ON A BRACKISH WATER PLIOCENE FAUNA OF THE SOUTHERN COASTAL PLAIN.

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In Bulletin 5A, of the State survey, on the phosphates and marls of Georgia by S. W. McCallie, page 87, 1896, attention is called to a marl bed on the Satilla River by the following remarks:

Several miles further up the river, on Mr. James P. King's estate, occurs an extensive marl bed. The property on which the deposit is located is situated 6 miles south of Atkinson, and of late years it has become quite a popular resort for fishing parties, whose attention is usually attracted by the peculiar appearance of the deposit. The principal exposure occurs at the base of a bluff, on the left bank of the river, a few hundred yards north of the mansion house. The bluff, which is about 30 feet in height, shows the following geological section:

	Feet.
Soil	1½
Bluish clays	2
Motley, sandy clays	10
Light-colored, sandy clays	5
Yellowish, sandy clays	4
Laminated blue clays	2
White sand	1
Blue clay	2½
Marl	2

At the time of our visit only about 2 feet of the marl bed was exposed above the surface of the water. However, detached fragments of the bank below this level show that the bed attains a thickness at this point of 4 feet or more. The deposit consists almost entirely of small bivalve shells, with a sandy clay matrix. Associated with the shells are fragments of bones and what appear to be the remains of the carapaces of turtles and crabs. The marl has been used to a limited extent by Mr. King as a fertilizer on various crops, and it is said to have given very satisfactory results. It is evidently of much value, locally, as a fertilizer. However, it could not probably be transported to any distance with profit. Another outcropping of the deposits occurs about a mile farther up the river; but it here seems to be diminished in thickness, and also contains more sand and clay.

In 1911 the Hon. T. H. Aldrich examined some of this marl at the suggestion of Mr. McCallie, and, recognizing that many of the species were new and that the indications were that the fauna was of

Pliocene age, described in the Nautilus[1] a number of the species. His introductory remarks are as follows:

Some years since Professor S. W. McCallie, State geologist of Georgia, called my attention to a small block of soft marl in the State museum which had a number of shells in it, and at my solicitation the same was kindly forwarded to me for examination. I found the specimens were a mixture of fresh water and marine, and that the fresh water ones seemed to be new, besides being more or less distorted. The specimens were very fragile. Notwithstanding the greatest care many of the most distorted were badly broken. It is hoped that a future examination will reveal more species and an assortment of forms far greater than those here described. The horizon is probably *Pliocene*, and seems to represent a southern fauna. The exact locality is 4 miles south of Atkinson, Wayne County, Georgia, on the Satilla River. The list of species is as follows:

1. *Rangia cuneata* Gray. (Common, rather small.)
2. *Mulinea lateralis* Say.
3. *Mulinea congesta* Con.
4. *Dosinia*.....sp.? (Young shells.)
5. *Modiolaria*.....sp.?
6. *Gemma purpurea* H. C. Lea.
7. *Neritina*.....sp.? (Too poor for identification.)
8. *Neverita*.....sp.? (Fragments.)

The new species described were:

9. *Potamides saltillensis.*
10. *Potamides cancelloides.*
11. *Paludestrina plana.*
12. *Amnicola saltillensis.*
13. *Amnicola georgiensis.*
14. *Amnicola expansilabris.*
15. *Planorbis antiquitus.*

It is to be noted that by a typographical error the name *satillensis*, from the Satilla River, was misspelled *saltillensis*, probably from some confusion with the Saltilla River of eastern Mexico.

Some of this marl was sent in to the United States Geological Survey by the parties under Dr. T. Wayland Vaughan's direction, who were working on the geology of the coastal plain of the United States, chiefly by Mr. George C. Matson. Part of the material came from the original locality on the Satilla River, Georgia (station 6132), and was collected for Mr. Matson by L. W. Stephenson. The same fauna was recognized in material from a well at the depth of 49 feet in the northeast quarter of section 28, township 3 north, range 2 west, Louisiana meridian, 6 to 8 miles southwest of Alexandria, Louisiana (station 6040). This locality is known as the Frank Muse place in Rapides Parish, owned by Dr. R. O. Simmons and others. Also from a well of the Producer's Oil Co., Pine Prairie oil field, Louisiana (station 6445). The depth here was given as 1,540 feet, but I accept this with all reserves. Lastly, several localities near Burkeville, Newton County, Texas, were discovered

[1] Vol. 24, No. 11, March, 1911, pp. 131–132, continued in the April number, pp. 138–140, with plates 8–10.

and explored for fossils by Messrs. Vaughan and Matson. These were, respectively, 1 (station 3614) and 3 (station 6440) miles southeast of Burkeville. The material here is a fragmentary rock, with very poorly preserved fossils, almost all in the form of molds or internal casts, and contains, besides traces of barnacle valves and mollusks, bones of birds and carbonized fragments of wood. The molluscan fauna is mostly the same as at the Satilla locality.

Mr. Geo. C. Matson has kindly furnished the following data in regard to the geological conditions at Burkeville:

> My collection was obtained from the south side of Cow Creek about one to one and a half miles from the town of Burkeville, Texas. The fossils occurred as casts and molds in lenses of limestone about four to six inches thick. These lenses are exposed in a small gully and the available area for collection does not exceed four or five square feet.
>
> The limestone is very hard and weathers light gray or yellow with a rough surface resulting from unequal resistance to solution. Associated with the imprints of shells are a few fragments of bones, but it is difficult to obtain anything but fragments of either vertebrate or invertebrate remains because the rock splits so irregularly. The limestone lenses are imbedded in a very plastic clay which is light blue or green where recently exposed but changes to black or brown on weathered surfaces. In this clay or scattered over its surface are many rounded or oval concretions of calcium carbonate, occasional vertebræ and fragments of other bones, together with oyster shells similar to those found in the limestone. The concretions vary from small nodules, apparently formed by the cementing of still smaller granules, to flat bowlders from a few inches to a foot or more in diameter. Many of the larger concretions show concentric and radial cracks filled with calcite and are therefore to be classed as septaria.
>
> The black clay found at this locality is not confined to the vicinity of Burkeville, for it extends southward about four miles and is reported some distance north of town. This clay may be traced into western Louisiana where it forms the Anacoco prairies. By means of scattered outcrops it is possible to determine its occurrence several miles east of the Texas-Louisiana boundary.

The interest of this fauna lies not only in its being strictly brackish water and containing a large number of hitherto unknown species, but in its wide distribution along the edge of the Pliocene coastal plain, forming a faunal horizon hitherto unrecognized.

The conditions appear to have been not unlike those which obtain at certain portions of the Gulf coast to-day; probably lagoons into which the streams poured fresh water carrying with it small fresh-water gastropods and occasionally valves of Unionidæ. On the other hand, the sea had access to the lagoons, keeping the salinity of the water such that oysters and anomias could flourish with other smaller mollusks which frequent oyster beds, while occasionally purely salt-water shells might be ejected by wandering fishes or carried by violent storms.

It will be noted that the softer marl of Satilla River has preserved most of the small fresh-water gastropods, which are absent from the coarser sediments of the western localities where the oysters appear

more abundantly, while the cerites and melanians are generally distributed.

This account of the fauna is published by permission of the Director of the United States Geological Survey, under whose auspices the fossils were collected.

A description of the species found follows:

RANGIA CUNEATA Gray, var. SOLIDA, new.

Plate 20, fig. 7.

Shell small, very solid, rounded triangular, externally smooth except for incremental lines; beaks low, pointed, close to the margin; dorsal margins nearly straight, meeting under the beaks at an angle; hinge much as in *R. cuneata* but the laterals shorter.

Length 20, height 17, diameter 10 mm.

Station 6040; abundant; also from the locality on the Satilla River, Georgia. Type, U. S. Nat. Mus., No. 166282.

This form differs from *R. cuneata* in many particulars; if the specimens collected are adult, there is an enormous difference in size; but of this I am uncertain and so lay no stress on this feature. Specimens of *R. cuneata* of the same size as the fossils differ by being more inflated and less triangular; by having the beaks more distant from the hinge line and the dorsal margins constituting one sweeping curve instead of meeting at an angle; by the longer and more sharply striated lateral teeth and larger cardinals.

This is the form referred to in Aldrich's list.

MULINIA SAPOTILLA Dall.

Plate 20, fig. 1.

Mulinia sapotilla DALL, Trans. Wagner Inst., vol. 3, pt. 4, p. 902, pl. 28, figs. 7, 8, 9, 14, 1898.

Stations 6040 and 6445. Also in the Pliocene of the Caloosahatchie River, Florida, as one of the most characteristic species.

The specimens from the Satilla marl are all immature and vary very much in relative length, inflation, etc. I have seen no other *Mulinia* from these marls and feel reasonably confident that the *M. congesta* mentioned by Mr. Aldrich is an accidental intruder. *M. lateralis* might well occur here, but has not been found in any of the material I have examined.

HETERODONAX ALEXANDRA, new species.

Plate 20, fig. 8.

Shell differing from the recent *H. bimaculata* in the different proportions of the valves before and behind the beaks, the anterior portion being shorter and the posterior portion much more produced and more compressed. The posterior part of the valve is consider-

ably longer than the anterior, while these proportions are reversed in the recent shell. The fossil is also less solid than recent shells of the same size.

Although the fossil is only represented by two broken right valves the difference is so remarkable that I have no hesitation in regarding it as a distinct species.

The fossils come from station 6040, near Alexandria, Louisiana. Type, U. S. Nat. Mus., No. 166286.

MYTILOPSIS, sp. indet.

Very young specimens of a species of *Mytilopsis* allied to *M. leucopheatus* of Conrad were found in the marl from station 6040. They were too immature to be specifically identified. It is possible that this is the shell referred to *Modiolaria* by Mr. Aldrich, or that his shell may be *Modiolaria lateralis* Say, which is known from the Pliocene of Florida.

UNIO (LAMPSILIS?) SANDRIUS, new species.

Plate 20, figs. 4, 5.

Shell small, solid, bluntly rounded and inflated in front and rapidly attenuated and almost pointed behind; anterior end shorter, posterior longer, the beaks nearly at the anterior fourth of the shell; beaks with one or two obsolete concentric undulations, or quite smooth, small, distinctly prosocoelous; remainder of the surface smooth except for faint incremental lines and a shallow sulcus close to the posterior dorsal margin in each valve with an obsolete ridge on each side of it; in front of and under the beaks is a wide obscurely lozenge-shaped excavation, probably occupied in life by an extension of the ligament and with a sharp-edged border; ligamentary attachment behind the beaks linear; interior with the anterior muscular scar deeply impressed, the posterior scar faint; dentition in the left valve a transversely corrugated lamina, narrow and elongated, not divided into teeth, under which is a cavity for the tooth of the opposite valve; lateral tooth long, single, with a deep narrow sulcus above it; right valve with a strong obscurely triangular corrugated tooth, the distal end sharply bifid. Length of shell, 24; height, 12.5; diameter about 12 mm., measured on incremental lines of broken valve, the total length of which is over 30 mm.

Section 28, township 3, range 2, 6 to 8 miles west of south of Alexandria, Louisiana, at station 6040. Type, U. S. Nat. Mus., No. 166288.

There seems to be no recent species of close relationship to this. From the look of the fossil the color of the nacre was probably purple.

The locality is the "Frank Muse place," from about 48 feet below the surface in a well. Specimens from station 3614, in Texas, are too poor to be identified but have some resemblance to this species.

UNIO (PLEUROBEMA?) ALIXUS, new species.

Plate 20, fig. 2.

Shell represented by a fragment which from the incremental lines must have been a shorter, heavier, and more triangular shell than *U. sandrius*, the beaks are nearly terminal and, though decorticated, show a median depression but no traces of concentric sculpture; the ligamentary area is impressed much as in *U. sandrius*, but is much shorter, wider, and more triangular; the tooth above is divided into two laminæ, transversely corrugated and narrow as seen from above, but below is very thick and ponderous and deeply raggedly cleft for the opposite cardinal. There is one left lateral and sulcus as in the last, but shorter. The proportions, taken from incremental lines, are length 16, height 11, diameter about 10.5 mm. The adult shell of course was at least twice that size.

Same locality (station 6040) as the last species, from which it differs in form, in weight, and especially in the character of the ligamentary area and left cardinal tooth. Type, U. S. Nat. Mus., No. 166289.

It might perhaps be regarded as nearest to *Pleurobema clava* of the recent fauna.

UNIO (UNIO) MUSIUS, new species.

Plate 20, fig. 6.

Shell short, rounded-triangular, represented by a fragment including the perfect umbo of a right valve; ligamentary area narrow, elongate, two rather thickish right laterals, the cardinal strong, triangular with the upper surface deeply transversely strigose; there is a faintly elevated ray from the beak which has six or seven subequidistant concentric lamellæ, strongest behind and somewhat produced when they cross the ray; on the anterior umbonal slope two or three elevated threads arise in a radiating manner; becoming more prominent distally.

Length of fragment about 11 mm. Type, U. S. Nat. Mus., No. 166290.

This appears to resemble *U. obesus blandingianus* of the recent fauna; it comes from the same locality (station 6040) as the preceding species, from which it is obviously very distinct.

OSTREA VIRGINICA Gmelin.

Ostrea virginica Gmelin, Syst. Nat., p. 3336, 1792.
Ostrea elongata Solander, Portland Cat. No. 3312, p. 151, 1786.

Stations 3614, 6040, 6440, and 6445. Also Pliocene of Florida, Pleistocene, and Recent.

The only stations from which identifiable oysters were obtained were 3614 and 6440, in Texas. But abundance of comminuted fragments and very young valves occurred at all the stations.

ANOMIA, sp. indet.

A large *Anomia* with irregular radial sculpture, but with the hinge-line and muscular impressions worn away, was obtained with the oysters at station 3614; and at station 6440 an impression, remarkably like a large *Lima*, but which is probably due to a distorted specimen of the same *Anomia*. If the surface sculpture is characteristic it is an undescribed species.

POTAMIDES MATSONI, new species.

Plate 21, figs. 1, 2, 7.

Shell solid, rude, subconic, of about 10 whorls; nucleus small, smooth; spire acute; axial sculpture of incremental lines and numerous flexuous low undulations hardly well defined enough to call ribs in average shells but strong and regular in some and obsolete in other specimens. Spiral sculpture of 1 strong posterior and 2 anterior weaker, flattish cords with channeled interspaces, the posterior interspace wider and more conspicuous, all surmounted at times by fine spiral threadlets which are frequently absent or obsolete; the rounded base has 6 or more similar cords with wider interspaces, varying in prominence in different individuals; aperture subquadrate, the outer lip very flexuous, a wide sinus above, the lip patulous on the base, the canal short, very wide and shallow and curved to the left; the pillar very short and the body covered with a smooth callus; the inside of the outer lip smooth. Length of shell 28, maximum width 13; width at seventh whorl, counting backward, 2.5 mm.

Station 6040, near Alexandria, Louisiana, Matson; also at stations 3614, 6440, and 6445. Type, U. S. Nat. Mus., No. 166293.

POTAMIDES MATSONI, var. GRACILIOR new.

Shell with practically the same sculpture, but more regular and slender, and with the sculpture more uniform. Length 20, maximum diameter of base 7 mm.

With the typical form but readily separable, and from the same localities, stations 6040, 6440, and 6445. Type, U. S. Nat. Mus., No. 166294.

CERITHIOPSIS? BURKEVILLENSIS, new species.

Plate 22, fig. 5.

Shell elevated, rather slender, with about eight whorls exposed, strongly sculptured; suture deep, spiral sculpture of a strong strap-like band immediately in front of the suture, and another behind the next suture; with a rather deep furrow in front of the band; axial sculpture of about 18 strong flattish ribs with narrower interspaces, passing under the furrows at either end, obscurely nodulating the presutural band, and having faint indications of a spiral groove divid-

ing the ribs about in the middle. Length of 8 whorls, 10; maximum diameter of last visible whorl, 2.5 mm.

Station 6440, near Burkeville, Texas, Matson. Type, U. S. Nat. Mus., No. 166316.

The base of the last whorl is missing in both molds. The sculpture recalls that of *Terebra*, but the general aspect is more like *Cerithiopsis*. The description is drawn from a gutta-percha cast from the original mold.

PACHYCHEILUS ANAGRAMMATUS, new species.

Plate 21, figs. 5, 8.

Shell slender, with about 11 whorls, the earlier ones smooth, rather flat-sided, but with a distinct suture; the later ones more rounded, with spiral cords, at first obscure, later sharp, with wider channeled interspaces, about 4 between the suture and the periphery; on the base about 6, the outer cord distinct, the others becoming more feeble and obscure toward the axis; or the whole shell may be smooth and flat-sided like the early whorls; aperture rounded, the peritreme sharp, simple, a rather thick callus spread over the body. Length of shell when complete, about 24; diameter of last whorl, 8 mm.

Stations 6040, Louisiana, and 6440, Texas; Matson. Type, U. S. Nat. Mus., No. 166295.

PACHYCHEILUS CANCELLOIDES Aldrich.

Potamides cancelloides ALDRICH, Nautilus, vol. 24, pt. 12, p. 138, pl. 8, figs. 2, 2*a*, 1911.

Station 6132, Aldrich and Matson, Satilla River, Georgia.

This species appears to belong rather to *Pachycheilus* than to *Potamides*.

PACHYCHEILUS SATILLENSIS Aldrich.

Potamides saltillensis ALDRICH, Nautilus, vol. 24, pt. 11, p. 132, pl. 8, figs. 1, 1*a–c*, 1911.

Station 6132, Aldrich and Matson. Also at station 6440, near Burkeville, Texas, Matson.

PACHYCHEILUS SUAVIS, new species.

Plate 21, figs. 6, 9.

Shell acutely conical, with about 10 whorls, the apical portion sculptured, the last 2 whorls smooth, except for incremental lines; nucleus very small (not seen); subsequent whorls (except the last one or two) with about a dozen flexuous ribs with wider interspaces, crossed by 4 or 5 flattened spiral cords separated by narrow grooves; this sculpture is sometimes prolonged even to the last whorl, becoming gradually feebler, yet in the majority of cases it becomes obsolete on the eighth and is wholly absent on the last whorl. The latter is

ovately rounded and sculptured only by incremental lines, though in young specimens there is sometimes a series of fine spiral grooves near the canal. Aperture narrowly ovate, acute behind; outer lip flexuous, sharp, produced in front, smooth inside; pillar arcuate, smooth, with a thick layer of enamel extending over the body; suture distinct, not appressed. Length (slightly decollate), 20; maximum diameter, 9.5 mm. Length of figured specimen, 16 mm.

Station 6040 near Alexandria, Louisiana; also from station 6445, the Producer's Oil Co.'s well, Pine Prairie oil field, at a depth of 1,540 feet, Louisiana, Matson; and at station 6440, Texas. Type, U. S. Nat. Mus., No. 166298.

This is a form of rather unusual characters for the genus, but one of somewhat similar aspect among recent shells has recently been described by Doctor Pilsbry from Mexico.

TURRITELLA SATILLA, new species.

Plate 22, fig. 6.

Shell of 10 or more whorls, small, acute, fragile, with a minute smooth nucleus of 2 or 3 whorls; suture deep, distinct; spiral sculpture on the subsequent whorls of 3 prominent more or less beaded elevated threads or cords, with one or more simple minute threads in the wider interspaces; axial sculpture of incremental flexuous lines which, when strong, cut the major spirals into beads or nodules; base bordered by major cord, within which it is slightly concave and smooth; aperture subquadrate and simple. Length of type-specimen, 4.5; maximum diameter of base, 1.5 mm.

Station 6040, near Alexandria, Louisiana. Type, U. S. Nat. Mus., No. 166300.

Though so small a shell, this species possesses all the usual characters of the genus, and may grow to a much larger size.

ISAPIS OBSOLETA, new species.

Plate 22, fig. 8.

Shell small, with an acute spire and slightly turrited whorls; last whorls much the largest, ovate, spirally sculptured with 7 channeled grooves crossed by prominent lines of growth visible only in the grooves; interspaces smooth except for faint incremental lines; aperture ovate, outer lip sharp, simple; pillar arcuate, with a narrow umbilical chink behind it; nucleus lost. Length of shell, 3.5; diameter, 2.5 mm.

Station 6040, near Alexandria, Louisiana. Type, U. S. Nat. Mus., No. 166301.

A very distinct species of a genus which contains but a few species on the American coast.

SYRNOLA THELMA, new species.

Plate 20, fig. 3.

Shell small, elongate-conic, smooth except for incremental lines; suture distinct, not deep; apical portion decollate; aperture narrowly ovate, outer lip simple, blunt, base rounding into a strongly twisted short pillar, body with no visible callus. Length of decollate fragment (two whorls), 2; diameter, 1 mm.

Station 6040, near Alexandria, Louisiana. Type, U. S. Nat. Mus., No. 166302.

This fragment is sufficient to show the presence of the genus and the main characteristics of the shell.

PALUDESTRINA ALDRICHI, new species.

Plate 22, fig. 7.

Shell small, smooth, polished, elongate, with six or more well defined whorls; nucleus very minute, rather blunt; whorls with a little shoulder near the suture, giving them a slightly turrited appearance; there is no sculpture except faint incremental lines; aperture ovate with a continuous, simple peristome; umbilical chink narrow, distinct; base a little produced and evenly rounded. Length, 4.5; diameter, 1.6 mm.

Station 6040 near Alexandria, Louisiana. Type, U. S. Nat. Mus., No. 166303.

The several forms of this genus that follow appear to be distinct, but they show a certain amount of variation also between the individuals, so that it is difficult to estimate the value of the differences, observed.

PALUDESTRINA PLANA Aldrich.

Paludestrina plana ALDRICH, Nautilus, vol. 24, pt. 12, p. 139, pl. 8, fig. 3, 1911.

Station 6132, Aldrich and Matson; station 6040, Louisiana, Matson.

?PALUDESTRINA GEORGIENSIS Aldrich.

Amnicola georgiensis ALDRICH, Nautilus, vol. 24, pt. 12, p. 139, pl. 99, figs. 4, 4*a*; pl. 10, fig. 13, 1911.

Station 6132, Aldrich and Matson.

The remarkable deformations to which this species submits render its generic place difficult to determine.

?PALUDESTRINA SATILLENSIS Aldrich.

Amnicola saltillensis ALDRICH, Nautilus, vol. 24, pt. 12, p. 139, pl. 9, figs. 5–11; pl. 10, fig. 15, 1911.

Station 6132, Aldrich and Matson.

PALUDESTRINA CURVA, new species.

Plate 22, fig. 4.

Shell of about six whorls, which are notably rounded, giving a constricted aspect to the suture; surface smooth, polished; aperture entire, ovate; the peristome simple with a marked chink behind the inner lip. Length, 3.5; maximum diameter, 2 mm.

Station 6040, near Alexandria, Louisiana, Matson. Type, U. S. Nat. Mus., No. 166308.

This species is less elevated than *P. aldrichi*, and has much more rounded whorls than *P. turricula*.

PALUDESTRINA CINGULATA, new species.

Plate 22, fig. 1.

Shell small, slender, regular, with about 6 whorls, evenly rounded and with a distinct suture; surface polished, sculpture only of faint spiral grooves of which 1 or 2 near or in front of the periphery are more pronounced than the others; apex rather blunt, smooth; aperture ovate, simple, the peristome not reflected, simple, interrupted by the body over which there is a moderate coat of enamel; there is no umbilicus, but a minute chink behind the pillar lip.

Length, 4.6; diameter, 1.5 mm.

Station 6040, near Alexandria, Louisiana. Type, U. S. Nat. Mus., No. 166304.

PALUDESTRINA TURRICULA, new species.

Plate 22, fig. 9.

Shell small, compact, acute, of about 6 whorls; nucleus very small, blunt; surface of subsequent whorls smooth, polished, the incremental lines and occasional faint microscopic spirals form the only sculpture. The whorls are somewhat straight-sided, and the portion immediately in front of the suture is compressed into a small rounded shoulder which gives a turriculate aspect to the spire. Length, 4; diameter, 1.75 mm.

Station 6040, near Alexandria, Louisiana. Type, U. S. Nat. Mus., No. 166307.

This species is very common along with *P. aldrichi*, which is differentiated by its more elongate form, its rounded whorls, and more slender shell. The aperture in both species is exactly alike except for the little curve corresponding to the shoulder of the whorl.

PALUDESTRINA MILIUM, new species.

Plate 22, fig. 2.

Shell minute, ovate, of nearly 5 whorls; apex minute, rather blunt, last whorl much the largest; suture distinct, surface smooth and pol-

ished; aperture ovate, peristome entire, not interrupted by the body; a minute chink behind the pillar lip but no umbilical perforation. Length, 2; diameter, 1 mm.

Station 6040, near Alexandria, Louisiana. Type, U. S. Nat. Mus., No. 166309.

This little shell indicates by its color that when living it was of a dark, perhaps purplish, color.

PYRGULOPSIS? SATILLA, new species.

Plate 22, fig. 3.

Shell minute, smooth, with a rather swollen nucleus of a whorl and a half, and three or more subsequent sharply carinated whorls; the carina is at the anterior third of the whorl which slopes flatly down to it from the preceding suture; there is a second carina in front of the first on which the suture is wound and which is only visible on the base of the last whorl which is flattish. Aperture defective in the specimen. Length, 1.2; diameter, 0.5 mm.

Station 6040, near Alexandria, Louisiana. Type, U. S. Nat. Mus., No. 166310.

I refer this extremely minute shell to *Pyrgulopsis* at a venture, as it can not be regarded as a *Paludestrina* or the tip of a *Turritella*.

NERITINA SPARSILINEATA Dall.

Neritina, sp. indet. ALDRICH, Nautilus, vol. 24, pt. 11, p. 131, No. 7, 1911; vol. 26, pl. 1, figs. 3, 4, 1912.

Stations 3614, 6040, 6132, 6440, and 6445.

This species was figured but not named by Messrs. Aldrich and Pilsbry, and though the attention of Doctor Pilsbry was called to the omission, no name has yet been printed as far as I know. It is one of the most widespread and characteristic species of this horizon. An adult specimen measures 10 mm. in height and 7.5 mm. in greatest diameter. It is remarkable for its subacute conical form. The black lines vary as in *N. pupa*. The labial callus is profuse and the inner lip obsoletely striated or smooth.

PLANORBIS OPHIS, new species.

Plate 21, figs. 3, 4.

Shell small, deeply and closely enrolled, the summit slightly less so than the base, and showing about four whorls; the coil from in front appears almost exactly symmetrical; aperture semilunate, the body protruding well into it, outer lip (adult?) thin, sharp; surface polished almost smooth above, the striations in harmony with the incremental lines are more perceptible on the base; the surface of the spire is concavely flattened, but as usual the basal parts in the umbilical cavity retain their rotundity. Diameter of coil 4; height of aperture 2.6 mm.

Station 6040, near Alexandria, Louisiana. Type, U. S. Nat., Mus., No. 166315.

PLANORBIS ANTIQUITUS Aldrich.

Planorbis antiquitus ALDRICH, Nautilus, vol. 24, pt. 12, p. 140, pl. 10, figs. 16, 16*a*, 16*b*, 1911.

Station 6132, Aldrich and Matson.

EXPLANATION OF PLATES.

PLATE 20.

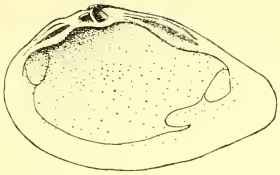
Fig. 1. *Mulinia sapotilla* Dall, lon. 15 mm., p. 228.
2. *Pleurobema alixus* Dall, lon. 16 mm., p. 230.
3. *Syrnola thelma* Dall, alt. 2 mm., p. 234.
4. *Lampsilis sandrius* Dall, from above, lon. 32 mm., p. 229.
5. The same, profile view of a young shell, 20 mm. long, p. 229.
6. *Unio musius* Dall, part of right valve showing sculpture of beak, lon. 11 mm., p. 230.
7. *Rangia* (*cuneata* var. ?) *solida* Dall, interior of right valve, lon. 20 mm., p. 228.
8. *Heterodonax alexandra* Dall, part of right valve, lon. 8 mm., p. 228.

PLATE 21.

Fig. 1. *Potamides matsoni* Dall, young shell, alt. 12 mm., p. 231.
2. The same, side view of lip of adult shell.
3. *Planorbis ophis* Dall, view of base, lat. 4 mm., p. 236
4. The same, in profile.
5. *Pachycheilus anagrammatus* Dall, a profile view of outer lip, p. 232.
6. *Pachycheilus suavis* Dall, profile of the outer lip, p. 232.
7. *Potamides matsoni* Dall, adult shell, alt. 28 mm., p. 231.
8. *Pachycheilus anagrammatus* Dall, adult, alt. 24 mm. The upper whorls are less smooth than usual; p. 232.
9. *Pachycheilus suavis* Dall, adult, alt. 20 mm., p. 232.

PLATE 22.

Fig. 1. *Paludestrina cingulata* Dall, alt. 4.6 mm., p. 235.
2. *Paludestrina milium* Dall, alt. 2 mm., p. 235.
3. *Pyrgulopsis satilla* Dall, alt. 1.2 mm., p. 236.
4. *Paludestrina curva* Dall, alt. 3.5 mm., p. 235.
5. *Cerithiopsis*? *burkevillensis* Dall, alt. 10 mm., p. 231.
6. *Turritella satilla* Dall, alt. 4.5 mm., p. 233.
7. *Paludestrina aldrichi* Dall, alt. 4.5 mm., p. 234.
8. *Isapis obsoleta* Dall, alt. 3.5 mm., p. 233.
9. *Paludestrina turricula* Dall, alt. 4 mm., p. 235.



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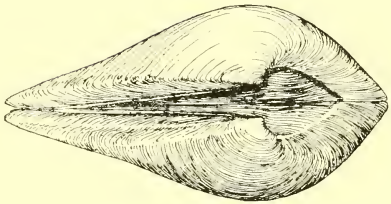

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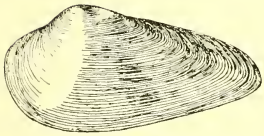

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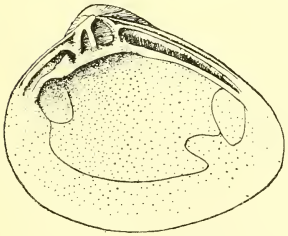

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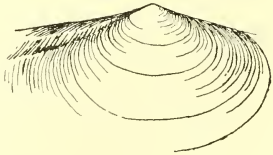
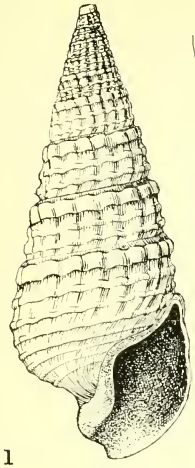


PLIOCENE MOLLUSKS OF THE COASTAL PLAIN.

FOR EXPLANATION OF PLATE SEE PAGE 237.



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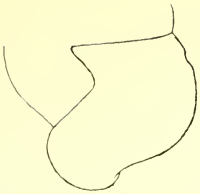

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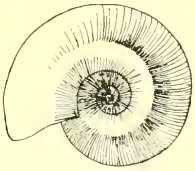

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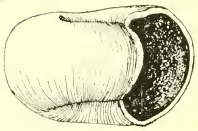

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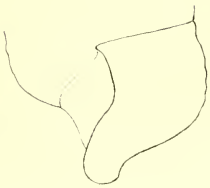

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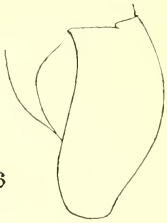

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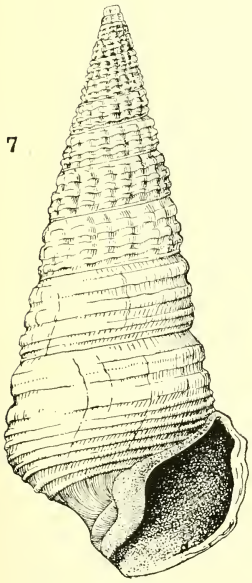

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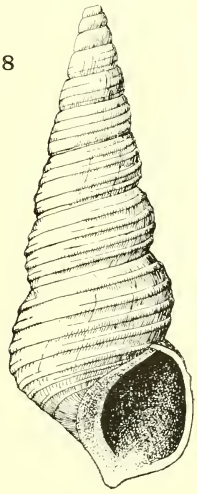

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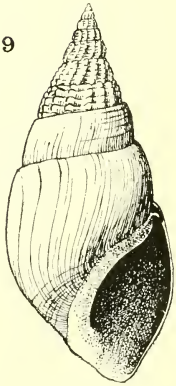

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PLIOCENE MOLLUSKS OF THE COASTAL PLAIN.

FOR EXPLANATION OF PLATE SEE PAGE 237.

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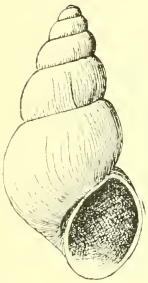

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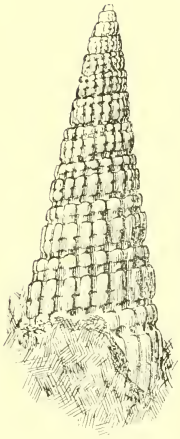

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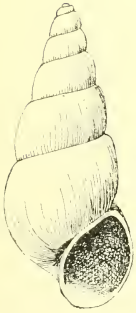

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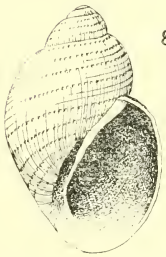

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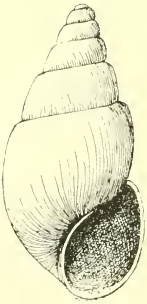

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PLIOCENE MOLLUSKS OF THE COASTAL PLAIN.

FOR EXPLANATION OF PLATE SEE PAGE 237.