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ARTICLE I.—*Synopsis of the Extinct Batrachia and Reptilia of North America.*  
By Edward D. Cope.

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SYNOPSIS  
OF THE  
EXTINCT BATRACHIA, REPTILIA AND AVES OF NORTH AMERICA.

BY EDWARD D. COPE.

Read September 18, 1868, and April 2, 1869.

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PREFACE.

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It is not designed in the present essay, to give descriptions of the known remains of the Batrachia, Reptiles and Birds, which have been more or less fully made known by others. This is left for the day when our knowledge shall more nearly approach completeness. While the subject is in its infancy, I have thought best to describe only those species and types which are new, and those portions of imperfectly known forms which will throw additional light on their relations and affinities. In adhering to this plan, I have been able to add no little to the history of the Reptiles already described by my predecessors, Leidy, Owen, Dawson, Wyman, Lea, etc. Where, however, I have had nothing to add, I have referred to their published descriptions, which are numerous and well-known. The literature of the subject will then be found under the respective specific heads.

The present Memoir was originally prepared under the title of "Contributions to the History of the Vertebrates of the Mesozoic Periods in New Jersey and Pennsylvania," and presented to the Academy of Natural Sciences of Philadelphia, for publication, Fifth Month, 14, 1867. The more important parts of its contents were at the same time embodied in a series of remarks before the Academy. This essay was withdrawn, owing to delay in the publication, and the remarks made were not printed. An abstract of part



of them was, however, published in the Proceedings of the Academy for the same year, page 234.

Additional material was shortly afterwards sent to the writer, and the important contributions on the Batrachia of the coal measures, and on the Elasmosauridæ, written. The Palaeophis and some of the Testudinata and Pythonomorpha were also added.

In the course of these investigations, prosecuted during the past six years, with reference to the structure and relations of the extinct Reptilia, the following general conclusions have been attained to, besides many of lesser significance.

First: That the Dinosauria present a graduated series of approximations to the birds, and possess some peculiarities in common with that class, standing between it and the Crocodilia.

Second: That serpents exist in the Eocene formations of this Country.

Third: That the Chelydra type was greatly developed during the American Cretaceous, and that all the supposed marine turtles described from it, are really of the first named group.

Fourth: That the Reptilia of the American Triassic are of the Belodon type.

Fifth: The discovery of the characters of the order Pythonomorpha.

Sixth The development of the characters of numerous members of the Batrachian Sub-order Microsauria in the United States.

I must express my obligations to Prof. Geo. H. Cook, of the Geological Survey of New Jersey, who kindly placed the specimens procured during the Survey at my disposal. I am also particularly indebted to Prof. John S. Newberry, of Columbia College, New York, and director of the Geological Survey of Ohio, for the loan of the unique and important material from the carboniferous beds at Linton, Ohio, contained in his private collection. I am under similar obligations to Wm. R. Webb, Superintendent of the Land Office at Topeka, Kansas, for the important type specimens of *Polycotylus latipinnis*, and to Prof. Agassiz, for the freedom of study and description of the unequalled Mosasauroid material in the Museum of Comparative Zoology, Cambridge. Also to Philip P. Tyson, of Baltimore, for similar advantages, and to Dr. Theophilus M. Turner, of Fort Wallace, Kansas, for the discovery of that extraordinary reptile, the *Elasmosarus platyurus*, and its shipment in unusually good condition. Dr. E. R. Showalter, of Uniontown, Alabama, has placed me under obligation, in sending the beautiful fossil of *Clidastes propython*. I must also express obligations to Prof Marsh, of Yale College, Dr. Lockwood, of Keyport, New Jersey, and to other friends.



## SYNOPSIS OF THE PRIMARY TYPES EMBRACED IN THIS ESSAY.

THE Classes Aves, Reptilia, and Batrachia are those over which the present review extends. The classes of veretebrata not included are: the Dipnoi, Pisces, Elasmobranchi, Dermopteri, and Leptocardii and the Mammalia.

The Aves, Reptilia, and Batrachia are characterized and distinguished from all the other classes as follows: the points wherein they differ from each other are italicized.

## BATRACHIA.

*Axial element of the brain chamber a single membrane bone, the parasphenoid; occipital condyles two, on the exoccipitals.*

Mandible compound, supported by quadratum.

A distinct coracoid bone.

Limbs when present ambulatory, attached anteriorly to a scapular arch which is free from the cranium.

*Nervous System.* Cerebral hemispheres larger than optic lobes, *not covering the optic thalami, and with the lateral ventricle on their inner side.*

Fornix and arbor vitæ none; *medulla oblongata straight; olfactory lobes terminal, sessile.*

*Circulatory System.* Heart with two and three chambers.

*Three or more aorta bows; aorta with two roots from a ductus communis and bulbus arteriosus.*

## REPTILIA.

*Axis of brain case, the basi-occipital and sphenoid elements developed in the primordial cartilage, the first with exoccipitals bearing one condyle.*

Mandible compound, supported by quadratum.

Coracoid bone distinct.

Limbs the anterior attached to a scapular arch which is free from cranium.

Metatarsals and metacarpals distinct; carpals and second row of tarsals also distinct; usually the first row of tarsals also.

Pubis not in contact with ischia distally.



*Nervous System.* Cerebral hemispheres larger than optic lobes, *extending over and concealing optic thalami, and with the lateral ventricles on their outer side.*

Fornix and arbor vitæ none; *medulla oblongata abruptly curved; olfactory lobes terminal pedunculate.*

*Circulatory System.* Heart with three or four chambers.

*Aorta with two roots, and rarely an additional bow; no bulbus arteriosus.*

#### AVES.

*Osseous structure* as in Reptilia, except metatarsal and usually metacarpal bones are confluent with each other, and with the carpal and second series of tarsal bones; first series of tarsals confluent with tibia.

*Pubis* turned backwards and more or less confluent with ischium.

*Nervous System.* Cerebral hemispheres larger than optic lobes, and concealing optic thalami with the lateral ventricle.

*Fornix and arbor vitæ present; medulla oblongata bent; olfactory lobes inferior sessile.*

*Circulatory System.* Heart with four chambers.

*Aorta with one root turning to the right, no bows, and no bulbus arteriosus.*

### Class I.—BATRACHIA.

The vomer is double, and usually bears teeth in this class; the premaxillary is single or double.\* Teeth never planted in deep alveoli.

There are six orders, as follows:

#### TRACHYSTOMATA.

Caudal vertebræ and frontal bones distinct. Inferior pelvic elements not confluent.

O. o. maxillaria, prefrontalia, palatina and pterygoidea wanting; nasalia present.

Ethmoid, two lateral pieces, each forming part of palate.

Mandible toothless, condyloid, teeth pleurodont. No "postorbital and supertemporal bones." First pair ceratohyals distinct.

\* Two premaxillary bones are usually ascribed to the Batrachia, but in many Salamanders they are confluent. Thus while they are double in Salamandra, they are single in Hemisalamandra, Triton and Diemyctylus. In Amblystomidæ they are double. Among Plethodontidæ, they vary. Of Plethodontine genera Batrachoseps and Stereochila (Cope gen. nov. for *Pseudotriton marginatus* Hallow) have them single, and Plethodon double. Of Spelerpine forms, Manculus (Cope gen. nov. for *Salamandra quadridigitata* Holbr.) Oedipus and Spelerpes have but one, and Geotriton and Gyrinophilus (Cope gen. nov. for *Salamandra salmonea* Storer *Pseudotriton salmoneus* Bd.) have two premaxillaries. Desmognathus and Amphiuma have single premaxillaries.



## TESTUDINATA.

## CRYPTODIRA.

## EMYDIDAE.

## EMYDINAE.

STYLEMYS, *Leidy*.

*Stylemys*, *Testudo* and *Emys*, Leidy, Proceed. Ac. N. Sci., 1851, 172. *Testudo*, Leidy l. c. 1852, 59. Smithson. Contrib. to Knowl., 1852, 103.

The species which I refer to this genus, are Emydoids with the usual elongate form of digits which characterizes the aquatic species, but with a single caudal marginal scutum, as in *Testudo*. Another Emydoid genus which approaches *Testudo* most, is *Manuria*, Gray. Here however the anal marginal plate is divided, and the pectoral plates do not meet on the median line. In *Stylemys* the latter are only narrowed.

The ilium is formed much as in *Chelydra*, somewhat dilated proximally in a posterior direction. The pubis is like some Emydoids in the length and lateral direction of its lateral process, while its stout form, with distal dilatation, articulated with its fellow on the median line is like that of *Chelydra*.

A right femur is entirely Testudinoid, and presents one peculiarity which I have only observed in *Testudo polyphemus*. The great trochanter (which is always large in the Testudinata) extends entirely round from its origin, to near the head of the femur, embracing a marked fossa. In other genera the greater tuberosity with the lesser enclose a fossa-like groove, which separates them entirely.

The capitula of the ribs extend to the vertebræ, but not to their centra; they are in contact with the laminiform neural spines.

A marked character of the genus also consists in the considerable separation of the neural arch from the vertebral carapacial bones. It is suspended as it were, some distance below them by the laminiform elevation of the joined neurapophyses, which are united by suture to the similar thin plate-like neural spines, which descend from the transverse vertebral expansions. The depth of this vertebral septum is greater than the length of each vertebral bone, behind the middle of the column. The centra are very thin as in *Cistudo*.

Leidy named some individuals of one of the species, *Stylemys*, while others were referred to *Emys*. As he gave no characters to it, and afterwards abandoned it, referring the species to *Testudo*, I only adopt the name for the purpose of diminishing the synonymy.



STYLEMYS NEBRACENSIS, *Leidy*.

*Stylemys nebracensis*, *Emys hemispherica* and *E. oweni*. Pr. A. N. Sci., Phila., 1851, p. 172.

*Testudo nebracensis*, Leidy, Ancient Fauna Nebraska, 103. *T. hemispherica*, *T. oweni* et *T. lata*, Leidy l. c. Tabs. xix, xx, xxi, xxiii, xxiv.

Miocene Tertiary of Nebraska.

A specimen of this species presented to the Academy of Natural Sciences by Dr. Hayden measures 20 inches in length, and 15 inches in width.

STYLEMYS CULBERTSONII, *Leidy*.

*Testudo culbertsonii*, Leidy, Ancient Fauna of Nebraska, Tab. xxii.

Miocene Tertiary of Nebraska.

STYLEMYS NIOBRARENSIS, *Leidy*.

*Testudo (St.) niobrarensis*, Leidy, Proceed. Ac. Nat. Sci., Phil., 1858, 29.

Pliocene of the Niobrara river, Nebraska.

COMPSEMYS, *Leidy*.

Proc. Ac. N. Sci., 1856, 312.

The remains of this genus do not offer any very marked features to distinguish them from *Emys*. The existence of generic distinction is however suggested by the delicate areolate sculpture of the surface of the carapace. Costal capitula well developed; vertebral scuta subquadrate.

## COMPSEMYS OBSCURUS.

*Emys obscurus*, Leidy, Pr. A. N. Sci., 1856, 312.

From the Upper Jurassic of Long lake, Nebraska.

COMPSEMYS VICTUS, *Leidy l. c.*

Upper Jurassic Bad Lands, Judith River, Nebraska.

CISTUDO, *Flem.*CISTUDO EURYPYGIA, *Cope*.

This extinct species is represented by a portion of the posterior margin of the carapace, which includes more or less of four marginal, two vertebral, and one costal, scuta. The relations of the osseous elements are much as in *C. clausa*; *i. e.*, the posterior costals are united on the median line, without rudimental vertebral below, and the last vertebral is an irregular pentagon with the two anterior sides elongate. There are traces of angular concentric sculpture as in the existing species, which encloses a slightly angular boss on the posterior margin of the costal scutum.

What distinguishes this box-tortoise from the existing one, is the greater width of the vertebral scuta, and the different form of the marginals. The costal suture of the vertebral, instead of joining a prolongation of the penul-



ultimate marginal, joins a superior angle of the antepenult. The superior margin of the penultimate is straight, and but little elevated above the caudal pair. From this increased width of the last vertebral, its lateral suture is more oblique, and what remains of the lateral suture of the penultimate vertebral is still more oblique, indicating a still wider scutum. The posterior vertebral bone is a little more elongate than in several individuals of *C. clausa*.

The posterior margin is not recurved, but is vertical, and therefore from a female animal. There are no emarginations or processes. On the inferior aspect, the concavity which receives the crest of the ilium is deeper and nearer the margin than in *C. clausa*.

This species was found by Samuel R. Harrison, M. D., of Easton, Md., on Oxford Neck in Talbot Co., Maryland, in connection with postpliocene fossils, as follows: *Elephas americanus*, *Cervus canadensis*, *Cariacus virginianus*, *Chelydra serpentina*.

Remains of a *Cistudo* occur in the postpliocene bone breccia of caves in S. W. Virginia, but whether they belong to *C. clausa* or some other species is not as yet determined.

#### EMYS, *Brongniart*.

The only species of this genus which I have had the opportunity of studying are the three following from the cretaceous green-sand of New Jersey. They agree in the massive thickness and dense structure of plastron and carapace, which peculiarity suggests doubt as to their aquatic habitat, and enquiry as to whether they may not have been more or less terrestrial. Their reference to *Emys* is provisional, as the limbs, cranium and caudal marginal scute are unknown. In *E. petrosus* the heads of the posterior ribs are rudimental as in *Adocus*.

The species may be distinguished as follows:

Sutures of hyo-and hyposternal bones, coarse and ragged; hyosternal nearly twice as thick anteriorly as posteriorly; eighth marginal acute edged, its width 11-12 length hyosternal, its depth 5-4 the same.

#### E. FIRMUS.

Sutures minutely rugulose, hyosternal thicker anteriorly; eighth marginal with thick obtuse edge, depth 3-4 length hyosternal, its width .55 same; superior plane of hyosternal transversely as wide as a costal, inferior plane very convex; mesosternum width .66 length of do.; size medium.

#### E. PETROSUS.

Sutures minutely rugulose; hyosternal thickest posteriorly, its inferior face plane, superior plane twice as wide as a costal; width of mesosternum 6-7 length, and width of eighth marginal .05 length of same; size smaller;

#### E. TURGIDUS.



EMYS FIRMUS, *Leidy*.

Cretac. Rept. 106, Smithsonian Contrib., No. 192, *Adocus firmus* Cope, Proceed. Acad. Nat. Sci., Phil., 1868, 235, Geolog. Surv. N. Jersey, App. C.

An individual of this species is represented by same characteristic fragments in the Museum of Rutgers College, N. J. As remarked, they have many characters like the following species; while in the surface markings, dermal scutes, etc., they resemble as much the *Adocus beatus*. I have not seen the costal bones.

This is a large species and of extraordinarily massive construction. This was no doubt an adaptation in defense of enemies, perhaps as protection from blows or snaps of the more gigantic reptiles of that time. I give the measurement of this species from Leidy.

	<i>In.</i>
Length margin 7th and eighth marginals,	5.75
Width seventh plate,	2.5
" eighth "	2.75
Depth "	3.75
Left hyosternal, length from exterior angle mesosternum ,	3.
Thickness at latter suture,	1.+
" postero-medially,	.625

This species is distinguished from both the following by the relatively much larger size of the postero-median, and probably the other marginal bones. Its points of resemblance to the *E. turgidus* are more numerous than to the *E. petrosus*. Like both of these the mesosternum is truncate behind.

Position. The upper bed of Cretaceous Green Sand, New Jersey.

EMYS PETROSUS, *Cope*.

*Adocus petrosus*, Cope, Proc. Acad. Nat. Sci., Phila., 1868, 236, Geol. Surv. N. Jersey, App. C.

This species is represented by portions of four costal bones, parts or wholes of six marginal bones, most of the right hyosternal, and a posterior portion of the right hyposternal, with the head of the os coracoideum. They were found in the West Jersey Marl Company's pits, Gloucester Co., N. J., in the same locality whence the *Laelaps* was procured. It is characterized by the very massive structure of its carapace and plastron, and for the posteriorly truncate form of its mesosternum. Another species (*E. firmus*) which unites the same peculiarities, is included in this genus, though I have not seen its costal bones.

The hyosternal bone is preserved in its axillary margin, and is continuous with two marginals of the carapace of the same side. Two of the costals are adjacent and give the outlines of the vertebral bones and scutes. These show the inferior outline to be very convex, the whole, from angle to angle of the marginal bones of opposite sides amounting to an arc of about 124 degrees. Each hyosternal is slightly concave below the plane of their common suture. Each thins out laterally, though the one preserved is very thick on the axillary margin. There is little difference between the thickness at the mesosternal and the hyposternal sutures. All the sutures have minute rugosities, differing much from sternals in *Adocus* and *Taphrosphys*, which are very ragged, and resembling those of *Pleurosternum pectorale m.* The piece of hyposternal is even thicker than the hyosternal. The



bone is everywhere remarkable for the thickness of its dense layer, and the closeness of the texture of the spongy. The former is one-third the thickness of the sternal and costal bones fractured.

The scute sutures of the inferior surface are obsolete; those of the dorsal surface are like those of *Adocus*; *i. e.*, the vertebrals with bracket-shaped lateral borders with the costal proceeding from the point of the bracket.

The marginal bones vary much in thickness proximally; they have two proximal sutures, one side convex, the other concave. Four have a heavy border, round in section; in two of these it is considerably everted: another has a rather thin margin, slightly decurved, with a submarginal groove separating it from the most massive portion. The costal bones are strongly convex in their length, indicating an arched carapace.

	<i>Measurements.</i>	
	<i>In.</i>	<i>Lin.</i>
Hyoosternal width,	3	9.
“ “ to origin axillary abutment,	2	1.5
“ length on median suture,	2	1.5
“ thickness near mesosternal line,		9.
“ “ “ hyposternal “		7.2
Hyposternal thickness near poster. suture,		9.
Costal, width,	1	7.5
“ thickness vertebral suture,		8.
Marginal No. 1 width,	2	1.5
“ “ length,	1	7.
“ “ proximal thickness,		3.
“ No. 5 “ “		8.2
“ “ length,	1	6.
“ “ width,	1	7.5
“ “ width dermal scute,		9.

This animal is therefore a species of considerable size, though less than most of those described here, and particularly convex and solid in every part. While the sutural lines of the hyoosternal measure about the same as in *E. firmus* (*Emys Leidy*), it is much more convex and not so thick at the mesosternal suture. The marginal bones are relatively just half the size. The *Pleurosternum pectorale*, differs in being very much flatter, and in having a more discoid mesosternal bone. The hyoosternals are also much thicker at their union with the marginals, than the present is.

A portion of a hyo-or hyposternal bone collected at the same place, and near or at the same time, may be referred to a larger individual of the same species or to *E. firmus*. It exhibits a wedge for a diagonal gomphosis, between the two sutures, which are preserved. The thickness on the median suture is 14 lines.

The density of the sternal bones is in marked contrast to that of the *E. crassus* according to Owen, where the structure is remarkably spongy and open.

#### EMYS TURGIDUS, *Cope.*

This species is represented by two individuals in a more or less fragmentary condition in the private collection of Dr. Samuel Lockwood, of Keyport, N. J. One of these, selected for description, embraces proximal portions of four left costal bones and of three right ones, with a vertebral, other fragments of costals, four marginals (one from the bridge), the greater part of both hyoosternals and the mesosternum.

These indicate a species of about half the bulk of the *E. petrosus*, and differing in many particulars. These are especially the relatively much wider and flatter, hyoster-



nals, and thinner edged more recurved marginals. The size of the marginals is similar to those of the last, while the mesosternal element is larger. The scutal sutures are better preserved than in the type of *E. petrosus*, nevertheless none are preserved on the lower surfaces except that which divides the mesosternum longitudinally throughout. The vertebral scuta are  $\frac{2}{3}$  as wide as long, and have longitudinal borders, which are scarcely produced at the junction with the intercostal suture, and are otherwise somewhat irregular. The carapace is swollen in an interrupted line bordering the vertebral scuta externally, leaving the median parts of these smooth. The marginals are also slightly swollen just within the costal-marginal sutures. The marginal bones are concave externally, and thickened inferiorly at some distance within the margin. That from the bridge is angulated at one extremity at  $45^\circ$ , at the other less. The union of the hyosternals behind and with the mesosternal behind, is by a groove and keel suture. The mesosternal is much thinner anteriorly than posteriorly.

	<i>In.</i>
Length heads of four costals,	4.375
"    vertebral,	1.06
Width    "	1.
Length hyosternal,	2.4
"    "    from mesosternal,	1.8
Thickness "    at    "	.65
"    "    posteriorly,	.7
Length vertebral scutum,	2.3
Width    "    "	.75

From the upper Green Sand Bed, Cretaceous N. J., at Hornerstown, N. J.

EMYS PETROLEI, *Leidy*.

Proceed. Academy, 1858, Postpliocene, Harden Co., Texas.

A very distinct species, probably of the more terrestrial type of the genus, as *Che-lopus*, etc.

\* ADOCUS, *Cope*.

Emydoid tortoises in which the rib heads of the posterior costal bones are represented by a rudimental lamina, and the anterior by a crest or truncate ridge in addition. Vertebral scuta narrow; external surfaces smooth or nearly so.

Name from *A* privative and *δοξος* rafter (*i. e.*, rib head).

This genus, formerly characterized, differs from *Emys* in the absence of costal capitula of the costal plates of the carapace, a feature pointed out by *Leidy* in the type species.



It also possesses a character of Pleurosternum in the presence of a series of marginal dermal plates on the sternal bridge. It belongs to the true Emydidae, having the eight paired sternal bones instead of ten of the first mentioned. The markings of the dermal plates of the plastron are not distinct.

ADOCUS BEATUS, *Leidy*.

*Emys beatus*, Leidy, Cretaceous Reptiles, Smithsonian, Contrib. 1804, 107.

Remains of a considerable portion of the plastron and carapace of this species from the marl excavations of David Haines near Medford, N. J., furnish important characters, as already indicated. The posterior lobe of the sternum is long and flat, and strongly emarginate behind; its greatest length is 5 in. 9 lin., greatest (anterior) width 5 in. 8 lin. The thickness of the hyosternal bones is a little greater at the sides than at the median portion; latter measurement 7 lines; all the pieces of the plastron are thicker than those of the carapace.

The anterior lobe of the sternum in *A. beatus* would appear to have been more or less moveable.

ADOCUS PRAVUS, *Leidy*.

*Emys praeus*, Leidy, Proceed. Ac. Nat. Sci., 1856, 312, Cretaceous Rept. Tab.  
Middlebed, or upper Cretaceous green sand New Jersey.

This species is referred here because of its general resemblance to the others of the genus. Its costal bones have not yet been procured.

PLEUROSTERNUM, *Bell*.

Some of the Emydinae of the New Jersey Green Sand exhibit only faint impressions of the usual horny dermal plates. It is probable therefore that such were covered with coriaceous plates as in the genus *Dermatemys* and some species of *Hydraspididae*.

The species which is referred to *Dermatemys*, *D. mavei* Gray from Mexico, is further distinguished generically by a series of marginal plates between the axilla and groin on each side, within the usual marginal series. The same peculiarity characterizes also the genus *Macrochelys*, which has however no affinity with the present.

The hyosternal bones, quite perfectly preserved, of an aquatic tortoise, from the farm of David Haines near Medford, present the double marginal series of *Dermatemys*. It differs from the species of that genus in the apparent fusion of the pectoral and humeral dermal scuta, a peculiarity which I have not seen in any modern genus of Emydidae or Hydraspididae. This is characteristic of Pleurosternum, and the scuta are really distinct, the pectoral having an unusually posterior position, on account of the intercalated sternal



bone. The hyosternals are prolonged forwards, extensively embracing the mesosternum; the latter piece is subcircular, and truncate behind. The episternals and mesosternal are lost. The extreme anterior lip of the hyosternals is crossed by a groove, apparently the suture of the gular plate; it has reached the external margin a half inch in front of the posterior margin of the episternal. This would leave sufficient width for an intergular plate, which would refer the genus to the Hydraspididae. As however the other pieces of the sternum have been found in England, it is certain that the genus is Cryptodire.

PLEUROSTERNUM PECTORALE, *Cope sp. nov.*

The plastron of this species is massive, and three times as thick in the middle as at the sides. The posterior hyosternal suture has been immoveable, and its rugae are minute. The anterior or axillary buttresses have risen higher on the costal plates, and are directed obliquely forwards. The axillary outline is deeply concave. The external surface is without sculpture. Behind the truncate axillary plate is one long hexagonal inner marginal, while the anterior third of a second is truncated by the posterior suture. The posterior humeral dermal suture, approaches the hyosternal suture towards the median line but slightly.

	<i>In.</i>	<i>Lin.</i>
Width of a hyosternal,	3	
Depth at middle, on hyost. suture,		10.
"    outer end    "    "		2.8
Length median suture,	1	6.4
From posterior suture to axilla,	1	4.6
Antero-posterior extent hyosternal (exclus. sutural process),	2	2.5
Width inguinal scute interiorly,		4.
"    "    "    externally,		8.5

The inferior surface of the plastron is convex, the interior nearly plane.

The species was about the size of the *Ptychemys rugosa* Ag. of the Delaware. It is distinguished from the *Emys pravus* of Leidy by the transverse hyosternal suture, the greater transverse extent, and thickness of hyosternals. In *A. firmus* Leidy the humero-pectoral dermal suture is anterior, and the mesosternal is transversely truncate behind.

CHELYDRINAE.

The extinct species of this group indicate a successional relation of forms such as the theory of evolution would anticipate.

Those of the Miocene and Eocene periods in America are not known, but so far as they are in Europe, they resemble those of the present. In the cretaceous, the genus *Propleura* appears, which approximates the genus *Chelone* in the probable more natatory character of the fore limb than in *Chelydra*; the humerus has a more flattened shaft, and is not quite so much curved as in the latter; its proximal condyle and crests are those of *Chelydra*, and this point has chiefly decided me in referring the genus to the neighborhood of the latter, rather than to the *Cheloniidae*. The independence of the *Cheloniidae* rests entirely on the structure of the fore limb, for its other peculiarities are repeated by genera in various other families. The natatory character has a strong ex-



pression in the form of both humerus and femur, and decided by this test, the genera following are all Chelydroid Emydidae.

The metatarsals of the hind foot preserved, indicate a broad natatory member more like those of *Trionyx* than those of *Chelydra*.

At the same time the vertebral dermal scutes have the most narrowed form characteristic of various genera of Emydidae. The femur has a slender curved shaft as in *Chelydra* and *Chelys*. The sternum is more that of *Chelydra* than of the sea turtles. This is seen in the narrowness of the sterno-carapacial bridge, which is very wide in *Chelone*, and very narrow in *Chelydra*. In the cretaceous genera, the width is intermediate, and the hyo and hyposternal bones are united medially, and are not merely prolonged anteriorly and posteriorly as in *Chelone*. The lateral sternal regions were therefore less protected than in the sea turtles, while the general small size and form of the sternal bones also point to the cross-shaped plastron of *Chelydra*.

It does not offer any approach to the Pleurodira, since the xiphisternum is free from the pelvis. The cranium of the genus *Euclastes*, which belongs here, shows the technical details of the Cheloniidae, with the form of head, physiognomy, and no doubt, the carnivorous adaptations of *Chelydra*. In the genus *Osteopygis*, also of the cretaceous, the characters diverge still more from those of the modern sea turtles. Here five marginals in front and three behind, are united with the disc. The anterior marginal scutum becomes united with the first vertebral. In other respects the characters are those of *Propleura*. In *Lytoloma* the marginals are free as in *Chelone*.

Several genera have been discovered in the lithographic slates and other strata of the Jurassic period in Germany, Switzerland and France. These have been described by Münster, Wagner,\* and Von Meyer.† Some of these are allied to *Chelone*, but the majority of them appear to me to have a near relationship to *Chelydra*, and to those herein described. This has been scarcely alluded to by the learned authors quoted, and in general their affinities to existing forms have been but obscurely indicated. Those which I would refer to this neighborhood are:

EURYSTERNUM Münst.

E. wagleri Münst.

E. crassipes Wagn. (*Palaeomedusa*  
Mey.)

E. redtenbacheri (*Acichelys* Mey.)

IDIOCHELYS Mey.

I. fitzingeri Mey.

I. wagneri Mey.

HYDROPELTA Mey.

H. meyeri Thioll.

PLATYCHELYS Wagn.

P. oberndorferi Wagn.

\* Abhandl. d. m. ph. cl. K. Bayerisch Acad. Wiss. IX.

† Reptilien o. d. Lithograph. Schiefer.



Eurysternum differs from Chelydra as Osteopygis does, in a greater coössification of the discal and marginal bones anteriorly and posteriorly. It differs from the latter in the stout ambulatory foot like that of the Chelydra, and in the apparent absence of the temporal osseous roof, which I suspect Osteopygis to possess. The vertebral dermal scuta are wider than in any species of our genera, but this is but a specific character.

In Idiochelys the marginal bones are more distinct from the disc, entirely so posteriorly; there are numerous omissions of the vertebral bones of the carapace; this does not occur among our species so far as known.

Hydropelta is in general much like Osteopygis, but in it the hyo and hyposternal bones, have an articulation by gomphosis with the third and tenth marginals respectively, a character certainly wanting to the American genera. There is also no median sternal fontanelle, which is present in our types.

Platycheilus has a still greater union of carapacial disc and margin; only three ribs have free extremities on each side.

Our forms then appear to differ from those of the Jurassic of Europe, up to the present time. It is important to observe, that instead of being of marine habit as has been supposed, they are representatives of modern fresh water species, and were probably inhabitants of brackish estuaries of our coast.

#### OSTEOPYGIS, Cope.

Proceed. Acad. Nat. Sciences, Phila., 1868, 147.

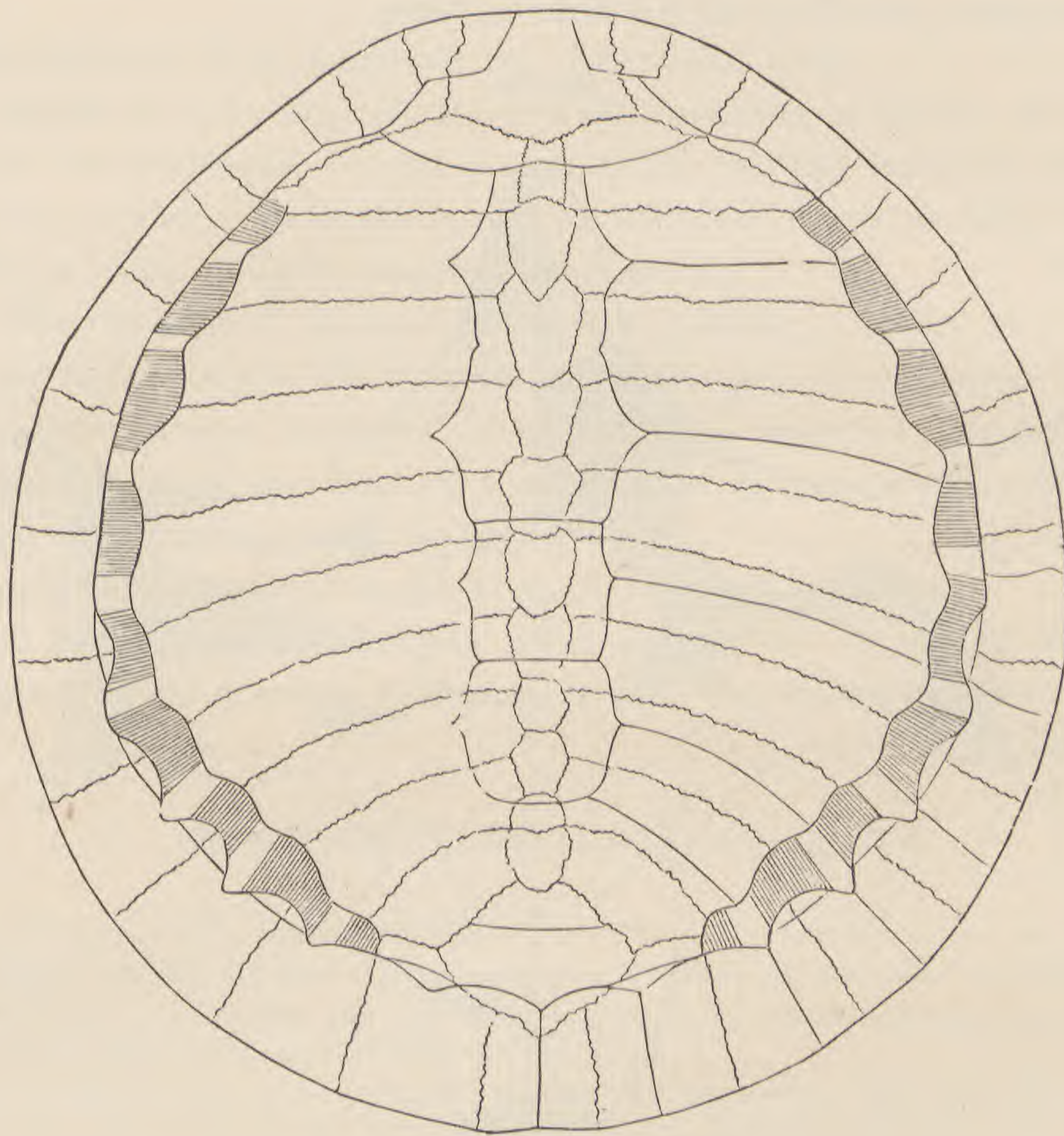
This genus has been characterized above, in part. It has the usual twenty-three marginal bones with ten costal bones on each side, nine of which send their free extremities for gomphosis with the marginals. Though in sutural union with the second marginals, each sends a costal process into a corresponding pit of the latter. The intercostal union is prolonged, and the vertebral scuta are rather narrow, and do not therefore extend far on the former. The four posterior marginals are prolonged considerably within the groove marking the suture of the costal and marginal scuta. The posterior marginal plates of all the species are very flat and expanded, the lateral on the contrary trigonal or subtrigonal in section, with a distinct inferior plane.

The accompanying cut gives the characters of the genus as exhibited in the carapace of the typical species. The dermal sutures are omitted from the left side, so as to show more clearly those of the skeleton.

The plastron of Osteopygis is more like that of Chelydra than any other known genus. The hyo-, hypo-, and xiphisternals are united on the median line by a coarse open suture as in that genus, and are not separated as in Chelone. They are much more united than in Trionyx.



Fig. 38.



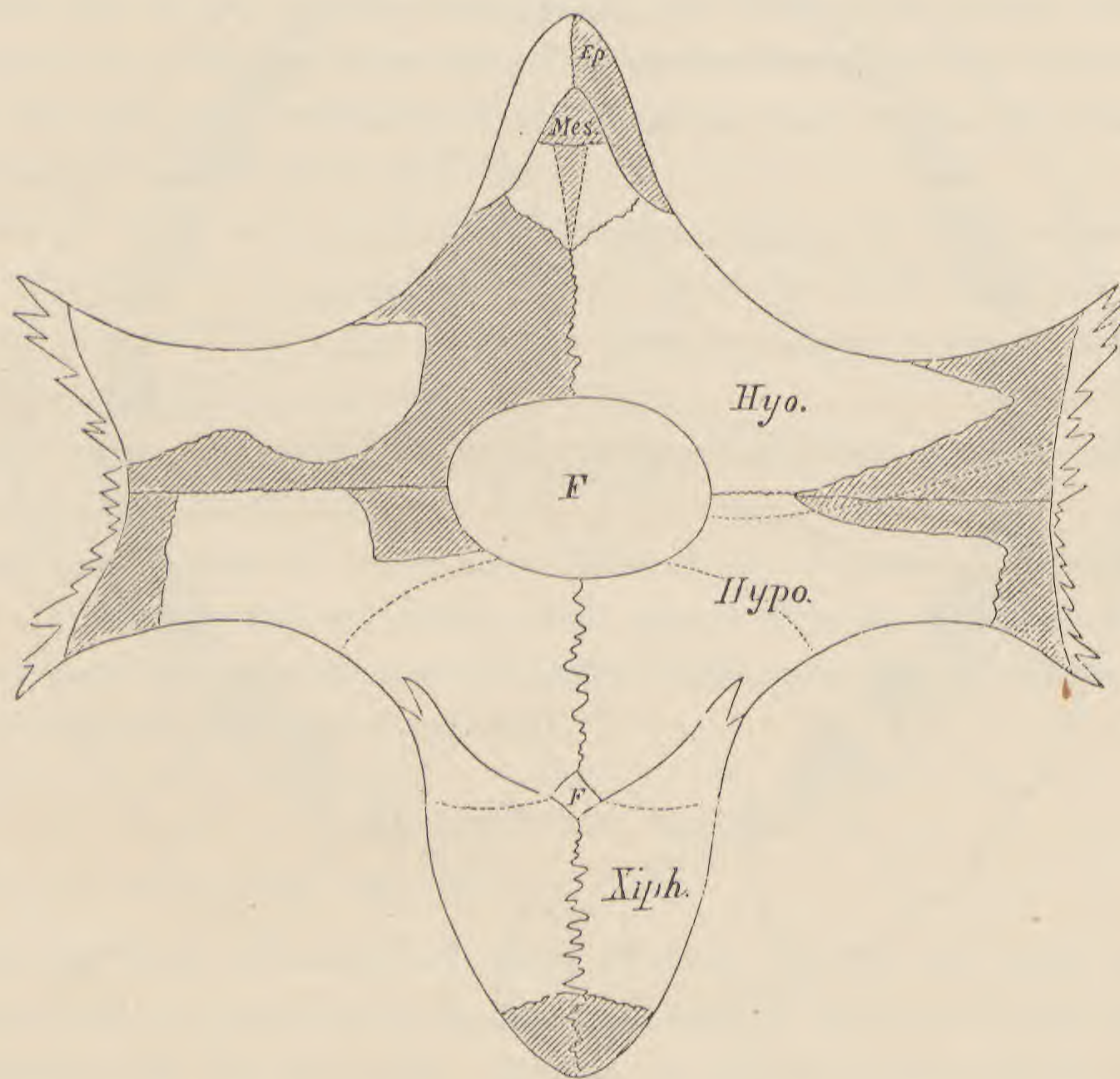
OSTEOPYGIS PLATYLOMUS carapace.

The xiphisternal is united with the hyposternal precisely as in *Chelydra*, that is, by a mutual marginal gomphosis at the anterior extremity of the former, its peg being the external; and by a deep groove in the inner margin of the xiphisternal, which receives the adapted margin of the hyposternal. The xiphisternal lobe is wider than in *Chelydra*, while the bridge is very much wider, being about as in *Trionyx*, and much narrower than in *Chelone*. This constitutes a point of separation from the first named genus. There is a median fontanelle, larger than in *Chelydra serpentina* at the junction of the four sternal elements. The external margin of the hyosternal, is free and serrate as in *Chelydra*. The mesosternal has not been identified, but the episterna are narrower and greatly incurved, more as in *Chelydra* and *Chelone* than as in *Trionyx*. In the accompanying restoration, the shaded portions are those which have not been pre-



served. The outlines of the episterna are not entirely demonstrable. The scale is near that of the carapace preceding, but is a little too large.

Fig. 39.



OSTEOPYGIS PLATYLOMUS plastron.

Dermal sutures are visible in the two species whose sterna we have. Abdominal and inguinal plates can be demonstrated; the anterior are not distinguishable. If anal scuta exist, they must be very small, but they are probably absent as in *Chelydra*.

Some of the Eocene *Chelones* have the posterior vertebral plates more dilated than in the recent species, but they all present the penultimate marginals supported by a distinct pair of ribs, and the anterior marginals separate from the disc, and without rib.

The femur of a presumed species of the genus is more slender than in the *Chelones*, but resembles closely that of *Trionyx*, while two phalanges of the same are peculiar in their stout base and subterminal constriction. They are however flattened and have transverse distal condyles, being thus rather adapted for paddles than for progression, thus showing the genus to have been truly aquatic.

There appear to be remains of three species in our collections distinguished as follows:



I. The margins of the posterior marginal plates continuous, either notched or even medially.

*a* The rib-fossae of the marginals flat; ?no nuchal scute.

Upper margin of inner face of (7th and 8th) posterior marginals much produced; lower margin not prolonged. Lower margin of 5th and 6th marginals not projecting, their inner face vertical. Outer face of narrow marginals convex or little concave, their scuta  $1\frac{2}{3}$  long as wide. Eighth marginal  $\frac{4}{5}$  wide as long. PLATYLOMUS.

*aa* The rib-fossae of the *lateral* marginals cylindric; a nuchal scute.

Upper and lower margins 7th marginal both prolonged; lower margin 5th very much produced inwards giving a horizontal inner, as well as outer face; outer face of narrow marginals concave except the anterior; scuta of latter  $1\frac{1}{2}$  long as wide; 9th marginal  $\frac{7.5}{6}$  wide as long; 5th marginal nearly .75 wide as long. EMARGINATUS.

II. Margins of the posterior marginal plates acuminate medially.

Posterior lateral bones short, wide, width greater and length, pit round, margin strongly repand; anterior laterals less confluent with disc, strongly concave on outer face.

CHELYDRINUS.

#### OSTEOPYGIS PLATYLOMUS, *Cope Sp. Nov.*

This species is represented by portions of two individuals, first perhaps half the carapace and plastron with all the marginal bones of one side, and many of those of the other, of a large individual from the Pemberton Marl Company's Pits, Burlington Co., N. Jersey, presented to the Academy by Dr. Samuel Ashhurst; the second, a few portions from the pits of David Haines, near Medford, Camden Co., N. J.

The carapace is flat, as indicated by the slight curvature of numerous costal bones, and without keels, as indicated by an anterior and two posterior vertebral bones. The posterior and adjacent margin is flat and wide, extending to a thin edge. The anterior vertebral, has the anterior margin entirely forming a deep notch, extending to nearly opposite the lateral angles of the bone a feature not seen in the genus *Chelone*. It is crossed not far from its middle (it is broken behind) by the dermal suture. The posterior vertebral is transverse, occupies a concavity formed by the three posterior marginals, extending to beyond the middle of the penultimates on each side. The posterior vertebral dermal scute is of great width, its outer suture not reaching the marginals on any of the bones just mentioned. The anterior vertebral scuta as seen on numerous costal bones, were of peculiar form. Their borders diverged very little at their anterior and posterior portions, but curved outwards abruptly to meet the costal dermal suture, forming an acute angle.

Marginal bones heavy at the sides and in front, the former concave on the upper face, the lower face plane but upturned at the edge. Front laterals convex below with broad rounded margin; none of these projecting above the marginal dermal suture except to form suture with costal plate as in *C. repanda*. This suture first appears on the middle of the tenth marginal bone counting the lateral caudal as first: marginal bones eleven on each side, all with equal lengths, as in *Cheloniidae*.

The rib pits are flat, very much so medially, the anterior one more nearly cylindric.

The width of the marginal scute on the ninth and tenth marginal bones, is 1.63 its length, measuring from the obtuse margin. The width of the first (posterior) scute is nearly equal to its length.

The surface of the bone generally is marked by small irregular straight grooves.

Portions of the sternum are parts of two hypo-, a hyo-, and xiphisternal. The hyposternal of the left side has a



less antero-posterior extent between the groin and transverse suture than in the species of *Chelone*. Its transverse extent at the same region is greater, implying a greater closure of the sternal fontanelle. It presents on its outer posterior margin a pit for articulation with the xiphisternal by gomphosis. The hyosternal of the right side is much heavier than the last, and has a bevelled outer anterior face, where it rises steeply to meet the marginal bones of the carapace. Its sutural margin is broken away. The xiphisternal is broken at both ends; it is flat and rather thin. A large part of its inner margin is fitted for articulation with the long hyposternal. Its thin outer margin is contracted gently, nearly opposite the middle of the posterior fontanelle.

There are no distinct dermal sutures crossing these. The nuchal marginal scute is confluent with the first vertebral.

	<i>Measurements.</i>	<i>Ft.</i>	<i>In.</i>	<i>Lin.</i>
Length of second marginal,		2		10.2
"    eleventh    "		2		11.1
"    caudal    "		3		3.7
Width of second    "		1		1'.
"    eleventh    "		3		9.5
"    caudal    "		2		7.2
"    sixth, infer. face (average),		1		9.
"    last vertebral,		2		4.
"    an anterior do.,		2		2.
"    episternal,		2		5.5
"    hyposternal (longitudinal),		2		4.
Length inner suture episternal,		2		8.
"    free rib,		1		5.
Width costal bone distally,		2		11.5
Length carapace (estimated),		2	2	
Width    "    "		2		

#### OSTEOPYGIS EMARGINATUS, *Cope Sp. Nov.*

Of this species a considerable portion of carapace and plastron were discovered near Barnesboro, and deposited in the Museum at Rutgers College by the State Geological Survey of New Jersey, under Prof. Geo. H. Cook.

It is near the *O. platylomus*, but differs in the greater width of all the marginal bones in relation to their length, in the greater prolongation of the inner edge of the lower face of the lateral marginals, and in the cylindrical ribs and rib pits of the lateral marginals. In the *O. platylomus* the rib pits are everywhere alike, entirely flat and longitudinal.

A vertebral osseous plate is strongly emarginate anteriorly, as in the last species, but not to more than half the depth; the piece is more elongate, especially the antero-lateral or short sides which enter the greatest width twice, in the *platylomus*  $2\frac{2}{3}$  times. In this specimen it is not crossed by a dermal suture; in the other it is, hence the plates compared are not the same, but probably are only adjacent. A costal bone exhibits the head of an anterior rib, which has a strong spongy crest on its anterior margin. The anterior sutural margin converges outwardly towards the posterior margin, which is parallel with the rib axis. On the upper surface the sutures of the plates are distinct; the anterior vertebral is very divergent, making an angle of  $45^\circ$  with the median line. The anterior suture of the posterior plate of the two is less divergent. Three junctions of posterior and anterior vertebral scute sutures with the costals, compared with two similar junctions in the *O. emarginatus*, show that the former come together at a less angle, and are therefore more oblique. The anterior marginal scute is, as in *Chelone*, present and not confluent with the first vertebral as in *O. platylomus*. Both the first and second marginal bones are entirely united with the carapace: in the *O. platylomus* but the inner half of the second. The anterior vertebral bone widens within the margin as in other species, but it is the first costal which completes the consolidation of the carapace anteriorly. Both second and first marginal bones are slightly concave along the outer face; both are convex or plane in the species before described.



The third and fourth marginal bones, while of the same length as those of *O. emarginatus*, are half as wide again, a form produced by the projection inwards of the lower face. The fifth presents the same peculiarity in a more marked degree, and has a thicker outer margin or is more rounded from below. The fossa for the rib is less than .2 the length of the bone, while the same in *O. emarginatus* is .33 the length. The seventh marginal has the prominent inner lower edge, but is more elevated than the same in the species last described. Its superior surface is therefore considerably more concave. The most posterior marginals, as characteristic of the genus, are prolonged considerably within the inner suture of the marginal scuta. They are quite flat, plane above, and with a rounded concavity beneath within the margin; the rib pit is flattened in these. The dermal suture crosses the marginal bones in all the marginals from the fifth backwards inclusive just in front of the costal pit. A hyosternal, a hyposternal, and two xiphisternal bones are all that remain of the sternum. They are of much the same form as those of *O. emarginatus*. The hyposternal has the external groove posteriorly to receive the xiphisternal, while the episternals have a groove internally to receive the hyosternals. The xiphisternals are toothed on their inner margin for common suture which is not so long as in *O. emarginatus*. The xiphisternals have evidently been shorter and more broadly rounded behind than in that species. They have not the same thin acute external margin proximally nor strong intermarginal thickening distally seen in the same, but are of more uniform proportions. The hyosternal preserved is the distal portion, while that of *O. emarginatus* is chiefly proximal. It is however obviously a thinner plate than in the latter, and more as in *Propleura sopita*. The anterior margin preserved is that between the episternal and axillary portions; it is regularly thinned out; the distal part of the bone is flat, and the median suture toothed. A short free margin indicates a mesosternal fontanelle. Median and posterior fontanelles also present.

<i>Measurements.</i>			<i>In.</i>	<i>Lin.</i>
Length second marginal,			3	0.75
Width " " (external)			2	4.
Length fifth " "			2	11.
Width " " (below)			2	
Length seventh " "			3	2.
Width " " (below)			2	8.
Length tenth " "			3	3.
Width " " (external)			3	10.5
Length of a vertebral bone,			2	5.
Width " " "			1	9.5
From end of xiphisternal notch to anterior margin of hyposternal,			2	6.
Greatest width episternal,			2	4.5

Portions of another individual from Barnesboro, confirm the characters already given, and indicate the largest of the group known by the shell alone.

The remains are the first and eleventh marginal bones of the right side, and the fifth of the left, with the nuchal and numerous costals, including the humeral or first costal. Also several vertebral bones, with parts of the sternum, the scapula, coracoid, femora, etc.

The marginals exhibit the characters of the genus, the eleventh particularly, which is wanting in the first specimen, exhibiting a suture for union with pygal bone. It is therefore produced much beyond the suture of the marginal scuta, a peculiarity not existing in any species of *Propleura*. The same bone is relatively considerably stouter than in *P. sopita*. The first marginal is deeper and shorter than in the same, and the fifth differs in the same way, and is much wider as well. The nuchal is concave and arched medially, and bears a well marked marginal scutum. The adjacent scutum on each side is relatively shorter than any of the others, and has an oblique inner suture.

The vertebral bones are narrower than in the *O. platylomus* and are elongate oval in outline behind. They present superiorly a shallow longitudinal groove interrupted at the middle of the length.

The scapula presents a short coracoid articular surface. The procoracoid is flattened in the plane of the scapula.



The femur presents the usual constricted cylindric shaft, with trochanters whose planes include an angle a little less than 90°.

	<i>In.</i>	<i>Lin.</i>
Length of eleventh marginal,	3	6.5
Width " "	4	.3
Width of a costal,	3	2.
" " first marginal,		22.5
Length " "	2	7.
" nuchal bone,	5	
" vertebral,	2	3.
Width " "		15.5
Diameter shaft of femur,		7.3

#### OSTEOPYGIS CHELYDRINUS, *Cope, Sp. nov.*

This large and most distinct species was found in the same locality as the preceding. It is unfortunately only represented by ten marginal plates more or less perfect, and portions of some costals, but these are sufficient to indicate some of its peculiarities. It combines more of the peculiarities of *Chelydra* in these pieces, as *Euclastes* does in the physiognomy of its cranium.

The marginal bones are relatively much shorter than in any of the other species. It is however referred to this genus with certainty since the anterior rib-bearing marginal bone has been united with the middle disc by suture, and some of those posterior are ossified within the common margin of the costal and marginal scuta. The outer margin of these and of the median bones of the series, is very heavy, but little produced, but projecting from a concave upper face. The inferior faces of the posterior median are convex and produced inwards further than usual, and joins the inner face by an obtuse angle. The rib-pits extend deeply, or to within a short distance of the surface.

One posterior marginal is thicker than in *O. emarginatus* and has a convex inferior face. The upper margin of the inner face is prolonged above the lower. The rib-pit is round; the dermal suture well marked. On this bone the character of the posterior outline is marked. The anterior half of the margin is quite concave, leaving a strong and prominent angle at the extremity of the dermal suture. This is much stronger than those seen in *Catapleura repanda*, though the bone described is more posterior than those of the latter.

The surface of the posterior bone has some faint vascular grooves; the others are without them, but are of a coarse texture.

	<i>Measurements.</i>	
	<i>In</i>	<i>Lin.</i>
Length posterior marginal,	2	9.3
Width " "	3	2.
Depth " " within,		9.5
Width lower face middle marginal,	1	7.7
Length anterior united marginal,	2	6.
Width " " "	1	9.
Width dermal scute on same,	1	2.8
Thickness costal bone,		4.

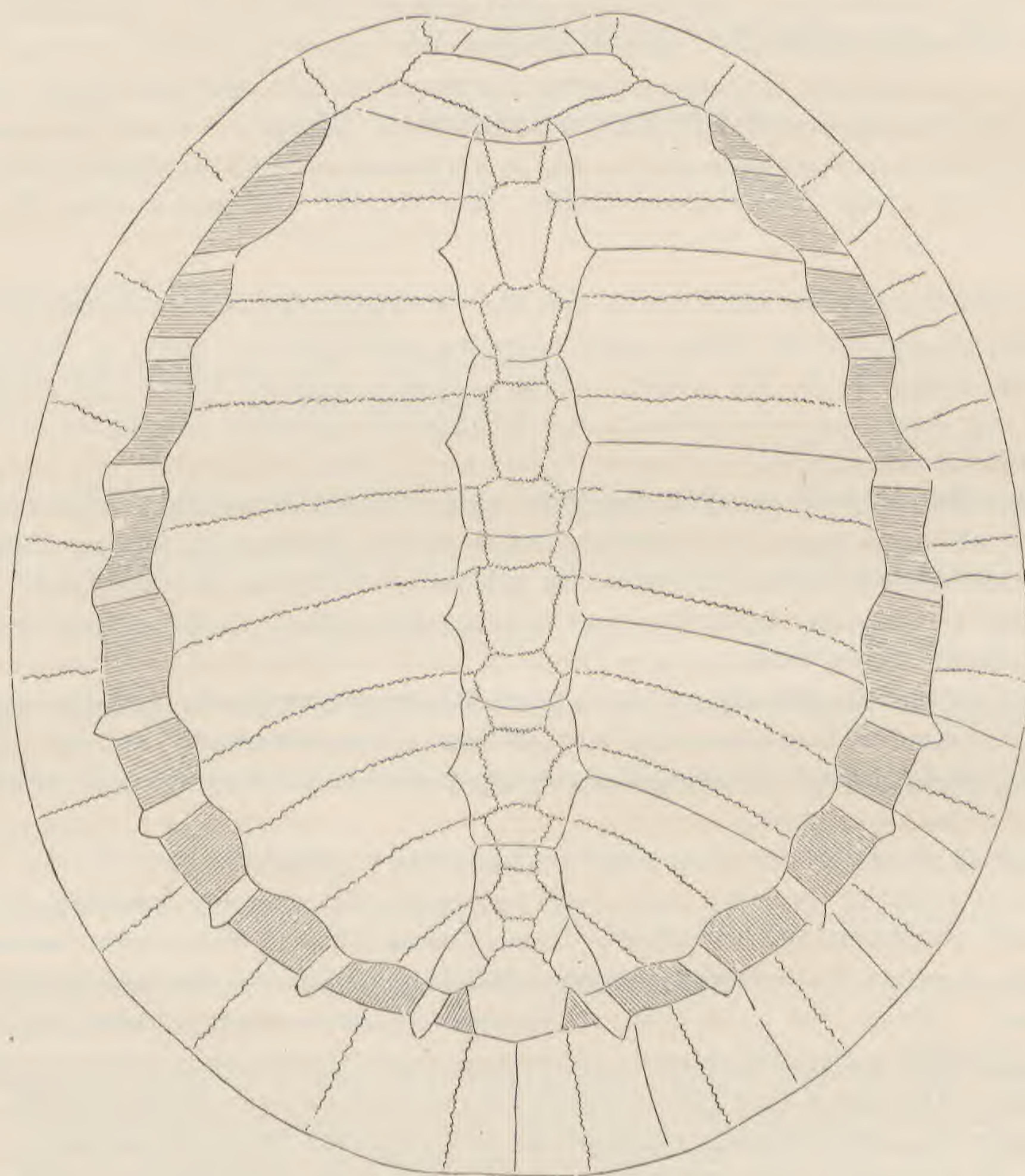
#### PROPLEURA, *Cope.*

This genus of Chelydrinae is intermediate between *Osteopygis* and *Lytoloma*, presenting more characters of the former than of the latter, so far as regards the carapace. The marginal bones are free behind, except probably that the median is attached to the posterior supernumerary vertebral (this piece is lost in my specimens); and the series of marginal dermal scuta are connected by a median marginal cut off from the anterior



vertebral, as in *Chelone*. This occurs in *Osteopygis*. The anterior connection between the carapacial disc and margin is more as in *Osteopygis*. The first marginal has a weak connection with the disc, but is almost free posteriorly; the edge of the second marginal is broken, but I have doubts whether it was attached as in the known species of *Osteopygis* by the margin; it was supported by a strong rib as in that genus, a point in which both differ from *Chelone*.

Fig. 39.

Carapace of *PROPALEURA SOPITA*, restored.

The femur has the slender shank of *Osteopygis*; the humerus is broad and stout.

I. Margins of posterior marginals regular or convex.

Upper and lower inner margins of 8th marginal bone equal, with cylindric fossa, width  $\frac{8}{9}$  the length—that is much longer than in the *O. platylomus*: vertebral scuta elongate, little dilated at lateral angles; width 5th marginal bone little over .6 the length.

SOPITA.



The accompanying cut is a restoration of the typical species of the genus, and may be compared with those of the genera preceding and following. Like the others, it is derived from a great number of broken fragments which have been arranged and attached. On one side the dermal sutures have been omitted for clearness sake.

The structure of the sternum appears to be identical with that of *Osteopygis*.

It may be added that the genus *Eucastes*, Cope, was established on the cranium of a turtle, which will perhaps be found to enter either this genus or *Osteopygis*, in either of which cases it will have priority of publication.

#### PROPLEURA SOPITA, Leidy.

*Chelone sopita*, Leidy, Cretac. Rept. N. Amer. Smiths. contr. xii., 104. *Osteopygis s.*, Cope, Pr. A. N. S., Phila., 1868, 147.

This species is indicated by two marginal bones, part of a costal, half a femur, a tarsal and two phalanges, which lay in close proximity in a block of the Timber creek Limestone taken from the quarry of Barclay Edwards, near Harrisonville, Salem county, N. J. The original specimen, several marginal bones of one individual, are in the State Collection of New Jersey, while the specimens also described and figured by Leidy in the Cretaceous Reptiles, I can scarcely refer to the same species.

The principal evidence, however, on which this species rests, is a partially complete carapace and plastron, with some limb bones from the marl excavations at Birmingham, N. J.; and for which the Academy of Natural Sciences is indebted to Judson Gaskill, one of the proprietors. The portions preserved are the first, third, fourth, seventh to caudal marginal bones of one or both sides; the front vertebral, with numerous costals and the hyo- hypo, and fragments of epi- and xiphisternal elements.

The specimen is of about the same size as that on which *Osteopygis emarginatus*, from the same place is chiefly based, and the anterior marginal bones are similar in proportions to those of the latter, and not so broad in relation to their length as in *O. platylomus*. In some other respects it approaches nearer the otter, which seems to stand rather between it and the *O. emarginatus*.

The front marginals are of about the same length as those of the *O. platylomus*, but are very much thinner and lighter. The external margin of the first is convex and continuous, with a marked concavity of the nuchal bone, which is slighter in *O. platylomus*, and is wanting in *O. emarginatus*. The posterior part of the first is of increased thickness, while the second is still more rapidly heavier. They have no groove on the inner inferior edge, but a wide, shallow one externally. This is weak on the third; the external face of the fourth exhibits a slight continuation of it; the same face of the fifth is regularly concave. The superior face of the seventh is gently concave, and the inferior more strongly convex. The edge of the eighth is slightly everted, while the more posterior are flat. The rib-pits are round conic, those from the ninth posteriorly not completed above, from the thinness of the bones. The edges of the posterior bones are not prolonged within that dermal sutural groove. The intermarginal dermal grooves are more indistinct in this species than in others, or at least are so in the three specimens I have seen. The costo-marginal suture is not visible either on the fourth or any more anterior marginal bone.

	<i>In</i>	<i>Lin.</i>
Length of edge of nuchal marginal,	4	6
Length of first marginal.	2	9.6
Width of " "	1	9.6
Width of fourth " above (greatest)	2	
Width of " " below (median)	1	2.5
Length of " "	2	11.2



	<i>In.</i>	<i>Lin.</i>
Length of seventh marginal,	3	1.4
Thickness of " " posteriorly		11.5
Width of " " below	2	2.5
Width of eleventh " above	3	6
Length of " " (median)	3	3

Large portions of many costal bones are preserved. These show the ossification to have been more extensive than in the species of *Chelone*. Their thickness is more uniform than in some species. The capitula of the ribs are round, and are on subcylindric bases. The anterior is peculiar for its flattened form; on its anterior margin is a broad rugose band, which contracts into a groove on the side of the capitular process. The dermal sutures are quite distinct. The vertebral scuta are longer than wide, with bracket-shaped lateral sutures, little prolonged at the angles. One of the transverse intervertebral sutures is strongly concave, probably backward. Where the capitulum springs from the inferior surface of the costal bone, there are usually six, or more or less, radiating short grooves, pointing towards it as a centre.

	<i>In.</i>	<i>Lin.</i>
Width of costal bone,	1	7.2
Thickness " " on margin,		3
Length poster half lateral suture vertebral scute,	2	2
Width vertebral scute on costal bone (greatest)	2	4

Large portions of both *hyosternals* and both *hyposternals* are preserved, with fragments of an epi- and xiphisternal. The inguinal margin is strongly curved and thickened; its median portion is concave, with a sharp margin below. The axillary thinned medially and inwardly, and thickened outwardly. The hyposternals are also thinned towards the hyosternals. The episternal is acuminate posteriorly, and steeply bevelled on the outer margin. The xiphisternal is attached as in *osteopygis*, by a groove on its inner face, embracing the margin of the hyosternal. This groove is, relatively, considerably shorter than in the two species of that genus known. The proportions of the bone are narrower than in them; the edge is thin, and the surface rises abruptly from it over a thickening which does not appear in either of the before mentioned species. The external sutural process is also more posterior. The margin of the hyosternals is thinner than in *O. emarginatus*, and they thicken inwardly as well as outwardly; they only thicken outwardly in *O. platylomus*.

	<i>Lin.</i>
Width hyosternal,	24.5
Thickness inguinal margin hyposternal,	5.8
Width xiphisternal (cross axis) at end inner hyposternal groove,	19
Width episternal two inches from proximal end,	14.5

A perfect *femur*, and a humerus with the head injured, were procured with the other bones. The former is characterized by its slender shaft, the great antero-posterior extent of its united head and great trochanter, and the large transverse extent of the condyles. In general form it is much more like *Chelys* than *Chelone*, though in the points mentioned it exceeds the former. The articular surface of the head is very convex, and is prolonged in a narrow band along the summit of the great trochanter. The little trochanter stands nearly at right angles to the first. The shaft is sub-round medially. Compared with the femur described under *Taphrosphys molops*, but which may belong to *Propleura augusta*, the inner tubercle is not so prominent and acute, and the posterior projections of the condyles are not so strong. The head of the uncertain femur is not projected so far forwards, and is much more convex; the great trochanter is not continuous with it, hence the articular surface is not prolonged.

	<i>In.</i>	<i>Lin.</i>
Length of femur,	5	3
Width of head and trochanter,		22
Width of condyles,		18



The *humerus* is curved like the femur, but is flatter and broader as compared with the other dimensions. The shank is flattened, and the condyles relatively less dilated transversely than those of the femur. Inside the inner distal margin is a deep open groove, for the passage of the humeral artery. The coracoid has a constricted shaft; its clavicular articular face is short, and the suture smooth. In *Trionyx*, the latter is longer and interlocking.

	<i>In.</i>
Estimated length carapace,	26
Estimated width    “	24

The following characters are observed in the Harrisonville specimen :

The species differs from the *Osteopyges* in its relatively wider posterior marginal plate, with very indistinct dermal sutures; though the surface is fully preserved and the vascular grooves distinct, these are very faint. The costal pit is less flattened, and the inner margins of the plate are equal, the upper being less prolonged. The anterior marginal differs from the same in *O. emarginatus*, in lacking an open groove within the lower margin. The form of the femur has been noticed in the remarks on the genus. It is considerably curved, and with a slender shaft. The inner condyle is the larger, and within it is a compressed longitudinal ridge. Surface striate with small ridges.

Edge of the posterior marginal bone slightly recurved.

	<i>In.</i>	<i>Lin.</i>
Length eighth marginal,	3	7.5
Width    “    “	3	1.5
Depth    “    “    at rib pit,		11.5
“    last anter. marginal with rib at margin,		9.5
Width condyles femur,	1	9.7
Diameter shaft near middle,		8.5
Length phalange,	1	1

The *Euclastes platyops*, *Cope*, is only known from a cranium found in the same limestone. The present species bears some nearer relation to that in dimensions than any known.

A very large specimen of this species was presented to the author by John Miers, who procured it from his pit near Hornerstown, from the upper cretaceous green sand. Its dimensions exceed those of any of the other *Chelydrinae*, yet they present the incomplete extension of the union of the marginal and carapacial bones characteristic of the genus.

	<i>In.</i>	<i>Lin.</i>
Length of ninth marginal	4	4
Width,	3	6
Depth (medially within),	1	2
Length tenth marginal,	4	1
Width,	4	1

These marginals are opened by *l. l. c.* marginate at the end of the inter-marginal scutal sutures. The measurements of the proximal extremity of the humerus give further indication of its proportions.

	<i>In.</i>	<i>Lin.</i>
Length of the condyle and deltoid ridge,	2	9
“    “    “    alone,	1	4.5
“    “    postero-interior crest,	1	



CATAPLEURA, *Cope*.

In this genus, as in the two preceding, the carapacial disc is united by suture to two marginal bones, on each side of the nuchal bone, forming a solid arch. What the mode of attachment between the two may be posteriorly, material is not sufficient to determine; but from the form of some tenth and ninth marginals, I suspect that this union is not so great as in *Osteopygis*, but rather as in *Propleura*, by the caudal marginal only. There is a nuchal scutum, as in the last genus. What distinguishes it from that genus, as well as from *Osteopygis*, is the entire absence of the rib and pit articulation between the second marginal and the corresponding costal bones. It is in this respect similar to *Chelydra*, and to *Chelone*, counting one rib less than in *Propleura*. From the similarity in thickness and form of the first marginal, I suppose the genus *Lytoloma* to have been similar to the present, in this respect, and a supposed second marginal confirms the view.

The only species of this genus yet known is peculiar in the form of the nuchal marginal. It is not wider than the first and second marginals, and does not, therefore, extend over the front of the carapace, as in *Osteopygis*, *Chelydra* and *Chelone*. It is intermediate in extent in *Propleura sopita*, while it is identical in form in the *Lytoloma jeansii*. The natural position of the type species is, therefore, plain enough. In the present genus and *Propleura* the form of this piece is perhaps of not more than specific value.

I. The margins of the posterior marginal plates repand or concave.

Posterior lateral bones, with upper margin produced within, narrow; width 6-7ths length, margin openly repand; anterior marginal scuta  $2\frac{2}{3}$  long as wide, many of these bones confluent with disc, none concave on outer surface.

C. REPANDA.

CATAPLEURA REPANDA, *Cope*.

*Osteopygis repandus*, Cope, Proc. A. N. Sci., Phila., 1863, p. 147.

This species is based on remains of one individual, which is represented by parts or wholes of ten marginal and of many costal plates. Its size is smaller than the preceding species, and it is further characterized by the repand outline of the posterior marginals with obtuse points at the dermal sutures. The middle marginals are concave instead of convex below, as in *O. emarginatus*. The narrow anterior marginals are convex on the outer surface, and bear very elongate scutes, which are narrower than in any other species. Five of these marginal bones have been united above by suture to vertebral or costal plates, indicating the same degree of ossification as in *O. emarginatus*. The dermal sutures are less marked than in that species, but are indistinct, as in *P. sopita*. On two costal plates, the margins of these are distinct. They are straight, make open angles with the transverse grooves, and with each other, and indicate scutes longer than broad. The costal bones are plane, longitudinally, but considerably decurved from and below the middle. The costal ridge is distinct throughout, and narrow, and extends obliquely to the posterior suture, and then projects shortly for attachment to the marginal bone. The costal heads present at their posterior bases an acute ridge, which diverges posteriorly, embracing a strong groove between it and the body of the rib: both extend but a short distance posteriorly. I have not seen this feature in the ribs of the *O. emarginatus*, and *O. platylomus*.



The vascular grooves are quite distinct, forming short, straight and zigzag, sometimes crossing grooves. In the posterior or wider marginals, the upper inner margin is produced inwards above the lower. The rib pits are round. None of the marginal bones have recurved edges.

	<i>Measurements.</i>	<i>In.</i>	<i>Lin.</i>
Width of a posterior marginal,		2	1.5
Depth " " " within,		1	
Depth " an anterior " at edge,			7
Length " " "		2	4.5
Width " " "		1	9
Width of dermal scute on same,			9
Width of middle marginal, above		1	9
Width " " below		1	
Length of costal bone on curve,		5	
Width " " "		1	11
Thickness of costal bone at middle margin,			2.5

The specimens on which this species are based were obtained from the pits of the West Jersey Marl Company, near Barnesboro, Gloucester county, New Jersey, and were presented to the author by I. C. Voorhees, Superintendent there.

#### LYTOLOMA, *Cope.*

This genus is more like *Chelone* than any of the *Chelydrine* forms here described. The characters are derived solely from portions of the carapace which are preserved, and are as follows:

The marginal bones free from the carapace except at the anterior and posterior portions, narrow anteriorly, expanded behind.

The evidence for these characters consists: first, of a median and a first marginal bone of a species from the green sand of Barnesboro; second, of two marginals and a mandibular arch from Birmingham; third, of four consecutive posterior marginals from Mullica Hill; fourth, of parts of a skeleton from Hornerstown. The first represents the *Chelonoid* freedom of all but the nuchal marginal plate, in front, by the entirety of the margins of the first. The second presents a free anterior marginal, and a narrow middle marginal with rib pit. The third probably belonged to the same species as the last, and presents in the inner margins an absence of the disposition to expansion, which exists in the genus *Osteopygis*, where the union of disc and marginals is extensive. It appears to have been similar to the genus *Propleura* in the posterior part of the carapace.

Two species of the genus appear to be indicated by the material at my disposal, which can be thus distinguished.

The anterior (first and probably second) marginals with entire convex margin.

L. JEANESII.

The anterior (second and probably first) marginals with openly emarginate margin.

P. ANGUSTA.



LYTOLOMA JEANESII, *Cope, Spec. Nov.*

This turtle is known by two marginal bones, the nuchal with its suture for the first vertebral distinct, and the first with the usual divergent suture for union with the nuchal. A second specimen, which I owe to the liberality of John Meirs, was taken from the lower part of the upper Greensand bed at Hornerstown, Monmouth county, N. J.

It shows its relationship to the *Catapleura repanda* in the narrow proportions of the nuchal bone, which thus resembles an ordinary marginal, and differs entirely from the form in *Chelydra* and *Chelone*. Another point of similarity is the union of this bone with the first marginal by a coarse gomphosis, the process pertaining to the latter.

Its marked peculiarity is the normally narrow and free first, and therefore second marginal bones. The first gradually narrows inwardly, and is bordered by a regular, slightly concave, free margin. Its suture with the nuchal is straight: its suture with the second has the entering angle near the outer margin seen in *C. repanda*, *P. sopita*, etc. The rounded margin of the nuchal is not heavy; that of the first marginal is more so than in *C. repanda*, and increases near the posterior suture.

An indistinct scutal suture crosses the middle of the marginal; but whether the marginal scuta are narrower than the bone, cannot be determined. The line separating the first vertebral from the nuchal descends, or narrows the nuchal scutum, but not so rapidly as in *C. repanda*, being straight instead of concave.

The first marginal bone is three-fifths as wide as long in the present species; in the *C. repanda* four-fifths as wide as long.

	<i>Lines.</i>
Width nuchal marginal,	16.5
Width " scutum,	8.5
Width first marginal,	15.5

The Hornerstown specimen furnishes portions of several costals, and three marginals, with the head of the humerus. They were taken by the writer from the green sand, in natural relation; they indicate an animal of as large size as the *Osteopygis emarginatus*, and demonstrate that the characters on which this genus rests, although those of immature *Osteopyges*, are nevertheless those of adult animals.

The superior margin of the first marginal is entire, and rather thin, showing its complete separation from the carapacial disc. The outer margin is somewhat thickened, and the proximal extremity exhibits the usual wedge-shaped articulation. Length exteriorly,  $3\frac{3}{8}$  in.; width, 1 in. 5 l. A lateral marginal, perhaps the sixth, is remarkable for its narrow form, and the nearly equal measurements of the three chords of its transverse section. The external face is thus very oblique and the margin not at all recurved, or in any way emarginate. The rib pit is round conic. Length, 3 in. 9 l.; external face, 1 in. 6 lin. wide; internal chord, 1 in. 5 l. The inferior and superior inner margins are alike thin and acute. Width of a costal bone, 3 in. 6 lin.; depth near sutural margin, 3 lines. Diameter humeral condyle, 1 in. 6 lin. The costal bones are without sculpture.

Discovered in the upper green sand-bed or the upper Cretaceous, near Barnesboro, Gloucester Co., and Hornerstown, Monmouth Co., N. J.

This species is named after Joseph Jeanes, of this city, an active and liberal member of the Academy of Natural Sciences of Philadelphia.

LYTOLOMA ANGUSTA, *Cope.*

*Chelone sopita*, Leidy. Cretac. Rept. U. S. Smithsonian Contrib., XII., p. 105 (Second Specimen), Tab. XIX., fig. 2.

Posterior and lateral marginal bones, with the upper margins, not produced beyond the lower. The second with a deep, open emargination, the length twice the average breadth. Width of fifth .5 length, the superior surface concave; vertebral scuta wide, angles produced.

This species is at present indicated by a mandible and some marginal and costal bones. These are, however, so characteristic and different from anything hitherto observed in the Cretaceous Green Sand of New Jersey as to de-



mand record. Its form suggests the same portion of the *Thalassochelys planimentum* and *Th. crassicostatus* of Owen (*Chelone* Ow.) from the Eocene of England; but it is much more obtuse, and broader, in relation to its length, than either of these. As the extent of the symphysis among Testudinata bears some relation to the position of the posterior opening of the nares, the pertinence of this jaw to the *Euclestes platyops* suggests itself. Its flatness and shallowness, and want of recurved alveolar margins, are appropriate to the shallowness and small alveolar margin of the maxillo-palatine face. There is, however, no trace of that elevation and acumination of the extremity of the symphysis, associated with the premaxillary concavity and foramen to the nasal meatus, which is to be looked for, and which occurs to some extent even where the foramen is wanting, *e. g.*, in the *Thalassochelys caouana*. In its specific features, it is different from the *E. platyops* in its greater abbreviation. In the former, the width at the anterior margins of the coronoid process is to the median length anterior to the line between these points, as 2:4-5; in the latter, measuring on the cranium below, as 2:1 3-5.

In this species the posterior margin of the symphysis is opposite the anterior part of the coronoid bone; the anterior margin of the coronoid elevation of the dentale measures the posterior or third of the symphysis. The sutures of the dentale with other elements nowhere consolidated. The internal groove passes round the hinder face of the arch, situated deeply between the prolongations of the superior and inferior plates. Mandible beneath, flat, abruptly rising to the alveolar ridge. This is broken away, but from fragments of surface remaining, has been but little elevated. Superior alveolar faces, nearly plane, slightly elevated longitudinally on the median line, where the surface is slightly striate. Portions of the superficial plate remaining offer no evidence of an upward curvature, though a small portion of the extremity has been worn off.

A striking feature in this species is the size and depth of the fossa for the insertion of the masseter muscle. It is relatively greater than in any of the recent Chelonidæ which I have seen, and indicates great muscular power. This necessitates the shortness of the mandible, as it is less strengthened in the vertical direction than the modern species. The mental foramen enters in the anterior portion of this fossa. The dental foramen, of equal size, enters below the middle of the coronoid bone. The wall of the fossa is the inferior plate of the mentum prolonged into a strong ridge.

	<i>Measurements.</i>	<i>Lines.</i>
Length of symphyseal line,		25
Width at anterior margins, coronoid processes,		42.7
“ apices coronoid bones,		42.7
Elevation apices coronoid bones,		19
Depth at symphysis behind,		8

Two portions of peculiar marginal bones, from the left side of the carapace of one of the Chelonidiæ, found at the same time and place as preceding, have much the same mineral character, and probably belong to it. The piece from the median margin is quite thick on the inner face, which, with the upper face, is concave; lower, slightly convex.

	<i>Lines.</i>
Depth within,	10.5
Width below,	15.5
Width above,	12.5

Fossa for costal extremity, open conic.

A portion of what is perhaps a fourth left marginal, is triangular in section, each side concave, the inner face most extensive. The margin is obtuse, and presents an open concavity, thus connecting the forms of the second and fifth bones here described.

Width of inferior margin, 9.5 lines.

Second marginal very shallow, vertically; a very open emargination between dermal shields, which have left a shallow sutural groove. It presents a narrow truncate inner margin, and there is no rib-pit in it.



	<i>Lines.</i>
Depth within (distally),	7.
Greatest width,	16.5
Width at emargination,	13.5

A costal bone of the right side, with its external portion broken away, accompanied the above, but probably does not belong to the same species. It is thin, and the head of the rib is almost cylindric. The surface is marked with delicate vascular grooves, which are largely parallel to each other. The external angle of a vertebral scute falls near the posterior border 2.3 inches from the vertebral suture, indicating considerable breadth. The angle is right. The anterior outer suture is slightly concave, and begins to assume a nearly longitudinal direction on the costal suture, one inch from the vertebral.

	<i>Lines.</i>
Width of bone,	23.5
Thickness at lateral suture,	2.5
Longer vertebral suture,	14

The specimen indicating this species was found near Pemberton, Burlington Co., N. J., and was presented to the Museum of the Academy by Dr. Samuel Ashhurst. At the same time and place were found plates and a broken femur of correlative size of a large individual of *Prochionias sulcatus*; the latter measured 18 lines across head, and 16 across condyles. There were also remains of *Adocus*, *Hyposaurus*, *Holops*, and *Mosasaurus*.

Prof. Leidy describes (Cretaceous Reptiles) two species of Marine Turtles—*Chelone sopita*, and *Chelone ornata*. There is no evidence that the mandible herein described pertained to either of these species, and the identification of the accompanying marginal bones indicates a considerable difference. These are in the present species concave below, in the *P. sopita* convex or plane. In *L. angusta* the suture of the dermal scutes marks an entrant angle; in the *P. sopita*, a projecting one. The same bones are relatively narrower than in any of the species of *Osteopygis*, and have planer margins, and round pits. Their narrowness suggests that the extremal marginals may have been still less united with the disc than in the species of *Propleura*.

This species is also known from the three marginal bones, and part of a fourth, described and figured by Dr. Leidy, as above. I suppose them to be from the sixth to the ninth of the left side, inclusive. The animal has suffered an injury, as a deep notch is cut in the margin between the eighth and ninth, and another just behind the rib-pit of the ninth.

The species differs markedly from the *P. sopita* in the flatness and slenderness of the more lateral marginal bones, and were it not for the posterior marginal of the *P. angusta* preserved, might be referred to that tortoise. The inner edge of the seventh is not so deep as in the *P. sopita*, and the breadth relatively less; the same is true of the sixth. The superior edge is prolonged but little beyond the inferior. The pits for the costal pegs are behind the line of the posterior two-fifths of the length, on all the bones. Pits round conic, inner edges equal. Margin from seventh slightly curved up.

	<i>Lines.</i>
Width sixth,	18
Depth " on inner border,	10.5
" seventh " "	9
Length " " "	31.5
Width " (average,	20.5
Width of eighth, $\frac{7}{8}$ the length.	

From the upper Cretaceous Green Sand Bed, Mullica Hill, Gloucester Co., N. J.

#### EUCLASTES.

*Cope*, Proceedings Academy Nat. Sciences, 1867, p. 39.



This genus was established on a species, represented by a single imperfect cranium, procured by Thomas Heritage from his marl excavations, near Hurfftown, in Camden Co., N. J. The matrix in which it is preserved is very similar to that near Vincentown, in which the cranium of the *Thoracosaurus neocaesariensis* was discovered, being a coarse, granular limestone.

The physiognomy of this large turtle in the obliquely expanded zygomata and short muzzle is like the Pleurodire genera *Podocnemis* Wagl. among recent *Chelonia*, and *Bothremys* Leidy, of the same age, among extinct forms. Its completely over-arching temporal fossae add to the impression of its affinity to the former genus, but on inspection of the vomer, it is found to be as in the true *Cheloniidae*, largely developed on the palatal surface between the *o. o.* maxillaria, and to extend to a posteriorly situated nareal opening. Though this element is unossified in the *Chelonioid* types of *Pleurodira*, *Peltocephalus* and *Podocnemis*, it is well developed in the family *Chelydidae*, (Agassiz) and the peculiarity of the cretaceous species might still exist in this suborder. As it is a matter of much interest to determine the precedence in time of the two suborders of the *Chelonians*, I have taken pains to remove the matrix from the orbital and nasal cavities, so as to determine the structure of the pre-frontal bone. As I have elsewhere pointed out, this sends downward a column to the vomer, either vertically or directed obliquely inwards, in all the *Cryptodira*, while in the *Pleurodira* the column is wanting.

The diagnosis will be as follows: That of the *Bothremys* a *Hydraspid*, which has furnished the only other cranium from the same formation, is introduced. It also has the vomer osseous extensively in contact with the maxillaries on the palatine surface.

*BOTHREMYS, Leidy.*

Posterior nares separating vomer from *o. o.* palatina; premaxillary margin concave, involute; alveolar profoundly concave, vomerine surface a sulcus; nasal meatus floored in front.

*EUCLASTES, Cope.*

Maxillaries and palatines separated throughout by the prolonged vomer; posterior nares opposite palatal front margin of orbits; premaxillary margin projecting beak-like; alveolar face little concave, vomer forming a central ridge. Floor of nasal meatus perforate for hook of mandible.

While *Bothremys* had an inferior mouth and projecting muzzle, as in the modern *Hydraspides*, the nostrils of the *Euclastes* were superior and behind the short projecting beak. The orbits are not, as in the *Macrochelys* of the Mississippi, far anterior and reduced in



size; but their centres are distant from the end of the muzzle (measured axially) more than one-third the total length of the cranium.

The descending portion of the pre-frontal is very wide, and equal to the width of the maxillary outside the lachrymal foramen; the latter is small. Internally, the columns of the prefrontals converge below to nearly an acute angle, and are directed forwards along the vomer. They restrict the nasal meatus extensively, leaving its diameter less than that of the columns. On the muzzle the pre-frontals have but a short common suture, admitting the frontal far between them. The internal nostrils have a diameter each side the septum equal to that between the pre-frontals.

#### EUCLASTES PLATYOPS, *Cope.*

Premaxillaries narrow, rounded in front; maxillary outline, nearly straight to below anterior rim of orbits, where the breadth of the muzzle is 4 inches, length to end of muzzle only 2. Plane from top of prefrontals to maxillary margin straight, oblique maxillary margin with a gentle sigmoid flexure; Squamosal much expanded below and behind orbits. Frontal region flat, parietal rising behind; nasal meatus subquadrate, slightly narrowed below, its palatal foramen with a free lateral osseous margin. Alveolar ridge divergent, little projecting above the oblique surface; the latter is most concave behind on each side of the vomer, presents no ridges, and few nutritious foramina. Line of common suture of o. o. maxillaria in front of vomer, in a sulcus. Palatines cuneiform with everted margins posteriorly, latter most elevated on each side the small choanal opening, which is bounded in front by the projecting posterior knob of the vomer. The maxillaries are very massive, and underlie more than two-thirds the area of the orbits; they receive a very extensive descending portion of the prefrontals, their union extending so far towards the median line as to leave but a narrow nasal meatus. This offers a powerful resistant face to the motion of the mandibles. The posterior orbital margin is .75 inch in thickness, and is at right angles to its alveolar margin. Pterygoids almost entirely broken away. The following measurements will furnish the best data for a comprehension of the form in detail.

	<i>In.</i>	<i>Lin.</i>
Total length cranium,	11	
Breadth behind orbits,	8	6.
"    between poster. margins orbits,	5	2.5
Least interorbital width,	2	2.5
Width of nasal meatus,	1	2.5
Depth premaxillaries,	1	1.
"    maxillary at middle orbit,	1	3.5
"    squamosal at zygomatic arch,	2	2.
Length naso-prefrontals,	2	3.
"    "    "    common suture,		6.2
"    common suture frontals,	2	4.
"    from anterior margin orbit to nasal meatus,		11.
"    "    premaxillary margin to end vomer,	3	9.
Width posterior nares together,	1	1.5
"    palatine bone opposite end of vomer,		.9
"    vomer near anterior extremity,		.7
Greatest diameter of orbit,	2	.6
Least    "    "    "	2	



The broad, regular alveolar surfaces have no doubt supported a massive corneous table, in some degree like that of *Platypeltis ferox*, and with little or no external cutting margin. This arrangement, as well as the compactness of structure, are appropriate to a nutrition dependent on crushing more or less hard bodies, as molluscs. That the *Ostreacae*, *Terebratulæ*, etc., of the sea coasts or estuaries in which it lived formed much of its food, is therefore quite probable.

Estimating the proportions to have been similar to those of *Chelydra serpentina*,\* the dimensions of the *Euclastes platyops* were——

	<i>Ft.</i>	<i>In.</i>
Length from end muzzle to end tail,	6	10.
“ of carapace,	2	8.5

This species belongs most probably to one of the genera of the same type here described, but whether to *Peritresius*, *Propleura* or *Osteopygis*, is not as yet ascertainable. In any case, *Euclastes* is an older name than either of the above.

#### PERITRESIUS, *Cope.*

This genus is proposed to express the characters of the *Chelone ornata* of Leidy. Nothing is known of the species but a costal and parts of two adjacent marginal bones. These are covered with coarse tubercles, as in some *Trionyx*, and more as in *Prochionias nodosus*. There are no dermal sutures on the specimens, and it is not probable that the dermal covering was corneous or scutiform. The pit for the rib is very small and flat, and not at all as in *Chelone*. Were it not that the head of the rib is not so flattened as in *Trionychidae*, I should imagine the genus might be allied to *Emyda*, or the *Trionyches*, with marginal bones. With our present knowledge, it is better that the costal bone should remain near *Peritresius*.

The structure of the costal bone above the inferior or costal layers is vesicular. The entire freedom of the marginal bone separates the form from any of our known *Pleurodira*.

#### PERITRESIUS ORNATUS, *Leidy.*

*Chelone ornata*, Leidy, Proc. A. N. Sci., 1856, 303 Cretaceous Rept., l. c.

Marginal bones, covered with coarse tubercles in the middle, and coarse ridges near the sutures, which are wider than the intervals between them.

New Jersey.

#### TRIONYCHIDAE.

Seven species of this family have been found in the North American strata, all referable to

\* Compared inappositely with *Hydraspis maximiliani* in the original description.



TRIONYX, *Geoffr.*

Costal bone transversely figured by narrow elevated ridges.

T. LIMA.

Costal bone with thick, low transverse ridges, which are connected by cross-ribs, which leave series of pits.

T. PRISCUS.

Costal bones with transverse irregular grooves proximally, which remain along the suture only distally, leaving a triangular area of a shallow honey-comb pattern medially.

Large, massive; the grooves of the shell widens the intervening ridges.

T. PENNATUS.

Smaller, light; the grooves much wider than the fine separating ridges.

T. BUIEI.

Costal bones, with a shallow, coarse honey-comb pattern, tending to confluence distally.

The vertebral segments shorter and wider; shell heavy, much arched.

T. HALOPHILUS.

The vertebral segments of the carapace long and narrow; shell thinner, flat.

T. GUTTATUS.

TRIONYX HALOPHILUS, *Cope.*

Proc. A. N. Sci., Phila., 1869, p. 12.

Established upon numerous portions of vertebral sternal and costal plates, from near Summit Bridge, Newcastle Co., Delaware, and from Camden Co., New Jersey; both from the lower bed of marl, according to Cook's explanation of the Cretaceous period.

This species differs from the *Trionyx priscus* Leidy, in the character of its sculpture. It is pitted coarsely and regularly, five to six in an inch on a costal or vertebral plate. In the *Tr. priscus* the pits are considerably smaller, and disposed in series across the costal plates, which are separated by ridges stronger and more elevated than those that separate the pits themselves. The same arrangement is visible on a portion of a xiphisternal bone, from green sand, near Petersburg, Va., in the collection of John S. Haines, member of the Academy, with portions of costal plates, all referable to the *Tr. priscus*. The specimen described by Leidy was from Monmouth Co., N. J. The confluence of several of the pits produces a somewhat similar appearance, as is common among *Trionyches*, on the outer margin of the second costal plate from the front on the left side, and probably on the extremities of the other plates, none of which are preserved. On a portion of a sternal plate, probably xiphisternal, the pits are equal and regularly distributed, but much smaller than on a costal, to the number of ten in an inch.

One costal bears a portion of the head of the rib; one vertebral a nearly complete centrum and neural arch, and another, pleurapophyses. Of a perfect vertebral plate the length and width are equal; the anterior suture concave, the posterior convex. The costal segments are markedly curved. The following measurements will furnish further characters.



	<i>Lin.</i>
Length of vertebral plate,	16.25
“ anterior suture plate,	7.5
“ “ lateral suture plate,	7.25
“ posterior “ “ “	11.
“ “ suture,	10.
Diameter of neural canal,	2.25
Length of centrum vertebra, No. 2,	13.75
Width “ behind diapophyses,	7.
“ “ at “	12.
Depth “ with plate, anteriorly,	12.
Width of costal plate No. 1,	17.
“ head of rib on No. 1 at origin,	7.
Width costal plate, No. 3,	21.25
“ “ “ 5,	25.5
Thickness of costal plate at 28.25 lines from prox. suture,	4.5
“ second plate at rib on outer margin,	6.25
“ vertebral plate near margin,	3.75

The costal plate of *Trionyx*, mentioned by Leidy (Cretaceous Reptiles, 113), from Burlington Co., N. J., probably pertains to the same species. Besides the localities above alluded to for the *Tr. priscus*, Leidy records a probably third cretaceous species from the Mississippi. The marine habitat of some of these species becomes quite probable, for both individuals and species are perhaps too numerous for all to have wandered from the mouths of rivers. We have the authority of Duchaillu for the statement that the *Aspidonectes aspilus* is found occasionally at sea, outside the mouths of the rivers, where it occurs in tropical western Africa.

#### TRIONYX GUTTATUS, *Leidy*.

Proc. Acad. Nat. Sci., Phila., 1869, p. 66.

Tertiary, at Church Buttes, near Fort Bridger, Wyoming Territory, discovered by Dr. F. V. Hayden.

#### TRIONYX FOVEATUS, *Leidy*.

Pr. A. N. S., 1860, p. 148.

From the Upper Jurassic Bad Lands of the Judith River, Nebraska.

#### TRIONYX PENNATUS, *Cope*.

Pr. A. N. Sci., 1869, p. 12.

This species is represented by the distal half or less of a single costal bone. It indicates a large species of size similar to the *Trionyx-priscus*, Leidy, and of a peculiar and handsome style of sculpture. The bone thickens distally, and the margin is heavy and truncate, and rises abruptly above the free extremity of the rib proper. The general surface is plane; the structure consists of strong sulci, which are as wide as the intervening ribs, which diverge slightly outwards on each side of a narrow plane line, which extends on each side along the inter-costal suture. Proximally, these grooves are continuous across the costal bone, forming a very open chevron, pointing outwards; but they shorten, and are separated by a triangular area of sub-round pits, which are not regular nor corresponding with the sulci; the latter shorten to the margin of the bone. The diameter of the pit is often smaller than that of the sulci.



	<i>Lines.</i>
Width costal bone,	25.
Thickness proximally,	3.
"    distally,	4.5
"    at base of free rib,	6.
Sulci in an inch, five.	

*Locality*—The upper bed of Green Sand in Monmouth Co., N. J. In the collection of O. B. Kinne, Director of the marl pits at Squankum.

#### TRIONYX BUIEI, *Cope, Sp. Nov.*

This species is represented by numerous costal bones in a more or less fragmentary condition. They resemble somewhat those of the *T. pennatus*. There are narrow transverse ridges extending in slightly curved lines from the margins to a distance inward on the costal bones. Near the middle of the length of the bone they are interrupted by irregularities and cross-ridges, producing a honey-comb arrangement, while more distally the ridges and included grooves are more continuous. Five intervals are included in six lines. Thickness of the costal bone at lateral suture, 2.2 lines.

From the Miocene, near Mt. Olive, Duplin County, N. C. Obtained by the Geological Survey of North Carolina by Prof. W. C. Kerr, Director. Dedicated to Dr. D. H. Buie, of Wilmington, N. C., a geologist and naturalist.

#### TRIONYX PRISCUS, *Leidy.*

Proc. Acad. Nat. Sci., 1852, p. 329. Cretaceous Reptiles, Tab.

From the Cretaceous green-sand of New Jersey.

#### TRIONYX LIMA, *Cope.*

Proc. Acad. Nat. Sci., Phila., 1869, p. 12.

This species is known by a costal bone, of which the proximal part has been broken away. It is the largest of our Trionyches.

The distal end of the bone is oblique and slightly concave; it is remarkably thick. The superficial sculpture is its strongest mark. This consists of numerous narrow, much elevated transverse ridges, which are finest and most closely arranged distally. They are irregular in their course, presenting occasional short interruptions, and rarely inosculate. The irregularities are most abundant proximally. The distance between the ridges is greater than the width of the same. There are five in a half inch distally, and 4.5 proximally. Probably on the proximal extremity of the costal bones the ridges are much more irregular, as they are generally less longitudinal there than distally in all our species.

Thickness at middle, distally, 9 lines; thickness at fractured edge, proximally, 6 lines.

From the Miocene marl of Cumberland Co., N. J. Found by John Hummel.

#### CHELONIIDAE.

No species referable with certainty to the present family, have been found in North American beds older than the Tertiaries.

#### CHELONE GRANDAEVA, *Leidy.*

Proc. Acad. Nat. Sci., Phila., 1861, p. 303.

This large species was originally characterized from a number of vertebral bones. Since then more abundant material has enabled me to ascertain its characters more precisely.



The ossification of the disc is perhaps more extensive than in *C. mydas*, if the small size of the extremities of the ribs be indication. They are very flat in both directions. The surface is smooth, or with only the vascular grooves found in the species of the family generally. A nuchal or marginal vertebral is partially preserved, having lost the posterior portion. The margin is heavy, thinner than as usual medially, and with a little irregularity where the dermal scutum crosses. The suture with the first marginal is nearly straight, except that the latter sends a flat process a considerable distance over the posterior face of the former.

The right scapula and part of the procoracoid are preserved. These have the extensive union characteristic of *Chelone*, and the short coracoid suture. The scapula is flattened so as to be antero-posterior above, transverse below. The procoracoid is strongly compressed to a vertical section. The head and great trochanter of the femur are preserved. These also present the characters of *Chelone*. The little trochanter is on the shaft some distance below the head. All but its base is lost. The great trochanter is higher than the head, and is a plane at right angles to the plane of the latter. Its extremity is conic, and its connecting portion contracted and descending below the line of the head.

	<i>Lines.</i>
Width of costal bone,	39.5
Thickness " at suture,	6.
" of nuchal bone at marginal suture,	9.
Length neck scapulo-procoracoid,	42.
Width " "	18.
Length coracoid suture,	18.
Depth procoracoid at middle,	16.
Length scapula to infer. side,	38.
Width " extremity,	20.
Transverse diameter shaft femur,	22.8
Diameter shaft and great trochanter,	45.3

The accompanying cuts show the forms of the head of the femur and of the scapula.

Another specimen in the museum of the Academy, from the same locality, exhibits the characters of four marginal bones and a fragment of one of the hyosternals. In general characters the middle and posterior of the former are

Fig. 40.

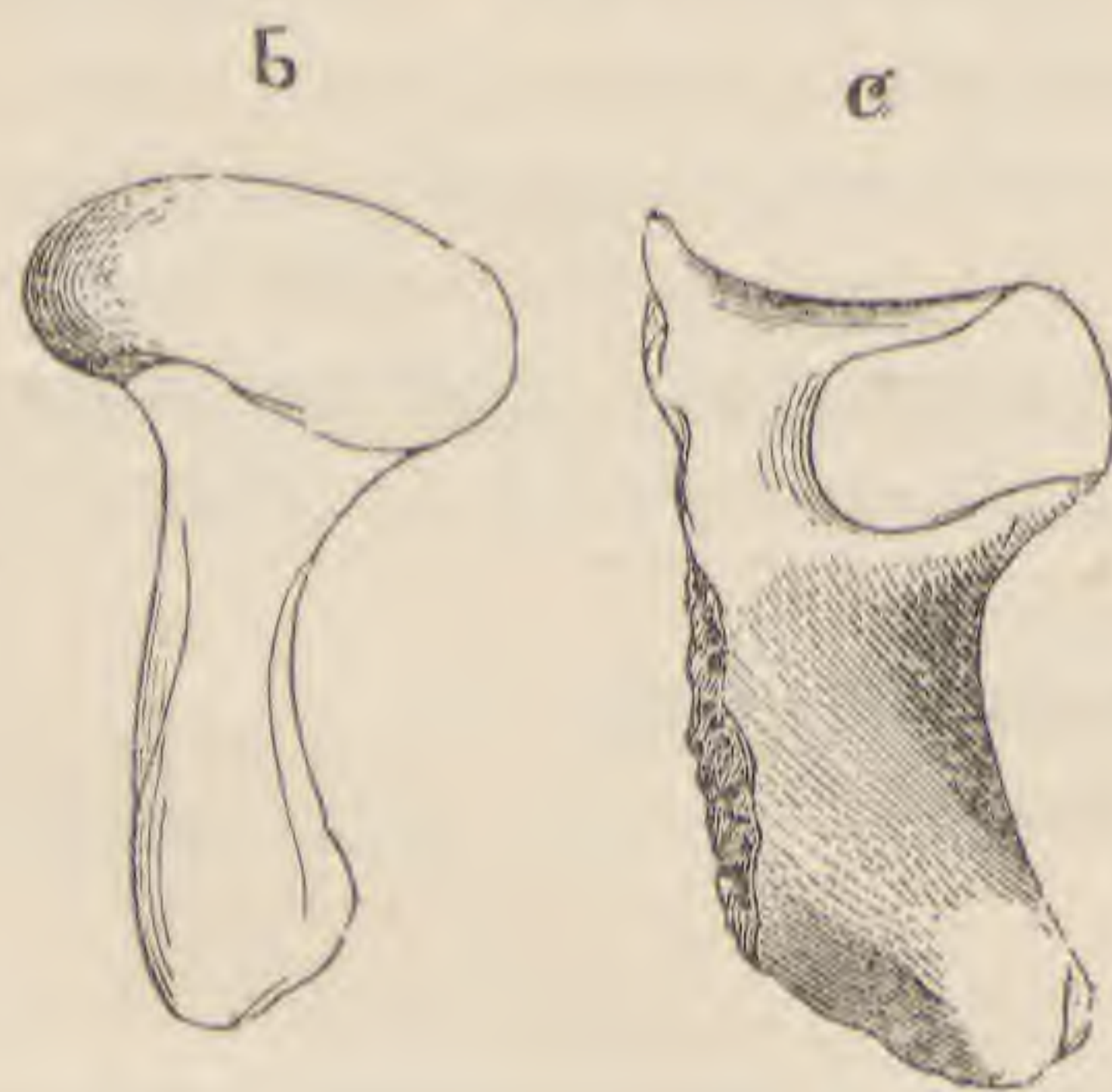
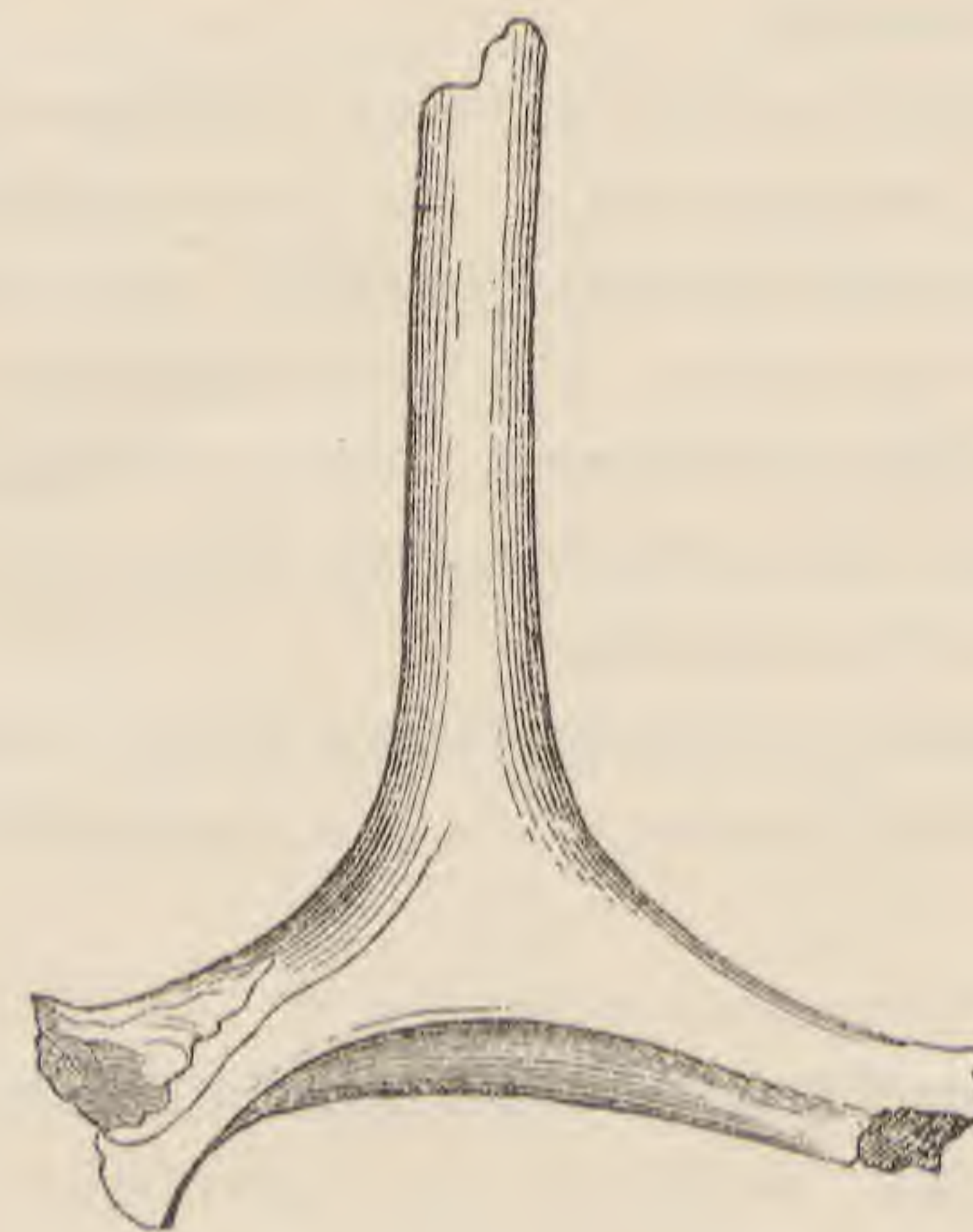


Fig. 41.



like those of *Propleura*; the anterior presents the characteristic slenderness seen in *Chelone*. One end of the latter is broken; the remainder measures four inches in length, 22.5 lines in width, and only 10.5 lines in depth medially, being flat and thin. The outer margin is flat and entire. The inner presents two shallow pits at its posterior part, close together, the hinder partly on the suture with the adjoining marginal, and directed a little forwards; the anterior directed backwards. As this is probably the anterior rib-bearing, or third marginal, it looks probable that



the free rib of the corresponding costal bone is directed obliquely backwards to the posterior part of the marginal and somewhat in the line of the outer extremity of the costal, instead of parallel to its lateral sutures, as in the others, which brings the rib to the middle of the marginal bone. That this is the case, is proven by the extremity of the corresponding costal bone. The direction of the free portion of the rib, instead of being parallel to the inter-costal suture, makes with it an angle of about  $35^{\circ}$ . This is a marked character, and not present, so far as I am aware, in any of the recent species.

A more median marginal is thick, and quite trigonal in section, and narrower than in the *Propleuras*: width below, 28.5 lines; depth of inner (concave) face, 21.5 lines; the measurements are approximate, as the margins are worn. The margin has a strong emargination near the middle. Two more posterior marginals exhibit a pronounced, but more open notch. Length of one of these 3 inches, 10.5 lines (median); width at notch, 30 lines; greatest width, 34 lines; depth, 12 lines. Inferior face transversely convex, margin not revolute. In all, the dermal intermarginal suture is distinct, crossing a little behind the middle.

The portion of hyosternal is that of a *Chelone*, and not *Chelydriform*.

Another species probably occurs in the same bed, but being indicated by the marginal of the young, it is not ready for description.

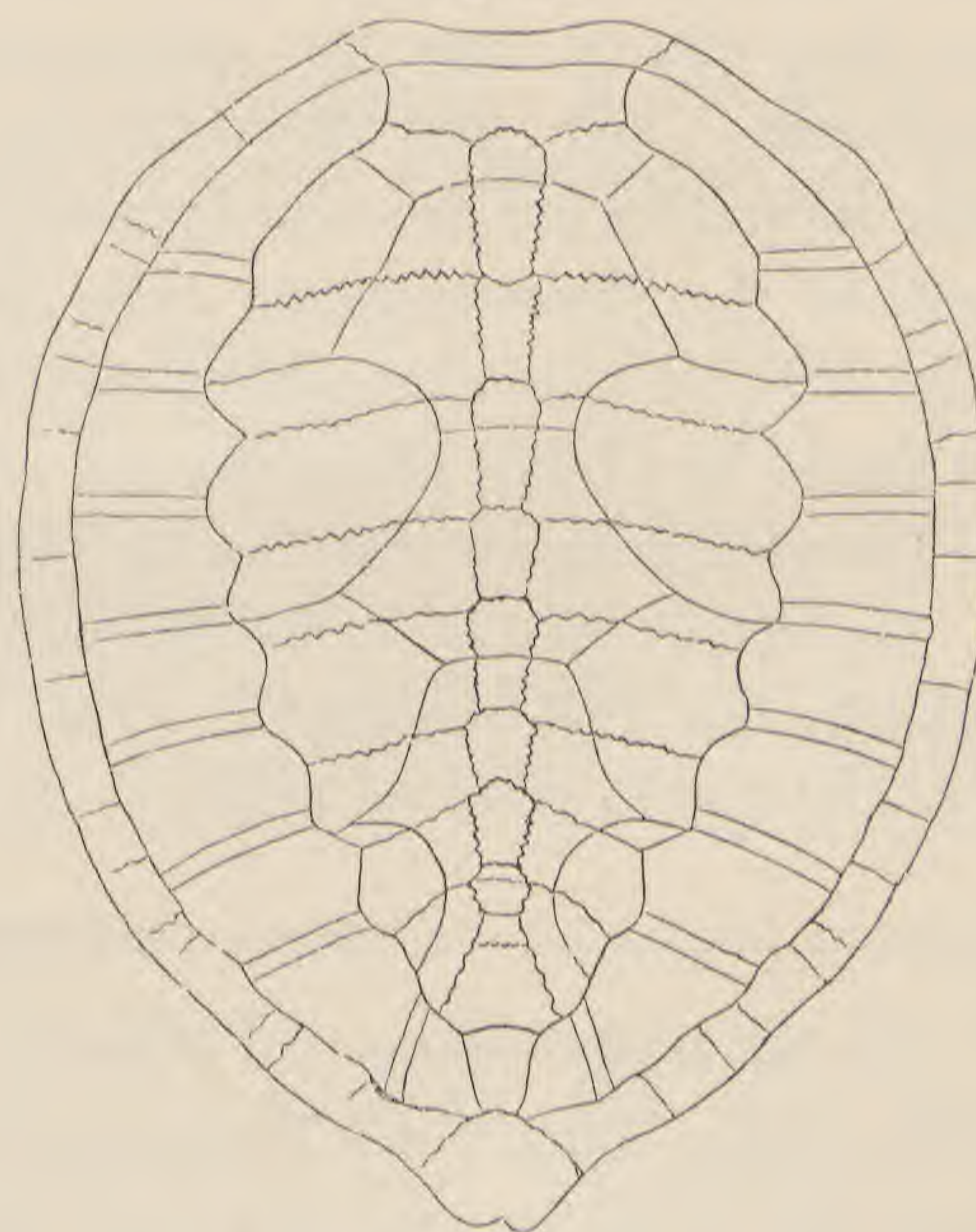
### CHELONE PARVITECTA, Cope.

*Chelone* Cope, Sp. Proceed. Acad. Nat. Sci., Phila., 1867, 143.

This species is indicated by a costal bone from Squankum, N. J., and by a part of another from Charles County, Maryland. It is characterized by its lightness, and by the breadth of the dorsal dermal scutum, as compared with the length of the bone, which indicates an abbreviation of the latter, and relatively small size of the carapace. The character of the broad scute and short costa is one of immaturity; but the margins of the former are curved, indicating length, and an adult outline; and the surface of the bone has a peculiar sculpture, not found in the *C. grandaeva* Leidy, the other species from the same beds. The latter is larger, and with smooth costal bones of regular thickness in specimens of the same size as the present.

The costal of *C. parvitecta* is light. Its surface is marked by longitudinal impressed grooves, which are more or less confluent; the surface is thus more or less tubercular. On one of the sutures the grooves run transversely to the bone for about half its length. Within the suture of the vertebral scutum the surface is strongly punctate; external angle of vertebral scutum less than right; sutures well marked.

Fig. 42.



CHELONE MIDAS LINN.

	In.	Lin.
Length costal bone without rib,	5	
"    "    to angle vertebral suture,	1	10.5
Median width costal bone,	1	9.
Thickness    "    at rib,		4.2
"    "    at margin,		2.5

*Position*—Probably the Miocene. The rib above described is in the collection of O.



B. Kinne, Director of the Squankum Company's marl excavations, Squankum, Monmouth County, N. J.

#### PLEURODIRA.

This division of the order, now found only in the southern hemisphere, had, in Mesozoic and Cainozoic time, as is known to geologists, a much more extended distribution. It has presented to various naturalists the appearance of a repetition under another type of structure, of the groups of Cryptodira. Agassiz, in his contributions to the Natural History of the United States, Vol. I., states that he believes it to form a series of families parallel with those of the other suborder; but he does not attempt to define them. He gives as types of these families *Chelys*, *Sternothaerus*, *Pelomedusa*, *Hydraspis*, *Chelodina*, and *Podocnemis*. After some examination of their structure, assisted by an essay on their cranial characters by Dr. Gray,\* I believe that four such families exist, the types of which are *Pelomedusa*, *Sternothaerus*, *Hydraspis*, and *Podocnemis*. I have already indicated the fact that *Pelomedusa* has the foot of the *Testudinidae*. I also find that it has the rudimental *intersternal* bone, as figured by Wagler in *Podocnemis*, and that *Sternothaerus* has this bone complete on each side, entirely separating the hyo- and hyposternals, as in the extinct, and till now uncharacterized family of the *Pleurosternidae*. The *Hydraspididae* have neither this bone nor a zygomatic arch, but a peculiar parieto-mastoid arch, as in the *Chamaeleons*. These characters are shared by *Chelys*, *Chelodina* and others. *Podocnemis* adds to the zygomatic arch, the lateral-intersternal bone, an Emydoid foot, and no parieto-mastoid arch.

The extinct species of the *Pleurodira*, as yet found in Europe, belong to the *Sternothaeridae* and *Podocnemididae*. This I have readily determined from the good descriptions and figures given by Professor Owen in the *Paleontographical Society's* volumes.

#### STERNOTHAERIDAE.

To this family belongs the *Platemys bullockii* Owen, from the lower Eocene. It represents a genus which I call *DIGERRHUM*, which differs from *Sternothaerus* in having the anterior lobe of the sternum immobile, and two ranges of marginal plates, as in *Pleurosternum* and *Chelone*.

#### PODOCNEMIDIDAE.

To this family belong *Emys laevis* and *Platemys bowerbankii* of Owen, who compares the latter species to *Podocnemis*. So far as I can see they both appear to belong to the genus *Podocnemis*, and may be called *Podocnemis laevis*, and *P. bowerbankii*.

To this family may perhaps also belong the genus.

\* Proc. Zool. Soc., London, 1864.



BOTHREMYS, *Leidy*.

Cretaceous Reptiles, p. 110–113, which differs from *Podocnemis* as *Chelys* does from other *Hydraspidæ*, *i. e.*, in having an osseous vomer. This is, however, only a generic character. Its characters are more fully pointed out under *Euclastes*, while we refer to *Leidy's* excellent description and figure for other details.

BOTHREMYS COOKII, *Leidy*.

Is only known from a cranium from the Cretaceous Green Sand of Gloucester Co., N. J. It is in unusually good preservation, but has not yet been associated with its carapace and other elements. It will probably be found to belong to either the following genus, or *Prochonias*, in which case the latter becomes a synonyme.

Probably to the *Podocnemididæ* also is to be referred the new genus,

TAPHROSPHYS, *Cope*.

American Naturalist, 1869, 90.

Which presents the characters of *Podocnemis* in several respects. It has like it an inter-marginal sternal bone on each side, which does not extend to the median line, as in *Sternothaerus*. The other characters are as follows:

Ischium, with a small attachment on the posterior margin of the xiphisternal bone; pubis, with a linear attachment on the same, each well separated from the other. Ilium received into a deep, elongate pit on the last two costal elements of the carapace. Antero-external angle of the hyosternal bone received into a strong pit near the margin of the first costal. Postero-superior or inguinal prolongation of the hyposternal received into a deep linear groove of the corresponding costal bone. Intergular dermal plate, intermarginal; nuchal plate, none.

The marginal bones at the sterno-costal bridge have somewhat expanded margins, though their inferior aspect is not in the plane of the sternum. This point, and the absence of the nuchal scute, are points of resemblance to *Podocnemis*. The latter genus differs in having a marginal intergular and round pubic suture scar. The anterior or nuchal marginal bone is much larger than the first or second lateral, and is opbyriform, being much wider behind than at the margin. The vertebral bones are continued to between the costal bones which support the ilia in one example of *T. molops* only. There are strong vertical inguinal and axillary supports of the carapace, which are transverse continuations of the hyo- and hyposternal bones in those positions, and their articulations with the carapace are by a strong gomphosis.

In this genus, as well as in *Podocnemis*, the attachment of the marginal bones to the



costals is without gomphosis, and by light squamosal suture, except in front and at the bridge, where the suture is closer and the bones thicker.

In three species the iliac pit has been seen in numerous specimens from both sides of the carapace. In all cases it is very elongate, opening posteriorly on the plane of the costal bone. It extends to near the margins of the last and penultimate costals, commencing near the proximal or vertebral end. The pit which receives the axillary buttress is well defined, near the extremity of the first costal bone; the end opposite to it is crossed by a suture of the first vertebral scutum; a ridge also extends from the pit to the capitulum: just anterior to the latter a strong crest probably represents the connate first rib, which is free in some Emydidæ.

The posterior lobe of the plastron is deeply emarginate.

The materials on which the generic and specific characters of the tortoises included under this head have been based are abundant in the middle bed of Cretaceous Green Sand in New Jersey, but are usually obtained in such a fragmentary condition as to require much labor for their interpretation. The case has been especially difficult in the present genus, owing to the difference in the sculpture of different parts of the same carapace. These varieties are the longitudinal parallel grooved surface, the coarser and more finely reticularly grooved, and the plane; the last either erose or smooth. The reticulate groove is sometimes so deep, and the areolæ so raised as to be truly tubercular.

These differences indicate both parts of the same species and different species. The longitudinal grooving is characteristic of the costal bones of *Taphrosphys strenuus*, and the costal and some thoracic bones of *T. molops*. The reticulate sculpture is close on the marginal bones of *T. molops* and *T. sulcatus*, closest on a portion of the bridge of the former. It is coarse and open on the abdominal bones of *T. molops* and *T. sulcatus*, but often passes into an eroded surface, which gives no distinct pattern, but is generally roughened. In *P. nodosus* the reticulate sculpture is so close and strong, as to leave tubercle-like interspaces; while *P. enodis* is entirely smooth.

Six species may be clearly distinguished. They differ considerably in the forms of the mesosternal bones, and their relations to the intergular scutum, which covers them in part. The forms of the pubic and inguinal sutural articulations are also quite characteristic, as well as the relative thickness of the shells. In size the species vary from that of an average snapping turtle (*T. leslianus*) to that of the largest sea turtles (*T. strenuus*.)

#### *Synopsis of Species.*

*a* An azygus bone in front of the caudal marginal. *Taphrosphys*.

Mesosternum transverse, broader than long; intergular scute, not reaching the posterior border; first vertebral scute shorter; shell heavy; pubic scar wide, much elevated; xiphisternum thin edged; large size.

T. MOLOPS.



*aa* No azygus bone in front of caudal marginal. *Prochonias*.

Mesosternum transverse, intergular scute extending to its posterior suture; first vertebral scute elongate backwards; shell thin; pubic scar wide, not elevated; inguinal costal pit plane, xiphisternum thin edged; size medium. T. LONGINUCHUS.

Mesosternum longitudinal, narrowed; first vertebral scute shortened; costal bones reticulate sculptured; pubic scar long, narrowed, not elevated; inguinal costal pit plane; xiphisternum thin edged; size large. T. SULCATUS.

*aaa* Posterior vertebrae not known.

Mesosternal bone as broad as long; the intergular scute not reaching its posterior margin; first vertebral scute shortened; inguinal costal pit plane; shell thin; size smaller; pubic scar wedge-shaped. T. LESLIANUS.

Mesosternal? costal bones reticulate or parallel grooved; inguinal costal pit elevated inwardly, descending to usual plane distally, its fundus keeled; xiphisternum with thick obtuse margin behind; shell thick, vesicular inferiorly; very large. P. STRENUUS.

Carapace thin, surface sculptured with tubercular, ridge-like or vermiform prominences in strong relief; angle of bridge obtuse; size large. P. NODOSUS.

Either *Prochonias* or *Taphrosphys* may hereafter be found to be identical with *Bothremys*, Leidy.

#### TAPHROSPHYS MOLOPS, *Cope*.

Large, stout; costal bones, 3.6 inches in thickness at their proximal portions; the posterior narrower than the anterior, and thinning out exceedingly at their extremities. Hyosternal 3.6 lines thick behind, costal plates with longitudinal grooves, marginals and parts of plastron reticulate, other parts of plastron open reticulate, or with inosculating striae. Proximal end of anterior rib-plates very coarsely reticulate. Vertebral scutes large, as broad or broader than long, with straight margins. Some of the costal capitula small, others large, those of the first pair with a high projecting keel alongside of them, which have sutural extremity next the vertebra.

This species is indicated by many specimens. Among these may be mentioned a large part of the carapace and plastron of an individual from near Barnesboro, fewer parts of another from Gloucester County, New Jersey, and part of the carapace of two others from Birmingham, Burlington County. Also, one costal and two sternal bones, in the possession of the State Survey of New Jersey, at New Brunswick, from the middle green sand bed of Tinton Falls, Monmouth Co., N. J., with fragmentary specimens from various other places.

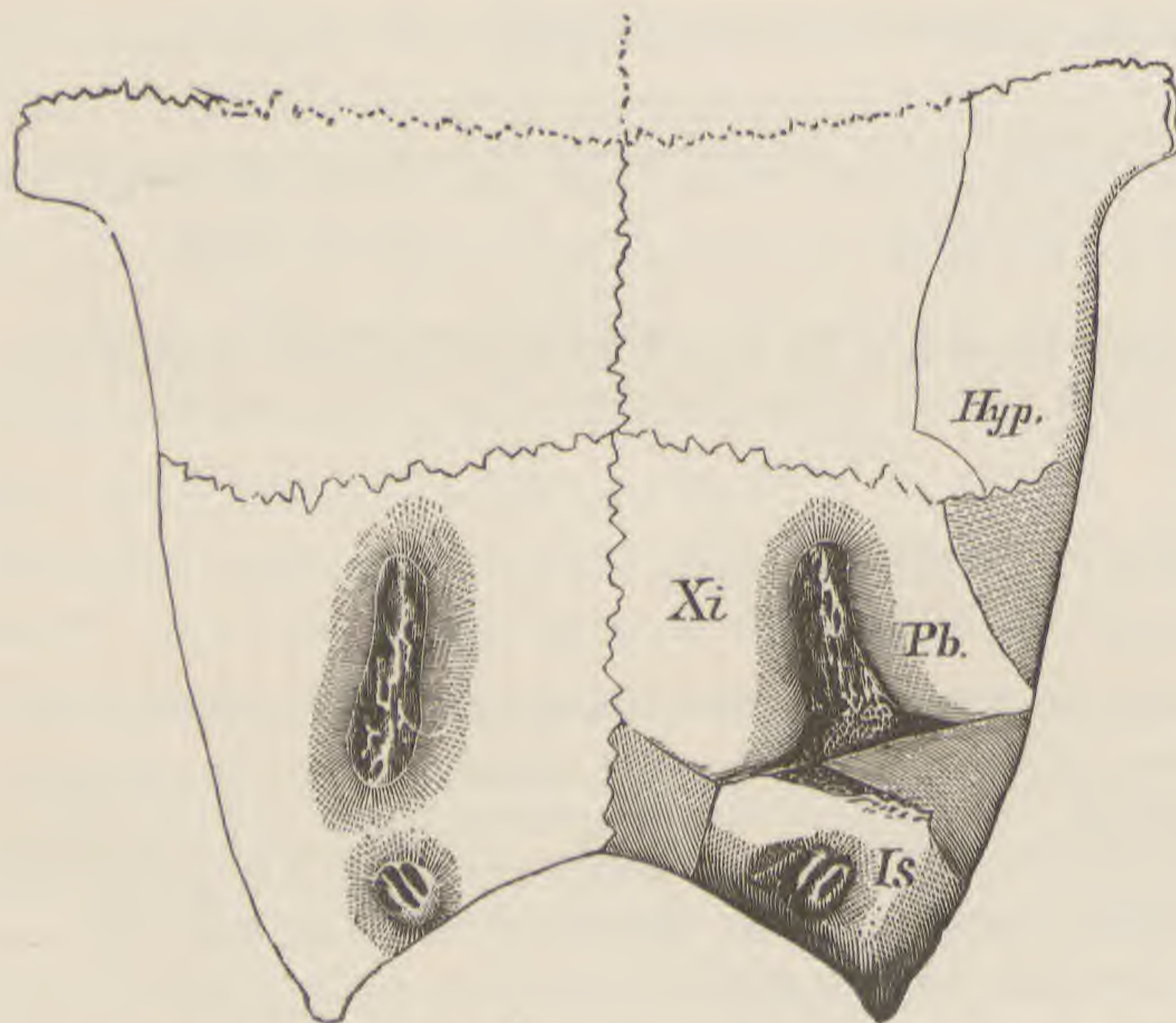
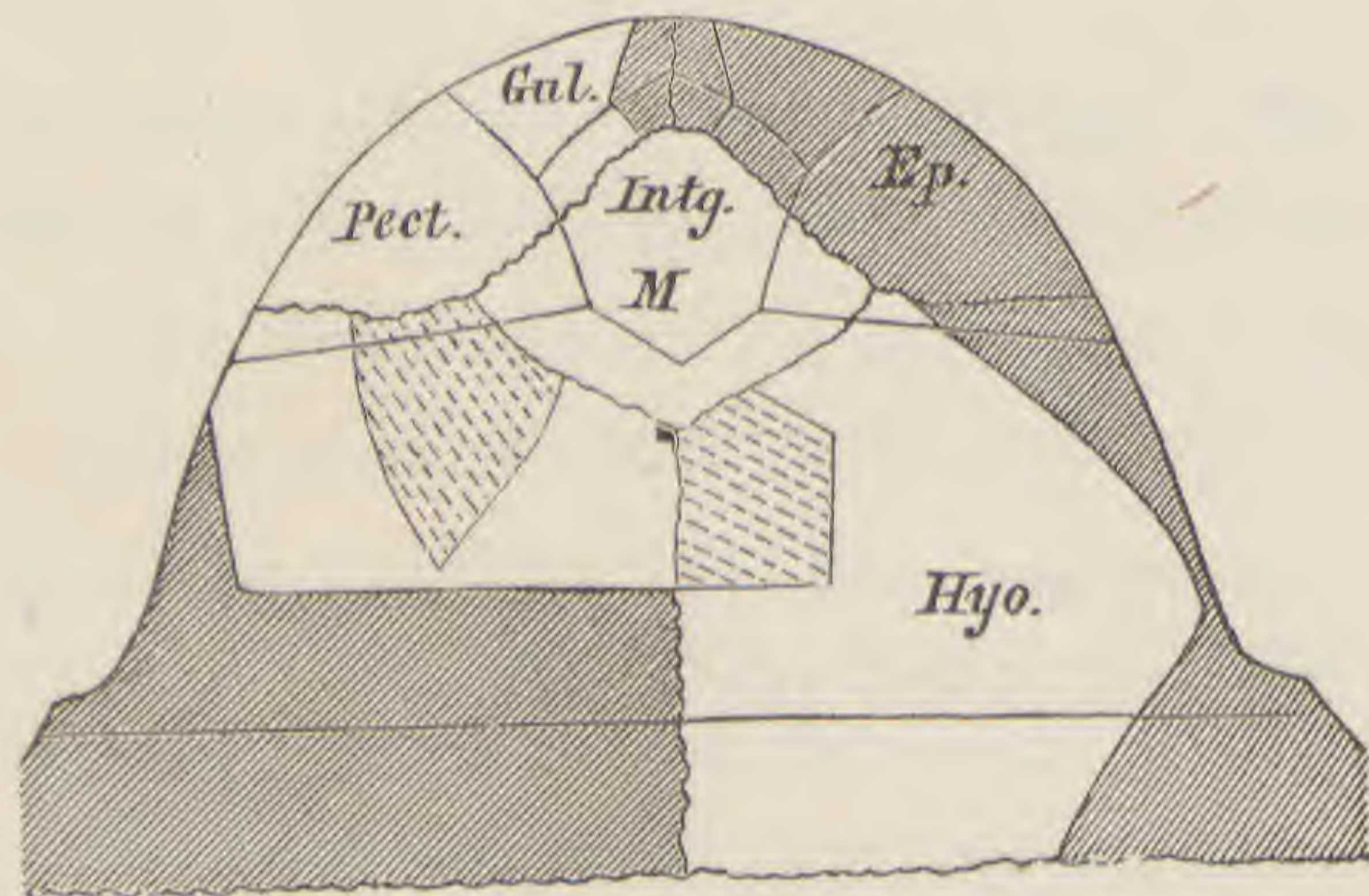
These show the species to have been more massive than the *P. sulcatus*; all the pieces, but more especially the costal bones, are thicker and heavier.

The first costal bones are remarkable for a deep curved elongate pit with raised edges, for the purpose of receiving the upper extremity of the hyosternal axillary buttress. It is deepest posteriorly, and is curved forwards and inwards. The distal margin presents two outlines, both thinned out and in contact with a marginal by a weak squamous suture, without any gomphosis. Indeed, the recurrent part of the margin, which formed a notch in the disc, was not



probably in contact with marginal bone till maturity. These costal bones are gently curved, and with longitudinal shallow grooves of sculpture.

Fig. 43.



ment of another no doubt larger specimen, 7.5 lines. The mesosternum, with the dermal sutures is fortunately preserved; the former is transverse diamond shape. The character of the plastron, except the hyosternal region, may be learned from the accompanying cuts of restorations. A cut of the axillary pit and its position is also given.

In a fine specimen from Hornerstown, for which I am indebted to Jno. G. Meirs, the lateral intersternal bones are easily seen. They present a rounded interior outline, and apply to an equal extent of the hyo- and hyposternal bones. They extend but one third the distance to the median longitudinal suture, and are much as in the *Podocnemis* of the Amazon. Posterior lobe of plastron 10.5 in. wide, between inguinal notches.

One of the costal bones from Tinton Falls exhibits the pit for the inguinal buttress. It differs from that of the pubis of the other specimens, and of *P. princeps* and *P. enodis* in not being situated on an elevated ridge or pedestal,

The individual of which the greatest number of fragments is preserved, is from near Barnesboro, shows that the reticulate sculpture of the marginal bones at the bridge is distinct above, obsolete below. There are three and parts of two others in the bridge in *Platemys* and *Emydoids*; three of those of *P. sulcatus* Leidy are known; two of those of the present species are preserved. Both have been wholly attached to the plastron; one has an acute, but not thin or recurved outer margin; the other is strongly obtuse. All three of those of *T. sulcatus* are, according to Leidy, thin and recurved.

	In.	Lin.
Length of obtuse marginal,	2	6
Width of inferior face	1	9

The edges of the anterior marginals are thin and acute, not revolute nor notched.

	In.	Lin.
Width margin of median vertebral-		
marginal bone,	1	8.
Width marginal scutum, next it,	2	6.
Length " "	2	4.5

The free lateral margin of the hyposternal is obtuse, not thickened or grooved, thinning a little near the suture with the xiphisternal.

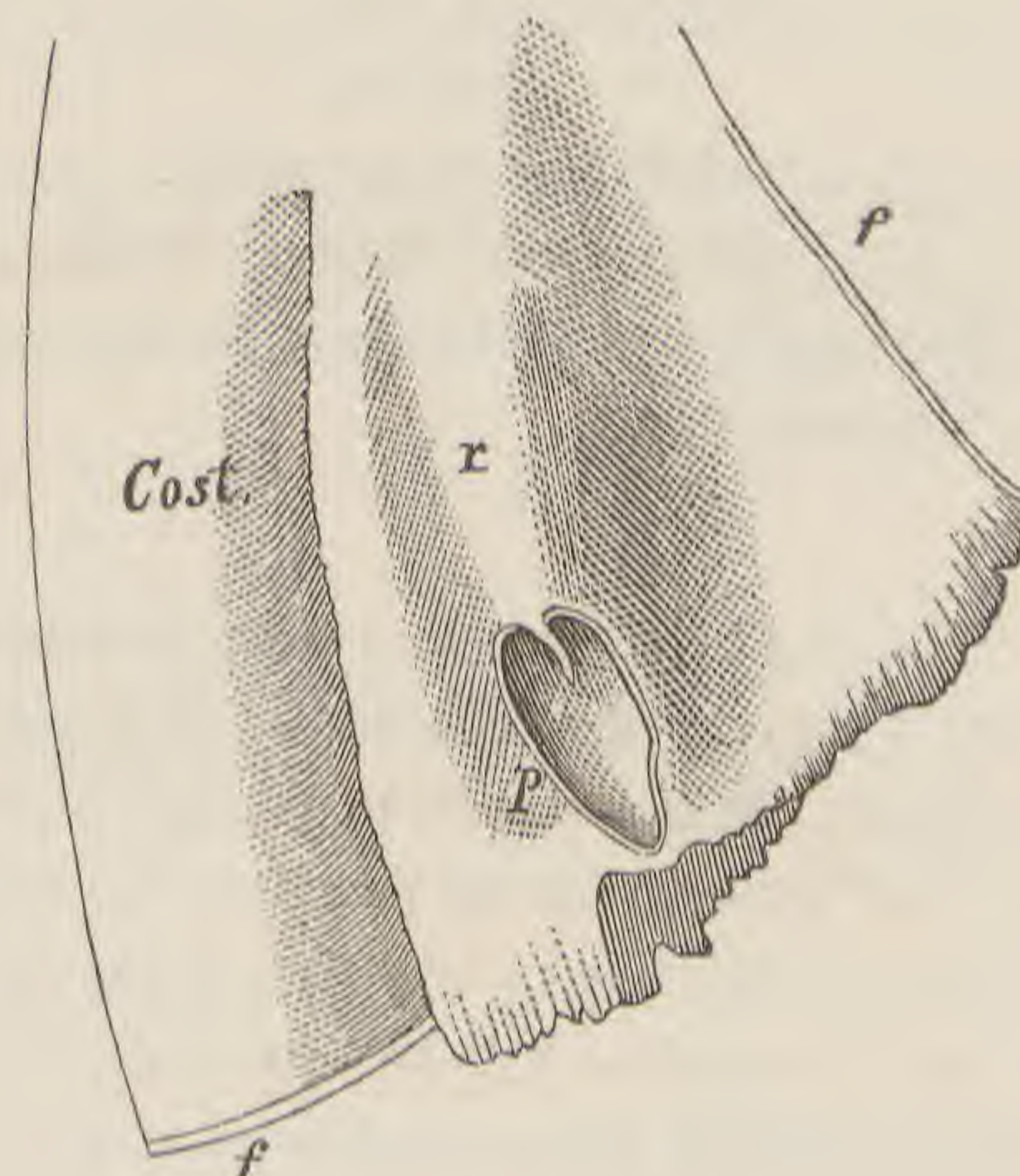
The sternum in general is not thick in this specimen; in the thickest portion of the hypo-hyosternal suture 5 lines; in a frag-



but is a narrow pit with the margins much raised, and with a delicate carina along its middle; sides little rugose. Length of fossa 1.5 inches; it is parallel to the costal suture, at a distance of one inch.

The specimen from Birmingham accompanied that of the *Lytoloma angusta*, and a femur. As the proximal region of the latter has no resemblance to that of any Cheloniid, I suspect it belongs to the genus *Taphrosphys*, especially as its size relates to that of this species. Its peculiarity consists in the head being very much compressed, and the great trochanter smaller and in the same plane. The lesser trochanter is opposite the middle of the side of the head, its plane being parallel with that of the head, and connected with the latter by a thick cross-bridge; it is independent of the great trochanter. From the outside the articular face of the head extends through an arc of  $190^{\circ}$ . The distal extremity of the femur is considerably like that of the *Propleura sopita*. The shank is narrow, and rapidly expands to the condyles, and on the inner side into a prominent rugose ridge. Condyle quite prominent below, the inner most so; shank next to them striate. Middle of shank lost.

Fig. 44.



Length of axillary pit,  
Greatest width,  
Width on costal bone,  
Diameter head femur,  
" condyles do.,

In.	Lin.
1	7.5
	8.
2	0.5
1	2.5
1	4.

Another specimen from Barnesboro exhibits an azygus bone in contact with the caudal marginal. It resembles the coössified proximal portions of the last pair of costal bones, and bears with the penultimate the pit for attachment of the crest of the ilium. It appears, however, to be bounded by continuous suture posteriorly, and hence is perhaps a vertebral bone. Its surface, like that of the plastron, is reticulately grooved. Pubic suture grooved medially directed inwards from lateral sternal margin, with high crest on outer edge, larger; margin of plastron dilated, thin; marginal bones thick, with heavy margin.

The free margins of the xiphisternal thin out regularly to the flat inferior surface. The edges of the marginal bones are, on the contrary, much thicker than the former, and than the same pieces in *P. sulcatus*, since the heavy portion is much nearer the margin. Sutures of the scutes are apparent on these bones, and the anterior of the anal scutum on the xiphisternal. The ischiadic scar is large and on an elevation; it is elevated on the outer margin, and deeply grooved in the middle line. A sub-round elevation, with cross ridges, situated near the margin of the plastron, is the attachment of the pubis.

Length of ischiadic suture,  
Width " "  
Distance from nearest margin behind,

In.	Lin.
2	1.5
	7.3
1	6.5

The posterior vertebral has a peculiar form, and if correctly identified would indicate a short caudal and shortened ultimate costal bone. It is thicker than any of the costal bones of other species, and has at its anterior part below, a short longitudinal ridge. Its sculpture is like that of the sternum, composed of inosculating grooves, forming a coarse figure. Its anterior outline is transverse; antero-lateral, oblique; latero-posterior, straight longitudinal not continuous with the former, but with a short margin at an obtuse angle, which proceeds from the antero-lateral at a projecting right angle. Posterior suture concave, to meet the posterior or caudal marginal. Latero-posterior margin bevelled below. Penultimate costal narrowing proximally, and supporting the longitudinal elevation which bounds the iliac pit anteriorly.



	<i>In.</i>	<i>Lin.</i>
Antero-posterior extent of last vertebral,	2	4.
Width to middle line,	1	7.5
Thickness in front,		8.
"    behind,		5.5
Width costal near head,	1	9.
Thickness costal near head,		5.

The presence of this azygus bone may be abnormal, in which case the group *Prochonias* will not be distinguished from *Taphrosphys*.

VAR. ENODIS, *Cope*.

This may be a smooth or worn individual of *T. molops*. The remains are in good condition, and do not appear to have been eroded or corroded. It is indicated by a large portion of the plastron of a single individual from Barnesboro, N. J. It is a species of considerable size and solidity, and is distinguished by the entire absence of any sculpture, or of grooves for the margins of horny scuta. The external margin of the whole length of the hyposternal bone is of equal thickness and nearly equally obtuse, a circumstance uncommon among tortoises. The vertical portion of this bone is massive, indicating strong union with the carapace. The margin of the hyosternal, descending from the bridge-process, is more compressed and acute, as are also other portions of the margin of the anterior lobe of the sternum.

The ischiadic scar is not far behind the hyosternal suture, and is quite elevated on a broad base. It is wider behind than before.

	<i>In.</i>	<i>Lin.</i>
Length of hyosternal from middle of vertical process,	4	3.
Thickness of margin of do.,		5.
Length of pubic scar,	1	10.2
Distance behind hyosternal suture,	1	2.5
Thickness of xiphisternal near do. suture,		5.

This may be an old *T. molops* worn smooth.

Position:—The upper green-sand bed of the upper cretaceous of New Jersey.

TAPHROSPHYS LONGINUCHUS, *Cope*.

Spec. nov.

Established on a nearly complete but much fractured individual, from the excavations of David Haines, N. Jersey.

This is one of the smaller species, and is of light construction, though rather stouter than the *T. sulcatus*. In many points it resembles the latter species, but differs in many others.

A marked peculiarity is seen in the greater posterior prolongation of the first vertebral dermal scutum. Its posterior suture enters the first costal bone considerably nearer the costal than the nuchal suture; it is considerably nearer the nuchal than the costal in *T. molops*, *T. sulcatus*, and *T. lesianus*. The costo-first-vertebral dermal sutures are thus less divergent than in *T. lesianus*, at least. The suture with the first vertebral bone is quite concave. The axillary pit is strongly marked, but not so much so as in *T. molops*.

	<i>M. M.</i>
Width first costal bone (proximal),	0.0645
Thickness (posterior),	.0085
Width from costal suture to transverse dermal,	.026
"    axillary pit,	.0125

Three vertebral bones indicate that the most elongate are not so slender as those of the genus *Trionyx*. The lateral outlines are straight and make an open angle with each other, the short anterior and posterior are gently convex backwards. The last vertebral bone is small and subround. Three rudimental vertebrae were attached beneath the



penultimate and ultimate costals, covering their sutural union, as indicated by sutural areas remaining. The penultimates are separated anteriorly by the round bone above mentioned; their posterior united halves supported the first supernumerary vertebral. The remaining two were beneath the last pair of costals. Pygal bone sub-triangular with two obtuse ridges medio-anteriorly, and a slight projection laterally in front. This whole region is precisely like that in *T. sulcatus*.

The iliac pit is much like that in *T. sulcatus*, but the anterior bounding ridge is wanting for most of the length; the distal extremity of the same, also, is not distinctly outlined. The inner margin is more so, by an elevated ridge or ridges. Proximally its margin is partly formed by the rudimental costal, of a subcubic form attached by a suture in a pit, as in *T. sulcatus*.

	<i>M. M.</i>
Length average vertebral,	0.035
Width, greatest,	.025
" anterior,	.0075
" last vertebral,	.019
Length " "	.017
" pygal,	.061
" united extremities two last costals,	.036
" penultimate costal,	.104

The vertebral regarded as of average form exhibits but a short lamina or neural spine connecting the arch and superior plate. The neural arch is not coössified with the centrum, and the capitular articular face is well developed.

The inguinal articular pit is strongly marked and rather wide; distally its fundus is continuous with the plane of the costal bearing it.

	<i>M. M.</i>
Length inguinal pit,	.032
Width " "	.006
" costal bone bearing it,	.0475
" average costal bone,	0.33

A marked character of the species is seen in the mesosternal bone, one-half of which is preserved. From the acute angle formed by the extremity, it is evidently even more transverse than that of *T. molops*. The sutures are very coarse, as in other species, the anterior directed forwards, the posterior outwards. The intergular scute is larger than in the other species, as its right margin extends nearly to the outer and posterior sutures of the bone. All the sutures of the plastron are coarse.

The axillary margin of the hyosternal is not thinned; that of the xiphisternal is thinned, and they enclose a wide median emargination behind. Their extremities are not so acute as in one example of *T. molops*. The iliac scar is very prominent and rugose. The pubic scar is longer and much wider in proportion to the general size, than in *T. sulcatus*, and is wider behind than before. It is not elevated as in *T. molops*. Its sutural ridges are very numerous and acute.

	<i>M. M.</i>
Length from median suture to xiphisternal posterior angle,	.059
" xiphisternal scar,	.037
Width " " (greatest),	.0085

The marginals are like those of *T. molops*, on a smaller scale. The posteriors are light, the anterior heavier, those of the bridge present a small angle, but not thin nor revolute. The reticulation is with their length. Length and width of a posterior marginal about equal, viz: m. 0.0465.

The scapula is continued into a procoracoid with axis at right angles to it, and length of union not great, but about as in Emydioid Pleurodira.

	<i>M.</i>
Diameter glenoid cavity,	.014
Length of scapulo-procoracoid neck,	.021



The humeri are short, with stout head and condyles, slender shaft, and considerable curvature. Head presented inwards and upwards; condyles downwards, the outer angle most prominent. A slight tuberosity on inferior aspect near inner angle. Outer outline of shaft quite concave. Deltoid ridge a prominent crest, its posterior margin falling considerably short of the head; the outer margin continuous, convex. Postero-inferior crest broken; the planes of the two make a little more than a right angle with each other.

	<i>M.</i>
Total length humerus, (straight)	.097
Diameter condyles,	.025
“ deltoid crest to middle shaft,	.02
“ shaft at middle (transverse),	.009

Nothing but a fragment of the great trochanter with head, is left of the femur. The former is continuous with the latter, straight; with flat outer side, and narrow. Form quite as in *Propleura*.

This individual appears to be mature. Its remains are accompanied by a few fragments of a large individual, of this species or *T. sulcatus*.

Position. The upper green sand bed of the Upper Cretaceous of New Jersey. Discovered by John Haines.

#### TAPHROSPHYS SULCATUS, *Leidy*.

*Platemys sulcatus*, Leidy. Proceed. Acad. Nat. Sciences, Phila., 1856, 303. Cretaceous Reptiles, 109. Tab. XIX, fig. 4.

Pubis attached to a narrow, little elevated longitudinal sutural surface. Margins of sternum thin, flat; surface deeply reticulate grooved; bones, especially the marginal, thin, light, costals thinned at margins; mesosternum longer than wide.

This species is so fragile as to be rarely preserved in more than a few pieces. The largest part of a single individual that has come under my notice, consists of the more or less complete posterior three costal bones of the carapace, with last vertebral marginal, some anterior costals, xiphisternum, etc. Another similar series of fragments of another individual was procured at the same time and place, *i. e.*, near Barnesboro, N. J.

These specimens show that the last pair of costals is not separated by a vertebral bone, and the penultimate pair is only separated at their anterior part. This last vertebral is of reduced and rounded proportions; the one preceding it is of the normal form, *i. e.*, with elongate postero-lateral border. The costal capitula are developed on all the bones. Sutural surfaces are present on the inferior face of the proximal and contiguous pairs of costal bones, for the attachment of rudimental and inferiorly placed vertebral pieces. One elongate extends from the last true vertebral over the anterior margin of the last pair of costals. The latter have two scars; the anterior rectangular, the posterior ovate. The pygal bone is elongate ovate anteriorly; inferiorly it presents a flattened longitudinal ridge, and an elevation on the anterior part of the lateral margin.

The last costal has a very irregular inferior surface. Its proximal part is thickened, and then rises outwardly into the ridge, that margins the iliac pit. This ridge is most elevated on the capitulum, and develops an acute process outwards from it. The posterior part of the pit is occupied by an ovoid bone, truncate outwardly where it articulates with the ilium, which appears to be a rudimental costal element belonging to the second rudimental vertebral piece. It presents a rudimental capitulum towards the latter.

Behind this piece a narrow transverse groove extends outwardly, and is bounded by a longer groove anteriorly and a short one posteriorly. Near the distal extremity of the bone is a thickening, which terminates abruptly round an ovate posterior margin. Its anterior margin is on the posterior edge of the preceding costal bone. The distal margin sends a short process downwards.

The penultimate is characterized by the high crest a little in front of its posterior margin, proximally, which encloses in front the iliac pit. The crest continues distally, and turning abruptly encloses the extremity of the pit.

The external margin of the last costal is strongly angulate; the penultimate less so. As in all of our *Pleurodira*, the marginal sutures are half squamosal, and with striiform ridges.

The external sculpture is coarsely reticulate, tending to enclose areas longitudinal with the costals towards their middle and distal portions. That of the marginal bones is closer. The dermal scuta are separated by sutures indistinctly marked on the carapace in all the species of our *Pleurodira*. In this species the vertebrae are very broad.



and with external angles less than a right angle. It marks the proximal third of the costal bone. The posterior is truncate behind; the pygal is considerably longer than broad.

Proximal halves of the two first costals, with the costal crest for the first pair of ribs, are preserved. The suture for the first vertebral bone is little concave. The inter-vertebral dermal suture crosses it, just anterior to the point opposite to the completed capitulum of the bone.

The xiphisternal, besides being much thinner relatively than that of *Taphrosphys molops*, is of different form; while its hyposternal suture forms nearly a right angle with the common suture; in the latter species, an acute angle. The pubic scar in *P. sulcatus* is of nearly the same length, but much narrower and less elevated. This I have observed in five specimens. The posterior lobe of the sternum is deeply emarginate. The pubic scars in both converge slightly anteriorly.

The second specimen, above mentioned, furnishes portions of marginal bones and sternal bridge. The latter presented an obtuse angle between the lateral and inferior planes. It also possesses the mesosternal, somewhat broken. Its external angle is considerably more than right, and indicates a thin bone considerably longer than wide, and more like that of *P. leslianus* than any other species of the genus.

<i>Measurements of Spec. No. 1.</i>		<i>In.</i>	<i>Lin.</i>
Length of ante-penult costal bone,		7	9.
Width " proximally,			20.
" " distally,	2		7.
" penultimate proximally,			15.5
" posterior vertebral,			14.5
" posterior costal proximally,			13.
" " distally,	2		4.
Length of " "	4		9.
" iliac scar,	3		
" rudimental costal,			7.
" caudal marginal,	2		10.
" suture between posterior pair marginal scutal,			19.
Width of caudal marginal,	2		7.5

This is a species of considerable size. The fragments originally described by Leidy are three united marginals from the position of the sternal bridge. They show that these elements have a thin junction with both plastron and carapace, and are not separate from the latter, as one might be led to suppose.

The marginals near the bridge have a flat and broad inferior surface, and are produced into a narrow slightly recurved margin, while the free marginals have the external face plane—not recurved—and the internal thickened a line within the margin.

What is probably a nuchal margin (from Barnesboro, Professor Cook's Collection) is not thickened within, and has, as in other genera, a much greater transverse extent posteriorly than at the margin. Its form is as follows: Length, 2 in., 8 lin.; width, 2 in., 6.5 lin. A peculiarity in the dermal markings is that there is no nuchal scutum, but a suture as in the caudal marginal bone.

Two marginal bones, having the sculpture characteristic of this species, appear to be referable to it after comparison with specimens in the Museum of the Academy. One, a median posterior, is considerably shorter than the other, probably a posterior or lateral, a peculiarity not seen among living species. The latter has a thin edge, is thickened along the line of the lower two-fifths the diameter, and then thins out to the upper suture, which is only 1.5 lines wide.

	<i>In.</i>	<i>Lin.</i>		<i>In.</i>	<i>Lin.</i>
Width of lateral plate,	3	0.5	Length of caudal,	2	7.
Length " "	3	4.5	Width " "	2	8.

These plates are crossed in the usual manner by the sutures of the marginal and costal scuta. They are all from the Birmingham pits.

Fig. 45.

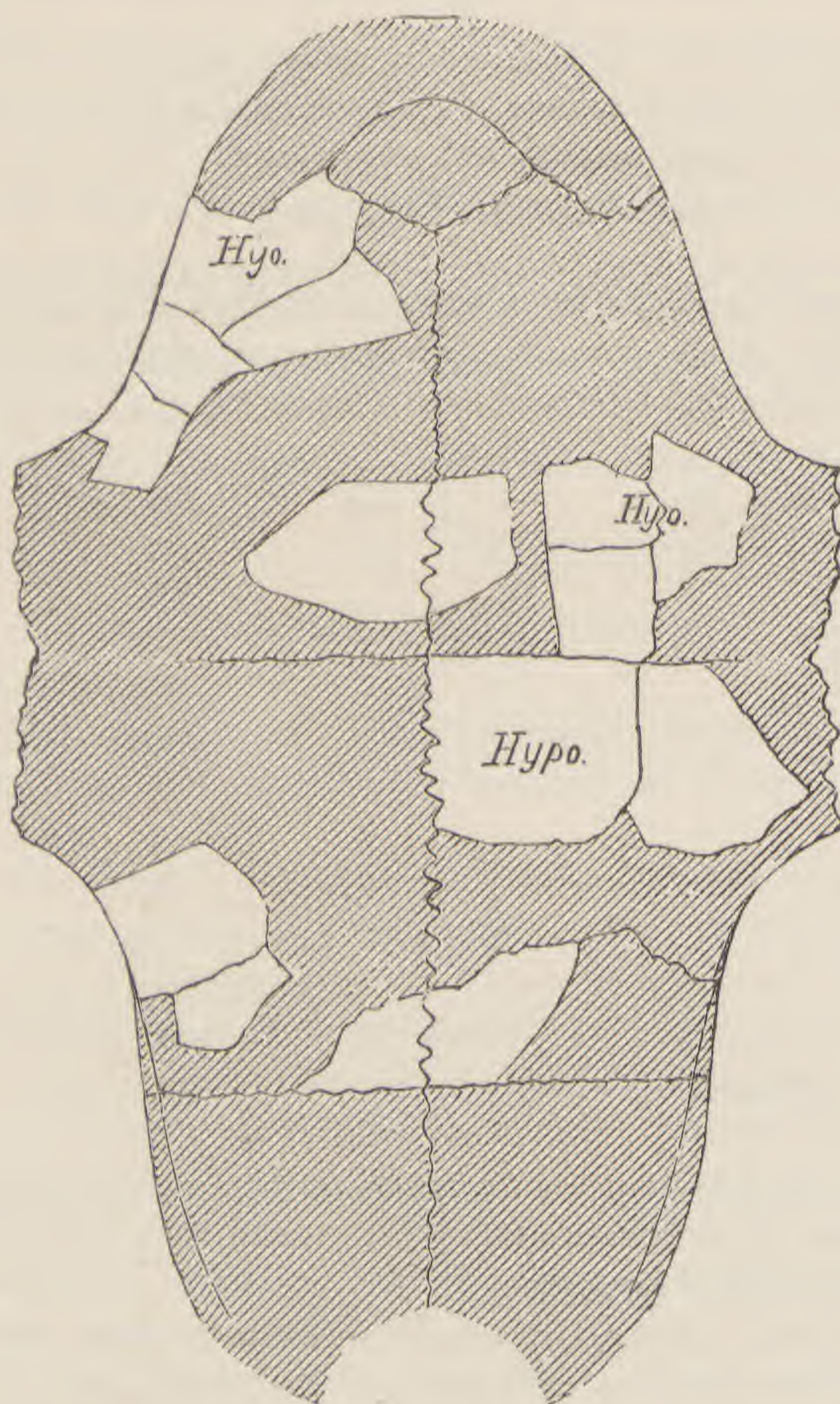




The plastron of this species is relatively much thinner than in the other species of the genus.

A sternum, probably, of this species, is in my collection. It is unfortunately without the xiphisternal pieces, but conforms in all respects with what we know of *P. sulcatus*. Its surface has been injured by pyrites. It is characterized by its thinness and general lightness, as well as by the singular form of the hyosternal element.

Fig. 45.



The remains consist of a large portion of the plastron, and two costal bones, found in the marl excavations of the West Jersey Company, near Barnesboro.

The external surface of the plastron exhibits neither sculpture nor impression of sutures of scutes. It is slightly rugose in some places. The free margin at the axillary and inguinal regions is obtuse, but becomes thin a little distance before reaching the episternal and xiphisternal sutures, respectively.

The suture between the hyo- and hyposternals is straight and fine, while that between hypo- and xiphisternals is straight and coarse. The longitudinal median suture is irregular and very coarse. That between hyo- and episternum is remarkable in its direction, thus distinguishing the species from *Adocus pravus*, with which this plastron might otherwise be compared. It advances posteriorly on the outer part of the hyosternal, causing its junction with the margin to be an inch behind its junction with the mesosternum; the reverse is the usual relation in tortoises.

The bones of the plastron, while more than half as wide again as those of *A. beatus*, are medially scarcely half so thick; the thickness increases to within a certain distance of the outer margin.

The accompanying restoration of the plastron is merely designed to illustrate the form and characters of the sutures described. The outlines of the mesosternum are erroneous; the piece is longitudinal, not transverse; it had not been obtained at the time the cut was made.

<i>Measurements.</i>		<i>In.</i>	<i>Lin.</i>
Total width plastron externally, within elevations of bridges,		11	10.
Length hyosternal, on margins, from first rise at axilla to episternal suture,		3	8.
From latter to mesosternal suture,		1	10.75
Thickness hyosternal at middle sut.,			4.25
“ hyposternal “ “			2.8

#### TAPHROSPHYS LESLIANUS, *Cope*.

This is a smaller and more delicate species than the last, and differs in many particulars. It is found on a single individual, which, though not more than half the size of the *T. sulcatus*, is evidently adult. The portions preserved are a considerable number of the element of carapace and plastron, but none other. The union of the costal and marginal bones is complete. The first costal has the same form as in *T. molops*, bearing as usual, a crest representing



an anterior rib. The axillary pit is less prominently margined by a high osseous wall, and it is elongate and curved forwards, nearly reaching the margin of the bone. The rib head is complete.

With its fellow, it embraces a first vertebral, which is about twice as long as wide and six-sided. The sides are in the order of their length: posterior (shortest), anterior, postero-lateral, antero-lateral. The anterior marginal is narrow in front. It expands so much posteriorly as to make the first lateral almost triangular. The second marginal is nearly quadrate. The edge of these marginals is thin above the nape, and thickens laterally. In the posterior it is gradually thinned out and a very little recurved. The second vertebral bone is not so long as broad: those following increase gradually in length.

The narrow extent of the hyposternal bone in front of the inguinal crest indicates as in *T. molops*, an intermarginal sternal. The sutures retire posteriorly from that point, suggesting the continuation of that bone towards the middle line. The cavity of the plastron is extended well laterally at the bridge. The hypo-xiphisternal suture is nearly transverse. The pubic scar is little elevated, and broadest posteriorly. Its median crest extends throughout the whole length. The posterior margin of the xiphisternal is not preserved. The mesosternum is of a rounded form, but obtusely pointed behind, and with lateral rounded projections. The posterior sutures are bevelled forwards and upwards.

The sculpture is much like that of *Taphrosphys sulcatus*. The marginal bones have a delicate transverse reticulation, and the costals a coarser longitudinal one. The under surfaces do not present any sculpture, perhaps, on account of corrosive action.

	M.
Length of last costal,	.08
“ iliac pit,	.02
“ pubic scar,	.024
“ third costal bone,	.106
Width third (costal bone proximally),	.0242
“ “ “ (distally),	.026
Thickness “ “ (proximally),	.007
“ “ “ (distally),	.0025
Width first “ (greatest),	.094
Length “ vertebral,	.039
Width “ “	.0182
“ second “	.02
Length “ “	.02
Length median marginal,	.068
Width “ “ (anterior),	.0327
“ “ “ (posterior),	.063
“ hyposternal,	.063
Thickness “	.004
Length “	.092
“ mesosternal,	.0305
Width “	.0315

The dermal scuta have been thin, as in other species of this group. The sutures are all straight except that between the first and second vertebrae, which is convex backwards. The vertebrae are broader than long, and their external angle is near the middle of the length of the costal bones. The anterior vertebral is of longer form than the others, somewhat like the frustrum of a triangle, of which the base is anterior. The second marginal is wider than long; the third longer than wide. The intergular scutum is subtriangular, the apex shortened by short facets, and extending three-fourths the distance to the posterior margin of the bone.

This species was discovered by my friend, Dr. Samuel Lockwood, who lent the single and typical specimen from his private collection for description. It is dedicated to Prof. J. P. Lesley, the Geologist, and Secretary of the American Philosophical Society.



TAPHROSPHYS STRENUUS, *Cope.*

This, the largest of our extinct Pleurodira, is represented by portions of three individuals.

The largest has been much broken up by the workmen, and many parts of the carapace and plastron are recognizable in the larger and smaller fragments.

The various elements are of great thickness, proportionately as well as absolutely, so that this is the most massive as well as largest species of the genus; in two of the specimens the episternals are considerably thickened at the anterior suture, a feature not seen in the next stoutest species, *T. molops*. In the first specimen, the costals have the longitudinal reticulate sculpture; the marginals close reticulate, and the sternal bones are openly reticulate. The inguinal costal articular groove is characteristic. Instead of lying in one plane as in other species, it occupies the crest of a ridge which ascends proximally to a considerable elevation, resembling in this, the pubic scar of *T. molops*. It is, however, nearly smooth within and has no distal boundary; the fact of its being on the middle line of a costal bone, fixes its character.

One of the elements of the plastron at one of the sutural angles, exhibits an extensive overlapping, or squamosal suture, to the extent of half the thickness of the bone, and distance of *M.* .028. The articular extremities of the two scapulæ are remarkable for their size. The forms of the mesosternum, and marginal bones of the bridge are unknown. The anterior marginals are thick and of coarse cellular structure. The posterior are thinned out to an edge.

	<i>M.</i>
Width of ordinary costal,	0.061
Thickness " "	.015
Width costal bearing inguinal groove,	.084
Thickness " " "	.013
" " at proximal part of groove,	.037
Diameter articular and scapula,	.065
" glenoid cavity (transverse),	.044
Thickness episternal at median suture,	.023
General uniform thickness of hyposternal,	.018

Of the second specimen numerous portions of carapace and plastron, with head of femur and coracoid, furnish various characters.

The costal bones are marked with shallow grooves, more closely placed than in *Taphr. molops*, and with less transverse inosculation. The marginals are rough from the reticulate sculpture. The abdominal surface presents a coarser and less distinct sculpture of the same kind; its dermal sutures are also distinct.

The pubic scar is lost, but the ischiadic remains. It is obliquely oval, and very near the margin of the deep posterior notch of the plastron. Anterior and exterior to it is the shallow fossa seen in the same position in *T. strenuus*. The anterior lobe of the sternum has convergent margins, but is broadly truncate in front, each half of the margin being slightly concave.

The point of union of the episternals is prominent, upwards and forwards. The margin of the posterior part of the episternal, and anterior part of the hyosternal, is rather thinned out, without intermarginal ridge. The suture between the two is at right angles to it, and at a little distance from it, it turns forward.

All the bones are thick except the costals, and the spongy layer is vesicular. The sutures of the costals are smooth and dense, except opposite the spongy layer.

The femur is characterized by the wide expanse of its trochanters and slenderness of its shaft. The planes of the former make an angle together of over 90°. The greater is nearly continuous with the head. The coracoid has two short sutural, and one cotyloid articular faces; its shaft is contracted and slightly curved.

	<i>In.</i>	<i>Lin.</i>
Width plastron in front,	6	1.5
" " at hyo-episternal suture,	12	1.5
" from mesosternal to front margin,		20.
" costal,	2"	3.5



	<i>In.</i>	<i>Lin.</i>
Thickness costal,		5.
"    marginal,		9.7
"    episternal (average),		9.
"    xiphisternal near outer margin,		7.8
Expanse trochanters,	2	3.
Long diameter shaft femur,		8.
"    head of coracoid,		17.5

A large species is represented by numerous fragments from the Miocene marls of Eastern North Carolina, found for the most part by the Geological Surveyors under Prof. Kerr. This genus is Cretaceous, and is probably intrusive in Miocene beds. It occurs in fragments in connection with the cretaceous Dinosauria, *Hipsibema* Cope, and *Hadrosaurus* Leidy, in the few places where they have been found. As the species cannot be well defined, I do not name it.

A large part of the left xiphisternal, with the adjacent part of the hyposternal, the former bearing the anterior part of the pubic sutural scar, was found in the marl at James King's. The size and thickness of the parts indicate the largest species of the genus, being at least equal to the same parts in *P. strenuus*. As the pubic suture is not preserved in the specimen of *P. strenuus*, I find the distinction to be only indicated by the structure of the osseous tissue. This is very much more dense than in the species found in New Jersey, where it is very spongy and open, more so than in the other species. The inferior dense layer is thick, but not thicker than in *P. strenuus*. The inferior surface is somewhat worn, and does not display marked structure. The pubic scar is elevated, and bears longitudinal sutural ridges; it presents the usual obliquity inwards and forwards.

	<i>Lines.</i>
Thickness at hyposternal suture,	9.5
Width base pubic scar,	18.

#### TAPHROSPHYS NODOSUS, *Cope.*

This species is chiefly represented by a number of broken costal and marginal bones, from Hornerstown, Monmouth County, New Jersey. A costal plate with rib-head from Tinton Falls, Monmouth County, is also in the collection of the New Jersey Geological Survey, and I have found other portions near Barnesboro, Gloucester County. It is one of the rarest, as well as most strikingly marked, of our extinct Testudinata.

The costal bones are thin for their size, which exceeds that of other species of our extinct Pleurodira except the last. The prominent character is seen in the sculpture, which consists of elevated coarse ridges, forming a reticulate pattern, somewhat as in *Trionyx*, which are frequently broken into tubercles of various shapes, which are again confluent in some places, forming shorter or longer ribs. These may be short, curved, or angulate; there is a series of short straight ones radiating from the intercostal sutures on some of the costal bones. These projections are everywhere in strong relief. Portions of two marginal bones fix the position of the species here, and forbid any immediate affinity to the Trionychidae or Chelydrinae, though the resemblance to *Peritresius ornatus* cannot be overlooked. These bones are marked by impressed pits, less marked than those of the costals. They present an obtuse angle of faces, inclined at more than 90°, showing the bridge to be less angulate than in either *P. sulcatus* or *Taphrosphys molops*. On one of the costals traces of the intercostal dermal suture are visible in a continuous groove of the sculpture. Width of a costal bone 2 in., 9 lin.

I am indebted to John Meirs for this specimen, which was found eighteen feet below the surface of the chocolate marl, which lies below the upper bed of green sand.

Another individual is represented by a portion of the plastron taken from the chocolate marl near Barnesboro, at a locality different from any of the other species. There is not enough preserved to exhibit the ischiadic attachment; it is therefore uncertain to what genus it belongs. It exhibits, however, the peculiar reticulate sculpture of the *P. princeps*, but carried to a higher degree.

It differs in that the surface of the bone is tuberculately rugose, the grooves being deep and wide, and leaving



ridge-like and other elevations between them. On some portions of the surface they assume a longitudinal direction. A portion of the margin is rather abrupt and thick. Thickness of bone, one inch from margin less than nearer the same; greatest thickness, 6 lines.

## APPENDIX TO THE TESTUDINATA.

### *Lembonax*, Cope.

Established on the remains of a marine turtle which presents the peculiarity of a regular continuous inner margin of the hyo- and hyposternal bones, without radiating processes for intercalation with that of the opposite side, or emargination for the median fontanelle. It follows either that there is no fontanelle, or that the fontanelle is continuous to the xiphisternals, in either case differing from *Chelone* and *Puppigerus*. The hyo-xiphisternal suture is transverse, as in *Emydidæ*, for a portion of its length nearest the median line; or this element having transverse parallel sutural outlines may be intercalated between hyo- and hyposternals, as in *Pleurosternum*, though this I consider altogether improbable. The suture for the episternals oblique, and not squamosal, as in *Chelone* and *Chelydra*, but by shallow gomphosis; the anterior inner margin of the hyosternal retreating outwards a little, and leaving space apparently for mesosternum: the hyo-hyposternal suture by fine deep gomphosis; the hyo-xiphisternal by shallow coarse gomphosis.

The common neck of the scapulo-procoracoid bone is short, and more like an *Emydoid* than a *Chelonioid*.

On the whole, there is reason to suspect that this form is more nearly related to *Chelydra* than to *Chelone*.

### *Lembonax polemicus*, Cope.

Spec. nov.

The sternum presents a longitudinal angle on each side, leaving the median plane portion of the sternal bones rather narrow, as in species of *Chelone*. The angle is slight, the surface rounded. The inner face of the hyosternal is strongly radiate-ridged towards the inner anterior angle, and the inner face of the margin serrate; the posterior portions of the margins are slightly roughened. The inner margin of the hyposternal is regular, smooth, and thinned obtusely; it is without radiating ridges.

The external surface is smooth, without sculpture.

The sternum has been small for the size of the animal, judging by indications furnished by the scapular glenoid cavity. No portions of the carapace are preserved.

	<i>M. M.</i>
Antero-posterior length hyosternal,	.24
Width do. to longitudinal angle,	.136
Antero-posterior extent hyposternal,	.1525
Width do. to angle,	.155
Long diameter extremity scapulo-procoracoid,	.115
Do. neck of do.,	.098
Do. distal extremity scapula,	.059

This species was derived from the Eocene marl of New Jersey, where excavated by the Farmingdale and Squankum Marl Company, to the Director of which, A. J. Smith, I am indebted for the specimens on which the present identification is based.