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A NEW FOSSIL TURTLE, KINOSTERNON ARIZONENSE, FROM ARIZONA.

By CHARLES W. GILMORE,

Associate Curator, Division of Paleontology, United States National Museum.

INTRODUCTION.

In a collection of vertebrate fossils made by Dr. J. W. Gidley in the spring of 1921, near Benson, Cochise County, Arizona, were two well-preserved turtle specimens, the first extinct representative of the family Kinosternidae to be found in North America. It is also of interest that they are the male and female of a new species about to be described. Both specimens were found in the same deposit of fossils, within a few feet of one another, and associated with a considerable fauna consisting of mammal and bird remains.

Eight species of the genus *Kinosternon* are recognized in North America by Stejneger¹ and Barbour, of which only two, *Kinosternon sonoriense* LeConte and *K. flavescens* (Agassiz) are said to range into Arizona. It is the latter species to which the fossil form appears to be most nearly related.

I wish at this time to express my appreciation of the assistance given me by Dr. Leonhard Stejneger of the United States National Museum, especially in the comparison of the fossil with the extant species of Kinosternidae, a work that was made comparatively easy because of his intimate knowledge of the living species.

Family KINOSTERNIDAE.²

Nuchal plate produced into costiform processes, underlying the marginals. Plastral bones eight, the entoplastron being absent. Shell covered with epidermal shields. Caudal vertebrae procoelus. Neck completely retractile within the shell. Temporal region not roofed over; no parieto-squamosal arch. Digits moderately elongate; phalanges with condyles; claws four or five.

¹A check List of North American Amphibians and Reptiles, Harvard University Press, 1917, pp. 111-112.

²The definition of the family and genus is that given by Dr. G. A. Boulenger in his Catalogue of the Chelonians, Rhynchocephalians, and Crocodiles in the British Museum (new ed.), 1889, p. 33.

Genus *KINOSTERNON* Spix.

Carapace more or less depressed; marginal shields, one azygos nuchal and 11 pairs. Plastron articulating with the marginals by suture, front and hind lobe moveable; gular shield single or absent; pectoral shields not extending on the bridge. Postorbital and temporal arches moderate. Digits webbed; fingers all clawed, outer two clawless. Tail short.

KINOSTERNON ARIZONENSE, new species.

Plates 1 to 5.

Type.—Male. Cat. No. 10463, U.S.N.M.; consists of the nearly complete carapace and plastron, the latter lacking the anterior lobe; lower jaws, fragmentary vertebrae, limb bones, etc.

Paratype.—Female. Cat. No. 10462, U.S.N.M.; consists of the nearly complete carapace and plastron.

Type-locality.—Benson Locality Quarry, two miles south of Benson, Cochise County, Arizona.

Horizon.—Pliocene.

Collector.—J. W. Gidley, 1921.

When found the specimens were entirely disarticulated and broken into numerous pieces, and the assembling of these portions has resulted in some distortion and other imperfections in the carapace as may be observed in the illustrations (see pls. 1 and 3). Some small areas of both upper and lower shells were missing, although as a whole they are in a remarkably good state of preservation.

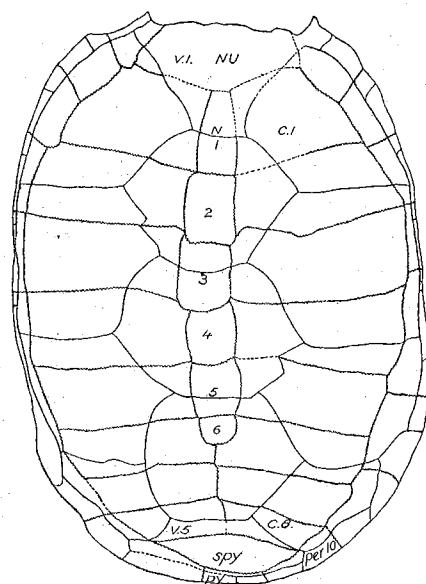


FIG. 1. CARAPACE OF *KINOSTERNON ARIZONENSE*. NO. 10463, U.S.N.M. TYPE, MALE. C. 1, C. 8, COSTAL BONES 1 AND 8; N, 1, 2, 3, 4, 5, 6, NEURAL BONES 1 TO 6; NU, NUCHAL BONE; PER 10, TENTH PERIPHERAL BONE; PY, PYGAL BONE; SPY, SUPRAPYGAL BONE; V1, V5, VERTEBRAL SCUTES 1 AND 5. ONE-HALF NATURAL SIZE.

The much larger size of the fossil forms at once distinguishes them from any living species, and I therefore propose the name *Kinosternon arizonense* for their reception.

A comparison of the two specimens show them to be very similar, in the extent and arrangement of the various bony elements, as well as the epidermal shields which covered the osseous parts in life. That the larger specimen is a male appears to be shown by the concavity of the posterior lobe, the swelling outward of the lateral borders of this lobe back of the inguinal notch, and the fact that it fills this

KINOSTERNON Spix.

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part of the carapace less completely than in the female, specimen No. 10462, U.S.N.M. (See pls. 2 and 4.) With the exception of the considerable difference in size of the two these are exactly the differences to be observed between the sexes of *K. flavescens*, as is shown by specimens Cat. Nos. 22671 and 19058, U.S.N.M.

While there are other characters, to be pointed out later, which indicate the affinities of *K. arizonense* to be nearest to *K. flavescens*, the sudden enlargement of the marginal scutes beginning with the ninth, see figs. 3 and 4, which arises well above the middle of the eighth peripheral, whereas the superior terminations of those anterior barely reach the middle and are usually below, are precisely the conditions found in *K. flavescens*, a character which Doctor Stejneger assures me is constant for that species, and one which serves to distinctly separate it from all other members of the genus.

In outline the carapace of *K. arizonense* is broadly oval, slightly excavated above the neck (see fig. 2), the hinder end evenly rounded with a slight median V-shaped notch. The length of the carapace of the paratype in a straight line is 148 millimeters. It is estimated that the carapace of the type which lacks some of the median anterior margin, would slightly exceed 170 millimeters in length. In width the type measures 118 millimeters; the paratype 108 millimeters; height at the center, type 73 millimeters, paratype 47.5 millimeters.

The surfaces of the shell are smooth, there being no indications of ridges or carinae, such as are found in some of the living species of the genus. The sulci are narrow and well impressed. The bone of both carapace and plastron is relatively thin. The free margins of the peripherals present a sharp edge, those posterior to the inguinal notch having a tendency to flare upward.

The paratype (pl. 3) shows the presence of a good sized nuchal slightly excavated for the neck on the free border, which measures 21 millimeters wide; the greatest width of this bone is 36 millimeters. It cannot be determined from the present specimens whether the nuchal was in contact with the first neural or whether these elements

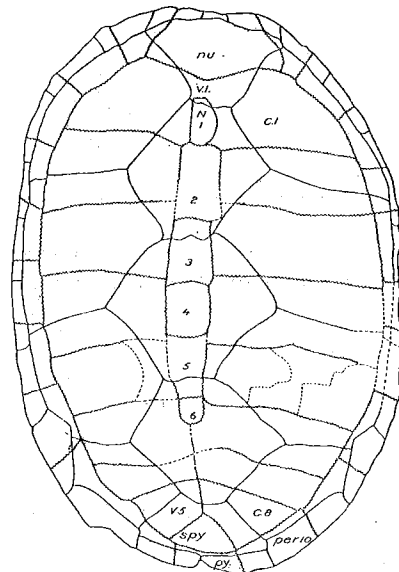


FIG. 2. CARAPACE OF KINOSTERNON ARIZONENSE. No. 10462, U.S.N.M. PARATYPE. FEMALE. C. 1, C. 8, COSTAL BONES 1 AND 8; N. 1, 2, 3, 4, 5, 6, NEURAL BONES 1 TO 6; NU, NUCHAL BONE; PER 10, TENTH PERIPHERAL BONE; PY, PYGAL BONE; SPY, SUPRAHYAL BONE; V1, V5, VERTEBRAL SCUTES 1 TO 5. ONE-HALF NATURAL SIZE.

were separated by the intervention of the first costals meeting on the median line as in *Kinosternon leucostomum* as figured by Boulenger.*

In the type there are six neurals, all except the sixth being present. That a reduced sixth neural existed is clearly indicated by the excavated ends of the sixth pair of costals which unite on the median line posterior to the sixth neural, as shown in Figure 1. All except the sixth are longer than wide.

Measurements of neurals in millimeters.

No.	Length.		Width.	
	Type.	Paratype.	Type.	Paratype.
1.....	17.5	12.5	9	5.5
2.....	17.5	.....	13	10
3.....	18	19	13	11
4.....	14.5	17	13	9.5
5.....	13.5	.....	12	.....
6.....	8	.....	9	.....

There are the usual eight costals of which the sixth, seventh, and eighth pairs meet on the median line. The single suprapygals in the

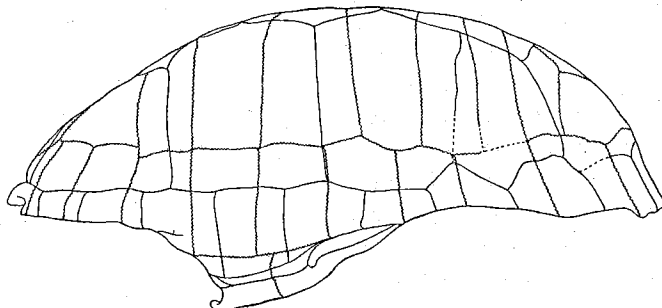


FIG. 3. CARAPACE OF *KINOSTERNON ARIZONENSE*. NO. 10463, U.S.N.M. TYPE. MALE. VIEWED FROM THE LEFT SIDE. ONE-HALF NATURAL SIZE.

type is large, having a greatest transverse diameter of 41 millimeters. The pygal is 26 millimeters wide and 18 millimeters long.

There are ten pairs of peripherals. The second in the type measures 22 millimeters from the free border to the union with the first costal plate; the fourth 20 millimeters; the seventh 24 millimeters; and the tenth 25.5 millimeters. The peripherals of the paratype, except for their smaller size, are identical in other respects. The fifth and sixth unite firmly by suture with the plastral bones as shown in Figure 7.

The paratype shows the nuchal scute to be very small. The vertebrals in both specimens are wider than long, being widely and acutely expanded at their centers.

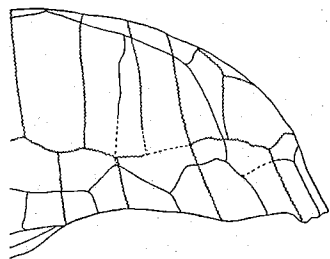
*Catalogue of the Chelonians, Rhynchocephalians, and Crocodiles in the British Museum, 1889, fig. 12, pp. 35.

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als in millimeters.

Length.		Width.	
Type.	Paratype.	Type.	Paratype.
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SIDE. ONE-HALF NATURAL SIZE.

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Measurements of vertebrals in millimeters.

No.	Length.		Width.	
	Type.	Paratype.	Type.	Paratype.
1.....	.....	35	46	37
2.....	35	35	43	37
3.....	32.5	35	50	44
4.....	37	31.5	46	38
5.....	39	26	50	36

There are eleven pairs of marginal scutes as in the living species. The costo-marginal sulci, on the peripherals of the anterior half of the carapace, cross them well below the middle of their height, rising slightly on the median ones, but when the eighth is reached an

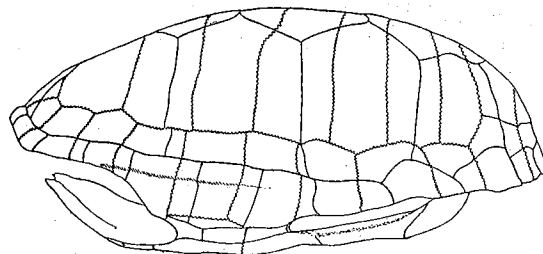


FIG. 4. CARAPACE OF KINOSTERNON ARIZONENSE. No. 10462,
U.S.N.M. PARATYPE. FEMALE. VIEWED FROM THE LEFT
SIDE. ONE-HALF NATURAL SIZE.

abrupt increase in size of the marginals takes place as shown in Figures 3 and 4, as in the living *K. flavescens*. The intermarginal sulci descend a little in front of the middle of the length of the peripherals.

In the type the front lobe of the plastron is missing, but in the paratype the plastron is almost perfectly preserved. The description to follow is based largely on that of the paratype. It is composed of eight bones the entoplastron being absent. The front lobes are hinged in both specimens, see Figures 5 and 6, the hinder ones being rigidly fixed. This species differs from *K. flavescens* in having a broadly V-shaped hinge line whereas in the living species it runs nearly straight across the plastron.

The greatest length of the plastron at the center is 117 millimeters, with a greatest transverse diameter of 92.5 millimeters. The anterior lobe is 41 millimeters long and 65 millimeters wide at the base. The width of this lobe grows gradually less for more than half its length, then rounds in rapidly toward the center which is slightly truncated. In *K. flavescens* this lobe narrows in more rapidly from the hinge forward, thus giving it a more pointed appearance.

The posterior lobe is 51 millimeters long and 57 millimeters wide at the base, whereas in the much larger type (male) specimen, the length of this lobe at the center is only 46.5 millimeters, and 53 millimeters wide at the base, but which expands posteriorly to 68 millimeters wide. It will thus be observed that the posterior lobe in the male is relatively much smaller than in the smaller female, compare Figures 5 and 6, a difference that prevails in the two sexes of the living *K. flavescens*. The posterior end is indented by a U-shaped notch, 7.5 millimeters deep and 10 millimeters wide in the

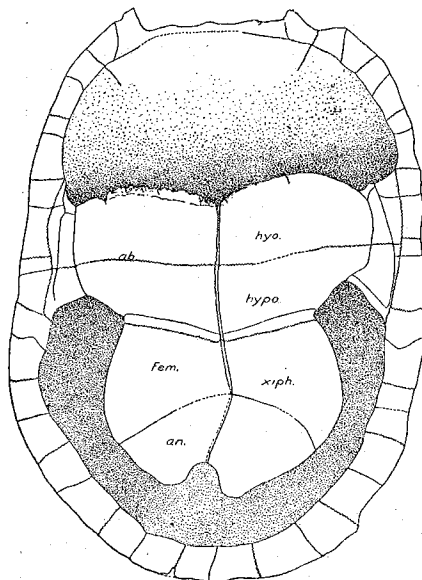


FIG. 5. PLASTRAL VIEW OF CARAPACE OF KINOSTERNON ARIZONENSE. No. 10463, U.S.N.M. TYPE. MALE. AB, ABDOMINAL SCUTE; AN, ANAL SCUTE; FEM, FEMORAL SCUTE; HYO, HYOPLASTRAL BONE; HYPO, HYPOPLASTRAL BONE; XIPH, XIPHIPLASTRAL BONE. ONE-HALF NATURAL SIZE.

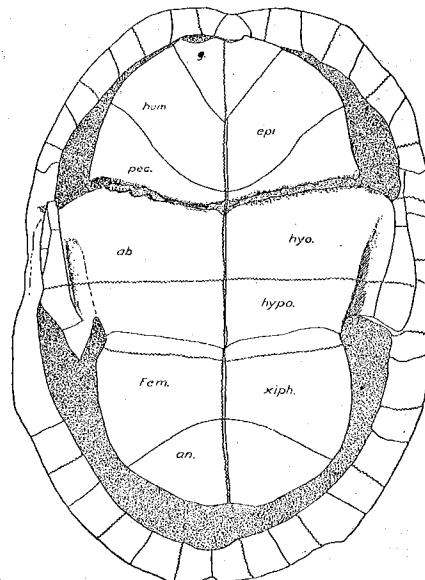


FIG. 6. PLASTRON OF KINOSTERNON ARIZONENSE. No. 10462, U.S.N.M. PARATYPE. FEMALE. AB, ABDOMINAL SCUTE; AN, ANAL SCUTE; EPI, EPIPLASTRAL BONE; HYO, HYOPLASTRAL BONE; HYPO, HYPOPLASTRAL BONE; XIPH, XIPHIPLASTRAL BONES. MORE THAN ONE-HALF NATURAL SIZE.

male but only slightly indented in the female. The posterior extremities of the plastron end about 27 millimeters anterior to the posterior margin of the carapace. In the paratype this distance is only 18 millimeters. The bridge in the type has a width of 25 millimeters, but in the smaller paratype it measures 29 millimeters fore and aft. The plastron at the center of the bridge in the type measures 99 millimeters in width; the paratype 92 millimeters.

The free borders of the plastron are acute on both front and hinder lobes, thickening slightly from the border inward, but nowhere does the plastron exceed 4 millimeters in thickness. The bevelled

sters long and 57 millimeters wide. In the larger type (male) specimen, the width is only 46.5 millimeters, and 53 millimeters high, which expands posteriorly to 68 millimeters. It is observed that the posterior lobe is smaller than in the smaller female, and that the anterior lobe prevails in the two sexes. The posterior end is indented by a deep notch and 10 millimeters wide in the

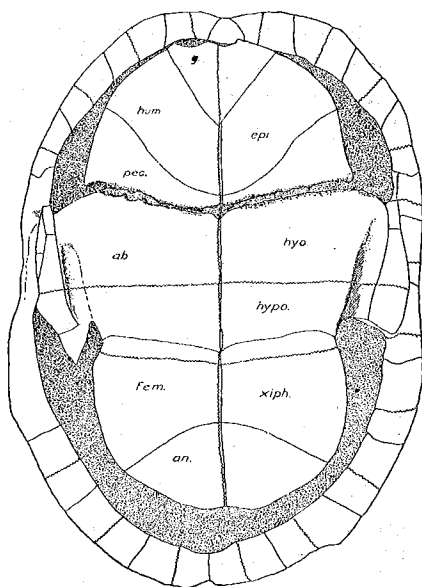


FIG. 6. PLASTRON OF KINOSTERNON ARIZONENSE. No. 10462, U.S.N.M. PARATYPE. FEMALE. AB, ABDOMINAL SCUTE; AN, ANAL SCUTE; EPI, EPIPLASTRAL BONE; HYO, HYOPLASTRAL BONE; HYPO, HYPOPLASTRAL BONE; XIPH, XIPHIPLASTRAL BONES. MORE THAN ONE-HALF NATURAL SIZE.

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In the paratype this distance is n the type has a width of 25 millimeters it measures 29 millimeters fore center of the bridge in the type the paratype 92 millimeters.

re acute on both front and hinder the border inward, but nowhere differs in thickness. The bevelled

superior lateral borders on both front and back lobes are comparatively narrow as is well shown in Figure 7 and Plate 5.

Measurements of plastral bones and dermal scutes in millimeters.

	Type No. 10463, male.	Paratype No. 10462, female.
Length of epiplastral bone.....	17	40
Length of hyoplastral bone on median line.....	22.5	15
Length of hypoplastral bone on median line.....	35	19
Length of xiphiplastral bone on median line.....		41
DERMAL SCUTES.		
Length of gular scute on median line.....		20
Length of humeral scute on median line.....		18
Length of pectoral scute on median line.....		2
Length of abdominal scute on median line.....	36	32
Length of femoral scute on median line.....	18	17.5
Length of anal scute on median line.....	20	26

The single triangular gular scute extends posteriorly one-half the length of the anterior lobe, (see pl. 4), but in four specimens of *K. flavescens*, now before me, this scute only extends posteriorly one-third the length of the anterior lobe, because of this the humerals in the living species are correspondingly long on the median line. The paratype agrees with the extant species in having the pectorals meeting narrow on the median line. Boulenger,⁴ however, in his definition of the species *flavescens* distinguishes it by having "pectoral suture nearly as long as that between humerals (in the adult)." Yet no specimens available to me in the National Museum collections show such a condition, all being short. *K. flavescens* also differs from the fossil species in having narrow femorals and pointed triangular anals. In *K. arizonense* these scutes at the center are of nearly equal length. On the bridge are two transversely narrow inframarginal scutes, the anterior one being very much smaller than the posterior. These scutes lie almost wholly on the plastral bones. (See figs. 5 and 6).

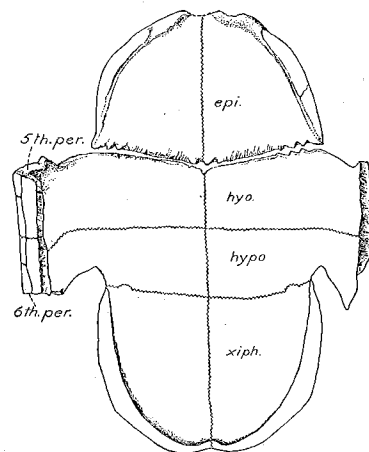


FIG. 7. PLASTRON OF KINOSTERNON ARIZONENSE. No. 10462, U.S.N.M. PARATYPE. FEMALE. SUPERIOR VIEW. EPI, EPIPLASTRAL BONE; HYO, HYOPLASTRAL BONE; HYPO, HYPOPLASTRAL BONE; 5TH PER, 6TH PER, PERIPHERAL BONES 5 AND 6; XIPH, XIPHIPLASTRAL. ONE-HALF NATURAL SIZE.

⁴Catalogue of the Chelonians, Rhynchocephalians, and Crocodiles in the British Museum, 1889, p. 40.

Kinosternon arizonense apparently has its closest affinities with *K. flavescens* which now ranges into this same part of Arizona. It may be distinguished at once from that species by its much larger size; the more rounded anterior extension of the anal scutes, as contrasted with their longer and more pointed triangular shape in *K. flavescens*, which bring about a reduction of the femorals on the median line. Other differences might be pointed out such as the reduced number of neurals, broader anterior lobe, etc., but Doctor Stejneger, who has made an exhaustive study of the Kinosternidae, tells me that many of these features are so inconstant they cannot be relied upon for specific differentiation.

EXPLANATION OF PLATES.

PLATE 1.

Carapace of *Kinosternon arizonense*. Cat. No. 10463, U.S.N.M. Type. Male. Superior view. About $\frac{3}{4}$ natural size.

PLATE 2.

Plastron of *Kinosternon arizonense*. No. 10463, U.S.N.M. Type. Male. Ventral view. About $\frac{3}{4}$ natural size.

PLATE 3.

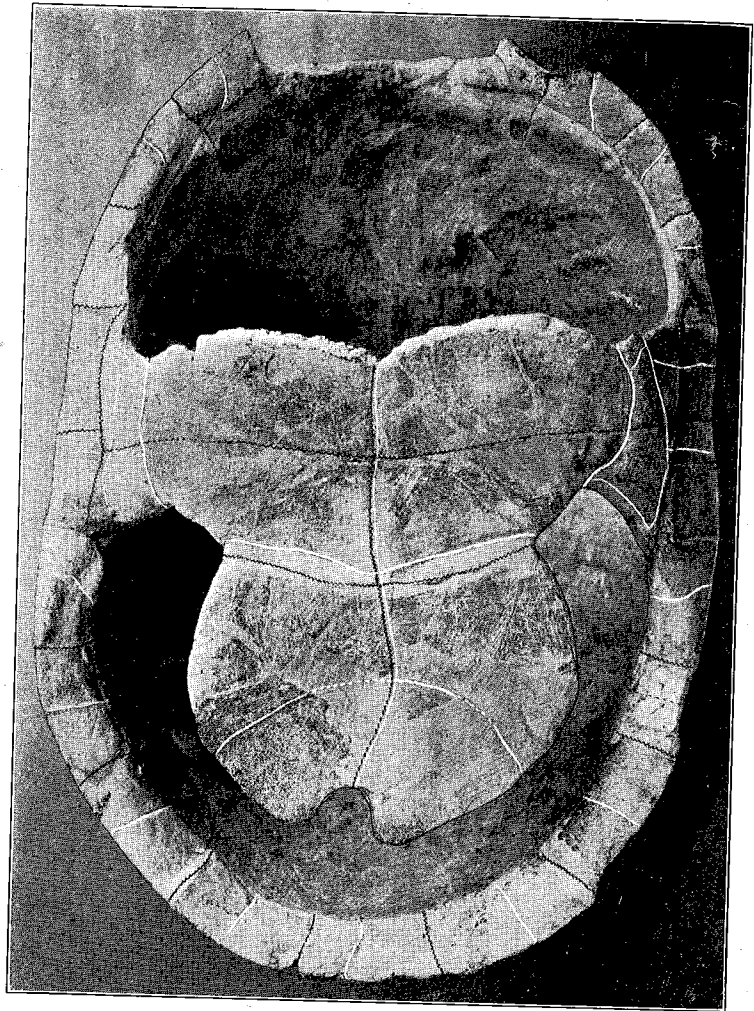
Carapace of *Kinosternon arizonense*. No. 10462, U.S.N.M. Paratype. Female. Superior view. About natural size.

PLATE 4.

Plastron of *Kinosternon arizonense*. No. 10462, U.S.N.M. Paratype. Female. Ventral view. Natural size.

PLATE 5.

Plastron of *Kinosternon arizonense*. No. 10462, U.S.N.M. Paratype. Superior view. Natural size.

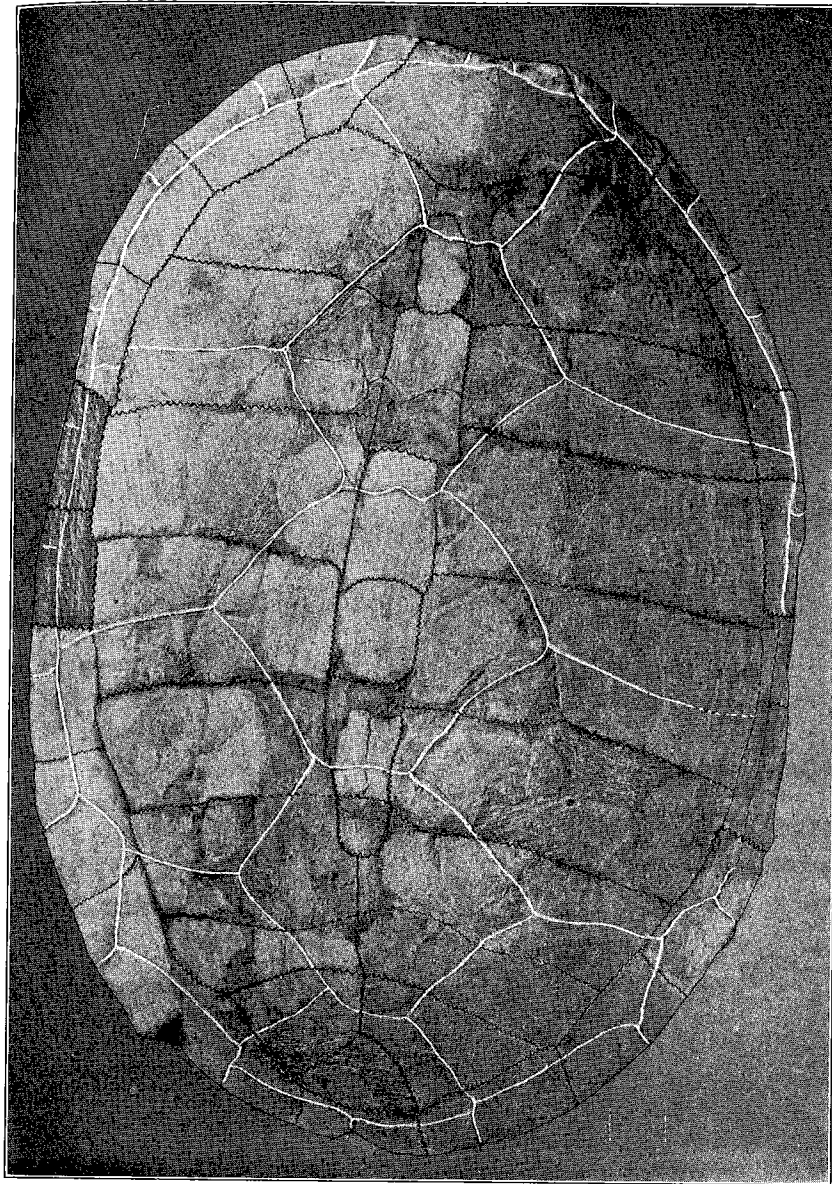


PLASTRON OF KINOSTERNON ARIZONENSE.

FOR EXPLANATION OF PLATE SEE PAGE 8.

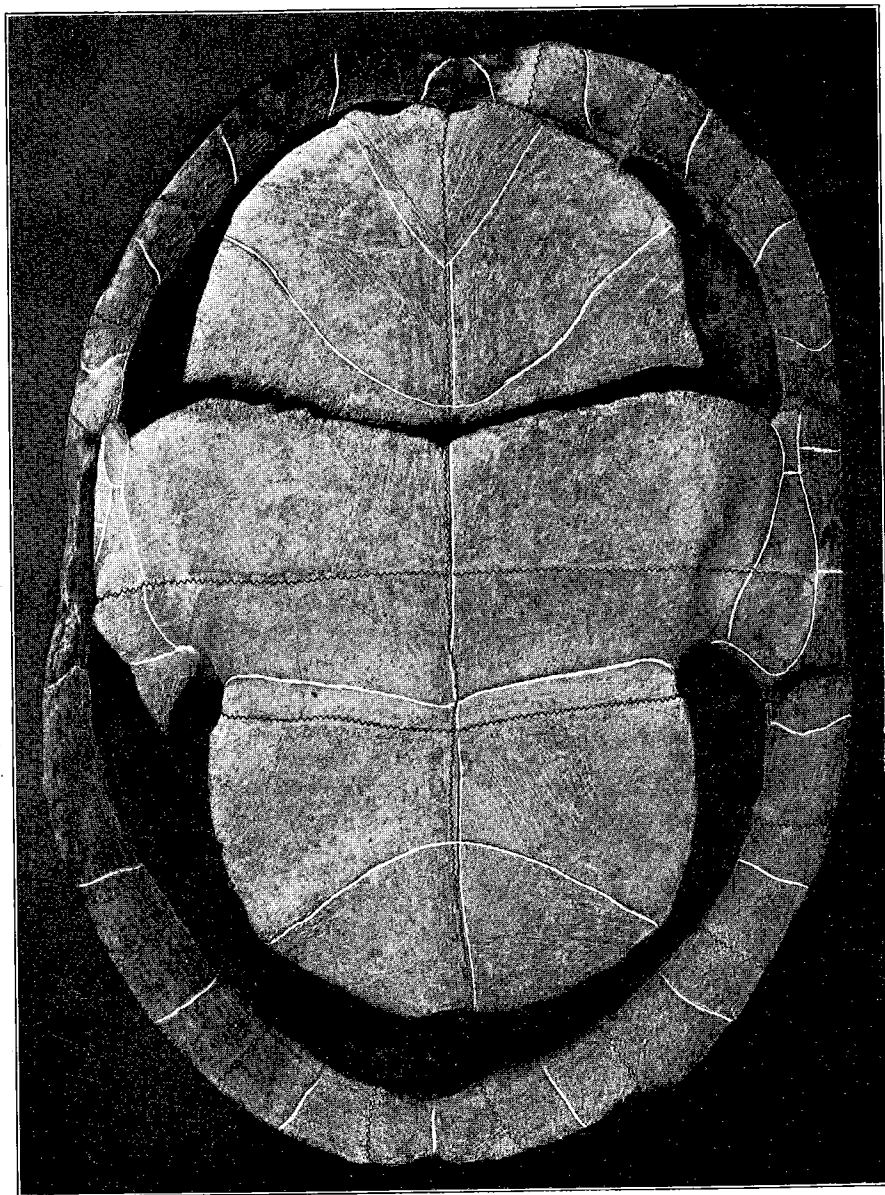


TERNON ARIZONENSE.
PLATE SEE PAGE 8.



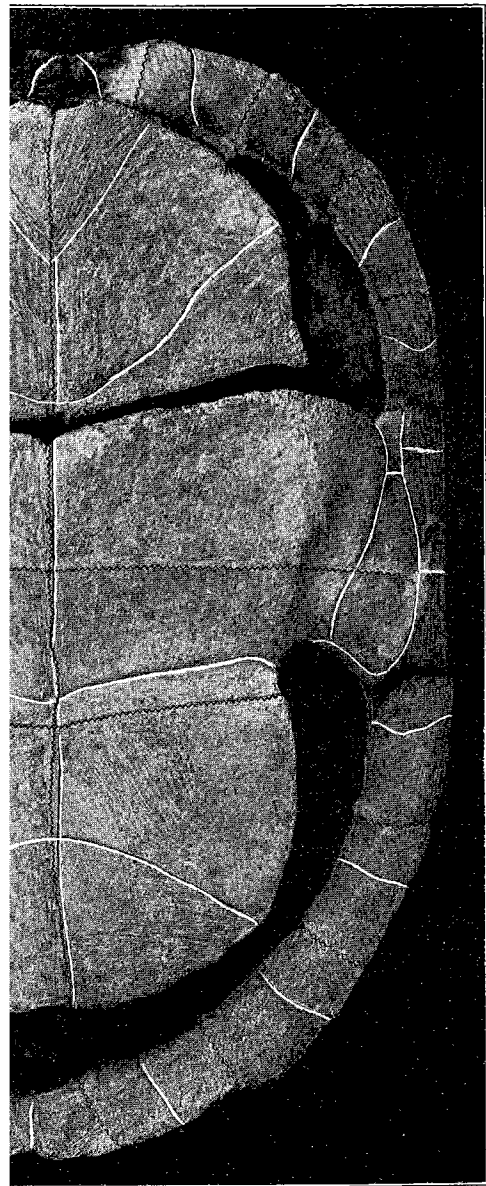
CARAPACE OF KINOSTERNON ARIZONENSE.

FOR EXPLANATION OF PLATE SEE PAGE 8.



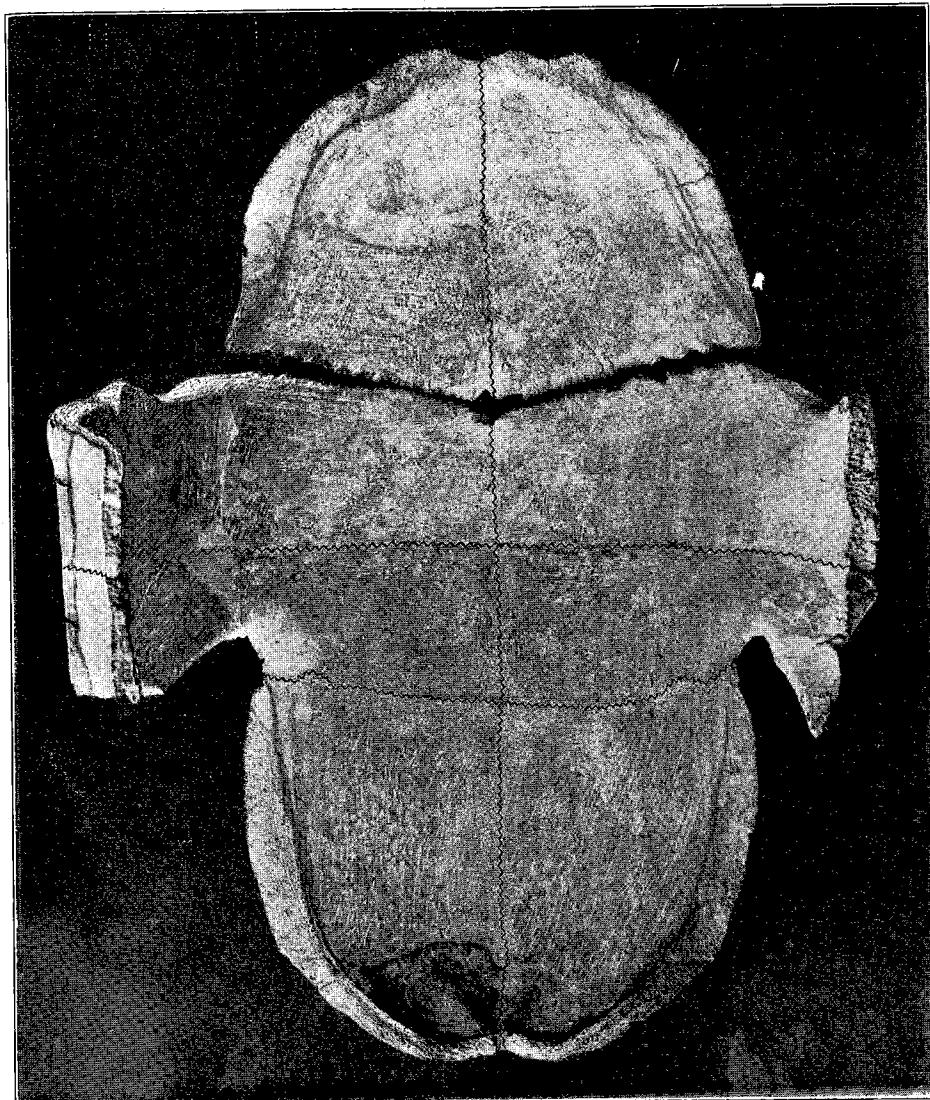
PLASTRON OF KINOSTERNON ARIZONENSE.

FOR EXPLANATION OF PLATE SEE PAGE 8



KINOSTERNON ARIZONENSE.

FIGURE OF PLATE SEE PAGE 8



PLASTRON OF KINOSTERNON ARIZONENSE.

FOR EXPLANATION OF PLATE SEE PAGE 8.