

A CONTRIBUTION TO THE INVERTEBRATE FAUNA OF THE OLIGOCENE BEDS OF FLINT RIVER, GEORGIA.

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INTRODUCTION.

The fossils described in this paper were collected on or near the Flint River, Georgia, above and below the town of Bainbridge, by Messrs. T. W. Vaughan, C. Wythe Cooke, and W. C. Mansfield, of the United States Geological Survey. While their state of preservation in many cases leaves much to be desired, the identification of the fauna has some importance for the geology of that part of the coastal plain of the southern United States. A feature of somewhat unusual interest paleontologically is the presence in the upper bed of a relatively large number of species of the Cerithiidae, several of them of unusual size, recalling the analogous group in the Parisian Eocene of France, and not paralleled in any of the other Tertiary horizons of the United States so far as known. Attention was called to the presence of these large Cerithia in our southern Tertiary by the writer in 1890,¹ but it was not until the present collection was made that material suitable for study was obtained.

These fossils are immediately separable into two groups characterizing two zones, the upper zone being represented chiefly south of Bainbridge, and the lower zone around and north of that town. The extensive solution which these beds have undergone has probably removed the upper bed in the vicinity of Bainbridge, leaving behind more or less scattered remains of silicified fossils over or near the present surface of the soil.

Sixty-one species have been identified from the upper zone, of which 29 are new to science. From the lower zone 39 species were obtained, of which 9 are new. Five of the new species and 14 of the others are common to both zones.

Of the forms from the upper zone, omitting the new species, 51 per cent are identical with species found in the *Orthaulax pugnax* zone at Tampa, Florida, including the two species of *Orthaulax*.

It is probable, allowing for the distance between the two localities, and for the shallower water indicated by the Flint River species,

¹Bull. Soc. Zool. France, vol. 15, 1890, pp. 97-98.

that this upper zone should be regarded as the local equivalent of the *Orthaulax pugnax* zone of Tampa, Florida. In this conclusion Dr. T. W. Vaughan, in charge of the geological exploration of the coastal plain, concurs.

The lower zone has only 20 per cent of species common to the *Orthaulax pugnax* zone and *Orthaulax* is not among the fossils obtained from it. Omitting the new forms, about one-fourth of the species are common to the Vicksburgian Oligocene, and three-eighths are also represented in the Jacksonian or Ocala horizons. Only about 6 per cent of the species of the lower zone are common to the marls of the Chipola River or the lower bed at Alum Bluff, while from the upper zone about 10 per cent survive in the Chipola fauna.

The lower zone, therefore, while distinctly younger than the Ocala horizon, is believed by Doctor Vaughan and the writer to occupy a position between that and the *Orthaulax* zone, near the base of the upper Oligocene.

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DISTRIBUTION OF THE SPECIES.

	Upper bed.	Lower bed.	Ocala.	Vicksburg.	Orthaulax.	Chipola.
<i>Arca subprotracta</i> Heilprin	x	x		x		
<i>ecullotoides</i> Conrad.....	x			x		
<i>Glycymeris cooki</i> Dall.....	x	x				
<i>mississippiensis</i> Conrad.....	x	x		x		
<i>Ostrea mauricensis</i> Gabb.....	x			x		
<i>vicksburgensis</i> Conrad.....	x		x	x		
<i>cf. podagrina</i> Dall.....	x					
<i>Pecten alpha</i> Dall.....	x					
<i>suwanneësis</i> Dall.....	x	x	x			
<i>anatipes</i> Morton.....		x		x		
<i>Spondylus filiaris</i> Dall.....	x				x	
<i>Lima halensis</i> Dall.....	x					
<i>Modiolus grammatus</i> Dall.....		x			x	
<i>Gregariella</i> , species.....	x				?	
<i>Arcoperna inflata</i> Dall.....		x				
<i>Lithophaga nuda</i> Dall.....	x				x	
<i>Crassatellites parameus</i> Dall.....	x	x				
<i>Venericardia praecisa</i> Dall.....		x	x			
<i>Cardita shepardi</i> Dall.....	x				x	
<i>Phacoides perovatus</i> Dall.....	x	x				
<i>wacissanus</i> Dall.....	x	x				
species.....		x				
<i>Miltha ocalana</i> Dall.....	x	x	x			
<i>hillsboroënsis</i> Heilprin.....	x				x	
<i>Cardium glebosum</i> Conrad.....	x	x	x	x		
<i>eversum</i> Conrad.....	x			x		
species.....	x					

Distribution of the species—Continued.

	Upper bed.	Lower bed.	Ocala.	Vicks- burg.	Orth- aulax.	Chi- pola.
<i>Laevicardium</i> , species		X				
<i>Chione bainbridgensis</i> Dall	X	X				
<i>Macrocallista</i> cf. <i>ovata</i> Rogers		X	X			
<i>Antigona caesarina</i> Dall	X	X				X
<i>Pitaria silicifluvia</i> Dall		X				
<i>calcanca</i> Dall		X				
<i>Psammobia cerasia</i> Dall		X				
<i>Tellina segregata</i> Dall	X				X	
<i>Semele</i> , species		X				
<i>Maetra mississippiensis</i> Conrad		X		X		
<i>Conus vaughani</i> Dall	X					
<i>cookei</i> Dall	X					
<i>demiurgus</i> Dall		X				X
<i>tortilis</i> Conrad		X	X			
species	X					
<i>Turris</i> , species		X				
<i>Marginella silicifluvia</i> Dall	X					
<i>halensis</i> Dall	X					
<i>Lyria mansfieldi</i> Dall		X				
<i>silicata</i> ? Dall	X				X	
<i>Mitra syra</i> Dall	X				X	
<i>Xancus wilsoni</i> Conrad	X			X		
<i>Fusinus nexilis</i> Dall		X			X	
<i>Murex rufirupicolus</i> Dall		X				
<i>Epitonium</i> ? <i>dubiosum</i> Dall	X					
<i>Cymatium cecilianum</i> Dall	X					
<i>Bursa victrix</i> Dall	X					
<i>Cassis sulcifera</i> Sowerby		X				
<i>globosa</i> Dall	X	X	X			X
<i>Orthaulax inornatus</i> Gabb	X				X	
<i>pugnax</i> Heilprin	X				X	
<i>Strombus chipolanus</i> Dall	X				X	X
species indet.		X				
<i>Bittium silicium</i> Dall	X					
<i>Diastrona georgiana</i> Dall	X					
<i>Cerithium silicifluviatum</i> Dall	X	X				
<i>mascotianum</i> Dall	X					
<i>halense</i> Dall	X					
<i>vaughani</i> Dall	X					
<i>cookei</i> Dall	X					
<i>corallicolum</i> Dall	X					
<i>eutextile</i> Dall	X					
<i>vaginatatum</i> Dall	X					
<i>insulatum</i> Dall	X					
<i>Cerithiopsis diagona</i> Dall	X					
<i>Turritella halensis</i> Dall	X					
<i>tampae</i> Heilprin	X				X	
species indet.		X				
<i>Calyptrea trochiformis</i> ? Conrad		X		X		
<i>Xenophora conchyliophora</i> Born	X	X	X	X	X	X
<i>Ampullina solidula</i> Dall	X	X			X	
<i>streptostoma</i> Heilprin	X	X			X	
<i>Amauropsis ocalana</i> Dall	X	X	X			
<i>Sinum imperforatum</i> Dall	X				X	
<i>Margarites corallica</i> Dall	X					
<i>Teinostoma sublimata</i> Dall	X					
<i>Liotia halensis</i> Dall	X					
<i>persculpturata</i> Dall	X					
<i>Nerita tampaensis</i> Dall	X				X	
<i>Dentalium ladinum</i> Dall					X	

DESCRIPTIONS OF SPECIES.

ARCA SUBPROTRACTA Heilprin.

Arca subprotracta HEILPRIN, Proc. Acad. Nat. Sci., Phila. for 1881, p. 449.

Arca (Byssarca) protracta CONRAD, Journ. Acad. Nat. Sci., Phila., new ser., vol. 1, 1848, p. 126, pl. 13, fig. 36; not of Rogers, 1837.

Locality.—Station 6171, on the east bank of the Flint River at Bainbridge, Decatur County, Georgia, L. W. Stephenson, 1908. U. S. Nat. Mus. Cat. No. 166762. Also in the Oligocene of Vicksburg, Mississippi; Conrad.

BARBATIA (CALLOARCA) CUCULLOIDES Conrad.

Arca cuculloides CONRAD, Fos. Tert. Form., No. 3, p. 37 (not figured), 1833.

Byssarca lima CONRAD, Journ. Acad. Nat. Sci., Phila., new ser., vol. 1, 1848, p. 125, pl. 13, fig. 23; not of Reeve, 1844.

Barbatia (Calloarca) cuculloides DALL, Trans. Wagner Inst. Sci., Phila., vol. 3, 1898, p. 624.

Locality.—Station 3383, at the base of the bluff at Little Horseshoe Bend, just below the mouth of Blue or Russell Spring branch, on the east bank of the Flint River, 4 miles below Bainbridge, Decatur County, Georgia, in fossil coral reef; T. W. Vaughan, 1900. U. S. Nat. Mus. Cat. No. 166763. Also in the Oligocene of Vicksburg, Mississippi; Conrad.

GLYCYMERIS COOKEI, new species.

Plate 84, figs. 1, 2, 3, 4.

Shell small, slightly inequilateral, strongly sculptured; valves thick, suborbicular, with inner margins fluted in consonance with the external sculpture and the areas between the umbones very narrow and relatively long; sculpture of 12–15 stout flattened radial ribs, which distally become grooved on the summit and eventually duplex; the interspaces are channeled and about as wide as the ribs; in some specimens traces of intercalary threads, one to an interspace, begin to show themselves. There is no perceptible concentric sculpture, but all the specimens show a tendency to granulation of the surface, which, however, may be due to conditions of fossilization. The umbones are small and pointed; the hinge line is narrow, with seven or eight well-developed teeth on either side of the center. Height, 14; breadth, 15; diameter (double), 10 mm.

Locality.—Station 7095 on the east bank of Flint River, just above Lambert Island, about 10½ miles below Bainbridge, Decatur County, Georgia; also at station 7076, about half a mile below the island. Cooke and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166710.

The peculiar sculpture of this species is quite distinctive and does not closely resemble any other known Oligocene species. It is quite probable that it attains a larger size than that above noted.

GLYCYMERIS MISSISSIPPIENSIS Conrad.

Pectunculus mississippiensis CONRAD, Journ. Acad. Nat. Sci., Phila., new ser., vol. 1, 1848, p. 125, pl. 13, fig. 25.

Axinaea mississippiensis CONRAD, Amer. Journ. Conch., vol. 1, 1865, p. 12.

Glycymeris mississippiensis DALL, Trans. Wagner Inst. Sci., Phila., vol. 3, 1898, p. 608.

Localities.—Stations 3388, 3401, 6175, 7096, 7132, and 7150a, on the Flint River, within a range of 12 miles of Bainbridge, Decatur County, Georgia; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166764. Also in the Oligocene of Vicksburg, Mississippi; Conrad.

OSTREA MAURICENSIS Gabb.

Ostrea mauricensis GABB (part) Journ. Acad. Nat. Sci., Phila., ser. 2, 1860, p. 376, pl. 67.—DALL, U.S.Nat.Mus.Bull. 90, 1915, p. 123.

Oligocene of southern New Jersey; of the layers above the Altamaha grit of Georgia; of the *Orthaulax pugnax* zone at Ballast Point, Tampa Bay, Florida; of the beds at Vicksburg, Mississippi (Gabb); and at station 3400, at Mitchell Griffin's field, 8 miles southeast of Bainbridge, Decatur County, Georgia; T. W. Vaughan, 1900. U. S. Nat. Mus. Cat. No. 166747.

Poorly preserved specimens, apparently identical with those referred in the literature to Gabb's species.

OSTREA VICKSBURGENSIS Conrad.

Ostrea vicksburgensis CONRAD, Proc. Acad. Nat. Sci., Phila., for 1848, p. 296; Journ. Acad. Nat. Sci., Phila., new ser., vol. 1, 1848, p. 126, pl. 13, figs. 5, 37.

Ostrea mortoni GABB, Proc. Acad. Nat. Sci., Phila., for 1861, p. 329.

Locality.—Station 7074, on the west bank of Flint River at Hale Landing, 7 miles southeast of Bainbridge, Decatur County, Georgia, in coralliferous chert; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166765. Also in the Oligocene of Vicksburg, Mississippi; Conrad, and the Jacksonian Eocene.

OSTREA cf. PODAGRINA Dall.

? *Ostrea podagrina* DALL, Proc. U. S. Nat. Mus., vol. 18, 1895, p. 122; Trans. Wagner Inst. Sci. Phila., vol. 3, pt. 4, 1898, p. 682, pl. 30, figs. 5, 6.

Locality.—Station 2326, at Blue or Russell Spring, near the Flint River, 4 miles south of Bainbridge, Decatur County, Georgia; R. Pumpelly, 1891, U. S. Nat. Mus., Cat. No. 166748.

A species of oyster, apparently similar to *O. podagrina*, and differing from the others cited, but too imperfect to be positively identified with the form collected by Eldridge from the Sulphur Spring on the Suwannee River.

PECTEN (LYROPECTEN?) ALPHA Dall.

Plate 84, fig. 9.

Pecten (Lyropecten) alpha DALL, Trans. Wagner Inst. Sci. Phila., vol. 3, pt. 4, 1898, p. 725 (not figured).

Shell small, thin, nearly equilateral, suborbicular, slightly convex, sculptured with 9 or 10 radial folds with subequal deep rounded interspaces, the disk and submargin also bearing fine radial threads; these appear to be smooth, but the condition of the specimens is such as to prevent a positive decision and they may have been slightly scaly; on the posterior ear of the left valve are five or six fine elevated radial threads with wider interspaces; the other ear is defective; height of valve 24; breadth 23 mm.

Locality.—Station 7075, on the east bank of Flint River, about 10½ miles below Bainbridge, Georgia, and just above Lambert Island; C. W. Cooke and W. C. Mansfield, 1914. Also at Sulphur Springs ferry, Suwannee River, Suwannee County, Florida; Burns. U. S. Nat. Mus. Cat. No. 166711.

PECTEN (AEQUIPECTEN) SUWANNEËNSIS Dall.

Plate 83, figs. 2, 3, 4.

Pecten (Aequipecten) suwanneënsis DALL, Trans. Wagner Inst. Sci. Phila., vol. 3, pt. 4, 1898, p. 724.

Localities.—Jacksonian Eocene of the Suwannee River, Florida, Burns; and at station 7075, on the east bank of the Flint River, just above Lambert island, about 10½ miles below Bainbridge, Decatur County, Georgia; station 7076, at bend half a mile below Lambert island on the east bank of Flint River, about 12 miles below Bainbridge; and station 7079, at Mascot Point, below the mouth of Blue Spring branch, in chert blocks on the east bank of Flint River; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. Nos. 166749, 166750, and 166757.

PECTEN (CHLAMYS) ANATIPES Morton.

Pecten anatipes MORTON, Amer. Journ. Sci., vol. 23, 1833, p. 293, pl. 5, fig. 4; Synopsis Org. Rem., 1834, p. 58.

Vicksburgian Oligocene at Heidelberg and in Jasper County, Mississippi, Johnson; station 7096, at Red Bluff, on the west bank of Flint River, 7 miles above Bainbridge, Decatur County, Georgia; and station 7132, on the west bank of Flint River, opposite Little Horseshoe Point, half a mile below Mascot Point, and 4½ miles below Bainbridge, in loose lumps of limestone; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166752.

SPONDYLUS FILIARIS, new species.

Plate 83, figs. 5, 6.

Shell large, thin, more or less irregular from its attachment to irregular surfaces which its growth follows, sculptured with small low radiating rounded threads without spiny processes, arranged in groups of five to eight, with the interspaces averaging subequal; these groups separated by larger but similar single threads; the inner margin of the valves slightly crenulated; concentric sculpture of inconspicuous incremental lines; beak of upper valve rather pointed, with a small and narrow inconspicuous auricle on each side, the lower valve not obtained; the hinge as usual in the genus, but narrow with a small resilifer. Height of large upper valve, approximately, 65; breadth, 57; depth, 18 mm. The small valve figured is about 20 mm. in height.

Locality.—Station 7078, on the east bank of Flint River, near the lower end of Smith's Reach, about one-quarter of a mile below Hale Landing, Decatur County, Georgia; collected by Dr. C. Wythe Cooke and W. C. Mansfield, 1914. Also with *Spondylus bostrychites* Guppy, in the Tampa siliceous beds at Ballast Point, Tampa Bay, Florida, by W. H. Dall in 1886. U. S. Nat. Mus. Cat. No. 166712.

This species is represented by a defective specimen in the Tampa collection which was supposed, when studied, to be a worn variant of *S. bostrychites*. But the more complete material obtained on the Flint River shows that its sculpture does not take on the spinose character of the latter species and the sculpture is finer and more regular. Between perfect shells the distinctiveness should be complete.

LIMA HALENSIS, new species.

Plate 83, figs. 1, 7, 8.

Shell ovate, moderately thin, with a short hingeline and inconspicuous auricles; sculpture of about 16 strong nearly smooth radial ribs with subequal channeled interspaces, the ribs near the submargins obsolescent and the submargins and auricles sculptured only with rather conspicuous incremental lines. The ribs are themselves sculptured with more or less obsolete minute radial striations most distinct toward the middle of the disk; concentric sculpture confined to more or less prominent incremental lines not rising into scales or imbrications; beaks narrow; anterior gape small with its bounding valve-margins thickened and slightly reflected; hinge area small, flat, with no crural callosities, the ligamentary pit large, equilaterally triangular, shallow; valves subequal, and moderately convex. Height, 52; breadth of shell, 37; of hingeline, 16; diameter, 14 mm.

Locality.—Station 7074, at Hale landing, on the west bank of Flint River, 7 miles southeast of Bainbridge, Decatur County,

Georgia, in coralliferous chert; Vaughan, Cooke, and Mansfield, 1914; station 7078, on the east bank of Flint River, below the mouth of Blue Spring branch, at Mascot Point, in chert blocks, by the same collectors, in 1914. U. S. Nat. Mus. Cat. No. 166713.

The chief peculiarity of this species and one by which it is easily distinguished is the presence of strong radial ribs with channeled interspaces, but without the strong almost spinose imbrications with which we are familiar in analogous recent species.

MODIOLUS (BRACHYDONTES) GRAMMATUS Dall.

Modiolus (Brachydontes) grammatus DALL, Trans. Wagner Inst. Sci. Phila., vol. 3, 1898, pt. 4, p. 794, pl. 30, fig. 2; Bull. U. S. Nat. Mus. No. 90, 1915, p. 127, pl. 26, fig. 4.

Locality.—Station 7096, at Red Bluff, on the west bank of Flint River, 7 miles above Bainbridge, Decatur County, Georgia; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166753. Also in the *Orthaulax pugnax* zone at Ballast Point, Tampa Bay, Florida. U. S. Nat. Mus. Cat. No. 165184.

MODIOLARIA (GREGARIELLA), species indeterminate.

Localities.—Station 7074, at Hale landing, on the west bank of the Flint River, 7 miles southeast of Bainbridge, Decatur County, Georgia, in coralliferous chert; and station 7079, at Mascot Point on the east bank of Flint River below the mouth of Blue (or Russell) Spring branch, in chert blocks; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166754.

Casts of a species probably belonging to the section *Gregariella*, but too imperfect to be specifically determined, were obtained as above mentioned. Two species of this general type have been obtained from the *Orthaulax pugnax* zone at Ballast Point, Tampa Bay, Florida.

Genus ARCOPERNA Conrad, 1865.

ARCOPERNA INFLATA, new species.

Plate 85, fig. 1.

Shell small, thin, inequilateral, the umbones nearly terminal, prosoelous, small; the anterior dorsal slope abruptly descending, the posterior nearly at a right angle to it, slightly convexly arcuate; both ends bluntly rounded, base almost straight; hinge edentulous, much as in *Musculus*; inner margins of the valve apparently smooth, interior disk concealed by matrix; the external sculpture of almost microscopic radial striae over the whole surface, and concentric emphatic resting stages, irregularly disposed on the lower part of the disk, to the number of two or three. Height, 12; length, 18.5; diameter (double), 9 mm.

Locality.—At station 7096, at Red Bluff, Flint River, on the west bank, 7 miles above Bainbridge, Decatur County, Georgia; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166714.

This shell seems to find a place halfway between *Crenella* and *Botula*. The type is *A. filosa* Conrad, from the Vicksburgian, from which the present shell differs by its much less prominent umbones and dorsally less and ventrally more arcuate profile.

LITHOPHAGA NUDA Dall.

Lithophaga nuda DALL, Trans. Wagner Inst. Sci. Phila., vol. 3, 1898, pt. 4, p. 800, pl. 11, fig. 7; pl. 35, fig. 27; Bull. U. S. Nat. Mus. No. 90, 1915, p. 129, pl. 24, fig. 4; pl. 26, fig. 7.

Locality.—Station 3381, at the base of the bluff at Little Horseshoe Bend, just below the mouth of Blue (or Russell) Spring branch of the Flint River, 4 miles below Bainbridge, Decatur County, Georgia; T. W. Vaughan, 1900. U. S. Nat. Mus. Cat. No. 166755. Also from the *Orthaulax pugnax* zone at Ballast Point, Tampa Bay, Florida. U. S. Nat. Mus. Cat. No. 165187.

The shell is seldom well preserved, but the casts of the burrows of this species are very common, and often in their silicified form retain a cavity more or less occupied by water.

CRASSATELLITES PARAMESUS, new species.

Plate 85, figs. 4, 5, 7, 8.

Shell solid, thick, inequilateral, the anterior end shorter; subovate, beaks small, pointed, flattened; anterior dorsal margin with an ovate-lanceolate, nearly smooth, deeply depressed lunule, the outer margin of which is abrupt and sharp-edged; the escutcheon is more than twice as long as the lunule, less depressed, concentrically striated, and with the bounding carina rounded off and less abrupt; the hinge is strongly developed, the anterior cardinal tooth very prominent, arcuately produced; the resiliary pit narrow and deep; there are no traces of lateral teeth, though the dorsal margins of the right valve are attenuated and produced; the inner margins of the valves are not crenulated; the adductor scars are conspicuous, the posterior larger, both rounded; the external sculpture on the flattened beaks comprises about ten concentric low rather sharp waves with much wider interspaces, angulated behind where they cross a low ridge which radiates from the vicinity of the umbo to the posterior basal margin, near which it becomes obsolete; in front of this ridge the concentric waves become closer, smaller, and more numerous, behind it every alternate rib, in general, ceases and the interspaces between the others are therefore about twice as wide as on the anterior part of the valve; the basal margin is obscurely angulated by the end of the ridge and the margin behind it subtruncated; the anterior end is evenly rounded and the base gently arcuated. Height 28; length of shell 35; of part behind the vertical from the umbones 21; diameter 16 mm.

Locality.—Station 7096, at Red Bluff on the west bank of Flint River, about 7 miles above Bainbridge. Also at station 7131, Cherry Chute on the Flint River, $2\frac{3}{4}$ miles below Bainbridge, Decatur County, Georgia; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166715.

This species in a general way is intermediate between the Vicksburgian *Crassatellites mississippiensis* of Conrad, and the *C. deformis* Heilprin, of the Tampa *Orthaulax pugnax* zone. It is also found in the upper bed at station 7079, at Mascot Point, on the Flint River, in chert blocks. U. S. Nat. Mus. Cat. No. 166766.

VENERICARDIA PRAECISA Dall.

Venericardia praecisa DALL, Trans. Wagner Inst. Sci. Phila., vol. 3, 1903, pt. 6, p. 427, pl. 56, figs. 7, 8.

Locality.—Station 7095, on the east bank of Flint River, at the bend near the "Old Factory," about three-quarters of a mile north-east of the railway station at Bainbridge, Decatur County, Georgia; Cooke and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166756. Also in the Jacksonian Eocene of Cleveland County, Arkansas; G. D. Harris.

CARDITA (CARDITAMERA) SHEPARDI Dall.

Cardita shepardi DALL, Bull. U. S. Nat. Mus. No. 90, 1915, p. 133, pl. 21, figs. 10, 11.

Locality.—Station 7075, on the east bank of Flint River, about $10\frac{1}{2}$ miles below Bainbridge, Decatur County, Georgia, and just above Lambert island; Cooke and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166757. Also in the *Orthaulax pugnax* zone at Ballast Point, Tampa Bay, Florida. U. S. Nat. Mus. Cat. No. 165193.

This little species is closely related to the recent *C. domingensis* of the West Indies.

PHACOIDES PEROVATUS, new species.

Plate 84, figs. 7, 8.

Shell large, moderately thin, moderately inflated; inner margin of the valves entire, the pallial line rather near the margin, deeply impressed, posterior muscular impression narrow, prolonged downward inside the pallial line, beak rather pointed, and inclined forward, with, in the right valve, two narrow cardinal teeth below it; in the east there are no distinct traces of lateral teeth. Altitude of larger east, 53; of smaller one, 48; breadth, 45 and 34; diameter (double), 30 and 18 mm., respectively.

Locality.—Station 7150a, from east bank of Flint River, just below wagon bridge at Bainbridge, Georgia, from loose blocks of chert; and station 7079, from chert blocks at Mascot Point, on the east bank of

Flint River, below the mouth of Blue Spring branch; Vaughan, Cooke, and Mansfield, October, 1914. U. S. Nat. Mus. Cat. No. 166716. Also on the left bank of Flint River at Bainbridge; A. H. Brooks, 1900.

Unfortunately no part of the exterior is represented by the specimens received. It is probable, however, that it was sculptured only by more or less conspicuous incremental lines, without radial sculpture.

From any other species of the group in the southern Tertiary this is readily distinguished by its markedly oval form.

The validity of the name *Phacoides* as a generic appellation has been called in question from the fact that it is doubtful whether Blainville used it in that sense or merely as a group name. However, as it was subsequently used by J. E. Gray in 1847 as a generic name, it seems that, failing any prior designation for the group in question, the question is hardly worth raising.

PHACOIDES (HERE) cf. WACISSANUS Dall.

?*Phacoides (Herc) wacissanus* DALL, Bull. U. S. Nat. Mus. No. 90, 1915, p. 137, pl. 23, fig. 12.

Localities.—Station 7075, on the east bank of Flint River, about 10½ miles below Bainbridge, Decatur County, Georgia, and just above Lambert island; Cooke and Mansfield, 1914; station 7131, 2¾ miles below Bainbridge, at Cherry Chute on the Flint River, from hard residual blocks on a small island; and at station 7150a on the east bank of Flint River from loose blocks of chert just below the wagon bridge at Bainbridge; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166758.

P. wacissanus was collected from the limestone of Wacissa, Jefferson County, Florida (U. S. Nat. Mus. Cat. No. 165200) and is rather common in the *Orthaulax pugnax* zone at Ballast Point, Tampa Bay, Florida.

PHACOIDES, species indeterminate.

Locality.—Station 7096, at Red Bluff on the west bank of Flint River, 7 miles above Bainbridge, Decatur County, Georgia; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166759.

A species represented by unidentifiable casts, but apparently different from the others here mentioned, was obtained at the above locality.

PHACOIDES (MILTHA) OCALANUS Dall.

Phacoides (Miltha) ocalanus DALL, Trans. Wagner Inst. Sci. Phila., vol. 3, 1903, pt. 6, p. 1375, pl. 50, fig. 14.

Localities.—Station 7079, at Mascot Point, on the east bank of Flint River, below the mouth of Blue (or Russell) Spring branch, in chert blocks; and at station 7096, on the west bank of Flint River at

Red Bluff, 7 miles above Bainbridge, Decatur County, Georgia; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166760.

The species was originally described from the Jacksonian Eocene of the Ocala horizon, Ocala, Florida, where it was collected by Mr. Joseph Willcox.

PHACOIDES (MILTHA) HILLSBOROËNSIS Heilprin.

Plate 88, fig. 12.

Lucina hillsboroënsis HEILPRIN, Trans. Wagner Inst. Sci. Phila., vol. 1, 1887, pp. 117, 120, pl. 16, fig. 62.

Phacoides (Miltha) hillsboroënsis DALL, Trans. Wagner Inst. Sci. Phila., vol. 3, 1903, pt. 6, p. 1376; Bull. U. S. Nat. Mus. No. 90, p. 139, fig. 5, 1915.

Localities.—Station 3381, at the base of the bluff at Little Horseshoe bend just below the mouth of Blue (or Russell) Spring branch, 4 miles below Bainbridge, Decatur County, Georgia, on the east bank of Flint River; T. W. Vaughan, 1900. Also at station 7095, just above Lambert Island, 10½ miles below Bainbridge, on the east bank of Flint River; and at station 7079, at Mascot Point, Flint River, in chert blocks; Vaughan, Cooke, and Mansfield, 1914, U. S. Nat. Mus. Cat. No. 166761.

This species is widely distributed, having been previously reported from the *Ortharulax pugnax* zone at Ballast Point, Tampa Bay, Florida; from the lower bed at Alum Bluff, Apalachicola River, Florida; and from the Chipola marl in Calhoun County, Florida, by Heilprin, Burns, and Dall. U. S. Nat. Mus. Cat. No. 114706, etc.

CARDIUM (TRACHYCARDIUM) GLEBOSUM Conrad.

Cardium glebosum CONRAD, Journ. Acad. Nat. Sci., Phila., new ser., vol. 1, 1848, p. 122.—DALL, Trans. Wagner Inst. Sci. Phila., vol. 3, 1900, pt. 5, p. 1080.

Cardium globosum CONRAD, Amer. Journ. Conch., vol. 1, 1865, p. 7; not of Bean, 1839.

Locality.—Station 7075, on the east bank of Flint River, 10½ miles below Bainbridge, Decatur County, Georgia, just above Lambert Island; Cooke and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166767. Also from the Red Bluff beds of Mississippi.

CARDIUM EVERSUM Conrad.

Cardium eversum CONRAD, Journ. Acad. Nat. Sci., Phila., new ser., vol. 1, 1848, p. 122, pl. 12, fig. 18.

Locality.—Station 3381, at the base of the bluff at Little Horseshoe Bend, 4 miles below Bainbridge, Decatur County, Georgia, just below the mouth of Blue (or Russell) Spring branch, on the east bank of Flint River, Georgia; T. W. Vaughan, 1900. U. S. Nat. Mus. Cat. No. 166769. Also originally from the Oligocene of Vicksburg, Mississippi; Conrad.

CARDIUM (TRACHYCARDIUM), species indeterminate.

Locality.—Station 7079, at Mascot Point, on the east bank of the Flint River below the mouth of Blue (or Russell) Spring branch, in chert blocks; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166768.

This indeterminable species recalls *C. bowdenense* Dall, of the Oligocene of Bowden, Jamaica, and the *Orthaulax pugnax* zone at Ballast Point, Tampa Bay, Florida, but is not sufficiently perfect to be positively identified. It is, at all events, one of the group exemplified by *C. muricatum* Linnaeus.

CARDIUM (LAEVICARDIUM), species.

Locality.—Station 7096, at Red Bluff, on the west bank of Flint River, 7 miles above Bainbridge, Decatur County, Georgia; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166770.

A small species of this type, not sufficiently well preserved to identify specifically.

CHIONE BAINBRIDGENSIS, new species.

Plate 84, figs. 5, 6.

Shell small, slightly inequilateral, moderately inflated, thin; beaks small, rather prominent, prosocœlous, with a short lanceolate impressed lunule below them; the escutcheon narrow and more elongated; sculpture of numerous sharp recurved lamellæ, somewhat sparser on the beaks but elsewhere uniformly distributed, and more elevated near the anterior end; radial sculpture of numerous fine threads evenly distributed, with narrower interspaces, strong on the front surface of the lamellæ and in the interspaces, but wanting on the back or concave side of the lamellæ; inner margin of the valves finely crenulated; anterior end of the valves rounded, the base prominently arcuate, the posterior end more pointed; hinge as usual in the genus. Height of somewhat defective valve, about 25; length, 35; diameter (double), 18 mm.

Localities.—Station 7095, on the east bank of Flint River, at the bend near the "Old Factory," about three-fourths of a mile north-east of the railway station at Bainbridge, Georgia. Also at station 7131, at Cherry Chute, 2¾ miles below Bainbridge, in hard residual blocks of limestone; and stations 3381, 7074, 7075, 7078, 7079, 7095, 7096, and 7131, at various points on Flint River above and below Bainbridge and within a dozen miles of that town; Cooke and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166717.

Each horizon from the Chattahoochee to the recent fauna contains a species of *Chione* of this general type, but distinguished by minor differences from the species in the zones above or below. *Chione woodwardi* Guppy, from the Oligocene of Bowden, Jamaica, is an example of the group.

MACROCALLISTA (CHIONELLA), species indeterminate.

cf. *Macrocallista ovata* ROGERS, Trans. Amer. Philos. Soc., new ser., 1837, vol. 5, p. 340, pl. 27, fig. 2, 1839.

Locality.—Station 7096, on the west bank of Flint River, 7 miles above Bainbridge, Decatur County, Georgia, at Red Bluff; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166771.

Roger's species is from the Eocene of Maryland and Virginia, and is probably not identical with the imperfectly preserved form from Georgia, but the two have a certain similarity, and better specimens of the latter are needed before an exact comparison can be made.

ANTIGONA (aff.) CAESARINA Dall.

? *Cytherca caesarina* DALL, Trans. Wagner Inst. Sci. Phila., vol. 3, 1903, pt. 6, p. 1275, pl. 53, fig. 5.

Localities.—Station 3381, at the base of the bluff at Little Horse-shoe Bend, on the east bank of the Flint River, 4 miles below Bainbridge, Decatur County, Georgia, just below the mouth of Blue (or Russell) Spring branch; T. W. Vaughan, 1900. Also at station 7074, on the west bank of Flint River, 7 miles southeast of Bainbridge at Hale landing; station 7078, near lower end of Smith's Reach, about a quarter of a mile below Hale landing; station 7079, at Mascot Point, near station 3381; and at station 7096 on the west bank of Flint River at Red Bluff, 7 miles above Bainbridge; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166772.

The *A. caesarina* was originally described from the sandstone of White Beach near Osprey, Florida, and the Oligocene marl of the Chipola River, Calhoun County, Florida. The present species is not sufficiently well preserved for a positive determination of its relations.

PITARIA (LAMELLICONCHA) SILICIFLUVIA, new species.

Plate 85, figs. 2, 3.

Shell small, inflated, arcuate, moderately thick; valves slightly inequilateral, rounded in front and behind with a prominently arcuate base, the inner margins smooth; beaks prominent, inflated, small, conspicuously incurved and prosocoelous, with an impressed and broadly heart-shaped lunule bordered by an impressed line; sculpture of small concentric waves with narrower interspaces; the crests of the waves, at first rounded, become more sharp-edged and crowded toward the basal margin; in the left valve there is no escutcheon; pallial line obscure, but the sinus is apparently small and triangular; the hinge is strongly developed, the middle cardinal largest, the anterior left lateral strong and subconic. Height of valve, 16; length, 19; length behind the vertical from the beaks, 14; double diameter of left valve, 16 mm.

Locality.—Station 7096, at Red Bluff, west bank of Flint River, 7 miles above Bainbridge, Decatur County, Georgia; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166718. Also from the Oligocene of Vicksburg, Mississippi.

PITARIA (LAMELLICONCHA) CALCANEA Dall.

Pitaria (Lamelliconcha) calcanea DALL, Trans. Wagner Inst. Sci. Phila., vol. 3, 1903, pt. 6, p. 1270, pl. 55, fig. 19.

Locality.—Station 7096, at Red Bluff, on the west bank of the Flint River, 7 miles above Bainbridge, Decatur County, Georgia; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166773. Also in the Oligocene of Vicksburg, Mississippi; Johnson.

PSAMMOBIA CERASIA, new species.

Plate 84, fig. 10.

Shell thin, elongate, inequilateral, the anterior side shorter, the beaks inconspicuous; basal and dorsal margins roughly parallel, both ends evenly rounded, margins entire; pallial line and sinus indistinguishable; hinge in the left valve of three small diverging teeth; the exterior of the shell not preserved, but probably smooth. Length of valve (slightly defective in front), 45; length of posterior portion behind the vertical from the beaks, 28.5; height at the beaks, 25; estimated diameter, 10 mm.

Locality.—Station 3401, lower bed at Cherry Chute, west side of Flint River, 3 miles below Bainbridge, Georgia; T. Wayland Vaughan, collector, in 1900. U. S. Nat. Mus. Cat. No. 166719.

This form probably belongs to the subgenus *Gobraeus*, but whether the outer surface is smooth or sculptured with oblique lines, as in so many other species, can not be determined until more material is obtained.

TELLINA SEGREGATA Dall.

Tellina segregata DALL, Trans. Wagner Inst. Sci. Phila., vol. 3, 1900, pt. 5, p. 1019, pl. 37, figs. 7, 8; Bull. U. S. Nat. Mus. No. 90, 1915, p. 151, figs. 3, 11.

Locality.—Station 7075, on the east bank of Flint River, about 10½ miles below Bainbridge, Decatur County, Georgia, just above Lambert island; Cooke and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166774. Originally collected in the *Orthaulax pugnax* zone at Ballast Point, Tampa Bay, Florida. U. S. Nat. Mus. Cat. No. 157847.

?SEMELE, species indeterminate.

Locality.—Station 7094, on the west bank of Flint River, at the railway bridge at Bainbridge, Decatur County, Georgia; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166775.

An impression, probably of a valve of *Semele*, too imperfect to identify specifically.

MACTRA MISSISSIPPIENSIS Conrad.

Mactra mississippiensis CONRAD, Journ. Acad. Nat. Sci. Phila., new ser., vol. 1, 1848, p. 121, pl. 12, fig. 14.

Locality.—Station 3401, on the west bank of Flint River, 3 miles below Bainbridge, Decatur County, Georgia, at Cherry Chute; T. W. Vaughan, 1900. U. S. Nat. Mus. Cat. No. 166776. Also from the Oligocene of Vicksburg, Mississippi; Conrad.

CONUS VAUGHANI, new species.

Plate 86, fig. 1.

Shell of moderate size, solid, conic, with about 11 whorls excluding the (defective) nucleus; the spire is moderately elevated, wavy-nodulous at the shoulder, with a very narrow but sharply cut suture; between the shoulder and the edge of the suture are three distinct spiral threads with somewhat wider interspaces; the sculpture of the sides of the shell, for at least half the length of it, is composed of spiral rows of low pustules apparently seated on obscure flattish spiral threads. The remainder of the sides, the aperture, and the canal are obscured by matrix. Height of shell, about 47; diameter at shoulder, 23; height of spire about 7 mm.

Locality.—Station 7074, at Hale landing on the west bank of Flint River, 7 miles southeast of Bainbridge, Decatur County, Georgia, in coralliferous chert; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166720.

This species recalls *Conus consobrinus* Sowerby, of the Santo Domingo Oligocene, but the granulation is not on elevated zones and the spire is lower and less conspicuous, judging from the insufficient description of this unfigured species, which is united by some authors with the *C. granozonatus* of Guppy.

CONUS COOKEI, new species.

Plate 86, fig. 2.

Shell of moderate size, regularly biconic, of eight or nine whorls, each on the spire rising slightly above the suture in front of it, the space between the sutures flattish, carrying three spiral threads with wider interspaces; the shoulder of the whorl simple; in front of the suture a very slight inflation of the upper half of the whorl, the rest being direct and flattened; near the shoulder the whorl is sculptured rather closely with obscure spiral threads; in front of these the sculpture becomes strap-like, separated by narrow sharp grooves; nearer the canal these flat spaces begin to be divided by a shallow medial groove, giving them a paired effect, these again become closer and feebler close to the canal. Length, 38; length of shell in front of the shoulder, 34; diameter at shoulder, 19 mm.

Locality.—Station 7079, on the east bank of the Flint River below the mouth of Blue Spring branch, at Mascot Point, in chert blocks; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166721.

This description is taken from a cast made from a mold in the chert rock. The shell seems nearest to the *Conus stenostomus* of Sowerby, from the Santo Domingo Oligocene, but is less attenuated anteriorly, has the spire less scalar and the extreme apex of the spire is much less prominent.

CONUS DEMIURGUS Dall.

Conus demiurgus DALL, Trans. Wagner Inst. Sci. Phila., vol. 3, 1903, pt. 6, p. 1633, pl. 60, fig. 22.

Locality.—Station 7096, on the west bank of Flint River, 7 miles above Bainbridge, Decatur County, Georgia, at Red Bluff; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166777. Also in the Oligocene marl of the Chipola River, Calhoun County, Florida; Dall.

CONUS TORTILIS Conrad.

Conus tortilis CONRAD, Proc. Acad. Nat. Sci., Phila., for 1855, p. 260.—WAILLES, Geol. Miss., 1858, pl. 15, fig. 5.—CONRAD, Amer. Journ. Conch., vol. 1, 1865, p. 30.

Locality.—Station 7096, on the west bank of Flint River, 7 miles above Bainbridge, Decatur County, Georgia, at Red Bluff; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166778. Also in the Eocene of Jackson, Mississippi.

CONUS, species indeterminate.

Localities.—Station 3381, at the base of the bluff at Little Horse-shoe Bend, just below the mouth of Blue (or Russell) Spring branch, 4 miles below Bainbridge, Decatur County, Georgia, on the Flint River; T. W. Vaughan, 1900. U. S. Nat. Mus. Cat. No. 166779; and at station 7074, on the west bank of Flint River, 7 miles south-east of Bainbridge, at Hale landing, in coralliferous chert; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166780.

Internal casts of undeterminable species of *Conus* were obtained at the above localities.

TURRIS, species indeterminate.

Locality.—Station 7094, on the west bank of Flint River, at the railway bridge at Bainbridge, Decatur County, Georgia; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166781.

Casts of an undeterminable species of *Turris* were collected at the above locality.

MARGINELLA SILICIFLUVIA, new species.

Plate 88, fig. 1.

Shell small, smooth, slender, with about five moderately convex whorls, the suture obscured by a thin wash of enamel; apex blunt; last whorl much the largest, the suture behind it slightly constricted; outer lip slightly thickened, the aperture obscured by the presence of matrix. Actual length of specimen, 8.5 mm.; the total length probably about 8.8; diameter, 4 mm.

Locality.—Station 7074, on the west bank of Flint River, 7 miles southeast of Bainbridge, at Hale landing, in coralliferous chert; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166722.

This species belongs to the group of *Marginella avena* Lamarck, a representative of which has hitherto been missing from this horizon.

MARGINELLA HALENSIS, new species.

Plate 88, fig. 2.

Shell small, smooth, a thin layer of callus covering the rather blunt spire, which appears to consist of three or four whorls; the aperture concealed by matrix; the outer lip noticeably thickened, the reflected callus carried around the outside of the canal; the body inflated, rapidly attenuated anteriorly, the periphery at the shoulder. Length, 2.75; diameter 1.78 mm.

Locality.—Station 7074, on the west bank of Flint River, 7 miles southeast of Bainbridge, Decatur County, Georgia, at Hale landing, in coralliferous chert; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166723.

LYRIA MANSFIELDI, new species.

Plate 86, fig. 3.

Shell fusiform, solid, with about seven whorls, excluding the (lost) nucleus; suture distinct but not impressed; whorls rapidly enlarging, moderately convex, with an acute apex; axial sculpture of about (on the penultimate whorl) nine low and ill-defined ribs, none distinct on the earlier whorls and on the last whorl becoming obsolete anteriorly; the lines of growth are also rather marked; spiral sculpture near the canal of four or five flattish threads with wider interspaces; the canal is bent to the right and has a distinct siphonal fasciole; outer lip defective; inner lip with eight or more columellar plaits more prominent anteriorly, with a rather heavy callus on the body near the junction of the outer lip. Length of shell, 47; of last whorl, 41; maximum diameter, 22 mm.

Locality.—Station 7096, at Red Bluff, on the west bank of Flint River, 7 miles above Bainbridge, Decatur County, Georgia; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166724.

This is not unlike *Lyria pulchella* Sowerby, of the Santo Domingo Oligocene, but has a higher spire and fewer and stronger ribs. *Lyria musicina* Heilprin, has a deeper suture and more emphatic sculpture.

LYRIA, sp. aff. SILICATA Dall.

Lyria silicata DALL, Bull. U. S. Nat. Mus. No. 90, 1915, p. 59, pl. 10, fig. 3 (*Orthaulax pugnax* zone, at Ballast Point, Tampa Bay, Florida).

Locality.—Station 7074, at Hale landing, on the west bank of Flint River, 7 miles southeast of Bainbridge, Decatur County, Georgia, in coralliferous chert; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166800.

Another specimen from the vicinity of the Blue Spring, near Flint River, resembles the type specimen of *L. silicata* in being smooth, but is even more inflated and shorter in proportion. Until more and better specimens of this form are obtained, the limits of its variation can not be safely determined.

MITRA SYRA Dall.

Mitra syra DALL, Bull. U. S. Nat. Mus. No. 90, 1915, p. 60, pl. 12, fig. 17.

Locality.—Station 3383, at the base of the bluff at Little Horseshoe bend, just below the mouth of Blue (or Russell) Spring branch, 4 miles below Bainbridge, Decatur County, Georgia, on the Flint River; T. W. Vaughan, 1900. U. S. Nat. Mus. Cat. No. 166782. Also in the *Orthaulax pugnax* zone at Ballast Point, Tampa Bay, Florida, Post; U. S. Nat. Mus. Cat. No. 165067.

XANCUS WILSONI Conrad.

Turbinella wilsoni CONRAD, Journ. Acad. Nat. Sci., Phila., new ser., vol. 1, 1848, pt. 2, p. 120, pl. 12, fig. 12.

Locality.—Station 3381, at the base of the bluff at Little Horseshoe bend, 4 miles below Bainbridge, Decatur County, Georgia, and just below the mouth of Blue (or Russell) Spring branch, on the east bank of Flint River; T. W. Vaughan, 1900. U. S. Nat. Mus., Cat. No. 166783. Also at station 7075, on the east bank of Flint River, 10½ miles below Bainbridge and just above Lambert island; and at station 7079, on the east bank of Flint River, below the mouth of Blue Spring branch, at Mascot Point, in chert blocks; Vaughan, Cooke, and Mansfield, 1914. Also in the Oligocene of Mississippi at Vicksburg; Conrad.

FUSINUS NEXILIS Dall.

Plate 88, fig. 13.

Fusus (Chrysodomus) nexilis DALL, Trans. Wagner Inst. Sci. Phila., vol. 3, 1890, pt. 1, p. 198, pl. 8, fig. 6 (not fig. 4), 1890.

Fusinus nexilis DALL, Bull. U. S. Nat. Mus. No. 90, 1915, p. 66, pl. 8, fig. 8.

Locality.—Station 7096, on the west bank of Flint River, at Red Bluff, 7 miles above Bainbridge, Decatur County, Georgia; Vaughan,

Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166784. Also in the *Orthaulax pugnax* zone, at Ballast Point, Tampa Bay, Florida; Dall, 1885. U. S. Nat. Mus. Cat. No. 112054.

The figure does not show as clearly as might be wished the strength of the sculpture on the upper part of the spire, the curvature of the canal, or its constriction at the base of the whorl.

MUREX RUFIRUPICOLUS, new species.

Plate 86, fig. 8.

Specimen represented by an internal cast with a slightly defective apex; fusiform with over four whorls, a long straight canal, a rounded aperture, the outer lip expanded, thickened, crenulate, with a prominent guttered spine at the shoulder, a large dentiform callosity internally just in front of the suture, and six prominent internal lirations diminishing anteriorly, in front of the groove at the shoulder. There appear to have been two feeble varices or thickenings visible on the internal cast on each of the antecedent whorls, and an expansion of the outer lip continued some distance down on the right margin of the canal. Length of the cast as figured, 42; maximum diameter of the last whorl, 19 mm.

Locality.—Station 7096, on the west bank of Flint River, 7 miles above Bainbridge, Decatur County, Georgia, at Red Bluff; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166725.

Ordinarily an internal cast is of little value in determining a species of gastropod, but in this case the imprint is so complete that distinctive characters separating this form from any other now known from the Gulf Coast Oligocene, are present.

EPITONIUM(?) DUBIOSUM, new species.

Plate 88, fig. 3.

Shell minute, only the last whorl accessible, the whorl with a circular cross section, smooth except for thin, sharp lamellae, of which there appear to be at least 30 on the (last) whorl; aperture slightly expanded with a sharp margin, apparently entire; umbilicus deep, circular, rather large for the shell. Maximum diameter of whorl, 1.5; minimum diameter, 1; height, 0.75 mm.

Locality.—Station 7074, on the west bank of the Flint River, 7 miles southeast of Bainbridge, Decatur County, Georgia, at Hale landing, in coralliferous chert; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166726.

This fragment may be the basal whorl of a minute *Epitonium*, or possibly a Trochoid allied to *Vetulonia*.

The impossibility of detaching the matrix renders a final decision impracticable; but, in any case, the characteristics are such that a complete specimen could not fail to be recognized. If we were per-

mitted to include a land shell in this marine deposit one might suspect it to be one of the lamellose Vallonias.

CYMATIUM CECILIANUM, new species.

Plate 85, fig. 10.

Shell small, thin, of about five whorls excluding the (decollate) apex, with a few thin, almost sharp varices irregularly disposed; suture distinct, not channeled; early whorls with two sharp revolving ridges, subequal, forming the periphery; within the excavated but not channeled interspace a single small spiral thread; in the space between the suture and the first ridge there are three or four threads, the first, well separated from the suture by an excavated but not channeled interval, is a little more prominent and sharper than the others; in the narrower space between the second ridge and the suture in front of it are one or two fine threads; the last whorl between the suture and the canal are seven or eight prominent rather sharp ridges, the two near the periphery most prominent; all are acutely nodulose, where they cross the varix and are separated by subequal interspaces which carry two or three fine spiral threads in each; the canal is almost straight and obliquely spirally closely threaded; there is no callus on the inner lip in the specimen, which is probably somewhat immature; the outer lip is wanting. Length of decollate five whorls, 25; of last whorl, 17; diameter of last whorl, about 14 mm.

Locality.—Station 7074, on the west bank of Flint River, 7 miles southeast of Bainbridge, Decatur County, Georgia, at Hale landing, in coralliferous chert; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166727.

BURSA VICTRIX, new species.

Plate 88, fig. 10.

Shell of moderate size, the apex wanting, the type-specimen cast from a mold comprising three whorls, with discontinuous lateral varices two to a whorl; the varices are rounded and nodulous, the sculpture harmonizing with the spiral sculpture of the roundly inflated whorls; the suture is distinct, not channeled. The sculpture comprises on the last whorl a smooth interval sloping from the suture; then a sparsely prominently beaded cord; then a wider interval carrying a less prominent and less distinctly beaded cord, followed by a simple spiral thread; then a broad band forming the shoulder of the whorl and carrying about a dozen semiglobular prominent nodulations, the whole sharply spirally striated; in front of this two subequal and equidistant narrower bands similarly but more closely and feebly nodulous and striated, in front of which on the preceding whorls the suture is laid. The base shows two minutely

beaded spirals, alternating with single plain spiral threads, followed by 8 or 10 smaller, mostly simple and closely adjacent threads, one or two of which show a tendency toward beading. The canal is short and twisted, and obscurely spirally threaded. Height of three visible whorls, 42; diameter at decollate earliest whorl, 11; maximum diameter of last whorl, 27 mm.

Locality.—Station 7079, on the east bank of Flint River, below the mouth of Blue (or Russell) Spring branch, at Mascot Point, in chert blocks; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 160728.

CASSIS SULCIFERA Sowerby.

Plate 86, fig. 4.

Cassis sulcifera SOWERBY, Quart. Journ. Geol. Soc. of London, vol. 6, pt. 1, May, 1849, p. 47, pl. 10, fig. 1. (Santo Domingo.)

Localities.—Station 3381, at the base of the bluff at Little Horseshoe bend, on the Flint River, 4 miles below Bainbridge, Decatur County, Georgia, just below the mouth of Blue (or Russell) Spring branch, in fossil coral reef; T. W. Vaughan, 1900; U. S. Nat. Mus. Cat. No. 166785. Also at station 3388 at Red Bluff, on Flint River, 7 miles above Bainbridge, in the upper fossiliferous stratum at that locality; at station 7074, at Hale landing, 7 miles southeast of Bainbridge, on the west bank of Flint River, in coralliferous chert; at station 7079, on the east bank of Flint River, at Mascot Point, in chert blocks; at station 7096, at Red Bluff, on the west bank of Flint River, 7 miles above Bainbridge; at station 7150a on the east bank of Flint River, just below the wagon bridge, from loose blocks of chert; Vaughan, Cooke, and Mansfield; and from the Oligocene of Santo Domingo; Sowerby.

Though no complete specimens were found, the identification of the species appears to be certain.

CASSIS GLOBOSA Dall.

Cassis (Phalium) globosum DALL, Trans. Wagner Inst. Sci. Phila., vol. 3, pt. 1, 1890, p. 161; pt. 2, 1892, p. 262, pl. 20, figs. 6, 11.

Locality.—Station 3381, at the base of the bluff at Little Horseshoe bend, on the Flint River, 4 miles below Bainbridge, Decatur County, Georgia, just below the mouth of Blue (or Russell) Spring branch on the east bank of the river; T. W. Vaughan, 1900. U. S. Nat. Mus. Cat. No. 166786. Also in the Jacksonian Eocene of Ocala, Florida, and the Oligocene marl of the Chipola River, Calhoun County, Florida.

Unidentifiable remains of a species of *Cassis* from station 3401, on the west side of Flint River, at Cherry Chute, 3 miles below Bainbridge, probably belong to this species.

ORTHAULAX INORNATUS Gabb.

Plate 88, fig. 9.

Orthaulax inornatus GABB, Proc. Acad. Nat. Sci., Phila., vol. 24, 1872, p. 272, pl. 9, figs. 3, 4.—GUPPY, Quart. Journ. Geol. Soc. London, Nov. 1876, p. 520, pl. 28, fig. 8.—DALL, Bull. U. S. Nat. Mus. No. 90, 1915, p. 86, pl. 11, fig. 8, 1915.

Localities.—Station 3383, at the base of the bluff at Little Horse-shoe bend, on the east bank of the Flint River, just below the mouth of Blue (or Russell) Spring branch, four miles below Bainbridge, Decatur County, Georgia, in fossil coral reef; T. W. Vaughan, 1900. U. S. Nat. Mus. Cat. No. 166787. Also from the Oligocene limestone at White Beach, Florida, and the *Orthaulax pugnax* zone at Ballast Point, Tampa Bay, Florida; Dall and Willcox. U. S. Nat. Mus. Cat. No. 165099.

Imperfect but perfectly identifiable fragments were obtained by Doctor Vaughan.

In response to a criticism by M. Cossmann that a perfect specimen was not figured in a recent publication, it may be noted that a perfect or nearly perfect adult specimen of this species is yet unknown. All that collectors have been able to secure so far are either immature specimens or fragments. Out of several hundred specimens of *O. gabbii* obtained at Alum Bluff only one retained the outer lip, and a complete specimen of *O. pugnax* is still a desideratum.

ORTHAULAX PUGNAX Heilprin.

Wagneria pugnax HEILPRIN, Trans. Wagner Inst. Sci. Phila., vol. 1, 1887, p. 106, pl. 15, figs. 36, 36a.

Orthaulax pugnax DALL, Trans. Wagner Inst. Sci. Phila., vol. 3, pt. 1, 1890, p. 170, pl. 8, figs. 6, 8; Bull. U. S. Nat. Mus. No. 90, 1915, p. 87, pl. 15, figs. 5, 10.

Localities.—Station 7074, on the west bank of Flint River, 7 miles southeast of Bainbridge, Decatur County, Georgia, at Hale landing, in coralliferous chert; and station 7079, on the east bank of Flint River below the mouth of Blue (or Russell) Spring branch, at Mascot Point, in chert blocks; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166788. Also from the Oligocene zone of which it is the type fossil, at Ballast Point, Tampa Bay, Florida; from Antigua, Cuba, and the Panama Canal Zone.

This can be distinguished at once from *O. inornatus* by its stouter and shorter form and blunt spire. Of neither species has an absolutely perfect specimen been collected, the thin expanded outer lip being invariably defective.

STROMBUS CHIPOLANUS Dall.

Strombus chipolanus DALL, Trans. Wagner Inst. Sci. Phila., vol. 3, pt. 1, 1890, p. 176, pl. 4, fig. 1; pt. 2, 1892, p. 263, pl. 13, figs. 1, 3; Bull. U. S. Nat. Mus. No. 90, 1915, p. 87, pl. 9, figs. 9, 10.

Localities.—Station 7074, on the west bank of Flint River, 7 miles southeast of Bainbridge. Decatur County, Georgia, at Hale landing,

in coralliferous chert; and at station 7079, on the east bank of Flint River at Mascot Point, below the mouth of Blue (or Russell) Spring branch; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166789. Also from the Oligocene marl of the Chipola River, Calhoun County, Florida, and in the *Orthaulax pugnax* zone, at Ballast Point, Tampa Bay, Florida.

STROMBUS, species indeterminate.

Locality.—Station 7096, at Red Bluff, on the west bank of Flint River, 7 miles above Bainbridge, Decatur County, Georgia; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166790.

An indeterminate cast of a species of *Strombus* was obtained at the above locality.

BITTIUM SILICIUM, new species.

Plate 86, fig. 11.

Shell small, slender, with a distinct, not channeled, suture and, in the decollate specimen, about eight nearly flat-sided strongly sculptured whorls; axial sculpture of about, on the penultimate whorl, 24 narrow low riblets, with about equal interspaces, overridden and obscured by the strong spiral sculpture. The latter consists of four spiral cords near the apex, rather more slender than the ribs, with about equal interspaces, but later they become broader and stronger, the interspaces relatively somewhat narrower, the cords where they cross the ribs are swollen rather than nodulous, and the interspace separating the anterior and posterior pairs is deeper and more channeled than the others; on the last whorl the ribs are feebler than previously and the periphery is formed by the fourth cord. On the base follow four more crowded simple spirals, the anterior a little more prominent than the others and separated by a wider space from a sort of keel and several finer threads which encircle the vicinity of the canal and the canal itself. The latter is short and shallow; the aperture is defective; the apex of the shell is wanting. Length of shell, 20; of last whorl, 7; diameter of decollation, 3; of the base, 7 mm.

Locality.—Station 7075, on the east bank of Flint River, about 10½ miles below Bainbridge, and just above Lambert Island; Cooke and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166729.

DIASTOMA GEORGIANA, new species.

Plate 86, fig. 6.

Shell small, slender, acute, the nucleus small, pointed, of about two whorls, obscured by adherent matrix, with about 10 subsequent gradually enlarging whorls; sculpture coarse, axially sculptured with about (on the penultimate whorl) a dozen rounded ribs with subequal interspaces, these ribs broader and more prominent anteriorly;

sutures deep, not channeled, and the whorls well rounded; spiral sculpture comprising two strong rounded cords with a narrower interspace at the periphery, with two finer threads behind and one in front of the more prominent pair; base convex with about five subequal spiral threads with about equal interspaces; the canal short and patulous, the aperture mostly concealed by matrix, but with the outer lip slightly flaring and a prominent rounded varix behind it. Length of shell, 6; maximum diameter, 2.6 mm.

Locality.—Station 7075, on the east bank of Flint River, about $10\frac{1}{2}$ miles below Bainbridge, Decatur County, Georgia, and just above Lambert Island; Cooke and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166730.

CERITHIUM SILICIFLUVIUM, new species.

Plate 87, figs. 4, 5.

Shell large, solid, acute-conic, of 10 or more moderately convex whorls, earlier whorls sculptured with 11 or 12 retractively arcuate narrow simple axial ribs extending from suture to suture, with wider interspaces, the periphery of the whorls nearer the anterior suture; the cast of this part of the shell (fig. 4) shows no spiral sculpture; later whorls show an increasing number of more closely set ribs and a slight constriction appears a short distance in front of the suture, giving the effect of a narrow ill-defined presutural spiral band, which becomes more distinct on the later whorls; spiral sculpture also appears, at first as fine striae, later as narrow channels separating subequal flattish spiral cords, of which there are seven or eight on the last whorl of the cast (fig. 5). Length of seven whorls, 45; diameter of the posterior whorl of the seven, 5; of the anterior, 18 mm.

Locality.—Station 3383, at the base of the bluff at Little Horseshoe bend, just below the mouth of Blue (or Russell) Spring branch, Flint River, 4 miles below Bainbridge, Decatur County, Georgia; T. W. Vaughan, 1900. U. S. Nat. Mus. Cat. No. 166731.

This species has the same type of sculpture as *C. mascotianum*, but the reticulation is less coarse, the shell more slender, the whorls more convex, the presutural band narrower and less conspicuous than in that species. In both the casts do not show either the aperture or the base, but the sculpture and form are quite sufficient to discriminate the species when more perfect examples are obtained.

This species is also found in the lower bed at station 7150a, on the east bank of Flint River, near Bainbridge, just below the wagon bridge, in loose blocks of chert, and at station 7096 on the west bank, 7 miles above Bainbridge at Red Bluff, by Vaughan, Cooke, and Mansfield in 1914. It is the only species of Cerite known to be common to both horizons.

CERITHIUM MASCOTIANUM, new species.

Plate 87, fig. 12.

Shell large, robust, conical, the specimen a cast from an impression in a chert block, showing part of five flattish whorls; axial sculpture of about 30 narrow slightly flexuous ribs with narrower interspaces becoming less prominent on the later whorls; also irregularly distributed thickened varices, of which three are seen on the cast of three half whorls; suture distinct not channeled; in front of it the next whorl carries a thickened band separated from the rest of the whorl by a marked constriction and undulated by the posterior ends of the axial ribs; this band is also more or less spirally striated. Between the constriction and the periphery of the base are six or seven strap-like flattened bands, overriding the ribs without becoming nodulous, the interspaces very narrow. There is also more or less fine spiral striation, which is indistinct on the cast. Length of three whorls, 32; diameter of the posterior of the three, 16; of the anterior one, 22 mm.

Locality.—Station 7079, on the east bank of Flint River, below the mouth of Russell or Blue Spring branch at Mascot Point; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166732.

Fragmentary casts give a length of 70, a maximum width of 22 mm., and show more than 10 whorls. The base appears to have been convex and smooth with a very short stout twisted pillar.

CERITHIUM HALENSE, new species.

Plate 87, figs. 9, 10.

Shell large, conic, the apex defective, the remainder comprising $10\frac{1}{2}$ flat whorls rapidly widening; suture inconspicuous, not interrupting the lateral planes of the spire; sculpture on the ninth whorl comprising a spiral band just in front of the suture, ornamented with low rounded nodules separated from one another by distinct spaces, about four nodules to 10 millimeters length along the band; in front of this are two narrower more closely nodulous spirals with narrower spiral interspaces rather distinctly channeled; in front of the anterior one of these is a somewhat larger similarly nodulous band about half as wide as the first one; in the interspaces or just behind the suture there is occasionally a narrow not nodulate thread; no axial sculpture is perceptible; on the last whorl there is a small thread at the rounded periphery of the base, which in the preceding whorls is usually covered by the suture; the base is flat and smooth except for incremental lines which indicate that the basal part of the outer lip is produced and rounded; the siphon appears to have been very short and

strongly twisted; the specimens do not show the aperture. Height of 10 whorls as figured, 46; of the ninth whorl, 5.5; diameter of ninth whorl, 19; maximum diameter of specimen (fig. 9), 24; of (decollate) apex, 4 mm.

Locality.—Station 7074, at Hale landing on the west bank of Flint River, 7 miles southeast of Bainbridge, Decatur County, Georgia, in coralliferous chert; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166733.

A slight variation in the strength of the spiral bands in front of the broad presutural band is visible in some of the specimens when the first and fourth of the four anterior spirals may both be stronger than the included pair. A mold of 16 whorls measures—length, 77, and maximum diameter, 27 mm. The base is convex and smooth with a pillar like that of *C. mascotianum*. Another base measures 32 mm. in diameter.

CERITHIUM VAUGHANI, new species.

Plate 87, fig. 8.

Shell large, solid, flat sided, conic, the cast as figured showing part of five whorls; suture distinct, not channeled; whorls flat, spirally sculptured, the sculpture comprising in front of the suture a conspicuous row of beadlike nodules with about equal interspaces, on the last whorl about 26 in number; in front of this three slightly undulated fine spiral threads with wider subequal interspaces; beyond these a slightly more prominent and more distinctly undulated cord, with a spiral groove in front of it and between it and the sharp edge of the slightly convex nearly smooth base, on the edge of which the preceding sutures are laid; base sculptured only with faint lines of growth, the form of which indicates that the basal lip of the aperture was sharply and roundly produced with a narrow and deep acutely angular notch at the periphery of the base. There are no indications on the cast of axial sculpture unless the undulations of the spirals be so construed. Height of four whorls, 31; diameter of the earliest of these at the posterior suture, 14; diameter of base of last whorl, 25 mm. The aperture and canal are wanting in the mold.

Locality.—Station 7074, on the west bank of Flint River, 7 miles southeast of Bainbridge, Decatur County, Georgia, at Hale landing, in coralliferous chert; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166734.

CERITHIUM COOKEI, new species.

Plate 87, fig. 11.

Shell of moderate size, slender, acute, of about 10 regularly enlarging whorls; suture distinct, an elevated spiral cord in front of it giving a channeled effect; whorls moderately convex; sculpture

mostly spiral, consisting, first, of the above-mentioned rather prominent cord separated by a somewhat excavated interspace from (on the earlier whorls three) flattened spirals with equal wider interspaces, in two of which on the last whorl faint indications of a very small intercalary thread are visible; the last whorl rounds evenly to the convex base, on which five spiral bands occur, but with narrower groovelike interspaces; these basal bands are distinctly undulated or subnodulous. The canal was apparently short and strongly twisted, the aperture not represented on the mold. Height of 10 whorls (the nucleus not preserved), 41; maximum diameter of last whorl (the outer lip wanting), 17 mm.

Locality.—Station 3381, a fossil coral reef at the base of the bluff at Little Horseshoe bend, just below the mouth of the Blue (or Russell) Spring branch, 4 miles below Bainbridge, on the Flint River, Decatur County, Georgia; T. W. Vaughan, 1900. U. S. Nat. Mus. Cat. No. 166735.

CERITHIUM CORALLICOLUM, new species.

Plate 87, fig. 6.

Shell large, heavy, the decollate specimen with seven whorls, the four or five earlier whorls with an appressed suture; the subsequent turns in the type-specimen have a strongly marked shoulder just in front of the suture, giving the effect of a channel; the whorls moderately rounded, the earlier ones crossed by (about 14) slightly retractorily curved narrow rounded ribs extending from suture to suture, with somewhat wider interspaces; on the later whorls the ribs gradually become more sparse and prominent with wider interspaces, and are sigmoidly flexuous, subnodulous at the shoulder, and rather abruptly ceasing a short distance behind the succeeding suture; on the last whorl there is a slight constriction in front of the presutural nodules; spiral sculpture of fine at first subequal threads with narrower interspaces; later there is some irregularity in the width of the spirals which become flattish; on the last whorl between the shoulder and the periphery of the base there are about 15 of these spirals; the indications of the defective specimen are that the threads become more prominent at least near the periphery of the rounded base; the aperture is gone, but its posterior commissure is thickened and extended backward toward the periphery of the preceding whorl. Length of specimen as figured, 47; diameter of last whorl, about 20; of apex at fracture, 5 mm.

Locality.—Station 7074, on the west bank of Flint River at Hale landing, 7 miles southeast of Bainbridge, Decatur County, Georgia, in coralliferous chert; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166736.

Though the type-specimen is so imperfect, the sculpture is quite sufficient to distinguish it from any of the other species described in this paper.

CERITHIUM EUTEXTILE, new species.

Plate 87, fig. 7.

Shell elongate, slender, thin, of about 10 flattened whorls; suture distinct but shallow, not channeled; earlier whorls with (about 24) narrow, low equidistant axial ribs extending straightly from suture to suture, and crossed by six or seven fine, equal and equidistant spiral cords, with occasional finer threads in the interspaces, forming an even and finely reticulate surface; the axial sculpture becomes obsolete about the middle of the spire, the spirals become more numerous until, on the last whorl, there are some 25 subequal, sometimes sharp, revolving threads; base slightly rounded, canal short; length of decollate shell as figured, 39; of last whorl, 14; diameter at decollation, 3; at base, 12 mm.

Locality.—Station 3381, at base of bluff at Little Horseshoe bend, 4 miles below Bainbridge and just below the mouth of Blue (or Russell) Spring branch, Flint River, Decatur County, Georgia; T. W. Vaughan, 1900. U. S. Nat. Mus. Cat. No. 166737.

This is a very characteristic species and can not fail to be recognized when better material is available.

CERITHIUM VAGINATUM, new species.

Plate 87, figs. 1, 2, 3.

Shell about 25 mm. long, acute, slender, with 9 or 10 evenly rounded whorls, suture distinct, not channeled; early whorls with three undulate spiral cords, with subequal interspaces, between the sutures; the undulations appear to be the result of the cords overriding faint axial ribs, but the ribs are indicated chiefly by the undulations and are absent from the later whorls; there are also fine spiral threads covering the entire surface, and occasional rounded varices irregularly distributed and more numerous on the earlier whorls. On the last whorl the posterior cord alone is undulated; the others are of a squarish form, with slightly narrower, deeply channeled interspaces; in addition to the three major cords there are two or three smaller ones, one at the edge of the base and the others in front of it, with a finer thread between and near the short twisted canal; aperture only slightly expanded, most of it defective in the specimens; length of specimen (fig. 1), 22; diameter at decollation, 4; diameter of last whorl, 11 mm.

Locality.—Station 7075, on the east bank of Flint River, about 10½ miles below Bainbridge, and just above Lambert Island; Cooke and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166738.

This species belongs to the group of *C. georgianum* Lyell and Sowerby, but differs from that species by its smaller size and less arcuate axial ribs.

CERITHIUM INSULATUM, new species.

Plate 86, fig. 12.

Shell small, acute, strongly sculptured with more than nine rounded whorls (the apex defective); suture distinct, not channeled; axial sculpture of 12 to 15 rounded ribs extending from suture to suture, but not over the base, with occasional much stronger but similar varices irregularly distributed; spiral sculpture of (on the penultimate whorl) five rounded threads, subequal and equidistant, which are swollen where they override the axial ribs; there is a strong simple spiral cord, at the periphery of the base, which is sometimes more or less visible behind the suture, and on the moderately rounded base are two or three rather strong spirals with equal or wider interspaces; the canal is short and twisted; the aperture concealed by matrix but with a thickened outer lip. Height (slightly decollate), 19; height of last whorl, 6.5; maximum diameter, 9 mm.

Locality.—Station 7075, on the east bank of Flint River, 10½ miles below Bainbridge, Decatur County, Georgia, just above Lambert Island; Cooke and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166739.

This species belongs to the group of *Cerithium muscarum* Say, and *C. georgianum* Sowerby, but is sufficiently distinct from either.

CERITHIOPSIS DIAGONA, new species.

Plate 86, fig. 7.

Shell small, slender (decollate), with 10 remaining flat-sided whorls; last whorl with a mesial constriction, on each side of which are two spiral cords, the anterior pair subequal, separated by a narrow sulcus, with the most anterior forming the periphery of the whorl; both cords are nodulously undulated, with about 22 nodulations separated by narrower intervals; of the posterior pair the first is laid upon the preceding inconspicuous suture and is broader than either of the anterior pair, is similarly but less distinctly undulated; the second cord is much smaller but also undulated. The base is flattened and nearly smooth, or faintly spirally striate, the condition of the specimen making the determination of the surface uncertain; the aperture is subquadrate, the canal short and twisted, the edge of the pillar with a thick not very sharply defined fold. Length of specimen as figured, 10; diameter of the base, 4; length axially of the last whorl, 2 mm.

Locality.—Station 7074, on the west bank of the Flint River at Hale landing, 7 miles southeast of Bainbridge, Decatur County, Georgia, in coralliferous chert; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166740.

TURRITELLA HALENSIS, new species.

Plate 86, fig. 9.

Only a mold of about five whorls of this species is available, but the sculpture differs from that of any of the Tampa species and it therefore seems proper to describe it. The whorls increase in diameter very slowly and overhang somewhat at the suture. The spiral sculpture comprises on the best preserved whorl two or three minor threads in front of the suture; then one simple, more elevated major spiral; then a constriction carrying two minor threads with equal interspaces, in which are a few faint spiral striae; then a stronger and more prominent major spiral, simple and forming the periphery of the whorl; this spiral grows proportionately more prominent as the whorls succeed one another. In front of this and separated by a faintly spirally striated equal interspace is a third simple major spiral overhanging the next suture, and which in the earlier whorls is about equal in strength to the major spiral behind it, but in the later ones is somewhat weaker. Height of the three best preserved whorls, 21; diameter of the earlier of the three, 9.5; of the latest of the three, 14 mm. The base and apex of the shell are defective.

Locality.—Station 7074, on the west bank of the Flint River, 7 miles southeast of Bainbridge at Hale landing, in coralliferous chert; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166741.

TURRITELLA TAMPAE Heilprin.

Turritella tampae HEILPRIN, Trans. Wagner Inst. Sci. Phila., vol. 1, 1887, p. 113, pl. 8, fig. 53.—DALL, Trans. Inst. Sci. Phila., vol. 3, pt. 2, 1892, p. 309, pl. 17, fig. 8; Bull. U. S. Nat. Museum No. 90, 1915, p. 97, pl. 14, fig. 1.

Localities.—Stations 3381 and 3383 at base of the bluff, on the east side of Flint River, 4 miles below Bainbridge, Decatur County, Georgia, at Little Horseshoe bend, just below the mouth of Blue (or Russell) Spring branch, in fossil coral reef; T. W. Vaughan, 1900. U. S. Nat. Mus. Cat. No. 166791. Also at station 7074 at Hale landing on the west bank of Flint River, 7 miles southeast of Bainbridge, in coralliferous chert; and station 7075, on the east bank of Flint River, 10½ miles below Bainbridge and just above Lambert island; Vaughan, Cooke, and Mansfield, 1914. The original provenance of the species, as its name implies, was in the *Orthis pugnax* zone at Ballast Point, Tampa Bay, Florida, Heilprin, 1885. U. S. Nat. Mus. Cat. No. 165119.

TURRITELLA, species indeterminate.

Locality.—Station 7096, at Red Bluff on the west bank of Flint River, 7 miles above Bainbridge, Decatur County, Georgia, and station 7079, at Mascot Point, on the east bank below the mouth of

Blue (or Russell) Spring branch, and about 4 miles below Bainbridge, in chert blocks; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166792.

Casts of an unidentifiable *Turritella* not identical with *T. tampae* were obtained at the localities mentioned.

CALYPTRAEA (TROCHITA) TROCHIFORMIS Lamarck.

?*Infundibulum trochiformis* CONRAD, Journ. Acad. Nat. Sci., Phila., new ser., vol. 1, 1848, pp. 113, 133, pl. 11, fig. 3.—Cf. DALL, Trans. Wagner Inst. Sci. Phila., vol. 3, 1892, pt. 2, p. 352.

Locality.—Station 7096, at Red Bluff, on the west bank of Flint River, 7 miles above Bainbridge, Decatur County, Georgia; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166793.

Impressions of a *Calyptraea*, which is doubtless identical with that referred to by Conrad to Lamarck's species, were found as above mentioned.

XENOPHORA CONCHYLIOPHORA Born.

Plate 86, fig. 10.

Trochus conchyliophorus BORN, Mus. Caes. Vind. index, 1778, p. 333.

Xenophora laevigata FISCHER DE WALDHEIM, Tab. Syn. Zoogn., 1808, p. 113.

?*Trochus leprosus* MORTON, Syn. Org. Rem., 1834, p. 15, pl. 46, fig. 6.

Phorus reclusus CONRAD, Proc. Acad. Nat. Sci., Phila., vol. 7, 1855, p. 262.—WAILLES, Geol. Miss., 1854, p. 289, pl. 17, figs. 6a, 6b.

Xenophora agglutinans GREGORIO, Mon. Eoc. Ala., 1890, p. 144; not of Lamarck.

Xenophora humilis DALL, Trans. Wagner Inst. Sci. Phila., vol. 3, pt. 1, 1890, p. figs. 10, 10a; not of Conrad.

Xenophora conchyliophora DALL, Trans. Wagner Inst. Sci. Phila., vol. 3, pt. 2, 182, 1892, p. 360; Bull. U. S. Nat. Mus. No. 90, 1915, p. 105, pl. 15, figs. 1, 3.

Localities.—Station 7078, on the east bank of Flint River, about a quarter of a mile below Hale's landing, Decatur County, Georgia, near the lower end of Smith's reach; Cooke and Mansfield, 1914. Also at station 7079, on the east bank of Flint River, at Mascot Point, below the mouth of Blue (or Russell) Spring branch, in chert blocks; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus., Cat. No. 166794.

A species of *Xenophora* which presents no distinguishable specific characters from the recent shell described by Born from the West Indies has been obtained from nearly every fossiliferous horizon from the Upper Cretaceous Ripley formation to the Pleistocene. If, as seems probable, these shells belong to one and the same species, it is one of the oldest, if not the very oldest, species of mollusk now living.

AMPULLINA SOLIDULA Dall.

Plate 85, fig. 9.

Ampullina solidula DALL, Trans. Wagner Inst. Sci. Phila., vol. 3, pt. 2, 1892, p. 376, pl. 22, fig. 31; Bull. U. S. Nat. Mus. No. 90, 1915, p. 108, pl. 3, fig. 10.

Localities.—Station 3295, at Blue (or Russell) Springs, 4 miles south of Bainbridge, Decatur County, Georgia, on the east bank of

the Flint River; A. H. Brooks, 1900. Station 3388, at Red Bluff on Flint River, 7 miles above Bainbridge, from the upper fossiliferous horizon in the bluff; T. W. Vaughan, 1900. Station 7096, at the same locality; Vaughan, Cooke, and Mansfield, 1914. Station 7075, on the east bank of Flint River, 10½ miles below Bainbridge, and just above Lambert Island. Station 7079, at Mascot Point on the east bank of Flint River below the mouth of Blue Spring branch, in chert blocks; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166795. Also in the *Orthis pugnax* zone at Ballast Point, Tampa Bay, Florida; Dall. U. S. Nat. Mus. Cat. No. 112933.

AMPULLINA STREPTOSTOMA Heilprin.

Plate 85, fig. 11.

Natica streptostoma HEILPRIN, Trans. Wagner Inst. Sci. Phila., vol. 1, 1887, p. 112, pl. 16, fig. 51.

Ampullina streptostoma DALL, Trans. Wagner Inst. Sci. Phila., vol. 3, pt. 2, 1902, p. 374; Bull. U. S. Nat. Mus. No. 90, 1915, p. 107, pl. 12, fig. 27.

Localities.—Station 3295, at Blue (or Russell) Springs, 4 miles south of Bainbridge, Decatur County, Georgia; station 3388, at Red Bluff, on Flint River, 7 miles above Bainbridge, from the upper fossiliferous horizon of the bluff; station 3381, at base of bluff at Little Horseshoe bend, just below the mouth of Blue Spring Branch on the east bank of Flint River, 4 miles below Bainbridge, in a fossil coral reef; station 3383 at the same locality; station 6171, at Bainbridge; station 7076, on the east bank of Flint River, at the bend half a mile below Lambert island, about 12 miles below Bainbridge; station 7079, at Mascot Point on the east bank of Flint River, below the mouth of Blue Spring branch, 4 miles south of Bainbridge, in chert blocks; station 7096, same locality as station 3388; and at Jacksonboro, Georgia, and the *Orthis pugnax* zone at Ballast Point, Tampa Bay, Florida. U. S. Nat. Mus. Cat. No. 166796.

As the above list indicates, this is one of the most common Oligocene species of the region, occurring in several horizons, but rarely in even tolerably perfect condition.

AMAUROPSIS OCALANA Dall.

Plate 88, fig. 11.

Amauropsis ocalana DALL, Trans. Wagner Inst. Sci. Phila., vol. 3, pt. 1, 1890, p. 377.

Localities.—Station 7074, at Hale landing on the west bank of Flint River, 7 miles southeast of Bainbridge, Decatur County, Georgia, in coralliferous chert; station 7079, at Mascot Point on the east bank of Flint River below the mouth of Blue (or Russell) Spring branch, 4 miles below Bainbridge, in chert blocks; and station 7095, on the east bank of Flint River, at the bend near the "Old Factory,"

about three-quarters of a mile northeast of the Atlantic Coast Line railway station at Bainbridge; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166797. Also in the Jacksonian limestone at Ocala, Florida; Willcox; U. S. Nat. Mus. Cat. No. 115744.

This species by inadvertance was not figured in the Wagner Transactions and the name was omitted from the index of part 1 of the volume. It has some resemblance to the "*Natica phasianelloides* Orbigny," figured on plate 1 (fig. 7) of the unpublished Paleontology of Cuba, proofs of the plates of which, possessed by the U. S. Geological Survey, were purchased from the Cotteau library. Orbigny's species, however, is larger, more ovate, with a shorter spire and much less elegant form.

SINUM IMPERFORATUM Dall.

Sinum imperforatum DALL, Bull. U. S. Nat. Mus. No. 90, 1915, p. 109, pl. 5, fig. 8.

Locality.—Station 7075, on the east bank of Flint River, about 10½ miles below Bainbridge, Decatur County, Georgia, and just above Lambert Island; Cooke and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166798. Also in the *Orthaulax pugnax* zone, at Ballast Point, Tampa Bay, Florida. U. S. Nat. Mus. Cat. No. 166107.

A specimen of this species was obtained at the locality on Flint River, above mentioned.

MARGARITES CORALLICUS, new species.

Plate 88, figs. 5, 6.

Shell small, turbiniform, of about four whorls; nucleus minute, flattened; earlier whorls slightly subangular, feebly spirally striated, with a conspicuous smooth cord behind the suture, which is closely appressed to it; last whorl evenly rounded, rather inflated, rapidly enlarging toward the aperture, which is concealed by matrix; with a strongly convex imperforate base. Maximum diameter 4; height 2.8 mm.

Locality.—Station 7074, on the west bank of Flint River, 7 miles southeast of Bainbridge, Decatur County, Georgia, at Hale landing, in coralliferous chert; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166744.

TEINOSTOMA SUBLIMATA, new species.

Plate 88, figs. 7, 8.

Shell small, depressed, smooth, with about four whorls; nucleus small, inflated; subsequent whorls nearly covered with enamel and inclosed by the last whorl; spire nearly flat, periphery subangular in the earlier whorls, becoming rounded on the final turn; outer lip slightly depressed above, simple, not sharp; aperture oblique, inter-

rupted by the body; pillar strong, slightly concave; lower lip meeting it at a slight angle and produced beyond it so as to cover the umbilical depression; base moderately convex, imperforate; surface slightly granulate, probably due to mineralization. Maximum diameter, 4; minimum diameter, 3; height, 2.5 mm.

Locality.—Station 7074, on the west bank of Flint River, 7 miles southeast of Bainbridge, Decatur County, Georgia, at Hale landing, in coralliferous chert; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166745.

LIOTIA (ARENE) HALENSIS, new species.

Plate 88, fig. 4.

Shell small, solid, turbiniform, of about three whorls, the suture appressed, indistinct, with a minute spiral beaded line in front of it; in front of this are two or three fine simple spiral threads with slightly wider interspaces; in front of these are three much stronger simple spirals, on the anterior of which the suture is laid, the interspaces wider and channeled. A fourth similar cord, forming the periphery of the base, enters the aperture just below the sutural commissure. The base is slightly flattened and sculptured with four or five simple cords, with slightly wider interspaces, both diminishing in size toward the pillar. The umbilical region is imperforate; the aperture is sub-circular, slightly crenulated on the outer lip in harmony with the sculpture; the pillar lip thickened and somewhat angular outside of the aperture, where it meets the lower lip. Height, 2; maximum diameter, 3 mm.

Locality.—Station 7074, on the east bank of Flint River, 7 miles southeast of Bainbridge, Decatur County, Georgia, at Hale landing, in coralliferous chert; Vaughan, Cooke, and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166742.

LIOTIA? PERSCULPTURATA, new species.

Plate 86, fig. 5.

Shell small, turbinate, with three or more rapidly increasing rounded whorls, separated by a deep but not channeled suture; apex concealed by matrix; last whorl sculptured by about 15 strong closely beaded subequal spiral cords, separated by subequal channeled interspaces, both evenly distributed over the whole whorl; the interspaces are axially sculptured by sharp, elevated, equal lamellae or imbrications about five to a millimeter, with equal interspaces and uniformly distributed; aperture circular, the inner margin thick and smoothly bevelled to the outer edge, the throat smooth, the base of the whorl imperforate. Height as figured, 65; diameter, 7 mm.

Locality.—Station 3383, from a fossil coral reef at Little Horse-shoe Bend, just below the mouth of Blue or Russell Spring on Flint

River, 4 miles below Bainbridge, Decatur County, Georgia; T. W. Vaughan coll. 1900. U. S. Nat. Mus. Cat. No. 166743.

This fossil, of which no perfect specimen was collected, has such characteristic sculpture that even a fragment of it can be identified. Some little doubt as to its genus existed, as some species of *Vanikoro* have an analogous sculpture. These, however, have a different aperture, and there can be little doubt that the present species should group with the imperforate *Liotias*.

NERITA TAMPAËNSIS Dall.

Nerita tampaënsis DALL, Trans. Wagner Inst. Sci. Phila., vol. 3, pt. 2, 1892, p. 421, pl. 17, fig. 3; Bull. U. S. Nat. Mus. No. 90, 1915, p. 114, pl. 16, fig. 2.

Locality.—Station 7075, on the east bank of Flint River, about 10½ miles below Bainbridge, Decatur County, Georgia, and just above Lambert Island; Cooke and Mansfield, 1914. U. S. Nat. Mus. Cat. No. 166799. Also in the *Orthaulax pugnax* zone at Ballast Point, Tampa Bay, Florida, and various other localities about Tampa Bay; Dall and Burns.

DENTALIUM LADINUM, new species.

Plate 85, fig. 6.

Shell slender, slightly curved, strongly sculptured, the posterior end more or less incrustated by matrix and the anterior end defective, but the section in front seems to be practically circular; near the posterior end there are 10 or 11 longitudinal ribs, subequal and separated by wider interspaces; at about one-third the distance from the posterior end finer intercalary threads begin to appear, sometimes two, usually one, and rarely none in the widening interspaces. These gradually enlarge until anteriorly they become equal to the original ribs, and all the ribs toward the aperture are more or less paired. The surface in the specimen is largely granulose, but this is probably an incident of silicification; a few indications of incremental lines are perceptible near the anterior end. Length of the specimen, 36; diameter anteriorly, 5; posteriorly, 2 mm.

Locality.—Station 6774, at Rock Island, in the Suwannee River, about half a mile above the wagon bridge at White Springs, Hamilton County, Florida; Vaughan and Cooke, 1913. U. S. Nat. Mus. Cat. No. 166746.

EXPLANATION OF PLATES.

PLATE 83.

- FIG. 1. *Lima halensis* Dall, exterior of right valve; height, 52 mm.; p. 493.
 2. *Pecten suwanneënsis* Dall, cast of left valve; height, 28 mm.; p. 492.
 3. The same, cast of interior of left valve; height, 20 mm.; p. 492.
 4. The same, exterior of right valve; height, 25 mm.; p. 492.
 5. *Spondylus filiaris* Dall, young valve; height, 20 mm.; p. 493.
 6. The same, showing outline and sculpture of adult upper valve; height, 65 mm.; p. 493.
 7. *Lima halensis* Dall, from cast taken from a mold of the hinge line; breadth 16 mm.; p. 493.
 8. The same, exterior of left valve; height, 52 mm.; p. 493.

PLATE 84.

- FIG. 1. *Glycymeris cookei* Dall, exterior of young valve with entire ribs; height, 14 mm.; p. 490.
 2. The same, interior of valve, showing hinge; height, 10 mm.; p. 490.
 3. The same, exterior of larger valve with bifurcated ribs; height, 13 mm.; p. 490.
 4. The same, exterior of another valve; height, 11 mm.; p. 490.
 5. *Chione bainbridgensis* Dall, defective adult right valve; length, 35 mm.; p. 499.
 6. The same, exterior of young left valve; length, 18 mm.; p. 499.
 7. *Phacoides perovatus* Dall, cast of interior of right valve; height, 48 mm.; p. 496.
 8. The same, cast of another valve; height, 53 mm.; p. 496.
 9. *Pecten alpha* Dall, mold of exterior of left valve; breadth, 23 mm.; p. 492.
 10. *Psammobia (Gobraeus) cerasia* Dall, right valve; height, 25 mm.; p. 501.

PLATE 85.

- FIG. 1. *Arcoperna inflata* Dall, right valve; length, 18.5 mm.; p. 494.
 2. *Pitaria (Lamelliconcha) silicifluvia* Dall, exterior of right valve, somewhat encrusted; length, 19 mm.; p. 500.
 3. Interior of the same valve, showing hinge; p. 500.
 4. *Crassatellites paramesus* Dall, exterior of young left valve, showing early sculpture; height, 28 mm.; p. 495.
 5. The same, cast of an adult left valve; height, 33 mm.; p. 495.
 6. *Dentalium ladinum* Dall; length, 36 mm.; p. 522.
 7. *Crassatellites paramesus* Dall, interior of right valve, showing hinge; height, 28 mm.; p. 495.
 8. Exterior of the same valve; p. 495.
 9. *Ampullina solidula* Dall; height, 40 mm.; p. 518.
 10. *Cymatium cecilianum* Dall; height, 25 mm.; p. 507.
 11. *Ampullina streptostoma* Heilprin; height, 40 mm.; p. 519.

PLATE 86.

- FIG. 1. *Conus vaughani* Dall, from a cast; length of entire figure, 51 mm.; p. 502.
 2. *Conus cookei* Dall, from cast; length of shell, 38 mm.; p. 502.
 3. *Lyria mansfieldi* Dall; length, 47 mm.; p. 504.
 4. *Cassis sulcifera* Sowerby, fragment showing the spire; width, 32 mm.; p. 508.
 5. *Liotia? persculpturata* Dall, back of specimen showing sculpture; height, 6.5 mm.; p. 521.
 6. *Diastoma georgiana* Dall; length, 6 mm.; p. 510.
 7. *Cerithiopsis diagona* Dall; length, 10 mm.; p. 516.
 8. *Murex rufirupicolus* Dall, internal cast; length, 42 mm.; p. 506.

9. *Turritella halensis* Dall, from a cast; length of entire figure, 57 mm.; p. 517.
10. *Xenophora conchyliophora* Born, internal cast; maximum diameter, 42 mm.; p. 518.
11. *Bittium silicium* Dall; length, 20 mm.; p. 510.
12. *Cerithium insulatum* Dall, from a cast; length, 19 mm.; p. 516.

PLATE 87.

- FIG. 1. *Cerithium vaginatum* Dall, length of defective shell, 22 mm.; p. 515.
2. The same, fragment showing detail of spire; length, 17 mm.; p. 515.
 3. The same, cast of last whorl showing intensified sculpture; height of whorl, 11 mm.; p. 515.
 4. *Cerithium silicifluvium* Dall, cast of apex, length, 19 mm.; p. 511.
 5. The same, cast of decollate specimen; length, 45 mm.; p. 511.
 6. *Cerithium coralliculum* Dall, length of entire figure, 47 mm.; p. 514.
 7. *Cerithium eutextile* Dall, length of shell, 39 mm.; p. 515.
 8. *Cerithium vaughani* Dall, cast; height of shell, 32 mm.; p. 513.
 9. *Cerithium halense* Dall, length of entire figure, 60 mm.; p. 512.
 10. The same, cast showing sculpture of lower whorls; length of shell, 26 mm.; p. 512.
 11. *Cerithium cookei* Dall, height of shell, 41 mm.; upper part of apex obscured; p. 513.
 12. *Cerithium mascotianum* Dall, length of entire cast, 53 mm.; p. 512.

PLATE 88.

- FIG. 1. *Marginella silicifluvia* Dall, length, 8.5 mm.; p. 504.
2. *Marginella halensis* Dall, length, 2.75 mm.; p. 504.
 3. *Epitonium ? dubiosum* Dall, diameter, 1.5 mm.; p. 506.
 4. *Liostia (Arene) halensis* Dall, diameter, 3 mm.; p. 521.
 5. *Margarites corallicus* Dall, back view, diameter, 3 mm.; p. 520.
 6. The same, showing spire, diameter, 3 mm.; p. 520.
 7. *Teinostoma sublimata* Dall, base; diameter, 4 mm.; p. 520.
 8. The same, front view; diameter, 4 mm.; p. 520.
 9. *Orthaulax inornatus* Gabb, fragment showing spire; p. 509.
 10. *Bursa victrix* Dall, cast from mold, length of entire figure, 48 mm.; p. 507.
 11. *Amauropsis ocalana* Dall, internal cast; height, 40 mm.; p. 519.
 12. *Miltha hillsboroënsis* Heilprin, right valve; altitude, 48 mm.; p. 498.
 13. *Fusinus nexilis* Dall, cast; height, 17.5 mm.; p. 505.