largely destroyed, but the supra-pygals and pygal are complete. The pygal is slightly curved inward and its posterior border is even with the peripherals. The specimen is not well enough preserved for specific allocation. The carapace length is approximately 340; the width approximately 320.

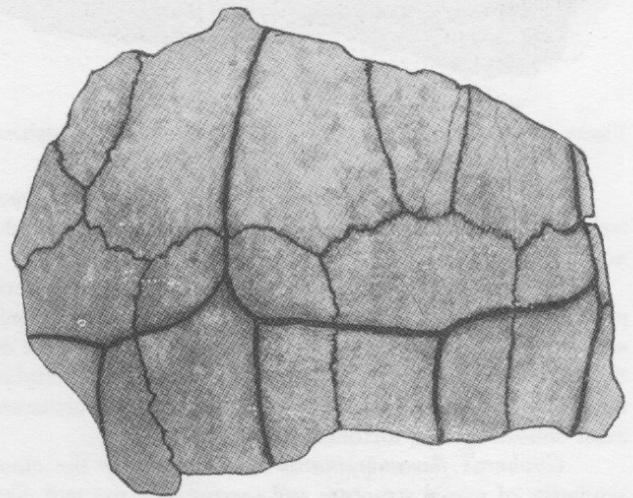


Figure 5.- *Gopherus pargensis*, new species, holotype (TMM 41536-29). The University of Texas catalog number for the holotype specimen. Note sulcus of dermal lamina crossing pleural-peripheral suture to middle of peripherals (x 1/2).

A large peripheral of *Geochelone* (FC 512, Figure 6) compares in size with the large specimens of fossil tortoises found in the United States (Hibbard and Dalquest, 1966; Preston, 1966), and with the large *Geochelone* from the Galapagos Islands. The fragment measures: length, 111; breadth, 100; thickness, 42.

The two specimens of *Geochelone* may represent two different species, or they may reflect individuals on age different in one species.

DISCUSSION

During 18 years of systematic collecting, mostly in the rainy seasons when fossils are often washed out, the sediments have yielded remains of four species of tortoises of the family Testudininae. Three of these belong to the genus *Gopherus*. Sympatry of three species of *Gopherus* is surprising but is more pronounced in the mammalian fauna (seven kinds of *Equus*, for example). It is noteworthy that *Gopherus pargensis* is a highly differentiated species that probably made demands on its environment quite different from

those of the other two species of *Gopherus*. The three species were identified as follows:

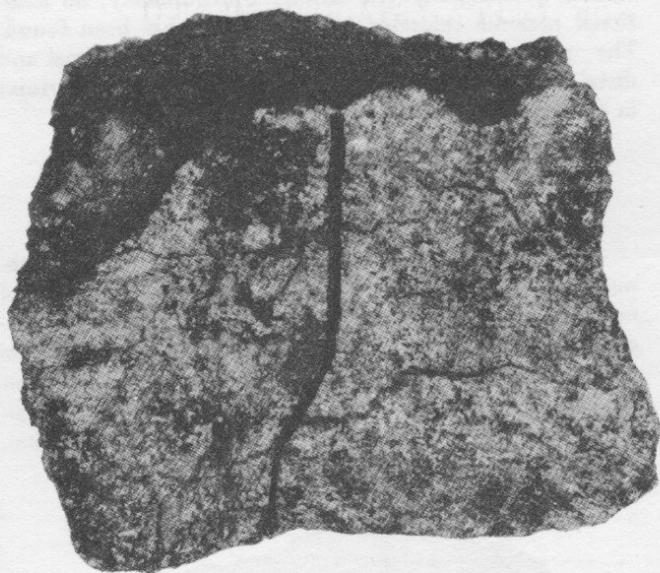


Figure 6.- *Geochelone* sp. (FC 512). Large isolated peripheral (x 3/4).

Gopherus auffenbergi, previously described, is characterized by short third, fifth and seventh pleurals which do not reach the pleural-peripheral suture.

In *Gopherus pargensis* new species, the pleural-peripheral suture has a vaulted aspect. The sulcus of the laminae crosses the pleural-peripheral suture to the middle of the peripherals. The vaulted aspect of the pleural-peripheral suture and the position of the costomarginal sulcus are most unusual among tortoises.

Gopherus flavomarginatus is identified by the close similarity of carpal structure and carapace sutures and sulci of the fossil skeleton to the skeleton of the living species, from the State of Coahuila, Mexico.

Gopherus is a strictly American genus. Numerous fossil species have been described from the Oligocene to the Pleistocene in the United States. The geographic ranges of the four extant species of the genus are presently confined to the southeastern United States and northern Mexico. The discovery of *Gopherus flavomarginatus* as a fossil in the State of Aguascalientes, in central Mexico, shows that the species had a greater geographic range in the Pleistocene. The specimens of *Gopherus* from Aguascalientes mark the southernmost record of occurrence for the genus.

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REFERENCES CITED

- Auffenberg, W., 1966, The carpus of the land tortoises (Testudininae): Florida State Mus., Bull. 10, p. 159-192.
- Brattstrom, B. H., 1961, Some new fossil tortoises from western North America with remarks on the zoogeography and paleoecology of tortoises: Jour. Paleontology, v. 35, p. 543-560.
- Carr, A., 1952, Handbook of turtles: Ithaca, N. Y., Comstock Publ. Assoc., 542 p.
- Hibbard, C. W., and Dalquest, W. W., 1966, Fossils from the Seymour Formation of Knox and Baylor Counties, Texas, and their bearing on the late Kansan climate of that region: Michigan Univ., Contr. Mus. Paleo. 21, p. 1-66.
- Legler, J., 1959, A new tortoise, genus *Gopherus*, from north-central Mexico: Kansas Univ., Mus. Nat. Hist., Publ. 11, p. 335-343.
- Mooser, Oswaldo, 1959, La fauna "Cedazo" del Pleistoceno en Aguascalientes: Univ. Nal. Autón. México, Inst. Biología, Anales, v. 29, p. 409-452.
- 1972, A new species of Pleistocene tortoise, genus *Gopherus*: Southwest. Naturalist, v. 17, p. 61-65.
- Mooser, Oswaldo, and Dalquest, W. W., 1975, Pleistocene mammals from Aguascalientes, central Mexico: Jour. Mamm., v. 56, p. 781-820.
- Preston, R. E., 1966, Turtles of the Guilliland faunule from the Pleistocene of Knox County, Texas: Papers Mich. Acad. Sci., Arts, Letters, v. 51, p. 221-239.
- Smith, H. M., and Smith, R. B., 1976, Synopsis of the Herpetofauna of Mexico: North Bennington, John Johnson, Vt., v. III, p. T-G-1.
- Van Devender, T. R., Moodie, K.B., and Harris, A. H., 1977, The desert tortoise (*Gopherus agassizi*) in the Pleistocene of the northern Chihuahuan desert: Herpetologica, v. 32, p. 298-304.