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From North-central Mexico

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A New Tortoise, Genus *Gopherus*, From North-central Mexico

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JOHN M. LEGLER

In the course of taxonomic studies of the genus *Gopherus* it was found that specimens from north-central Mexico belong to an hitherto unrecognized species, which is named and described below.

Gopherus flavomarginatus new species

Holotype.—U. S. National Museum 61253, adult; stuffed specimen with disassociated skull; 30 to 40 miles from Lerdo, Durango, Mexico; obtained by Dr. Elswood Chaffee, 1918.

Paratypes.—USNM 61254, adult, stuffed specimen with skull in place, other data the same as those for holotype; USNM 60976, adult, stuffed specimen with disassociated skull, Lerdo, Durango, Dr. Elswood Chaffee, May 1918; University of Illinois 42953-4, adults, two carapaces, Carrillo, Chihuahua, Pete S. Chrapliwy and Kenneth L. Williams, 1 August 1958; University of Kansas 39415, adult, carapace only, 8 mi. E and 2 mi. S Americanos, Coahuila, Robert W. Dickerman, 19 May 1954.

Diagnosis.—A large tortoise of the genus *Gopherus*, having a flat-topped, posteriorly-flared shell, carapacial laminae that are pale with contrasting dark centers (at least on the lateral margins of the carapace), intergular seam longer than interhumeral, obtuse gular projections, and a relatively wider skull than other Mexican representatives of the genus.

Description of species.—Ground color of carapace pale yellow to straw in smaller specimens, pale brown in larger specimens; in some specimens a slight indication of darker radial markings on carapace; epidermal areolae of carapace (if present) and first two or three zones of growth (around areolae) dark brown to black, their contrast with the ground color greater in smaller specimens; ground color of lateral marginals yellowish, much paler than remainder of carapace; black areolae of marginals contrasting sharply with ground color even in old individuals; plastron pale, approximately the same shade of yellow as lateral marginals, marked with sharply contrasting blotches of black or dark brown in younger specimens, becoming immaculate with age.

Carapace low, evenly arched or slightly flat-topped in cross section, its height slightly more than 50 per cent of its length; top of carapace, between highest parts of first and fourth central laminae, more or less flat in profile; carapace flared, wider posteriorly than anteriorly; central laminae all broader than long, the first not (or but slightly) narrower posteriorly than anteriorly; plastron deeply notched behind, the inner margins of the notch straight, neither convex nor concave; gular projections truncate (not pronglike) having no notch or but a shallow notch between them; greatest combined width of gular laminae much greater than greatest length; interlaminal length of gular greater

than that of humeral; one large axillary scute on each side, approximately rectangular but slightly wider below than above; one or two inguinal scutes on each side, the anterior roughly triangular and much larger than posterior.

Anterior surface of antebrachium having enlarged, juxtaposed (or slightly imbricated), osteodermal scales arranged in seven to eight longitudinal rows, each scale yellowish with a black or dark brown center; scales on lateral edge of antebrachium, from fifth claw to elbow, ten in number and darker than other antebrachial scales; two enlarged black-tipped, yellow spurs on posterior surface of thigh, inner spur approximately half the size of outer. Head relatively wide, greatest width of skull slightly more than 80 per cent of condylobasilar length; width of head 1.3 to 1.7 times diameter of hind foot; scales on top of head large but irregularly arranged (see table 1 for measurements of type and paratypes).

TABLE 1. MEASUREMENTS, IN MILLIMETERS, OF THE HOLOTYPE AND PARATYPES OF GOPHERUS FLAVOMARGINATUS NEW SPECIES

CATALOGUE NUMBER AND COLLECTION	Length of carapace	Width of carapace	Length of plastron	Height	Diameter of hind foot	Width of head
USNM 60976.....	246	212	252	108	31	41
USNM 61253.....	222	166	212	96	21	36
USNM 61254.....	371	292	358	157	43	55
IU 42953.....	281	220	.....	.....	.....	.....
IU 42954.....	278	214	.....	.....	.....	.....
KU 39415.....	303	232	.....	.....	.....	.....

Duges (1888:146-147, and 1896:479) twice reported specimens of *Gopherus polyphemus* from Chihuahua (see discussion of distribution); his description of two living examples (1888) agrees generally with the above description of *G. flavomarginatus*. He stated that the iris of his smaller specimen was yellow and the iris of a larger specimen brown.

It will be most interesting to learn the color of juveniles of *G. flavomarginatus*. Considering the dark color of the epidermal areolae of adults, I would expect the color of hatchlings to be dark brown to nearly black, with each lamina acquiring paler borders as it grew, rather than acquiring darker borders as is usually the case in *G. berlandieri* (personal observation), *agassizii* (Miller, 1932:194, pl. 2; Woodbury and Hardy, 1948:165, figs. 9 and 10), and *polyphemus* (personal observation).

PLATE 7

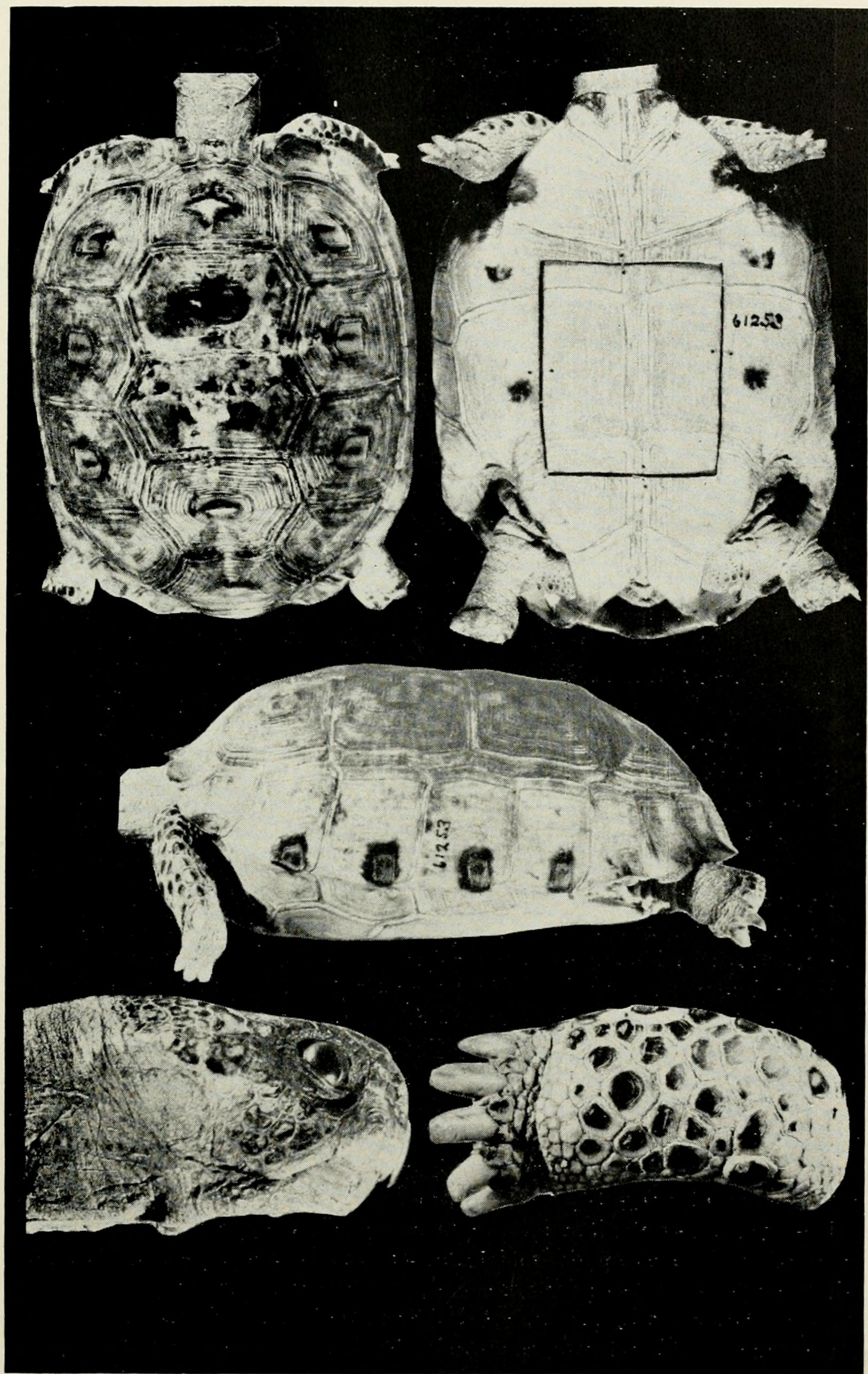


PLATE 7. *Gopherus flavomarginatus* new species: *Top*—Dorsal and ventral views of holotype ($\times \frac{1}{3}$); *Middle*—Lateral view of holotype ($\times \frac{1}{3}$); *Bottom*—Head of paratype (USNM 61254) ($\times \frac{1}{2}$) and antibrachium of holotype ($\times \frac{5}{6}$). Dark outline on plastron of holotype indicates where portion of shell was removed (and then replaced) in course of preparation.

PLATE 8

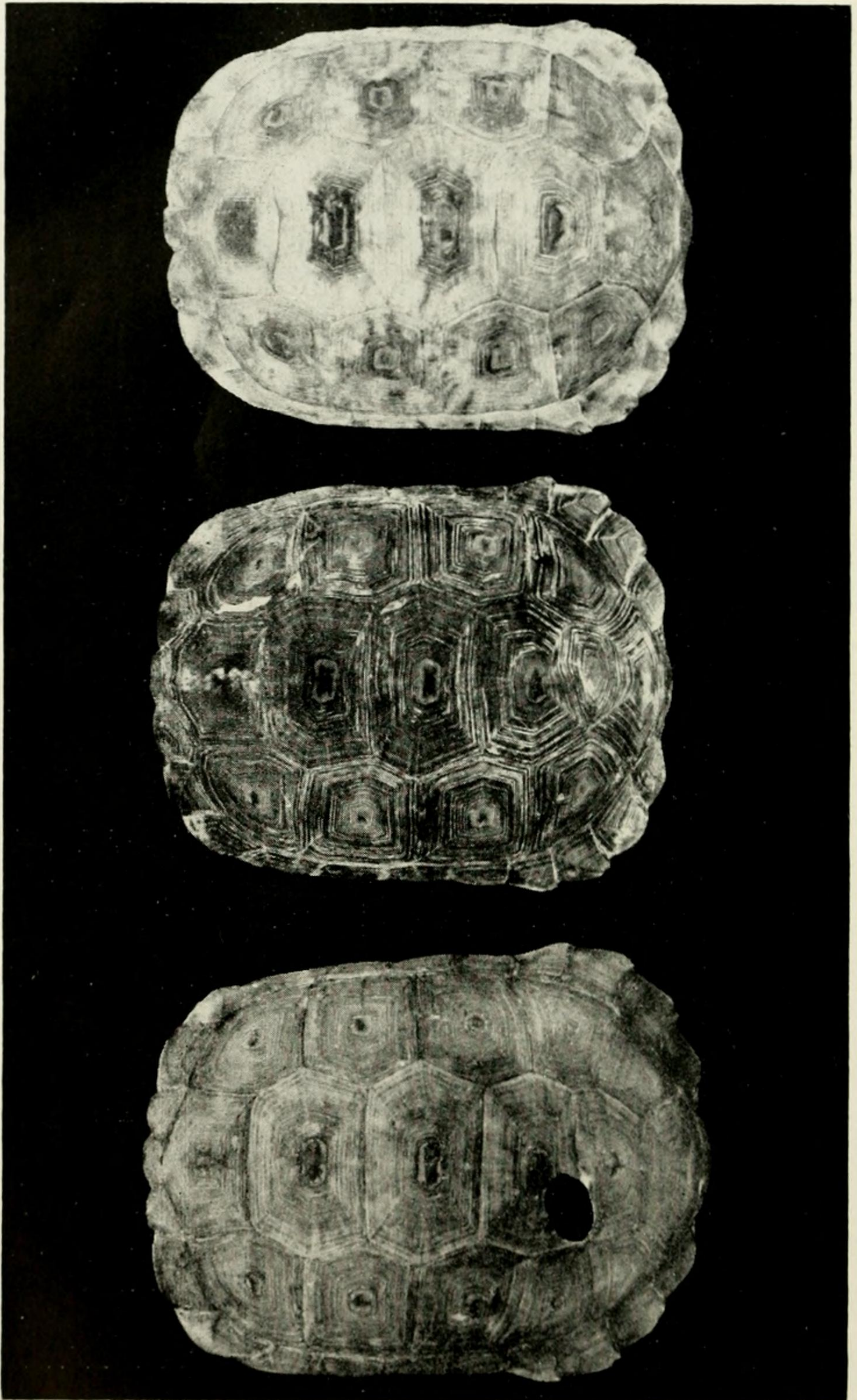


PLATE 8. *Gopherus flavomarginatus* new species: Dorsal views of paratypes (from top to bottom, IU 42953, IU 42954, and KU 39415), approximately $\frac{1}{5}$ natural size.

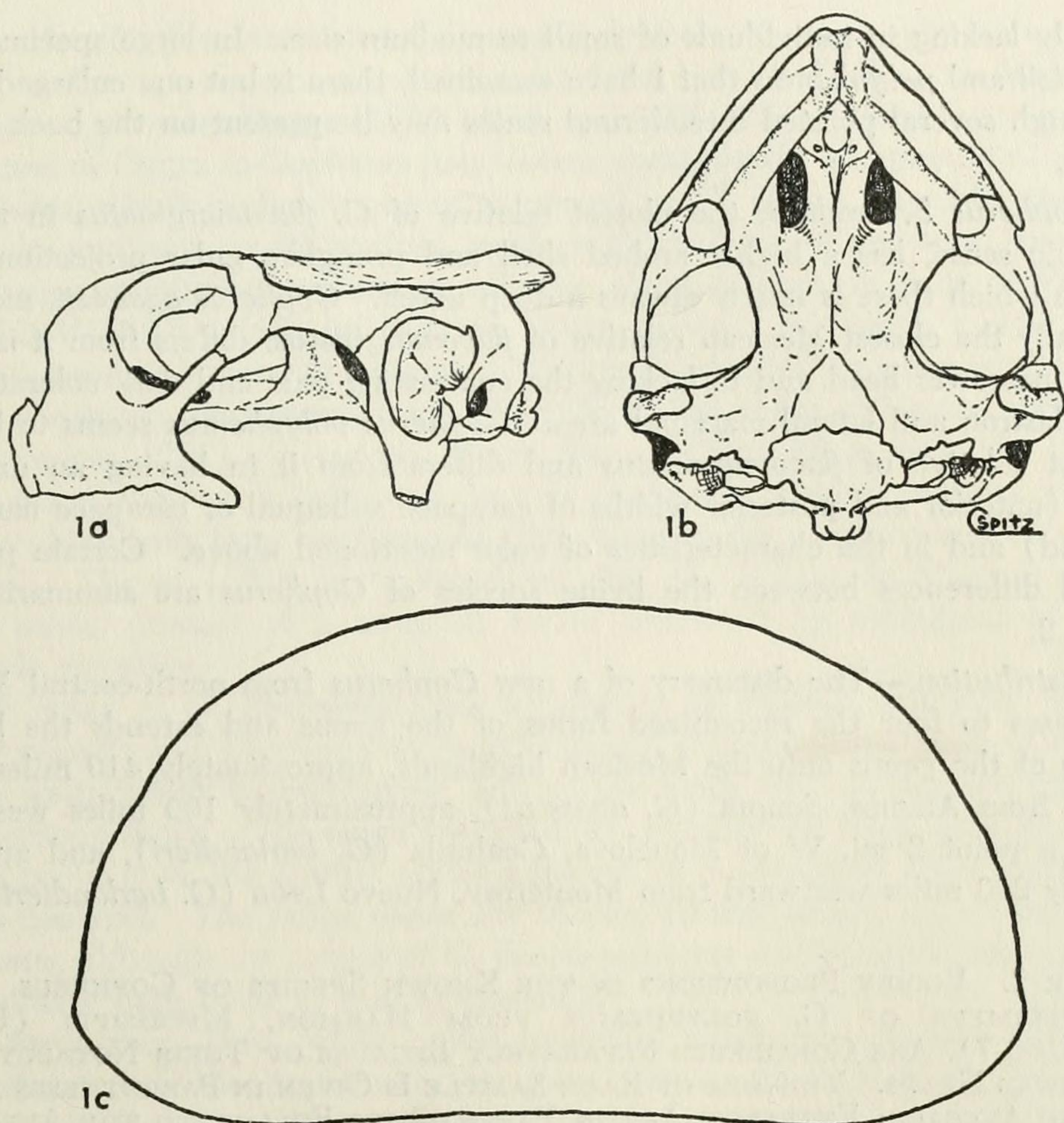


FIG. 1. *Gopherus flavomarginatus* new species: 1a and 1b—Lateral and ventral views of skull of holotype ($\times 1$); 1c—Cross section of paratype (USNM 60976) taken through middle of third central lamina ($\times \frac{2}{5}$).

Anomalies.—There is a high incidence of anomaly in the type series. Three of the specimens (USNM 60976, IU 42954, and KU 39415) have a supernumerary central lamina. All of the specimens from Durango are anomalous in regard to the marginal laminae. In the holotype the first marginals are small, approximately as wide as the small precentral. In the largest paratype (USNM 61254) the first and second marginals are fused to form a single large scute on each side. In the remaining Durangan paratype (USNM 60976) there are eleven normal marginals on each side but a supernumerary lamina occurs between the first and second marginal on the left and between the precentral and first marginal on the right side. The remaining three paratypes have the number of marginals that is normal for the genus.

Relationships.—*Gopherus flavomarginatus* differs from all other species of the genus by its larger size and by having an intergular seam that is longer than the interhumeral seam. The possession of a single, rectangular axillary scale, wider below than above, also tends to distinguish *flavomarginatus* from other living *Gopherus*; in the other species this scute (frequently paired in *berlandieri*) is generally triangular or at least pointed below. Femoral spurs are developed to varying degrees in the other species of *Gopherus*; they are

usually lacking in individuals of small to medium size. In large specimens of *agassizii* and *polyphemus* that I have examined, there is but one enlarged spur, although several pointed osteodermal scales may be present on the back of the thigh.

Gopherus berlandieri, the closest relative of *G. flavomarginatus* in a geographic sense, has a highly arched shell and pronglike gular projections, between which there is nearly always a deep notch. *Gopherus agassizii*, morphologically the closest Mexican relative of *flavomarginatus*, differs from it in having a narrower head and in lacking the contrasting pale and dark coloration of the plastron and lateral marginal area. *Gopherus polyphemus* seems to be the closest relative of *flavomarginatus* and differs from it in having an unflared shell (anterior and posterior widths of carapace subequal or carapace narrower behind) and in the characteristics of color mentioned above. Certain proportional differences between the living species of *Gopherus* are summarized in table 2.

Distribution.—The discovery of a new *Gopherus* from north-central Mexico increases to four the recognized forms of the genus and extends the known range of the genus onto the Mexican highlands, approximately 410 miles eastward from Alamos, Sonora (*G. agassizii*), approximately 100 miles westward from a point 2 mi. W of Monclova, Coahuila (*G. berlandieri*), and approximately 200 miles westward from Monterrey, Nuevo León (*G. berlandieri*).

TABLE 2. BODILY PROPORTIONS IN THE KNOWN SPECIES OF GOPHERUS. TWO SPECIMENS OF *G. POLYPHEMUS* FROM HARMON, MISSISSIPPI (USNM 53166-7), ARE CONSIDERED SEPARATELY BECAUSE OF THEIR NOTABLY NARROWER HEADS. THE SIZE OF EACH SAMPLE IS GIVEN IN PARENTHESES ABOVE THE AVERAGE; EXTREMES ARE IN PARENTHESES FOLLOWING THE AVERAGES.

SPECIES AND GENERAL LOCALITY	Greatest width of skull as a percentage of condy- lobasilar length	Height of shell as a percentage of width of carapace	Height of shell as a percentage of length of carapace	Diameter of hind foot as a percentage of width of head
<i>G. polyphemus</i> (Florida)	(6) .94 (.92-.97)	(13) .53 (.48-.58)	(13) .39 (.36-.42)	
<i>G. polyphemus</i> (Mississippi)	(2) .87 (.84-.89)	(2) .53 (.52-.54)	(2) .43 (.40-.45)	
<i>G. berlandieri</i> (Texas and NE Mexico)	(21) .78 (.70-.83)	(22) .56 (.48-.62)	(21) .46 (.43-.51)	
<i>G. agassizii</i> (U.S. and N. Sonora)	(6) .77 (.70-.83)	(8) .53 (.49-.58)	(8) .41 (.38-.44)	
<i>G. agassizii</i> (Alamos, Sonora)		(4) .56 (.52-.59)	(4) .39 (.37-.41)	(4) .92(.87-1.00)
<i>G. flavomarginatus</i> (North-central Mexico)	(2) .83 (.82-.83)	(3) .54 (.51-.58)	(3) .43 (.42-.44)	(3) .71 (.58-.78)

Thus far, *G. flavomarginatus* is known only from the three localities represented in the type series and from the indefinite locality, "Bolson de Mapimí", Chihuahua, given by Duges (1888:146-7, and 1896:479). These long-doubted references of Duges to *Gopherus polyphemus* seem clearly to represent *G. flavomarginatus*, which probably occurs in several or all of the internally drained basins in northeastern Chihuahua, western Coahuila, and northern Durango. This region is within the Basin and Range physiographic province of Fenneman (1931:326-8) and the Mapimí biotic province of Smith (1949:231). Duges (*supra cit.*) seems to have used "Bolson de Mapimí" in a restricted sense, as it is shown on some recent maps (Nat. Geog. Soc., Map of Mexico and Central America, 1953) (American Geog. Soc., Culican Map, NG 13, 1935). Other maps show this bolson to include internally drained portions of the Mexican highlands from northeastern Chihuahua to the region near Lerdo and Torreon. Thayer (1916:73) pointed out that the Bolson de Mapimí, in its larger sense, consists of a series of basins separated by mountains of considerable elevation.

The range of *G. flavomarginatus* appears to be limited ultimately by the higher elevations of the Sierra Madre Occidental and the Sierra Madre Oriental to the west and east, respectively, and to the south by the Mexican plateau. The northern limits of the range are less clear; possibly the range extends as far as the portions of the United States adjacent to northeastern Chihuahua, but this is doubtful. The range seems not to overlap that of any other species of *Gopherus*, although the ranges of *G. flavomarginatus* and *G. berlandieri* closely approximate each other in central Coahuila.

In September, 1958, when I was collecting turtles near Cuatro Ciénegas, Coahuila, I took the opportunity to query natives, as well as an American rancher, about the possible occurrence of tortoises in the area. Most persons had seen no tortoises in the area or said they had seen them only rarely. Several older men who had herded goats in the area all their lives said that tortoises (referred to as "Tortuga del Monte") were common on the other side of the Sierra de La Madera and Sierra de La Fragua ranges west of Cuatro Ciénegas. These men referred probably to *G. flavomarginatus*. Americanos lies approximately 75 miles west-northwest of Cuatro Ciénegas.

It is indeed remarkable that a population of large tortoises in northern Mexico has so long escaped the notice of naturalists. Also remarkable is the fact that the late Dr. Leonhard Stejneger, in view of his intense interest in North American chelonians and his familiarity with the genus *Gopherus*, did not remark on the specimens from Durango when he saw them; a thorough search of Stejneger's notes revealed no clue that he had ever studied the specimens. Perhaps his first reaction to the specimens, like mine when I first examined the two disassociated skulls, was to consider "Lerdo" a misspelling of "Laredo." However, a check of old correspondence and accession records at the National Museum confirmed, beyond doubt, the validity of the locality data for these specimens. Dr. Chaffee, the collector, frequently sent specimens of plants and animals to the Museum from Durango and Zacatecas; his home was in Lerdo.

Size.—The largest specimen of *Gopherus flavomarginatus* (USNM 61254) exceeds by more than 50 millimeters the length of the largest known specimens of *G. agassizii*, and slightly exceeds the length of the largest specimen

of *G. polyphemus* that I have examined (USNM 51357, length of carapace 360 millimeters, a specimen formerly kept at the National Zoological Park). *G. polyphemus* is the largest tortoise inhabiting the United States; the maximum length of 343 millimeters given for the species by Carr (1952:334) probably more closely approaches the true maximum in free-living populations. *G. agassizii* rarely attains a length greater than 300 millimeters (Woodbury and Hardy, 1948:152-5). The fact that representatives of the genus do not attain a larger size in the United States may be due to the decimation of natural populations by man for food and souvenirs.

There have been several indications that a large species of tortoise existed in north-central Mexico. The Chihuahuan specimens reported by Duges (248 and 202 millimeters long, respectively) rank in size with the smaller paratypes of *G. flavomarginatus*; Duges stated, however, that the species was said to attain a length of one meter but that he thought such large size surely to apply to another species.

Mr. Charles M. Bogert recently related to me two stories that are here worthy of note. One of them, which Bogert learned from the late Dr. Karl P. Schmidt, concerns a collector who was sent by the Chicago Natural History Museum (then Field Museum) to Coahuila in the early part of the century to obtain materials for a desert exhibit. When the exhibit had been completed several decades later, the collector, visiting the museum, inquired as to where the large tortoises were that he had collected in Coahuila. Dr. Schmidt could find no record of such tortoises and suggested that possibly they had been confused with Galapagos tortoises (*Geochelone*). Dr. Robert F. Inger is unable to locate the specimens or add anything to the story. The collector stated that the large tortoises had been found in only one bolson in Coahuila.

Mr. Bogert further related that, in 1946 when he was camped at Las Delicias, Coahuila, a Mexican mule herder told him of seeing a large tortoise "three bolsons north" of the bolson in which Las Delicias is located (the general area referred to would be near Americanos). The man awoke one morning to find his saddle missing; following tracks from the place where the saddle had been left, the man eventually found it on the back of a large tortoise. The tortoise had apparently sought shelter beneath the saddle and, finding it unsatisfactory, had walked away with the saddle on his back.

Either of the incidents related above, or the reference of Duges (*loc. cit.*) to large size, since they are based on second or third-hand accounts, would seem to be unrealistic and of little scientific value when considered alone and at face value. However, in the light of the discovery of *Gopherus flavomarginatus*, these accounts have new meaning and tend to support my proposal that the species is the largest tortoise in North America.

Remarks.—The paratypes at the University of Illinois were found in a trash-dump in Carrillo. According to what the collectors learned from local inhabitants, the species is used for food and the shells are sometimes used for poultry dishes or even for eating utensils. Although the species is found on the flat, sandy desert near Carrillo, it is more common on the nearby mountain slopes and is seen there most frequently after rains. Dickerman (field notes, 1954) likewise noted that the species was eaten near Americanos; the K. U. paratype represents the best (and only specimen saved) of several broken shells found in that area. Judging by the habits of other members of the genus and by the notes of Duges (1888:147), *G. flavomarginatus* is probably herbivorous.

Acknowledgments.—A portion of this study was completed in the summer of 1958, while I was an internee at the United States National Museum. I am grateful to Dr. Doris M. Cochran of that institution for helpful information regarding the origin of the type and for permission to study other specimens in her care. Thanks are due also to Messrs. Pete S. Chrapliwy and Kenneth L. Williams who collected two of the paratypes and who generously provided their notes on the specimens when learning of my study, to Dr. Hobart M. Smith and Mr. Charles M. Bogert for offering helpful suggestions and for the loan of specimens, and to Mr. Jebb Taylor for assistance with taking data. The drawings are the work of Mrs. Connie Spitz; the photographs are by the author.

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