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MOLLUSKS OF THE CHICKASAWHAY MARL

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ABSTRACT—The mollusks of the lower, typical part of the Chickasawhay marl of Mississippi and Alabama indicate that the formation is contemporaneous with the upper Oligocene Flint River formation of Georgia and Suwannee limestone of Florida. The upper beds contain a smaller fauna that appears to be contemporaneous with that of the lower Miocene Tampa limestone of Florida.

PREFATORY NOTE

WHEN Wendell Clay Mansfield died suddenly on July 24, 1939, he left behind him in collections and manuscript papers the results of some 18 months of work in the field and in the laboratory on the mollusks of the Chickasawhay marl of eastern Mississippi and western Alabama. His stratigraphic notes were not organized, but his faunal determinations and descriptions were nearly completed. These have been assembled and revised by Julia Gardner, his colleague in the Geological Survey. K. E. Lohman, in charge of the Photomicrographic Laboratory, and N. W. Shupe, photographer, coöperated in the completion of the illustrations.

Doctor Mansfield's training for the study of the Chickasawhay was exceptional, for he was familar with the mollusks of the upper Oligocene Flint River formation of Georgia and had reported on the synchronous Suwannee fauna of Florida and those of the succeeding Miocene Tampa limestone. His final work on the Chickasawhay faunas is herewith presented.

The name Chickasawhay, taken from a river in southeastern Mississippi, was used in the guidebook of the eleventh annual field trip of the Shreveport Geological Society (Blanpied et al., 1934) to designate certain marine deposits in Wayne County, Mississippi, and partly equivalent beds in Alabama that had previously been included in the Oligocene Byram marl (Cooke, 1926). The authors of the guidebook divided the Chickasawhay into two members, an upper and a lower, about whose ages they expressed a diversity of opinion, some holding that both members are Miocene, representing a marine facies of the Catahoula sandstone, and others that the lower member is Oligocene. Cooke (1935) rejected the reference to the Catahoula but adopted the unit as a marl member of the Byram marl above the Bucatunna clay member. He regarded the Chickasawhay marl member of the Byram as probably equivalent in age to the newly named Flint River formation of Georgia, basing his correlation on preliminary studies of fossils from the lower member. Later, under the name Chickasawhay marl, he treated it as an independent Oligocene formation contemporaneous with the Flint River formation and the Suwannee limestone of Florida (Cooke, 1939).

The great majority of the species described herein occur in the lower member, which should be considered the typical part of the formation. The most significant species from these beds are named in the accompanying list, prepared by Miss Gardner, which indicates very close relationship to

the Suwannee limestone and the Flint River formation, and more distant affinities with the somewhat older Byram marl. This confirms Cooke's (1935, 1939) correlation.

Ten species occur in somewhat younger beds, which are referred by Mansfield to the upper part of the Chickasawhay marl (upper Chickasawhay member of Blanpied

SOME SPECIES IN THE LOWER, TYPICAL PART OF THE CHICKASAWHAY MARL

Species of possible stratigraphic significance	Byram marl	Flint River formation	Suwannee limestone	Tampa limestone	Related forms from other formations
Glycymeris cf. *G. suwanneensis* Mansfield.	—	—	cf	—	*Glycymeris suwanneensis* Mansfield
Anadara mummi Mansfield	cf	—	x	—	*Anadara lesueuri* (Dall)
Anadara macneili Mansfield	—	—	x	—	
Brachidontes mississippiensis (Conrad)	x	—	—	—	
Arcoperna inflata Dall?	—	?	—	—	
Pteria cf. *P. argentea* Conrad	cf	—	—	—	*Pteria argentea* Conrad
Chlamys howei Mansfield, n. sp.	—	—	cf	—	*Chlamys* aff. *C. vaun wythei* Hertlein
Chlamys mcguirti Mansfield, n. sp.	—	cf	—	—	"*Pecten suwanneënsis*" Dall (in part)
Chlamys chickaria Mansfield, n. sp.	—	—	?	—	
Chlamys aff. *C. duplex* (Cooke)	—	—	—	—	*Chlamys duplex* (Cooke) described from Anguilla
Ostrea vicksburgensis Conrad	x	x	x	—	
Crassatellites paramesus Dall	—	x	—	—	
"*Venericardia*" *waynensis* Mansfield, n. sp.	—	cf	cf	—	"*Venericardia*" *serricosta brooksvillensis* Mansfield
Miltha cf. *M. chipolana* Dall	—	—	?	—	
Miltha cf. *M. hillsboroensis* (Heilprin)	—	?	?	—	*Miltha hillsboroensis* (Heilprin)
Miltha? hernandoensis Mansfield	—	—	?	—	
Divaricella sp.	—	—	?	—	
Trigoniocardia cf. *T. gadsdenense* Mansfield	—	—	?	—	
Nemocardium diversum waynense Mansfield, n. subsp.	cf	—	—	—	*Nemocardium diversum* Conrad
Macrocallista cf. *M. sobrina* (Conrad)	cf	—	—	—	*Macrocallista sobrina* (Conrad)
Chione bainbridgensis Dall	—	x	x	—	
Chione catunna Mansfield, n. sp.	—	—	—	cf	*Chione* (*Chamalea*) *rhodia* Dall
Corbula laqueata Casey?	?	—	—	—	
Corbula taylorensis Mansfield, n. sp.	cf	—	—	—	*Corbula engonata* Conrad
Panope taylorensis Mansfield, n. sp.	—	—	?	—	
Kuphus incrassatus Gabb	—	—	x	—	
Terebra waynesboroensis Mansfield, n. sp.	cf	—	—	—	*Terebra tantula* Conrad
Conus aff. *C. imitator* Brown and Pilsbry	—	—	x	—	
Pleurofusia cf. *P. vicksburgensis* Casey	cf	—	—	—	*Pleurofusia vicksburgensis* Casey
Fusiturricula cf. *F. servata* (Conrad)	cf	—	—	—	*Fusiturricula servata* (Conrad)
Tropisurcula cf. *T. caseyi* (Aldrich)	cf	—	—	—	*Tropisurcula caseyi* (Aldrich)
Syntomodrillia? cf. *S.? tantula* (Conrad)	cf	—	—	—	*Syntomodrillia? tantula* (Conrad)
Scobinella taylorensis Mansfield, n. sp.	cf	—	—	—	*Scobinella caelata* Conrad
Olivella cf. *O. affluens* Casey	cf	—	—	—	*Olivella affluens* Casey
Lyria cf. *L. mississippiensis* (Conrad)	—	—	x	—	
Tritiaria cf. *T. vicksburgensis* Aldrich	cf	—	—	—	*Tritiaria vicksburgensis* (Aldrich)
Metula taylorensis Mansfield, n. sp.	cf	—	—	—	*Metula fragilis* Casey
Rapana cf. *R. vaughani* Mansfield	—	—	—	cf	*Rapana vaughani* Mansfield
Scalina cf. *S. trigintanaria* Conrad	cf	—	—	—	*Scalina trigintanaria* Conrad
Cassis flintensis Mansfield, n. sp.	—	x	x	—	
Sconsia cf. *S. lintea* (Conrad)	cf	—	—	—	*Sconsia lintea* (Conrad)
Ficus mississippiensis Conrad?	?	—	x	—	
Turritella cf. *T. gatunensis* Conrad	—	—	x	—	
Turritella monroensis Mansfield, n. sp.	—	cf	—	—	*Turritella halensis* Dall
Turritella aff. *T. bowenae* Mansfield	—	—	cf	—	*Turritella bowenae* Mansfield
Pachycrommium sp.	—	?	?	—	
Sinum cf. *S. mississippiense* (Conrad)	cf	—	x	—	*Sinum mississippiense* (Conrad)

et al., 1934). These species show close relationship to and some identities with species in the Miocene Tampa limestone of Florida, and perhaps the beds containing them should be referred to that formation rather than to the Chickasawhay. These species are: *Barbatia* cf. *B. marylandica* Conrad, *Mytilus* (*Mytiloconcha*) sp., *Atrina* aff. *A. argentea* Conrad, *Ostrea blanpiedi* Howe (1937), *Anodontia* sp., *Cardium* cf. *C.* (*Cerastoderma*) *phlyctaena* Dall, *Cancellaria* (*Trigonostoma*) sp., *Fasciolaria* cf. *F. petrosa* Dall, *Petaloconchus varians* d'Orbigny, and *Ampullina* (*Ampullinopsis*) *amphora* Heilprin.

The collections on thich this study is based are in the U.S.National Museum.

—*C. Wythe Cooke*

SYSTEMATIC DESCRIPTIONS

Genus NUCULANA Link

NUCULANA WAYNENSIS Mansfield, n. sp.

Plate 25, figure 25

Shell rather small, thin, full, inequilateral. Anterior margin well-rounded. Posterior extremity narrowed, truncate. Base broadly arcuate. Beak low, obtuse, devoid of sculpture. Lunule linear; escutcheon linear-lanceolate, defined by the obscure angulation of the shell and the strong concentric lamination. Sculpture feeble, restricted to a concentric striation, most distinct and most crowded on the medial portion of the disk and toward the ventral margin, faint toward the anterior dorsal margin, and obsolete on the rostrum. Ligament pit minute, subumbonal, wider than high. Teeth strong, taxodont, elevated medially, about 22 in the anterior series, about 18 in the posterior series.

Holotype (U. S. Nat. Mus. 498508, a left valve) measures: Width, 11.2 mm; height, 5.4 mm; diameter of single valve, 2.2 mm.

Occurrence.—Lower part of Chickasawhay marl at station 14204, Taylor Mill Creek, blue marl bed just east of bridge on Highway 45, 1½ miles north of Waynesboro, Wayne County, Miss.

The species most closely resembling *Nuculana waynensis* Mansfield is an undescribed form from the Byram marl at Vicksburg, Miss. The Chickasawhay species, however, is larger than the Vicksburg form, more produced, and more constricted posteriorly.

Nuculana waynensis is known only from the holotype and a broken topotype.

Subgenus SACCELLA Woodring

NUCULANA (SACCELLA?) TAYLORENSIS Mansfield, n. sp.

Plate 25, figures 24, 26

Shell rather small, moderately thin and full, equivalve, inequilateral. Anterior margin rounded; posterior margin narrow and subtruncate; base broadly arcuate. Beaks low, obtuse, very feebly sculptured. Lunule feebly indicated. Escutcheon sunken, linear-lanceolate, defined by a low ridge and laminated by the strong growth sculpture. Surface sculptured with closely spaced, flat-lying concentric lamellae, most distinct on the medial part of the disk and crowded toward the ventral margin, obsolete near the anterior dorsal margin and on the rostrum and in the depression immediately in front of it. Ligament pit minute, wider than high. Teeth taxodont, small, crowded, about 20 in the anterior series and 18 in the posterior.

Holotype (U. S. Nat. Mus. 498509, a left valve) measures: Height, 5.0 mm; width, 9.5 mm; diameter of a single valve, 2.4 mm. Both holotype and paratype, a broken right valve U. S. Nat. Mus. 498510, are from station 14204, Taylor Mill Creek, blue marl bed just east of bridge on Highway 45, 1½ miles north of Waynesboro, Wayne County, Miss.

Nuculana taylorensis is a shorter, less slender shell than *N. waynensis* described from the same locality. Small specimens from station 14368, Jay Branch above the road from Perdue Hill to Mount Pleasant Landing, Monroe County, Ala., are similar in sculpture to those from Taylor Mill Creek but are relatively shorter and higher. The anterior depression is wanting in *N. taylorensis*, but in the other characters it agrees very well with the widely distributed *Saccella*.

Occurrence.—Lower part of the Chickasawhay marl. ALABAMA: Station 10334?, one-fourth mile northeast of Perdue Hill, Monroe County, Ala. (incomplete external mold). MISSISSIPPI: Station 14204, Taylor Mill Creek, blue marl bed just east of bridge

on Highway 45, 1½ miles north of Waynesboro; station 14345?, sec. 34, T. 9 N., R. 7 W., Sandy Creek (a single incomplete valve); station 14349, glauconitic bed near base of Chickasawhay River section, one-fourth mile downstream from highway bridge, 2½ miles west of Waynesboro, Wayne County (molds only).

Genus GLYCYMERIS Da Costa

GLYCYMERIS sp. cf. G. SUWANNEENSIS Mansfield

Plate 25, figure 4

Specimens of *Glycymeris* displaying the general form and finely cancellate sculpgeneral form and finely cancellate sculpture of *G. suwanneensis* Mansfield, 1937, are recorded in molds and in the original shell at a few localities in the lower part of the Chickasawhay marl. The beaks seem a little more full at the extreme tips in the forms from Alabama, but the relationship to the species from the upper Oligocene of Florida is certainly close. The Flint River specimens referred by Dall, 1916, to *Glycymeris mississippiensis* are triple the size of Conrad's type and close to *G. suwanneensis*. In Conrad's brief description he includes as one of the characteristics "series of teeth uninterrupted." This, together with the small size, about 10 mm, according to the figure, indicates a young shell, but no adult topotypic material certainly referable to *mississippiensis* has been observed in the collections of the U. S. National Museum. Apparently there was, in the upper Oligocene of the Gulf province, a widespread group characterized by a subcircular outline; a shell broadly inflated and full even to the tips of the beaks, closely but somewhat obscurely threaded radially, and closely lirate concentrically, the minute interspaces giving a somewhat punctate aspect to the surface. The distal teeth are coarse and oblique, the subumbonal dentition finer and vertical. The line is, perhaps, continued in *Glycymeris americana* Defrance of the later Tertiary and Recent faunas of the East Coast and West Indian faunas.

Figured specimens (U. S. Nat. Mus. 498511) measures: Height, 25.5 mm; width, 27.0 mm; convexity of single valve, 8 mm.

From station 14205, in soft marl under limestone ledge in gully about one-fourth mile north of Perdue Hill, Monroe County, Ala. A closely related if not identical species is recorded in the Mint Spring marl member of Marianna limestone at station 14203 on Horton's Mill Creek and at station 6647*a*, 1⅓ miles southwest of Boyce, Wayne County, Miss.

Occurrence.—Lower part of Chickasawhay marl. ALABAMA: Station 14205, one-fourth mile north of Perdue Hill, Monroe County; station 14323?, highest fossiliferous bed in ravine 200 yards south-southwest of Jones' old plantation house, about 1 mile northwest of Glendon Station (internal mold); station 7166?, east side of Tombigbee River, just south of Payne's Hammock, Clarke County (internal mold). MISSISSIPPI: Station 14283?, "Chione limestone" at top of hill on old road leading down to Lime stone Creek, 3 miles north of Waynesboro, (external mold). A few other internal molds from the lower Chickasawhay of western Alabama and eastern Mississippi may be conspecific with the Perdue Hill specimens.

GLYCYMERIS sp.

Plate 25, figure 36; plate 26, figure 13

Specimens of a small *Glycymeris* preserved as incomplete external molds are characterized by the breaking down of the primary ribbing on the ventral part of the shell. *Glycymeris arctata* (Conrad) ,1848, from the Red Bluff clay, and *G. cookei* Dall, 1916, from the Flint River formation, show a somewhat similar sculpture, but *G. arctata* runs larger and is less inflated. In *G. cookei* the anterior dorsal margin seems less produced than in this species. In all three of the forms the concentric growth laminae are unusually regular and prominent.

The height of the mold (U.S.N.M. 498512) is 13 mm. The locality is station 10334, the lower part of the Chickasawhay marl, one-fourth mile northeast of Perdue Hill, Monroe County, Ala.

Similar molds are found at station 2398 and at 14205*a*, which are probably identical with station 10334. A somewhat more inflated form (pl. 25, fig. 36) occurs in the lower Chickasawhay at station 6753, on the east side of Conecuh River at Old Weaver Chute, 2 or 3 miles below McGowans bridge, Escambia County, Ala. The difference may, however, be individual.

External molds indicating a shell even more closely resembling *Glycymeris arctata* is fairly common in the Chickasawhay at station 7211, on the east bank of Murder Creek, about 3 miles north of Castleberry, Conecuh County, Ala. *Glycymeris canalis* Brown and Pilsbry from the Gatun formation of the Canal Zone may be a later representative of the group. The fragment of an external mold from station 14287, on Patton Creek, 1½ miles east of Waynesboro, Wayne County, Miss., recalls *G. cookei* in sculpture and in outline, though it seems relatively broader and more symmetrical than the Flint River species.

Genus BARBATIA Gray
BARBATIA sp. cf. B. MARYLANDICA
Conrad
Plate 25, figure 5

Incomplete external molds from the upper part of the Chickasawhay marl should probably be referred to the group of *Barbatia marylandica* Conrad. The form is rather common at a single locality, station 14287, the waterfall on Patton Creek, a quarter of a mile above Highway 45, 1½ miles east of Waynesboro, Wayne County, Miss. More than a single unit has probably been included under *marylandica*, for the Tampa species does not seem identical with the Maryland individuals. Certainly the constriction of the anterior portion of the shell is much more marked in the Calvert type than it is in the Tampa forms. The molds of *Barbatia* sp. cf. *B. marylandica* are more evenly rounded anteriorly than in the Vicksburg species, *Barbatia mississippiensis* Conrad, and the radial sculpture is more regular.

Barbatia marylandica, s. l., has been recorded in the lower and middle Miocene from New Jersey to Florida, and a few molds from the upper Oligocene (Suwannee) limestone of Florida have been questionably referred to it.

The figured specimen is the mold of an incomplete left valve (U. S. Nat. Mus. 498513), from the upper Chickasawhay at station 14287.

BARBATIA sp. cf. B. CUCULLOIDES
Conrad
Plate 25, figure 3

Molds from the lower part of the Chickasawhay marl at station 10334, a quarter of a mile northeast of Perdue Hill, Monroe County, Ala., have preserved no characters by which they may be separated from *Barbatia cuculloides* (Conrad) from the upper Eocene and Oligocene of the eastern, middle, and western Gulf province. The material is fragmentary, but it retains the characteristic ribbing pattern on the medial and posterior parts of the shell; the strong radial outlining the posterior keel; in front of the keel, a few strong but irregular radials, and behind it, a convex, cuneate area extending from the umbones to the outer margin and sculptured with incrementals and finer and more or less obsolete radials.

The species is represented at the single locality and is too imperfectly preserved to be specifically determinable.

The figured right valve from station 10334 is U. S. Nat. Mus. 498514.

Subgenus ACAR Gray
BARBATIA (ACAR) sp. cf. B. (ACAR)
DOMINGENSIS (Lamarck)
Plate 25, figure 11

External molds displaying the characteristic form and sculpture of the *Barbatia domingensis* group were recovered from the lower part of the Chickasawhay marl at station 7166, on the east bank of the Tombigbee River, just south of Payne's Hammock, Clarke County, Ala. The characters of the hinge and ligament areas are not known. The type of *B. domingensis* (Lamarck) is a Recent shell, but conspecific or closely related forms are recorded in the Gulf and mid-American provinces throughout the Tertiary, particularly since the opening of the Miocene. The group has a meagre representation in the Eocene of Mississippi and the Western Gulf, and this is one of the few lower Chickasawhay occurrences recorded in the Oligocene faunas.

The figured specimen is a right valve, U. S. Nat. Mus. 498515.

Genus ANADARA Gray
ANADARA MUMMI Mansfield
Plate 25, figures 6, 8;
plate 26, figures 12, 14

Anadara mummi MANSFIELD, *1938*, Washington Acad. Sci., Jour., vol. 28, no. 3, p. 104, fig. 14.

The holotype of *Anadara mummi* (U.S.

N.M. 497651) measures about 20 mm in height and in width and about 9 mm in the convexity of the single valve. It is from the Suwannee limestone at station 12723, the upper bed on the H. L. Parrish farm, 3½ miles southeast of Wausau, Washington County, Fla. The figured specimens are right and left valves (U.S.N.M. 498677) from station 14204.

Anadara mummi differs from the closely related *A. lesueuri* (Dall) from the Byram marl, in the more quadrate outline and the more closely spaced ribs, especially those of the right valve. The shell in *A. mummi* is heavier and shorter than that of the coexistent *A. macneili* and is more truncate posteriorly. The ribs are medially sulcate away from the umbones as they are in *A. macneili*, but there is no tendency toward the development of a secondary groove on either side of the primary sulcation. In *A. macneili* the adult ribs break down toward the ventral margin into pairs of double ribs, but in *A. mummi* there is only the single division of the primary ribs. However, in poorly preserved and not fully adult specimens, the separation of *A. mummi* and *A. macneili* is difficult or impossible.

Occurrence.—Lower part of Chickasawhay marl. Station 13239, NW ¼ sec. 17, T. 8 N., R. 5 W., Bucatunna Creek; station 14282, blocks of "*Chione* limestone" along side road of Limestone Creek, 3 miles north of Waynesboro; station 14204, lower bed of blue marl, just east of highway bridge on Highway 45, 1½ miles north of Waynesboro; station 14349, bed no. 4, greensand bed of Chickasawhay River section, 2½ miles west of Waynesboro, Wayne County, Miss.

ANADARA MACNEILI Mansfield
Plate 25, figures 1, 2

Anadara macneili MANSFIELD, *1938*, Washington Acad. Sci., Jour., vol. 28, no. 3, p. 103, figs. 12, 17, 18.

The radial ribs on this species are rather strongly beaded. They begin to divide at about the convexity of the valve into two proximate ribs, the median groove deepening and widening ventrally. A further division takes place near the ventral margin so that on either side of the strong medial sulcation there is a secondary groove, and the original rib is divided into two more or less clearly defined pairs of radials.

The holotype is a left valve (U.S.N.M. 497648) measuring about 25 mm in length and 20 mm in width. It was collected from the Suwannee limestone, stations 10461 and 12723, at the A. L. Parrish farm, 3½ miles southeast of Wausau, Washington County, Fla. The specimens figured in the present report are left valves (U.S.N.M. 498673 and 498674) from the lower Chickasawhay at station 14205, the gully about a quarter of a mile north of Perdue Hill, Monroe County, Ala.

Occurrence.—Lower part of Chickasawhay marl. ALABAMA: Stations 6758 and 14292, the south bank of Yellow River at Watson [Watkins] and Henderson wagon bridge, 4 miles north of the Florida line, Covington County; stations 6753 and 14293, the fossiliferous bed at Weaver's Chute on the east side of the Conecuh River, 2 or 3 miles below McGowan's bridge, Escambia County; station 14205, soft marl in gully about a quarter of a mile north of Perdue Hill; station 14205*a*, limestone overlying soft marl in gully about one-fourth mile north of Perdue Hill; station 10334, one-fourth mile northeast of Perdue Hill, Monroe County; station 14323, highest fossiliferous bed in ravine 200 yards south-southwest of Jones' old plantation house, about 1 mile northwest of Glendon Station; station 7166, east bank of Tombigbee River, just south of Payne's Hammock, Clarke County; stations 13381, 14291, about 1.3 miles north of Millry, Washington County. MISSISSIPPI: Station 13396, hillside above mouth of Limestone Creek, near middle of sec. 25, T. 9 N., R. 7 W.; station 14519, old road on east side of new road, south of Limestone Creek, about half a mile up the hill; station 14281, "*Chione* limestone," Taylor Mill Creek, 1½ miles north of Waynesboro, Wayne County.

Genus BRACHIDONTES Swainson
BRACHIDONTES MISSISSIPPIENSIS (Conrad)
Plate 25, figure 40

Modiola mississippiensis CONRAD, *1847*, Acad. Nat. Sci. Philadelphia, Proc., vol. 3, p. 295.

Modiola mississippiensis CONRAD, *1848*, Acad. Nat. Sci. Philadelphia, Jour., 2d ser., vol. 1, p. 126, pl. 12, fig. 19.

Modiolus (*Brachydontes*) *mississippiensis* Conrad. DALL, *1898*, Wagner Free Inst. Sci., Trans., vol. 3, pt. 4, p. 796.

The rostral fold is acute near the umbones but broadens and flattens toward the ventral margin. The rostral area and that behind it are covered with a close, flat, radial lineation. In front of the rostral area, the radial sculpture abruptly ceases, and only the incremental sculpture remains. On the short, narrow anterior lobe in front of the beaks, a few short radial lirae are developed. They are strongest toward the front and evanesce away from the lateral margin. The holotype is from the Byram marl at Vicksburg, Miss.

The species exhibits the characteristic sculpture of *Musculus*, but it far exceeds the dimensions of that small form.

The specimens from the lower part of the Chickasawhay marl of southern and western Alabama and eastern Mississippi cannot be separated from the topotypes. The figure illustrates a mold of the exterior of a left valve (U.S.N.M. 498534), about 28 mm in its greatest dimension, from the lower Chickasawhay at station 6758, on the south bank of the Yellow River, 4 miles north of the Florida line in Covington County, Ala.

Occurrence.—Lower part of the Chickasawhay marl. ALABAMA: Stations 6758 and 14292, site of Watson and Henderson bridge, on the south bank of the Yellow River about 4 miles north of the Florida line, Covington County; station 7166, east bank of the Tombigbee River, just south of Payne's Hammock, Clarke County. MISSISSIPPI: Station 14204, lower bed of blue marl east of bridge on Highway 45, $1\frac{1}{2}$ miles north of Waynesboro; station 13241, Rocky Creek, sec. 18, T. 8 N., R. 5 W., Wayne County.

Genus ARCOPERNA Conrad
ARCOPERNA INFLATA Dall

Arcoperna inflata DALL, *1916*, U. S. Nat. Mus., Proc., vol. 51, p. 494, pl. 85, fig. 1.

Shell small, thin, inequilateral, the umbones nearly terminal, prosocoelous, 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. DALL, 1916.

The horizon is the Flint River formation.

Arcoperna inflata Dall is probably represented by external molds from two localities in the lower Chickasawhay, the one, station 6753, Weaver Chute on the east side of the Conecuh River, 2 or 3 miles below McGowan's Bridge, Escambia County, Ala.; the other, station 13396, the hillside above the mouth of Limestone Creek, near the middle of sec. 25, T. 9 N., R. 7 W., Wayne County, Mississippi. The outlines are too incomplete to form sufficient basis for determination, but the diagnostic sculpture is retained and offers strong evidence of the identity of the Alabama and Mississippi forms with that from Georgia. The radial sculpture of *inflata* is exceedingly fine and crowded with an occasional conspicuously heavy resting stage; that of the genotype from Vicksburg is almost equally fine, but it is interrupted by the overriding incrementals. The radial sculpture on the Alabama and Mississippi molds is identical with that from the Flint River formation of Georgia.

Genus MYTILUS Linnaeus
Subgenus MYTILOCONCHA Conrad
MYTILUS (MYTILOCONCHA) sp.

Warped internal molds occur in considerable abundance in the upper part of the Chickasawhay marl at station 14289, near the top of the Chickasawhay River section, one-fourth mile downstream from the bridge on the Waynesboro-Laurel highway, $2\frac{1}{2}$ miles west of Waynesboro. The matrix is a gray clay impregnated with angular grains of clear quartz. The molds indicate a rather slender, arcuate species about 60 mm in length and 25 mm in width, similar in a general way to *Mytilus* (*Mytiloconcha*) *incurvus* Conrad, 1839, described from Calvert County, Md., and occurring both in the Calvert and in the Choptank. The upper Chickasawhay species is smaller, however, than the Chesapeake form and more slender. It

is much smaller also than a species from the Hawthorn formation in Wakulla County, Fla., which is similar to if not identical with the Maryland form. The characters retained by the Mississippi species are not sufficient to permit a specific identification.

Genus PTERIA Scopoli
PTERIA sp. cf. P. ARGENTEA Conrad
Plate 25, figure 7

A somewhat crushed and damaged specimen of *Pteria* from the Chickasawhay marl of Perdue Hill, Monroe County, Ala., has preserved no characters by which it can be certainly separated from *Pteria argentea* Conrad, 1848, described from Vicksburg, Miss. It is possible that the form from Perdue Hill is not so much produced posteriorly and is less oblique than the Vicksburg form, but more probably, though the original shell is retained, the margins are broken so that the outline assumes a more quadrate aspect than that of the perfect shell. The dorsal parts, the beak, and the auricles are similar in the Perdue Hill and Vicksburg examples.

The figured right valve (U.S.N.M. 498516), is a little more than 25 mm in width along the dorsal margin. The locality from which it comes is station 14205, the soft marl under the ledge in the gully about one-fourth mile north of Perdue Hill, Monroe County, Ala. Molds of an apparently identical species occur in the lower Chickasawhay above; at station 10334, one-fourth mile northeast of Perdue Hill, and at station 13396, the hillside above the mouth of Limestone Creek, near the middle of sec. 25, T. 9 N., R. 7 W., Wayne County, Miss.

Genus ATRINA Gray
ATRINA sp. aff. A. ARGENTEA Conrad

Indeterminate molds, not necessarily conspecific, from two localities establish the presence of the genus *Atrina* in the Chickasawhay marl in western Alabama and eastern Mississippi. In shell structure, outline, and in the faint traces of ornamentation, the forms recall *Atrina argentea* Conrad, 1848, described from Vicksburg, Miss. Fragmentary internal molds and molds of the exterior were collected at station 7165, bed no. 5 in the bluff section east of the Jackson-Rockville road, 200 yards north of Salt Creek, NW $\frac{1}{4}$ sec. 34, T. 6 N., R. 2 E., $4\frac{1}{2}$ miles south of Jackson, Clarke County, Ala. A few fragments of shell still cling to an internal mold from the upper part of the Chickasawhay marl from station 14287, the waterfall on Patton Creek, one-fourth mile above Highway 45, $1\frac{1}{2}$ miles east of Waynesboro, Wayne County, Miss.

Genus CHLAMYS "Bolten" Roeding
Subgenus PLAGIOCTENIUM Dall
CHLAMYS (PLAGIOCTENIUM) HOWEI
Mansfield, n. sp.
Plate 26, figures 1, 3, 4

Shell small for the group, thin, fragile; the outline between the submargins an arc of not far from 240°; left valve flattened in the umbonal area, very feebly inflated medially; right valve feebly inflated, both in the umbonal and the medial areas. Prodissoconch retained on many individuals, a minute porcellaneous cuneate shell, smooth except for feeble concentric wrinkles, the beak acute and interrupting the dorsal margin. Primary costals originating at the outer margin of the prodissoconch, not increasing by intercalation; 17 or 18 in number, usually 18, low, rounded, as wide or slightly wider than the intercostals; nonlirate or with feeble, fortuitous threading. Concentric imbrications thin, sharp, very regular, overriding the radials, and looped backward slightly toward the umbones as they cross the costals, and forward toward the ventral margins at the intercostals. Submargins low, smooth, angular. Auricles rather wide, moderately high; nonlirate except for 1 to 3 fortuitous threads on occasional specimens. Byssal notch shallow; ctenolium absent. Cardinal margins turned inward and a little downward, bevelled, the inner edge acute. Cardinal crura in right valve more strongly developed than those in the left, rudely parallel to the dorsal margin. Ligament pit small, deltoid. Single muscle impression obscure, circular, included for the most part within the upper posterior quadrant. Inner margins crenate in harmony with the primary ribbing,

Holotype (U. S. Nat. Mus. 498517, a left valve) measures: Height, 49.0 mm; width, 50.0 mm; convexity, 5.0 mm. Paratype, (U. S. Nat. Mus. 498518, a right valve) measures: Height, 36.4 mm; width, 39.0

mm; convexity, 6.6 mm. Figured specimen (U. S. Nat. Mus. 498519, a right valve) measures: Height, 45.0 mm; width, 47.0 mm; convexity, 9.0 mm. Holotype and paratype from station 14204, lowest bed at bridge over Taylor Mill Creek, on Highway 45, 1½ miles north of Waynesboro, Wayne County, Miss. Figured specimen from station 14286, east of prisoners' house at State Quarry, 3 miles north-northwest of Waynesboro, Wayne County, Miss.

Chlamys howei may be known by its compressed, subcircular outline and rather low, smooth ribs overridden by the unusually even, concentric imbrications. The species varies somewhat in the degree of inflation, but the widest range of variation is in the form of the ribs and the occasional development of an obscure secondary liration on the primary costals. Commonly there is a single low thread cresting the rib and giving it an obscurely V-shaped outline, and occasionally near the ventral margin a secondary is developed on either side of the medial threading, thus squaring the costal. This is particularly noticeable in those specimens in which the intercostals are unusually flat and the angle of intersection with the costals acute. Such variants occur in the same lump with typical *C. howei* and are not considered to be of taxonomic significance.

Chlamys howei is probably related closely to a specimen from the Suwannee limestone of Florida figured by Mansfield, 1937, under the name of *Chlamys* (*Aequipecten*) sp. aff. *C. vaun wythei* Hertlein, a replacement name for *Pecten vaughani flabellum* Cooke, 1919, from the Miocene of Santa Cruz and Santiago, Cuba. The Cuban shell is smaller than either of the Oligocene forms, the auricles distinct, the dorsal margins more produced and the arc included between their extremities not more than 180°. In the Suwannee species the costals are fewer and more prominent than those of *C. howei*. A form even more closely related to *Chlamys howei* may be represented in the Flint River formation in Decatur County, Ga., though the specimen in question is incomplete, and the relationship cannot be determined with assurance. The two species are similar in general aspect, but the costals of the Georgia form are more numerous by two or three. *Pecten* (*Aequipecten*) *effosus* Brown and Pilsbry, 1911, from the Gatun formation of the Canal Zone is similar in outline but differs in the somewhat more elevated and angular costals and the lirate auricles.

The species has not been recorded in western Mississippi. It is named in honor of Dr. Henry V. Howe, the head of the Department of Geology at Louisiana State University, Baton Rouge, La.

Occurrence.—Lower part of Chickasawhay marl. ALABAMA: Station 10050, 1.7 miles southeast of Gainestown on the road to Lambard's Landing, Alabama River (left valve more sharply sculptured, as a rule, than in the usual *C. howei*); stations 7163 and 14520, gully north of old road from Jackson to Walker Springs, about 1 mile north of Glendon (left valve more strongly sculptured, as a rule, than in the usual *C. howei*); station 7166, east bank of Tombigbee River, just south of Payne's Hammock, bed no. 3, Clarke County; station 13392, 4 miles south of Cullomburg on road to Millry, Choctaw County; station 14291, about 1.3 miles north of Millry (typical), Washington County. MISSISSIPPI: Station 14510, Steep Hill Branch, about one-eighth mile from its mouth, SE ¼ sec. 18, T. 8 N., R. 5 W., from bed four to six feet above limestone ledge; station 14509, Bucatunna Creek, about 200 yards below Steep Hill Branch, bed no. 3; station 10053, 4 miles north of Waynesboro on road to Shubuta, near middle of sec. 24, T. 9 N., R. 7 W., bed no. 4; station 13385, one-eighth mile north of Limestone Church, 1½ miles southeast of Boyce; station 14285, bed above "*Chione* limestone," Limestone Creek Church locality, 4 miles north of Waynesboro; station 13386, hill above quarry at mouth of Limestone Creek, 3 miles north-northwest of Waynesboro; station 14286, just east of prisoners' house at State quarry, 3 miles north-northwest of Waynesboro; station 14284, cut in first hill north of Limestone Creek, on new highway, 3 miles north of Waynesboro (rare); station 14283*a*, marl overlying "*Chione* limestone," top of hill on old road leading down to Limestone Creek, 3 miles north of Waynesboro; station 14282, "*Chione* limestone," block of limestone along roadside at Limestone Creek, 3 miles north of Waynesboro; station 14204, lowest bed of blue marl, on Taylor Mill Creek, just

east of highway bridge on Highway 45, 1½ miles north of Waynesboro; stations 14361, 14362, 14515, glauconitic bed near base of section on Chickasawhay River, about one-fourth mile downstream from bridge on Waynesboro-Laurel road, 2½ miles west of Waynesboro, Wayne County.

CHLAMYS (PLAGIOCTENIUM) MCGUIRTI
Mansfield, n. sp.
Plate 26, figures 7, 11

Shell rather small, solid, subcircular; subequilateral. Right valve more inflated than the left; the maximum curvature within the dorsal half of the shell; the left valve compressed in the dorsal region and most convex medially. Costals prominently arched, wider than the intercostals, 21 on the right valve of the cotype; 19 on the left valve, but not of the same individual; those of the right valve flattened on top and inclined to be undercut laterally, the interspaces evenly concave; the costae of the left valve obtusely V-shaped; fortuitous radial striations occasionally developed but no other secondary radial sculpture. Concentric lamination strong and regular in the intercostals, possibly equally strong and regular upon the costals but badly worn upon the ribs of the right cotype; a few heavy resting stages near the outer margin. Submargins narrow, depressed, devoid of ornamentation other than incremental. Auricles rather small, cuneate, the anterior auricle of the right valve decidedly larger than that of the left but with a shallow and inconspicuous byssal sinus; medial part of ears, both on the right valve and the left, finely threaded with about four sharp lirae, overridden by the strong and sharp incrementals. Dorsal margins of right valve incurved slightly. A single pair of low crura subparallel to the dorsal margin. Ligament pit rather large and shallow. Other characters of interior not known.

Syntypes (a right and a left valve of different individuals, U. S. Nat. Mus. 498520, 498521) measure: Right valve: Height, 35.5 mm; width, 36 mm. Left valve: Height, 35.5 mm; width, 35.0 mm. From station 14205, soft marl in gully about one-fourth mile north of Perdue Hill, Monroe County, Alabama.

Chlamys mcguirti differs from *C. howei* in the less circular outline, the more angular ribs, more numerous by two or three, and in the lirate auricles. Although the types of *C. howei* and *C. mcguirti* seem sufficiently distinct to parry confusion, in the long series represented by each of the species, there are variants passing with no perceptible break from one to the other. *Chlamys mcguirti* is the more cosmopolitan type and may be represented in the Flint River faunas of Decatur County, Ga., by some of the forms incorrectly included under *Pecten suwaneënsis* Dall, an Ocala limestone species. *Chlamys mcguirti* does not, however, develop the secondary liration toward the distal extremities that is not uncommon though not typical in *C. howei*, and which is characteristic of a group of upper Oligocene species such as *C. duncanensis* Mansfield, 1934, rather widely distributed in the eastern Gulf. Both *C. howei* and *C. mcguirti* occur at a number of localities in western Alabama and eastern Mississippi, but *C. howei* alone has been recorded from Taylor Mill Creek and only *C. mcguirti* from Perdue Hill.

Specimens from southern Alabama display the broad outline of *C. howei* and the rib count of *C. mcguirti*. Such forms occur commonly at station 6753, old Weaver Chute, two or three miles below McGowan's Bridge, Escambia County, Ala. A single juvenile, possibly referable to *Plagioctenium*, occurs at station 14204, the lower bed of blue marl, Taylor Mill Creek, just east of the bridge on Highway 45, 1½ miles north of Waynesboro, Wayne County, Miss.

An incomplete single valve (U.S.N.M. 166807) from the Flint River formation at station 6159, Decatur County, Ga., more closely resembles *C. howei* in outline and convexity and in the form of the ribs, though it agrees with *C. mcguirti* in the number of ribs.

The specimens from the Suwannee limestone described by Mansfield (1937, p. 214) as species C are juvenile or incomplete, but the relationship to *C. mcguirti* is probably close.

Pecten ceibanus Cooke from the Alazan clay of Mexico is broader and more inflated, with larger auricles. The left valve is not known, but the species presents the outline of true *Pecten*.

Occurrence.—Lower part of the Chicka-

sawhay marl. ALABAMA: Station 14205, soft marl in gully about one-fourth mile north of Perdue Hill, Monroe County; station 14205*a*, overlying ledge in gully about one-fourth mile north of Perdue Hill; station 10334, one-fourth mile northeast of Perdue Hill; station 10050?, road to Lambards Landing, 1.7 miles southeast of Gainestown, Clarke County, Ala., (2 left valves broader and more compressed than *C. mcguirti* but similar in sculpture pattern) station 14322?, uppermost fossiliferous bed on north side of Salt Creek on road from Jackson to Rockville, sec. 34, T. 6 N., R. 2 E. (two poorly preserved specimens, identification in doubt); stations 13381 and 14291, railroad cut and nearby road cut about 1.3 miles north of Millry, Washington County. MISSISSIPPI: station 14288?, southwest corner sec. 8, T. 8 N., R. 5 W., 1 mile north-northeast of Denham, Wayne County, Miss., (fragmentary external molds, determination in doubt); station 14510, Steep Hill Branch about one-eighth mile from its mouth, SE $\frac{1}{4}$ sec. 18, T. 8 N., R. 5 W., from bed 4 to 6 feet above limestone ledge (a right and a left juvenile valve), Wayne County.

Subgenus AEQUIPECTEN Conrad

CHLAMYS (AEQUIPECTEN) GAINESTOWNENSIS Mansfield, n. sp.

Plate 26, figures 9, 19, 20

Shell rather small for the subgenus; inequilateral; slightly inequivalve, both valves rather feebly convex, but the greatest curvature of the shell higher up toward the dorsal margins in the left valve than in the right, and the right valve more evenly inflated than the left. Valves similarly sculptured with about 19 arched ribs counting those at the margins; the entire disk, both costal and intercostal spaces, threaded with coarse lirae made scabrous by the overriding incrementals; the medial liration on the rib slightly more prominent than those on either side, and the costal lirations, commonly three in number, slightly more prominent than the three or four in the concave intercostal areas. Submargins rather low, obtusely angulated, prickled at the intersection of the incrementals and the very fine radial threadlets. Auricles rather large, coarsely lirate; with six to ten irregular threads. Byssal notch deep; posterior right auricle and anterior and posterior left auricles cuneate, the width slightly exceeding the height. Dorsal margins of right valve turned inward slightly over the left. Cardinal crura of right valve concealed by the matrix; a single slender pair in the left valve subparallel to the dorsal margin and a second pair obscurely defined and rudely parallel to the margin of the small, subumbonal ligament pit. Character of muscle impression not known, but an unusual number of specimens are preserved as paired valves.

Holotype (U. S. Nat. Mus. 498522, paired valves) measures: Height, 54 mm; width, 52 mm; convexity of double valves, 17.5 mm. Paratype (U. S. Nat. Mus. 498523, a left valve) measures: Height, 51.4 mm; width, 52.0 mm; convexity of single valve, 10 mm. Holotype from station 10050, road to Lambards Landing, 1.7 miles southeast of Gainestown, Clarke County, Ala.; paratype from station 7163, gully north of old road from Jackson to Walker Springs about 1 mile north of Glendon, Clarke County, Ala.

In general form and sculpture pattern *Chlamys gainestownensis* resembles *C. burnetti* Tucker from the Tampa limestone, but the dorsal margins of the Tampa form are more produced and the arc included between them smaller; the primary costals are fewer by two or three, and the secondary lirations is relatively coarser. The group is probably continued in *Chlamys acanikos* Gardner of the Chipola formation of Florida and may be represented in *Chlamys* (*Aequipecten*) *canalis* Brown and Pilsbry of the Emperador limestone of the Canal Zone.

Occurrence.—Lower part of Chickasawhay marl. ALABAMA: Station 10050, road to Lambards Landing, 1.7 miles southeast of Gainestown; stations 7163 and 14520, gully north of old road from Jackson to Walker Springs, about 1 mile north of Glendon; station 7165, 200 yards north of Salt Creek, bed no. 5 of section, NW $\frac{1}{4}$ sec. 34, T. 6 N., R. 2 E., $4\frac{1}{2}$ miles south of Jackson; station 3640?, Payne's Hammock, 10 miles south of Jackson, Clarke County. A poorly preserved but related species in the Chickasawhay marl at station 14322, the uppermost fossiliferous bed on the north side of Salt Creek on the road from Jackson to Rockville, sec. 34, T. 6 N., R. 2 E.

CHLAMYS (AEQUIPECTEN) GLENDONENSIS
Mansfield, n. sp.
Plate 26, figures 15, 21

Shell small, solid, moderately inflated, the left possibly more so than the right; subcircular in outline. Ribs narrow, abruptly elevated, squarish on the adult disk, 21 in number; juvenile costals simple, the secondaries introduced in the adolescent stage, the adult costals threaded with three scaly secondary lirae, with one to three similar threads in the intercostal spaces, the medial secondary commonly stronger than those on either side. Submargins narrow, not angulated at the intersection with the disk, sculptured with about a dozen exceedingly fine, minutely spinose lirae. Ears moderately large; both the right and the left posterior auricles closely threaded with about eight lirations, the anterior auricles, both the right and the left more coarsely threaded with about half a dozen heavy, corrugated lirae; byssal notch shallow; ctenolium not observed.

Holotype (U. S. Nat. Mus. 498524, a right valve) measures: Height, 29.8 mm; width, 31.0 mm; convexity, 6.3 mm. Figured left valve (U. S. Nat. Mus. 498525,) measures: Height, 22.5 mm; width, 21.0 mm; convexity, 5.7 mm. Holotype from station 7163, gully north of road from Jackson to Walker Springs, about 1 mile north of Glendon, Clarke County, Ala. Figured left valve from station 14362, glauconitic bed near base of Chickasawhay River section, about one-fourth mile downstream from bridge on Waynesboro-Laurel road, $2\frac{1}{2}$ miles west of Waynesboro, Wayne County, Miss. The figured left valve is decidedly higher relatively than the right and has not been accepted as a paratype of *C. glendonensis*.

Chlamys glendonensis has much in common with *Chlamys gainestownensis*, and it was for a time considered the young of that species. The shells though they are less than half as large as *C. gainestownensis* present no adolescent characters, and the costals are consistently more numerous by two or three.

Pecten thetidis Cooke, 1919 (not *Pecten thetidis* Sowerby), from Crocus Bay, Anguilla, is a smaller, more evenly inflated disk, with only about 19 ribs, the secondary threading confined for the most part to the tops of the costals; a stronger, concentric imbrication; and more angular submargins.

Occurrence.—Lower part of Chickasawhay marl. ALABAMA: Station 14205, soft marl under ledge in gully, about one-fourth mile northeast of Perdue Hill, Monroe County; stations 7163 and 14520, gully north of the road from Jackson to Walker Springs, about 1 mile north of Glendon; station 14323 highest fossiliferous bed in ravine, 200 yards southwest of Jones plantation house, about 1 mile northwest of Glendon Station, Clarke County; station 13392, road from Cullomburg to Millry, 4 miles south of Cullomburg, Choctaw County; stations 13381 and 14291, railroad cut and adjoining road cut about 1.3 miles north of Millry, Washington County, MISSISSIPPI: station 14284, just north of Limestone Creek on new highway, 3 miles north of Waynesboro; station 13396?, hillside above mouth of Limestone Creek, near middle of sec. 25, T. 9 N., R. 7 W.; station 14281, "*Chione* limestone," Taylor Mill Creek, below bridge on Highway 45, $1\frac{1}{2}$ miles north of Waynesboro; station 14362, glauconitic bed near base of section, Chickasawhay River, one-fourth mile downstream from bridge on Waynesboro-Laurel road, $2\frac{1}{2}$ miles west of Waynesboro, Wayne County.

CHLAMYS (AEQUIPECTEN) WAYNENSIS
Mansfield, n. sp.
Plate 26, figures 17, 18

Shell small, solid, both the right and the left valve inflated, the right more strongly than the left, and the maximum convexity occurring nearer the dorsal margins; ventral and lateral margins evenly rounded. Radial costae, 20 on the right syntype, 18 on the left, strong, even, squarish on the medial portion of the disk, more inclined to be arched toward the ventral margins; intercostals U-shaped with nearly parallel sides; secondary thread developed on the summit on the medial portion of the disk and later with the widening of the rib, a secondary on either side of the medial thread; in the intercostal channels, a single, strong, medial liration developed near the ventral margin with occasional lateral lirae. Concentric imbrications sharp and crowded, looping backward over the primary costals, but with a secondary crenulation at the inter-

section with the secondaries. Submargins narrow, semicrescentic, sculptured only with the incremental laminae. Auricles rather small, the anterior auricle on the right valve moderately produced, threaded with about half a dozen coarse lirae; byssal sinus moderately wide, strongly wrinkled by the incrementals the posterior ear of the right valve and the anterior and posterior ears of the left valve slightly wider than they are high, threaded with six or seven somewhat irregular lirations, much finer than those on the anterior auricle. Ctenolium including a few coarse teeth. Dorsal margins of right valve turned inward; a single pair of cardinal crura produced at a low angle to the margin. Ligament pit small, subumbonal. Muscle scar obliterated. Ventral margins strongly crenulate in harmony with the primary ribbing, the crenae persisting for some little distance from the margin, and the intercostal channels reflected in the form of double ribs similar to those of *Amusium*.

Syntypes (U. S. Nat. Mus. 498526, right, and 498527, left valve, not of the same individual) measure: Right valve: Height, 25.0 mm; width, 25.5 mm; convexity, 7.6 mm. Left valve: Height, 20.2 mm; width, 21.0 mm; convexity, 5.3 mm. From station 13386, hill above quarry at mouth of Limestone Creek, 3 miles northwest of Waynesboro, Wayne County, Miss.

Chlamys (*Aequipecten*) *waynensis* bears both in outline and sculpture pattern a general similarity to *Pecten* (*Aequipecten*) *thetidis* Cooke, not Sowerby, but it differs in the coarser concentric imbrication, the larger auricles and the more sharply defined submargins, which in *waynensis* are devoid of radial sculpture but in *C. thetidis* are finely lineated radially. *Chlamys glendonensis*, also of the lower Chickasawhay, is larger and decidedly less inflated.

Occurrence.—Lower part of Chickasawhay marl. ALABAMA: Station 10334?, one-fourth mile northeast of Perdue Hill, Monroe County (larger and less strongly inflated than type); station 7163?, gully north of road from Jackson to Walker Springs, 1 mile north of Glendon (larger and less evenly inflated than the type); station 10050, road to Lambards Landing, 1.7 miles southeast of Gainestown, Clarke County. MISSISSIPPI: Station 10053, road from Shubuta to Waynesboro near middle of sec. 24, T. 9 N., R. 7 W., 4 miles north of Waynesboro, bed no. 4; station 13385, one-eighth mile north of Limestone Church, 1½ miles southeast of Boyce; station 13386, hill above Quarry at mouth of Limestone Creek, 3 miles northwest of Waynesboro; station 14286, just east of prisoners' house at State Quarry, 3 miles north-northwest of Waynesboro; station 14361, Chickasawhay River section, the glauconitic bed near the base, about one-fourth mile downstream from bridge on Waynesboro-Laurel Highway, 2½ miles west of Waynesboro, Wayne County.

CHLAMYS (AEQUIPECTEN) CHICKARIA
Mansfield, n. sp.
Plate 26, figures 6, 16

Shell of moderate dimensions for the group, not strongly inflated, the right valve slightly less compressed than the left, and the maximum convexity within the dorsal half of the disk. Lateral margins produced, the umbonal angle exceeding a right angle by 10° or 15°. Costals 19 in number on the holotype, strong, simple in the juvenile and possibly the adolescent stages, trisected in the adult by lateral grooves rather than by the development of secondary lirae upon the primaries, a secondary threading developed, however, in the intercostal channels; both costals and intercostals overrun by a fine, sharp, concentric imbrication. Submargins rather narrow, semicrescentic, sculptured only with growth lines and fortuitous radial filaments. Auricles of only moderate dimensions; anterior ear of right valve with a deep sinus, strongly lirate, the dorsal two of the six lirae stronger and more closely spaced than the four in front of them; posterior auricle of right valve and anterior and posterior auricles of left valve decorated with finer and more numerous radials. Dorsal margin of right valve turned inward; a pair of slender cardinal crura subparallel to the dorsal margin in the right valve and ventral to them a second, shorter pair running about midway between the dorsal crura and the raised margins of the trigonal resilifer. Ventral margins deeply crenate, the intercostal channels of the outer surface appearing on the inner surface as *Amusium*-like ribs.

Holotype (U. S. Nat. Mus. 498528, a right valve) measures: Height: 33.0 mm; width,

33.0 mm; convexity, 6.0 mm. From station 14284, highway, just north of Limestone Creek, 3 miles north of Waynesboro, Wayne County, Miss.

The species is remarkable for the incised secondary sculpture on the costals. The immature left valve (U.S.N.M. 498529) shown on plate 26, figure 6, may be the young of *C. chickaria*, but the ribs seem more elevated medially, and the concentric sculpture more imbricated. The height of the specimen is 19.5 mm, the width, 20 mm. Like the holotype, it comes from station 14284.

Occurrence.—Lower part of Chickasawhay marl. Station 14284, highway just north of Limestone Creek, 3 miles north of Waynesboro, Wayne County, Miss.

A right valve 43 mm high and 45 mm wide recovered from the Suwannee limestone at a depth of 55 feet in a well near Thomasville, Ga. (station 10393), may be referable to *Chlamys chickaria*.

CHLAMYS sp. aff. C. DUPLEX (Cooke)
Plate 26, figure 5

Two right valves from the lower part of the Chickasawhay marl at station 10050, 1.7 miles southeast of Gainestown, Clarke County, Ala., recall *Pecten* (*Patinopecten*) *duplex* Cooke (1919, p. 140, pl. 11, figs.10 a, b) in the narrow, squarish, medially sulcate ribs. The type of *duplex* is a badly damaged pair of valves in an indurated matrix. The left valve is compressed, the right is feebly inflated, much more feebly than in the Alabama species here figured. The ornamentation in the two forms is similar in general character, although the ribs in the Anguilla species number 19 instead of 21 as in the Chickasawhay form. The submargins are wider in the Alabama individuals, but the auricles are not so wide and show more evidence of radial liration. The figured individual (U.S.N.M. 498530) is 38 mm in height, and the width, before the breaking of the posterior lateral margin, probably exceeded the height.

CHLAMYS sp.
Plate 26, figure 2

Juveniles characterized by a low rib count, 16 in the figured specimen, do not conform to any recognized species. The lateral margins are more sloping than in the majority of the Chickasawhay Pectens, and the angle between them exceeds a right angle by less than 10°. The ribs in the umbonal region are simple, sharply defined, and strongly and smoothly arched; a medial thread, rendered minutely spinose by the overriding incrementals, is developed a short distance from the umbones and, later, lateral threads. In an individual slightly older than that figured, a medial secondary is developed in the intercostal channel. The ventral margin is evenly crenulated by the primaries. The submargins are relatively wide, semicrescentic, microscopically lineated radially, or smooth excepting for incrementals. The auricles of the left valve, the only valve known, are moderately large, a little wider than high, and threaded with about half a dozen scabrous lirae.

The figured left valve (U.S.N.M. 498531), a juvenile, is 24 mm high and 23.5 mm wide. It is from station 14510, Steep Hill Branch, about one-eighth mile from its mouth in the SE $\frac{1}{4}$ sec. 18, T. 8 N., R. 5 W., Wayne County, Miss. from a bed 4 to 6 feet above the limestone ledge. No similar juveniles have been found elsewhere.

The species is higher than either *Chlamys howei* or *C. mcguirti* and differs from both in the regular development of a radial sculpture. The early primaries are less angular than those of *C. gainestownensis*, and the secondaries are developed in a different manner and order of succession; the costals in *C. glendonensis* are more numerous and differ in form and secondary ornamentation; in *C. waynensis*, the shell is lower and more inflated medially, and the costals more angular; in *C. chickaria*, the secondary sculpture is developed by the longitudinal grooving of the primaries. The form of *Chlamys* sp. resembles that of *C. thetidis* Cooke, but the concentric sculpture is much less strong.

Only three left valves, all of them immature, have been found.

Genus ANOMIA Linnaeus

ANOMIA TAYLORENSIS Mansfield, n. sp.
Plate 25, figures 13, 14

Shell very thin and fragile, lustrous, somewhat greenish; of moderate size; the left valve inflated in the umbonal area.

Sculpture of crude plications irregular in form and arrangement. Margin of left valve incurved and thickened slightly. Ligament scar narrow, crescentic, symmetrically placed high up beneath the left umbone. The two byssal scars and the adductor scars included within the chalky, dorsoventrally produced area on the medial, dorsal portion of the interior, the dorsal extremity of the scarred area near the ligament scar but not in contact with it, the ventral extremity near the median horizontal. Major byssal scar the most dorsal of the three, subcircular, the minor byssal scar also subcircular, slightly smaller than the major scar but almost in line with it. The adductor scar, intermediate in size between the byssal scars and posterior to them in position. Right valve not known.

Holotype (U. S. Nat. Mus. 498532) with imperfect ventral margin measures: Height: 38 mm (estimated); width, 36 mm; convexity, 9.5 mm. Paratype (U. S. Nat. Mus. 498533) measures: Height, 22.5 mm; width, 20.0 mm. From station 14204, Taylor Mill Creek, lower blue marl, just east of bridge on Highway 45, 1½ miles north of Waynesboro, Wayne County, Miss.

Although there are comparatively few records of *Anomia* in the Gulf Oligocene in western Alabama and eastern Mississippi in the lower part of the Chickasawhay marl, *A. taylorensis* is widespread and far from rare. Like most of the genus, it varies widely in outline. The holotype is by no means the largest of the individuals that represent the species in the Museum collections. A height of 45 mm is not at all uncommon. The degree of convexity is also variable. The holotype is of average inflation, but the paratype is more highly and more evenly convex than the majority of individuals. Many of the valves show no sculpture whatever, and an irregular wrinkling of the shell is commonly developed only at the ventral margin. In specimens from the higher Chickasawhay the radial sculpture seems a constant factor, and this difference should probably be recognized in the taxonomy.

Anomia microgrammata Dall and *A. glypta* Gardner from the Chipola formation are finely lineated radially. *Anomia suwanneensis* Gardner from the Hawthorn formation at White Springs on the Suwannee River in Hamilton County, Fla., is a larger, heavier shell with the scars in the left valve not so close to the dorsal margin as they are in *A. taylorensis*. It seems, however, to be closer to the Chickasawhay form than any other of the described species.

Occurrence.—Lower part of the Chickasawhay marl. ALABAMA: Station 14205, soft marl under ledge in gully about one-quarter of a mile north of Perdue Hill; station 10334, one-quarter of a mile northeast of Perdue Hill, Monroe County; station 14323, highest fossiliferous bed in ravine 200 yards south-southwest of Jones' old plantation house, about 1 mile northwest of Glendon Station, Clarke County; station 13381, 1.3 miles north of Millry, Washington County. MISSISSIPPI: Station 10053, road from Shubuta to Waynesboro, near middle of sec. 24, T. 9 N., R. 7 W., bed no. 4, 4 miles north of Waynesboro, Wayne County; station 14510, Steep Hill Branch about one-eighth of a mile above its mouth, SE ¼ sec. 18, T. 8 N., R. 5 W.; station 14285, bed above "*Chione* limestone," Limestone Creek Church locality, 4 miles north of Waynesboro; station 13385, one-eighth of a mile north of Limestone Church, 1½ miles southeast of Boyce; station 13386, hill above quarry at mouth of Limestone Creek, 3 miles northwest of Waynesboro; station 13396, hillside above mouth of Limestone Creek, near middle of sec. 25, T. 9 N., R. 7 W.; station 14286, east of prisoners' house at State Quarry, 3 miles north-northwest of Waynesboro; station 14283*a*, highest fossiliferous bed, at top of hill on old road leading down to Limestone Creek, 3 miles north of Waynesboro; station 14204, Taylor Mill Creek, the lower bed of blue marl, just east of bridge on Highway 45, 1½ miles north of Waynesboro; station 14281, "*Chione* limestone "overlying blue marl on Taylor Mill Creek, 1½ miles north of Waynesboro; stations 14349, 14362, 14515, glauconitic bed near base of Chickasawhay River section, about one-fourth of a mile downstream from bridge on Waynesboro-Laurel highway, 2½ miles west of Waynesboro, bed no. 4; station 14363, above glauconitic bed of the Chickasawhay River section; station 14345, Sandy Creek, sec. 34. T. 9 N., R. 7 W., Wayne County.

A closely allied form differing in the stronger radial sculpture is included in col-

lections from the upper part of the Chickasawhay marl at the following localities: ALABAMA: Station 11088, Choctaw Bluff, on the Alabama River, sec. 27, T. 5 N., R. 3 E., Clarke County. MISSISSIPPI: Station 14350, near the top of the Chickasawhay River section, about one-fourth of a mile downstream from bridge on Waynesboro-Laurel highway, 2½ miles west of Waynesboro; station 14289, near the top of the Chickasawhay River section; station 14287, waterfall on Patton Creek, one-quarter of a mile above Highway 45, 1½ miles east of Waynesboro, Wayne County.

Genus OSTREA Linnaeus

OSTREA VICKSBURGENSIS Conrad

Ostrea vicksburgensis CONRAD, *1848*, Acad. Nat. Sci. Philadelphia, Jour., 2d ser., vol. 1, p. 126, pl. 13, figs. 5, 37.

Plicated; very irregular and adhering, the upper valve not flat, but swelling in an irregular manner. Height 1¾ [inches]. CONRAD, 1848.

Although Conrad's description of *O. vicksburgensis* is short and his illustrations poor, specimens from the Byram marl at Vicksburg, Miss., have been determined with assurance under his name.

Ostrea vicksburgensis is a relatively small, thin species, commonly rather broad and lopsided, with perhaps a dozen strong, sharp plicae on the attached right valve, and fewer and feebler folds on the left. There is a certain increase in the number of folds by anastamosing and intercalation. The major folds on the right valve usually spring from the umbones; those of the left valve have a later origin. The lower valve is a little deeper than the upper and tends to develop fewer and more spinose ribs. The margins are fluted in some individuals, some much more strongly than in others.

The species is widespread in the upper Oligocene of the Gulf from the Flint River formation of Georgia to northeastern Mexico.

Occurrence.—Lower part of Chickasawhay marl. ALABAMA: Station 6749, McGowan's Bridge, west bank of Conecuh River, about 1 mile below the mouth of Sepulga River, Escambia County; station 14205, soft marl under ledge in gully about one-fourth mile north of Perdue Hill, Monroe County; station 13392, on road from Columburg to Millry, 4 miles south of Collumburg, Choctaw County; station 13381, 14291 railroad cut and adjoining road cut, about 1.3 miles north of Millry, Washington County. MISSISSIPPI: Station 10053, 4 miles north of Waynesboro on road to Shubuta, bed no. 4, Wayne County; station 13385, one-eighth mile north of Limestone Church, 1½ miles southeast of Boyce; station 14285, bed above "*Chione* limestone," Limestone Creek Church locality, 4 miles north of Waynesboro; station 14513*a*, Limestone Creek church, directly below upper ledge; station 14283*a*, from marl overlying "*Chione* limestone," at top of hill on old road leading down to Limestone Creek, 3 miles north of Waynesboro; station 14284, just north of Limestone Creek, on new highway 3 miles north of Waynesboro; station 13386, hill above quarry at mouth of Limestone Creek, 3 miles northwest of Waynesboro; station 14286, just east of prisoners' house at State Quarry, 3 miles north-northwest of Waynesboro; station 6648, Chickasawhay River, one-fourth mile west of Woodward and 2 miles northwest of Waynesboro; station 14204, Taylor Mill Creek, just east of highway bridge, 1½ miles north of Waynesboro; station 14362, Chickasawhay River section, 2½ miles west of Waynesboro, bed no. 4.

Upper part of Chickasawhay marl. MISSISSIPPI: Station 14350?, Chickasawhay River 2½ miles west of Waynesboro, (fragments only); station 14365?, the same section, bed no. 8 (worn fragments only); station 14289?, the same section, bed no. 9 (thin and worn fragments, possibly reworked); station 13388, one-fourth mile above wagon bridge, 2½ miles south of Waynesboro, Wayne County, reworked?

OSTREA sp. indet.

Massive *Ostrea* recalling *O. normalis* Dall, 1898, and *O. vaughani* Dall, 1915, in their general dimensions and weight but probably distinct from both of them occur at station 10334, the lower part of the Chickasawhay marl, one-fourth mile northeast of Perdue Hill, Monroe County, and at station 7165, bed no. 5, in the bluff east of the Jackson-Rockville road, 200 yards north of Salt Creek, 4½ miles south of Jackson, Clarke County, Ala. This may be the species in-

correctly determined as *Ostrea mauricensis* Gabb (Dall, 1916). Dall reported Gabb's species from station 3400, 8 miles southeast of Bainbridge, Decatur County, Ga.

OSTREA sp. cf. O. ANTIGUENSIS Brown

A corroded left valve from station 7163, the gully north of the road from Jackson to Walker Springs, 1 mile north of Glendon, Clarke County, Ala., is comparable in size to *Ostrea antiguensis* Brown, from the Antigua formation of the Island of Antigua. There are also traces on it of plications resembling those of *O. antiguensis*, but the material is much too incomplete to be determined. *Ostrea antiguensis* is rather widespread in the upper Oligocene of Antigua and is recorded from Puerto Rico.

OSTREA BLANPIEDI Howe

Ostrea blanpiedi HOWE, *1937*, Jour. Paleontology, vol. 11, no. 4, p. 362, pl. 44, figs. 1–4.

The type locality of *Ostrea blanpiedi* is a small stream gully one-eighth of a mile northwest of the type locality of the upper Chickasawhay, in the NW ¼ sec. 10, T. 8 N., R. 7 W., Wayne County, Miss. The species is locally of reef-making abundance and is recorded by Howe from upper Chickasawhay faunas as far west as Leaf River, Smith County, Miss. He also reports the species from western Alabama, from Choctaw Bluff on the Alabama River in Clarke County. The specimens from station 11088, Choctaw Bluff, in the collections of the U. S. National Museum are much less heavy than *Ostrea blanpiedi* from the type locality. They and similar forms from station 3640, Payne's Hammock on the Tombigbee River, 10 miles south of Jackson, may be taxonomically distinct from the *Ostrea blanpiedi* of Wayne County.

Occurrence.—Upper part of Chickasawhay marl. MISSISSIPPI: Station 14287, waterfall on Patton Creek, one-fourth mile above Highway 45, 1½ miles east of Waynesboro; stations 14289, 14351, 13238, NW ¼ NW ¼ sec. 25, T. 8 N., R. 7 W., Chickasawhay River, elevation 126, Wayne County.

Genus PERIPLOMA Schumacher

PERIPLOMA sp.

Specifically indeterminate molds, some of them with fragments of a thin, subnacreous shell adhering, are locally common in the Chickasawhay of eastern Mississippi. It is probable that more than a single species is represented. Fragments of a thin, concentrically wrinkled shell are retained on the two molds from the lower Chickasawhay at station 14204, the lower blue marl just east of the bridge over Taylor Mill Creek on Highway 45, 1½ miles north of Waynesboro, Miss. The height of the larger mold is about 28 mm, the width about 34 mm. The diagnostic spoon is retained on the smaller individual. A form similar in outline but represented only by internal molds occurs at station 14516, in the glauconitic greensand near the base of the Chickasawhay River section. The section is about a quarter of a mile downstream from the bridge on the Waynesboro-Laurel road, 2½ miles west of Waynesboro. The internal molds at the top of the Chickasawhay at station 13388, 2½ miles south of Waynesboro, Miss., probably represent a second species, They run larger than the specimens from the lower Chickasawhay, between 35 and 40 mm in height and between 40 and 45 mm in width. The medial inflation of the valves is rather marked, but they are compressed toward the ventral and lateral margins and present a somewhat warped aspect. Traces of the former presence of a clavicular rib and of a chondrophore are discernible.

The genus has a meagre representation in the mid-Tertiary of the East Coast and Gulf. *Periploma peralta* Conrad from the St. Marys formation of Maryland and *Periploma gardneri* Soot-ryen from the Shoal River, and the lower Choctawhatchee formations of Florida are almost double the size of the Chickasawhay forms. An undescribed Vicksburg species is about the same size as those from the Chickasawhay but is relatively wider.

Genus THRACIA (Leach Ms.)
de Blainville
Subgenus CYATHODONTA Conrad

THRACIA (CYATHODONTA) TAYLORENSIS
Mansfield, n. sp.
Plate 25, figure 39

Species known from three damaged right valves from a single locality. Shell small, very thin and brittle, transversely ovate in outline. Umbones rather low and apparently flattened, subcentral. Anterior part of

shell broadly and evenly rounded, the posterior contracted and subtruncate, depressed slightly behind the rostrum and elevated at the oblique dorsal margin. Rostrum obtuse, clearly marked at the umbones, flattening ventrally, defined, however, not only by the contour of the shell but also by the abrupt change in the character of the sculpture. Low, evenly undulating ripples on the disk and anterior portion of the shell, abruptly replaced on the rostrum by much finer, irregular concentric wrinkles; both the ripples and the spaces between them concentrically striated; the area behind the rostrum obscurely granulated. Characters of interior not known.

Holotype (U. S. Nat. Mus. 498535, a right valve) measures: Height, 16 mm; width, 22 mm. From the lower part of the Chickasawhay marl at station 14204, the lower bed of blue marl, just east of the bridge on Taylor Mill Creek, on Highway 45, 1½ miles north of Waynesboro, Miss.

Thracia (*Cyathodonta*) *vicksburgiana* Dall from Vicksburg, Miss., is larger, more produced anteriorly, and more strongly sculptured concentrically. The *Thracia?* sp. from station 12723, the A. L. Parrish farm, 3½ miles southeast of Wausau, Washington County, Fla., to which reference was made by Mansfield, 1933, resembles *T. vicksburgiana* in size and sculpture pattern. The subspecies *Thracia vicksburgiana hernandoensis* Mansfield, 1937, is even larger than the Vicksburg form. *Thracia* (*Cyathodonta*) *gatunensis* Toula, 1908, from the Canal Zone, and Dall's closely related if not identical *Cyathodonta guadalupensis* and *C. spenceri* from the Island of Guadaloupe are all strongly and evenly rippled concentrically.

The Recent *Cyathodonta* are widely distributed in the warmer waters.

Genus CRASSATELLITES Krüger
CRASSATELLITES PARAMESUS Dall

Crassatellites paramesus DALL, *1916*, U. S. Nat. Mus., Proc., vol. 51, p. 495, pl. 85, figs. 4, 5, 7, 8.

The holotype and paratype are from station 7096, at Red Bluff, on the west bank of the Flint River, 7 miles above Bainbridge, Decatur County, Ga. Additional specimens were collected from the Flint River formation at station 7131, at Cherry Chute on the Flint River, 2¾ miles below Bainbridge, and at station 2311, Hawkinsville, Pulaski County, Ga.

Like *Crassatellites mississippiensis* Conrad from the Byram marl at Vicksburg, Miss., and *C. deformis* (Heilprin) of the Tampa limestone, *Crassatellites paramesus* is a heavy, subovate shell, with flattened umbones. The sculpture on the umbones is coarser in *C. paramesus* than in *C. mississippiensis*, not so coarse as in *C. deformis* (Heilprin). In the degree of development and persistence of the concentric sculpture on the disk, *C. paramesus* is intermediate between the Vicksburg species characterized by a sculpture that is restricted largely to the umbones and the lateral areas, and the Tampa limestone form in which a strong and fairly regular sculpture persists from the anterior margin across the disk to the posterior keel.

The height of the incomplete paratype, a left valve (U.S.N.M. 166715), is 27 mm. The squeeze of an incomplete right valve (U.S.N.M. 498536) may represent a shell half again as large. The mold from which it was made was collected from the Chickasawhay marl at station 14283, the "*Chione* limestone" at the top of the hill leading down to Limestone Creek, 3 miles north of Waynesboro, Miss.

There is a common but very poorly preserved form at station 14287, the waterfall on Patton Creek, one-fourth mile above Highway 45, and 1½ miles east of Waynesboro. It cannot be determined with assurance, but the coarse, concentric rippling seems to occupy a larger area on the disk than it does in the usual C. *paramesus*.

Occurrence.—Lower part of Chichasawhay marl. ALABAMA: Station 14293, east side of Conecuh River at Weaver's Chute, sec. 18, T. 2 N., R. 13 E., Escambia County; station 14205*a*, gully about one-fourth of a mile north of Perdue Hill, Monroe County; station 14291, railroad and adjoining road cut, about 1.3 miles north of Millry, Washington County. MISSISSIPPI: Station 14519, old road on east side of new road south of Limestone Creek, about halfway up the hill; station 14283, "*Chione* limestone" at top of hill on old road leading down to Limestone Creek, 3 miles north of Waynes-

boro; station 14282, "*Chione* limestone" blocks along roadside, probable fallen from station 14283; station 14281, "*Chione* limestone," Taylor Mill Creek, 1½ miles north of Waynesboro, just east of bridge on Highway 45, Wayne County.

Genus CRASSINELLA Guppy
CRASSINELLA sp.
Plates 25, figures 16, 17

Two fragile left valves (U.S.N.M. 498537) not sufficiently preserved to constitute types were recovered from the lower part of the Chickasawhay marl at station 14204, the lower bed east of the bridge over Taylor Creek, 1½ miles north of Waynesboro on Highway 45. They are compressed, trigonal, little forms less than 3 mm high, ornamented with fine, concentric lirae, about seven in all and evenly spaced from the tip of the beaks to the ventral margin. These shells may well represent an undescribed species allied to undescribed specimens from the Byram marl at Vicksburg. The Vicksburg shells are of a similar size and shape, but the concentric ornamentation is less regular and more delicate and laminated.

Genus VENERICARDIA Lamarck
"VENERICARDIA" WAYNENSIS
Mansfield, n. sp.
Plate 25, figures 9, 10, 18

Shell small for the group, relatively thin, obliquely ovate in outline. Umbones full, prominent, the tips turned inward and forward, anterior in position. Lunule short, broad, incised, semicordate in the single valve. Escutcheon not defined. Anterior margin broadly rounded in front of the lunule, merging smoothly into the upcurved ventral margin; posterior lateral margin obtusely truncate, the posterior area obscurely defined by the change in the contour of the shell and the lesser elevation of the costals. Ribs 18 to 19 in number, high, strong, weakly undercut laterally, not quite so wide as the interspaces, obtusely serrated by growth lamellae; ribs on the posterior slope only a little less elevated than the medial and anterior costals, except for the fourth from the margin, which is a little weaker than those on either side; secondary sculpture in the form of a radial thread developed in the adult at the base of each rib. Dentition preserved in a few individuals. In the right valve, a very short, platy anterior cardinal, parallel to the lunular margin and grooved on the inner face, and a heavy, much produced, and feebly arcuate medial cardinal grooved on the dorsal face and produced parallel to the ligament groove, the posterior cardinal fused with the margin of the ligament groove; a pustule analogous to the posterior lateral at the extremity of the groove. In the left valve, a peglike anterior cardinal, flattened transversely and grooved on its dorsal face; and a slender, much produced posterior cardinal. A pustular anterior lateral at the extremity of the sulcus outlining the lunule, and a faint dimple in line with the ligament groove for the reception of the incipient posterior lateral. Adductor scars and simple pallial line distinct on fresh individuals. Interior margins with shallow flutings, some of them traceable, faintly, to the umbones.

Holotype (U. S. Nat. Mus. 498538, a left valve) measures: Height, 21.0 mm; width, 23.0 mm. Paratype (U. S. Nat. Mus. 498539, an incomplete left valve) measures: Height, 17.5 mm; width, 19 mm. Holotype from station 14204, lower bed just east of bridge over Taylor Mill Creek, on Highway 45, 1½ miles north of Waynesboro, Miss. Paratype from station 14205, in soft marl underlying ledge in gully about one-fourth of a mile north of Perdue Hill, Monroe County, Ala.

The character of the dentition excludes this shell from *Venericardia* s.s. "*Venericardia*" *serricosta* (Heilprin) is roughly similar in general form and sculpture, but the Tampa species is more inflated, the posterior area more clearly defined, the primaries a little more elevated, and the transverse beading on the tops of the primaries sharper. The subspecies in the Suwannee at Brooksville, Hernando County, Fla., may differ from "*V.*" *waynensis* in the more uniform sculpture on the posterior slope, but the two forms are very close indeed. The Suwannee species was described from incomplete, external molds. The species cited by Dall, 1916, in his report on the Flint River fauna under the name of *Cardita* (*Carditamera*) *shepardi* Dall is not the same as that which he described from the Tampa limestone in

1915, but a form very close to and possibly identical with *"Venericardia" waynensis*. *Venericardia* sp., Mansfield, 1938, from the A. L. Parrish farm, Washington County, Fla., is also a member of this compact group, widespread in the eastern Gulf in the late Oligocene. The race was probably continued through *Venericardia serricostata* Heilprin of the Tampa limestone into *Venericardia hadra* Dall and *V. himerta* Dall of the Alum Bluff group of Florida.

Occurrence.—Lower part of Chickasawhay marl. ALABAMA: Station 14205, in soft marl underlying ledge in gully about one-fourth of a mile north of Perdue Hill; station 10334, one-fourth of a mile northeast of Perdue Hill, Monroe County; station 14323, highest fossiliferous bed in ravine, 200 yards south-southwest of Jones' old plantation house, about 1 mile northwest of Glendon Station; stations 3640 and 7166, Tombigbee River, just south of Payne's Hammock, 10 miles south of Jackson; station 7165?, bluff east of Jackson-Rockville road, 200 yards north of Salt Creek, no. 5 of section, 4½ miles south of Jackson, Clarke County. MISSISSIPPI: Station 13239?, NW ¼ sec. 17, T. 8 N., R. 5 W., Bucatunna Creek locality; station 13396, hillside above mouth of Limestone Creek, near middle of section 25, T. 9 N., R. 7 W.; station 14286, just east of prisoners' house at State Quarry, 3 miles north-northwest of Waynesboro; station 14204, Taylor Mill Creek, just east of bridge on Highway 45, 1½ miles north of Waynesboro; station 14349, greensand bed of Chickasawhay River section, one-fourth mile downstream from bridge on Waynesboro-Laurel highway, 2½ miles west of Waynesboro, Wayne County.

"VENERICARDIA" sp.

Specifically indeterminate internal and external molds related in a general way to *"Venericardia" waynensis* Mansfield are common at station 14364, near the top of the Chickasawhay River section, one-fourth of a mile below the bridge on the Waynesboro-Laurel Highway, 2½ miles west of Waynesboro, Wayne County, Miss. They indicate a transversely elongate shell similar in form and dimensions to *"V." waynensis* and *"Venericardia" serricosta* (Heilprin), abundant in the Tampa limestone. The ribs, however, are grooved on either side of the beaded medial crest, giving a tripartite aspect to the costals. The flattening of the shell during the process of fossilization has probably exaggerated this effect.

The matrix is an indurated argillaceous sandstone with clear angular quartzes and pockets of loose sand and glauconite.

Genus CHAMA Linnaeus or Genus PSEUDOCHAMA Odhner

From the molds alone it is impossible to differentiate between *Chama* which is attached by the right valve and *Pseudochama* which is attached by the left.

Molds similar to *Chama* or *Pseudochama* sp. A, Mansfield, 1937, occur in the lower part of the Chickasawhay marl at the following localities: ALABAMA: Station 10334, one-fourth of a mile northeast of Perdue Hill, Monroe County. MISSISSIPPI: Station 14283, *"Chione* limestone" on top of hill on old road leading down to Limestone Creek, 3 miles north of Waynesboro; station 14282, blocks of *"Chione* limestone" along roadside, probably fallen down from station 14283.

Genus ANODONTIA Link ANODONTIA sp.

Specifically indeterminate internal molds of paired valves are common at a few localities in the higher Chickasawhay. In form and dimensions they are similar to *Lucina corpulenta* Dall, 1903, from the Chipola formation of Florida. Comparable molds are common at a number of localities in the Tampa limestone of Florida, but they run larger. An average mold from the upper Chickasawhay measures 35 mm in height, 37 mm in width, and 27 mm in diameter. The size is conspicuously uniform. No juveniles have been observed, and the largest mold noted was 45 mm high. Among the Tampa Anodontias there is one over 70 mm in height and many small, presumably immature individuals. More than one species of *Anodontia* may be represented in that assemblage, and there are many specimens which, in the few characters preserved, are identical with these from the upper Chickasawhay. Nothing of the sort has been recognized in the Suwannee limestone,

the Flint River formation, or the Byram marl. The genus is present, however, in the middle Eocene faunas of the Gulf province and probably continued to exist during the Oligocene.

Occurrence.—ALABAMA: Station 11088, Choctaw Bluff, Alabama River, Clarke County. MISSISSIPPI: Station 14285, bed above "*Chione* limestone," Limestone Creek Church locality, 4 miles north of Waynesboro; station 13241, center of sec. 18, T. 8 N., R. 5 W., Rocky Creek locality (1 specimen); station 14508, Bucatunna Creek, about 200 yards below Steep Hill Branch, SE ¼ sec. 18, T. 8. N., R. 5 W., bed no. 3 (1 specimen); station 14508*a*, bed no. 4 of the section at station 14508 (3 specimens); station 14289, near top of Chickasawhay River section, one-fourth of a mile downstream from bridge on Waynesboro-Laurel Highway, 2½ miles west of Waynesboro (very abundant); station 13237, NE ¼ SW ¼ sec. 10, T. 8 N., R. 7 W., elevation 140 to 145 feet; station 13238, NW ¼ NW ¼ sec. 25, T. 8 N., R. 7 W., oyster bed, elevation 126 feet, Wayne County.

Genus MYRTAEA Turton
Section MYRTAEA s.s.
MYRTAEA (MYRTAEA) TAYLORENSIS
Mansfield, n. sp.
Plate 25, figures 20, 21

Shell of moderate dimensions, thin, equivalve, subequilateral, and moderately inflated. Squarish in outline; the dorsal margins oblique and gently sloping; both the anterior and posterior margins truncate, the posterior more produced and not so close to the vertical as the anterior; ventral margin broadly and evenly arcuate. Lunule and escutcheon long, narrow, depressed, defined by an incised groove. Both the anterior and posterior areas depressed and defined, the anterior the more sharply. Surface crowded with moderately fine concentric lamellae, the edges more upright on the lateral areas and weakly spinose at the margins. Ligament groove narrow, produced about three-fourths of the length of the dorsal margin. A single, short, oblique, bifid cardinal tooth in the right valve; short, double sockets near the distal extremities to receive the bevelled margins of the lunule and escutcheon of the opposite valve. Two short, divergent laminar cardinals in the left valve; the margins of the lunule and escutcheon functioning as laterals. Interior feebly rayed. The anterior and posterior adductor scars distinct, the posterior the larger, both of them rudely elliptical in outline. Pallial line simple. Inner margins somewhat thickened, smooth.

Syntypes (U. S. Nat. Mus. 498540) measure: Right valve: Height, 9.0 mm; width 9.4 mm; convexity, 2.3 mm. Left valve of different individual: Height, 7.9 mm; width, 8.0 mm; convexity, 2.1 mm. From station 14204, lower bed of blue marl, just east of bridge on Highway 45, 1½ miles north of Waynesboro, Wayne County, Miss.

Lucina vicksburgensis Casey from the Mint Spring marl member of the Marianna limestone is a less finely and sharply sculptured little shell, and the lunule is shorter and deeper than that of *Myrtaea taylorensis*. *Myrtaea limoniana* Dall, 1903, described from the Bowden marl, is broadly similar in size and sculpture pattern, but it is less angular in outline.

In America *Myrtaea* is first recognized in the Eocene and continues through the middle and later Tertiary to the Recent and is living today in temperate and tropical seas.

Myrtaea (*Myrtaea*) *taylorensis* is common at the type locality, but it has not been found elsewhere.

Genus MILTHA H. and A. Adams
MILTHA sp. cf. M. CHIPOLANA Dall
Plate 25, figure 23

Phacoides (*Miltha*) cf. *P. chipolana* Dall. MANSFIELD, *1938*, Washington Acad. Sci., Jour., vol. 28, no.3, p. 104, fig. 10.

Poorly preserved but apparently closely related fragments of *Miltha* have been recovered from a number of localities in the upper Oligocene from Florida to western Alabama. They have much in common with *Phacoides* (*Miltha*) *chipolanus* Dall from the Chipola and Oak Grove formations but seem slightly more elevated in the umbonal area. The form cited in 1938 was from the Suwannee limestone at station 12723, on the A. L. Parrish farm, 3½ miles southeast of Wausau, Washington County, Fla. An external mold also from the Suwannee

limestone from station 12317, 10.2 miles northwest of Brooksville, Hernando County, Fla., may be conspecific. Incomplete shells which are not separable from the Suwannee molds occur in the lower Chickasawhay at station 14205 in the soft marl directly beneath the ledge in a gully one-fourth of a mile north of Perdue Hill, Monroe County, Ala. A fragment of a right valve (U.S.N.M. 498541) showing the characteristic dorsal area is figured.

MILTHA sp. cf. M. HILLSBOROENSIS (Heilprin)

The holotype of *Miltha hillsboroensis* (Heilprin) is a Tampa limestone shell. The species was recorded from the Flint River formation of Georgia by Dall, 1916, and at a number of localities in the Suwannee limestone of Florida by Mansfield, 1937. Poorly preserved molds in the lower Chickasawhay are probably conspecific. Such molds have been found at the following localities: ALABAMA: Station 7165, bed no. 5, bluff east of the Jackson-Rockville road, 200 yards north of Salt Creek, 4½ miles south of Jackson; station 7166, east bank of Tombigbee River, just south of Payne's Hammock, Clarke County. MISSISSIPPI: Station 13386, hill above quarry at mouth of Limestone Creek, 3 miles northwest of Waynesboro; station 14282, blocks of "*Chione* limestone" along side road of Limestone Creek, 3 miles north of Waynesboro; station 14519, old road, east side of new road, south of Limestone Creek, about halfway up the hill; station 14349, glauconitic bed near base of Chickasawhay River section, one-fourth mile downstream from bridge on Waynesboro-Laurel road, 2½ miles west of Waynesboro, Wayne County.

MILTHA? HERNANDOENSIS Mansfield
Plate 25, figure 35

Phacoides (Miltha?) hernandoensis MANSFIELD, *1937*, Florida Geol. Survey, Bull. 15, p. 245, pl. 17, figs. 2, 7.

The syntypes of *Miltha? hernandoensis* Mansfield are from the Suwannee limestone at station 12758, Camp Concrete rock quarry, 5.9 miles northeast of Brooksville, Hernando County, Fla. An external mold of a left valve (U.S.N.M. 498542) collected from the lower part of the Chickasawhay marl agrees with the Suwannee species in all the characters revealed. The Chickasawhay locality is station 14519, an old road leading down to Limestone Creek, from a bed about halfway up the hill and about 3 miles north of Waynesboro, Wayne County, Miss.

Genus DIVARICELLA von Martens

DIVARICELLA sp.
Plate 25, figure 33

Two valves of the genus *Divaricella* have been taken from stations near Perdue Hill, Monroe County, Ala.; the figured specimen from station 10334, the limestone ledge one-fourth mile northeast of Perdue Hill, and another from station 14205, the bluish gray marl beneath the ledge one-fourth mile north of Perdue Hill. They do not agree specifically with any described species. Indeed, except for *Lucina (Cyclas) subrigaultiana* Meyer, 1886, a larger and less inflated shell from the "Lower Vicksburgian" at Vicksburg, Miss., no Divaricellas have been described from the Oligocene of the East Coast and Gulf provinces. There is, however, an undescribed species recorded by Mansfield, 1937, in the Suwannee limestone at station 12758, about 5 miles northeast of Brooksville, Hernando County, and a similar form at station 12723, the upper bed on the H. L. Parrish place, 3½ miles southeast of Wausau. The specimens from Perdue Hill seem identical with that from Brooksville, but both the Perdue Hill and Brooksville individuals seem more coarsely sculptured than that from Wausau. *Divaricella chipolana* Dall, 1903, is larger and less convex than the Suwannee species and superficially less closely allied than *Divaricella waltoniana* Gardner, 1926, of the later Shoal River fauna.

The figured squeeze of an external mold of a left valve, U.S.N.M. 498543, is 10–11 mm high and 11–12 mm wide.

Genus DIPLODONTA Bronn

DIPLODONTA sp. cf. D. ALTA ANCLOTENSIS Mansfield
Plate 25, figure 15

The holotype of *Diplodonta alta anclotensis* Mansfield is from the Tampa limestone at Tarpon Springs, Fla. An internal

mold of paired valves, (U.S.N.M. 498544) similar in a general way but more narrow and produced anteriorly were taken from the lower part of the Chickasawhay marl at station 14281, the "*Chione* limestone" below the bridge at Taylor Mill Creek, on Highway 45, 1½ miles north of Waynesboro, Wayne County, Miss. Less inflated forms more closely resembling *Diplodonta alta* Dall, also from the Tampa limestone, occur at stations 14204, the lower bed of blue marl below the "*Chione* limestone" of station 14281, and at station 14205, in the soft marl under the limestone ledge in the gully one-fourth mile north of Perdue Hill, Monroe County, Ala. Molds indicating possibly a related species occur in the upper Chickasawhay at station 14287, at the waterfall on Patton Creek, one-fourth mile above Highway 45, 1½ miles east of Waynesboro.

The height of the figured mold is 18.5 mm; the width, 20.0 mm; the diameter, 13.0 mm.

Subgenus SPHAERELLA Conrad
DIPLODONTA (SPHAERELLA?) WAYNENSIS
Mansfield, n. sp.
Plate 25, figure 12

Shell small, rounded, strongly inflated, equivalve and nearly equilateral. Umbones gibbous, incurved and prosogyrate, slightly anterior in position. Anterior dorsal margin higher and shorter than the sloping posterior shoulder; anterior lateral margin broadly arcuate, rounding smoothly into the upcurved base, the posterior lateral margin more oblique. Surface corroded, but obscure traces of growth wrinkles remaining. Characters of interior not known.

Holotype (paired valves, U. S. Nat. Mus. 498545) measures: Height, 14.0 mm; width, 14.0 mm; diameter, 11.0; mm. From lower part of Chickasawhay marl at station 14516, base of glauconitic bed in Chickasawhay River section, about 800 feet below the bridge on the Waynesboro-Laurel road, 2½ miles west of Waynesboro, Wayne County, Miss.

The reference of *Diplodonta waynensis* to the subgenus *Sphaerella* is uncertain. Superfically *Sphaerella* may be separated from *Diplodonta* by the thin, highly inflated shell and conspicuous umbones. The most significant differences, however, are to be found in the hinge, which in *D. waynensis* is inaccessible.

There is nothing in the upper Oligocene very close to this relatively small, high, and highly inflated species. *Diplodonta catopotium* Dall from the Tampa limestone is little more than half the size of the Chickasawhay form, and the beaks are much lower. The species which it most strongly resembles is *Diplodonta* (*Sphaerella*) *turgida* (Conrad), 1848, from the Red Bluff clay and the Mint Spring marl. *Diplodonta waynensis* is higher than the lower Oligocene species, not quite so strongly inflated, and with a less evenly rounded posterior lateral margin.

The type of *Diplodonta* (*Sphaerella*?) *waynensis* is unique.

Genus CARDIUM Linnaeus
Subgenus TRACHYCARDIUM Mörch
CARDIUM (TRACHYCARDIUM?) sp. A
Plate 25, figure 38

Specifically indeterminate internal and incomplete external molds of the old *Cardium*, s.l., are widespread in the upper Oligocene of western Alabama and southern Mississippi. Of the majority of the individuals only a few superficial characters remain, and they contribute little to the knowledge of the fauna. There was, obviously, a large *Cardium* representation in the lower Chickasawhay including probably a considerable number of species, some of them common. The figured squeeze of the left valve (U.S.N.M. 498548) probably referable to *Trachycardium* indicates a strongly inflated, subovate to suborbicular shell with an evenly rounded anterior lateral margin and a fairly well differentiated posterior area. There are 38 sharply rounded or obtusely V-shaped ribs, six of them on the posterior slope. A few traces remain of a rather strong concentric wrinkling near the distal extremities of the ribs, but other costal ornamentation, if it was ever developed, has been lost. The height of the shell was probably about 25 mm and the width approximately equal to the height. The mold is from station 14349, the glauconitic bed near the base of the Chickasawhay River section, one-fourth mile downstream from the bridge on the Waynes-

boro-Laurel Highway, 2½ miles west of Waynesboro, Miss.

Cardium precursor Dall from the lower Vicksburg is less strongly inflated, the ribs seem less crowded, and the intercostal channels more flattened. *Cardium eversum* Conrad, 1848, also from the Mint Spring marl member of the Marianna limestone, is relatively higher, more inflated, with more numerous, more rounded, and more closely spaced ribs. *Cardium* (*Trachycardium*) *hernandoense* Mansfield, 1937, from the Suwannee limestone is similar to *C. eversum* in relative dimensions and general outline, and the rib count runs up to 50. It is possible that the Chickasawhay species may be represented by those forms cited by Mansfield (1938, p. 104, figs. 7, 13) under the name of *Cardium* (*Trachycardium*) aff. *C. hernandoense* Mansfield from the Suwannee limestone of station 12723, the A. L. Parrish farm, 3½ miles southeast of Wausau, Washington County, Fla. Some of the Suwannee forms, however, seem closer to *Cardium precursor* Dall than anything indicated in the lower Chickasawhay.

Apparently similar Cardia were collected at station 13396, the hillside above the mouth of Limestone Creek, near the middle of sec. 25, T. 9 N., R. 7 W., and at station 14281, the "*Chione* limestone" at Taylor Mill Creek below the bridge on Highway 45, 1½ miles north of Waynesboro. The *Cardium* at station 14348, near the base of the Chickasawhay River section, one-fourth mile below the highway bridge on the Waynesboro-Laurel road, 2½ miles west of Waynesboro, does not have so many ribs, and there is a relatively higher *Cardium* with fewer ribs at station 14519, the old road on the east side of the new road south of Limestone Creek, about half-way up the hill, and at station 13386, the hill above the quarry at the mouth of Limestone Creek, Wayne County, Miss. Relatively higher Cardia with a higher rib count occur at a number of localities: Station 14205*a*, the overlying limestone in the gully about one-fourth mile north of Perdue Hill, Monroe County; station 14323, highest fossiliferous bed in ravine 200 yards south-southwest of Jones' old plantation house, about 1 mile northwest of Glendon Station; stations 7165 and 14322, uppermost fossiliferous bed on north side of Salt Creek on Jackson-Rockville road, sec. 34, T. 6 N., R. 2 E., 4½ miles south of Jackson, Clarke County, Ala.; station 14283, the "*Chione* limestone" at the top of the hill on the old road leading down to Limestone Creek, 3 miles north of Waynesboro; station 14282, blocks of "*Chione* limestone" along the road side which have probably fallen from station 14283; station 14281, the "*Chione* limestone," Taylor Mill Creek, below bridge on Highway 45, 1½ miles north of Waynesboro; station 13239, the NW ¼ sec. 17, T. 8 N., R. 5 W., Wayne County, Mississippi. A somewhat similar form retaining traces of costal nodes is associated with apparently simple ribbed forms at station 10334, one-fourth of a mile northeast of Perdue Hill, Monroe County, Ala. A less inflated, possibly somewhat oblique, multicostate species is indicated by molds from station 14293, at Weaver Chute on the east bank of the Conecuh River, sec. 18, T. 2 N., R. 13 E., Escambia County, Alabama.

Incerta sedis

There are a number of Cardia in the lower Chickasawhay, too imperfectly preserved to figure or to describe. A species between 45 and 50 mm high, with about 30 apparently smooth, flattened ribs is dimly recorded at station 14205*a*, the overlying limestone in a gully about one-fourth mile north of Perdue Hill, Monroe County, Alabama. There are a number of other ovate and ovate-trigonal *Cardium* molds at different horizons in the lower Chickasawhay, some with decorated ribs, others with no obvious costal ornamentations. Fragments of ribs with hooded imbrications similar to those of *Cardium* (*Trachycardium*) *glebosum* Conrad were collected at station 7211 on the east bank of Murder Creek, about 3 miles north of Castleberry, Conecuh County. A somewhat similar species occurs at station 7166, just south of Payne's Hammock on the Tombigbee River, Clarke County, Alabama. Another interesting but very imperfectly known *Cardium* occurs at station 7166, a species 30–35 mm high and 25–30 mm broad, with highly decorated, crowded ribs that must number well above 50. There is no other described spe-

cies from a comparable horizon in which the costals are so numerous and so highly adorned. Nothing like it occurs at any other locality in the upper Oligocene.

Subgenus CERASTODERMA Mörch
Section DINOCARDIUM Dall
CARDIUM sp. cf. C. (CERASTODERMA) PHLYCTAENA Dall
Plate 25, figures 34, 45

The synonomy of *Cardium* (*Cerastoderma*) *phlyctaena* Dall is as follows:

Cardium (*Cerastoderma*) *phlyctaena* DALL, *1900*, Wagner Free Inst. Sci., Trans., vol. 5, p. 1097, pl. 48, fig. 13.
Cardium (*Cerastoderma*) *phlyctaena* DALL, *1915*, U. S. Nat. Mus., Bull. 90, p. 144, pl. 25, fig. 10.
Cardium (*Thrachycardium*) *phlyctaena* Dall. MANSFIELD, *1937*, Florida Geol. Survey, Bull. 15, p. 253.

External molds closely comparable to *Cardium phlyctaena* Dall of the Tampa limestone occur in considerable abundance at station 14287, the waterfall on Patton Creek, one-fourth mile above Highway 45, 1½ miles east of Waynesboro, Miss. The characters retained, however, are not sufficient to make a determination sure. The rib counts in the Florida and Mississippi shells are similar and so, in a general way, are the ornamentations on the ribs, although the placement of the spines on the posterior ribs seems to be at the ventral margin in the Mississippi form and at the dorsal margin in the type of *C. phlyctaena*. The Patton Creek molds also seem to indicate a rather more inflated species than that described by Dall, and the angle between the anterior dorsal and lateral margins seems less obtuse than *C. phylctaena*.

The figured squeeze of the external mold of a left valve is U. S. Nat. Mus. 498549.

There is no record of the species at any other locality.

Genus TRIGONIOCARDIA Dall
TRIGONIOCARDIA sp., cf. TRIGONIOCARDIA GADSDENENSE (Mansfield)

A single incomplete specimen of *Trigoniocardia* was collected in the lower part of the Chickasawhay marl at station 7166, bed no. 3 of the section on the east bank of the Tombigbee River just south of Payne's Hammock, Clarke County, Alabama. This left valve (U.S.N.M. 498546) cannot in its present poorly preserved state be separated from molds and shell fragments from the Suwannee limestone in northern Florida segregated by Mansfield, 1937, under the name *Cardium* (*Trigoniocardia*) aff. *C. gadsdenense* Mansfield. They were considered distinct from *C. gadsdenense* s.s. because of the more rounded keel and more widely spaced ribs.

Genus NEMOCARDIUM Meek
NEMOCARDIUM DIVERSUM WAYNENSE Mansfield, n. subsp.
Plate 25, figures 27, 28

Holotype, a right valve, crushed at the umbone so that it appears relatively lower and wider than it would be in a perfect state. Shell very thin and fragile, evenly inflated along both the vertical and the horizontal axes. Anterior lateral margin smoothly rounding into the arcuate base; ventral margin not depressed in front of the posterior area. Posterior lateral margin truncate, the posterior area strikingly defined by the sculpture, probably feebly concave. Entire medial portion of shell finely lineated radially, the radials overrun and cancellated by an even finer concentric imbrication, faintly visible beneath the surface veneer. Radials not quite so fine toward the anterior dorsal margin and absent upon a very narrow area adjacent to the margin. Posterior area threaded with about 29 lirae minutely beaded by the incrementals, the three or four posterior lirae veiled by the surface polish, and adjacent to the dorsal margin a smooth band even more narrow than that which parallels the anterior dorsal margin. Characters of hinge and interior not known but probably similar to those of *Nemocardium diversum* (Conrad).

Holotype (U. S. Nat. Mus. 498547, a right valve) measures: Height, 23 mm; width, 25 mm; convexity, 10 mm. From station 14204, lower blue marl east of bridge over Taylor Mill Creek, on Highway 45, 1½ miles north of Waynesboro, Wayne County, Miss.

The subspecies *waynense* differs from *Nemocardium diversum* s.s., described by Conrad from the Byram marl at Vicksburg, in the finer radial sculpture on the posterior

area and the absence of the constriction in front of the posterior keel, which tends to sinuate the base line. The radial threads on the posterior area of *N. diversum* range in number from 20 to 25; those on the subspecies *waynense* average about 29; and the concentric laminae seem less faint and more closely spaced in the subspecies. The molds seem much higher relatively than the holotype, probably because of the crushing of the holotype in the umbonal area. Molds of *Nemocardium* from the Suwannee limestone of Hernando County, Florida may be related.

Occurrence.—Lower part of Chickasawhay marl. ALABAMA: Station 6735?, east end of wagon bridge over Murder Creek east of Castleberry, Conecuh County (internal and incomplete external molds). Station 14205*a*, limestone ledge in gully about one-fourth mile north of Perdue Hill, Monroe County; station 14291?, railroad and road cut about 1.3 miles north of Millry, Washington County. MISSISSIPPI: Station 14284?, just north of Limestone Creek on new highway, 3 miles north of Waynesboro (one external mold); station 13396, hillside above mouth of Limestone Creek near middle of sec. 25, T. 9 N., R. 7 W.; station 14204, lower bed of blue marl just east of bridge over Taylor Mill Creek, on Highway 45, 1½ miles north of Waynesboro; stations 14347 and 14281, "*Chione* limestone" overlying blue marl at station 14204; station 13239, NW ¼ sec. 17, T. 8 N., R. 5 W., Bucatunna Creek locality, Wayne County.

Genus MACROCALLISTA Meek
Subgenus CHIONELLA Cossmann
MACROCALLISTA (CHIONELLA?) sp. cf. M. (CHIONELLA) SOBRINA (Conrad)
Plate 25, figure 22

A slightly damaged right valve from the lower Chickasawhay at station 14205 (the soft marl beneath the limestone ledge, one-fourth mile north of Perdue Hill, Monroe County, Ala.) may be referable to *Macrocallista* (*Chionella?*) *sobrina* (Conrad), abundant in the Byram marl at Vicksburg, Miss. The shell of the Perdue Hill species seems a little lighter than that of *M. sobrina*, and the umbone more narrow and pointed. *Macrocallista tia* Kellum from the Trent marl of North Carolina is heavier and more compact than both *M. sobrina* and the Perdue Hill specimen, with a shorter posterior margin and broader, more rounded umbones.

The figured right valve (U.S.N.M. 498550) is the only one of its kind that has been recognized. The height is 23.5 mm; the width, 27.0 mm.

The subgenotype of *Chionella* is *Cytherea ovalina* Lamarck, from the Calcaire grossier of the Paris Basin. The dimensions and outline of *C. ovalina* are similar to those of *M. sobrina*, but the shell is much thinner and the hinge more delicate.

MACROCALLISTA (CHIONELLA?) PERDUENSIS Mansfield, n. sp.
Plate 25, figures 19, 30, 31

Shell small for the genus and rather thin, polished and porcellaneous in the fresh specimen, transversely elongate-ovate in outline. Beaks rather small and low, turned inward and forward, anterior in position. Lunule rather long, not very wide, cordate, defined by an incised linear groove. Anterior lateral margin arching smoothly outward in front of lunule. Posterior lateral margin produced and narrowly rounded at its extremity. Base line feebly arcuate medially, upturned anteriorly. Outer surface wrinkled and striated incrementally but with no definite sculpture pattern. Characters of interior imperfectly known but apparently similar to those of *M.* (*Chionella?*) *sobrina* (Conrad).

Syntypes measure: Right valve (U. S. Nat. Mus. 498551): Height, 17.5 mm; width, 27.5 mm. Left valve (U. S. Nat. Mus. 498552): Height, 18.0 mm; width, 27 ± mm. Topotype (U. S. Nat. Mus. 498553, a left valve): Height, 18.5 mm; width, 25.0 mm. From the lower part of the Chickasawhay marl at station 14205, soft blue marl beneath limestone ledge, one-fourth mile north of Perdue Hill, Monroe County, Ala.

Macrocallista (*Chionella?*) *perduensis* suggests a rather thin, compressed, and posteriorly produced *Macrocallista* (*Chionella?*) *sobrina* (Conrad). It is much smaller than the Miocene species *M. acuminata* Dall from the Chipola formation of Florida and smaller than the subquadrate *M. minuscula*

Kellum from the Trent marl at Silverdale, North Carolina. The transversely elongate Tampa species, *M. floridana* (Conrad), however, is a smaller and lower shell than *M. perduensis*. *Macrocallista* (*Chionella?*) *perduensis* is fairly common at the type locality but has not been recognized elsewhere unless an internal mold of a right valve from station 14349 (the glauconitic bed near the base of the Chickasawhay River section, one-fourth mile downstream from the highway bridge on the Waynesboro-Laurel road, 2½ miles west of Waynesboro) should be referred to this species. In outline the mold seems about midway between *M. sobrina* and *M. perduensis*.

Genus CHIONE Megerle von Mühlfeld
Subgenus CHIONE s. s.
CHIONE (CHIONE) BAINBRIDGENSIS Dall
Plate 25, figure 46

Chione bainbridgensis DALL, *1916*, U. S. Nat. Mus., Proc., vol. 51, p. 499, pl. 84, fig. 5 (holotype), fig. 6 (paratype).
Chione aff. *C. bainbridgensis* Dall. MANSFIELD, *1937*, Florida Geol. Survey, Bull. 15, p. 269 (in part).
Chione cf. *C. spenceri* MANSFIELD, *1938*, Washington Acad. Sci., Jour., vol. 28, no. 3, p. 105, fig. 8. Not *Chione spenceri* Cooke, 1919.

The holotype of *Chione bainbridgensis* Dall is a fragment of the posterior part of the shell, and the paratype is a squeeze of an external mold. The paratype shows the character of the original shell much better than the holotype. My first interpretation of the relationship of the specimens from 3½ miles southeast of Wausau, all of them external molds, was that they were more closely related to *C. spenceri* Cooke from Antigua, Leeward Islands, than to *C. bainbridgensis* Dall. *Chione bainbridgensis* and *C. spenceri* are closely related to each other, but the Antiguan shell is a little lower and more elongate, the beaks are more flattened on their summits, and there is a feeble depression in front of the posterior dorsal border which I have not observed on the specimens from Bainbridge.

Later collections from Bainbridge made by August F. Foerste are better preserved than Dall's type material. The figured mold of the right valve (U.S.N.M. 498554) is from station 14205*a*, one-fourth mile north of Perdue Hill, Clarke County, Alabama.

The species is commonly represented in the Flint River formation at several places near Bainbridge, Ga., in the Suwannee limestone at station 12723, 3½ miles southeast of Wausau, Washington County, and several places cited by Mansfield (1937) under *Chione* aff. *C. bainbridgensis* Dall. Juveniles and incomplete molds from the Tampa limestone are only tentatively referred to *C. bainbridgensis*. The specimens from the Tampa limestone at station 12292, Cherokee Sink, Wakulla County, Florida, may be conspecific with those from the upper Chickasawhay at station 14287, Patton Creek, 1½ miles east of Waynesboro, Miss.

Chione bainbridgensis is widely distributed in the lower part of the Chickasawhay marl in western Alabama and eastern Mississippi.

Occurrence.—Lower part of Chickasawhay marl. ALABAMA: Stations 6758 and 14292, south bank of Yellow River, site of Watson [Watkins] and Henderson bridge, sec. 13, or 14, T. 1 N., R. 15 E., Covington County; Stations 2398 and 14025*a*, limestone in gully about one-fourth mile north of Perdue Hill; station 10334, one-fourth mile northeast of Perdue Hill, Monroe County; station 14323, highest fossiliferous bed in ravine 200 yards south-southwest of Jones' old plantation house, about 1 mile northwest of Glendon Station; stations 7165 and 14322, uppermost fossiliferous bed 200 yards north of Salt Creek, on Jackson-Rockville road, 4½ miles south of Jackson; station 7166, east side of Tombigbee River, just south of Payne's Hammock, Clarke County. MISSISSIPPI: Station 14283, "*Chione* limestone" from the top of hill on old road leading down to Limestone Creek, 3 miles north of Waynesboro; station 14282, blocks of "*Chione* limestone" along roadside, probably fallen from station 14283; station 14519, old road on east side of new road, south of Limestone Creek, about halfway up the hill; station 14204, lower bed of blue marl, just east of bridge on Highway 45, 1½ miles north of Waynesboro; station 14281, "*Chione* limestone" overlying marl at station 14204; station 14360, *Kuphus* bed near base of Chickasawhay River section, one-fourth mile downstream from bridge on Waynesboro-Laurel road, 2½

miles west of Waynesboro; station 14348, sandstone near base of Chickasawhay River section; stations 14349, 14361, and 14362, glauconitic sands in lower part of Chickasawhay River section; station 14363?, glauconitic clays and sands in middle part of Chickasawhay River section; station 13239?, NW ¼ sec. 17, T. 8 N., R. 5 W., Bucatunna Creek, Wayne County.

Upper part of Chickasawhay marl: MISSISSIPPI: Station 14287?, waterfall on Patton Creek, one-fourth mile above Highway 45, 1½ miles east of Waynesboro, Wayne County, (two incomplete molds).

Subgenus LIROPHORA Conrad
CHIONE (LIROPHORA) PERDUENSIS
Mansfield, n. sp.
Plate 25, figures 41, 42, 44

Shell growing large for the genus, high, transversely ovate-trigonal in outline, rather strongly inflated. Umbones full, acutely tapering, bent forward and inward. Anterior lateral margin sweeping outward and downward in a strong, smooth arc and merging into the upcurved base. Posterior dorsal margin obliquely produced from the umbones to the short, truncate lateral margin. Lunule long, cordate in the double valves, defined by a deeply incised groove, wrinkled by the incrementals. Escutcheon produced the length of the dorsal margin, lanceolate, obliquely chased with fine, low-lying growth laminae. Umbonal area concentrically laminated, the anterior and medial parts of the shell heavily ribbed, the lamellae becoming increasingly wide and prominent; the free edges on the adult shell curved backward toward the umbones, pinching out on the dorsal area into narrow flanges, which disappear abruptly at the margin of the escutcheon. Thickened edges and concave dorsal faces of lamellae smooth, the lower two-thirds of the ventral margin and the basal edge of the valve closely fluted with strong, upright, rounded riblets. Interlamellar spaces smooth except for faint radial and growth striae. Inner lateral and basal margins from the beak to the distal extremity of the escutcheon finely crenate. Interior of right valve not known. Ligament groove deep, produced about half the length of the posterior dorsal margins. Anterior cardinal short, rather slender and oblique, the medial cardinal short, deltoid, broken in the holotype; the posterior cardinal laminar and produced, fused with the ventral base of attachment of the ligament. Muscle scars distinct. Pallial line rather distant from the margin, the sinus short and acutely angulated.

Holotype (an almost perfect left valve, U. S. Nat. Mus. 498555) measures: Height, 20.0 mm; width, 22.5 mm; convexity of single valve, 8.0 mm. Paratype (the external mold of a left valve, U. S. Nat. Mus. 498556) measures: Height, 29.0 mm; width, 35.0 mm. Holotype from station 14205, blue marl underlying limestone ledge in gully one-fourth mile north of Perdue Hill, Monroe County, Ala. Paratype from station 14281, "*Chione* limestone," Taylor Mill Creek, 1½ miles north of Waynesboro, Wayne County, Miss.

Chione perduensis recalls *Chione* (*Lirophora*) *victoria* Dall of the lower Vicksburg, from which the later Gulf Oligocene *Lirophora* presumably stemmed. The holotype of *C. victoria* is much more closely ribbed than the Perdue Hill species, and the fluting on the base of the outer surface of the ribs much stronger and more consistently developed. *Chione ballista* Dall of the Tampa limestone fauna more closely resembles in general aspect the lower Oligocene species from western Mississippi than it does the upper Oligocene form from western Alabama and eastern Mississippi. Molds from station 14322 indicate a species closely related to *C. perduensis* but relatively higher and with more widely spaced concentric lamellae.

Occurrence.—Lower part of the Chickasawhay marl. ALABAMA: Station 14205, soft marl under limestone ledge in gully about one-fourth mile north of Perdue Hill, Monroe County; station 14205*a*, limestone in gully about one-fourth mile north of Perdue Hill; station 10334, one-fourth mile northeast of Perdue Hill, Monroe County; station 7163, gully north of Walker Springs-Jackson road, 1 mile north of Glendon. MISSISSIPPI: Station 14283, "*Chione* limestone," top of hill on old road leading down to Limestone Creek, 3 miles north of Waynesboro; station 14282, blocks of "*Chione* limestone" along roadside probably fallen from station 14283; station

13396, hillside above mouth of Limestone Creek, near middle of sec. 25, T. 9 N., R. 7 W.; station 14281, "*Chione* limestone" below bridge at Taylor Mill Creek, on Highway 45, 1½ miles north of Waynesboro.

Subgenus CHAMALEA Mörch

CHIONE (CHAMALEA) CATUNNA Mansfield, n. sp.

Plate 25, figures 47, 48

Shell rather large, transversely ovate, inequilateral, moderately inflated. Posterior dorsal margin obliquely produced, the lateral and ventral margins apparently rounded on some individuals more strongly than on others. Characters of the lunule and escutcheon not known from the molds. Sculpture fairly sharp and regular in the umbonal region, the laminae becoming less regular and more crowded on the ventral half of the shell. Interlaminar spaces concentrically striated, with occasional fortuitous radial markings across the umbones. Inner margins crenate. Other characters of interior not known.

External molds of syntypes (a right and a left valve of two different individuals, from station 14508*a*, bed no. 4, on Bucatunna Creek, about 200 yards below Steep Hill Branch, SE¼ sec. 18, T. 8 N., R. 5 W., Wayne County, Mississippi, U. S. Nat. Mus. 498557) measure: Right valve: Height, 21 mm; width, 26 mm. Left valve: Height, 23 mm; width, 27 mm.

The absence of a defined radial sculpture and the relatively feeble and irregular concentric sculpture will readily isolate *Chione catunna* from the other described *Chione* in the lower Chickasawhay. *Chione* (*Chamalea*) *rhodia* from the Tampa limestone is similar in general form, and like *C. catunna* is sharply and distantly corded in the umbonal region. The Tampa limestone species is more compressed than that from Bucatunna; it is more flattened toward the umbones, and the tips of the umbones are more strongly prosogyrate than in *C. catunna*.

Occurrence.—Lower part of Chickasawhay marl. MISSISSIPPI: Station 14508, Bucatunna Creek, about 200 yards below Steep Hill Branch, SE ¼ sec. 18, T. 8 N., R. 5 W., bed no. 3; station 14508*a*, bed no. 4 of the section at station 14508; station 13241, sec. 18, T. 8 N., R. 5 W., Wayne County.

CHIONE (LIROPHORA) sp.

Plate 25, figure 43

Two crushed left valves of *Chione* (*Lirophora*), closely related to *Chione* (*Lirophora*) *perduensis*, were recovered from the lower blue marl at station 14204, east of the bridge over Taylor Mill Creek on Highway 45, 1½ miles north of Waynesboro, Miss. One of these (U.S.N.M. 498558) has been figured. The sculpture is similar to that of *C. perduensis*, and the relative dimensions are distorted by crushing, so that the shell seems lower in the figure than it really was. There were, however, certain original differences in the outline of the anterior and ventral margins of the two forms that may be of taxonomic significance. At Perdue Hill in Clarke County, Ala., it does not seem possible to separate the *Chione* (*Lirophora*) in the limestone from that in the marl beneath, although the earlier form is the smaller. The valves from the marl on Taylor Mill Creek are about the size of the holotype from the lower bed at Perdue Hill, and the "*Chione* limestone" overlying the marl on Taylor Mill Creek has furnished the paratype of *Chione perduensis*. Examples of *C. perduensis* might, therefore, be reasonably expected from the marl underlying the limestone at Taylor Mill Creek as well as at Perdue Hill.

Genus CORBULA (BRUGUIÈRE) Lamarck

Subgenus CORBULA s. s.

CORBULA (CORBULA) LAQUEATA Casey?

Plate 26, figures 8, 10

Corbula laqueata CASEY, *1903*, Acad. Nat. Sci. Philadelphia, Proc., p. 261.

The name was used by Conrad in manuscript and in check lists but had no standing until Casey's description was published.

Two small right valves (U.S.N.M. 498560) suggesting *Corbula laqueata* in miniature were collected at station 14204, the lower blue marl east of the bridge on Taylor Mill Creek, on Highway 45, 1½ miles north of Waynesboro, Miss. The larger valve is only 3.2 mm high by 3.8 mm wide, and the smaller is 3.0 mm high by 3.2 mm wide, a little more than half the size of the average *C. laqueata*. The sculpture seems to run farther up on the beaks on the eastern

Mississippi forms than it does in the Vicksburg species, and though the identity of the Wayne County and Vicksburg specimens is by no means established, the relationship must certainly be close.

Similar right valves occur at the following localities in the lower part of the Chickasawhay marl: ALABAMA: Station 7165, bed no. 5 of the section 200 yards north of Salt Creek on the Jackson-Rockville road, 4½ miles south of Jackson, Clarke County. MISSISSIPPI: Station 13396, hillside above mouth of Limestone Creek, near middle of sec. 25, T. 9 N., R. 7 W.; stations 14349 and 14362, glauconitic bed near base of Chickasawhay River section, one-fourth mile downstream from bridge on Waynesboro-Laurel road, 2½ miles west of Waynesboro, Wayne County.

Subgenus CARYOCORBULA Gardner
CORBULA (CARYOCORBULA) TAYLORENSIS
Mansfield, n. sp.
Plate 25, figures 29, 32, 37

Shell rather small, moderately heavy; inequilateral, not conspicuously inequivalve, but the right valve slightly larger and less compressed than the left. Outline transversely ovate, the base line of the right valve more flexuous than that of the left, and the depression in front of the acute posterior keel more marked. Posterior area feebly concave in both valves, the posterior dorsal margin more elevated in the right valve. Umbones subcentral, flattened, the beaks turned inward and forward. Anterior end broadly rounded, the posterior narrow and obliquely truncate. Both the right and the left valves concentrically wrinkled, the rugae absent upon the umbonal third, finer and more crowded in the left valve, dying out abruptly on the rostrum in both valves. Posterior area sculptured only with sharp growth laminae. Ligament internal, mounted on a cuneate condrophore projecting from the dorsal margin of the right valve and received in the umbonal socket of the left. Right cardinal heavy, trigonal, flattened on the ventral surface, upcurved at the tip, received in a correspondingly wide socket beneath the left umbone. Mantle cavity excavated. Adductor scars distinct, especially the posterior, which is thickened and semielliptical in outline. Pallial line obscure, entire, nearer to the base posteriorly than anteriorly. Gutter near the margin of the right valve indicating the line of closure of the left and running very close to the edge except on the posterior ventral part.

The three syntypes (U. S. Nat. Mus. 498559) measure: First right valve: Height, 5.5. mm; width, 8.0 mm; left valve: Height, 5.0 mm; width, 7.3 mm; second right valve: Height 5.7 mm; width 8.0 mm. From station 14204, blue marl east of bridge over Taylor Mill Creek, on Highway 45, 1½ miles north of Waynesboro, Wayne County, Miss.

Corbula taylorensis is closely related to *Corbula engonata* Conrad described from Vicksburg. However, it is a higher shell than *C. engonata*, and the concentric sculpture is finer and more regular.

Occurrence.—Lower part of Chickasawhay marl: MISSISSIPPI: Stations 14204 and 14346, lower bed of blue marl at Taylor Mill Creek, on Highway 45, 1½ miles north of Waynesboro; station 14349?, glauconitic bed near base of Chickasawhay River section, one-fourth mile downstream from bridge on Waynesboro-Laurel road, 2½ miles west of Waynesboro (internal mold only); station 14363?, glauconitic clay in middle part of the Chickasawhay River section, one-fourth mile downstream from bridge on Waynesboro-Laurel road, 2½ miles west of Waynesboro, Wayne County.

Genus PANOPE Menard de la Groye
PANOPE TAYLORENSIS Mansfield, n. sp.
Plate 25, figure 49

Panope cf. *P. parawhitfieldi* Gardner. MANSFIELD, *1938*, Washington Acad. Sci., Jour., vol. 28, no. 3, p. 107, fig. 19.

The internal mold cited in 1938 was a juvenile from the Suwannee limestone at station 12723, the A. L. Parrish farm, 3½ miles southeast of Wausau in Washington County, Fla. The present collection from the lower Chickasawhay includes an almost complete though somewhat crushed adult left valve from station 14204, the lower blue marl east of the bridge, on Taylor Mill Creek, on Highway 45, 1½ miles north of Waynesboro. The outline is relatively higher and shorter than that of the Oak Grove species. In *Panope taylorensis* the height slightly exceeds half the width; in *P. para-*

whitfieldi the width is more than double the height. The best diagnostic for separation is in the structure of the shell itself, which in *P. parawhitfieldi* is strongly pustulose; in *P. taylorensis* the pustules are absent or only faintly indicated. *Panope goldfusii* Wagner from the Chesapeake of Maryland and Virginia is more produced and more constricted posteriorly. *Panope oblongata* Conrad, 1848, from the Vicksburg, and *P. brooksvillensis* Mansfield, from the Suwannee limestone of Hernando County, Florida, are both lower and more slender shells, more inequilateral, and more produced and attenuated posteriorly. The Suwannee species is known only from molds, but the shells of *P. oblongata* are not rare and show traces of the pustulose surface sculpture so well developed in *Panope parawhitfieldi*.

Holotype (a left valve, U. S. Nat. Mus. 498561)from the lower part of the Chickasawhay marl at station 14204, lower blue marl east of the bridge over Taylor Mill Creel, on Highway 45, 1½ miles north of Waynesboro, Wayne County, Miss., measures: Height, 53 mm (possibly somewhat exaggerated by crushing); width, 100 mm.

An incomplete mold of the posterior part of the shell from station 14282 may be referable to *Panope taylorensis*. The locality is about 3 miles north of Waynesboro, on a side road near Limestone Creek, where blocks of "*Chione* limestone" had apparently fallen from the hill above.

Genus KUPHUS Guettard

The separation of borings similar in a general way to those of the Recent *Teredo* is based on the matrix in which the tubes are found. The borings in wood are referred tentatively to *Teredo*, those in the matrix of sedimentary origin to *Kuphus*.

KUPHUS INCRASSATUS Gabb

Plate 27, figure 35

Kuphus incrassatus GABB, *1873*, Am. Philos. Soc., Trans., vol. 15, p. 246.
Kuphus incrassatus GABB, *1881*, Acad. Nat. Sci. Philadelphia, Jour., n. ser., vol. 8, p. 342, pl. 44, figs. 12a–e.
Teredo circula ALDRICH, *1886*, Alabama Geol. Survey, Bull. 1, pt. 1, p. 36.
Teredo incrassata MAURY, *1917*, Bull. Am. Paleontology, vol. 5, p. 399, pl. 39, fig. 24.
Teredo (*Kuphus*) *incrassata* PILSBRY, *1922*, Acad. Nat. Sci. Philadelphia, Proc., vol. 73, pt. 2, p. 428.
Kuphus (*Kuphus*) aff. *polythalmia* (Linné). Cox, *1927*, Rept. Paleontology Zanzibar Protectorate, p. 62 (in part).
Teredo? incrassata MANSFIELD, *1937*, Florida Geol. Survey, Bull. 15, p. 282, pl. 21, fig. 4.
Teredo? incrassata MANSFIELD, *1938*, Washington Acad. Sci., Jour., p. 107, fig. 15.

The type locality of *Kuphus incrassatus* is "the brown earthy shale east of Guayabin" (Santo Domingo). The species occurs at a number of places in the Dominican Republic, particularly in the Cercado formation. The type locality of *Teredo circula* Aldrich is at Choctaw Bluff on the Alabama River in Clarke County, Alabama. If it is later proved, as it well may be, that more than one species is involved in these large tubes abundantly distributed in the middle Tertiary in the mid-American area, Aldrich's name will be available for the representatives in the upper Oligocene in the middle Gulf.

The assumption, however, of a close relationship between *K. incrassatus* Gabb of the upper Oligocene and lower Miocene mid-American faunas and *K. polythalmia* Linnaeus, living in the Indian Ocean does not seem justified.

Occurrence.—Lower part of Chickasawhay marl: ALABAMA: Station 11088, Choctaw Bluff, Alabama River; stations 7165 and 14325, bed no. 5 of section 200 yards north of Salt Creek, 4½ miles south of Jackson; station 301, Gainestown; station 3640, Payne's Hammock, 10 miles south of Jackson, Clarke County. MISSISSIPPI: Station 10053, road from Shubuta to Waynesboro, 4 miles north of Waynesboro; station 14285, bed above "*Chione* limestone," near Limestone Creek Church, 4 miles north of Waynesboro; station 13386, hill above quarry at mouth of Limestone Creek, 3 miles northwest of Waynesboro; station 13385, one-eighth mile north of Limestone Church, 1½ miles southeast of Boyce; station 14282, blocks of "*Chione* limestone" along roadside near Limestone Creek, probably fallen from top of hill, 3 miles north of Waynesboro; station 14281, "*Chione* limestone," Taylor Mill Creek, 1½ miles north of Waynesboro; stations 14348 and 14515, *Kuphus* bed near base of Chickasawhay River section about 800 feet below the bridge on the Waynes-

boro-Laurel road, 2½ miles west of Waynesboro, Wayne County.

Similar tubes are abundant throughout the Suwannee limestone of Florida, in the Oligocene of eastern Mexico, and of Anguilla and Puerto Rico. Gabb's types were probably from the Cercado formation, lower Miocene of the Dominican Republic. The figured tube is U.S.N.M. 496240 from the Suwannee limestone at station 12298, in Jefferson County, Fla.

Genus DENTALIUM Linnaeus
DENTALIUM sp.

Fragments of *Dentalium* preserved as external molds have much in common with *Dentalium ladinum* Dall (1916, p. 522, pl. 85, fig. 6) from the Suwannee limestone at Rock Island, one-half mile above the wagon bridge at White Springs, Florida. From the imperfect naterial the Chickasawhay tubes seem less arcuate than those of *D. ladinum* and the intercalaries are apparently introduced at a later growth stage. The shells of *Dentalium* sp. are not so large and coarse as those of *D. mississippiense*, but the fragmentary material does little more than establish the genus in the lower Chickasawhay.

Dentalium sp. was collected in the lower part of the Chickasawhay marl at station 6758, on the south bank of the Yellow River at Watson [Watkins] and Henderson wagon bridge in Covington County, Ala., 4 miles north of the Florida line; and at station 6749, the west bank of the Conecuh River, at McGowan's Bridge, Escambia County, Ala., about 1 mile below the mouth of Sepulga River.

Genus CADULUS Philippi
CADULUS WAYNENSIS Mansfield, n. sp.
Plate 27, figure 33

Shell small, polished, moderately slender and feebly arcuate. Dorsal margin nearly straight except near the posterior extremity. Ventral margin arcuate, the maximum diameter falling within the anterior fourth. Margin of apical opening broken slightly, so that the presence or absence of slits cannot be determined. Anterior orifice nearly circular.

Holotype (U. S. Nat. Mus. 498491) measures: Length, 4.5 mm; maximum diameter, 1.2 mm. From the lower part of the Chickasawhay marl at station 14346, Taylor Mill Creek, the lower bed of blue marl just below the bridge on Highway 45, 1½ miles north of Waynesboro, Wayne County, Miss. A further collection, station 14204, was later made from this same locality.

Cadulus vicksburgensis Meyer from the Byram marl of Mississippi is a more slender shell, with no conspicuous zone of inflation.

Only the holotype of *Cadulus waynensis* Mansfield and three topotypes from stations 14346 and 14204 are known.

Genus ACTEON Montfort
ACTEON sp.
Plate 27, figure 42

A single incomplete specimen consisting of the greater part of the body whorl was collected from the lower part of the Chickasawhay marl at station 14204, the lower bed at the bridge over Taylor Mill Creek, 1½ miles north of Waynesboro, Wayne County, Miss. The entire body whorl is spirally striated by grooves, which are rather widely separated, except on the basal area, where the interspaces are much narrower. The characteristic *Acteon* sculpture of fine axial grating is developed in the grooves. The specimen is too incomplete to name.

The figured specimen (U.S.N.M. 498453) is 8 mm high.

Casts from Perdue Hill (station 10334), Monroe County, Ala., seem closely related to *Acteon* sp., but the specific identity is uncertain.

Genus CYLICHNA Lovén
CYLICHNA sp.
Plate 27, figure 24

One small and possibly immature specimen of the genus *Cylichna* (U.S.N.M. 498454) was collected from the lower Chickasawhay at station 14204, the lower bed at the bridge over Taylor Mill Creek, 1½ miles north of Waynesboro, Wayne County, Miss. The specimen may represent a new species, but the material hardly justifies the naming of it.

The shell is subcylindrical and smooth, except for very faint, revolving lines on the anterior third of the body. The spire is sunken and perforate, and the outer lip longer than the axis of the body whorl. The aperture is narrow and dilated anteriorly; the

pillar reinforced and reversed in front, leaving behind it a narrow, crescentic, umbilical chink. The length of the shell is 2.9 mm; the maximum diameter, 1.3 mm. Nothing closely comparable to it has been observed in the Oligocene or Tampa faunas.

Genus TEREBRA Bruguière
Subgenus STRIOTEREBRUM Sacco
TEREBRA (STRIOTEREBRUM) WAYNESBOROENSIS
Mansfield, n. sp.
Plate 27, figure 23

Shell small, very slender, moderately solid, including $2\frac{1}{2}$ nuclear and 13 postnuclear whorls. Initial half-turn largely immersed, the two succeeding volutions slender and smooth. Postnuclear whorls marked by a prominent subsutural band, comprising about one-third of the whorl and defined anteriorly by a deeply incised groove. Axials about 16 to the whorl, moderately strong, feebly arcuate, triangular in outline, medially and anteriorly dissected by the subsutural groove but persisting from the anterior to the posterior suture. Spiral sculpture of obscure striae, apparent only under high magnification. Body whorl constricted basally into a moderately long and slender pillar. Anterior fasciole twisted slightly and defined posteriorly by a thin and sharply elevated keel. Pillar without observed plications.

Holotype (U. S. Nat. Mus. 498455) measures: Height, 23.5 mm; diameter, 4.2 mm. From the lower part of the Chickasawhay marl at station 14204, lowest bed at bridge over Taylor Mill Creek, $1\frac{1}{2}$ miles north of Waynesboro, Wayne County, Miss.

Terebra waynesboroensis is closely allied to *Terebra tantula* Conrad from the Byram marl but differs from the Vicksburg species in the obscurity and irregularity of the spiral sculpture. The size and slender outline are similar in the two species.

Terebra ballista Mansfield from the Tampa limestone has a greater apical angle than that of *T. waynesboroensis*, and the incised line delimiting the subsutural band of *T. ballista* is much more shallow.

The species is known only from the type locality.

TEREBRA (STRIOTEREBRUM) TANTULA
Conrad?
Plate 27, figure 22

A fragment of *Terebra* (*Strioterebrum*) from station 14204, the lower bed near the bridge at Taylor Mill Creek, $1\frac{1}{2}$ miles north of Waynesboro, Wayne County, Miss., may be referable to *T. tantula* Conrad, described from the Byram marl at Vicksburg, Miss. The spiral sculpture of the fragment in question is, however, a little coarser than that of typical *T. tantula*. The proper relationship of the specimen cannot be established until further material is obtained.

The figured specimen (U. S. Nat. Mus. 498456) is from the lower part of the Chickasawhay marl.

Genus CONUS Linnaeus
CONUS sp. aff. C. IMITATOR
Brown and Pilsbry

An imperfect external mold of a small specimen (U.S.N.M. 498457) belonging to the genus *Conus* has been collected from the lower Chickasawhay in the highest fossiliferous bed in a ravine about one mile northwest of Glendon Station, Clarke County, Ala. (station 14323). It closely resembles a specimen determined as *Conus* sp. aff., *C. imitator* Brown and Pilsbry collected from the Suwannee limestone in the upper bed on the A. L. Parrish farm about $3\frac{1}{2}$ miles southeast of Wausau, Washington County, Fla.

Genus PLEUROFUSIA DeGregorio
PLEUROFUSIA sp. cf. P. VICKSBURGENSIS
Casey
Plate 27, figure 6

External molds revealing the greater part of a shell comparable to that of *Pleurofusia vicksburgensis* Casey from the Byram marl were collected from the lower part of the Chickasawhay marl at station 14349, the greensand marl of the Chickasawhay River section, one-fourth mile downstream from the bridge on the Waynesboro-Laurel road, $2\frac{1}{2}$ miles west of Waynesboro, Wayne County, Miss. The figured, imperfect external mold, possible representing the same species, was found at station 6753, Weaver Chute, on the east side of the Conecuh River, Escambia County, Ala. The lecto-

type of *P. vicksburgensis* Casey (U.S.N.M. 481670) is figured by Harris in Palaeontographica Americana, vol. 2, no. 7, pl. 10, fig. 3. It indicates a species more strongly rippled axially than that from the Chickasawhay and has a spiral sculpture pattern which differs slightly in detail from that represented by the molds. The incomplete, figured mold (U.S.N.M. 498458) measures about 20 mm in height.

PLEUROFUSIA species
Plate 27, figure 5

An internal mold of the upper part of the spire (U.S.N.M. 498459) has been collected at station 14349, the greensand marl, of the Chickasawhay River section, one-fourth mile downstream from the bridge on the Waynesboro-Laurel road, 2½ miles west of Waynesboro, Wayne County, Miss. The mold indicates a shell comparable to but not conspecific with the shell from the same locality identified as *Pleurofusia* sp. cf. *P. vicksburgensis* Casey. *Pleurofusia* sp. is related also to an undescribed species from the Mint Spring marl member of the Marianna limestone, but, on account of the imperfect preservation of the Chickasawhay species, its analogy to that from the Mint Spring marl cannot be established.

Genus PLEUROLIRIA DeGregorio
PLEUROLIRIA? WAYNENSIS
Mansfield, n. sp.
Plate 27, figure 21

Shell of moderate dimensions, slender. Nuclear and early postnuclear whorls lost. Seven whorls, including the body, remaining. Axial sculpture restricted to incrementals. Spiral sculpture of revolving lines of varying degrees of prominence. Whorls carinated a little behind the middle by a strong flattened spiral; a second spiral of similar character but not so wide and less elevated revolving a little in front of the posterior suture; two other spirals, comparable to that in front of the suture, girdling the base of the body. Fine, sharp lirae not uniform in strength developed over the entire conch. Incrementals strong, sharp and regular, especially on the body; protractive in front of the carina, retractive behind it. Body whorl slender and gently constricted; anterior canal lost.

Incomplete holotype (U. S. Nat. Mus. 498460) measures: Height, 12 mm; diameter, 4.5 mm. From the lower part of the Chickasawhay marl at station 14204, lower bed at bridge over Taylor Mill Creek, 1½ miles north of Waynesboro, Wayne County, Miss.

Pleuroliria? waynensis, n. sp., resembles in sculpture pattern *Pleuroliria tenagos* Gardner from the Shoal River formation of Florida. The Shoal River species is decidedly larger, and the details of the sculpture pattern are distinct. The Chickasawhay species is known only from the holotype and the external mold of a larger specimen from the Chickasawhay River. With the extremities of the shell and the nuclear characters and those of the anterior canal unknown, it is not possible to be sure of the generic determination.

Occurrence.—Lower part of Chickasawhay marl. MISSISSIPPI: Station 14204, lower bed over Taylor Mill Creek, 1½ miles north of Waynesboro; station 14349, glauconitic marl on Chickasawhay River, one-fourth mile downstream from bridge, on Waynesboro-Laurel road, 2½ miles west of Waynesboro, Wayne County.

Genus FUSITURRICULA Woodring
FUSITURRICULA WAYNESBOROENSIS
Mansfield, n. sp.
Plate 27, figure 4

Species described from a single incomplete and crushed specimen. Apical portion of spire lost. Shell known only from the two high, latest whorls of the spire and the slender body smoothly tapering into the long and slender canal. Both spire and body undulated by strong, full, well-rounded ribs extending from the deep anal fasciole forward to the suture. Fasciole closely appressed against the preceding whorl, feebly waved by its axials, with an ill-defined sutural cord and obscure scratches on the depressed area. Siphonal notch broad and U-shaped, symmetrically placed on the fasciole. Low spiral fillets with intercalated lirae developed on the anterior and medial portions of the whorl and the base of the body and the canal. Outer lip incomplete, but, judging by the growth lines, expanding between the fasciole and the canal.

Incomplete holotype (U. S. Nat. Mus.

498461) measures: Height, 27.5 mm; diameter, 10.5 mm. From lower part of Chickasawhay marl at station 14204, Taylor Mill Creek, lowest bed at bridge, 1½ miles north of Waynesboro, Wayne County, Miss.

Fusiturricula waynesboroensis is more slender than *F. lapenotierei* (Dall) from the Tampa limestone, the axials are fewer and more inflated, the fasciole not so wide and less sharply defined, and the spiral sculpture less strong and regular.

The type is unique.

FUSITURRICULA sp. cf. F. SERVATA (Conrad)
Plate 27, figure 7

The mold of a shell closely allied to the Vicksburg species *Fusiturricula servata* (Conrad) was recovered from the lower Chickasawhay at station 6753, Weaver Chute, on the east side of Conecuh River, Escambia County, Ala. The ribs do not seem to spread so much in the Alabama form, and the sutural cord is less pronounced than in that from Vicksburg, but the other characters indicated in the mold seem very close to those of Conrad's species. The length of the mold (U.S.N.M. 498462) from the tip to the base of the body is about 30 mm.

FUSITURRICULA? sp.
Plate 27, figure 26

The external mold of a shell which may be a *Fusiturricula* and which recalls in a general way *Fusiturricula condominia* (Dall) and others of the genus from the Tampa limestone was collected from the lower part of the Chickasawhay marl at station 13396, near the middle of sec. 25, T. 9 N., R. 7 W., Wayne County, Miss. The ribs of the species are relatively few and more sharply pinched than in *F. condominia* or in any of its subspecies, and the outline is more slender than in *F. lapenotierei* (Dall). *Pleurotoma anita* Aldrich from the Red Bluff clay has a somewhat similar sculpture, but it is a less slender shell than that from Wayne County, and the spirals are more elevated. The length of the mold (U.S.N.M. 498463) is about 20 mm, but this is probably not more than two-thirds of the length of the original shell. The maximum diameter is about 10 mm. The species is known from the single incomplete mold.

Genus TROPISURCULA Casey
TROPISURCULA sp. cf. T. CASEYI (Aldrich)
Plate 27, figure 3

External molds from the lower part of the Chickasawhay marl at station 14323, the highest fossiliferous bed in a ravine 200 yards south-southwest of Jones' old plantation house, about one mile northwest of Glendon station, Clarke County, Ala., are very close to the genotype of *Pleurotoma (Drillia) caseyi* Aldrich, described from Red Bluff and recorded also from Byram and Vicksburg, Miss. The axials seem a little fuller and the spirals stronger and more elevated in the Clarke County species, but the two forms are closely related. The Byram form is recorded, too, from station 7211, on the east bank of Murder Creek, about 3 miles north of Castleberry, Conecuh County, Ala.

Figured mold (U. S. Nat. Mus. 498466) measures: Height, 12.5 mm; diameter, 3.6 mm.

Genus HEMIPLEUROTOMA Cossmann
HEMIPLEUROTOMA? sp.
Plate 27, figure 30

A single imperfectly preserved external mold (U.S.N.M. 498464) from the glauconitic marl near the base of the Chickasawhay River section may be referable to the genus *Hemipleurotoma* and apparently represents a new species. The form is relatively stout for the group, stouter than *Gemmula amica* Casey from the Red Bluff clay. There is a beaded double spiral on the anterior part of the whorl, and the beaded sutural cord is double on the final whorls. The axis of the fasciolar sinus follows the duplex anterior spiral, and the well-marked depression between the two pairs of spirals is crossed by retractive growth lines, indicating the posterior arm of the sinus. In the short interval between the anterior spirals and the inconspicuous suture the growth lines are protractive. The primary spirals on the medial and basal portions of the body are beaded, and so are the fine, symmetrically disposed secondaries. The pillar threads and those on the slightly bulging anterior fasciole are somewhat irregular in elevation and hackled by the intersecting growth lines. In none of

the other observed Oligocene or Miocene species is the growth sculpture on the medial and basal parts of the body so strong that it beads the spirals as in the Chickasawhay specimen.

The mold measures about 13 mm in height. It is from the lower part of the Chickasawhay marl at station 14349, about one-fourth mile downstream from the bridge over the Chickasawhay River, 2½ miles west of Waynesboro on State Highway 22.

Genus SYNTOMODRILLIA Woodring
SYNTOMODRILLIA? sp. cf. S.? TANTULA (Conrad)
Plate 27, figure 15

A single small crushed specimen from the lower part of the Chickasawhay marl at station 14204, the lower bed at the bridge over Taylor Mill Creek, 1½ miles north of Waynesboro, Wayne County, Miss., is apparently closely related to *Syntomodrillia? tantula* (Conrad), from the Byram marl. The type of *Syntomodrillia* Woodring is *Drillia lissotropis* Dall, Recent in the West Indies. The nucleus of *lissotropis* and of generically related Recent and Bowden species includes only about two whorls; that of the Oligocene *tantula*, between three and four. The nucleus of the Chickasawhay individual is similar to topotypic nuclei of *S. tantula*. The sculpture patterns of the Chickasawhay individual and the Vicksburg forms are similar, and the lower number of postnuclear whorls and the higher apical angle of the Chickasawhay specimen may be due to immaturity and, perhaps, in part to crushing.

The figured individual (U. S. Nat. Mus. 498965) measures: 5.9 mm in height.

Genus SCOBINELLA Conrad
SCOBINELLA TAYLORENSIS Mansfield, n. sp.
Plate 27, figures 14, 31

Shell small, subfusiform, the body whorl evenly tapering into the slender anterior canal, the greatest diameter near the median horizontal. Initial turn of the three-whorled protoconch largely immersed, the two succeeding volutions relatively high and smooth. The six and one-half to seven postnuclear whorls both axially and spirally sculptured, closely appressed, separated by an inconspicuous suture line. Anal fasciole sunken, moderately wide, a strong, beaded spiral slightly in front of the axis of the broad and deeply U-shaped incrementals that indicate the former position of the sinus. Axials rounded, separated by narrow, deeply trenched interaxials, bisected by an incised spiral, protractive in front of the fasciole, suppressed upon the fasciole but continued behind it in the form of the obscurer retractive nodes on the feeble sutural cord. Whorls shouldered by the abrupt posterior terminations of the ribs, which, on the body, are reduced to peripheral nodes becoming obsolete toward the aperture. Sides and base of body girdled with about seven strong fillets separated by channels of approximately the same width as the spirals; the long, straight pillar closely threaded. Aperture narrow, angulated posteriorly, incomplete in all of the available specimens. Pillar folds oblique, stronger posteriorly, varying from two to four or possibly more in number.

Holotype (U. S. Nat. Mus. 498467) measures: Height, 15 mm; diameter (aperture incomplete), 6 ± mm. Paratype (U. S. Nat. Mus. 498468) measures: Height of incomplete individual, 11.5 mm; diameter (aperture incomplete), 5 ± mm. From lower part of Chickasawhay marl at station 14204, lower bed at bridge over Taylor Mill Creek, 1½ miles north of Waynesboro, Wayne County, Miss.

The species is known only from four more or less imperfect shells from the type locality and from an external mold from Rocky Creek, which is probably conspecific. *Scobinella* collected at station 14368, Jay Branch, Monroe County, Ala., are more slender than *S. taylorensis* but otherwise similar. *Scobinella caelata* Conrad, described from Vicksburg, is similar in general sculpture pattern, though it is a larger, coarser shell with more prevalent beading. The mid-American species *Scobinella magnifica* Gabb from the Bowden, *Eucheilodon morierei* (Laville ms.) Cossmann from the Gatun, and *Scobinella tristis* Pilsbry and Johnson from the Miocene of the Dominican Republic are all relatively large, averaging at least three times the size of *taylorensis* and are more elaborately decorated. There is no record of the genus in the Tampa limestone

nor in the Alum Bluff group. Woodring in discussing the geologic range of *Scobinella* has observed (1928, p. 199) that

> *Scobinella* is another Eocene and Oligocene genus that survived until Miocene time in the West Indian region. In the United States, no species are known later than upper Oligocene. The last surviving Miocene species are the largest of all.

The record of *Scobinella* in the lower Chickasawhay is, then, an important bit of evidence for the pre-Miocene age of the lower Chickasawhay, and the likeness of the form to the Vicksburg species *caelata* speaks for an upper Oligocene age.

Occurrence.—Lower part of Chickasawhay marl. MISSISSIPPI: Station 14204, lower bed at bridge over Taylor Mill Creek, 1½ miles north of Waynesboro; station 13240?, sec. 18, T. 8 N., R. 5 W., 100 feet east of center on Rocky Creek, Wayne County.

Genus CANCELLARIA Lamarck

Subgenus BONELLITA Jousseume

CANCELLARIA (BONELLITIA) WAYNENSIS Mansfield, n. sp.

Plate 27, figure 19

Shell, small, ovate, rather fragile. Nuclear whorls lost; a little less than four complete postnuclear turns remaining; whorls of the spire low, broadly inflated and rapidly increasing in diameter, closely appressed, the suture line crenulated by the axials of the preceding volution; body relatively large, axials rounded, moderately elevated, feebly retractive, uniform in strength except on the final half of the body whorl, where the ribs tend to be varicose and irregular; 14 in number on the penultima. Spirals low, flattened, the two anterior paired on the whorls of spire, the medial reduced to a narrow thread, the posterior pair more widely spaced than the anterior, and behind them and very close to the suture, another threadlet; suture slipping forward a little toward the aperture, disclosing an additional spiral in front of the anterior pair and similar to them; body whorl with 13 primary bands; interspiral spaces grated by the incrementals, and in some, but not in all of them secondary spirals. Columella short, twisted, triplicate, the anterior fold formed by the sharpened and twisted margin of the pillar; 2 low, intermediate tubercles on the pillar, in line with the extremities of the folds. Shell depressed behind the pillar but not umbilicate. Aperture imperfect, apparently of moderate width, terminating anteriorly in an obscure spout with splayed margins.

Imperfect holotype (U. S. Nat. Mus. 498469) measures: Height, 11 mm; diameter, 6.7 mm. From lower part of Chickasawhay marl at station 14204, lowest bed at bridge over Taylor Mill Creek, 1½ miles north of Waynesboro, Wayne County, Miss.

Cancellaria waynensis recalls in a general way *C. mississippiensis* Conrad from Vicksburg, but the Byram marl species is a stouter shell with a deeper sutural channel and more vigorous sculpture, both axial and spiral. Some of the Alum Bluff species, such as *Cancellaria desmotis* Gardner, have something of the same general aspect, but in the adult stage they are narrowly umbilicate.

The type is unique.

Subgenus TRIGONOSTOMA Blainville

CANCELLARIA (TRIGONOSTOMA) sp.

Plate 27, figure 29

Incomplete external molds of *Cancellaria* (*Trigonostoma*) may represent a single species or two related forms, possibly of the group of *C.* (*Trigonostoma*) *subthomasiae* Dall from the Tampa limestone of Florida. The Tampa species is more angular than the shells indicated by the Alabama molds, and the shoulder is wider on the Florida form. They have in common, however, a sculpture of numerous narrow, sharply elevated, retractive riblets overridden by strong, even spiral threading. The body and the final whorl of the spire of the figured specimen (U.S.N.M. 498470) are about 15 mm high. The locality is station 14322, the uppermost fossiliferous bed on the north side of Salt Creek, Clarke County, Ala. A similar, but possibly not identical, species occurs at station 14287 at the waterfall of Patton Creek, one-fourth mile above Highway 45, 1½ miles east of Waynesboro, Wayne County, Miss.

Genus OLIVELLA Swainson

OLIVELLA sp. cf. O. AFFLUENS Casey

Plate 27, figure 16

One small nearly perfect shell closely allied to *Olivella affluens* Casey, 1903, was collected from the lower part of the Chickasawhay marl at station 14204, the lower

bed at the bridge over Taylor Mill Creek, 1½ miles north of Waynesboro, Wayne County, Miss. The shell is immature, but it exhibits the large nucleus which characterizes *affluens* Casey in contrast to that of another Vicksburg species, *Olivella mississippensis* (Conrad).

The figured specimen (U. S. Nat. Mus. 498471) measures: Height, 8.7 mm; diameter, 3.5 mm.

A crushed adult body whorl apparently referable to the same species occurs with the adolescent. The genus is indicated also by an internal mold from the lower part of the Chickasawhay marl from station 14362, the glauconitic marl near the base of the section about one-fourth mile downstream from the bridge over the Chickasawhay on the Laurel-Waynesboro road, 2½ miles west of Waynesboro, Wayne County, Miss.

Genus LYRIA Gray

LYRIA sp. cf. L. MISSISSIPPIENSIS (Conrad)

Plate 27, figure 41

A single incomplete external mold (U.S.-N.M. 498472) of a shell, referable in all probability to *Lyria*, was collected from the lower part of the Chickasawhay marl at station 14205a, a hard ledge in a stream, a quarter of a mile north of Perdue Hill, Monroe County, Ala. The species seems identical with that recorded from the Suwannee limestone (Mansfield, 1937, p. 108, pl. 3, fig. 3) under the name of *Lyria mississippiensis* Conrad? Both the Suwannee individual and that from Perdue Hill are more closely ribbed than either the usual *Lyria mississippiensis* Conrad from the Byram marl at Vicksburg, Miss., or *L. nestor* Casey from the Red Bluff on Carson's Creek, Wayne County, Miss., and probably represent an undescribed form. Dall (1890, p. 85, pl. 6, fig. 2) figured the Red Bluff species under the name of *L. costata* Sowerby, a rare shell described by Sowerby from the Barton beds, upper Eocene, of southern England. The example of the British species in the collections of the U. S. National Museum is a larger shell than the majority of the Gulf individuals; the whorls are higher and more rounded; the aperture narrower and less oblique, and the outer lip less constricted in front.

It is probable that the strong superficial likeness of the upper Eocene shell of southern England to the upper Oligocene form from the Gulf province of North America is a case of parallel development within a compact but sensitive group in which the generic characters are strongly marked, and the species from different time levels present slight but constant differences.

The height of the shell from Perdue Hill was probably about 15 mm and the diameter about 9 mm.

Genus LATIRUS Montfort

LATIRUS TAYLORENSIS Mansfield, n. sp.

Plate 27, figures 1, 2, 9

Nucleus smooth, buccinoid, of three and one-half to four rapidly enlarging volutions. Initial four or five axial riblets narrow, feebly arcuate, close-set, persisting from suture to suture with fairly uniform strength, overridden by three or four fine, equal and equispaced spirals; sculpture change at the close of about a quarter turn, the axials becoming fewer and more spreading and tending with the strong development of the sutural cord to become obsolete posteriorly. Sculpture on adult whorls of bulging, undulatory axials, not more than eight to the whorl, strongest peripherally and dying out on the excavated area in front of the suture. Initial spirals broadening and flattening, commonly three on the medial portion of the whorl with a fourth, not quite so wide, in front of the impressed posterior suture, and a fifth almost or entirely concealed by the anterior suture, which is wound upon it; one to three secondaries and tertiaries intercalated between each pair of primaries, with additional spirals on the posterior fasciole and on the pillar. Canal rather long and sculptured with alternating primary and secondary threads. Probably three columellar folds, the anterior not far behind the entrance to the canal, the angle to the axis of the shell increasingly high toward the aperture.

Estimated height of three largest syntypes (U. S. Nat. Mus. 498474) 45 mm. From lower part of the Chickasawhay marl at station 14204, lowest bed at bridge over Taylor Mill Creek, 1½ miles north of Waynesboro, Wayne County, Miss.

There is no single specimen that is entire,

but the characteristics of the shell can be determined by the synthesis of the incomplete syntypes. One of them includes the nuclear and three postnuclear whorls, a second, the middle and later whorls of the spire, and the third, the body and pillar.

Latirus taylorensis has much in common with *Latirus protractus* (Conrad) from the Byram marl. The nucleus is larger on the Chickasawhay species, the apical angle apparently higher, and tertiary spirals are commonly introduced between the primary and the intercalated secondary, a sculpture detail which has not been observed in *L. protractus.*

Latirus taylorensis is known from the type locality alone.

Genus FASCIOLARIA Lamarck
FASCIOLARIA sp. cf. F. PETROSA Dall
Plate 27, figure 17

Fragments (U.S.N.M. 498473) too incomplete for identification retain no characters by which they can be separated from *Fasciolaria petrosa* Dall (1915, p. 64, pl. 6, fig. 7) described from the Tampa limestone at Ballast Point. The form is not rare at the single locality at which it occurs, station 14364, the upper part of the section on the Chickasawhay River, one-fourth mile below the bridge on the Waynesboro-Laurel road, 2½ miles west of Waynesboro, Wayne County, Miss.

Its horizon is the upper part of the Chickasawhay marl, the probable time equivalent of the Tampa limestone.

Genus MELONGENA Schumacher
MELONGENA sp.
Plate 27, figure 27

Rather large specimens preserved as incomplete internal or external molds occur at several localities and seem to represent the same or closely related species. The external mold (U.S.N.M. 498475) from the Chickasawhay marl, station 14288, Rocky Branch, 1 mile north-northeast of Denham, Wayne County, Miss., which has been reproduced in the figure, shows the greater part of the spire. It is high for the genus and includes more than 5 whorls. The feebly concave, spirally lirate shoulder occupies ar least two-thirds of the height of the whorl. The peripheral tubercles are narrow but very prominent and knob-like and number probably eight to ten to the whorl. This specimen may be closely related to an unnamed species from the Suwannee limestone at station 12758, the Camp Concrete Rock quarry, 5.9 miles northeast of the courthouse at Brooksville, and at station 12761, along the highway, 2 miles north of Hudson, stations in Hernando and Pasco Counties, Fla. The tubercles seem less prominent, however, on the Suwannee species, and the shoulder ramp less wide relatively. The spire of the figured specimen from the Chickasawhay measures not far from 50 mm in height.

Other indeterminate molds occur at the following localities: Station 14287, Patton Creek, waterfall one-fourth mile above Highway 45, 1½ miles east of Waynesboro; station 6649, southwest bank of Chickasawhay River, 2½ miles south of Waynesboro; stations 14508, 14508a, beds 3 and 4 on Bucatunna Creek, about 200 yards below Steep Hill Branch, Wayne County, Miss.

Genus TRITIARIA Conrad
TRITIARIA sp.
Plate 27, figure 20

Shell rather small and slender, including between three and four smooth, rapidly enlarging nuclear and five sculptured postnuclear whorls, closely appressed and separated by sutures crenulated by the axials of the preceding whorl. Axials narrow, rounded, 10 or 12 to the whorl, for the most part fairly uniform in elevation but with an occasional varicose rib. Primary spirals flattened, three to four on the whorls of the spire with four of five intermediate secondary lirae crowded between each pair of primaries; body whorl closely threaded with primaries, secondaries and tertiaries. Shell so crushed that apertural characters are not known.

Figured specimen (U. S. Nat. Mus. 498476) 11.5 mm high, apparent diameter increased by crushing. From station 14204, lowest bed at bridge over Taylor Mill Creek, 1½ miles north of Waynesboto, Wayne County, Miss.

Tritiaria waynensis Mansfield from the same locality has a larger apical angle, the axial ribs are not so narrow, and the very fine secondary and tertiary spiral threading is not developed. Both the axial and spiral

sculpture of the figured species are more sharply defined than in *Tritiaria mississippiensis* (Conrad), the genotype from Vicksburg, and the shell is more slender.

Occurrence.—Lower part of Chickasawhay. ALABAMA: Station 6735, Murder Creek at the bridge east of Castleberry, Conecuh County, (molds); station 10334, one-fourth mile northeast of Perdue Hill, Monroe County (molds); station 14323, 1 mile northwest of Glendon, Clarke County (molds). MISSISSIPPI: Station 13239, Buca-

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EXPLANATION OF PLATE 25

FIGS. *1, 2—Anadara macneili* Mansfield. *1.* Left valve, U. S. Nat. Mus. 498673, ×1½. *2.* Left valve, U. S. Nat. Mus. 498674, ×1½. (p. 176)

3—Barbatia cf. *B. cuculloides* Conrad. Right valve, U. S. Nat. Mus. 498514, ×1. (p. 175)

4—Glycymeris cf. *G. suwanneensis* Mansfield. Left valve, U. S. Nat. Mus. 498511, ×1. (p. 174)

5—Barbatia cf. *B. marylandica* Conrad. Left valve, U. S. Nat. Mus. 498513, ×1. (p. 175)

6, 8—Anadara mummi Mansfield. *6*, Left valve, U. S. Nat. Mus. 498675, ×2. *8*, Right valve, U. S. Nat. Mus. 498676, ×1½. (p. 175)

7—Pteria cf. *P. argentea* Conrad. Right valve, U. S. Nat. Mus. 498516, ×½. (p. 178)

9, 10, 18—"Venericardia" waynensis Mansfield, n. sp. *9*, Paratype, left valve, U. S. Nat. Mus. 498539, ×1½. *10, 18*, Holotype, right valve, U. S. Nat. Mus. 498538, ×1. (p. 189)

11—Barbatia (*Acar*) cf. *B.* (*Acar*) *domingensis* (Lamarck). Right valve, U. S. Nat. Mus. 498515, ×2. (p. 175)

12. Diplodonta (*Sphaerella?*) *waynensis* Mansfield, n. sp. Left valve of paired valves of holotype, U. S. Nat. Mus. 498545, ×1½. (p. 193)

13, 14—Anomia taylorensis Mansfield, n. sp. Holotype, left valve, U. S. Nat. Mus. 498532 ×1. *14*, Paratype, left valve, U. S. Nat. Mus. 498533, ×½. (p. 184)

15—Diplodonta cf. *D. alta anclotensis* Mansfield. Internal mold of double valves, U. S. Nat. Mus. 498544, ×1. (p. 192)

16, 17—Crassinella sp. *16*, Left valve, U. S. Nat. Mus. 498537, ×2½. *17*, Left valve, U. S. Nat. Mus. 498537, ×2½. (p. 189)

19—Macrocallista (*Chionella?*) *perduensis* Mansfield, n. sp. Topotype, left valve, U. S. Nat. Mus. 498553, ×¾. (p. 196)

20, 21—Myrtaea (*Myrtaea*) *taylorensis* Mansfield, n. sp. Exterior and interior of syntype, right valve, U. S. Nat. Mus. 498540, ×2. (p. 191)

22—Macrocallista (*Chionella?*) cf. *M.* (*Chionella?*) *sobrina* Conrad. Right valve, U. S. Nat. Mus. 498550, ×¾. (p. 196)

23—Miltha cf. *M. chipolana* Dall. Fragment of right valve, U. S. Nat. Mus. 498541, ×1. (p. 191)

24, 26—Nuculana (*Sacella?*) *taylorensis* Mansfield, n. sp. *24*, Holotype, left valve, U. S. Nat. Mus. 498509, ×2. *26*, Paratype, right valve, U. S. Nat. Mus. 498510, ×2. (p. 172)

25—Nuculana waynensis Mansfield, n. sp. Holotype, left valve, U. S. Nat. Mus. 498508, ×2. (p. 172)

27, 28—Nemocardium diversum waynense Mansfield, n. subsp. Profile, ×1½ and side view, ×1, of holotype, right valve, U. S. Nat. Mus. 498547. (p. 195)

29, 32, 37—Corbula (*Caryocorbula*) *taylorensis* Mansfield, n. sp. Syntypes, U. S. Nat. Mus. 498559, ×2½. (p. 200)

30, 31—Macrocallista (*Chionella?*) *perduensis* Mansfield, n. sp. *30*, Syntype, left valve, U. S. Nat. Mus. 498552, ×¾. *31*, Syntype, right valve, U. S. Nat. Mus. 498551, ×¾. (p. 196)

33—Divaricella sp. Left valve, U. S. Nat. Mus. 498543, ×1½. (p. 192)

34, 45—Cardium cf. *C.* (*Cerastoderma*) *phlyctaena* Dall. Profile and side view of left valve, U. S. Nat. Mus. 498549, ×1. (p. 195)

35—Miltha? hernandoensis Mansfield. Left valve, U. S. Nat. Mus. 498542, ×½. (p. 192)

36—Glycymeris sp. Right valve, U. S. Nat. Mus. 498678, ×2. (p. 174)

38—Cardium (*Trachycardium?*) sp. A. Left valve, U. S. Nat. Mus. 498548, ×1. (p. 193)

39—Thracia (*Cyathodonta*) *taylorensis* Mansfield, n. sp. Holotype, right valve, U. S. Nat. Mus. 498535, ×1. (p. 187)

40—Brachidontes mississippiensis (Conrad). Left valve, U. S. Nat. Mus. 498534, ×1. (p. 176)

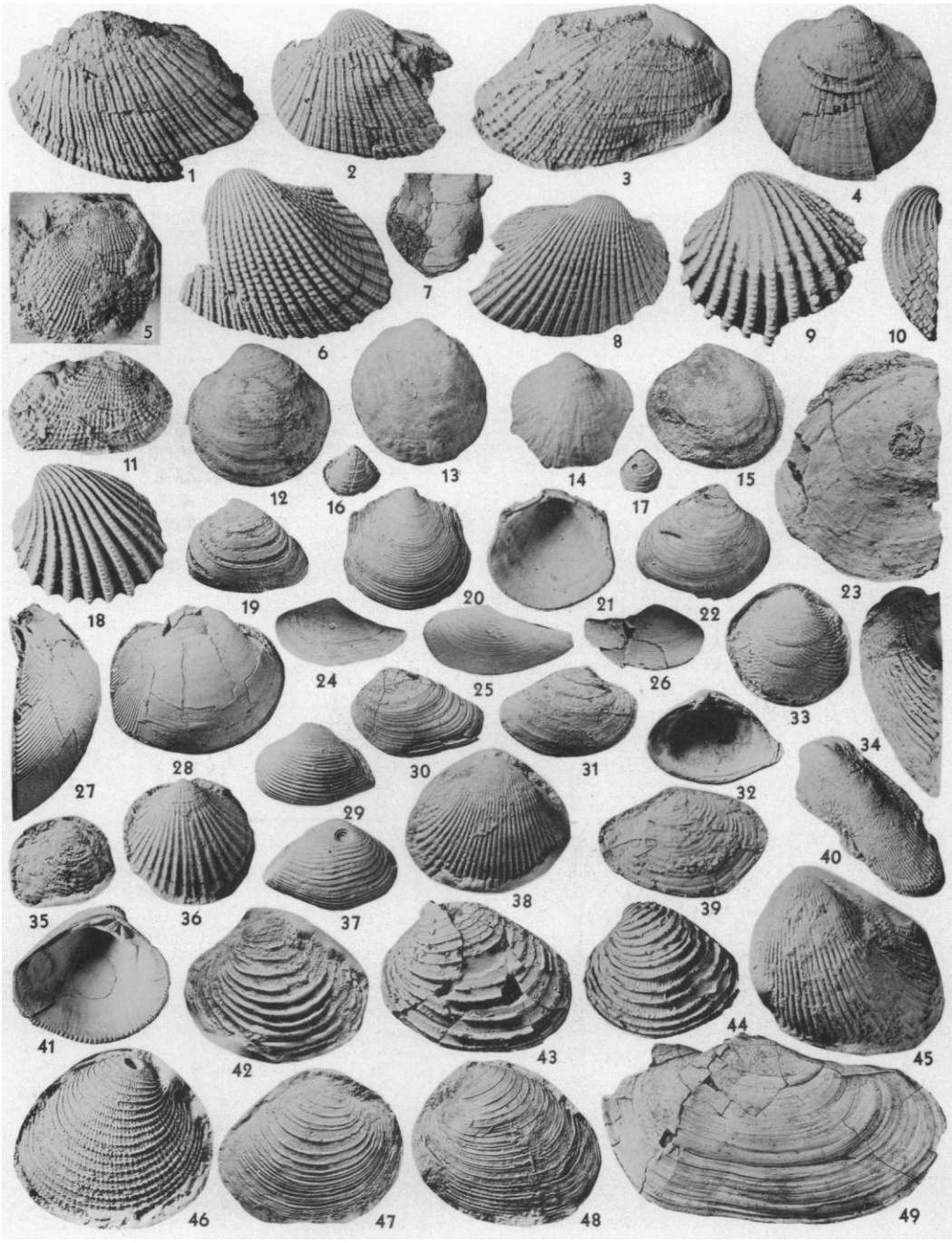
41, 42, 44—Chione perduensis Mansfield, n. sp. *41. 44*, Holotype, left valve, interior and exterior, U. S. Nat. Mus. 498555, ×1. *42*, paratype, left valve, U. S. Nat. Mus. 498556, ×¾. (p. 198)

43—Chione sp. Left valve, U. S. Nat. Mus. 498558, ×1½. (p. 199)

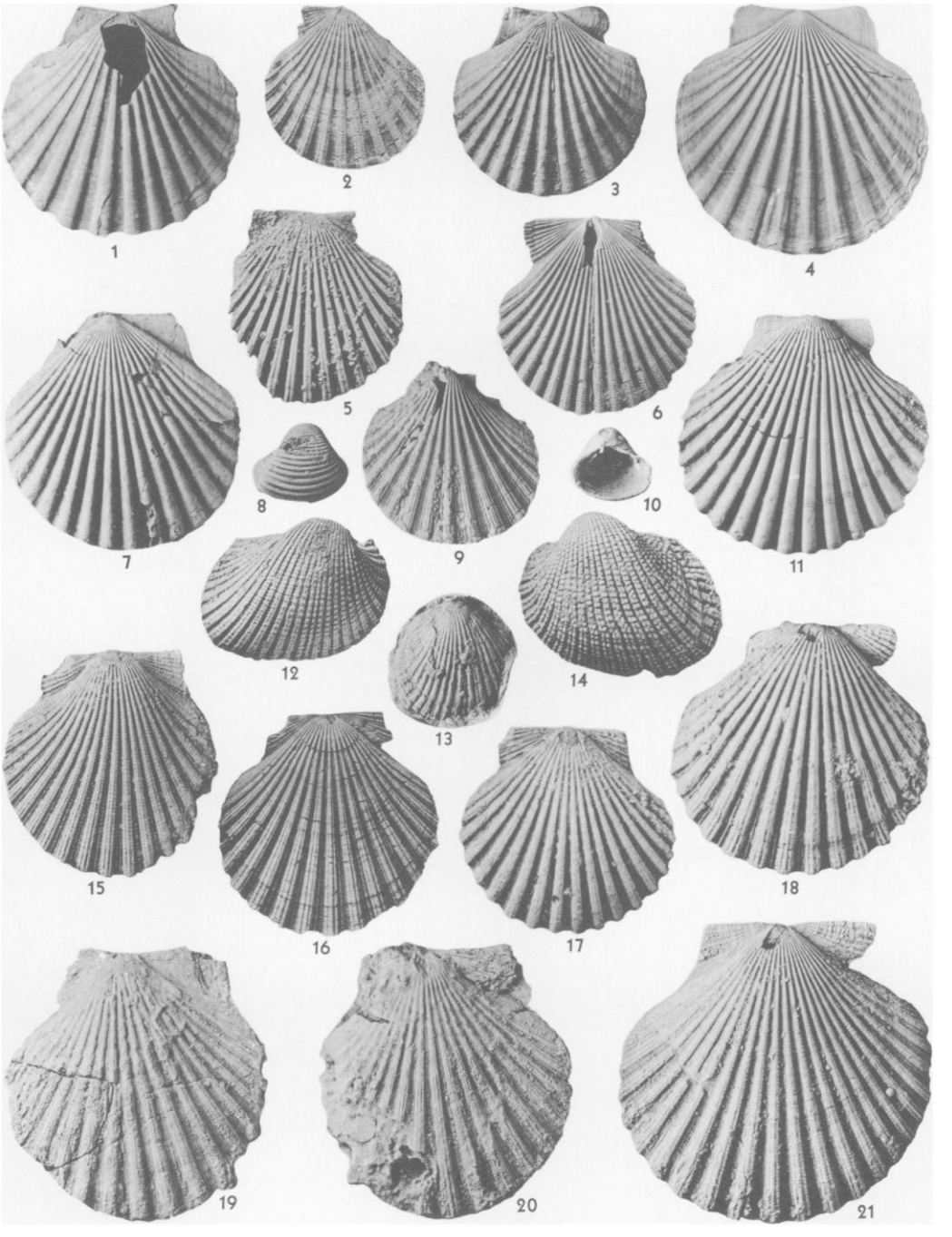
46—Chione bainbridgensis Dall. Right valve, U. S. Nat. Mus. 498554, ×1. (p. 197)

47, 48—Chione catunna Mansfield, n. sp. Syntypes, right and left valves, U. S. Nat. Mus. 498557, ×1. (p. 199)

49—Panope taylorensis Mansfield, n. sp. Holotype, left valve, U. S. Nat. Mus. 498561, ×½. (p. 200)



Mansfield, Chickasawhay Mollusks



Mansfield, Chickasawhay Mollusks

tunna Creek, NW ¼ sec. 17, T. 8 N., R. 5 W.; station 13240, Rocky Creek, sec. 18, T. 8 N., R. 5 W., 100 feet east of center (molds); station 13396, hillside above mouth of Limestone Creek, near middle of sec. 25, T. 9 N., R. 7 W. (molds); station 14204, lowest bed at bridge over Taylor Mill Creek, 1½ miles north of Waynesboro; station 14349, Chickasawhay River, glauconitic bed near base of section, one-fourth mile downstream from bridge, 2½ miles west of Waynesboro on road to Laurel, Wayne County.

TRITIARIA WAYNENSIS Mansfield, n. sp.
Plate 27, figure 12

Shell rather small, acutely tapering, including three and one-half to four smooth rapidly enlarging nuclear whorls and four sculptured postnuclear whorls, closely appressed and separated by sutures which are crenulated by the axials of the preceding whorl. Axials, 10 to 12 on the whorls of the spire, strong, well-rounded, extending from suture to suture and offset on contiguous whorls. Spirals flattened, alternating in strength with an occasional lira of the third order introduced. Body constricted basally, depressed slightly behind the raised margin of the fasciole. Fasciole expanded, lirate, emarginate, the sharp margin at the base of the body forming the posterior arm of the terminal notch.

Holotype (U. S. Nat. Mus. 498477) measures: Height, 8 mm; diameter, 4 mm. From lower part of Chickasawhay marl at station 14204, lowest bed at bridge over Taylor Mill Creek, 1½ miles north of Waynesboro, Wayne County, Miss.

Tritiaria waynensis differs from the genotype, *T. mississippiensis* (Conrad), in the shorter, less slender shell, more closely spaced and heavier axials, and in the wider primary spirals. The unnamed species of *Tritiaria* which occurs with *T. waynensis* is a more elevated and slender shell with a more elaborate development of delicate lirae crowding the spaces between the primary spirals.

The species is known only from a few imperfect shells from the type locality.

TRITIARIA sp. cf. T. VICKSBURGENSIS (Aldrich)
Plate 27, figure 40

Specimens preserved as external molds at two localities seem to be closely related to each other and to *Tritiaria vicksburgensis* (Aldrich) described from the Oligocene at Vicksburg, Miss. They have in common a sculpture of heavy rippled, retractive axials and alternating narrow and relatively wide spiral lirae. The molds indicate however, a rather more slender shell than that of *T. vicksburgensis*.

The height of the figured mold (U. S. Nat. Mus. 498492) of the body whorl is about 9 mm. From lower part of Chickasawhay

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EXPLANATION OF PLATE 26

FIGS. *1, 3, 4—Chlamys* (*Plagioctenium*) *howei* Mansfield, n. sp. ×¾. *1*, Right valve, U. S. Nat. Mus. 498519. *3*, Paratype, right valve, U. S. Nat. Mus. 498518. *4*, Holotype, left valve, U. S. Nat. Mus. 498517. (p. 178)

2—Chlamys sp. Left valve, U. S. Nat. Mus. 498531, ×1. (p. 184)

5—Chlamys aff. *C. duplex* (Cooke) Right valve, U. S. Nat. Mus. 498530, ×¾. (p. 184)

6, 16—Chlamys (*Aequipecten*) *chickaria* Mansfield, n. sp. *6*, Left valve, U. S. Nat. Mus. 498529 ×1½. *16*, Holotype, right valve, U. S. Nat. Mus. 498528, ×1. (p. 183)

7, 11—Chlamys (*Plagioctenium*) *mcguirti* Mansfield, n. sp. Syntypes, ×1. *7*, Left valve, U. S. Nat. Mus. 498521. *11*, Right valve, U. S. Nat. Mus. 498520. (p. 180)

8, 10—Corbula (*Corbula*) *laqueata* Casey?. Exterior and interior of right valve, U. S. Nat. Mus. 498560, ×3½. (p. 199)

9, 19, 20—Chlamys (*Aequipecten*) *gainestownensis* Mansfield, n. sp. *9*, Paratype, left valve, U. S. Nat. Mus. 498523, ×½. *19, 20*, Holotype, left and right paired valves, U. S. Nat. Mus. 498522, ×¾. (p. 181)

12, 14—Anadara mummi Mansfield. Right and left valves, U. S. Nat. Mus. 498677, ×2. (p. 175)

13—Glycymeris sp. Left valve, U. S. Nat. Mus. 498512, ×1½. (p. 174)

15, 21—Chlamys (*Aequipecten*) *glendonensis* Mansfield, n. sp. *15*, Left valve, U. S. Nat. Mus. 498525, ×1½. *21*, Holotype, right valve, U. S. Nat. Mus. 498524, ×1½. (p. 182)

17, 18—Chlamys (*Aequipecten*) *waynesis* Mansfield, n. sp. Syntypes ×1½. *17*, Left valve, U. S. Nat. Mus. 498527. *18*, Right valve, U. S. Nat. Mus. 498526. (p. 182)

marl at station 7166, Tombigbee River, east bank, just south of Payne's Hammock, Clarke County, Ala.; bed no. 3 of the measured section.

Another locality is station 6758, on the south bank of Yellow River, at Watson [Watkins] and Henderson wagon bridge, 4 miles north of the Florida line in Covington County, Ala.

Genus ALECTRION Montfort

The type of *Alectrion* Montfort, *Buccinum papillosum* Linnaeus, is an Indo-Pacific species superspecifically unlike the East Coast American Tertiary forms which have been referred to *Alectrion*. The nassoid molds from the Chickasawhay marl have not retained the characters necessary to determine the smaller superspecific groups into which the shells formerly called "*Alectrion*" are now divided.

"ALECTRION" sp. A
Plate 27, figure 28

Shell stout and subovate. Nucleus not preserved. Postnuclear whorls at least five in number, rapidly increasing in diameter, narrowly tabulated posteriorly. Axials running 12 to 15 to the whorl, narrow and clearly defined, almost vertical, overridden by the spirals, which cancellate them. Spirals four on the later whorls of the spire, probably about twice as many on the body, flattened, inclined to be nodose at the intersection with the axials; quadrate areas included between the axials, and the spirals wider than they are high. Body apparently constricted into a rather wide, lirate, deeply emarginate fasciole.

Figured specimen (U. S. Nat. Mus. 498493) measures: Height, 14 mm; diameter, 8 mm. From lower part of Chickasawhay marl at station 14282, 3 miles north of Waynesboro, from a fallen block of limestone along the roadside near Limestone Creek, Wayne County, Miss.

The second species questionably referred to "*Alectrion*" differs in the more rounded, less tabulated whorls of the spire, the less inflated body, less strongly constricted at the base, and the less evenly cancellate surface sculpture.

Occurrence.—Lower part of Chickasawhay marl. ALABAMA: Station 14322, highest fossiliferous bed in section on north side of Salt Creek, on road from Jackson to Rockville, Clarke County. MISSISSIPPI: Station 14282, fallen block of limestone along roadside near Limestone Creek, 3 miles north of Waynesboro; station 14283, hilltop above roadside and probably the source of the fallen block, near Limestone Creek, 3 miles north of Waynesboro, Wayne County.

"ALECTRION?" sp. B
Plate 27, figure 11

Molds which in general outline and sculpture pattern resemble "*Alectrion*" sp. A occur in the lower part of the Chickasawhay marl at station 13240, Rocky Branch, sec. 18, T. 8 N., R. 5 W., 100 feet east of the center of the section. They are not planed at the shoulder like the specimens of "*Alectrion*" sp. A, and the ribs are not so narrow. Apparently, too, the anterior canal is appreciably longer, and it is possible that the species should be referred to *Tritiaria* rather than to "*Alectrion*".

The length of the body of the figured mold (U. S. Nat. Mus. 498494) is 8.5 mm, the diameter, 6.5 mm.

"*Alectrion*" may be represented by molds which are fairly common at station 14519, an old road on the east side of the new road, south of Limestone Creek, about halfway up the hill, Wayne County, Miss., but the sculpture in most of the individuals looks muricoid rather than nassoid. One mold, however, strongly resembles the molds of "*Alectrion*" sp. B.

Genus METULA H. and A. Adams
METULA TAYLORENSIS Mansfield, n. sp.
Plate 27, figure 32

Species known only from a single somewhat crushed and incomplete specimen. Apical portion lost; body and two last whorls of spire remaining. Shell small, slender, the whorls closely wound, separated by distinct sutures, which are not crenulated by the axial ribs. On the spire a narrow sutural band cut off by an incised groove, which dissects the axials, and a second groove developed in front of the first on the body. Axials narrow, flattened, weakly arcuate, closely spaced, probably 20 to 25 to each of the later whorls of the spire, rubbed off on the final half-turn of the body. Interaxials

angular, not so wide as the axials, grated evenly on the later whorls of the spire; vestigial grooves on the upper part of the final half turn of the body, but on the medial part becoming increasingly stronger, and developing anteriorly into a flattened cording; anterior fasciole closely lirate. Characters of aperture not well known. Outer lip flaring slightly. Margin of anterior fasciole broken, probably feebly sinuated.

Holotype (U. S. Nat. Mus. No. 498495), measures: Height of incomplete specimen 8.5 mm; diameter, 3.0 ± mm. From lower part of Chickasawhay marl at station 14204, lower bed at bridge over Taylor Mill Creek, 1½ miles north of Waynesboro, Wayne County, Miss.

Metula taylorensis seems to be closely related to *M. fragilis* Casey, from the "Upper Vicksburg marl" of Mississippi. The Chickasawhay species differs from Casey's *fragilis* in the smaller shell, and the nearly smooth area on the upper half of the final half turn. The close-set axial ribbing is characteristic of both species. In the two mid-American Miocene species, *Metula cancellata* Gabb from the Gurabo formation of the Dominican Republic and *Metula gabbi* Brown and Pilsbry from the Gatun formation of the Canal Zone, the spiral sculpture overrides the axial, and both the axial and the spiral threading are developed over the entire body.

The type is unique.

Genus MUREX Linnaeus
MUREX? species
Plate 27, figure 10

Ill-preserved and immature specimens from station 14204, the lowest bed at the highway bridge over Taylor Mill Creek, 1½ miles north of Waynesboro, Miss., may be referable to *Murex*. The shell is more slender, and the canal much longer than in *Murex mississippiensis* Conrad from the Oligocene Byram marl and in form is more suggestive of *M. rufirupicolus* Dall described from an internal mold from the Flint River formation near Bainbridge, Georgia. There are probably eight to ten strong axial ribs to the whorl and on the body these are unequal and intermittently varicose. The persistence of the axials to the posterior suture obscures the ill-defined shoulder ramp. Strong rounded spiral cords, regular in size and spacing alternate with secondary threads on the later whorls of the spire and on the body. Secondaries are not developed on the early whorls, and on the shoulder the coarse primary sculpture is absent. The characters of the aperture are not known. The length of the figured specimen (U. S. Nat. Mus. 498496) is probably between 17 and 18 mm, the diameter, 7 mm. Other specimens from the same locality and representing the same species are smaller.

At station 13239, NW¼ sec. 17, T. 8 N., R. 5 W., Bucatunna Creek, Wayne County, Miss., a second species of *Murex*, closer to *M. mississippiensis* in form and sculpture, is indicated by a mold of the exterior. A third species more strongly and regularly sculptured with laminar varices is represented by external molds from stations 14361 and 14349, the glauconitic bed near the base of the Chickasawhay River section, one-fourth mile downstream from bridge on State Highway 22, 2½ miles west of Waynesboro on the Laurel road, Wayne County, Miss. A related species may be represented by a mold from station 10334, Perdue Hill, Monroe County, Ala.

Genus RAPANA Schumacher
RAPANA sp. cf. R. VAUGHANI Mansfield
Plate 27, figure 51

A species of *Rapana* (U.S.N.M. 498497) similar in form and general sculpture pattern to *R. vaughani* Mansfield described from the Tampa limestone at River Junction, Gadsden County, Fla., was recovered from the lower part of the Chickasawhay marl at station 14349, the glauconitic bed near the base of the Chickasawhay River section, one-fourth mile downstream from the bridge on the highway from Waynesboro to Laurel, 2½ miles west of Waynesboro. The intermediate spirals in the Tampa species are thinner and sharper than in that from the Chickasawhay, and the number and arrangement of the primaries and secondaries differ in the two forms. The holotype of *R. vaughani* measures 25 mm in height and 18 mm in diameter. The figured Chickasawhay mold is not so large, but the dimensions are comparable to those of the Tampa holotype.

The same or a closely related species may be represented by poorly preserved molds

from station 14288, Rocky Branch, southwest corner of sec. 8, T. 8 N., R. 5 W., 1 mile north-northeast of Denham, Wayne County, Miss., and from station 10334, one-fourth mile northeast of Perdue Hill, Monroe County, Ala.

Genus SCALINA Conrad

SCALINA WAYNENSIS Mansfield, n. sp.

Plate 27, figure 34

Species known only from the holotype, an incomplete shell with the apical whorls missing and the aperture broken. Shell fragile, slender, the 10 remaining whorls very slowly increasing in diameter and separated by impressed sutures; whorls well-rounded medially, obliquely shouldered posteriorly. Spiral sculpture off our equi-sized and equi-spaced, somewhat flattened spirals, the posterior of the four outlining the shoulder margin; two less prominent lirae on the shoulder ramp. Axials incremental in character extending from suture to suture, not overriding the spirals but fine, sharp, and evenly spaced. Characters of the aperture and of the base of the body lost.

Holotype (U. S. Nat. Mus. 498498) measures: Height, 17 mm; diameter about 5 mm, but shell too much crushed to give accurate maximum. From lower part of Chickasawhay marl at station 14204, lowest bed at bridge over Taylor Mill Creek, 1½ miles north of Waynesboro, Wayne County, Miss.

Scalina waynensis is remarkable for the strength and uniformity in size and spacing of the primary spirals. There is nothing very close to it specifically. The genus is recorded from the Eocene to the Recent. The genotype *Scala* (*Scalina*) *staminea* Conrad is a Moodys marl (formerly called Gosport sand) species. The other species listed in Conrad's first mention of *Scalina* was *Scala* (*Scalina*) *trigintanaria* Conrad from the Vicksburg, a more finely sculptured cancellate shell than *Scalina waynensis*.

The holotype of *Scalina waynensis* is the only known example of the species.

SCALINA sp. cf. S. TRIGINTANARIA Conrad

Scalina trigintanaria Conrad was described from the Byram marl at Vicksburg, Miss. It is a rare shell of rather large size for the group with well-rounded whorls. A specimen in the U. S. National Museum compared by C. Wythe Cooke with the type in the Academy of Natural Sciences in Philadelphia is threaded on the later whorls with eight equal and equi-spaced, somewhat flattened lirae overridden with numerous fine, sharp, laminar axials, extending from suture to suture, bent sharply forward at the posterior suture and abutting against the preceding whorl. Specimens from station 6735, and station 14355, bed no. 5 of the Cooke (1926, p. 291) section on Murder Creek, east of Castleberry, Conecuh County, Alabama, are too poorly preserved for positive identification, but they exhibit the form and spiral sculpture of the Vicksburg species. The axial lamellae are less crowded on the Alabama specimens, and none of the specimens are so large as the examples of *S. trigintanaria* from Vicksburg.

Genus CASSIS Scopoli

CASSIS FLINTENSIS Mansfield, n. sp.

Plate 27, figures 47, 48?, 49

Cassis sulcifera Sowerby. DALL, *1916*, U. S. Nat. Mus., Proc., vol. 51, no. 2162, p. 508, pl. 86, fig. 4. Not SOWERBY, *1850*, Geol. Soc. London, Quart. Jour., vol. 6, pt. 1, p. 47, pl. 10, fig. 1.

Cassis globosa Dall, *1916*, U. S. Nat. Mus., Proc., vol. 51, no. 2162, p. 508 (in part). Not *Phalium globosum* DALL, *1890*, Wagner Free Inst. Sci., Trans., vol. 3, pt. 1, p. 161. Not *Cassis* (*Phalium*) *globosum* DALL, *1892*, Wagner Free Inst. Sci., Trans., vol. 3, pt. 2, p. 262, pl. 20, figs. 6, 11 (fig. 6 = *Phalium globosum* Dall, from the Ocala limestone; fig. 11 = *Phalium brevicostatum* (Conrad), from railroad cut near Indian Mound, 4½ miles east of Newton, Miss.).

Cassis sp. WOODRING, *1928*, Carnegie Inst. Washington, Pub. 385, p. 305.

Cassis sp. MANSFIELD, *1938*, Washington Acad. Sci., Jour., vol. 28, no. 3, p. 101, fig. 11.

Shell of medium size, broadly biconic, the periphery, however, less than one-third the distance from the apex to the anterior extremity. Sculpture on early whorls not well-preserved, but traces retained of three beaded spirals, the posterior directly in front of the appressed suture, the anterior directly behind the suture, and the third spiral closer to the anterior than to the posterior spiral; posterior of the three spirals continuing directly in front of the suture to the aperture, heavily beaded on the later turns; anterior spiral developed on the body into a series of strong peripheral nodes, of which

six can be seen in the rear view; the third spiral with similar but more numerous beads than that in front of the suture; a secondary intercalated on the later whorls between each pair of primaries; a second series of nodes developed on the body, a little behind the middle, fewer in number than in the first series and staggered in position; space between the two series of nodes broken up into squarish pits by the intersection of the axial rugae with the evenly spaced spiral fillets; a similar series of checkerboard axials and spirals in front of the anterior nodes; axial sculpture relatively stronger and less regular on the anterior half of the body; an overhang and two or three stronger and more distantly spaced spirals behind the basal groove. Channel behind the fasciole narrow, U-shaped, very deep. Fasciole short, high, bent almost at right angles to the axis of the aperture. Aperture of holotype badly damaged. Outer lip on the paratype nearly vertical, heavily varicose, with traces retained of the characteristic transverse ridges. A wide spread of heavy callus on the inner face, its outer margin free and overlapping the preceding varix at 240° from the outer lip; inner margin of pillar transversely ridged; character of surface of body callus not known. Anterior canal short and narrow; margins parallel and very close together at the anterior extremity.

Holotype (U. S. Nat. Mus. 498499) measures: Height, 48.5 mm; diameter (not the maximum), 33 mm, Paratype (U. S. Nat. Mus. 498500) measures 70 mm in height. Holotype from station 14083, Flint River near Bainbridge, Ga. Paratype from station 12723, upper bed on A. L. Parrish farm, $3\frac{1}{2}$ miles southeast of Wausau, Washington County, Fla. Figured body whorl (U. S. Nat. Mus. 498672) from station 14281, $1\frac{1}{2}$ miles north of Waynesboro, Miss.

Holotype from Flint River formation; paratype from Suwannee limestone; figured body whorl from lower part of Chickasawhay marl.

The holotype, which is smaller than some of the other specimens from Flint River, was collected by August F. Foerste, when he accompanied Raphael Pumpelly on a boat trip down the river. The exact date is not known, but he referred to the Bainbridge material in a paper published in 1893. The collections were made at a number of points in the vicinity of Bainbridge, but the exact locality is not known. Later collections including *Cassis flintensis* have been made along the Flint River from a point 7 miles above Bainbridge to Blue Springs, 4 miles below Bainbridge.

The specimen which Dall figured came from station 7096, Red Bluff on the west bank of Flint River, 7 miles above Bainbridge, Decatur County, Ga. Woodring (1928) referred to this species as probably representing "the earliest American species of *Cassis*." Earlier species determined as *Cassis*, such as the Claiborne *brevicostatum* Conrad and the Ocala *globosum*, together with *caelatura* from the Byram marl, should be referred to *Phalium*. *Cassis sulcifera* Sowerby, a Dominican Miocene species to which the Flint River individuals were first assigned is more angular than that from the Flint River, the spire is lower and broader and the sides of the whorls more oblique. The spiral sculpture is much more obscure on the West Indian form, and the irregular, anastamosing tendency of the axials is accentuated. However, there seems to be a wide range of individual variation in these sculpture characters.

Occurrence.—Flint River formation. GEORGIA: Station 7118, roadside near bridge over Jones Creek, $1\frac{1}{4}$ miles southwest of Oakfield, Worth County; stations 3388 and 7096, Red Bluff on the west bank of Flint River, 7 miles above Bainbridge; station 14083, Flint River near Bainbridge; station 7150*a*, east bank of Flint River, just below the wagon bridge at Bainbridge, from loose blocks of chert; station 3391?, Bluff below Plant System Wharf, Bainbridge; station 2573, Blue Spring, east side of Flint River, 4 miles below Bainbridge; station 3381, base of the bluff at Little Horseshoe Bend, on the Flint River, 4 miles south of Bainbridge and about one-fourth mile from the mouth of the stream flowing from Blue Spring; station 7079, Mascot Point, east side of Flint River, below mouth of Blue Spring Branch; station 7074, Hale's Landing, west bank of Flint River, 7 miles southwest of Bainbridge, Decatur County; station 10393, well at depth of 55 feet, $4\frac{3}{4}$ miles east of Thomasville, Thomas County.

Suwannee limestone. FLORIDA: Station 12723, upper bed on the A.L. Parrish farm, 3½ miles southeast of Wausau, Washington County.

Lower part of Chickasawhay marl. ALABAMA: Station 14205*a*?, one-fourth mile north of Perdue Hill, Clarke County. MISSISSIPPI: Station 14281, highway bridge over Taylor Mill Creek, 1½ miles north of Waynesboro.

Genus SCONSIA Gray
SCONSIA sp. cf. S. LINTEA (Conrad)

A *Sconsia* too imperfectly preserved to determine but retaining no characters by which it may be separated from *Sconsia lintea* (Conrad) described from the Byram marl at Vicksburg has been recovered from the lower part of the Chickasawhay marl at station 14204, the lowest bed at Taylor Mill Creek, 1½ miles north of Waynesboro, Wayne County, and from station 13239, Bucatunna Creek, NW ¼ sec. 17, T. 8 N,. R. 5 W., also in Wayne County. A nondescript internal mold, which may very well represent the same species, was found on Rocky Branch, 1 mile north-northeast of Denham, Wayne County. *Sconsia lintea* has also been determined from external molds from station 7211, 3 miles north of Castleberry, Conecuh River, Ala.

INCERTA SEDIS
Plate 27, figure 38

An external mold (U.S.N.M. 498501) from the Suwannee limestone at station 12723, the upper bed on the A. L. Parrish farm, 3½ miles southeast from Wausaw, Washington County, Fla., reveals the outline and sculpture pattern of the anterior portion of the body of a species that is apparently new and of unusual interest. The species is with little doubt a cassid though not *Cassis*. It is probably allied to a rare form from the Vicksburg, which Conrad described in 1860 under the name of *Galeodia tricarinata*, but which is distinct from *Galeodia* in apertural characters. The lower middle and basal parts of the body of the Suwannee individual are girded with seven prominent spiral cords, with three to six secondary lirae intercalated between each pair of primaries. Both the primary and secondary spirals are more sharply elevated and more regular in size and disposition than those of Conrad's Vicksburg species. The curvature of the base of the body and the faint crenulation of the anterior peripheral primary are, however, similar in the Suwannee and the Vicksburg examples.

Genus FICUS ("Bolten") Roeding
FICUS MISSISSIPPIENSIS Conrad?
Plate 27, figures 36, 45

Ficus mississippiensis CONRAD, *1848*, Acad. Nat. Sci. Philadelphia, Jour., 2d ser., vol. 1, pt. 2, p. 117.
Pyrula mississippiensis SMITH, *1907*, Acad. Nat. Sci. Philadelphia, Proc., pp. 210, 214–216, 219, pl. 17, fig. 5.
Ficus sp. aff. *F. mississippiensis?*. MANSFIELD, *1938*, Washington Acad. Sci., Jour., p. 101.

Internal and external molds of a *Ficus* closely related to if not identical with *Ficus mississippiensis* Conrad described from the Byram marl at Vicksburg, Miss., are widely distributed in the upper Oligocene of the eastern Gulf. The spire of the figured mold seems a little lower than that of the usual Vicksburg individual, but there is an appreciable variation in the height of the spire in the specimens both from Vicksburg and from the localities farther east. The sculpture of the external molds is similar to that of Conrad's species. In the Alum Bluff and later representatives of the genus the spirals are relatively lower, less even, and less widely spaced, while the axials are less laminar, and the resulting sculpture pattern is decidedly cancellate. It is unfortunate that the diagnostic protoconch is not preserved, for the nucleus of *Ficus mississippiensis* includes a larger number of smooth whorls than the nuclei of the later species.

Figured mold (U. S. Nat. Mus. 498502) is 25 mm in diameter. From Suwannee limestone, at station 12723, A. L. Parrish farm, 3½ miles southeast of Wausau, Washington County, Fla.

Occurrence.—Suwannee limestone. FLORIDA: Station 12723, A. L. Parrish farm, 3½ miles southeast of Wausau, Washington County.

Lower part of Chickasawhay marl. ALABAMA: Stations 6735 and 14355, Murder Creek, at bridge east of Castleberry, Conecuh County; station 6749, McGowan's

Bridge, Conecuh River, 1 mile below the mouth of Sepulga River, Escambia County; station 7166, east bank of Tombigbee River, just south of Payne's Hammock, Clarke County. MISSISSIPPI: Station 13239, NW ¼, sec. 17, T. 8 N., R. 5 W., Bucatunna Creek, Wayne County.

Genus CLAVA Martyn

CLAVA sp.

Plate 27, figure 25

An apparently undescribed species is represented by two rather small and incomplete external molds from the lower part of the Chickasawhay marl at station 14519, about halfway up the hill, along the old road leading down to Limestone Creek, three miles north of Waynesboro, Wayne County, Miss. The shells were of moderate dimensions for the genus and rather slender. The sculpture is reticulate, the axials most evident at the intersection with the spirals, which they nodulate; the spirals flattened, strong, even, symmetrically disposed, three to each of the medial and later whorls of the spire. The axials are a little less closely spaced than the spirals, so that the rectangular pits enclosed are slightly wider than high. Toward the aperture, in the unfigured specimen, which is probably conspecific, the ribs tend to become varicose, and there are traces of an intercalated secondary between each pair of primaries.

Clava sp. is similar in general outline and sculpture pattern to *Clava parrishi* Mansfield, 1938, described from the Suwannee limestone on the A. L. Parrish farm, about 3½ miles southeast of Wausau, Washington County, Fla. The Chickasawhay species is less slender than *C. parrishi*; the axials are less closely spaced and less strongly nodose at the intersection with the spirals; and secondary spirals are not developed on the early and medial portions of the shell, as they are in the Suwannee species. A related form too imperfectly preserved for identification was collected from the Suwannee limestone, 10.2 miles northwest of Brooksville, Hernando County, Fla.

The height of the figured mold (U.S.N.M. 498503) is about 20 mm; the greatest diameter, 7 mm.

Subgenus OCHETOCLAVA Woodring

CLAVA (OCHETOCLAVA?) PERDUENSIS

Mansfield, n. sp.

Plate 27, figure 13

Shell rather small and slender, the tip and aperture not preserved. About seven closely appressed postnuclear whorls known, the whorls increasing very slowly in diameter, scarcely at all rounded, the body rather high and distorted by a strong varix. Axials low, rounded, feebly arcuate, extending from suture to suture, about 14 or 15 to each of the later whorls. Spirals straplike, emphasized by the fine, sharply incised striation on either side, very low and flat, but overriding the axials, approximately equal in width to the interspaces, four in number on the medial whorls of the spire, a fifth disclosed toward the body by the slight forward sag in the suture line. Characters of aperture not known.

Incomplete holotype (U. S. Nat. Mus. 498504) measures: Height, 20 mm; diameter, 7 mm. From lower part of Chickasawhay marl at station 14205*a*, gully, one-fourth mile north of Perdue Hill, Clarke County, Ala.

Clava (*Ochetoclava?*) *perduensis* is apparently related closely to *C. georgiana* (Lyell and Sowerby) and to the coexistant and possibly identical *C. platynema* (Dall). It is a much smaller shell than either of the other two, but the material is too imperfect to rule out the possibility of immaturity. A specimen of *C. georgiana* from Jacksonboro, the type locality, must have been between 65 and 70 mm high. No juvenile or adolescent specimens of *georgiana* or *platynema* are included in our collections, so an adequate comparison is not possible.

Clava (*Ochetoclava?*) *perduensis* is known from the type locality alone.

CLAVA (OCHETOCLAVA?) WATSONENSIS

Mansfield, n. sp.

Plate 27, figure 18

Species known only from incomplete external molds. Shell rather small, multigyrate, the exact number of whorls unknown; figured specimen including six to seven postnuclear volutions separated by channeled sutures. Whorls flattened, axials narrow,

rounded, probably 15 to 20 to each of the later whorls, persisting from suture to suture, fairly uniform in size excepting for an occasional varicose costal. Primary spirals straplike, disposed on the whorl with approximate symmetry, nodose at the intersection with the axials, which they overrun. A fine secondary threadlet intercalated between the posterior pair of primaries and that in front; between the two anterior primaries and between the anterior primary and the suture; posterior pair of primaries a little more closely spaced than the other two and without intercalaries. Suture drooping forward a little near the aperture disclosing an additional primary. Characters of aperture and anterior canal not preserved.

Incomplete holotype (U. S. Nat. Mus. 498505) measures: Height, 13 mm; diameter, 5 mm. From lower part of Chickasawhay marl at station 6758, south bank of Yellow River at Watson [Watkins] and Henderson Bridge, Covington County, Ala.

A knowledge of the characters of the aperture and the anterior canal are essential for the generic determination. The sculpture pattern and the dimensions recall *Clava* (*Ochetoclava*), but the subgenus has not previously been recorded in pre-Miocene faunas. Some of the species described as *Bittium* and *Cerithiopsis* from the Tampa and Flint River limestones have a sculpture pattern similar to that of *watsonensis*, but the shells are much smaller. A much smaller species of rather similar sculpture occurs in the upper Chickasawhay at station 14287, on Patton Creek, 1½ miles east of Waynesboro, Wayne County, Miss. A generic determination cannot be made.

Occurrence.—Lower part of Chickasawhay marl. Stations 6758 and 14292, the south bank of the Yellow River at Watson [Watkins] and Henderson Bridge, Covington County, Ala.

Genus PETALOCONCHUS H. C. Lea
PETALOCONCHUS VARIANS d'Orbigny

Poorly preserved specimens similar to those from the Tampa limestone that were referred questionably to *Petaloconchus varians* d'Orbigny were collected from the upper Chickasawhay. The locality is station 14287, at the waterfall on Patton Creek, one-fourth mile above Highway 45, 1½ miles east of Waynesboro, Wayne County, Miss.

Genus TURRITELLA Lamarck
TURRITELLA sp. cf. T. GATUNENSIS Conrad
Plate 27, figures 56, 57

Turritella gatunensis Conrad. MANSFIELD, *1938*, Washington Acad. Sci., Jour., vol. 28, no. 3, p. 102, figs. 1–3, 6.

In examining specimens referred to *T. gatunensis* from G formations of the Canal Zone two varieties are observed. In one variety which occurs in the Vamos-a-Vamos bed and in lower faunal zone of the Gatun formation, a depression develops on the early whorls whereas in the second variety occurring in the middle faunal zone of the Gatun formation at the Gatun dam (station 8365 and other stations) the earliest whorls are medially carinated, the anterior spiral coming in later.

The form at the A. L. Parrish farm more closely resembles those from the Vamos-a-Vamos and in the lower faunal zone of the Gatun formation.

Two external molds showing the early parts of a *Turritella* have been collected at station 13396, above the mouth of Limestone Creek, near the middle of sec. 25, T. 9 N., R. 7 W., Wayne County, Mississippi, by Roy T. Hazzard. These probably belong to *Turritella gatunensis* Conrad. Specimens from station 1/52, Gainestown Ferry, Clarke County, Alabama, referred by Cooke to the Chickasawhay marl member of the Byram marl are the same as those at the A. L. Parrish farm. MANSFIELD, 1938.

The figured holotype of *Turritella gatunensis* Conrad (1857) is a broken specimen and does not show the character of the early whorls. The type itself is apparently lost, and there is some doubt as to which variety is represented by Conrad's figure.

The Mississippi species should probably be referred to *Turritella gatunensis, s. l.* rather than to *T. gatunensis, s. s.*

The figured molds (U.S.N.M. 498506 and U.S.N.M. 498507) measure about 25 mm in height, but the figure of the former is ×1½, that of the latter ×1½.

The mold that includes the apical whorls in part is from station 14323, the highest fossiliferous bed in the ravine 200 yards south-southwest, of Jones' old plantation house, about 1 mile northwest of Glendon Station, Clarke County, Ala. The other figured mold is from station 14205*a*. Both specimens are from the lower part of the

Chickasawhay marl. The species is also recorded from several other localities.

Occurrence.—Lower part of Chickasawhay marl. ALABAMA: Station 14293, Weaver's Chute, east side of Conecuh River, sec. 18, T. 2 N., R. 13 E., Escambia County; station 14205*a*, overlying limestone in gully about one-fourth mile north of Perdue Hill, Monroe County; station 10052, Gainestown Ferry; station 14323, highest fossiliferous bed in ravine 200 yards south-southwest of Jones' old plantation house, 1 mile northwest of Glendon Station, Clarke County; station 14291, 1.3 miles north of Millry, Washington County. MISSISSIPPI: Station 13396, hillside above mouth of Limestone Creek, near middle of sec. 25, T. 9 N., R. 7 W., Wayne County; station 14204?, lower blue marl bed, Taylor Mill Creek, just east of highway bridge on Highway 45, 1½ miles north of Waynesboro (juveniles, identification uncertain); station 14281, "*Chione* limestone" above blue marl bed, Taylor Mill Creek, 1½ miles north of Waynesboro; station 13240, sec. 18, T. 8 N., R. 5 W., Rocky Branch, probably from the lower bed.

TURRITELLA MONROENSIS
Mansfield, n. sp.
Plate 27, figure 59

Shell large, slender, the apical angle between 15° and 20°, and the number of whorls probably between 15 and 20. Nuclear whorls and earliest postnuclear whorls lost. On earliest of the retained whorls a single strong basal cord, and in front of the posterior suture a sharp thread; and between the posterior thread and the anterior cord a concave medial area; a second basal cord emerging behind the anterior suture, and a second thread in front of the posterior suture, becoming in late adolescence equal in prominence to the original cord and thread with which they are paired; a fine sharp threadlet developed later on the strongly concave interarea but closer to the posterior pair of spirals than to the anterior pair; basal spirals apparently overrun with fine secondary threadlets, though the condition of preservation of the material obscures this character. Suture lines distinct and later whorls undercut. Characters of aperture lost, the body whorl doubtfully retained on a single individual; spiral sculpture on body possibly becoming obsolete, but the incrementals greatly strengthened; sinus as indicated by the growth lines deep, its axis coincident with the concave area between the anterior and posterior pairs of spirals.

Incomplete holotype (U. S. Nat. Mus. 498478) measures: Height, 68 mm; diameter, 17 mm. From lower part of Chickasawhay marl at station 14205*a*, overlying limestone in gully about one-fourth mile north of Perdue Hill, Monroe County, Ala.

Turritella monroensis recalls *T. halensis* Dall (1916) from the Flint River formation at Hale's Landing, Flint River, Ga. It is a more slender shell, however, than the Flint River species and differs in the detail of the sculpture pattern. In *T. halensis*, the anterior of the two basal cords is less prominent than that behind it; there is a single posterior primary, but several secondaries are intercalated between the primary and the posterior suture and on the shallow concave medial area between the anterior and posterior primaries. However, by slight modifications in the relative prominence of the posterior and the anterior spirals, and the introduction of additional secondaries, *T. monroensis* approaches very closely to *T. halensis*, and it is possible that the forms are only subspecifically distinct. Both *T. halensis* and *T. monroensis* may be in the line of descent from *T. martinensis* Dall of the Ocala limestone in Florida, and may belong to the group which includes *T. mississippiensis* Conrad from the Byram marl at Vicksburg. In sculpture pattern, the Vicksburg species more closely resembles *T. halensis* and lacks the characteristic paired anterior spirals of *T. monroensis*.

The species is known only from external molds.

Occurrence.—Lower part of Chickasawhay marl. ALABAMA: Station 14205*a*, overlying limestone, gully about one-fourth mile north of Perdue Hill, Monroe County; station 14323, highest fossiliferous bed in ravine 200 yards south-southwest of Jones' old plantation house, about 1 mile northwest of Glendon Station; station 14322?, uppermost fossiliferous bed on north side of Salt Creek on road from Jackson to Rockville, sec. 34, T. 6 N., R. 2 E., Clarke County (specimens adult and fairly numerous, but too imper-

fect for certain determination). MISSISSIPPI: Station 14285*a*, "*Chione* limestone," Limestone Creek Church, 4 miles north of Waynesboro; station 14282, "*Chione* limestone," blocks of limestone along roadside near Limestone Creek, 3 miles north of Waynesboro (probably blocks from top of hill); station 14281, "*Chione* limestone" at Taylor Mill Creek, 1½ miles north of Waynesboro, Wayne County.

TURRITELLA sp. aff. T. BOWENAE
Mansfield
Plate 27, figures 52, 58

A species known only from external molds from a few localities in southern Alabama resembles *Turritella bowenae* Mansfield (1937) in the general sculpture pattern but differs in the outline of the whorls. The whorls of *T. bowenae* are trapezoidal, and the regular outline of the spire is conspicuously interrupted only by the heavy basal cords. In the Alabama species the medial part of the whorl is broadly depressed, but it is less strongly concave than in *T. monroensis* Mansfield. In both *T. bowenae* and the unnamed species, the entire surface of the adult whorls seems to be overrun with a fine secondary threading, *Turritella monroensis* displays something of the sort on the posterior cords, but apparently the threading is much less prevalent than in *Turritella bowenae*.

Figured specimens (adolescent, U. S. Nat. Mus. 498479; fragment of adult whorls, U. S. Nat. Mus. 498480) measure: Height of adolescent, 39 mm; diameter of figured adult whorls of another individual, 19.5 mm. From lower part of Chickasawhay marl (probably synchronous with the Suwannee limestone of Florida from which *Turritella bowenae* was derived) at station 14292, south bank of Yellow River, site of Watson [Watkins] and Henderson bridge, sec. 13 or 14, T. 1 N., R. 15 E., Covington County, Ala.

The larger specimen figured has developed two rather strong basal cords, the lower slightly more prominent than the one behind it; two or three lirations on the feebly depressed medial area; a single posterior thread slightly more prominent than those in front of it, and stronger, also, than the one to three lirae on the posterior slope behind. In the specimens from the other two localities, station 7165, 200 yards north of Salt Creek, 4½ miles south of Jackson, and station 3640, Payne's Hammock, 10 miles south of Jackson, Clarke County, Ala., the posterior of the two basal cords is a little stronger than that in front of it, but the other details of the sculpture pattern are similar to those of the specimens figured.

TURRITELLA sp. cf. T. PAGODAEFORMIS
Heilprin

Numerous poorly preserved external molds of *Turritella* were recovered from the upper part of the Chickasawhay marl at station 14287, the waterfall on Patton Creek, 1½ miles east of Waynesboro, Wayne County, Miss. Among them is a fragment of a large and rather stout individual which in the characters retained resembles *Turritella pagodaeformis* Heilprin from the Tampa limestone of Florida. Most of the molds, however, represent a smaller, more slender undetermined species with a strongly concave median area.

TURRITELLA PERDUENSIS
Mansfield, n. sp.
Plate 27, figures 50, 54, 55

Shell of only moderate dimensions, slender, the apical angle between 15° and 20°. Whorls many, the number indeterminate, separated by distinct sutures. Nuclear and earliest postnuclear whorls lost. Earliest remaining whorls sculptured with two subequal beaded spirals, the one anterior, the other posterior, and between them a deep equatorial area, threaded with three or four finely beaded lirae; later sculpture modified by the introduction of a second posterior spiral behind the original, which within a few whorls equals the first in prominence and like it is rather strongly beaded; at a later growth stage a second anterior spiral emerges from behind the suture line, and additional secondaries are introduced. Characters of aperture not preserved.

A juvenile syntype (U. S. Nat. Mus. 498481) is 14 mm high. A syntype of 3 adult whorls (U.S.N.M. 498483) measures 20 mm in height and 10 mm in diameter.

There is one other syntype a fragment of about 4 whorls, probably not fully adult (U.S.N.M. 498482). The types are from the lower part of the Chickasawhay marl at station 10334, a quarter of a mile northeast of Perdue Hill, Monroe County, Ala.

The shell most closely comparable in outline and sculpture pattern is *Turritella ceibana* Cooke (1928) from the Oligocene of Mexico, but in the Mexican species the constriction at the suture is much more pronounced than in the adult *T. perduensis*; the anterior spiral is relatively stronger, and the posterior spiral is less definitely paired, although there is a beaded secondary behind the primary. The equatorial secondaries are less numerous and not so fine.

Turritella perduensis and *T. ceibana* probably belong to a group distinct from that represented by the larger, coarser shells of *T. halensis* and the closely allied *monroensis*, *T. bowenae* and the later *T. tampae* of Heilprin.

Turritella perduensis like the other species from the upper Oligocene limestones is known only from molds of the exterior.

Occurrence.—Lower part of Chickasawhay marl: ALABAMA: Station 10334, a quarter mile northeast of Perdue Hill; station 14205*a*, overlying limestone in gully about a quarter mile north of Perdue Hill, Monroe County.

TURRITELLA sp.
Plate 27, figure 53

A new species of *Turritella* is indicated by a broken external mold which includes a part of five whorls. The shell was of moderate dimensions and rather slender. Both the anterior and the posterior extremities have been lost. The sculpture pattern, however, differs from that of any described form. There are three prominently elevated spirals to the whorl, the anterior of the three a double cord. The medial and posterior are approximately equal in elevation, the posterior possibly slightly more prominent than the medial, the three spirals symmetrically disposed on the whorl and separated from the preceding and succeeding whorls by a deeply concave interspace. The suture line is exceedingly obscure.

The figured mold (U.S.N.M. 498484) is about 20 mm high and was collected at station 10053, 4 miles north of Waynesboro, Wayne County, Miss.

A closely related and possibly identical species may be represented by an external mold from station 13381, 1⅓ miles north of Millry, Washington County, Ala. In the Alabama species, the anterior of the three spirals, instead of being similar to the two in front of it excepting for the medial groove is split into two distinct and much finer spirals. In *Turritella ceibana* Cooke (1928) from Rio Buena Vista at La Ceiba road crossing Veracruz, Mexico, there are a pair of anterior and a pair of posterior spirals, and between them a concave, depressed area threaded by a beaded secondary. The primaries are strongly beaded, too, while those of the Mississippi shell were apparently simple.

Genus CALYPTRAEA Lamarck

CALYPTRAEA sp.

Internal and external molds of *Calyptraea* have been collected at a number of localities both in the lower and in the upper part of the Chickasawhay marl. The largest, an external mold 45 to 50 mm in diameter, from station 14364, near the top of the Chickasawhay River section, retains remnants of an irregular radial sculpture. Other molds referable to indeterminate *Calyptraea* were collected from the lower part of the Chickasawhay marl, at station 10334, one-fourth mile northeast of Perdue Hill, Monroe County; station 7165, 200 yards north of Salt Creek on Jackson-Rockville road, 4½ miles south of Jackson, Clarke County, Ala. Station 13386, hill above quarry at mouth of Limestone Creek, 3 miles northwest of Waynesboro; stations 14360 and 14362, the glauconitic beds near the base of the Chickasawhay River section one-fourth mile below the bridge on the Waynesboro-Laurel road, 2½ miles west of Waynesboro, Wayne County, Miss.

Genus POLINICES Montfort

POLINICES? sp.
Plate 27, figure 43

A small naticoid (U. S. Nat. Mus. 498671) 6.8 mm high and 6.2 mm in greatest diameter was collected from the lower Chickasaw-

hay at station 14204, the lowest bed at the bridge over Taylor Mill Creek on Highway 45, 1½ miles north of Waynesboro, Wayne County, Miss. Three or four rapidly increasing whorls are included. The outline of the spire is broad and fairly smooth, and the body is evenly rounded. The margin of the whorl in front of the suture is slightly crushed locally, much as in some specimens of *Polinices vicksburgensis* (Conrad), but this is doubtless an individual character incident to the thinness of the shell directly in front of the suture. The aperture is obliquely lobate and obtusely angulated posteriorly. The outer lip is smoothly flaring and rather sharp at the margin. The parietal callus is heavy at the commissure and broadly and feebly constricted between the commissure and the umbilicus. The characters of the umbilicus are obscured by the slight breakage of the shell. Apparently there is a feeble funicular rib similar to that of *P. vicksburgensis*, but it is not outlined by a well-defined groove like that of *P. byramensis* Cooke. The margin of the umbilicus is rounded much as in *P. vicksburgensis*, and in front of the umbilicus the margin of the aperture is slightly reverted and thickened. The calloused parietal wall indicates maturity, but adult *P. vicksburgensis* are double the size of the Chickasawhay specimen, which is probably new.

Other forms incompletely preserved but apparently similar in general character occur at station 13239 in the NW ¼ sec. 17, T. 8 N., R. 5 W., on Bucatunna Creek, Wayne County, Miss. A fragment from station 14289, sec. 10, T. 8 N., R. 7 W., on the Chickasawhay, Wayne County, Miss., displays the retractive grooves radiating from the posterior suture which characterize *Natica* (*Naticarius*).

Genus AMPULLINA Bowdich
Subgenus AMPULLINOPSIS Conrad
AMPULLINA (AMPULLINOPSIS) AMPHORA (Heilprin)
Plate 27, figure 39

Natica amphora HEILPRIN, *1887*, Wagner Free Inst. Sci., Trans., vol. 1, p. 112, pl. 16, fig. 50.
Ampullina (*Ampullinopsis*) *amphora* DALL, *1892*, Wagner Free Inst. Sci., Trans., vol. 3, pt. 2, p. 375.
Ampullina amphora DALL, *1915*, U. S. Nat. Mus., Bull. 90, p. 108, pl. 11, fig. 5. Occurrence in Chipola marl excepted.
Ampullina (*Ampullinopsis*) *amphora* MANSFIELD, *1937*, Florida Geol. Survey, Bull. 15, p. 175.

In its somewhat crushed and incomplete state the figured specimen measures almost 90 mm in height and 99 mm in greatest diameter. The diameter, however, is probably exaggerated by the crushing. The specimen is an internal mold to which thin fragments of the original shell still adhere. The sutures are deeply channeled, and strong retractive growth lines are developed on the final half turn. The figured example (U.S.N.M. 498485), was associated with large Ostrea in the upper Chickasawhay at station 14289, near the top of the Chickasawhay River section, one-fourth mile downstream from the highway bridge on the Waynesboro-Laurel road, 2½ miles west of Waynesboro, Wayne County, Miss. A body whorl, possibly referable to *Ampullina amphora*, was recovered, also, at station 14287, at the waterfall on Patton Creek, one-fourth mile above Highway 45, and 1½ miles east of Waynesboro, Wayne County, Miss.

The occurrence of *Ampullinopsis amphora* below the Tampa limestone and its time equivalents has not been established.

Genus PACHYCROMMIUM Woodring
PACHYCROMMIUM sp.
Plate 27, figure 44

Molds from the lower part of the Chickasawhay marl in western Alabama are similar, except for their much smaller size, to molds from the Flint River and Suwannee limestones of Georgia and Florida referred by Dall (1916) to *Amauropsis ocalana* Dall, and by Mansfield (1937) to "*Amauropsis*" aff. *A. burnsii meridionalis* Pilsbry. As Mansfield indicated, *Amauropsis ocalana* is a *nomen dubium*, for the specimens from the Ocala limestone were not adequately isolated, described, or figured. In any case, the Ocala species is distinct from that from Flint River. In *Amauropsis burnsii meridionalis* described by Pilsbry from the middle Miocene of the Dominican Republic, the whorls are more inflated than those of either the Flint River and Suwannee forms or of *Pachycrommium* sp, and the apical angle is higher than in any of the Oligocene molds. The Chickasawhay specimens from

Perdue Hill are little more than half as high as the mold figured by Mansfield from Flint River, the inflation of the body is slightly higher, and the apical angle slightly lower than that of the Georgia form. It is apparently closer, however, to the Flint River and Suwannee species than it is to *Pachycrommium*? sp., the conspicuously tabulated form from the Chickasawhay marl of Wayne County, Miss.

The height of the incomplete figured specimen (U.S.N.M. 498486) is 27 mm, the diameter, 17 mm. *Pachycrommium* sp. is known from the single locality, station 14205*a*, the overlying limestone in a gully about one-fourth mile north of Perdue Hill, Monroe County, Ala.

PACHYCROMMIUM? sp.
Plate 27, figure 8

An internal mold (U.S.N.M. 498487) of doubtful affinities differs, possibly generically, from the specimens referred to *Pachycrommium* sp. Both of the figured ampullinids include in their incomplete form between three and four volutions, but the body in *Pachycrommium*? is shorter relatively, and the whorls of the spire are strongly tabulated and separated by channeled sutures, so that the profile of the decollated spire is like a stile.

The height of the incomplete mold is 36 mm; the diameter, 26 mm.

Pachycrommium? sp. is fairly common in the lower part of the Chickasawhay marl at the single locality at which it occurs, station 14519, an old road on the east side of the new road, south of Limestone Creek, about halfway up the hill, Wayne County, Miss.

Genus SINUM "Bolten" Roeding
SINUM sp. cf. S. MISSISSIPPIENSE (Conrad)
Plate 27, figure 46

A species closely related to *Sinum mississippiense* described by Conrad (1848) from Vicksburg, Miss., is rather widely distributed in the lower part of the Chickasawhay marl in western Alabama and eastern Mississippi. The curvature of the body of the Chickasawhay form seems a little higher, and the profile of the posterior part of the shell less even than that of the Vicksburg species, The character of the sculpture is the same in the two forms, and the slight differences in outline are probably of less than specific value. Certain conclusions, however, cannot be drawn, for the Chickasawhay specimens are poorly preserved. The best of them has been figured. The small nucleus of three to four smooth, polished volutions is succeeded by two postnuclear volutions. The body is obliquely compressed, more so than in *S. mississippiense*, and the surface crowded with irregular flattened spirals more or less wrinkled by the growth lines. The margin of the aperture is broken. The inner lip was reinforced and reverted slightly but not sufficiently to close completely the narrow umbilical chink.

Figured specimen (U. S. Nat. Mus. 498488) measures: Height, 14 ± mm; diameters, 13.5 ± mm. From station 14204, lower bed of blue marl on Taylor Mill Creek, just below the highway bridge on State Highway 45, 1½ miles north of Waynesboro, Wayne County, Miss.

A similar mold apparently referable to the same species as those from the Chickasawhay was recovered in late collections of the Suwannee limestone in northern Florida.

Occurrence.—Suwannee limestone. FLORIDA: Station 12723, upper bed on the H. L. Parrish place, 3½ miles southeast of Wausau, Washington County, Fla.

Lower part of Chickasawhay marl. ALABAMA: Station 10334, one-fourth mile northeast of Perdue Hill, Monroe County; station 7166, bed no. 3, east bank of the Tombigbee River, just south of Payne's Hammock, Clarke County. MISSISSIPPI: Station 13396, hillside above mouth of Limestone Creek, near middle of sec. 25, T. 9 N., R. 7 W.; station 14283, top of hill on old road leading down to Limestone Creek, 3 miles north of Waynesboro; station 14204, lower bed, Taylor Mill Creek, just below the bridge on Highway 45, 1½ miles north of Waynesboro, Wayne County.

Genus EUNATICINA Fisher
EUNATICINA sp. cf. E. CONRADII Dall

A broken shell (U.S.N.M. 498489) comparable to *Eunaticina conradii* Dall from

the Vicksburg of Mississippi was collected from the lower part of the Chickasawhay marl at station 14204, the lowest bed at the bridge over Taylor Mill Creek on Highway 45, 1½ miles north of Waynesboro, Wayne County, Miss. The outline of the Chickasawhay shell is similar to that of *E. conradii*, but the sculpture seems a little coarser. The generic characters of the group are so marked that there is a strong resemblance between the Chickasawhay form, *Eunaticina caractica* Dall from the Chipola formation, and *Eunaticina regia* (Guppy) from the Bowden beds.

Genus TURBO Linnaeus
TURBO sp.
Plate 27, figure 37

The existence of *Turbo* in the Chickasawhay seas is strongly indicated if not established by internal molds and molds of the apical and peripheral surfaces. The nuclear characters are not known, nor those of the aperture and operculum. The shell must have included at least four postnuclear whorls, which were full and increased rapidly in diameter. A shoulder is obscurely suggested on the later whorls, but the body was apparently strongly and evenly rounded at the periphery. The early whorls of the spire are threaded with six subequal, apparently smooth spirals, the two peripheral spirals becoming slightly stronger relatively on the final whorl of the spire, and obscurely beaded. On the body, the beading becomes stronger on the principal spirals, and a single secondary is introduced between each pair of primaries on the medial part of the whorl. The suture is distinct and feebly excavated.

Diameter of figured mold (U. S. Nat. Mus. 498490), probably not the maximum, 25 mm. From lower part of Chickasawhay marl at station 14282, 3 miles north of Waynesboro, Wayne County, Miss. Blocks of limestone along side road, probably fallen from a higher level.

Turbo sp. suggests in its outline and sculpture pattern the higher, less evenly rounded and more ornate *Turbo* (*Taeniaturbo*) *dominicensis* Gabb from the middle Miocene of the Dominican Republic and the later Miocene of the Bowden beds of Jamaica. The characteristic features of the section *Taeniaturbo* Woodring are the wide, slightly raised band of callus with which the inner lip is fused in the umbilical area and the sculpture pattern of the operculum. The section has not been recorded in strata earlier than the middle Miocene nor from Recent waters other than those of eastern mid-America and the Gulf of Mexico.

Occurrence.—Lower part of Chickasawhay marl: MISSISSIPPI: Station 14282, 3 miles north of Waynesboro; station 14519, the old road on the east side of the new road, south of Limestone Creek, about halfway up the hill, Wayne County.

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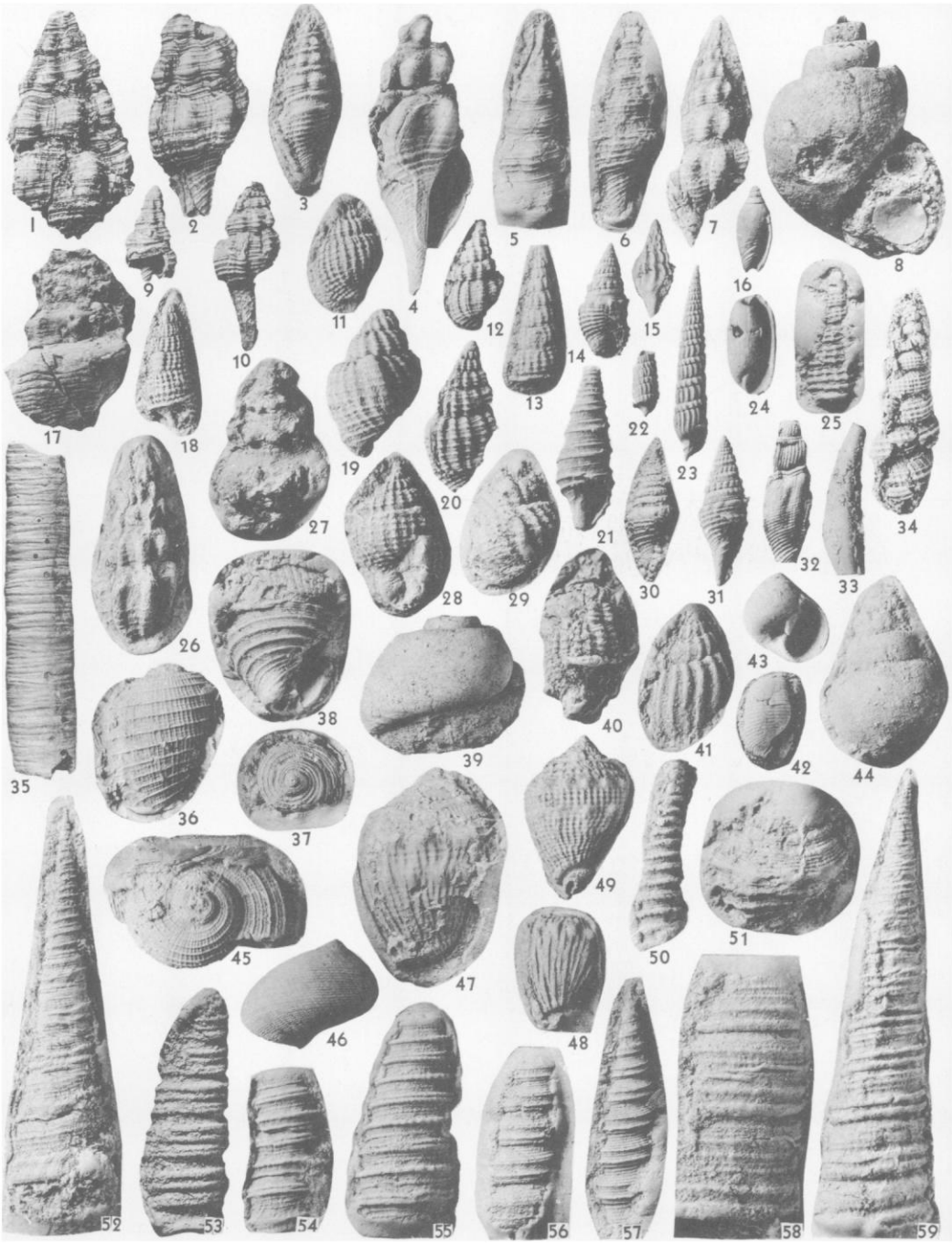
EXPLANATION OF PLATE 27

FIGS. *1, 2, 9*—*Latirus taylorensis* Mansfield, n. sp. Syntypes, U. S. Nat. Mus. 498474, ×1½. (p. 208)
3—*Tropisurcula* cf. *T. caseyi* (Aldrich). U. S. Nat. Mus. 498466, ×2. (p. 205)
4—*Fusiturricula waynesboroensis* Mansfield, n. sp. Holotype, U. S. Nat. Mus. 498461, ×1½. (p. 204)
5—*Pleurofusia* sp. U. S. Nat. Mus. 498459, ×1. (p. 204)
6—*Pleurofusia* cf. *P. vicksburgensis* Casey. U. S. Nat. Mus. 498458, ×1. (p. 203)
7—*Fusiturricula* cf. *F. servata* (Conrad). U. S. Nat. Mus. 498462, ×1. (p. 205)
8—*Pachycrommium?* sp. U. S. Nat. Mus. 498487, ×1. (p. 223)
10—*Murex?* sp. U. S. Nat. Mus. 498496, ×1½. (p. 213)
11—"*Alectrion?*" sp. B. U. S. Nat. Mus. 498494, ×1½. (p. 212)
12—*Tritaria waynensis* Mansfield, n. sp. Holotype, U. S. Nat. Mus. 498477, ×2. (p. 211)
13—*Clava* (*Ochetoclava?*) *perduensis* Mansfield, n. sp. U. S. Nat. Mus. 498504, ×2. (p. 217)
14—*Scobinella taylorensis* Mansfield, n. sp. Paratype, U. S. Nat. Mus. 498468, ×1½. (p. 206)
15—*Syntomodrillia?* cf. *S.? tantula* Conrad. U. S. Nat. Mus. 498465, ×2½. (p. 206)
16—*Olivella* cf. *O. affluens* Casey. U. S. Nat. Mus. 498471, ×1½. (p. 207)
17—*Fasciolaria* cf. *F. petrosa* Dall. U. S. Nat. Mus. 498473, × ½. (p. 209)
18—*Clava* (*Ochetoclava?*) *watsonensis* Mansfield, n. sp. Holotype, U. S. Nat. Mus. 498505, ×1½. (p. 217)
19—*Cancellaria* (*Bonellitia*) *waynensis* Mansfield, n. sp. Holotype, U. S. Nat. Mus. 498469, ×2. (p. 207)
20—*Tritiaria* sp. U. S. Nat. Mus. 498476, ×2. (p. 209)
21—*Pleuroliria? waynensis* Mansfield, n. sp. Holotype, U. S. Nat. Mus. 498460, ×2. (p. 204)
22—*Terebra* (*Strioterebrum*) *tantula* Conrad? U. S. Nat. Mus. 498456, ×1½. (p. 203)
23—*Terebra* (*Strioterebrum*) *waynesboroensis* Mansfield, n. sp. Holotype, U. S. Nat. Mus. 498455, ×1¼. (p. 203)
24—*Cylichna* sp. U. S. Nat. Mus. 498454, ×5. (p. 202)
25—*Clava* sp. U. S. Nat. Mus. 498503, ×1. (p. 217)
26—*Fusiturricula?* sp. U. S. Nat. Mus. 498463, ×1½. (p. 205)
27—*Melongena* sp. U. S. Nat. Mus. 498475, ×1½. (p. 209)
28—"*Alectrion*" sp. A. U. S. Nat. Mus. 498493, ×1½. (p. 212)
29—*Cancellaria* (*Trigonostoma*) sp. U. S. Nat. Mus. 498470, ×1. (p. 207)
30—*Hemipleurotoma?* sp. U. S. Nat. Mus. 498464, ×1½. (p. 205)
31—*Scobinella taylorensis* Mansfield, n. sp. Holotype, U. S. Nat. Mus. 498467, ×1½. (p. 206)
32—*Metula taylorensis* Mansfield, n. sp. Holotype, U. S. Nat. Mus. 498495, ×2½. (p. 212)
33—*Cadulus waynensis* Mansfield, n. sp. Holotype, U. S. Nat. Mus. 498491, ×5. (p. 202)
34—*Scalina waynensis* Mansfield, n. sp. Holotype, U. S. Nat. Mus. 498498, ×2. (p. 214)
35—*Kuphus incrassatus* Gabb. U. S. Nat. Mus. 496240, ×½ (after Mansfield). (p. 201)
36—*Ficus mississippiensis* Conrad? U. S. Nat. Mus. 498502, ×1. (p. 216)
37—*Turbo* sp. U. S. Nat. Mus. 498490, ×½. (p. 224)
38—*Incerta sedis*. U. S. Nat. Mus. 498501. (p. 216)
39—*Ampullina* (*Ampullinopsis*) *amphora* (Heilprin). U. S. Nat. Mus. 498485, ×¼. (p. 222)
40—*Tritiaria* cf. *T. vicksburgensis* (Aldrich). U. S. Nat. Mus. 498492, ×2. (p. 211)
41—*Lyria* cf. *L. mississippiensis* (Conrad). U. S. Nat. Mus. 498472, ×1½. (p. 208)
42—*Acteon* sp. U. S. Nat. Mus. 498453, ×1½. (p. 202)
43—*Polinices?* sp. U. S. Nat. Mus. 498671, ×2. (p. 221)
44—*Pachycrommium* sp. U. S. Nat. Mus. 498486, ×1. (p. 222)
45—*Ficus mississippiensis* Conrad? U. S. Nat. Mus. 498502, ×1. (p. 216)
46—*Sinum* cf. *S. mississippiense* (Conrad). U. S. Nat. Mus. 498488, ×1½. (p. 223)
47–49—*Cassis flintensis* Mansfield, n. sp. *47*, Paratype, U. S. Nat. Mus. 498500, ×½. *48*, sp.? U. S. Nat. Mus. 498672, ×½ (doubtfully identified). *49*, Holotype, U. S. Nat. Mus. 498499, ×½. (p. 214)
50, 54, 55—*Turritella perduensis* Mansfield, n. sp. *50*, Syntype, a juvenile, U. S. Nat. Mus. 498481, ×2. *54*, Syntype, 3 adult whorls, U. S. Nat. Mus. 498483, ×1. *55*, Syntype, 4 adult whorls, U. S. Nat. Mus. 498482, ×1½. (p. 220)
51—*Rapana* cf. *R. vaughani* Mansfield. U. S. Nat. Mus. 498497, ×1½. (p. 213)
52—*Turritella* aff. *T. bowenae* Mansfield. Juvenile, U. S. Nat. Mus. 498479, ×1½. (p. 220)
53—*Turritella* sp. U. S. Nat. Mus. 498484, ×1½. (p. 221)
56, 57—*Turritella* cf. *T. gatunensis* Conrad. *56*, U. S. Nat. Mus. 498506, ×1. *57*, U. S. Nat. Mus. 498507, ×1½. (p. 218)
58—*Turritella* aff. *T. bowenae* Mansfield. U. S. Nat. Mus. 498480, ×1½. (p. 220)
59—*Turritella monroensis* Mansfield, n. sp. Holotype, U. S. Nat. Mus. 498478, ×1. (p. 219)



Mansfield, Chickasawhay Mollusks