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DESCRIPTIONS OF SOME FLORIDIAN FOSSIL VERTE-  
BRATES, BELONGING MOSTLY TO THE  
PLEISTOCENE.

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PLATES 1-9.

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# CONTENTS.

	PAGE
Introduction .....	41
Mammalia .....	41
Equidae .....	41
Hipparion plicatile .....	41
Parahippus sp. ....	42
Cervidae .....	43
Odocoileus osceola .....	43
Reptilia .....	45
Testudinidae .....	45
Testudo ocalana, new species .....	45
Testudo incisa, new species .....	46
Testudo distans, new species .....	48
Testudo sellardsi, new species .....	49
Testudo luciae, new species .....	52
Bystra nanus, new genus and species .....	53
Gopherus praecedens, new species .....	55
Emydidae .....	57
Terrapene formosa, new species .....	57
Terrapene antipex, new species .....	58
Terrapene innoxia, new species .....	61
Pseudemys caelata .....	64
Trachemys ? delicata, new species .....	66
Trachemys bisornata .....	67
Trachemys sculpta Hay .....	68
Trachemys eglypha ? .....	70
Trachemys ? nuchocarinata, new species .....	70
Pseudemys floridana persimilis, new sub-species .....	71
Chelydra laticarinata, new species .....	72
Chelydra sculpta, new species .....	73

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Plates 1-9.

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The greater part of the vertebrate materials described in the present paper belongs to the collection of the Florida State Geological Survey and was put into my hands by Dr. E. H. Sellards for examination. However, the portion of the upper jaw of *Hipparion plicatile* was given me, on a visit to Ocala, Florida, by Mr. William M. Dale, to be transferred to the U. S. National Museum. The interesting little land tortoise herein described is the property of Dr. Henry G. Bystra, of Brooksville, Florida. The part of a plastron which is referred to *Terrapene antipex* belongs to Mr. Fred R. Allen, of St. Augustine.

Florida is extremely rich in the bones and teeth of extinct vertebrate animals; and the efforts of Dr. E. H. Sellards, the State Geologist, to secure and preserve these for science ought to receive the encouragement and assistance of all citizens of the State. Finders of fossil teeth and bones ought to send them to the office of the State Geologist, at Tallahassee, instead of bestowing them on transient visitors who esteem them only as curiosities.

## MAMMALIA.

### FAMILY EQUIDAE.

#### *HIPPARION PLICATILE* LEIDY.

Plate 2, fig. 8.

From Mr. William M. Dale, Gainesville, Florida, vice-president of the Dunnellon Phosphate Company, the National Museum has received a part of the palate of this species. It has received the number 8265. The specimen was found in a phosphate mine at Juliette, about three miles north of Dunnellon, in a bend of the

Withlacoochee river, at a depth of 60 feet under ground. This fragment contains the second, third and fourth premolars of the right side. The teeth are in fine condition. The fragment is illustrated on plate 2, figure 8, of the natural size. The following measurements have been secured:

Measurements of premolars in millimeters.

Dimensions taken	Height	Length	Width
Pm <sup>2</sup>	24	26	21
Pm <sup>3</sup>	24	22	22
Pm <sup>4</sup>	24	21	23

In the second premolar the protocone comes into pretty close contact with the anterior intermediate column (protoconule). In the other teeth it is well removed from the adjacent columns.

*PARAHIPPUS?* SP. INDET.

Plate 8, figs. 1-2.

In the collection of the Florida Geological Survey are five lower teeth which seem to belong to the genus *Parahippus*. No. 1634 is a right molar with a part of the front end missing and with a long hinder root; No. 1635, the anterior end of a right molar; No. 1636, the crown of a left molar; No. 1637, the crown of a left molar; No. 1638, the crown of another left molar. These teeth were all found at Newberry, Alachua county, Florida, and were presented by the Franklin Phosphate Company.

The following table presents the measurements of some of these teeth.

Measurements of lower teeth of *Parahippus* sp. indet., in millimeters.

Dimensions taken	No. 1636	No. 1637	No. 1638	No. 1634
Length -----	13.5	13.5	12	13.5
Width of front lobe---	10	10.5	10	10
Width of hinder lobe--	11	11.5	9.5	8.5

No. 1635 appears to have been a larger tooth than the others, inasmuch as the width of the front lobe is 12 mm.

In these teeth there is an internal cingulum which continues

across the front and rear of the crown. The mesostyle is marked off from the metaconid by a very shallow groove. While the crowns of all the other teeth are very black, that of No. 1637 is brownish yellow. It may be a milk tooth. Although these teeth probably belong to an undescribed species of *Parahippus* it seems to be better not to apply to them a systematic name until after better materials, especially upper molars, shall have been found. Figure 1 of plate 8 represents No. 1638; figure 2, No. 1636, both one-half larger than the natural size.

The writer has studied a fragment of an upper jaw, with molars of a *Parahippus*, which was found in phosphate deposits near Charleston, S. C. This jaw belonged to a much larger species than that which is represented by the teeth here described from Newberry, Florida.

#### FAMILY CERVIDAE.

##### *ODOCOILEUS OSCEOLA* (BANGS).

Plate 8, figs. 3-5.

In the collection of the Florida Geological Survey are some teeth which belong to *Odocoileus* and perhaps to the species now existing in Florida, *O. osceola*. By many this form is regarded as only a subspecies of *O. virginianus*. Of these teeth there are an upper right second molar (No. 1443), an upper left probably first molar (No. 1439), a lower right second molar (No. 1379), two lower left third molars (Nos. 1446, 1448), and a lower right third molar (No. 1424).

All of these teeth were found near Dunnellon, Marion county, in the "Cullens river mine," and were presented by Messrs. Schilman and Bene.

For purposes of comparison measurements have been secured from two skulls of the deer now living in Florida. These belong to the Biological Survey of the Department of Agriculture. One, No. 167764, is that of a doe which was obtained at St. Vincent; the other, No. 58292, that of a buck which was secured in Osceola county. The basilar length of the doe's skull is 221 mm.; that of the buck, 270 mm. The length of the teeth is taken near the middle of the width, while the width is taken across the front lobe and at the base of the crown.

Measurements of teeth of *Odocoileus osceola* in millimeters.

Upper Teeth.				Lower Teeth.			
	167764	58292	1439 1443		167764	58292	1379 1446
Pm <sup>2</sup> length----	12.5	12.5	--	Pm <sub>2</sub> length----	9.5	7.5	--
width----	10	10	--	width----	5.5	4.5	--
Pm <sup>3</sup> length----	10	10	--	Pm <sub>3</sub> length----	12	10.5	--
width----	11	11	--	width----	6.5	6.5	--
Pm <sup>4</sup> length----	9.5	9.5	--	Pm <sub>4</sub> length----	12	11.5	--
width----	12	12	--	width----	8.5	8	--
M <sup>1</sup> length----	13.5	13.5	13	M <sub>1</sub> length----	14	13.5	--
width----	13	14	14	width----	9	9.2	--
M <sup>2</sup> length----	14	14.5	14	M <sub>2</sub> length----	15	15	15
width----	15	15.5	14	width----	10	10.5	9.5
M <sup>3</sup> length----	13.5	14.5	--	M <sub>3</sub> length----	20.5	20.5	20
width----	15	15.5	--	width----	10	10	10

It will be observed that the two individuals of *O. osceola* agree closely in the measurements. The fossil teeth are not greatly different. However, in the tooth No. 1443 (pl. 8, fig. 3) the width across the hinder lobe is 12 mm.; while in the doe examined the width is 14 mm.; in the buck, 14 mm. In the molar No. 1439 (pl. 8, fig. 4) the hinder lobe is only 12 mm. wide. It is found too that the third lobe, or talon, of the hinder molar of the fossil teeth is 6 mm. wide; while in the existing deer in Florida it is only 5 mm. However, in the last lower molar, No. 1446, (pl. 8, fig. 5) the talon is 5 mm. wide. In the fossil molar No. 1379 the greatest width, 10 mm., is at the second lobe; while in the doe this width is found in the front lobe. The fossil upper molars seem, therefore, to have a narrower hinder lobe; while the talon of the hinder lower molar is wider than in the existing deer. On the other hand, the lower last molar, No. 1424, is about 1 mm. narrower in all parts than the other two third molars. One would hardly be justified in proposing at present a new name for the Pleistocene remains of *Odocoileus* found in Florida, but the differences need to be noted.

The finding of the antlers of deer in the Pleistocene deposits in Florida and South Carolina is not at all uncommon.



## REPTILIA.

## FAMILY TESTUDINIDAE.

*TESTUDO OCALANA*, NEW SPECIES.

Plate 3, figs. 1-4; Plate 9, figs. 1-3.

*Type-specimen*.—Left half of the epiplastron, No. 4299 of the Florida Geological Survey.

*Type locality and formation*.—Ocala, Florida. Pleistocene.

*Diagnosis*.—Epiplastral beak closely resembling that of *T. crassiscutata*. Thickest part of border behind the beak distant from free edge less than the thickness. In *T. crassiscutata* the thickest part equal to only one-half its distance from the free edge.

In a considerable collection of tortoise remains, including more than one, probably three or four species, which was presented by the Florida Lime Company and made near Ocala, Marion county, are some parts which belong apparently to an undescribed form. To this is given the name *Testudo ocalana*. As type of the species is taken the left half of the epiplastral beak, No. 4299 (pl. 3, fig. 1). This resembles closely the corresponding bone of a specimen which was found in Hillsboro county and which, after being referred provisionally to *T. crassiscutata*, was figured in three positions (Foss. Turtles N. A., p. 461, figs. 622 *a-c*). These figures are here reproduced (pl. 9, figs. 1-3) and will serve to illustrate the Ocala specimen. The latter measures from the midline in front to the outer hinder angle 79 mm.; the greatest thickness of the epiplastral lip is 34 mm., somewhat less than in the one figured. The greatest thickness at the end which articulated with the hypoplastron is 18 mm. It seems necessary to refer this specimen from Hillsboro county to this species.

In the collection is a large part of a hyoplastron, No. 4292, (pl. 3, fig. 2) which belonged to a slightly larger individual, inasmuch as the greatest thickness at the hyo-epiplastral suture is 22.5 mm. The form of the thickened border in this region is identical in the two specimens.

The bone extends to the midline and includes 28 mm. of this border behind the entoplastron. From this fact it is determined that the front lobe, measuring from where the humeropectoral sulcus crosses the border, had a width of 160 mm. The entoplastron was 66 mm. wide and was rounded behind. The sulcus mentioned passed close behind the entoplastron. The length of the pectoral

scutes at the midline was 17 mm. As usual, they expanded greatly behind the axillary notch. The bone is of moderate thickness, 12 mm. at the midline, about 8 mm. where it joined the hypoplastron.

The epiplastral and hyoplastral bones described differ from those of *T. crassiscutata* in having the thickest part of the bone, at the hyo-epiplastral suture relatively nearer the free border. In *T. crassiscutata* the greatest thickness is hardly equal to one-half of the distance from the free border to the summit of the slope on the upper surface. In *T. ocalana* the corresponding fraction is four-fifths or more.

A right first costal bone present (No. 4288) is referred provisionally to this species (pl. 3, fig. 3). Only a part of the hinder inner angle is missing. It presents borders for articulation with the first neural, the nuchal, the first, second, third, and fourth peripherals, and the second costal. From the outer angle to the border for the neural it measures 133 mm. The thickness at the neural is 10 mm. The border for union with the nuchal and the first and second peripherals is very irregular and jagged; that for union with the third and fourth peripherals is smooth. The first vertebral scute had a width in front of 94 mm. in addition to the width of the neural. At its hinder end the width was 48 mm. in addition to that of the neural.

A hinder peripheral, apparently the left eighth, is referred to this species. Its number is 4311. Figure 4 of plate 3 presents a view of its front borders.

#### *TESTUDO INCISA*, NEW SPECIES.

Plate 3, figs. 5-8.

*Type specimen*.—The xiphiplastral of the left side, No. 4287 of the collection of the Florida Geological Survey.

*Type-locality and formation*.—Ocala, Marion county, Florida. Pleistocene.

*Diagnosis*.—Xiphiplastron thick and heavy, with a deep and rounded notch at the rear, between the two acute terminal processes. Anal scutes very short at the midline.

In a lot of bones presented by the Florida Lime Company, at Ocala, is the xiphiplastral bone here described. Whether any of the other bones in the collection belong to the same species it is impossible to say. The bone here described and figured (pl. 3, fig. 5) indicates a tortoise fully as large as the existing so-called



gopher of Florida. The width at the front of the bone is 60 mm.; the length along the midline, 38 mm. From a line at right angles with the midline and proceeding from the front of the notch the lateral processes extended backward 29 mm. This is, therefore, the depth of the notch. Its width behind was 60 mm. At the inner front angle of the bone the thickness is 8 mm. This increases rapidly, especially near the outer border, where the thickness is 20 mm. From the top of the ridge thus formed the outer border descends steeply. At the furrow between the femoral and the anal scutes the border is acute and the wall slopes less steeply and has a height of 11 mm. The terminal process is triangular. Its lower face is convex. On its upper surface a sharp ridge runs from its base to its apex. From the summit of the ridge the surface slopes in each direction to the free borders of the process. The greatest thickness at the base is 12.5 mm. The area for the anal scute is 43 mm. wide, 39 mm. along the outer border and 8 mm. at the midline. This scute differed from that of the existing gopher (*Gopherus polyphemus*) in being much shorter at its median end.

With this xiphiplastral are associated provisionally the following specimens found at Ocala: A left seventh peripheral and a part of an eighth, No. 4286; a right seventh peripheral, No. 4297; a hinder right peripheral, No. 4305; a part of a left sixth costal, No. 4295; and a part of a bridge peripheral of the left side. The peripherals are remarkable because of their lack of curvature from the upper to the free border. As the xiphiplastral bone is suggestive of relationship with *Gopherus polyphemus*, so too are the peripherals. However, these peripherals are in one way quite different from those of the existing land tortoise of Florida. In this species the free border is prolonged somewhat where crossed by the intermarginal furrows; while in the peripherals here assigned to *T. incisa* the border is there notched. In both species the border is scalloped, but in *T. incisa* the notches are in the peripherals; in *Gopherus polyphemus*, between them.

The height of the left seventh peripheral, taken in front, is 75 mm.; taken behind, 65 mm. The thickness at the front and near the upper end is 8 mm. As will be seen from the illustration (pl. 3, fig. 6), the lower border is notched where crossed by the intermarginal furrow. This indicates that the hinder free border of the carapace was scalloped. The furrow just mentioned, as it ascends, comes nearer and nearer to the front border of the bone.

The outer face of the bone is nearly flat, as is too that of the preserved part of the eighth peripheral. On the inner face of the seventh peripheral is seen the ridge against which rose the hypoplastral buttress. This buttress appears to have been ankylosed to the peripheral.

The right seventh peripheral (pl. 3, fig. 7) belonged to a younger individual. On the plate its lower border is directed upward and the inner face is shown. A fragment of the hypoplastral buttress remains attached. The outer surface is nearly flat. The lower border is hardly notched. What appears to be a ninth, possibly an eighth, right peripheral is represented as showing its front border (pl. 3, fig. 8). The individual was of about the same size as that of figure 7. The outer surface is convex from front to rear, but plane from above downward. There is a quite deep notch in the free border.

*TESTUDO DISTANS*, NEW SPECIES.

Plate 3, fig. 9.

*Type-specimen*.—An entoplastron, No. 4289, in the collection of the Florida Geological Survey.

*Type-locality and formation*.—Ocala, Florida. Pleistocene.

*Diagnosis*.—Rear of entoplastron largely occupied by the pectoral scutes.

In the collection made at Ocala and presented by the Florida Lime Company is a large entoplastron which is different from any known to the writer. A description of it may eventually lead to the discovery of other parts of the species. It is represented by figure 9 of plate 3. The remarkable feature of the bone is the fact that the pectoral scutes extended forward on its area; whereas in nearly all other species of the genus these scutes have their front border just behind it.

The length of the bone along the midline is 128 mm.; the greatest width, 145 mm. The thickness near the midline and 80 mm. behind the front is 15 mm. As will be observed, the gular scutes extended backward on the entoplastron about 20 mm. The length of the humerals on the entoplastron is about 80 mm. but the left one is the shorter. The humero-pectoral sulcus entered the area of the bone nearest its widest part and swept forward and inward, then backward and inward to the midline.

This bone cannot belong to *T. crassiscutata*; because the ento-

plastron of the type, while not twice as wide as the bone here described, is nearly five times as thick. The entoplastron of that species has likewise a different shape; and the gulars seem to have occupied more of its anterior end. The bone cannot belong to *T. ocalana*; because in this species, as usual, the pectorals do not infringe on the entoplastron.

*TESTUDO SELLARDSI*, NEW SPECIES.

Plate 8, figs. 6-8.

*Type-specimen*.—A part of the xiphiplastron, accompanied by parts of the carapace, of a large tortoise, No. 1831 of the Geological Survey of Florida.

*Type-locality and formation*.—Vero, St. Lucie county, Florida. Pleistocene.

*Diagnosis*.—In size and structure resembling *T. crassiscutata*, but having the outer face of the anterior part of the thickened xiphiplastral border flat or concave, instead of convex; the thickness of the anterior end of the border contained in the distance to the bottom of the xiphiplastral notch 3.6 times, instead of 3 times.

In the paleontological collection at Tallahassee are various remains of this species regarded as hitherto undescribed. They were obtained in the canal of the Indian River Farms Company, near Vero, St. Lucie county, south of the Florida East Coast Railway. The fragments have the number 1831. As far as possible the fragments have been brought together. It is found that there are present a part of the second neural plate and all of the fourth, most of the fifth and all of the sixth, seventh and eighth; also the proximal ends of the right fourth, fifth, and seventh costals; and of the left fifth and seventh; also various other fragments of costals; also the left side of the xiphiplastron. These parts indicate a very large animal. Some of them are represented by figures 6-8 of plate 8.

The following are the dimensions of the neurals measured, the length being taken at the middle, the width where greatest, and the thickness at the middle of the costal border.

## Measurements of neurals in millimeters.

No.	Length	Width	Thickness
4	108	185	38
5	115	150	30
6	87	157	27
7	78	134	27
8	75 <sup>+</sup>	110	24

From the length of these neurals it is calculated that the carapace had a length of about four feet. Along the midline of the fourth neural there is a broad deep groove. The upper surface of the fifth neural slopes from both ends toward the scutal furrow which crosses it. That of the seventh is concave. The eighth neural is crossed by a scutal furrow. From the scutal furrow which crosses the fourth costal it is ascertained that the third vertebral scute had a width of 300 mm. The fourth vertebral scute extended back on the eighth neural plate.

It is especially in the hinder lobe of the plastron where are found differences which distinguish this species from *Testudo crassiscutata*. Some of these differences are brought out in the following table of measurements. In the third column are given the dimensions that the bone of *T. crassiscutata* would have in case the first measurement were the same as in *T. sellardsi*, 238 mm.

Measurements of xiphiplastra of *Testudo crassiscutata* and *T. sellardsi*, in millimeters.

Dimensions taken	T. sellardsi	T. crassiscutata	
		Actual	Reduced
From outer end of hypo-xiphiplastron to bottom of xiphiplastral notch -----	238	255	238
Greatest thickness of xiphiplastron at suture just named -----	66	85	80
Thickness of xiphiplastron at suture named and 80 mm. from border -----	40	35	33
Thickness of xiphiplastron at midline and 40 mm. in front of notch -----	35	32	30
Fore-and-aft extent of horn-covered portion of upper surface of xiphiplastral lobes -----	63	83	77
From tip of xiphiplastral lobes to bottom of notch, along the border of the bone -----	84	120	112

When we compare closely the xiphiplastron of the two species we find various differences which show themselves to the eye. The outer face of the wall running along the outer border of the bone is, at the anterior end, perpendicular in both species. Further backward, about one-third the distance to the extremity of the bone, the outer face of the wall in *T. crassiscutata* has become slightly convex fore-and-aft (pl. 8, fig. 8, a, a) and quite convex (pl. 8, fig. 8, c, c) from below to its upper border; whereas, in *T. sellardsi* it has become concave from front to rear (pl. 8, fig. 8, b, b) and only slightly convex (pl. 8, fig. 8, d, d) up and down.

From the summit of the wall mentioned its inner face falls off much more rapidly in *T. crassiscutata* than in *T. sellardsi*, so that at a distance of 80 mm. from the outer border of the bone, measured on the lower surface, the thickness is greater in the latter (40 mm.) than in the former species (35 mm.). At a point about halfway along the inner face of the wall the upper surface of the bone has sunken so much that a sort of wide pit is produced. In *T. sellardsi* this pit is much shallower.

The upper surfaces of the lobes of the xiphiplastron which were covered with horn are disproportionately broader in *T. crassiscutata* (85 mm.) than in *T. sellardsi* (65 mm.). The lower surface of the xiphiplastron of the type of *T. crassiscutata* is smooth; that of *T. sellardsi* are provided with vermiform grooves, from 3 mm. to 5 mm. in width and of varying depth. These continue on the horn-covered parts of the upper surface. This feature may have been individual.

The lack of common parts makes it practically impossible to compare the carapaces of the two species here mentioned. In the U. S. National Museum are two neural bones, found near Tampa, Florida, which the writer has figured (Foss. Turtles N. A., p. 460, fig. 618). It is, however, not wholly certain that they belonged to *T. crassiscutata*. One of these is the fourth neural and may, therefore, be compared with the fourth of *T. sellardsi* (pl. 8, fig. 6). It will be seen that they differ somewhat in outline; but this may not be important. The length of that of *T. crassiscutata* is 130 mm.; its width, 200 mm. The length is, therefore .65 of the width. In *T. sellardsi* the length is .53 of the width. In both species the width of the third vertebral scute was about 300 mm.



At present, it appears that parts of the carapace, not found with the rear portions of the plastron, belonging to *T. crassiscutata*, *T. sellardsi* and *T. hayi*, can hardly be distinguished, the one species from the other.

A comparison of text-figure 6 with that of a large land tortoise figured by Dr. Sellards, but without a systematic name (Seventh Ann. Rep. Fla. Geol. Surv. 1915, p. 70),\* shows at once that the animals represented belonged to quite distinct species. In the species figured by Sellards only the second neural bone had taken on the octagonal form. Indeed, the neurals in general had attained a stage of differentiation representing that of the Oligocene genus *Stylemys*. The fourth neural is hexagonal; whereas, in *T. sellardsi* it is octagonal. The fifth neural has quite different forms in the two species.

*TESTUDO LUCIAE*, NEW SPECIES.

Plate 9, fig. 5.

*Type-specimen*.—Part of the right hypoplastral bone, No. 1807 of the Florida Geological Survey.

*Type-locality and formation*.—Vero, St. Lucie county, Florida. Pleistocene.

*Diagnosis*.—A species perhaps as large as *T. crassiscutata*, but differing in having a thinner wall along the border of the base of the hinder lobe.

Among the materials in the Florida paleontological collection is a part of a very large species of *Testudo* which appears not to have been hitherto recognized. This fragment has the number 1807 and is recorded as having been obtained from the canal of the Indian River Farms Company, east of the Florida East Coast Railway, near the Indian river, at Vero, St. Lucie county. There can hardly be any doubt that the animal lived during the Pleistocene.

The part present and forming the type of the species belongs to the right side and hinder part of the hypoplastron. It is therefore a part of the base of the hinder lobe of the plastron. It extends backward nearly, but not quite, to the suture with the xiphiplastron. The animal was about the size of *T. crassiscutata* Leidy. It appears, however, to differ from that species sufficiently. As in

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\* Subsequently described as *Testudo hayi*. American Journal of Science, Vol. xlii, Sept., 1916.



the latter, the outer border of the hinder lobe formed a high wall, perpendicular on its outer face. Between the furrow separating the abdominal and the femoral scutes and the hypo-xiphiplastral suture the height of the wall is 90 mm. The summit of the wall is narrower than in Leidy's species. The outline figures (figs. 4, 5, pl. 9) represent sections taken at the hypo-xiphiplastral suture of the two species at the place described. It will be seen that in *T. crassiscutata* (fig. 4) the bone is everywhere thicker. Toward the midline of the lobe, 90 mm. from the outer border, the thickness in Leidy's species is 36 mm.; in the one here described, only 26 mm.

The furrow between the abdominal and femoral scutes descends from the summits of the wall mentioned to the lower surface of the bone. After passing inward and forward about 40 mm. it turns and passes inward and backward, making an angle of about 60° with the outer border. On the lower surface of the bone it is a very broad, illy defined groove.

#### BYSTRA, NEW GENUS.

*Diagnosis*.—Like *Testudo*, but small and with heavy shell, anterior end of plastron not emarginate at the ends of the gulo-humeral sulci. These sulci running nearly straight across the plastron and lying wholly in front of the entoplastron. Supercaudal scute single. Type *Bystra nanus*. Named in honor of the discoverer of the type specimen.

#### BYSTRA NANUS, NEW SPECIES.

##### Plate I.

*Type-specimen*.—A complete and only slightly injured shell belonging to Dr. Henry G. Bystra, of Brooksville, Fla.

*Type-locality and formation*.—Holder, Florida. Found in a phosphate mine and belonging probably to the Miocene or Pliocene.

*Diagnosis*.—Besides the characters given under the definition, the plastron of the type has a truncated and much thickened beak; a rather deeply notched hinder lobe, which is thick in front; and vertebral scutes of moderate width.

This specimen (pl. I) was found in the operations of mining for phosphate rock. It was enclosed in a mass of silicious sand, most of which was cemented into a hard mass. The left side of

the shell was somewhat crushed so that a few of the neurals are slightly injured, as well as some of the peripheral plates above the left bridge. No essential part of the structure of the shell is obscured.

The shell shows no indications of youth. The bones are closely apposed, so that it is sometimes difficult to discover the sutures. Nevertheless, the animal was a small one. The length from the front of the plastron to the rear of the carapace is only 100 mm. On account of the great convexity of the plastron it is believed that the shell belonged to a female. The following measurements have been secured:

Measurements in millimeters.	
Length from front of plastron to rear of carapace-----	100
Length from front of carapace to rear thereof-----	105
Height from bottom of carapace-----	60
Width over hinder limbs -----	75
Length of plastron along midline-----	88
Length of plastron to rear of hinder lobe-----	93
Width of front end of anterior lobe-----	24
Width at base of front lobe-----	44
Length of bridge -----	46
Width at base of hinder lobe-----	55
Width of notch at rear of hinder lobe-----	22
Length of epiplastra along midline-----	10
Length of entoplastron -----	18
Width of entoplastron -----	17
Length of hyoplastron along midline-----	20
Length of hypoplastron along midline -----	30
Length of xiphiplastron along midline -----	15

The structure of the carapace is identical with that of various species of *Testudo*. The costal plates about the bridges are alternately wide above, with narrow distal ends, and narrow above, with wide distal ends. Those costals which are wide above articulate each with three neurals, the middle one of which is slightly smaller than the others. Behind the series of neurals there are two suprapygals and a pygal. The last suprapygal has a width of 21 mm.; the pygal a width of 27 mm. The disturbed condition of the neurals precludes measurements of all of them. The first and the fifth have a width of 13 mm. The peripheral bones above the bridges have a height, from their lower borders, of 21 mm.; while the costals joining them have a height of 32 mm.

The vertebral scutes are of moderate width, the third being 21 mm. wide, the fourth, 23 mm.; the fifth 29 mm.

The supracaudal scute is not divided. The front of the an-

terior lobe of the plastron is cut off squarely. The edge is acute, but on the upper surface the bone thickens backward for a distance of 14 mm., attaining a thickness of 10 mm. At the rear of the plastron there is a notch 22 mm. wide and 7 mm. deep. From the hinder extremities of this lobe the border thickens forward to the femoral notch, attaining there a thickness of 10 mm.

The gular scutes form a strip across the front of the anterior lobe their hinder borders being nearly parallel with the front. They measure along the midline 7.5 mm. Along the midline the humeral scutes measure 19 mm.; the pectorals, 6 mm.; the abdominals, 37 mm.; the femorals, 15 mm.; the anals, 5 mm.

*GOPHERUS PRAECEDENS*, NEW SPECIES.

Plate 4, figs. 1-2.

*Type-specimen*.—A left xiphiplastral bone, No. 5463, of the Florida Geological Survey.

*Type-locality and formation*.—Vero, St. Lucie county. Pleistocene.

*Diagnosis*.—Resembling *Gopherus polyphemus*, but having a relatively broader xiphiplastron, which is also more deeply notched on the lateral borders.

In the collection of fossil remains made near Vero, by Dr. Sellards, is a left xiphiplastral bone which appears to belong to an undescribed species. It belonged evidently to a broad and heavy-shelled animal which had a somewhat greater size than the Florida "gopher," *Gopherus polyphemus*. Upper and lower views of the bone are here given (pl. 4, figs. 1, 2).

The bone lacks only a small fragment lost from the upper surface of the outer anterior angle. The width of the bone in front is 79 mm., making the width of the whole hinder lobe at this part 158 mm. The length of the suture between this bone and its fellow is 58 mm. It will be seen that the outer border is deeply notched at the crossing of the femoro-anal sulcus. The distance from the bottom of this notch to the median suture is 48 mm. At the rear of the hinder lobe there was a notch about 80 mm. wide and 20 mm. deep. The parts of the right and left bones included between this notch and the lateral notches stand forth like a pair of ears.

The close resemblance to *Gopherus polyphemus* makes it necessary to refer the new species to *Gopherus*. For the same reason

the species called *Testudo atascosae* (Hay, Foss. Turtles N. A., p. 464, figs. 627-628) must be known as *Gopherus atascosae*.

This xiphiplastral bone resembles that of *G. atascosae*. There are, however, numerous differences. The width of the xiphiplastral part of the hinder lobe in the types of the two species is nearly the same, 158 mm. and 168 mm. In *G. praecedens* the distance from the bottom of the posterior notch to the outer end of the hypo-xiphiplastral suture is 92 mm.; in *G. atascosae* it was about 110 mm. This comes about from the fact that the xiphiplastron of the former species, including the ear-like lobules, is shorter. In the type of *G. atascosae* it had a length of 100 mm.; that of *G. praecedens* is only 83 mm. long. In *G. praecedens* there is a wall-like thickening of the bone along the outer border not greatly unlike that of *G. atascosae* (op. cit. fig. 628a); but while this is 30 mm. high in the last named species, in *G. praecedens* it was only 21 mm. The section taken through the ear-like lobule of the bone appears to have been about the same in the two species (op. cit. fig. 628b) and the thickness seems to be closely the same, 22 mm.

The thickness of the bone forming the type of *G. praecedens*, measured at the middle of the anterior border, is 8.5 mm. The portion which forms the hinder lobule and which on the lower side is occupied by the anal scute appears swollen downward, projecting several millimeters below the rest of the bone. This anal area is finely pitted, while the surface of the remainder of the bone is smooth.

*Gopherus praecedens* probably resembled the species yet existing in Florida more than it did the extinct Texas species referred to above. The males of *G. polyphemus* have the lobules of the rear of the plastron swollen on the under surface, as they were in *G. praecedens*. The xiphiplastral bone of *G. polyphemus* is, however, somewhat narrower, as compared with the length; its lateral border is far less deeply notched; the outer face of the border of the bone, at the suture with the hypoplastral is perpendicular, even overhanging, instead of sloping upward and inward, as it does in *G. praecedens*; and the border of the bone in the hinder notch is much more acute than in the fossil species here described.

No other bones are present which can be with certainty referred to this species.

## FAMILY EMYDIDAE.

*TERRAPENE FORMOSA*, NEW SPECIES.

Plate 4, fig. 3.

*Type-specimen*.—The greater part of the hinder two-thirds of a carapace which belongs in the collection of the Geological Survey of Florida. Its catalogue number is 2973.

*Type-locality and formation*.—Ocala, Florida. Pleistocene.

*Diagnosis*.—Shell high and broad, with a dorsal keel, on each side of which the areas of the vertebral scutes are deeply impressed. Hinder border of carapace moderately flared outward. Shell thin.

This beautiful species is based on a carapace (pl. 4, fig. 3) which dorsally lacks the anterior portion back to the second vertebral scute, laterally the left costal and peripheral region to the ninth marginal scute and the right costal and peripheral region nearly to the sixth marginal scute. In the part of the shell preserved there are small areas missing.

All of the bones of the carapace are solidly united, so that the forms of the neural, costal and peripheral bones are unknown. The bone composing the neurals and costals is thin. At their upper ends the costals are about 4 mm. thick; at their lower ends, only about 2 mm. At the rear end of the eighth marginal scute the bone is 10 mm. thick. The rear of the carapace descends very steeply to the moderately outwardly turned hinder peripherals. The width at the rear of the eighth marginal scutes is 112 mm.; but it exceeded this somewhat over the bridges. Measured in a straight line, the distance from the front of the second vertebral scute to the rear of the carapace is 125 mm. It is estimated that the distance from the front of the carapace to the rear was about 155 mm. If this is correct, the width was .72 of the length. In a specimen of *T. carolina* the ratio is .86. While the hinder peripherals are only moderately flared outward, as seen from behind, it is different when they are viewed from below. They are turned backward so that their lower surfaces are horizontal. The very considerable thickness of the peripherals makes possible the difference noted. At the middle of the ninth marginal scute the distance from the acute free border of the peripheral to its inner border is 19 mm.

From the free border of the peripherals behind the lateral hinge-line a low but sharp keel runs forward as far as the cara-



pace is represented. This keel lies considerably above the upper edge of the lateral hinge line.

On the areas of the second, third and fourth vertebral scutes, on each side of the midline, there is a deep impression whose surface is irregular. There is left between the two impressions a conspicuous median keel; while outside of each impression, there is left a ridge. There appear, therefore, to be a median and right and left keels. The whole surface of the carapace is more or less undulating.

The sulci which separate the various scutes, especially the costals and the vertebrales, are narrow and deeply impressed. The vertebral scutes are of moderate width. The following are the dimensions:

Measurements of vertebral scutes in millimeters.

Scute	Length	Width
2	34	39
3	35	43
4	40	37
5	20	38

The height of the supracaudals is 13 mm.; that of the tenth marginal scute, 16 mm.; that of the eighth, 20 mm.

*TERRAPENE ANTIPEX*, NEW SPECIES.

Plate 4, figs. 4, 5. Plate 5, figs. 1-5.

*Type-specimen*.—A hinder lobe of the plastron, No. 5460 of the Florida Geological Survey.

*Type-locality and formation*.—Vero, St. Lucie County, Florida. Pleistocene.

*Diagnosis*.—Size large, the plastron attaining a length of 220 mm. or more; of medium breadth; shell thick and heavy; carapace with its free borders curved upwards, keel over the bridges; free surfaces mostly uneven.

From Vero Dr. Sellards has sent many fragments of a large box-tortoise which appears to have been hitherto undescribed and to which is given the name *Terrapene antipex*. The type is a hinder lobe, No. 5460 (pl. 5, fig. 1), in which all the bones are consolidated into one mass. The course of the hypoxiphiplastral suture is barely distinguishable. The under surface is concave,



thus indicating a male. The figure referred to gives a view of the upper surface of the hinder lobe. This lobe has a length of 136 mm. along the median line; the length, taken across the lateral hinges, is 133 mm. At the midline in front the thickness is 9 mm.; but backward this increases to 15 mm. The lateral hinge lines are 46 mm. long. The horn-covered surfaces, behind the lateral hinges, are 24 mm. wide and the thickness of the bone at the inner border of the surface, is 15 mm.

Seen from below, the hypoplastron has a length of 53 mm., the xiphiplastron, a length of 80 mm. The sulci separating the various scutes run a rather irregular course, especially the median sulcus. Measured on the midline the abdominal scutes are 40 mm. long; the femorals, 24 mm.; the anals, 71 mm.

A part of another hinder lobe of a male, No. 5902, was 140 mm. wide; but only 8 mm. thick at the midline in front. The abdominals are 50 mm. long; the femorals, 21 mm. In a damaged hinder lobe of a female, No. 5461, the width is 120 mm.; the thickness in front, 10 mm. The abdominals are 45 mm. long; the femorals 13 mm.; the horn-covered surface above is 18 mm. wide.

Figure 2 of plate 5 represents of two-thirds the natural size a portion of an anterior lobe which evidently belonged to this species. Its size agrees with that of the type hinder lobe. The width at the hinge line is 130 mm. The length at the midline was not far from 90 mm. The epiplastral lip is mostly gone; but its width was close to 55 mm. The horn-covered upper surface is 18 mm. wide. The hinder two-thirds of the free border is acute. The boundaries of the entoplastron are made out with difficulty. The bone was circular, with a diameter of 44 mm. The courses of the sulci are much as in a specimen of *T. triunguis* at hand.

On plate 4, figure 4, is represented the lower surface of a hinder lobe which is referred to this species. It was found near the coast, about 28 miles south of St. Augustine, by Mr. Fred R. Allen, 113 King street, St. Augustine. The length along the midline is 122 mm.; the width, 116 mm. The abdominal scutes are 46 mm. long; the femoral only 13 mm. Nevertheless, there appear to be no good reasons for not referring this specimen to the species here described.

A fragment, No. 4435, from 20 miles north of St. Augustine (pl. 4, fig. 5), shows a part of the right side of the carapace. There are seen a part of the area covered by the first costal scute,

the rear of the first marginal scute, the second and third marginals, and most of the fourth. At the sulcus between the second and third marginals the thickness is 13 mm. In this specimen the border at the third marginal is not much curved upward but in three other specimens it is considerably curved. The upper surface is rough.

Figure 3 of plate 5 presents a view of a fragment on which are wholes or parts of the third, fourth, fifth and sixth marginal scutes. This fragment shows that there is a rather prominent keel which lies above the bridge and runs through the marginals shown. Figure 4 of the same plate presents a view of a strip of the second costal scute, a considerable part of the third marginal and parts of the seventh and eighth marginals. The upper surface of this fragment, No. 5478, is relatively smooth. This piece and another, No. 5469, present the lateral hinge line. The surface of the hinge is flat and 8 mm. wide. The border of the carapace which bears this hinge is turned inward at nearly a right angle with that part of the peripherals which is above the lateral keel. This keel is nearly on a level with the upper edge of the lateral hinge and distant from it about 15 mm.

A fragment of the carapace, No. 1782, has only feeble indications of sutures. A part of the area occupied by the fifth vertebral scute shows that the latter had a width of 45 mm. At the free edge of the bone the eleventh marginal was 20 mm. long, the twelfth, 17.5 mm. The greatest height of the former was 26 mm.; that of the twelfth, at the midline, 15 mm. The hinder part of the tenth scute had a height of 27 mm. The border of the carapace, as here represented, is moderately flared outward, more than in *T. ornata*, about as much as in *T. major*.

Another fragment, No. 5480, (pl. 5, fig. 5), presents both eleventh peripheral bones, the pygal and the suprapygal. The sutures are open. The suprapygal is nearly triangular, 38 mm. wide and 27 mm. high. The pygal is 20 mm. wide, 21 mm. high, and 10 mm. thick. The peripherals are 26 mm. wide on the free border and 28 mm. high. They are moderately flared outward. The eleventh marginals were at least as high as the eleventh peripheral and the twelfth marginals are just as high as the pygals. The fifth vertebral scute was at least 40 mm. wide.

Unfortunately, besides the piece just mentioned, we have

nothing representing the median portion of the carapace; so that it is not known whether or not there was a median keel.

This species differs from *T. formosa* in various respects. It appears to have attained a greater size and to have had a thicker and heavier shell. It appears to have been narrower in proportion to the length. The border of the carapace at the lateral hinge line, as stated above, is turned inward at nearly a right angle with the part of the peripherals above the lateral keel. In *T. formosa* the border is directed downward and only a little inward; so that the lateral keel is placed high above the lateral hinge.

*Terrapene canaliculata* (Hay, Foss. Turtles N. A., p. 363, figs. 463-465) more closely resembles *T. antipex* than *T. formosa*; but the lateral keel is much more conspicuous, the free borders of the peripherals are more strongly recurved and the shell is still thicker and heavier. It is to be noted here that the peripheral illustrated by figure 463 of the work cited belongs to the left side, instead of the right.

It is evident that none of the above mentioned box-tortoises belong to *T. putnami* (Foss. Turtles N. A., p. 361, figs. 459, 460). This was a still larger animal than *T. antipex*, having had a plastron 146 mm. wide. The hypoplastron was, proportionately, much thicker than that of the species last mentioned. It is possible that the fragment of the carapace referred (as just cited, fig. 461) provisionally to *T. putnami* belongs really to *T. antipex*; but the rear of the carapace (fig. 462) is very different from the one above described from Vero, No. 5480; for in the latter the pygal or twelfth pair of marginal scutes rise to the upper border of the pygal bone; in that of figure 462, little more than to half the height of that bone.

#### *TERRAPENE INNOXIA*, NEW SPECIES.

Plate 6, figs. 1-4.

*Type-specimen*.—A complete carapace, No. 7080, of the Florida Geological Survey.

*Type-formation and locality*.—Pleistocene. Vero, St. Lucie County, Florida.

*Diagnosis*.—Carapace thin, relatively narrow, highest at middle of length, sloping hardly more rapidly backward than forward; nuchal bone not excavated; hinder peripherals little or not at all flared outwards; vertebral scutes of moderate width; hinder marginal scutes of moderate height.

In the collection made by Doctor Sellards at Vero, Florida, are several portions of the carapace of a box-tortoise which appears to differ from any of the described species, but which does resemble considerably female specimens of *T. major*, a common species of Florida. Two of the specimens from Vero furnish nearly complete carapaces. These have the numbers 7079 and 7080. In both, all the bones are thoroughly consolidated, so that no sutures are to be seen. In the one numbered 7079 the furrows separating the dorsal dermal scutes are so indistinct that these boundaries cannot in all cases be made out. In many places, too, the costal scutes appear to have been broken up into numerous minute patches. On this account the carapace numbered 7080 is taken as the especial type of the species (pl. 6, figs. 1, 2).

In order to facilitate comparisons between this species and its existing relative, possibly descendant, *T. major*, the following table of measurements is provided. Two specimens of *T. major*, a female and a male are measured, so that some of the variations which this species undergoes may be observed.

Measurements of carapaces.

	<i>T. innoxia</i>		<i>T. major</i>	
	No. 7079	No. 7080	No. 29335 ♀	No. 29337 ♂
Length from front of nuchal bone to rear of pygal -----	125	119	128	145
Width at middle of lateral hinge of plastron -----	84	80	87	105
Height of carapace at same point----	55	55	62	70
Length of nuchal scute-----	10	7	9	12
Width of nuchal scute-----	4.5	4	2	3.5
Length of first vertebral scute-----	25	27	26	29
Width of first vertebral scute, in front	32	27	24	27
Length of second vertebral scute-----	28	28	28	33
Greatest width of 2nd vertebral scute	32	30	31.5	38
Length of 3rd vertebral scute-----	—	25	29	32
Greatest width of 3rd vertebral scute	—	34	35	41
Length of 4th vertebral scute-----	—	26	32	37
Greatest width of 4th vertebral scute—	—	24	32	34
Length of 5th vertebral scute-----	22	20	23	27
Greatest width of 5th vertebral scute	29	25	32	34

In a fragment numbered 7081 the fourth vertebral scute is 31 mm. long and 31 mm. wide. In another, numbered 7082, the fifth vertebral is 26 mm. long and 30 mm. wide. It will be ob-



served that the widths of the dorsal scutes in the carapace No. 7079, so far as they can be determined, are somewhat greater than in the one taken as the type. The lateral hinge-line is 26 mm. long and the bone is here only 4.5 mm. thick.

The differences which the writer observes between the Pleistocene form and the one with which it is compared are as follows:

1. In *T. major* the greatest height of the shell is behind the middle of the length. From this point the outline descends rapidly, backward. In *T. immoria* the greatest height is at the middle of the length; and the descent is less rapid and is not much different from the descent forward.

2. In all the specimens of *T. major* at hand the nuchal bone is somewhat excavated in front for the neck. This is not usually the case in the fossil; but in a fragment No. 7083, there is a slight curving inward of the border.

3. In the existing species the nuchal scute is nearly or wholly suppressed. In the fossil it is well developed.

4. In the existing species the hinder marginal scutes are uniformly higher than they are in the fossil. The eleventh in No. 29335 is 17 mm. high; in the fossil specimen 14 mm. high.

The carapace numbered 7079 presents some features different from those of the one taken as the type. The median keel is wanting. The hinder peripherals flare outward considerably, while in the type specimen they do so hardly at all. In this respect, however, similar differences are seen among the four specimens of *T. major*. Evidently the vertebral scutes of No. 7079 were broader than those of No. 7080, but here again similar differences are found among the specimens of *T. major*. The carapace of the fossil species is thin and light, excepting the peripheral bones. Above the bridge there is in the type carapace a hardly perceptible keel passing from the anterior free border to the hinder one; in No. 7079 this is missing. This keel varies considerably among the four specimens of *T. major*.

One fragment, No. 7083, of a carapace in which the bones had not become ankylosed presents the nuchal and the first peripheral of the left side. The nuchal is 30 mm. long, and 36 mm. wide. The thickness at the border which joins the first peripheral is 7 mm. A fragment, No. 7084, comprises the bones on which lie the second, third, fourth, and a part of the fifth marginals. This

differs from the other specimens in having the surfaces more uneven.

Another fragment, No. 7082, of those referred to this species, shows the sutures between the bones. Between the last neural and the suprapygal the eighth costals join for a space of 9 mm. The furrow between the fourth and the fifth costals crosses the last neural. The suprapygal is 19 mm. wide; the pygal 16 mm. wide.

In none of the specimens referred to this species does the tenth marginal come at all near the fifth vertebral scute, a character which differentiates the species from Cope's *T. curypygia*.

No. 5471 of the collection (pl. 6, fig. 3) is an anterior lobe of the plastron. Its size, shape, and thickness suggest that it belonged to *T. imnoxia*. It presents no characters by which it may be distinguished from the same part in *T. major*. No. 7085 (pl. 6, fig. 4) is the left xiphiplastral bone. It is 41.5 mm. long on the median suture and 34.5 mm. wide on the hypo-xiphiplastral suture. The anal scute extends forward nearly to the suture last mentioned. The horn-covered surface on the outer border of the upper surface is flat and 9 mm. wide.

*PSEUDEMYS CAELATA* HAY.

Plate 2, figs. 1-7.

In the Fossil Turtles of North America, page 356, plate LVII, the writer described the species named above. The specimens are in the National Museum and were found somewhere in Levy county, Florida. The parts figured are the nuchal (made the type of the species), the first left costal, the fifth left costal, the seventh right (wrongly called the left third) and tenth peripherals, and the left hypoplastron.

In the collection of the Florida Geological Survey are several fragments of the same species. These also were found in Levy county, at what is called the Mixon locality, two miles northeast of Williston, the type locality of the Alachua formation. The parts present are the left epiplastron (3537); a part of the right hypoplastron (3420); a part of the right hypoplastron (3418); and a part of the left (3427); a fourth neural (3425), a part of the right fifth costal (3421); the right first peripheral (3415); two left second peripherals (3423, 3426); the right third peripheral (3410); a right and a left ninth peripheral (3416, 3417). These bones certainly do not all belong to the same individual. No two



pieces fit together. Seven of the pieces are here figured (pl. 2, figs. 1-7).

The epiplastral (pl. 2, fig. 1) has the sculpture better shown than that of the specimen in the National Museum, the ridges and grooves being sharply defined. Here, as in other parts, the ridges are more or less interrupted in their course. Those in the gular area are directed fore and aft; those of the humeral area are at nearly right angles to the midline of the plastron. The same is true of the upper side of the bone. At the free border the ridges are carried out into sharp tooth-like processes. The width of the gular scutes, taken together, was 52 mm. The width of the bone, from the median border to the outer angle, is 53 mm.; the thickness at the suture for union with its fellow is 11 mm.

The fragment of the right hyoplastron (pl. 2, fig. 2), does not reach the midline and falls short of reaching the hypoplastron. Furthermore, the free border in front of the axillary notch is damaged. Its sutural borders for union with the epiplastron and the entoplastron are present. The epiplastron appears not to have made so deep a notch between the hyoplastrals as in *Trachemys scripta*. The thickness at the hyoeplastral suture is 11.5 mm. The pectoral scute had a width of 33 mm. near its outer end. The character of the very distinct sculpture is shown by the figure.

The portion of hypoplastron adds nothing to the knowledge beyond that furnished by the nearly complete bone in the National Museum; and the sculpture of the latter is better defined.

The neural bone (pl. 2, fig. 3) is quite certainly the fourth. The length on the midline is 26 mm.; the greatest width 36 mm.; the thickness, 10 mm. The upper surface is covered with numerous small tubercles and longitudinal wrinkles.

The fifth costal is represented by only the distal end. On its inner surface is a ridge against which arose the buttress from the hypoplastron.

The first right peripheral (pl. 2, fig. 4) extends back from the acute free border a distance of 40 mm. and 36 mm. along the free border. Its thickness is 11 mm. The ridges on the area of the first marginal scute run nearly parallel with the furrow between this scute and the second. Those ridges on the area of the second scute run obliquely to this furrow, forward and outward. A part of the first costal scute occupied the inner end of the bone here described.

The second left peripheral (pl. 2, fig. 5) extends 35 mm. from the free border and 33 mm. along the border. Its thickness at the anterior inner angle is 12 mm.; at the posterior inner angle, 18 mm. The upper surface is concave from the free border to the suture with the costal plate; the lower surface convex. The other left second peripheral (3426) is not so wide from outside to inside and is somewhat thicker than the one with the number 3423. On the upper surface of these two peripherals the ridges in front of the intermarginal furrow are much broken up and irregular; behind this furrow they run parallel with the free border; above the longitudinal furrow they run at right angles with this furrow.

The right third peripheral (pl. 2, fig. 6) has lost a part of its hinder inner border. The length along the free border is 37 mm.; along the front border 37 mm. The thickness at the front end is 21 mm.; of the hinder end at the free border, 26 mm. The thickening at the hinder end of the bone is to provide for the buttress from the hyoplastron. The ornamentation of the three scutal areas is different. Above the longitudinal furrow there are descending ridges. In front of the intermarginal furrow there are irregular and anastomosing ridges; behind this furrow, there are longitudinal ridges.

The left ninth peripheral (pl. 2, fig. 7) has the free border 32 mm. long. The extent of the front border is 41 mm.; the greatest thickness on the latter 10 mm. From the upper or inner border to the free border the bone flares upward somewhat. The free border is thin and acute. Near the front end of the border for union with the sixth costal is a considerable pit for the end of the rib. Above the longitudinal furrow there are tubercles arranged in rows at right angles with one another. In front of the intermarginal furrow the interrupted ridges are parallel with the furrow; behind it they are directed outward and backward.

*TRACHEMYS? DELICATA*, NEW SPECIES.

Plate 7, fig. 1.

*Type-specimen*.—A right fourth costal plate, No. 3738 of the Florida Geological Survey.

*Type-locality and formation*.—Near Labelle, Lee county, Florida. Pliocene?

*Diagnosis*.—Carapace rather large, a foot or more in length; the neurals thick, the costals thin beyond the neural end. Scutal

furrows narrow and shallow; the sculpture consisting of low sharp ridges.

No. 3738 of the collection of the Florida Geological Survey presents the larger part of the right fourth costal of a turtle which probably belonged to either *Trachemys* or *Pseudemys*. The bone is recorded as having come from the top of a stratum of shell marl, below an unconformity, about one-eighth of a mile straight east of Labelle, on Caloosahatchee river. The marl is thought to be probably Pliocene. The bone is much more thoroughly fossilized than those bones from the Pleistocene.

The costal (pl. 7, fig. 1) has lost the distal end. The upper end (directed toward the left in the figure) measured along the edge of the second vertebral scute, is 36 mm. wide. Where the bone joined the third neural it is 10 mm. thick, but at a distance of 25 mm. it is reduced to 4 mm. From the position of the furrow between the third vertebral scute and the second and third costal scutes it is seen that the vertebral had only a moderate width.

The sculpture is on the pattern of that of *Trachemys scripta*, but it is more delicate. The ridges are low and sharp. On the area of the third costal scute there are four of these in a line 13 mm. long. On the area of the second costal scute the ridges are irregular in direction.

*TRACHEMYS BISORNATA* (COPE).

Plate 7, figs. 2-7.

A nuchal bone in the collection of the Florida Geological Survey, finely preserved, is referred to this species. It has the catalogue number 3735 and was found in Pleistocene deposits in Lee county. It bears this label: From above the unconformity; about 1-8 mile by land, east of Labelle, on Caloosahatchee river.

The nuchal (pl. 7, fig. 2) is larger than that of the Texas specimen described and figured by the writer (Fossil Turtles N. A., p. 353, pl. LVI, fig. 1), but the proportions are almost exactly the same. The length along the midline is 60 mm.; the greatest width, 70 mm.; the width in front, 38.5 mm.; the thickness at the lateral angles, 16 mm. The front border is acute. The front end of the first vertebral scute is 40 mm. wide. The character of the ornamentation is shown by the figure. In the one from Texas, above referred to, the transverse ridges of the areas of the right

and left first marginal scutes are more strongly developed. In the present specimen the longitudinal ridges are more prominent; but the two sets are present on the nuchals of both. The upper surface of the bone is quite uneven. Along the midline, in the area of the first vertebral scute, is a prominent rounded ridge, and this is continued forward by the elevated area of the nuchal scute. Just outside of the keel, on the area of the first vertebral scute, the surface is depressed.

To this species is referred provisionally a right third peripheral, No. 3740, found just north of Labelle on the Caloosahatchee. Figure 3 of plate 7 shows well the character of the sculpture and the relative height of the third and fourth marginal scutes. There is a well defined lateral keel. The length of the bone along the keel is 43 mm. Figures 4 and 5 of the plate present views of the two ends of the bone.

A right sixth peripheral, No. 1755, is likewise referred to this species. It came from the canal of the Indian River Farms Company, at Vero, north of this place, east of the Florida East Coast Railway bridge over Van Valkenburg Creek. The deposits are regarded as Pleistocene. The bone has a height, measured from the lateral keel and at the hinder end of the bone, of 44 mm. The length along the keel is 42 mm. In front the thickness on the keel is 5 mm.; at the rear, 13 mm. The sculpture (pl. 7, fig. 6) is identical with that of the third peripheral, above described; but it is not so strongly expressed. Figure 7 of the same plate presents a view of the hinder end of this bone.

At Vero Dr. Sellards collected the distal end of a fifth costal bone of the right side, and this is referred to *T. bisornata*. The greatest width is 42 mm.; and the bone indicates, therefore, a carapace of about 295 mm. in length, 11 inches. It resembles much the corresponding bone in *T. scripta*; but the thickening on the inner surface to receive the buttress of the plastron does not stand out so prominently.

#### TRACHEMYS SCULPTA HAY.

Plate 7, figs. 8-10.

The numbers 3740a and 3740c are given to two bones which are referred to *Trachemys sculpta*, a species described by the writer in 1908 (Fossil Turtles N. A., p. 351, pl. LIV, figs. 4-9). The type of the species is a nuchal bone which was found in Pleisto-

cene deposits of Hillsboro county, Florida. The other bones were referred provisionally to the same species.

The two bones here described (3740a being a part of the nuchal, and 3740c the right eleventh peripheral) are recorded as coming from the north bank of the Caloosahatchee river just above Labelle. This place is in Lee county and in the township numbered 43 south, 29 east.

The hinder half of the nuchal (pl. 7, fig. 8) is missing. The part present appears to be identical with the figured type but it is somewhat larger, the distance along the front being 32 mm., instead of 29 mm. The width of the bone at the hinder edges of the first marginals is 50 mm. instead of 41 mm. The front border is somewhat more deeply notched than in the type. The greatest thickness is 16 mm. The region of the nuchal scute is elevated, as in the type. Its surface is deeply pitted. The remainder of the surface of the bone is marked by prominent and sharp ridges.

The eleventh peripheral (pl. 7, fig. 9) is complete. Its greatest height is 37 mm.; the width along the free border, 34 mm.; the thickness at the suture with the tenth peripheral 12.5 mm. The bone joined the tenth peripheral, the eighth costal, the suprapygal and the pygal. The free border is notched where crossed by the inter marginal furrows. On its outer surface are scutal areas belonging to the eleventh and twelfth marginals and the fifth vertebral. The positions of the sulci indicate that the fifth vertebral did not come down on the pygal nor the fourth costal on the tenth peripheral. The fifth vertebral area is marked by sharp broken ridges and pointed tubercles. The sharp ridges of the area of the eleventh marginal run parallel with the front edge of the bone; those of the twelfth marginal area are directed backward and downward.

The proximal end of a right third costal, No. 352 (pl. 7, fig. 10), is referred to this species. On this fragment are shown parts of the second and third vertebral scutes and a part of the second costal scute. The figure referred to shows the character of the sculpture. The width of the bone along the sulcus between the costal scute and the two vertebrals is 28 mm.

From Vero, St. Lucie county, Dr. Sellards has sent to the writer some bones which appear to belong to this species. One, No. 7102, is a portion of a nuchal like that here figured (pl. 7, fig. 8). The nuchal scute is somewhat narrower and the sculpture of the bone in general is hardly so strong. There are also two



eleventh peripherals of the left side, Nos. 4418 and 5485, which, while differing slightly from each other, preserve the essential characters of the species.

At Vero was obtained a right sixth costal bone which is referred to *T. sculpta*. The sculpture of the surface is identical with that shown by figure 9, plate LIV, of the writer's Fossil Turtles of N. A.

*TRACHEMYS EUGLYPHA* (LEIDY)?

Plate 4, fig. 6.

From Ellenton Dr. Sellards has sent a portion of a nuchal bone which has the number 5775 and which it seems must be referred to Leidy's species named above. Most of the bone is missing behind the sulcus which runs between the first marginals and the first vertebral. Although differing in some respects from the type described and figured by Leidy (Trans. Wagner Inst., Vol. II, p. 27, pl. IV, fig. 1) it possesses many of the striking characters of that type specimen. It is extremely thick, 21 mm., at the suture with the first peripheral of each side. Just behind, at the rear of the nuchal scute, the thickness is 18 mm. The upper surface is strongly sculptured. The sulci form deep and sharp cuts. The nuchal scute area is 26 mm. long and 9 mm. wide. It ends in front in a sharp point, instead of being obtuse as in the type.

While the sculpture of the upper surface resembles somewhat that of *T. sculpta* the bone differs in being much thicker.

The type was found in Peace Creek deposits, which formerly supposed to belong to the Pliocene are now regarded by Dr. Sellards as undoubtedly Pleistocene.

*TRACHEMYS? NUCHOCARINATA*, NEW SPECIES.

Plate 6, fig. 5.

*Type-specimen*.—The anterior portion of a nuchal bone, No. 4437 of the collection of the Florida Geological Survey.

*Type-locality and formation*.—Florida Coast Line Canal, 20 miles north of St. Augustine. Pleistocene.

*Diagnosis*.—Nuchal bone furnished with a strongly developed median keel.

The portion of a nuchal bone which is taken as the type of this species lacks the hinder part, but it is so peculiar that it can hardly be confused with any other nuchal.

The length cannot be determined, but it was quite certainly

close to 46 mm. The extreme width is 57 mm.; the width along the anterior border is 32 mm. The greatest thickness in the border which joined the first peripheral is 11 mm. The bone along the anterior border is acute, and this border is notched in the midline. The upper surface of the bone is concave on each side of the median rounded keel. This keel is unusually prominent and projects well forward between the marginals of the first pair. The nuchal scute is extremely narrow on the upper surface; but on the lower side of the bone it widens posteriorly to 11 mm. The front width of the first vertebral scute is 46 mm. It narrows backward as far as the bone extends and was probably urn-shaped. The sulci are rather sharply and deeply impressed. The surface of the carapace was probably somewhat uneven.

*PSEUDEMYIS FLORIDANA PERSIMILIS*, NEW SUBSPECIES.

Plate 5, figs. 6-8.

*Type-specimen*.—A pair of epiplastral bones, No. 7098 of the Florida Geological Survey.

*Type-locality and formation*.—Vero, St. Lucie County, Florida. Pleistocene.

*Diagnosis*.—Gutter for the neck in the epiplastral lip more deeply excavated than in *P. floridana* and the border immediately outside of gular scutes less acute.

In the collection made by Dr. Sellards at Vero is a pair of epiplastral bones which resemble very closely the corresponding parts in specimens of *Pseudemys floridana*. Some differences, possibly not of great value, appear to exist. In order that these differences may be kept in mind and that the literature which may accumulate around this fossil form may be in a manner isolated, it is thought best to give it a subspecific name. Some of the peculiarities of the epiplastrals (No. 7098) will be seen from the figure (pl. 5, fig. 6). The epiplastral lip is 56 mm. wide. The width of the anterior lobe at the outer ends of the sutures between these bones and the hyoplastrals is 107 mm. The length of each of the sutures is 32.5 mm. The width of the entoplastron was 49 mm. The greatest thickness of the two bones on the suture uniting them is 13.3 mm. The thickness on the epi-hyoplastral suture is 11 mm. These measurements agree quite well with those made on the two shells of *P. floridana*, except that the thickness on the common suture in these does not exceed 11 mm.

The gutter for the neck is more deeply excavated than in either of the two shells mentioned and several others examined. Of the free border of each epiplastral the anterior two-thirds is much more obtuse than in the specimens of *P. floridana*. As in the latter, the horn-covered area on the upper surface of these bones is very narrow, being only 7 mm. wide at the epi-hyoplastral suture and only 4 mm. at the midline in front.

In the collection, with the number 7099, is a left xiphiplastral bone which is referred provisionally to this sub-species (pl. 5, fig. 7). The length along the median suture is 68 mm.; the width along the hypo-xiphiplastral suture is 61 mm. The corresponding measurements of the two mentioned shells of *P. floridana* do not differ much. The greatest thickness at the hypo-xiphiplastral suture and about 20 mm. from the free border is 11 mm. As in the case of *P. floridana*, the width of the horn-covered area on the upper surface and at the front of the bone is 8 mm. The depth of the notch at the outer end of the femoro-anal sulcus is much greater than in *P. floridana*, but it may be that this is not normal. A right third costal plate, No. 7100, is shown on plate 5 (fig. 8). Its width at the outer end is 48 mm. It appears to agree in all respects with the corresponding bone of the shells of *P. floridana* at hand.

*CHELYDRA LATICARINATA*, NEW SPECIES.

Plate 6, figs. 6-7.

*Type-specimen*.—The sixth left peripheral, No. 7094 of the Florida Geological Survey.

*Type-locality and formation*.—Vero, St. Lucie County, Florida. Pleistocene.

*Diagnosis*.—Peripheral bones considerably thicker than those of *C. serpentina*; those over the bridges with a sharp keel; upper surfaces smooth.

Among the chelonian bones collected at Vero are ten which appear to have belonged to the genus *Chelydra*. Three of the bones are parts of costals, five are peripherals, one a neural, and one is the inner portion of the left hyoplastral. A study of these bones makes it evident that two species are represented. As the type of the one above named a bone, No. 7094, the sixth left peripheral (pl. 6, fig. 6) is taken.

This bone has a length of 42 mm. It indicates that the length of the carapace was close to 315 mm. about 12 inches; therefore,

not so large as some specimens of *C. serpentina*. The width at its front end is 30 mm.; while that of a specimen of *C. serpentina*, with carapace 240 mm. long, is hardly 20 mm. The greatest thickness, at the hinder end, is 13 mm.; in the case of *C. serpentina*, only 6 mm. In individuals of *C. serpentina* there is a narrow ridge, sometimes obsolete, usually inconspicuous, which runs along on the bridge peripherals from the free border in front to that behind. In the species here described this ridge is very prominent. The surface above this ridge is much flatter than it is in the existing snapping turtle. The border of the bone below the keel mentioned is 12 mm. wide; in the specimen of *C. serpentina* used for comparison, only 6 mm. wide. The surface of the type bone is smooth.

A bone numbered 5943 (pl. 6, fig. 7) is the left eighth peripheral. Its length is 44 mm.; its width at the middle of the length is 34 mm., the thickness 11.5 mm. In the carapace of *C. serpentina* used for comparison these dimensions are respectively 31 mm., 16 mm., and 5.5 mm. The upper surface is somewhat flatter, the lower considerably more convex than in *C. serpentina*. The eighth and ninth marginals at their junction are 21 mm. high; in *C. serpentina*, 15 mm.

Another hinder peripheral, No. 5508, seems to be the tenth of the left side. It is shorter than the one last described, only 36 mm. The width is nearly the same at the two ends, 29 mm., but the upper edge is slightly eroded. It may have formed a jagged suture with the costals. The thickness is 11 mm. The surfaces are smooth. There is no notch in the free border where it is crossed by the sulcus between the corresponding marginals, differing in this respect from most specimens of *C. serpentina*; but in old individuals the notches, except the one in the eleventh peripheral of each, are often wanting.

#### CHELYDRA SCULPTA, NEW SPECIES.

Plate 4, fig. 7; Plate 6, figs. 8-9.

*Type-specimen*.—A ninth right peripheral, No. 5510 of the Florida Geological Survey.

*Type-locality and formation*.—Vero, St. Lucie County, Florida. Pleistocene.

*Diagnosis*.—Ninth peripheral not so thick as that of *C. lati-*

*carinata*; much thicker than in *C. serpentina*; border not notched; upper surface sculptured.

The ninth peripheral here considered (pl. 6, fig. 8) is 38 mm. long and 30 mm. wide at the ends; 27 mm. wide at the socket for the costal. It belonged to an individual whose carapace was close to 12 inches in length.

Inasmuch as we have at hand the hinder end of the eighth peripheral referred to *C. laticarinata* and the front end of the ninth of *C. sculpta* it is easy to compare them. The two bones are nearly of the same length, that of the first mentioned species being 44 mm. The thickness of the bone at the hinder end in *C. laticarinata* is 11 mm.; in *C. sculpta* 9 mm. The ninth marginal scute, on the hinder end of the eighth peripheral of *C. laticarinata*, has a width of 28 mm.; on the front end of the ninth peripheral of *C. sculpta*, the width is only 20 mm. On the lower side of the eighth peripheral of *C. laticarinata* the surface which was originally covered with horny material is 23 mm. wide; on the front end of the ninth of *C. sculpta* only about 12 mm. The upper surface of the peripheral of *C. laticarinata* is smooth; in *C. sculpta* it is varied by the presence of pits and grooves. By its inner border this bone was joined by a jagged suture with the sixth and seventh costal bones. This bone presents no indication whatever of a notch in its free border.

A left seventh peripheral from Vero with the number 7090 (pl. 6, fig. 9) has a length of 33 mm. and a thickness of 10 mm. at each end. The inner border is injured, so that the width cannot be determined; it was at least 23 mm. The rear of the seventh marginal is 11.5 mm. high. Differences in form between this bone and the eighth peripheral described above, differences seen especially on the underside, may be due to differences in age and size; but the upper surface of the seventh is strongly pitted and ridged; and it is, therefore, referred to *C. sculpta*.

The three fragments of costals can be only provisionally assigned. One, No. 7091, the upper third of apparently the right fourth costal (pl. 4, fig. 7) has a width of 29 mm. There is present a lateral carina running along outside of the vertebral scutes, as in *C. serpentina*. Mesiad of this is a longitudinal depression more marked than in the existing species. Descending behind the sulcus between the second and third costal scutes is a broad groove which is only faintly indicated in *C. serpentina*. The



whole hinder half of the costal bone is sculptured by ridges and grooves which run fore-and-aft.

The other fragments of costals, Nos. 7092 and 7093 appear to have belonged to younger individuals. They seem to show that the lateral dorsal carinae were more strongly developed than in *C. serpentina*.

It is impossible to say to which species the neural and the hyoplastral bone belonged.

Of the turtles described in this paper from the locality at Vero, Florida, the following according to the records of the Florida Geological Survey were found in place in horizon No. 2 of the published section:\*

*Terrapene innoxia*  
*Chelydra laticarinata*

*Testudo sellardsi*

The following species were found not in place.

*Testudo luciae*  
*Gopherus præcedens*

*Trachemys bisornata*  
*Trachemys sculpta*

The following species have been obtained from the next later or overlying deposit, No. 3 of the section:

*Pseudemys floridana persimilis*  
*Terrapene innoxia*

*Terrapene antipex*  
*Chelydra sculpta*

#### ADDITIONAL NOTE.

After this paper had taken on page form Doctor Sellards sent to the writer, for examination, a small collection which he had lately secured at Vero, and which furnishes some additional information. From all the materials examined the following turtles have been identified from the stratum which Doctor Sellards has called No. 3.

*Gopherus polyphemus*  
*Terrapene antipex*  
*T. innoxia*

*Pseudemys floridana persimilis*  
*Chelydra sculpta*  
*Chelonia mydas*

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\*Amer. Journ. Sci. Vol. xlii, p. 6, July, 1916; and this Volume, text-figure 2.

The bones referred to *Gopherus polyphemus*, the land tortoise now existing in Florida, present some differences when compared with recent skeletons, but with more materials, recent and fossil, these differences might disappear.

In the last lot received is a nearly complete carapace and considerable parts of two others of *Terrapene innoxia*. These were considerably broken up in getting them out of the ground. The shells are thin and delicate. Let us suppose that such shells had originally been buried in stratum No. 2 and had been disturbed in their partially unmineralized and soft condition. They could not have failed to be broken into fragments and scattered far and wide.

*Chelydra sculpita* is a species very distinct from the existing snapping turtle. As shown by the materials just received, it appears that all the peripheral bones were joined to the costal plates by jagged sutures. In *Chelydra serpentina* there are between the two sets of bones considerable fontanelles. In both species the bones are thin and fall apart readily on maceration. The shell could not suffer burial and redeposition. Now, in the new lot there are seven bones of one carapace. To the nuchal a right and a left first costal join accurately. The fourth and fifth costals of the right side belong together without doubt. That snapping turtle must have lived when stratum No. 3 enveloped it.

Out of six chelonians, then, found in that stratum at least three are extinct. Other fragments in the collections appear to indicate additional extinct species, but they do not justify final conclusions. In the opinion of the writer this stratum, No. 3, belongs to the Pleistocene and not to the later part of it.



*Bystra nanus*, gen. sp. nov. Type specimen. Slightly less than natural size.  
View of shell from the right side and from below. P. 53.

Plate 2.

- Figs. 1-7. *Pseudemys caelata*. Various bones. Natural size. P. 64.
1. Left side of epiplastron, showing lower surface. Fla. Surv. coll. No. 3537.
  2. Fragment of the right hyoplastron, showing the lower surface. Of the upper border of the figure the left half is for union with the right epiplastron; the right half for union with the entoplastron. No. 3420.
  3. A neural bone, probably the fourth. No. 3425.
  4. First peripheral of the right side, upper surface. No. 3415.
  5. Second left peripheral. No. 3423.
  6. Right third peripheral, part missing. No. 3410.
  7. Left ninth peripheral. No. 3417.
- Fig. 8. *Hipparion plicatile*. Piece of right side of upper jaw, with three molars. Natural size. P. 41.





Plate 3.

Figs. 1-4. *Testudo ocalana*. One-half natural size. P. 45.

1. Left half of epiplastron, seen from below. Type. No. 4299.
2. Right half of hyoplastron, seen from above. No. 4292.
3. Right first costal plate. No. 4288.
4. A hinder peripheral, probably the eighth, presenting a view of its front end. No. 4311.

Figs. 5-8. *Testudo incisa*. Various parts. One-half natural size. P. 46.

5. Left half of xiphiplastron. Seen from below. No. 4287.
6. Left seventh peripheral and part of eighth. No. 4286.
7. Right seventh peripheral, showing inner face. No. 4297.
8. Right eighth (or ninth) peripheral, showing anterior end. No. 4305.

Fig. 9. *Testudo distans*. Type entoplastron. Times .46. No. 4289. P. 48.



Plate 4.

Figs. 1,2. *Gopherus pracedens*. Type. Left xiphiplastral bone. Two-thirds natural size. No. 5463. P. 55.

1. Seen from below.

2. Seen from above.

Fig. 3. *Terrapene formosa*. Type. Hinder two-thirds of the carapace. One-half natural size. No. 2973. P. 57.

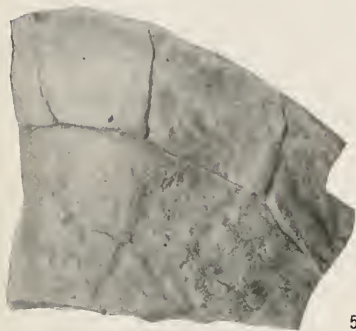
Figs. 4,5. *Terrapene antipex*. Two-thirds natural size. P. 58.

4. Hinder lobe of plastron. Allen specimen.

5. Right side of front of carapace. No. 4435.

Fig. 6. *Trachemys euglypha?* Part of nuchal bone. Two-thirds natural size. No. 5775. P. 70.

7. *Chelydra sculpta?* Part of supposed right fourth costal plate. Two-thirds natural size. No. 7091. P. 73



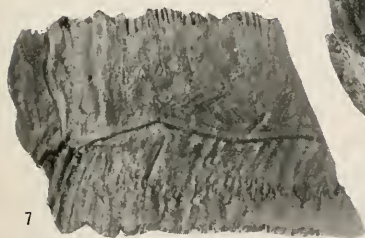
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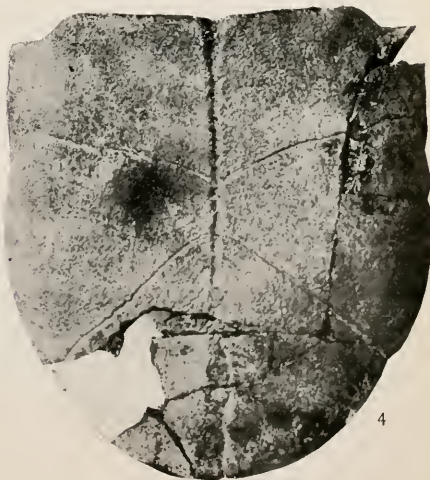
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Plate 5.

Figs. 1-5. *Terrapene antipex*. Parts of carapace and plastron. P. 58.

1. Hinder lobe of plastron seen from above. No. 5460. One-half natural size.
2. Part of front lobe, seen from above. No. 5462. One-half natural size.
3. Part of right side of carapace. Times .63. No. 5255.
4. Part of right side of carapace. Times .6. No. 5478.
5. Rear of carapace. Times .6. No. 5480.

Figs. 6-8. *Pseudemys floridana persimilis*. P. 71.

6. Epiplastral bones seen from above. No. 7098. Type.
7. Left xiphiplastral bone seen from above. No. 7099.
8. Right third costal plate. No. 7100.



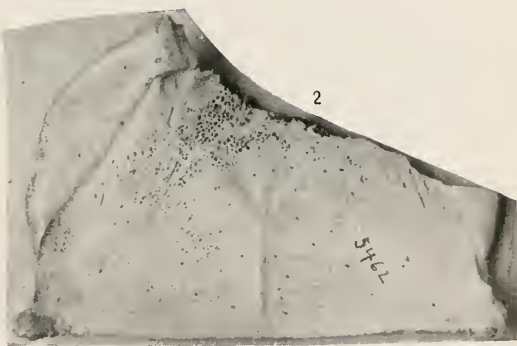
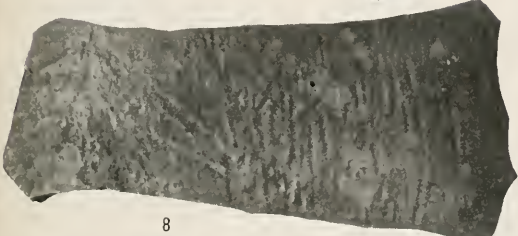
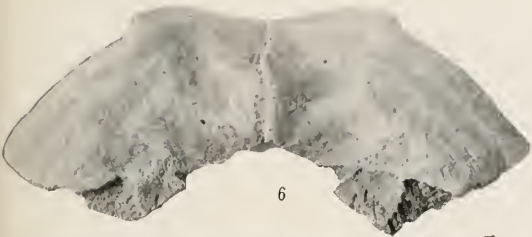


Plate 7.

All the bones of this plate are slightly less than the natural size.

Fig. 1. *Trachemys? delicata*. Type. Right fourth costal, with distal end missing. No. 3738. P. 66.

Figs. 2-7. *Trachemys bisornata*. P. 67.

2. Nuchal plate, No. 3735, showing upper surface.

3. Right third peripheral plate, showing outer surface. No. 3740.

4. Same bone, seen from behind. Shows sutural border for the fourth peripheral (on upper and right-hand parts of figure) and for hyoplastron and its buttress (on lower part of figure).

5. Same bone as that of figures 3 and 4, showing the front end, which joins the second peripheral.

6. Sixth right peripheral, showing outer surface. No. 1755.

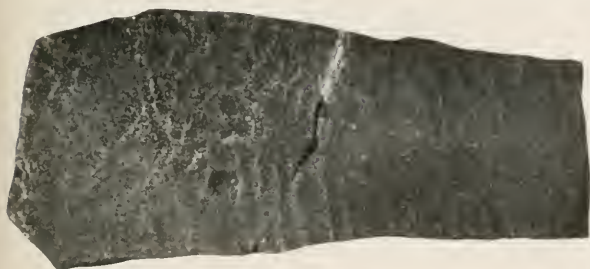
7. Same bone, showing the hinder end, for union with seventh peripheral.

Figs. 8-10. *Trachemys sculpta*. Three bones of carapace. P. 68.

8. Anterior part of nuchal bone. No. 3740a.

9. Eleventh right peripheral, showing outer surface. No. 3740e.

10. Proximal end of right third costal, showing outer surface. No. 352.



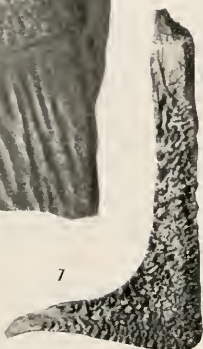
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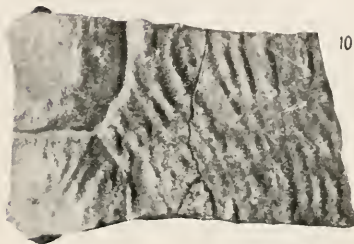
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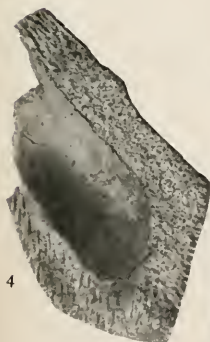
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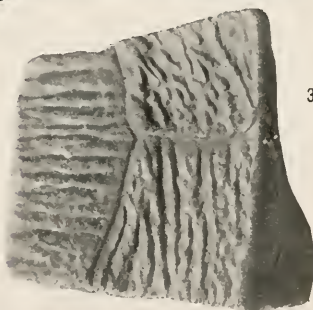
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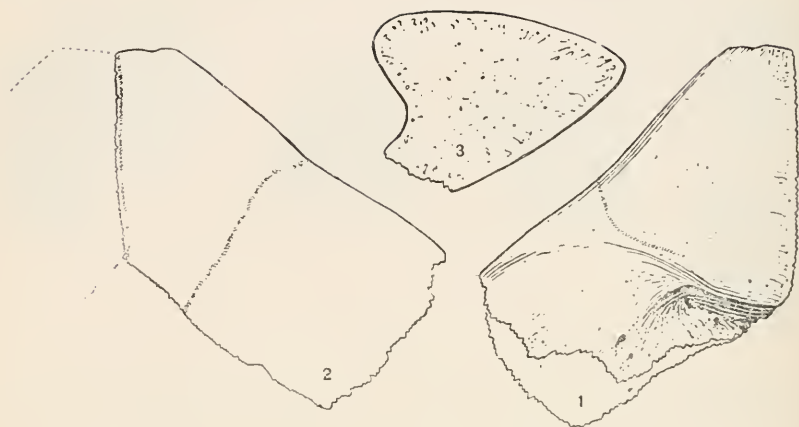
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Figs. 1-3:—*Testudo ocalana*. Right half of epiplastron. Natural size. Fig. 1. Seen from above. Fig. 2. Seen from below. Fig. 3. Showing symphyseal surface. P. 45.



Fig. 4:—*Testudo crassiscutata*. Section across border of hinder lobe at hypo-xiphiplastral suture. Two-thirds natural size. P. 53.

Fig. 5:—*Testudo luciae*. Section at same place as in Fig. 4. Two-thirds natural size. Fla. Surv. coll. No. 1807. P. 52.