

DESCRIPTIONS OF EIGHT NEW SPECIES OF FOSSIL
TURTLES FROM WEST OF THE ONE HUNDREDTH
MERIDIAN.

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The new species of fossil turtles described on the following pages were collected during the summer of 1909 by members of the U. S. Geological Survey. Dr. T. W. Stanton, Mr. M. R. Campbell, and Mr. W. R. Calvert, working in Upper Cretaceous areas whose deposits are quite certainly equivalent to the Lance (Ceratops) beds of Wyoming, discovered the remains here described as *Basilemys præclara* and *Aspideretes amnigenus*. Mr. J. H. Gardner discovered, in the Ignacio quadrangle, La Plata County, Colorado, the complete plastron named below *Alamosemys annexa*. It seems uncertain to what formation the beds belong, but this turtle indicates that they are the equivalent of the Torrejon deposits of New Mexico. Later in the season, Mr. Gardner, accompanied by Mr. J. W. Gidley, of the U. S. National Museum, spent two days in the vicinity of Ojo Alamo, San Juan County, New Mexico. In this region they found two distinct formations. In the lower, composed of sandstones, clays, and a bed of conglomerate, there were found fragmentary remains of dinosaurs and the turtles below described as *Basilemys nobilis* and *Adocus vigoratus*, together with considerable parts of *Aspideretes vorax?* and unidentifiable fragments of other Trionychida. These beds are probably the equivalents of the Lance Creek beds. Above these dinosaur-bearing deposits came a deposit of conglomerate, about 12 feet thick at most. Succeeding this are other beds of sandstone and clay, in which were found no remains except those of the turtles described below as *Compsemys vafer* and *Hoplochelys bicarinata*, and probably *Compsemys parva*. It is possible, however, that the last-named species belongs to the older beds. It is believed that the deposits above the upper bed of conglomerate belong to either the Puero or the Torrejon. It must be noted that Ojo Alamo is not more than about 100 miles from the Ignacio quadrangle in Colorado.

Although the Puerco and the Torrejon are usually assigned to the Lower Tertiary, it is the present writer's opinion that Professor Cope was right when he put them in the Upper Cretaceous.

The writer expresses here his obligations to the officers of the U. S. National Museum for the privilege of studying and describing the interesting materials above mentioned.

Genus COMPSEMYS Leidy.

The genus *Compsemys* has hitherto been known from only the most fragmentary materials and has had assigned to it a quite heterogeneous lot of species. Although the type is Leidy's *Compsemys victa*, of the Upper Cretaceous, it was for a long time supposed to be best represented by Cope's *Compsemys plicatula*, of the Upper Jurassic. In *The Fossil Turtles of North America*, page 47, the present writer removed the last-named species from *Compsemys* and assigned it to Marsh's genus *Glyptops*, a genus of Pleurosternidæ. Some scant materials in the American Museum of Natural History, believed to belong to *Compsemys victa*, led the writer to believe that the species possessed no mesoplastron and that it belonged among the Dermatemydidæ. In 1909, Mr. J. H. Gardner and Mr. J. W. Gidley discovered in probably Puerco or Torrejon deposits, near Ojo Alamo, New Mexico, materials representing the two new species of *Compsemys* described below. These materials show plainly that the genus had a very large mesoplastron and that it belongs to the superfamily Amphichelydia. The strong development of the axillary and the inguinal buttresses seem to ally the species with the Baënidæ, rather than with the Pleurosternidæ. The following definition of *Compsemys* is therefore proposed:

A genus of Baënidæ. Plastron relatively small, with broad mesoplastra which meet at the midline. Axillary and inguinal buttresses rising above the lower ends of the costals; these buttresses wide transversely to the body and shutting off ample sternal chambers. Peripheral bones united to costals by jagged sutures. Neural bones with the broader end forward. External surface of all the bones ornamented with small circular pustular elevations.

COMPSEMYS PARVA, new species.

The specimen which forms the type of the present species was collected by Messrs. Gardner and Gidley, at Ojo Alamo, San Juan County, New Mexico. The catalogue number in the U. S. National Museum is 6548. There is some doubt regarding the level at which the specimen was secured, but it is supposed that it came from the beds above the upper conglomerate: therefore above the dinosaur beds.

The individual was a small one, the length of the plastron having probably not exceeded 120 mm. There are present the greater part of both hypoplastra, a part of the right mesoplastron, a part each of

the right and the left hyoplastra, the greater portion of the left first costal bone, and parts of three other costals. All of these bones, except one of the costals, are illustrated here (Plate 10, figs. 1-3) by reproductions of photographs. The individual was not a young one, inasmuch as all the bones are closely sutured together. The bones, too, are relatively thick and solid. Fig. 1 presents a restoration of the plastron. Only the stippled portions are represented by bones actually known. Plate 10, fig. 1, represents the same bones placed in their natural relations.

The width of the hinder lobe is only 51 mm.; but this was probably narrow in comparison with the whole width of the shell, which was probably about 110 mm. wide.

The right hypoplastron is incomplete, since the outer anterior border and a part of the buttress are missing. Its length is 25 mm.; its thickness on the midline and on a line between the two buttresses is 6 mm.; where it joined the xiphiplastron, 3.5 mm. On the upper surface is a notch for a process of the xiphiplastron. But little of the subacute free border is preserved. Evidently the buttress was strong, and it probably ascended to the lower ends of the costals. The right hypoplastron is somewhat longer than the left and came into contact with the inner end

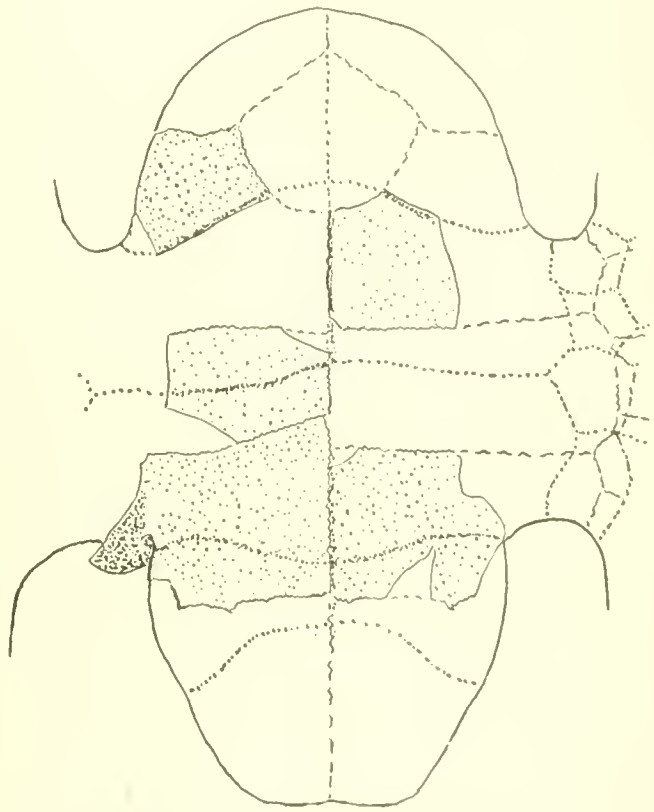


FIG. 1.—*COMPSEMYS PARVA*. $\times 3$. RESTORATION OF PLASTRON. THE STIPPLED AREAS INDICATE THE PARTS ACTUALLY KNOWN.

of the left mesoplastron. The latter bone is 12 mm. wide near the inner end. How long it was transversely to the body can not be accurately determined, nor its distal width. It is 6 mm. thick at the front edge. It is remarkable how near to the inguinal notches the hypo-xiphiplastral suture is placed. The mesoplastron of the left side was considerably wider at the inner end than was the one of the right side, inasmuch as it came into contact with the right hypoplastron a distance of 3 or 4 mm., and probably for a short distance with the right hyoplastron.

The right hypoplastron lacks the outer and the anterior portions. It is thick behind, to correspond with the mesoplastron. In the ante-

rior inner angle there is a notch for a part of the border of the entoplastron. Of the right hyoplastron there is present the outer and anterior portion. The free border is rather obtuse. The sutural edge for contact with the epiplastron remains, as well as that for union with the entoplastron. In the latter notch the bone is 4 mm. thick. One can not be certain regarding the form of the epiplastron. It is not probable that there was any specially developed epiplastral lip. There are on both hyoplastra traces of the humero-pectoral sulcus. From the axillary notches it was directed inward and strongly forward to cross the entoplastron, thus differing from that of *Glyptops*. The pectoro-abdominal sulcus crossed the plastron along the middle of the mesoplastra. The abdomino-femoral sulcus starts behind the bases of the inguinal buttresses and swings somewhat backward on its way to the midline. The median sulcus of the plastron follows closely the sutures between the bones of the two sides. In most of the relatives of this species it runs a very irregular course. There was probably a series of inframarginal scutes on each bridge, but these do not appear on the specimen.

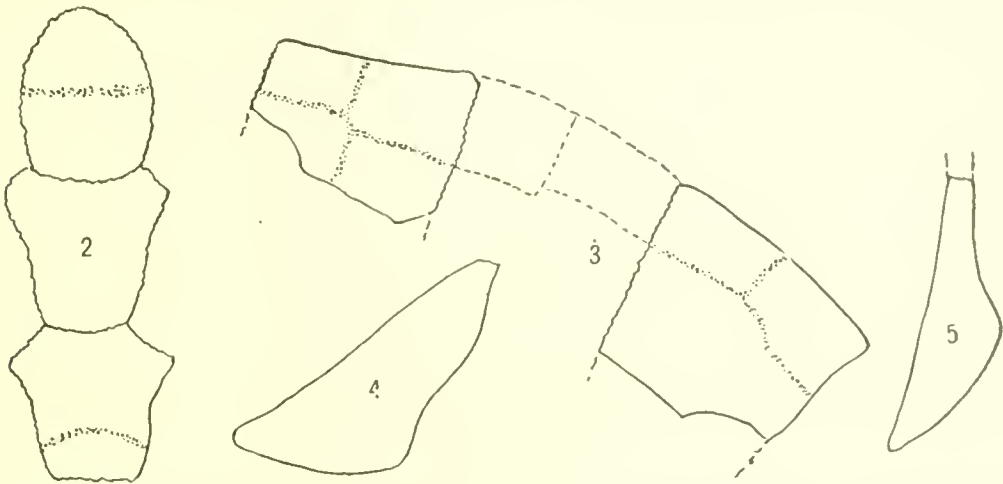
Of the left first costal (Plate 10, fig. 2) only the outer extremity is missing. The articulation with the peripherals was by means of dentated sutures. On the upper surface are parts of the first costal scute and of the first and second vertebrae. As the width of neither the nuchal nor the first neural bone is known it is impossible to determine accurately the width of the vertebral scutes represented. However, the first vertebral was considerably wider than the second. On the inferior surface of the bone is seen the ridge produced by the strongly developed rib, which forms an articulation with the axillary buttress. This buttress rose about 10 mm. above the lower border of this costal.

The costals represented by fig. 3 of Plate 10 belong to the left side. The one with the descending sulcus is probably the fourth from the front; and the next one, the fifth. These bones are about 3 mm. thick. The vertebral scutes extended out about 10 mm. from the neural borders. It is probable, therefore, that the vertebral scutes were not far from 30 mm. wide. All the bones of the specimen are ornamented with low, close-set elevations, or pustules, of which there are seven in a line 5 mm. long. Their summits are rounded and the valleys between them are of moderate width. In *C. victa* there is the same number of pustules in a 5 mm. line, but they seem to have more pointed summits and the intervening valleys are wider. In comparison with their width the bones of *C. parva* are considerably thicker than those of the type of *C. victa*. In *C. parva* the vertebral scute extends beyond the neural border of the costal a distance equal to the width of the costal; in *C. victa* the vertebral extends outward a distance equal to only two-thirds the width of the costal.

COMPSEMYS VAFER, new species.

The type of *Compsemys vafēr* consists of about nine peripherals, three neurals, a few fragments of costal plates, and some fragments of the plastron. This material was collected by Messrs. Gardner and Gidley near Ojo Alamo, New Mexico, in deposits about 50 feet above the upper conglomerate, and therefore above the dinosaur-bearing beds. The catalogue number in the U. S. National Museum is 6551. At the same level the collectors obtained the right mesoplastron and right hypoplastron of one individual and the left hypoplastron of another, which are regarded as belonging to the same species as that numbered 6551. The three bones last mentioned are included under the catalogue number 6553.

Most of the bones of the first-named individual are covered with a layer of clay which is so hard that it is very difficult to remove it.



FIGS. 2-5.—COMPSEMYS VAFER. $\times\frac{3}{2}$. 2, FIRST, SECOND, AND THIRD NEURALS; 3, FIRST AND THIRD RIGHT PERIPHERALS, WITH RESTORATION OF THE SECOND; 4, SECTION OF FRONT END OF EIGHTH PERIPHERAL; 5, SECTION ACROSS TENTH PERIPHERAL.

Nevertheless a few of the bones are in satisfactory condition. It is estimated that the carapace had originally a length of about 1 foot. The three neurals (fig. 2) are the first, second, and third of the series. The form of each is seen from the figure. The first is 25 mm. long and 19 mm. wide; the second is 21 mm. long, 23 mm. wide, and 7 mm. thick; the third is 22 mm. long, 24 mm. wide, and 8 mm. thick.

One fragment of a costal is 26 mm. wide, 4 mm. thick at one edge, and 5 mm. at the other. Another fragment (Plate 10, fig. 4) is figured to show the sculpture. Proximal ends of the three costals vary from 5 to 6 mm. in thickness. Fig. 5 of Plate 10 represents the upper surface of the right first peripheral. It is 5.5 mm. thick where it joined the nuchal, 8 mm. where it joined the second peripheral. The free border is obtuse. On the lower side the sculptured surface extends backward from the edge 8 mm. at the end next the nuchal; 14 mm. at the other end. On the upper surface are portions of the first and

second marginal scutes and of the first vertebral and first costal. The second peripherals are both missing, but both third peripherals are present. The length along the obtuse free border is 37 mm.; the height, 33 mm.; thickness in front, 7 mm.; behind, 15 mm. As will be seen (fig. 3) the marginal scutes run low down on this peripheral also. One of the bridge peripherals, apparently the fourth, is 33 mm. long and rises above the surface of the plastron 25 mm. Six of the hinder peripherals are represented in the lot. The eighth has a height of 45 mm. The others have the upper border broken away. Fig. 4 represents the anterior end of the eighth; fig. 5 a section of probably the tenth. The free border of all these peripherals is subacute. The position of the sulci on them has not been determined. All the bones, where the outer surface is visible, present an ornamentation of pustules. They are flat topped and the intervening valleys are very narrow. There are usually seven pustules in a line 5 mm. long.

The fragments of the plastron tell little. One piece appears to belong to the right hypoplastron and to bear a part of the base of the buttress. Attached is a fragment of the mesoplastron. At the suture between the two bones the thickness is 6.5 mm. Another fragment, perhaps the inner end of the mesoplastron, is 8 mm. thick. On a fragment of a costal plate the sulcus bounding laterally a vertebral scute is 16 mm. from the neural border. Taking into consideration the width of the neural bones, the vertebral scutes must have been about 55 mm. wide.

Figs. 1 and 2 of Plate 11 represent the three plastral bones included under the catalogue number 6553. The right hypoplastron (Plate 11, fig. 1) has a length of 43 mm. At the hinder inner angle the thickness is 4 mm.; at the middle of the length, on the suture with its fellow, the thickness is 8 mm.; at the anterior inner angle, 6 mm. No part of the free border behind the inguinal buttress remains; hence the width of the hinder lobe can not be determined. It could not have been far from 90 mm. The mesoplastron (Plate 11, fig. 1) has a width of 23 mm. near the inner end; but even within a distance of 20 mm. the width has increased to 30 mm. At its inner end this bone is 7.5 mm. thick, but the thickness becomes somewhat reduced outward. The left mesoplastron was evidently wider at the inner end than the right, for it certainly articulated with the right hypoplastron on an oblique line 10 mm. long and probably with the right hypoplastron also. The left hypoplastron (Plate 11, fig. 2) agrees in all essential respects with the other. There is no possibility that the bone is the hypoplastron.

On viewing the lower side of these bones one is struck with the irregularity of the median sulcus. Between the abdominal scutes it formed a great loop, toward the right in one individual and toward

the left in the other. The abdomino-femoral sulcus runs straight across the hypoplastra from opposite the middle of the inguinal buttresses, thus differing considerably from that of *C. parva*.

On the right mesoplastron and hypoplastron the lower surface is mostly furnished with small pits and low ridges, but there are areas where these are replaced by pustules. Especially near the sutural borders the pustules are arranged in rows at right angles with the suture. The left hypoplastron is everywhere ornamented with pustules and this is doubtless the normal condition. The pustules have the size and flatness seen on the bones of the type specimen.

The sculpture of this species differs from that of both *C. victa* and *C. parva*. The neural of *C. victa*, the second, fourth, or possibly sixth, is 24 mm. long, 25 mm. wide, and 9 mm. thick. The third neural of *C. vafer* is only 8 mm. thick. It is greatly to be desired that more complete specimens of *C. victa* be collected in the type-locality.

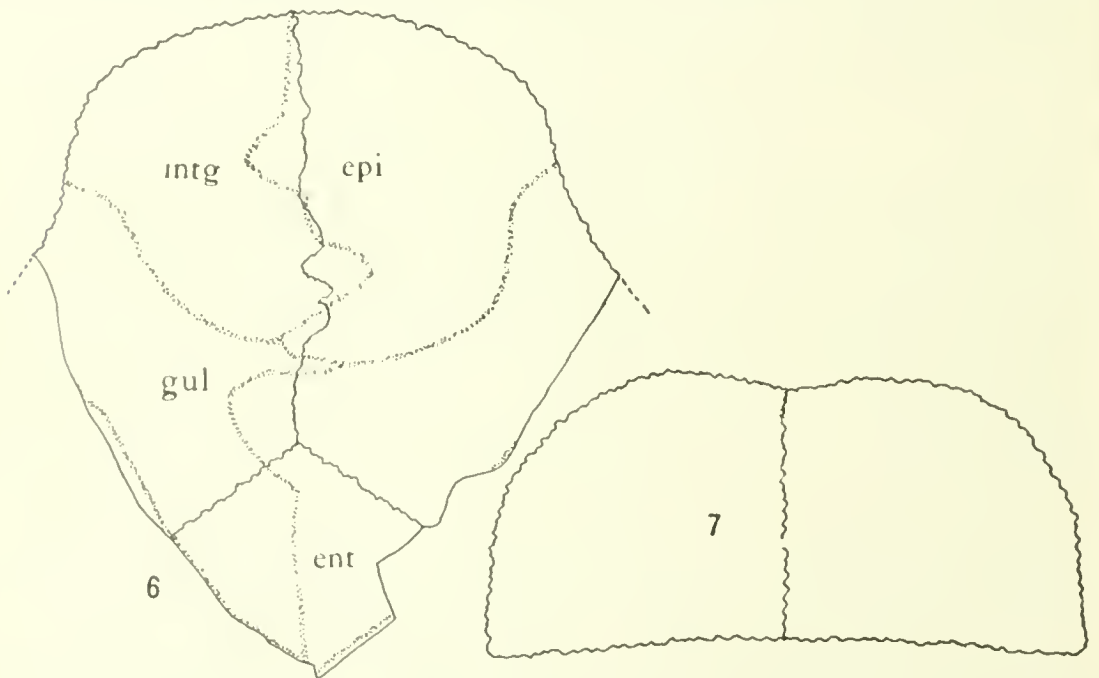
BASILEMYS PRÆCLARA, new species.

The remains on which this species is based were found on June 21, 1909, by a party of the U. S. Geological Survey consisting of Dr. T. W. Stanton, Mr. M. R. Campbell, and Mr. W. R. Calvert. The bones are accompanied by a note which states that they were found in the so-called somber beds, about 3 miles northeast of the mouth of Dirt Lodge Creek, South Dakota. The more accurate locality is given as section 12, township 20 north, range 22 east. This is in Boreman County, north of Grand River. In the same collection are bones of Trachodon, Triceratops, *Myledaphus bipartitus*, and other fossils belonging to the Lance formation, better known as Ceratops beds. The specimen consists of the epiplastral beak, a fragment of the rim of the posterior lobe of the plastron, the thickened anterior border of the nuchal, a free peripheral bone, and a number of fragments of the plastron and the carapace. The catalogue number of the specimen in the U. S. National Museum is 6540.

The most important part of the turtle here described is the epiplastral beak (Plate 10, fig. 6), and this indicates that the species is quite distinct from both *B. variolosa* and *B. sinuosa*. The individual had a size about that of the type of *B. sinuosa*; that is, the carapace was probably about 700 mm. long. This beak seems to differ from that of *B. sinuosa* in not being notched at the midline in front and in not being broadly channeled along the midline on the underside. It differs from that of *B. variolosa* in that it projects forward, at the gulo-humeral sulci, from the curvature of the remainder of the lobe. The lower surface of the fragment (fig. 6), which includes the whole length of the symphysis between the epiplastral bones and a part of the entoplastron, is very slightly concave, becoming convex and turned slightly upward in front. Fig. 7 shows a perpendicular trans-

verse section taken at the widest part of the fragment, which is apparently not far in front of the outer ends of the humero-pectoral sulci; fig. 8 presents a perpendicular section along the midline. The greatest thickness of the lip is 55 mm. Its width at the gulo-intergular sulci is 100 mm.; at the gulo-humeral sulci it must have been at least 120 mm. The lip of *B. sinuosa* is only 95 mm. wide at the latter-named sulci.

It is in the conformation of the intergular and gular scutes that are found the characters that most clearly distinguish this species from the two others mentioned. In *B. variolosa* the intergulars are very large and extend backward to or on the entoplastron; while the gulars are small and are crowded far away from the midline. In *B. sinuosa*

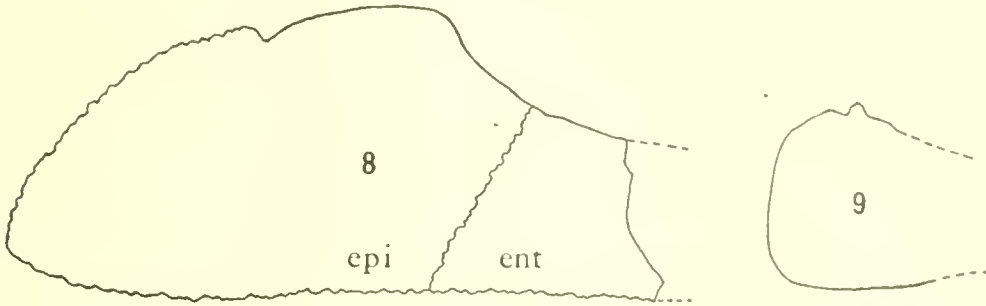


FIGS. 6, 7.—*BASILEMYS PRÆCLARA*. $\times \frac{1}{2}$. 6, LOWER SURFACE OF FRONT END OF PLASTRON; *ent*, ENTOPLASTRON; *epi*, EPIPLASTRON; *gul*, GULAR SCUTE; *intg*, INTERGULAR SCUTE; 7, SECTION ACROSS FRONT END OF PLASTRON A LITTLE IN FRONT OF ENTOPLASTRON.

the intergulars are much like those of *B. variolosa*, but the gulars extend inward and join each other on the entoplastron. In *B. præclara* the intergulars lack much of reaching backward to the entoplastron, while the gulars meet each other on the epiplastra and the entoplastron. The anterior end of the sulcus between the gulars is about 66 mm. behind the front of the lip; the hinder end about 124 mm. behind the front.

A fragment of the rim of the plastron belongs behind the left inguinal notch and includes the suture between the left hypoplastron and the left xipliplastron. The thickness of the bone at the suture is 47 mm. Fig. 9 shows a section taken 40 mm. behind this suture. The outer sculptured surface of the bones rises nearly perpendicularly from the flat lower surface to the summit of the ridge that

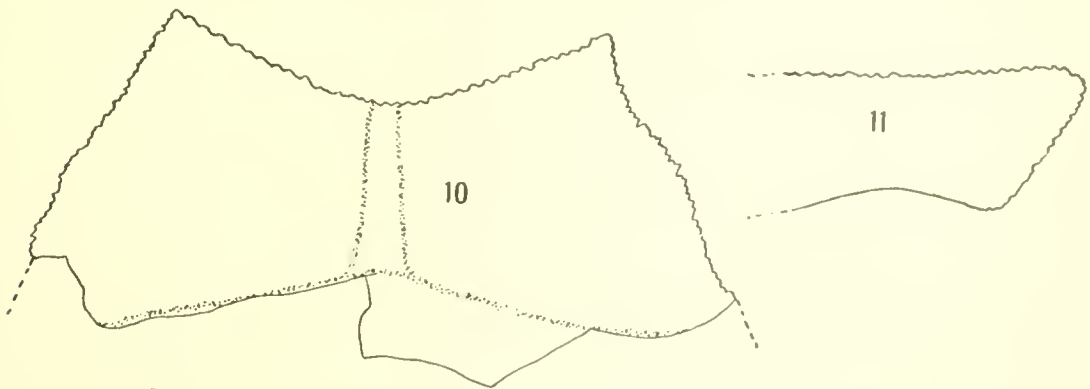
runs backward from the inguinal notch. Fig. 10 represents the outline of the anterior part of the nuchal bone, while fig. 11 shows the section of the bone where it joined the first peripheral. From one extremity of the bone to the other, at the anterior border and in a straight line, the distance is 87 mm. The greatest thickness of the bone is at the midline and amounts to 36 mm. The nuchal scute is 32 mm. long, 5 mm. wide in front, and 11 mm. behind. On the



FIGS. 8, 9.—*BASILEMYS PRÆCLARA*. $\times \frac{1}{2}$. 8, MEDIAN SECTION OF FRONT OF PLASTRON; *ent*, ENTOPLASTRON; *epi*, EPIPLASTRON; 9, SECTION OF FREE BORDER OF XIPIIPLASTRON 40 MM. BEHIND HYPOPLASTRON.

antero-inferior surface of the bone this nuchal scute broadens to a width of 25 mm. where it joined the soft skin.

There is present the thickened border of one free peripheral, probably one of the hinder ones. It is 90 mm. long at the free edge and has a maximum thickness of 26 mm. On the inferior surface the sculpture rises to a height of 45 mm. The bone is crossed by a sulcus between two marginal scutes. The sulci found on the various bones present great contrasts. Sometimes they are extremely narrow



FIGS. 10, 11.—*BASILEMYS PRÆCLARA*. $\times \frac{1}{2}$. 10, UPPER SURFACE OF FRONT OF NUCHAL; 11, SECTION ACROSS NUCHAL NEAR UNION WITH FIRST PERIPHERAL.

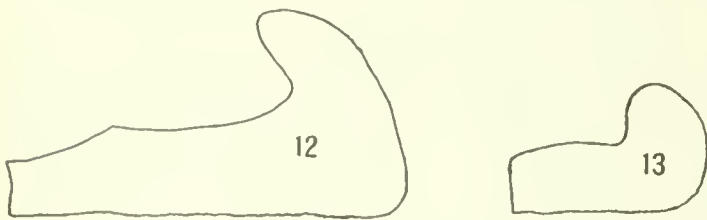
and shallow and can hardly be followed over the pits and ridges, while others are broad and sometimes deeply impressed. The bones are sculptured as in the two other species of the genus that have been mentioned. The ornamentation consists of pits separated by sharp ridges, and the latter rise into points at the boundary between three pits. On some parts of the carapace the pits are shallow, resembling those of some *Trionychida*. The lower surface of some of the plastral bones are rough but often devoid of the pits.

BASILEMYS NOBILIS, new species.

Among the turtle remains collected by Messrs. Gardner and Gidley at Ojo Alamo, New Mexico, are some portions of a species of *Basilemys*. These remains were found below the upper conglomerate bed, in the dinosaur-bearing deposits and about 50 feet above the lower conglomerate. There are many fragmentary parts of both the carapace and the plastron, but the most important part is the border of the right side of the hinder lobe of the plastron, including a portion of the hypoplastron and a part of the xiphiplastron. The bones present indicate a large turtle, one of nearly the size of the type of *Basilemys variolosa*, the type of the genus, the plastron of which was about 670 mm. long. The catalogue number of the type of *Basilemys nobilis*, here described, is 6555.

The right extremity of the fragment of hypoplastron reaches out to the suture with the eighth peripheral. From this suture to that between the hypoplastron and the xiphiplastron, following the curve,

is 102 mm. Near the former suture the bone is 52 mm. thick. From the border of the inguinal notch a wall extends backward along the border of the hinder lobe. At the hypo-xiphiplastral suture this wall rises 40 mm. above the lower surface of the



FIGS. 12, 13. — *BASILEMYS NOBILIS*. $\times \frac{1}{2}$. 12, SECTION ACROSS FREE BORDER OF XIPHIPLASTRON 40 MM. BEHIND HYPOPLASTRON; ON THE LEFT THE SECTION ENTERS DEPRESSION FOR PUBIS; 13, SECTION ACROSS FREE BORDER OF XIPHIPLASTRON 115 MM. BEHIND HYPOPLASTRON.

plastron. From the summit of the wall the bone slopes downward rapidly and about equally on the outside and the inside of the wall. Where the slope ceases on the inner side of the wall the xiphiplastron is about 17 mm. thick. Passing backward 40 mm. the wall is somewhat higher, slightly steeper on the outside and overhanging on the inner side (fig. 12). At a distance of 60 mm. behind the hypo-xiphiplastral suture the wall is 36 mm. high and still more overhanging on the inner side. At the base of the wall here the thickness of the xiphiplastron is 21 mm. As the rear of the xiphiplastron is approached the wall becomes lower, only 25 mm. where the fragment ends (fig. 13). On the upper surface of the xiphiplastron there is a large oval scar which was occupied by the pubis.

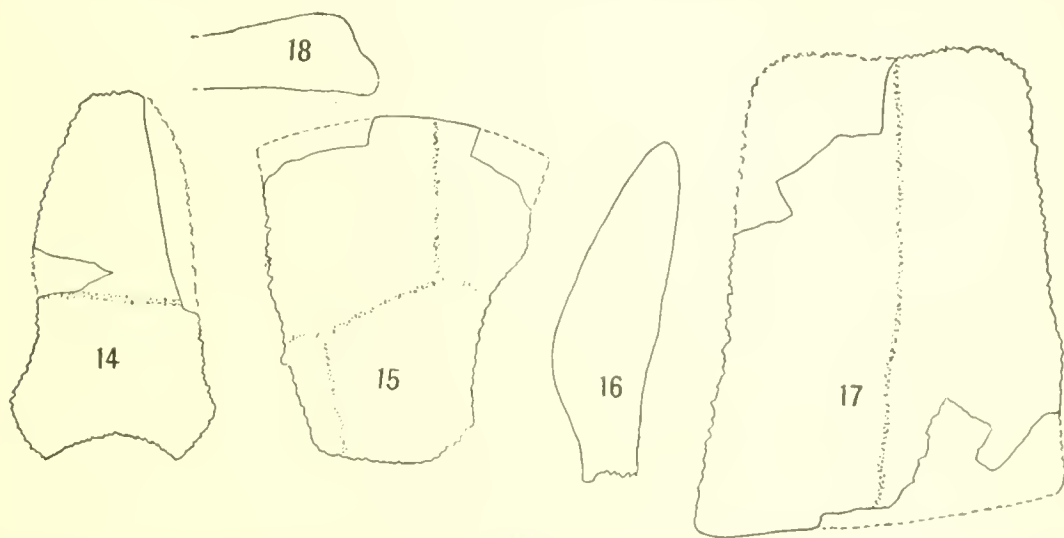
On the lower surface of the outer extremity of the hypoplastron are seen the narrow thread-like sulci which bound the inguinal scute. This is only 25 mm. wide and it is thrown well out on the extremity of the bone. In *B. variolosa* this scute is much wider and extends medially to the free border of the hinder lobe. On the sloping

outer face of the xiphiplastral wall, near the hinder end of the specimen, is seen a part of the femoro-anal sulcus.

From *B. præclara*, described above, this species differs in at least one important respect, the inner slope of the wall around the border of the hinder lobe of the plastron; as will be seen on comparing figures 9 and 12. It differs from *B. sinuosa* in about the same way; for in the latter the upper surface of the xiphiplastron slopes rapidly downward toward the central portion of the lobe. The writer has not at hand information regarding the same region in *B. variolosa*, but it probably does not differ in any important respect from that of *B. sinuosa*.

ADOCUS VIGORATUS, new species.

The fragmentary remains which are described under the above-given name were collected September 3, 1909, by Messrs. Gardner



FIGS. 14-18.—ADOCUS VIGORATUS. $\times \frac{1}{2}$. 14, FIRST NEURAL; 15, FIRST LEFT PERIPHERAL; 16, SECTION ACROSS FIRST LEFT PERIPHERAL, THE UPPER SURFACE TOWARD RIGHT; 17, LEFT SEVENTH PERIPHERAL; 18, SECTION ACROSS FREE BORDER OF BASE OF HINDER LOBE.

and Gidley, at Ojo Alamo, San Juan County, New Mexico. The bones were secured below the upper bed of conglomerate, in those beds which furnished remains of dinosaurs. The specimen bears the number 6554 of the catalogue of the U. S. National Museum.

The individual was one of considerable size, the length of the carapace having been probably 500 mm. One neural (fig. 14) present is probably the most anterior one. It is narrowed in front, notched behind, and crossed by the sulcus that passed probably between the first and the second vertebral scutes. The length is 68 mm. along the midline; the width is 40 mm. The anterior end was about 6 mm. thick; the posterior, 10 mm. Fig. 15 represents the form of the first left peripheral, while fig. 16 presents a section from the free border to the border that articulated with the first costal. The bone is about 53 mm. wide along the anterior border and 67 mm. high. Its greatest thickness is 19 mm., and this is the same

where the bone joined the nuchal and where it joined the second peripheral. The free border is obtuse. On the upper surface are seen part of the first vertebral scute, a part of the first costal scute, and parts of the first and the second marginal scutes. The ascending plate of one of the bridge peripherals is penetrated by the extremity of a rib.

Fig. 17 presents a view of the left seventh peripheral. Its length near the free border is 73 mm.; its height is 96 mm. The free border is subacute. The front border is greatly thickened, to form a shoulder to receive the inguinal buttress of the plastron. This buttress did not rise to the lower borders of the costals. On the upper part of the inner face of the bone is a shallow groove in which lay the end of the rib of the fifth costal plate. Farther down this rib enters the bone and descends a distance of 44 mm. from the upper border.

Of the plastron there are present a fragment of the right xiphiplastron and the portion of the hypoplastron that sends up the right inguinal buttress. Fig. 18 represents a section taken just behind this buttress. It shows the thickness of the bone and the form of the free border at the base of the hinder lobe. The underside of the fragment shows the outer end of the abdomino-femoral sulcus. The xiphiplastron is quite thin, the thickness just behind the femoro-anal sulcus being only 6 mm. The free edge is acute. The sulcus just named is directed forward as it moves toward the midline.

The outer surfaces of all the bones, those of the plastron as well as those of the carapace, are ornamented with shallow pits arranged in more or less regular rows. The rows are directed obliquely to the sutural borders of most of the bones (Plate 11, fig. 3). There are three rows of pits in a line 5 mm. long. The ridges between the pits are rounded on their summits and the cross ridges are feeble.

This species is evidently different from all of those described from the eastern region of the United States. From *A. lineolatus*, the type of which came from Colorado, the present species differs in having a coarser sculpture, three rows of pits in a 5 mm. line, instead of four or five.

ALAMOSEMYS ANNEXA, new species.

The type of this species was found by Mr. J. H. Gardner, of the U. S. Geological Survey, in the Ignacio quadrangle, La Plata County, Colorado. The exact locality is given as section 1, township 34 north, range 8 west. The following note accompanied the specimen: "Turtle bones from the top of the Animas or above." This refers to the Animas formation. Inasmuch as the type of the genus *Alamosmys substricta* was found in the Torrejon of New Mexico,^a it appears

^a Mr. Walter Granger, the discoverer of this turtle, informs me that it was found in a dry sand arroyo east of Escavada canyon. The locality is near the southeastern corner of San Juan County, close to the line between this county and what is now McKinley County.

probable that the same formation occurs in the Ignacio quadrangle. The number of the specimen in the catalogue of the U. S. National Museum is 6539.

No part of this specimen is present, except the plastron. Of this little is missing. The character which is depended on to separate the genus *Alamosemys* from *Adocus* is the restriction of the marginal scutes to the peripheral bones. As these bones are wholly missing, this character can not be observed. However, the plastron is so closely like that of *A. substricta*, the type of the genus, that there can be hardly a doubt that this species, too, belongs to *Alamosemys*.

The individual was somewhat smaller than the type of *A. substricta*, the total length of the plastron being 335 mm., from which it is estimated that the carapace was about 445 mm. long. The carapace of the type of *A. substricta* is 550 mm. long.

Fig. 19 shows the form and proportions of the plastron as well as the form and proportions of its various bones and horny scutes. The following table presents three columns of measurements. In the first column are certain measurements taken from the type of *A. substricta*; in the second are corresponding measurements taken from the plastron here described;

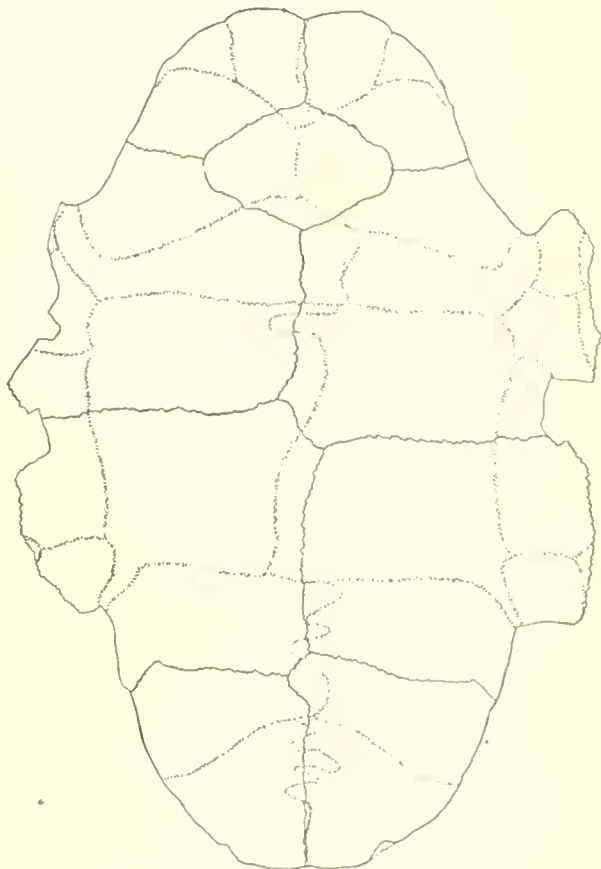


FIG. 19.—ALAMOSEMYS ANNEXA. $\times \frac{1}{2}$. LOWER SURFACE OF THE PLASTRON.

while in the third column are the measurements of the first column reduced by 16 per cent of their value. This reduction is made for the following reason: The length of the anterior lobe of *A. annexa* is made the standard of comparison and this is 84 mm. long. That of *A. substricta* is 100 mm., which reduced by 16 per cent becomes 84 mm. All the other measurements of *A. substricta* being reduced in the same proportion, we have the figures of the third column, which, on comparison with those of the second column, show the agreements and differences in these measurements of the two species.

Table of measurements.

Parts measured.	<i>A. substricta.</i>	<i>A. annua.</i>	<i>A. substricta</i> reduced
	mm.	mm.	mm.
Length of anterior lobe.....	100	84	84
Width of anterior lobe.....	209	177	175
Thickness of edge near front.....	9	8	7.5
Length of entoplastron.....	55	51	46
Width of entoplastron.....	90	71	76
Width of bridge.....	180	160	151
Length of posterior lobe.....	132	100	110
Width of posterior lobe.....	190	163	160
Contact of hyoplastral bones.....	100	72±	81
Contact of hypoplastral bones.....	135	100±	113
Contact of hyo and hypoplastral bones taken together.....	235	173	197
Length of intergular sulcus.....	50	43	42
Combined width of intergulars.....	75	65	63
Length of interhumeral sulcus.....	48	28	40
Length of interpectoral sulcus.....	46	40	39
Length of interabdominal sulcus.....	128	110	108
Length of interfemoral sulcus.....	80	52	67
Length of interanal sulcus.....	67	61	56

The anterior lobe is rounded in front, without appearance of epiplastral lip. Its free borders are subacute. Seen from above, the bones thicken from this edge, until at about 15 mm. from the edge they have a thickness of from 7 to 9 mm. The upper surface of the lobe is nearly flat. The buttresses, anterior and posterior, are little developed. The entoplastron differs from that of *A. substricta* in being somewhat pointed behind, instead of rounded or subtruncated. It is longer than that of *A. substricta* in the ratio of 51 to 46, and narrower in the ratio of 71 to 76. It will be observed that there is a union of the left hyoplastron with the right hypoplastron and a similar connection between the latter bone and the left xiphoplastron. Such irregularities are probably only individual peculiarities, but similar ones are quite common among the ancient turtles.

It is seen that the hyoplastra and the hypoplastra are shorter than in *A. substricta*, relatively to the length of the anterior lobe. The bridge, too, is shorter. The free border of the hinder lobe is somewhat less acute than that of the anterior lobe. At the hypo-xiphoplastral suture the bones are 9 mm. thick. On the midline, 30 mm. behind the suture just mentioned, the thickness is only 7 mm. The free borders of the xiphoplastrals posteriorly are acute. On the upper surface of each xiphoplastral there is a crescentic elevation for attachment of the pubic bone.

The lower surface of the plastron is very indistinctly sculptured. The appearance is as if there were rows of small pits, as in *Adocus*; but they are so faintly impressed that they are hardly to be detected.

It will be seen that many of the horny scutes had very irregular boundaries. Especially the median sulcus runs a very tortuous course. The gular and intergular scutes differ little from those of *A. substricta*. The humero-pectoral sulcus crosses the hinder border

of the entoplastron. In *A. substricta* the sulcus is only tangent to the bone. The line of contact between the right and the left humerals is thus shorter than in *A. substricta* in the ratio of 28 to 40, as is shown in the second and third columns of the table. The pectorals of the two species have the same relative length, as also the abdominals have. The hinder lobe of *A. annua* is more narrowed posteriorly than that of *A. substricta*. On each bridge there are four inframarginal scutes, which resemble closely those of the type of the genus.

Genus HOPLOCHELYS Hay.

Supported by the materials described below under the name *Hoplochelys bicarinata* the writer ventures to add to the definition of the genus that was given in his work *The Fossil Turtles of North America*, page 263.

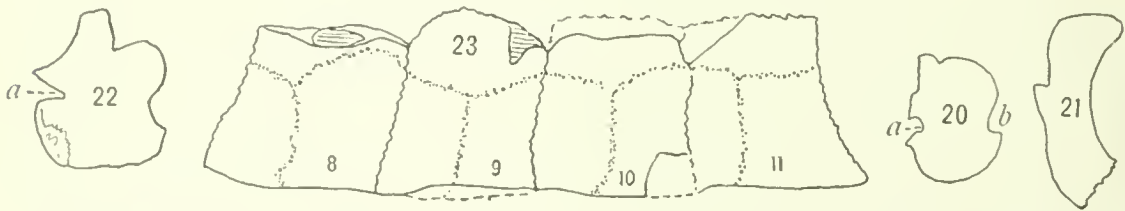
Shell thick and solid. Peripherals united to the plastral bones by means of digitations and dentated sutures; with the costals by gomphosis and in some cases by simple apposition, in others by close sutures. Carapace furnished with three dorsal carinæ, the median sometimes feebly developed. Plastron with the anterior and posterior lobes immovable and with the posterior narrow. A row of inframarginal scutes on each bridge. Pectoral and femoral scutes meeting and crowding the abdominals from mutual contact at the midline. Intergulars and gulars wanting, or consolidated with the humerals.

HOPLOCHELYS BICARINATA, new species.

The type of the present species has the catalogue number 6549 of the U. S. National Museum. It was collected September 2, 1909, at Ojo Alamo, San Juan County, New Mexico, by Messrs. Gardner and Gidley. It is stated to have been found 50 feet above the upper bed of conglomerate, and it therefore belongs probably to either the Puerco or the Torrejon. The type of the genus is *Hoplochelys crassa* (Cope). This was secured by Cope's collector at Chaco Canyon, San Juan County, New Mexico, but there is uncertainty whether in the Puerco or the Torrejon. Two other species of the genus, *H. saliens* and *H. paludosa*, are from the Torrejon; a third, *H. calata* Hay, is from the Fort Union of Montana, but the beds appear to be equivalent to the Torrejon.

Of the specimen here described there are present parts of two neurals, one complete costal, the left fourth, and parts of several others, eleven peripherals, and the greater part of the plastron. The bones are thick and the shell was heavy and solidly constructed. The outer surface of all the bones is undulating, but smooth, and there is no ornamentation of any kind. The carapace (Plate 12, fig. 1) had originally a length of about 175 mm. and a width of about 140

mm. The shell was high and strongly arched from side to side. Along the back ran a very feeble median keel and on each side a strong lateral keel. The lateral keels are not as acute on their summits as are those of *H. crassa*, but are rounded. On the side toward the midline the base of each lateral keel is bounded by the deep and sharply impressed sulcus which limits laterally the vertebral scutes. Just in front of the sulcus which descends between contiguous costal scutes the keel rises abruptly from the costo-vertebral sulcus and then rounds off into the general level of the costal bone. On the slope of the keel toward the median line a well-defined groove begins at the crossing of the descending sulcus and runs backward, gradually disappearing before reaching the next descending sulcus. The second neural is 25 mm. long, 16 mm. wide, and 7 mm. thick; the fourth, not present, had a length of about 23 mm.; the fifth is 18 mm. wide and 9 mm. thick near the anterior and its length was approximately 14 mm. The left fourth costal plate is 23 mm. wide where crossed by the costo-vertebral sulcus; 27 mm. at the distal end. Where it



FIGS. 20-23.—*Hoplocheelys bicarinata*. $\times \frac{2}{3}$. 20, FRONT END OF FOURTH PERIPHERAL—*a*, GROOVE FOR PROCESS OF HYOPLASTRON; *b*, LATERAL CARINA WITH GROOVE ABOVE IT; 21, HINDER END OF FOURTH PERIPHERAL; 22, FRONT END OF EIGHTH PERIPHERAL—*a*, PIT FOR PROCESS OF HYOPLASTRON; 23, EIGHTH, NINTH, TENTH, AND ELEVENTH PERIPHERALS.

joined the neural the thickness is 8 mm.; through the lateral keel, 8 mm.; through the distal end, 5 mm. The rib-heads were rather slender. The nuchal bone and both of the first peripherals are missing. The third peripheral is 27 mm. long; the fourth, 24 mm.; the fifth, 21 mm.; the sixth, 21 mm. The seventh is wanting on both sides. The eighth is 25 mm. long; the ninth, 24 mm. At its front the third peripheral is 23 mm. high and 9 mm. thick. The succeeding three are equally thick. Fig. 20 represents the front end of the fourth and fig. 21 the hinder end. The latter articulated with the anterior process of the hyoplastron. This process continued forward in a deep groove along the inner face of the fourth peripheral and entered a pit in the third. There is also a small pit in the third for the rib of the first costal, and in the fourth a larger one for the rib of the second costal. Doubtless there were pits in the succeeding three peripherals for the corresponding ribs, but the upper borders of these peripherals are broken away. The hinder end of the lower border of the fourth, the whole lower border of the fifth, and the anterior end of the lower border of the sixth peripherals formed a

jagged suture with the hyoplastron. The remainder of the lower border of the sixth and the whole of the same border of the seventh peripherals were similarly joined to the hypoplastron. The eighth (figs. 22, 23) has a pit in the inner face of its anterior end for a process of the hypoplastron. The anterior end of the eighth is 18 mm. thick, the posterior end 12 mm. The ninth peripheral (fig. 23) is 27 mm. high, and it has a pit near the hinder end of its upper border. The tenth peripheral (fig. 23) seems to have had a pit for the rib of the last costal plate. There is another peripheral (fig. 23) which appears to be the eleventh of the left side. It presents no pit in its upper border. Its border for the pygal is 9 mm. thick. The upper border of the third peripheral of the left side indicates that it joined the second costal by a jagged suture, and the same sort of union is betrayed by the distal end of what appears to be the second costal. The distal end of the fourth costal was evidently similarly sutured to the sixth peripheral. It is probable that all of the costals above the bridges were closely joined to the corresponding peripherals. The ninth peripheral has the upper border thin and smooth; the eleventh has this border jagged. From the somewhat upturned free border of the third peripheral a low keel, bounded above by a groove, is continued backward on the bridge peripherals, descending again to the free border of the eighth and succeeding peripherals.

Of the plastron there are missing the left epiplastron, the outer extremity of the left hypoplastron, the whole of the right xiphiplastron, and the hinder end of the left xiphiplastron. The form of the plastron and of its various bones is shown by the figure (Plate 12, fig. 2). The total length of the plastron was close to 130 mm. The anterior lobe is 40 mm. long and 70 mm. wide at the base. The free border is obtuse and about 5 mm. thick. There is no suggestion of an epiplastral lip. The entoplastron is 26 mm. long, 26 mm. wide, 9 mm. thick, pointed in front and broadly rounded behind. The hypoplastra joined a distance of 25 mm. on the midline; the hypoplastrals, 26 mm.; the xiphiplastrals probably about 40 mm. The hinder lobe was close to 48 mm. long and 55 mm. wide at the base. The greatest thickness of the hypoplastra is 14 mm.; of the xiphiplastra, 9 mm.

The sulci of the carapace are narrow, but deeply impressed. The sulci descending on the second, fourth, and sixth costal bones are nearer the hinder border of the bones. The second vertebral scute was evidently 34 mm. wide. The third was 36 mm. wide and about 45 mm. long. The costo-marginal sulci run along just below the upper borders of most of the peripherals, descending on the hinder peripherals to about the middle of their height. The intermarginal sulci descend a little in front of the middle of the length of the peripherals.

The scutes of the plastron (Plate 12, fig. 2) have a remarkable arrangement. On each bridge are two inframarginals, an anterior and a posterior. The anals and the femorals can be identified without doubt. The femorals extend forward to the hyo-hypoplastral suture. In front of the femorals is a pair of large scutes that reach nearly the middle of the entoplastron and overlap the hinder ends of the epiplastron. On each side, lying between the scutes just described and the inframarginals, is another large scute that extends from the axillary to the inguinal notch and inwardly to within about 18 mm. of the midline. It seems that these last-mentioned scutes must be the abdominals which, as in *Chelydra*, have been crowded from the midline by the expansion of the pectorals and the femorals. There are no traces of intergulars. Gulars and humerals remain to be accounted for, and only a single pair remains. It seems probable that the gulars have been suppressed or have coalesced with the humerals. The arrangement of the plastral scutes of this genus resembles that of *Baptemys tricarinata*,^a except that the abdominals of *Hoplochelys* have been excluded from the midline.

This species differs from *H. crassa* (Cope) in having the lateral keels of the carapace broader and more obtuse. *H. crassa* also evidently had the abdominal scutes pushed away from the midline. The width of these at the inguinal notch was about 13 mm.; whereas, in *H. bicarinata*, a larger individual, these scutes are only 5 mm. wide.

From *H. cælata*^b the present species differs in not having the bones sculptured with oblique ridges. The outer faces of the hinder peripherals are not flat, as they are in *H. cælata*, but more or less concave, with the free borders somewhat upturned. In *H. cælata* the hypoplastron did not enter the eighth peripheral. The hinder end of the seventh is thin, as is also the whole of the eighth. In *H. bicarinata* the anterior end of the eighth is much thickened and receives a process from the hypoplastron. The hypoplastron of *H. crassa* (Cope) does not pass behind the seventh peripheral, resembling in this respect *H. cælata*.

ASPIDERETES AMNIGENUS, new species.

The writer ventures to describe as a new species a trionychid turtle which was secured by the same party that discovered the type of *Basilemys præclara* and in the same locality and formation. The catalogue number in the U. S. National Museum is 6574. This turtle is represented by the greater part of one costal plate (Plate 11, fig. 4), which appears to be the second of the left side. Of this costal there is present all except a small portion near the middle of the

^a Hay, Fossil Turtles of North America, p. 276, figs. 347, 348.

^b Hay, Proc. U. S. Nat. Mus., vol. 35, p. 163, pl. 27.

length and a part of the hinder border near the distal end. Originally the costal had a length of about 180 mm. The breadth at the neural end is 41 mm; at the middle of the length, 51.5 mm. The thickness where the bone joined the neurals is 7 mm.; at the middle of the length, on the front border, 13.5 mm.; on the hinder border, 10 mm.; through the ridge formed by the rib at the distal end, 14 mm. The greater thickness of the anterior border, in the middle of the length, is due to the fact that the rib lies on the anterior half of the inferior surface. The free border of the carapace seems to have been cut off nearly at right angles with the upper surface, not beveled off as in many species of the family.

It is in the sculpture of the upper surface that is found a character which appears to distinguish this species from its relatives. The upper surface is furnished with a system of ridges which rise quite abruptly from the nearly plane intervals between them. Usually in the trionychid tortoises the ridges anastomose so as to produce pits more or less regular in form and size. In the present species the ridges show little tendency to anastomose, and on the proximal two-thirds of the costal there are comparatively few distinctly inclosed pits. On the proximal third the ridges run in no predominant direction and are interrupted and usually short. Many separate little hillocks are present.

On the median third of the costal the ridges, about 3 mm. apart, run mostly at right angles with the intercostal sutures and there are long flat valleys between them, but the ridges are often broken up into rows of hillocks. On the distal third of the costal the ridges are more irregular in their courses and are more often connected by cross ridges, so that there are definitely formed pits. These become more reduced in size as the free border is approached. Over the whole surface, but somewhat less conspicuously on the ridges, are seen the openings of minute vascular canals.

EXPLANATION OF PLATES.

PLATE 10.

Figs. 1-3. *Compsemys parva*×1.

Fig. 1. Plastral bones. On the left above, a part of the right epiplastron; on the right above, a part of the left epiplastron; below, the right and left hypoplastra.

2. Left first costal bone.

3. Two left costals, probably the fourth and fifth.

Figs. 4, 5. *Compsemys vafer*×1.

Fig. 4. A fragment of a costal, to show the ornamentation.

5. Part of right first peripheral.

6. *Basilemys praeclara*× $\frac{2}{3}$. View of the upper surface of the epiplastral lip.

PLATE 11.

Figs. 1, 2. *Compsemys vafer*×1.

Fig. 1. Median ends of mesoplastron and hypoplastron of right side, seen from below.

2. Left hypoplastron of another individual.

3. *Adocus vigoratus*×1. A part of a peripheral above the bridge, to show the ornamentation. The upper border of the bone is toward the left.

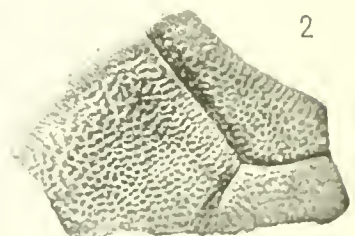
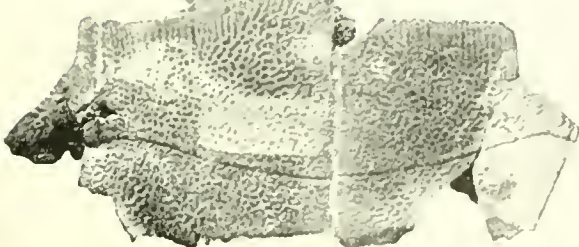
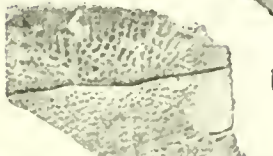
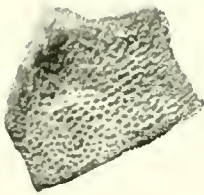
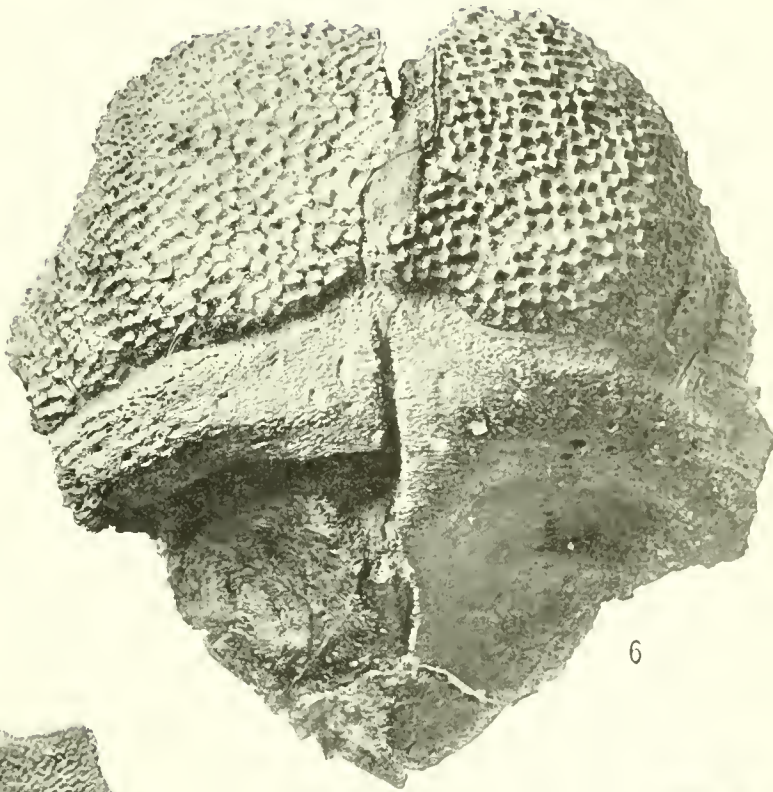
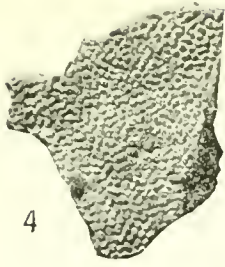
4. *Aspideretes amnigenus*×1. Left second costal plate. Some portions missing.

PLATE 12.

Hoplochelys bicarinata× $\frac{2}{3}$.

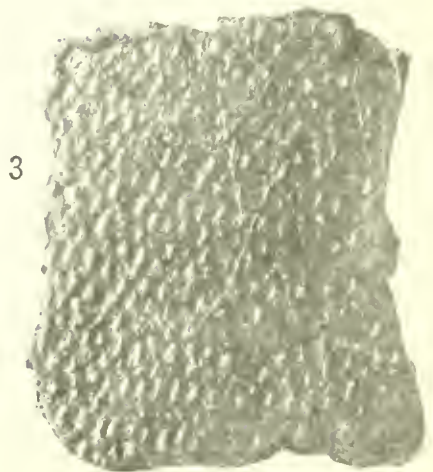
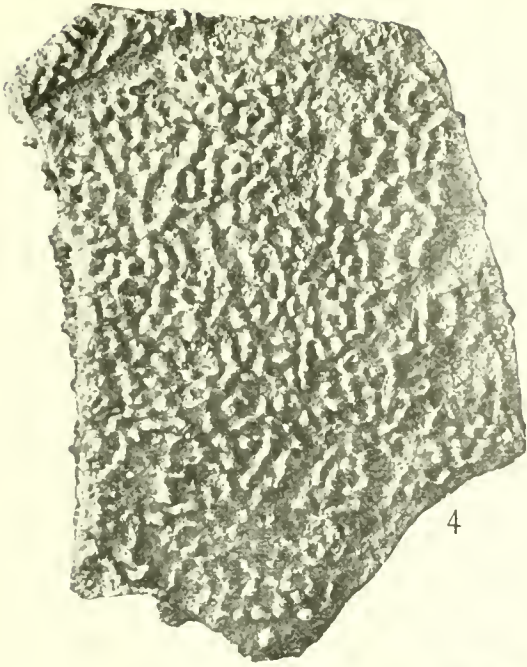
Fig. 1. Part of one neural and parts of six costals.

2. Most of the plastron and various peripherals.



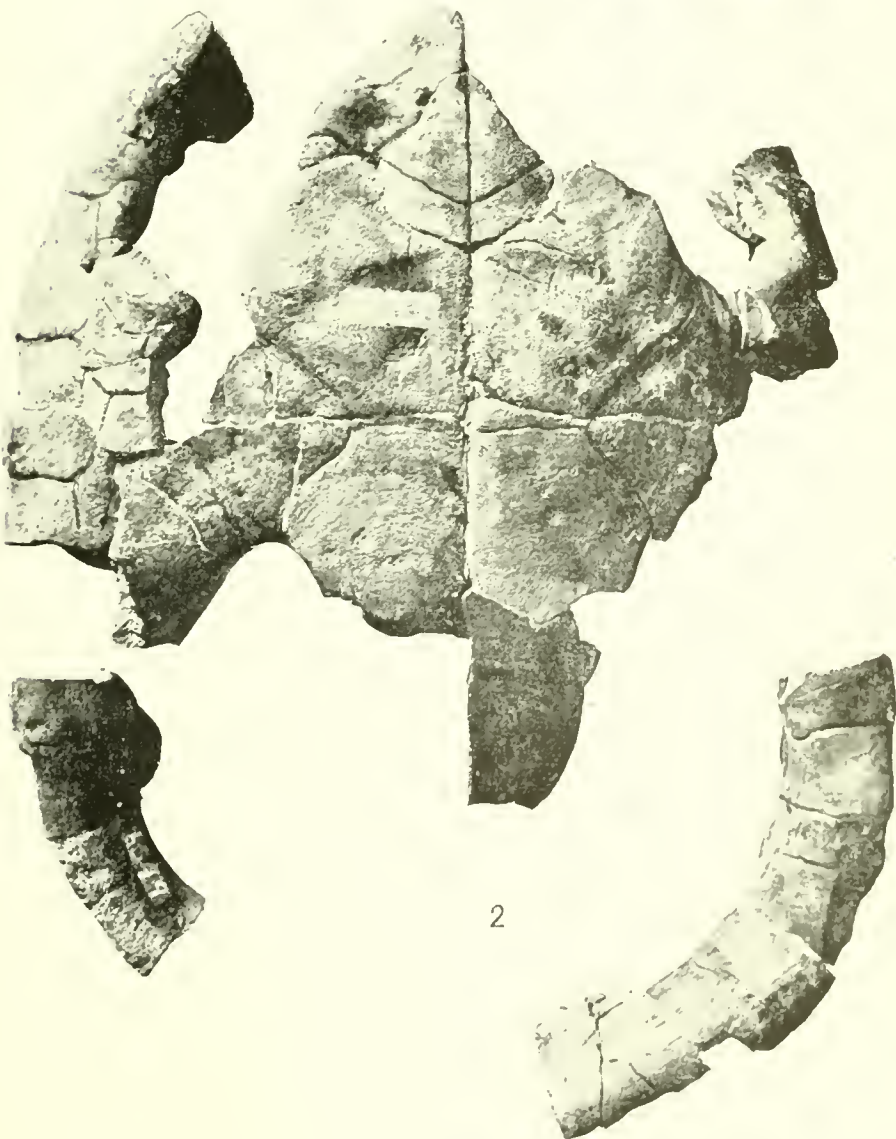
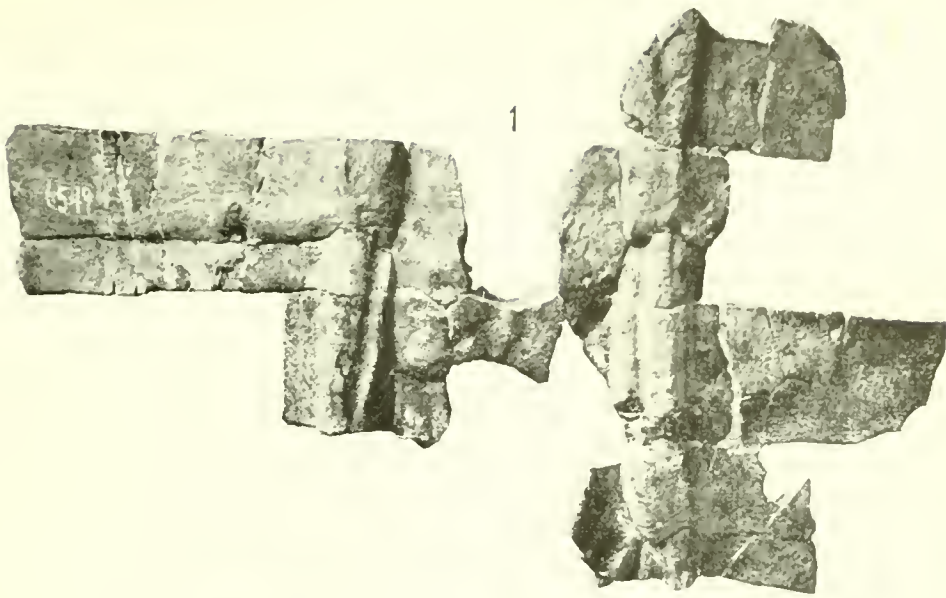
COMPSEMYS AND BASILEMYS.

FOR EXPLANATION OF PLATE SEE PAGE 326.



COMPSEMYS, ADOCUS, AND ASPIDERETES.

FOR EXPLANATION OF PLATE SEE PAGE 326.



HOPLOCHELYS BICARINATA.

FOR EXPLANATION OF PLATE SEE PAGE 326.