DESCRIPTIONS OF FIVE SPECIES OF NORTH AMERICAN FOSSIL TURTLES, FOUR OF WHICH ARE NEW.

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Through the liberality of the authorities of the United States National Museum the writer has been permitted to study and describe a number of specimens of fossil North American turtles. The results of his investigations are here presented.

GLYPTOPS PLICATULUS (Cope).

In the collection of the U. S. National Museum are various specimens of this species, most of them fragmentary. One of these is of special interest, inasmuch as it displays distinctly the sulci bounding the areas of the dermal scutes of the carapace. This specimen is Cat. No. 5458, and it was collected by a member of one of Prof. O. C. Marsh's parties at Como, Wyoming, in 1884. Only about the hinder half of the carapace and a fragment of one mesoplastron are preserved. The parts of the carapace are shown in fig. 1. The neurals begin with the third. On the right side the peripherals begin with the seventh; on the left, with the eighth.

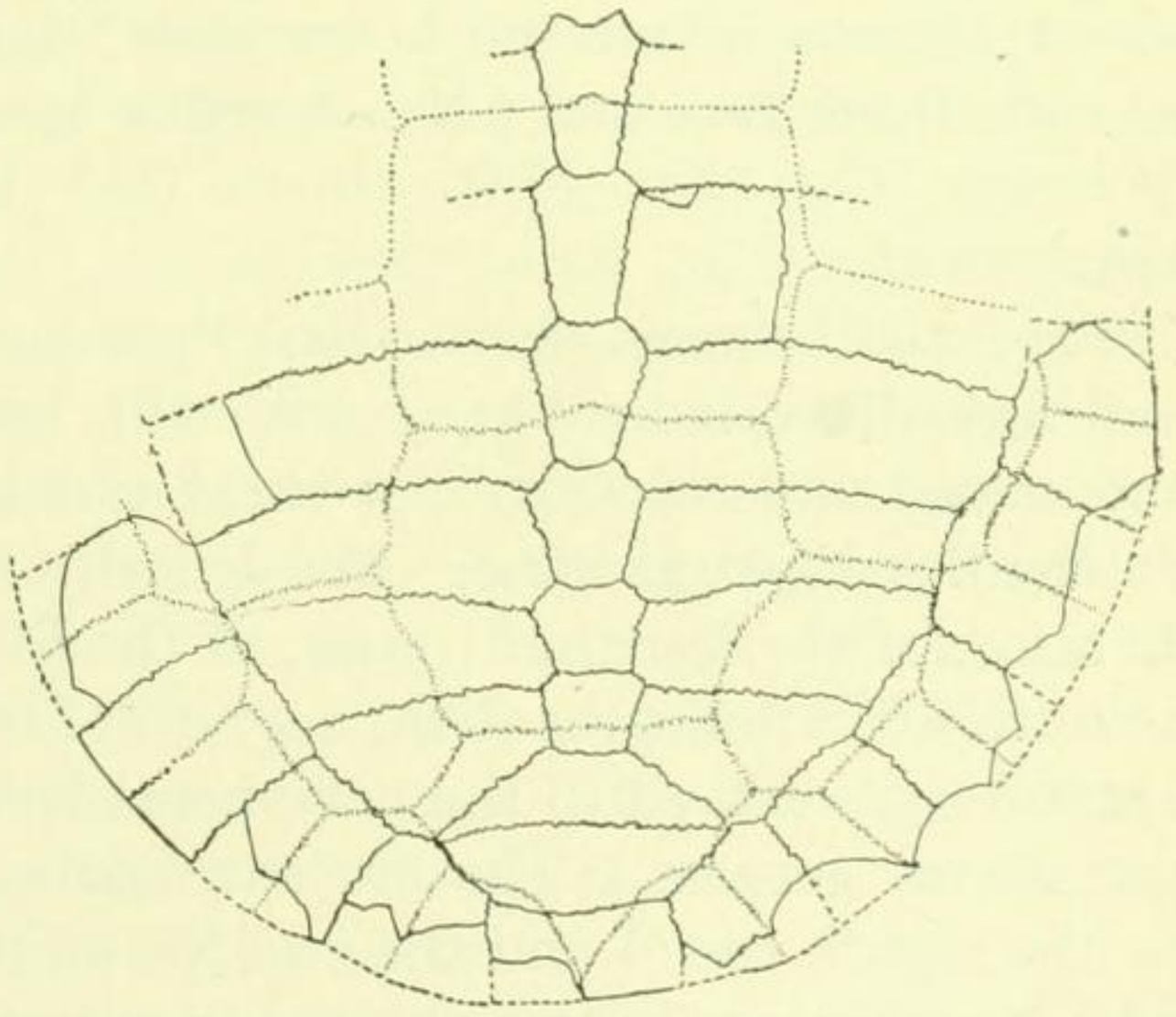


Fig. 1.—Posterior portion of carapace of Glyptops plicatulus.

The peripherals of the hinder border curve slightly upward toward the subacute free border. Those of the bridge region have the free border uprolled somewhat, thus presenting a sort of gutter

over the bridge. The dimensions of the peripherals are given in the table. The pygal is 33 mm. from side to side and only 16 mm. fore and aft. The neural bones have the usual forms and proportions.

This specimen shows distinctly that there were two large suprapygals, instead of one, as hitherto supposed by the writer. Plate VI and fig. 17 of the writer's forthcoming Fossil Turtles of North America show what was supposed to be a single suprapygal. The figure on the plate referred to is, however, crossed by a white line, which perhaps represents a suture, but which was taken to be a fracture. The figure here presented shows the forms of the two bones. The anterior measures 15 mm. on the midline; the posterior, 19 mm. The greatest width of each is 50 mm. Baur [a] stated that there were two suprapygals, but he did not describe them. From a figure prepared for Baur and awaiting publication by the writer [b] it was supposed that Baur had regarded the small bone succeeding the eighth neural as a suprapygal. Marsh represents only a single suprapygal in the specimen figured by him.[c]

Dimensions of peripherals.

Peripheral.	Length.	Height.
mm.	*mm.*	*mm.*
7	30	26
8	30	33
9	23	26
10	25	25
11	27	24

On the inferior surface of the carapace here described are seen the well-developed heads of the ribs. The buttress of the hypoplastron was strongly developed and fitted into an excavation in the contiguous borders of the fifth and sixth costal bones. The buttress rose about 18 mm. above the lower ends of these costals and was about 15 mm. thick fore and aft. Another specimen in the U. S. National Museum, Cat. No. 5733, shows that there were similar axillary buttresses.[d]

The sulci between the various dermal scutes are extremely narrow and threadlike, but all are traced with little difficulty. That between the second and the third vertebral scutes crosses, as usual in turtles, on the third neural bone. The length of the third vertebral scute is 52 mm.; of the fourth, 61 mm.; of the fifth, 46 mm. The fourth has a width of 72 mm.; the fifth, a width of 60 mm. The marginal scutes are mostly confined to the peripheral bones, rising to near the costoperipheral sutures. The eleventh pair, however, overlaps slightly on the eighth costal and the twelfth on the hinder suprapygal. The fifth vertebral extends backward to within 7 mm. of the hinder border of the bygal.

It is estimated that the carapace of this individual had a length of 255 mm.

[a] Proc. Acad. Nat. Sci. Phila., 1891, p. 411.
[b] Fossil Turtles of North America, p. 48, fig. 18.
[c] Amer. Jour. Sci., XL, 1890, pl. VII.
[d] Fossil Turtles of North America, pl. v, fig. 5.

HOPLOCHELYS CÆLATA, new species.

Plate XXVII, figs. 1–3.

The present species is based on rather meager remains, but it is believed that they indicate clearly the position of the animal and will enable one to identify other individuals furnishing the same parts. The materials consist of a peripheral, thought to be the seventh of the left side and the two succeeding ones; the eighth, ninth, and tenth of the right side; and some small fragments of costal bones. These have the Cat. No. 5958 in the U. S. National Museum. These remains were found by Mr. A. C. Silberling, in 1908, on section 35, township 6 north, range 15 east, being north of Big Timber, Sweet Grass County, Montana. The beds are regarded as belonging to the Fort Union epoch. The writer is informed by Mr. J. W. Gidley that the mammalian remains indicate equivalence with the Torrejon of New Mexico.

A comparison of these bones with corresponding parts of *Kinosternon integrum* makes it probable that the carapace of the new species had a length of about 114 mm. Fig. 1, Plate XXVII, gives a view of the outer surface of the peripherals of the right side; while fig. 2 shows the inner surface of those of the left side. It is seen at once from fig. 2 that the plastron articulated with the carapace principally by means of finger-like processes sent into the bridge peripherals. It seems quite certain that the upper borders of the peripherals were joined to the costals by jagged sutures. Likewise, the ends of the costal ribs entered deeply into the peripherals, as shown by the lower vertebra of fig. 2.

The peripherals are almost plane on their outer surfaces; on their inner they are convex from the free border to two-thirds their height, the upper third being concave. The free edge is acute. Probably a sharp carina crossed fore and aft the peripherals of the bridge. The peripherals present have the following lengths along the free border: The seventh, 13 mm.; the eighth, 14 mm.; the ninth, 16 mm.; the tenth, 16 mm. The seventh is 8.5 mm. thick at the front end; the greatest thickness of the ninth and tenth is a little less than 5 mm. On the inner surface of the peripherals behind the seventh the horny scutes rose about half the height of the bones.

The sulci that separated the various scutes are deeply and sharply impressed. Those descending between the marginals are nearer the front of their respective peripherals. What is regarded as the ninth marginal is strongly angulated above, as is also the eleventh.

A fragment of costal bone (Plate XXVII, fig. 3) has a maximum width of 10 mm. and a thickness of hardly 2 mm. It is probably a part of the seventh.

The sculpture of this turtle will distinguish it from any related Lower Eocene species yet known. The fragment of costal is crossed

diagonally by one prominent, narrow, and sharp ridge and by a number of less conspicuous ridges. As a result, the surface has a very uneven appearance. The peripherals also are, or have been, similarly sculptured. As shown by the tenth and eleventh (Plate XXVII, fig. 1), the area in front of the descending sulcus is ornamented by ridges nearly parallel with the sulcus, while the area behind it has grooves and ridges running downward and backward. A somewhat similar sculpture is observed on a specimen of *Pseudemys rubriventris*.

This species appears to be most closely related to *H. crassa* (Cope), fully described and figured in the writer's forthcoming monograph.[a] This species was described by Cope from the Lower Eocene of New Mexico, but whether from the Puerco or the Torrejon is uncertain. From this *H. cælata* differs in having the bones strongly sculptured; also apparently in having the peripherals more closely sutured to the costals and less concave outwardly.

ECHMATEMYS RIVALIS, new species.

The turtle which forms the subject of this description is represented by a damaged shell which was found by Mr. E. E. Smith, of the U. S. Geological Survey, in 1907, on the line between sections 19 and 20, township 23 north, range 93 west, in what is known as the North Rawlins coal field, in the eastern part of Sweetwater County, Wyoming. I am informed by Dr. T. W. Stanton that the beds in this region belong to the Wasatch, or are at most not older than the Wasatch. This conclusion is confirmed by this turtle. This specimen, now in the U. S. National Museum, is Cat. No. 5781. The parts of the shell preserved are shown by the figures.

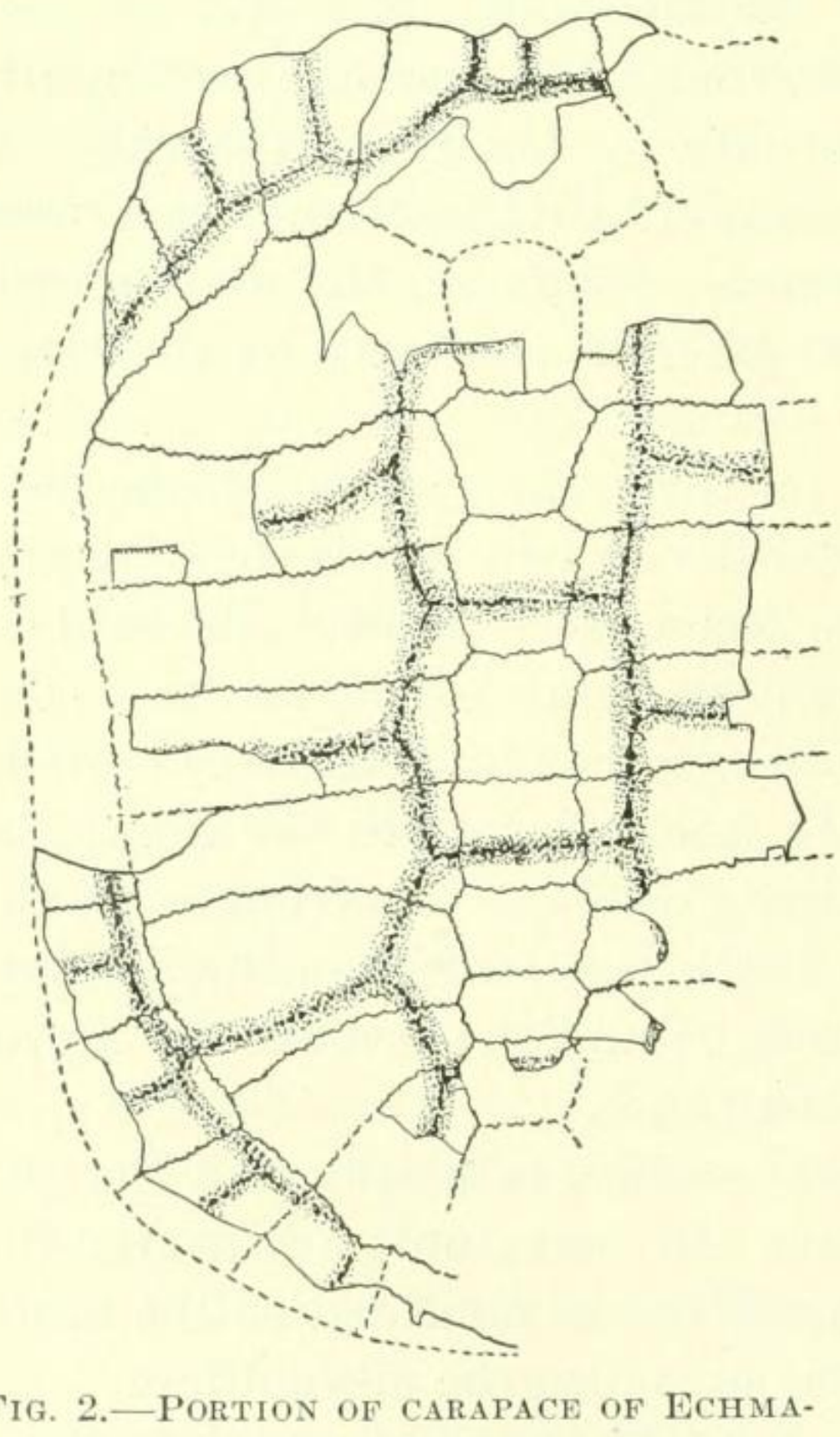


FIG. 2.—PORTION OF CARAPACE OF ECHMATEMYS RIVALIS.

The total length of the carapace (fig. 2), in a straight line, was originally close to 260 mm.; the breadth close to 190 mm. The nuchal bone has its hinder parts wanting. The free border has a width of 40 mm. It is conspicuously notched on each side of the nuchal scute. The first, second,

[a] Fossil Turtles of North America, p. 263, pl. XXXVIII, figs. 4–9, text-fig. 325.

third, and eighth peripherals and large parts of those succeeding are present. The free borders of the first and the second measure each 33 mm.; the height of the first is 32 mm.; that of the second, 25 mm., each measured at its hinder border. The width of the eighth is 25 mm.; its free border is wanting, as well as that of the peripherals behind it. Most of the first neural is gone; its hinder end was placed 75 mm. behind the front of the shell. The following table gives the dimensions of those neurals present:

Neural.	Median length.	Greatest width.
mm.	*mm.*	*mm.*
2	24	30
3	26	26
4	23	24
5	20	23
6	16	26
7	13	24

The eighth appears to have been 18 mm. long and 22 mm. wide. No part of the suprapygals remains.

The vertebral scutes are of moderate width, being longer than wide. The following table presents their dimensions:

Scute.	Length.	Width at hinder end.	Greatest width.
mm.	*mm.*	*mm.*	*mm.*
1	51	40	45
2	47	35	44
3	47	38	48
4	41	38	..
5	..	..	..

The nuchal scute is 15 mm. long and 11 mm. wide. The marginals do not rise as high as the peripherals that bear them, the second and the third lacking about 12 mm. of doing so. All the sulci of the carapace run along at the bottom of broad grooves varying from 8 to 10 mm. in width.

The plastron (fig. 3) had a length of 230 mm. The front of the epiplastral lip is damaged and the hinder angles of the xiphiplastra are missing, though they have left their impress in the sandstone matrix. The anterior lobe has a length of 60 mm. and a width of 107 mm. From the axilla the border of the lobe passes by a regular curve to the base of the epiplastral lip. The latter has a width of 37 mm., and it projected beyond the ends of the gular sulci at least 11 mm. The upper surface of this lobe is hidden. The entoplastron is 27 mm. long and 42 mm. wide, the greatest breadth being at the middle of the length. The hinder border is broad and rounded.

The bridge is 78 mm. wide, and of this the hyoplastron occupies 48 mm.

The hinder lobe had a length close to 92 mm.; the width at the base and at the ends of the hypo-xiphiplastral sutures is 105 mm. Halfway between the two points named the width is 108 mm. From the hypo-xiphiplastral sutures the width contracts rapidly to the ends of the femoro-anal sulci, where there are deep notches. Here the width is only 70 mm., perhaps less, inasmuch as the bones of the two sides appear here to be spread apart. The hinder angles of the xiphiplastra seem to have been acute.

All the sulci of the plastron, as of the carapace, occupy broad grooves. The gulars were 37 mm. wide in front and they overlap slightly the entoplastron. The humero-pectoral sulcus crossed the plastron just behind the entoplastron. The humerals occupy 28 mm. of the midline; the pectorals, 25 mm.; the abdominals, 61 mm.; the femorals, 40 mm. The length of the anals can not be satisfactorily determined.

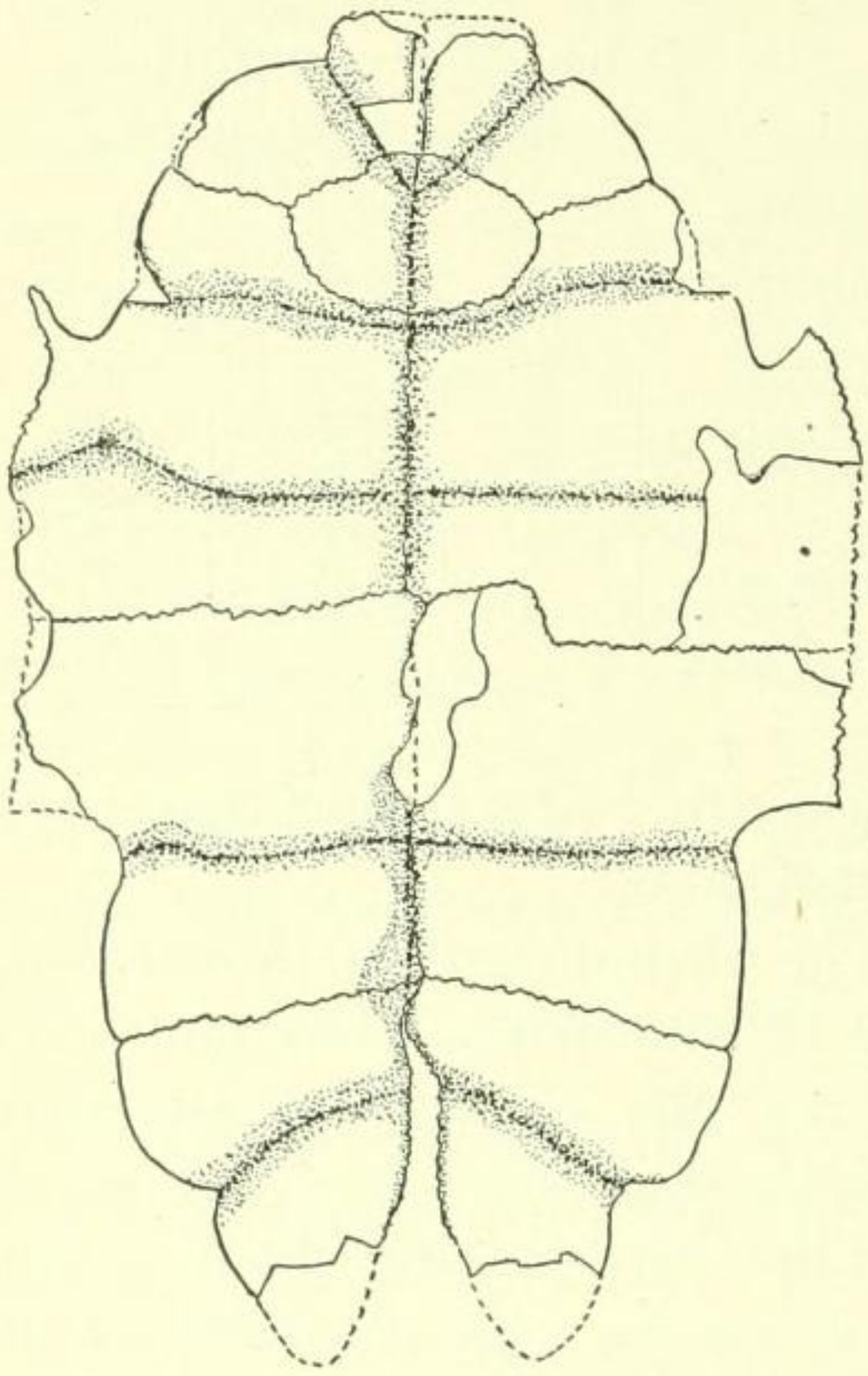


FIG. 3.—PLASTRON OF ECHMATEMYS RIVALIS.

This species resembled most of all Cope's *Emys lativertebralis*, described from the Wasatch of New Mexico.[a] The latter species had, however, both the neurals and the vertebral scutes relatively wider. The carapace and the plastron were not channeled along the course of the sulci. The epiplastral lip did not project so abruptly from the anterior lobe of the plastron and the hinder lobe was not conspicuously notched at the sides. The entoplastra of the two species differ in form.

TERRAPENE LONGINSULÆ, new species

Plate XXVI, figs. 1–3.

This species has as its type and only known specimen a nearly complete shell, the skull complete, the neck, the right and left scapulæ and coracoids, and both humeri. This specimen was collected in 1884 by Mr. J. B. Hatcher at Long Island, Phillips County, Kansas. The deposits are regarded as belonging to the Upper Miocene or Lower Pliocene. Mr. J. W. Gidley, of the U. S. National Museum, informs me that these beds have afforded remains of the short-legged rhinoceros, *Teleoceras fossiger*. The new species is accompanied by portions, including the characteristic epiplastral beak, of the turtle *Testudo orthopygia*, which occurs so abundantly in Decatur County. The white siliceous sand that adheres to the bones of the *Testudo* is identical with that filling the shell of the *Terrapene*.

The specimen is Cat. No. 5983 in the U. S. National Museum.

This species had a broad and rather depressed carapace. Its length (Plate XXVI, fig. 1) in a direct line is 133 mm.; the width at the hinder

[a] Wheeler's Surv. W. 100th Merid., IV, 1877, p. 53, pl. XXVII, figs. 1, 2; pl. XXVIII, figs. 1, 2.

ends of the fifth peripherals measures 110 mm., but was originally possibly not more than 100 mm.; the width at the front ends of the eighth peripherals, 100 mm. The height above the lower surface of the plastron is not more than 55 mm. The region occupied by the vertebral scutes is flat, with perhaps a mere suggestion of a depression near the borders of the scutes mentioned. The second and third peripherals are flared rather strongly upward. Those of the eighth and succeeding pairs are flared only slightly upward.

The nuchal bone originally measured about 28 mm. fore and aft. The extreme width is 41 mm., the width in front is 17 mm. The following table presents the dimensions of the neurals:

Neural.	Length.	Width.
mm.	*mm.*	*mm.*
1	12	10
2	11	14
3	12	14
4	11	14
5	11	16
6	11	15
7	13	13

As one of the anomalies of this carapace, we find a small bone that appears to be cut out of the area of the first costal. It borders the nuchal. The costals of the seventh pair meet on the midline. A process of the one of the left side turns backward to the suprapygal, thus preventing the lift eighth from meeting its fellow. The suprapygal is 17 mm. high and 25 mm. from side to side. The pygal is 11 mm. high and 13 mm. wide at the upper border.

The scutes of the carapace are extremely irregular and anomalous. On the left, the intercostal sulci, instead of descending on the second, fourth, sixth, and eighth costal plates, descend on the first, third, fifth, and seventh. Those of the right side are normally placed. As a result of this disturbance, the second, third, and fourth vertebral scutes are directed diagonally from the right to the left and forward. They are then each divided by a sulcus running diagonally to the left and backward. The first and the fifth are unsymmetrical.

Of the plastron (Plate XXVI, fig. 2) there is missing the right epiplastron and a little of the left. The total length was close to 134 mm. Of this, the anterior lobe occupied about 50 mm. The width at the transverse hinge is 83 mm. The entoplastron is 31 mm. long, with equal width. The width of the hinder lobe, at the lateral hinge-lines, is 91 mm.; at the hypo-xiphiplastral suture, 84 mm. The rear is nearly truncate in outline. The lateral hinge-lines are about 25 mm. long.

The gulo-humeral sulci extend well backward on the entoplastron. The humero-pectoral sulcus crosses the entoplastron a little behind the middle of its length. The pectoral and the abdominal scutes each measures 22 mm. on the midline; the abdominals, 21 mm.; the anals, 42 mm.

The skull (Plate XXVI, fig. 3) resembles in general that of *T. carolina* and *T. ornata*. The quadrato-jugal bones were wholly unde-

veloped. The length from the snout to the occipital condyle is 33 mm. The width at the articulation of the lower jaw is 23 mm.; at the base of the postorbital arch, 22 mm. The width of the interorbital space, at the fronto-prefrontal suture, is 9.5 mm. The orbit has a diameter of 10 mm., while the distance of the postorbital arch from the rim of the auditory chamber is only 6.5 mm. The opening of the auditory chamber is 5 mm. The distance from the tip of the lower jaw to a line joining the hinder ends of the rami is 20 mm.; from this line to the hinder end of the symphysis, 18 mm.

This species appears to be most closely related to *T. ornata*, a species now occupying Kansas and the regions to the southwest. It differs, however, in having the carapace narrower, or, at most, not wider, across the eighth peripherals than near the transverse hinge-line. Indeed, it seems to differ from all the living species in the same respect. In most specimens of *T. ornata* there is a low ridge along the midline and on each side of it a depression, features missing in *T. longinsulæ*. The rami of the lower jaw of the fossil species are nearly parallel as far forward as the coronoid process, whereas, in *T. ornata* and *T. carolina* they converge very perceptibly. The total absence of a median carina distinguishes the fossil from *T. carolina*.

ASPIDERETES GRANIFER, new species.

Plate XXVII, figs. 4, 5.

In the U. S. National Museum there is one nearly complete costal bone and some fragments of other costals of a trionychid turtle which appears to be hitherto undescribed. This material was collected by the late John B. Hatcher, July 10, 1887, at Cow Island, Montana. The deposits here belong to the Judith River Cretaceous. The specimen is Cat. No. 5736, U.S.N.M.

The costal to be described is 199 mm. long. The width near the neural border (fig. 5) is 40 mm.; at the free border (fig. 4), 62 mm. The thickness where it joined the neural is 4 mm.; near the free border, 9 mm. The free border is cut off at nearly a right angle with the upper surface, but the upper layer of the bone does not overhang the deeper layers. The rib did not extend beyond the free border of the disk, an indication of the great age of the animal. The disk must have been somewhat more than 400 mm. wide.

It is the character of the sculpture of the upper surface that distinguishes this turtle from all others yet known. The general appearance is that of a network of narrow, smooth, and sharply defined ridges surrounding flat-bottomed pits. Of these pits there are 4 in a line 10 mm. long. At the proximal end of the bone (fig. 5) the bottoms of the pits are shagreened; and in some of them there is a little elevation that resembles a glass bead or a grain of sand.

On the middle third of the bone the ridges are much interrupted, sometimes ending suddenly in a bead or a series of them. The pits, therefore, open into one another extensively, and most of them inclose a bead, others four or five of them.

Toward the free border (fig. 4) the ridges tend to run across the costal and more or less in rows parallel with the free border.

This species is referred to the genus *Aspideretes* for the reason that up to the present time no other genus of trionychids is known to have existed during the Cretaceous. All specimens sufficiently complete show the presence of a preneural bone.

EXPLANATION OF PLATES.

PLATE XXVI.

Terrapene longinsulæ × $\frac{5}{8}$.

Fig. 1. Carapace.

In front the first peripheral of the right side is missing; also the free border of the nuchal bone, on the left side, has been gnawed away by a rodent. On the sides and behind, some of the peripherals are wanting.

2. Plastron.

The right epiplastron and a small part of the left are missing.

3. Skull viewed from above.

PLATE XXVII.

Hoplochelys calata × 1.

Fig. 1. Ninth, tenth, and eleventh peripherals of right side, showing the upper surface. The sculpture is not well shown.

2. Seventh, eighth, and ninth peripherals of left side, showing the lower surface. In the left border of the ninth is a notch. In this is seen a fragment of the free rib-end of a costal, occupying a pit in the peripheral. In the seventh are seen pits for processes of the hypoplastron.

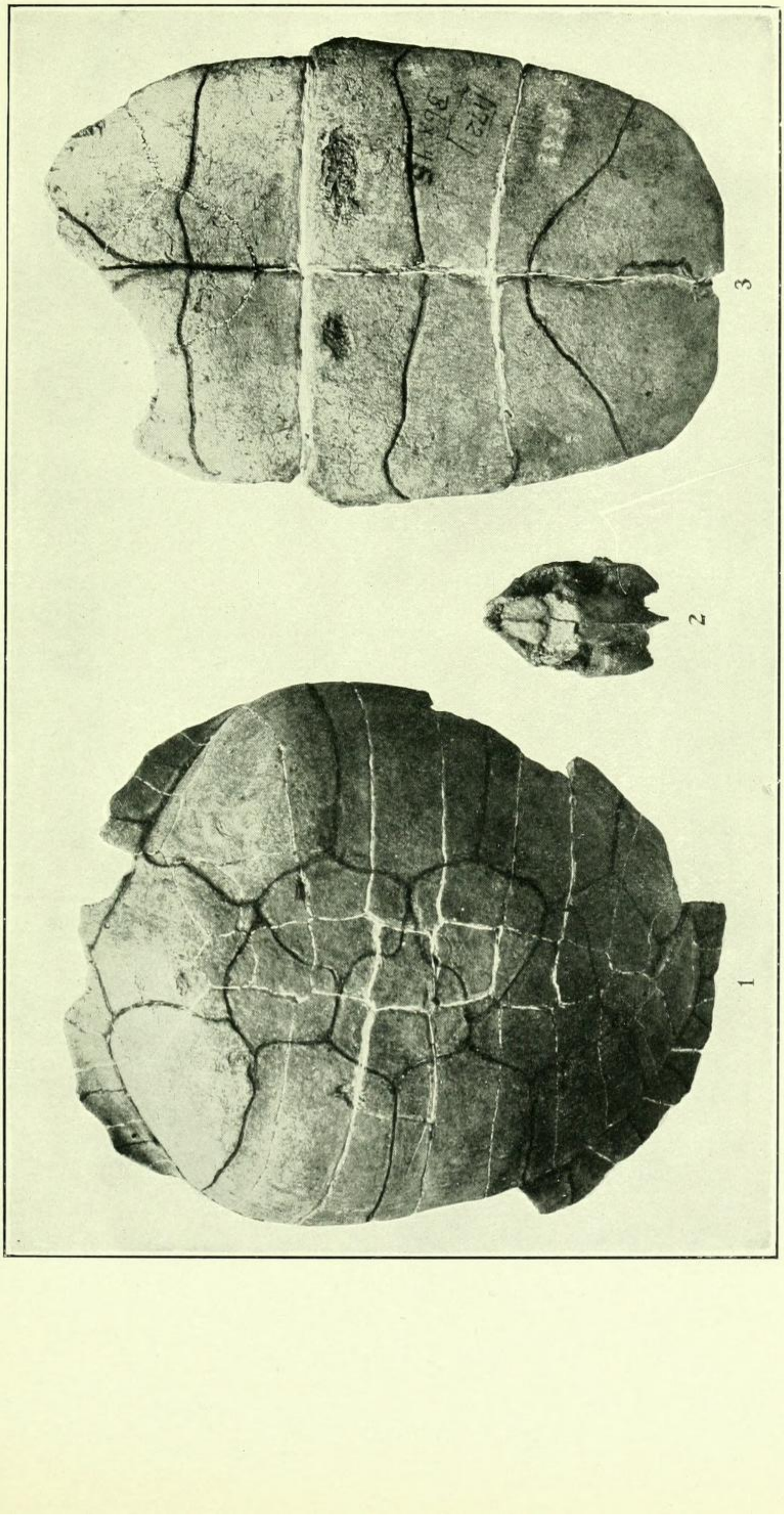
3. Fragment of a costal bone, showing sculpture.

Aspideretes granifer × 1.

4. A nearly complete costal bone.

5. Part of same costal as fig. 4.

The lower end of fig. 5 is to be applied to the upper end of fig. 4, so as to make the white line on the one join that on the other. The figures should be viewed with the light coming from the left. The lighter areas are the bottoms of pits, not convex surfaces.



CARAPACE, PLASTRON, AND SKULL OF TERRAPENE LONGINSULÆ.

FOR EXPLANATION OF PLATE SEE PAGE 169.

COSTAL AND PERIPHERAL BONES OF FOSSIL TURTLES.

FOR EXPLANATION OF PLATE SEE PAGE 169.