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FLORIDA STATE GEOLOGICAL SURVEY

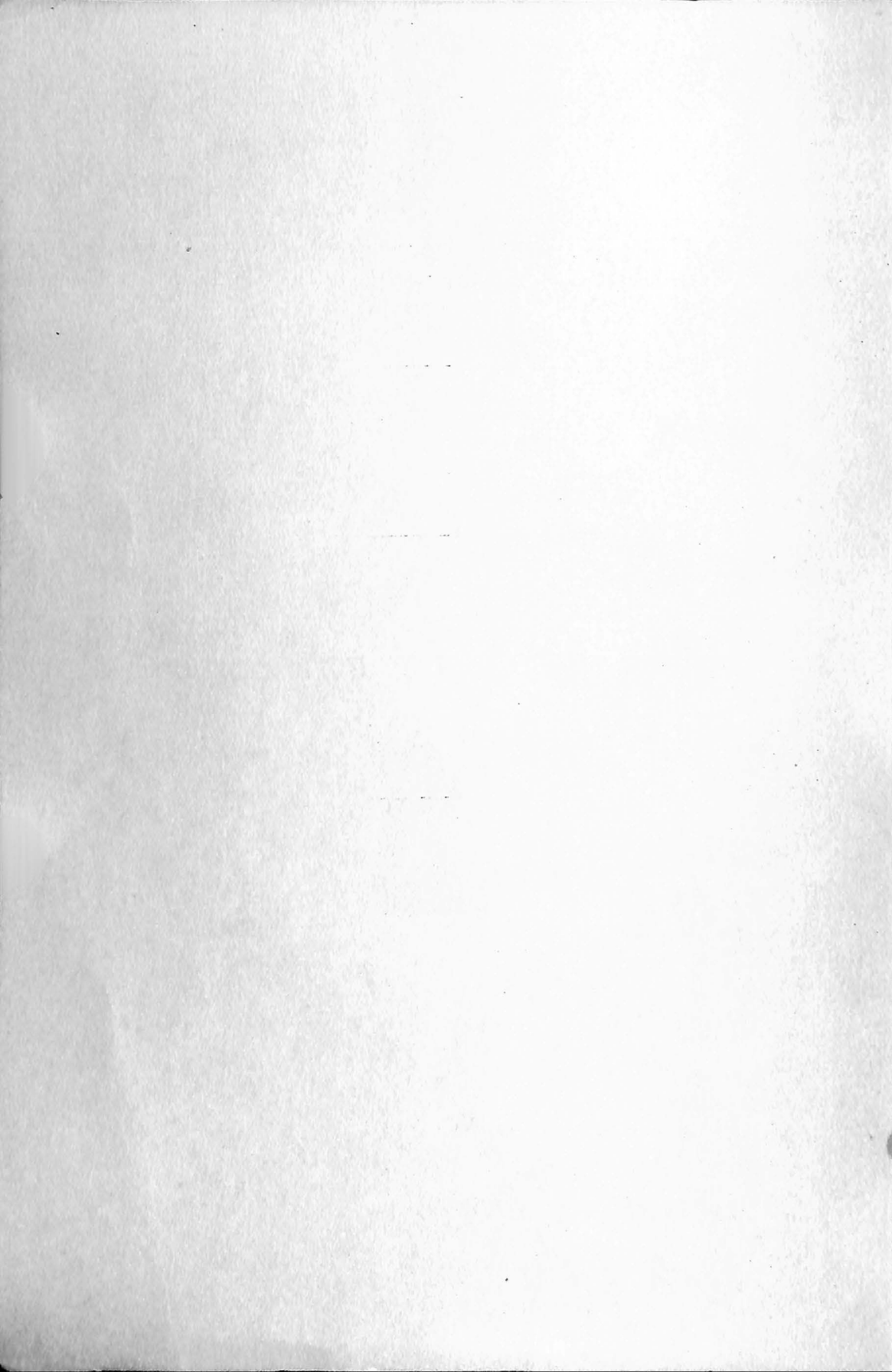
HERMAN GUNTER, *State Geologist*

BULLETIN No. 3

MIOCENE GASTROPODS AND SCAPHOPODS OF
THE CHOCTAWHATCHEE FORMATION
OF FLORIDA

By
W. C. MANSFIELD
OF THE
UNITED STATES GEOLOGICAL SURVEY

TALLAHASSEE, FLORIDA
1930



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LETTER OF TRANSMITTAL

*To His Excellency, Hon. Doyle E. Carlton,
Governor of Florida.*

SIR:

I have the honor to submit herewith for publication as Bulletin No. 3, of the Florida State Geological Survey, a report entitled "Miocene Gastropods and Scaphopods of the Choctawhatchee Formation" by Dr. W. C. Mansfield, of the United States Geological Survey. This report is a contribution from the Federal Survey without expense to the Florida Survey other than that of publication. It will form an important addition to the detailed knowledge of the fauna of the Choctawhatchee formation which is so well exposed in western Florida. It is anticipated that another paper will follow dealing with the pelecypods of this formation, thus giving to the Choctawhatchee very complete treatment. The Florida Geological Survey is fortunate in being the recipient of this generous co-operation.

Respectfully,

HERMAN GUNTER,
State Geologist.

Tallahassee, Florida,
January 1, 1930.

CONTENTS

	PAGE
Introduction	13
Historical review	14
Divisions of the Choctawhatchee formation	15
Arca zone	15
Typical exposure	15
Fauna	15
Ecphora zone	15
Typical exposure	15
Fauna	15
Distribution and correlation	16
Cancellaria zone	16
Typical exposure	16
Fauna	17
Distribution and correlation	17
List of stations	18
List and distribution of species	20
Descriptions of species	25
Acteonidae	25
Acteon vauhani	25
Acteocinidae	26
Acteocina canaliculata	26
Acteocina coënsis	26
Sulcularia sulcata harveyensis	27
Cylichnella jacksonensis	28
Volvula oxytata hosfordensis	28
Ringiculidae	29
Ringicula (floridana var.?) guppyi	29
Ringicula (floridana var.?) guppyi (more typical)	29
Bullariidae	30
Bullaria species	30
Terebridae	30
Myurella binodosa	30
Myurella dislocata	31
Myurella dislocata indenta	31
Myurella protexta?	31
Conidae	32
Conus adversarius	32
Conus floridanus	32
Conus testudinarius leonensis	32

	PAGE
Conidae—(Continued).	
<i>Conus harveyensis</i>	33
Turritidae	33
<i>Cymatosyrinx lunata</i>	33
<i>Cymatosyrinx lunata aepytuberculata</i>	34
<i>Cymatosyrinx lunata porrecta</i>	34
<i>Cymatosyrinx propeaepynota</i>	35
<i>Cymatosyrinx propeaepynota libertiensis</i>	35
<i>Cymatosyrinx</i> sp. aff. <i>C. eburnea</i>	36
<i>Cymatosyrinx</i> , species indeterminable	36
<i>Clathrodrillia?</i> <i>emmonsi</i>	36
<i>Clathrodrillia?</i> <i>emmonsi hosfordensis</i>	37
<i>Clathrodrillia?</i> <i>anteaphanitoma</i>	37
<i>Clathrodrillia?</i> <i>gracilina</i>	38
<i>Clathrodrillia?</i> <i>podagrina</i>	39
<i>Crassispira antealesidota</i>	39
<i>Bellaspira?</i> , n. sp.?	40
<i>Mangilia harveyensis</i>	41
<i>Mangilia coënsis</i>	41
<i>Mangilia gardnerae</i>	42
<i>Mangilia</i> sp. aff. <i>M. magnoliana</i>	43
<i>Brachycythara turrita</i>	43
“ <i>Cythara</i> ” <i>balteata?</i>	44
<i>Acmaturris metria</i>	44
<i>Glyphostoma watsoni leonensis</i>	45
Turritidae, Appendix	45
Cancellariidae	46
<i>Cancellaria</i> (<i>Cancellaria</i>) <i>tabulata</i>	46
<i>Cancellaria</i> (<i>Cancellaria</i>) <i>reticulata leonensis</i>	46
<i>Cancellaria</i> (<i>Cancellaria?</i>) <i>propevenusta</i>	47
<i>Cancellaria</i> (<i>Narona</i>) <i>agria</i>	48
<i>Cancellaria</i> (<i>Narona</i>) <i>coënsis</i>	49
<i>Cancellaria</i> (<i>Trigonostoma</i>) <i>perspectiva alumensis</i>	49
<i>Cancellaria</i> (<i>Trigonostoma</i>) <i>tenera</i>	50
<i>Cancellaria carolinensis?</i>	50
Olividae	51
<i>Oliva sayana</i>	51
<i>Olivella mutica</i>	51
<i>Olivella mutica coënsis</i>	52
<i>Olivella floridana</i>	53
<i>Olivella jacksonensis</i>	53
Marginellidae	54
<i>Marginella popenoei</i>	54
<i>Marginella</i> sp. aff. <i>M. contracta</i>	55
<i>Marginella</i> sp. cf. <i>M. gravida</i>	55

CONTENTS

7

	PAGE
Marginellidae—(Continued).	
<i>Marginella minuta</i>	55
<i>Marginella bella tersa</i>	55
<i>Marginella bella hosfordensis</i>	56
<i>Marginella denticulata clarksvillensis</i>	56
<i>Marginella aureocincta</i>	57
<i>Marginella precursor</i>	57
<i>Cypraeolina daeria</i>	58
<i>Cypraeolina</i> sp. cf. <i>C. ovuliformis</i>	58
Volutidae	58
<i>Aurinia mutabilis</i>	58
<i>Maculopeplum trenholmii</i>	59
Mitridae	60
<i>Mitra stephensoni</i>	60
<i>Mitra wandoensis</i>	60
<i>Mitra hosfordensis</i>	61
<i>Mitra hosfordensis libertiensis</i>	61
Xancidae	62
<i>Vasum?</i> sp.	62
Fascioliariidae	62
<i>Fasciolaria sparrowi</i>	62
<i>Fasciolaria gigantea harveyensis</i>	63
<i>Fasciolaria rhomboidea</i>	63
<i>Peristernia filicata</i>	64
<i>Fusinus dalli</i>	65
<i>Fusinus caloosaënsis gunteri</i>	65
<i>Busycon maximum alumense</i>	66
<i>Busycon maximum tudiculatum</i>	67
<i>Busycon maximum rapum</i>	67
<i>Busycon scalarispira?</i>	67
<i>Busycon pyrum propeincile</i>	68
<i>Busycon pyrum libertiense</i>	68
<i>Busycon pyrum apynotum</i>	69
<i>Busycon</i> sp. aff. <i>B. canaliculatum</i>	69
<i>Busycon perversum</i>	69
<i>Solenosteira vaghani</i>	70
Chrysodomidae	70
<i>Ephora quadricostata umbilicata</i>	70
Buccinidae	72
<i>Cantharus watsonensis</i>	72
<i>Ptychosalpinx laqueata</i>	72
<i>Dorsanum?</i> <i>plicatillum</i>	73
Columbrariidae	74
<i>Phos sloani floridanus</i>	74
<i>Phos vaghani</i>	75

	PAGE
Alectrionidae	76
Alectrion alumensis	76
Alectrion cornelliana	76
Alectrion floridana	76
Alectrion quadridentata	77
Alectrion consensa harveyensis	78
Alectrion consensa leonensis	79
Columbellidae	79
Anachis camax coënsis	79
Anachis clappi	80
Anachis wieserae	81
Strombina gunteri	81
Strombina gunteri leonensis	82
Muricidae	83
Typhis harrisi	83
Murex pomum	83
Purpura fluviana	83
Purpura marshalli	84
Eupleura miocenica	85
Eupleura caudata brevispira	85
Eupleura caudata leonensis	86
Urosalpinx trossulus?	86
Muricidea floridana libertiënsis	86
Muricidea floridana conradi	87
Epitoniidae	87
Epitonium sayanum, n. subsp.?	87
Epitonium turriculum	88
Epitonium alumensis	88
Mellanellidae	89
Melanella (Melanella) bartschi	89
Melanella (Melanella) magnoliana	89
Strombiformis leonensis	90
Strombiformis leonensis harveyensis	91
Niso willcoxiana gunteri	91
Pyramidellidae	92
Pyramidella species <i>a</i>	92
Pyramidella species <i>b</i>	92
Pyramidella species <i>c</i>	92
Turbonilla (Chemnitzia) species <i>a</i>	92
Turbonilla (Chemnitzia) species <i>b</i>	92
Turbonilla (Pyrgiscus) species <i>c</i>	92
Turbonilla (Pyrgiscus) species <i>d</i>	92
Turbonilla (Pyrgiscus) species <i>e</i>	93
Turbonilla (Strioturbonilla) species <i>f</i>	93
Cassididae	93
Sconsia hodgei	93

CONTENTS

9

	PAGE
Ficidae	93
<i>Ficus</i> aff. <i>F. papyratum</i>	93
Cypraeidae	94
<i>Cypraea carolinensis</i>	94
Cymatiidae	94
<i>Cymatium</i> (<i>Linatella</i>) <i>floridanum</i>	94
Strombidae	95
<i>Strombus pugilis floridanus</i>	95
Triphoridae	95
<i>Triphora</i> , species indeterminable	95
Cerithiopsidae	96
<i>Cerithiopsis</i> , species <i>a</i>	96
<i>Cerithiopsis</i> , species <i>b</i>	96
<i>Cerithiopsis</i> , species <i>c</i>	96
<i>Seila clavulus</i>	96
Cerithiidae	97
<i>Cerithium floridanum leonensis</i>	97
“ <i>Cerithium</i> ” <i>harveyensis</i>	98
<i>Alabina adamsi floridana</i>	99
<i>Alabina adamsi leonensis</i>	99
<i>Alabina adamsi harveyensis</i>	100
Modulidae	100
<i>Modulus woodringi</i>	100
Caecidae	101
<i>Caecum cooperi</i>	101
<i>Caecum floridanum compactum</i>	101
<i>Caecum coronellum</i>	101
<i>Caecum regulare</i>	102
<i>Meioceras nitidum</i>	102
<i>Meioceras</i> sp. aff. <i>M. cingulatum</i>	102
Vermetidae	102
<i>Serpulorbis granifera</i>	102
<i>Vermicularia spirata</i>	103
<i>Petalochonchus sculpturatus</i>	104
Turritellidae	105
<i>Turritella aluminensis</i>	105
<i>Turritella aluminensis gardnerae</i>	106
<i>Turritella etiwanensis</i>	106
<i>Turritella cookei</i>	107
<i>Turritella cookei harveyensis</i>	107
<i>Turritella cookei clarksvillensis</i>	108
<i>Turritella duplinensis</i>	108
<i>Turritella subannulata jacksonensis</i>	109
<i>Turritella subannulata ochlockoneënsis</i>	109
<i>Turritella species</i>	110

	PAGE
Architectonicidae	110
<i>Architectonica granulata</i>	110
<i>Architectonica nupera watsonensis</i>	111
Fossaridae	112
<i>Fossarus (Isapis) anomala floridana</i>	112
Rissoinidae	113
<i>Rissoina (Zebina) johnsoni</i>	113
<i>Rissoina (Zebina) clarksvillensis</i>	113
<i>Rissoina (Zebina) tersa</i>	113
<i>Rissoina (Phosinella) cancellata?</i>	114
Rissoidae	114
<i>Rissoa lipeus floridana</i>	114
Crepidulidae	115
<i>Crepidula aculeata</i> var. <i>costata</i>	115
<i>Crepidula aculeata</i> var. <i>spinosa</i>	115
<i>Crepidula plana</i>	116
<i>Crepidula fornicata</i> (Linné) and varieties	116
<i>Crepidula fornicata</i> var. <i>ponderosa</i>	117
<i>Crepidula fornicata cymbaeformis</i>	117
<i>Crepidula fornicata rostrata</i>	117
<i>Crepidula æsop</i> (? <i>Crepidula fornicata</i> var. <i>rostrata</i>)	118
Calyptraeidae	118
<i>Crucibulum auriculum</i>	118
<i>Crucibulum auriculum imbricatum</i>	119
<i>Crucibulum constrictum</i>	119
<i>Crucibulum multilineatum</i>	120
<i>Calyptraea centralis</i>	120
Xenophoridae	121
<i>Xenophora delecta floridana</i>	121
Hydrobiidae	122
<i>Amnicola</i> aff. <i>A. floridana</i> , var. <i>convexa</i>	122
Naticidae	122
<i>Natica canrena</i>	122
<i>Tectonatica pusilla</i>	123
<i>Polinices coënsis</i>	124
<i>Polinices (Euspira) internus</i>	125
<i>Polinices (Neverita) duplicatus</i>	126
<i>Polinices (Mammillaria?) caroliniana</i>	127
Turbinidae	127
<i>Turbo castaneus</i> var. <i>crenulatus</i>	127
Liotiidae	128
<i>Molleria duplinensis parva</i>	128
Trochidae	129
<i>Calliostoma aluminium</i>	129
<i>Calliostoma philanthropus pontoni</i>	129
<i>Solariella vughani</i>	130

	PAGE
Trochidae—(Continued).	
Tegula (Omphalius) exoleta	131
Vitrinellidae	132
Cyclostrema bartschi	132
Circulus gunteri	132
Circulus? leonensis	133
Teinostoma carinatum	134
Teinostoma nanum umbilicatum	134
Teinostoma harveyensis	135
Teinostoma (Pseudorotella?) washingtonensis	135
Fissurellidae	136
Fissuridea nucula	136
Fissuridea cattiliformis alumensis	137
Dentaliidae	137
Dentalium (Dentalium) attenuatum	137
Dentalium (Dentalium) carolinense	138
Dentalium (Dentalium?) disparile leonense	139
Dentalium (Graptacme?) pleiocenum?	139
Dentalium, species <i>a</i> , ? aff. Dentalium (Laevidentalium) callipeplum..	140
Siphodentaliidae	140
Cadulus floridanus	140
Cadulus thallus	141
Cadulus aff. C. (Polyschides) quadridentatus	141

MIOCENE GASTROPODS AND SCAPHOPODS OF THE CHOCTAWHATCHEE FORMATION OF FLORIDA¹

By WENDELL C. MANSFIELD

INTRODUCTION

The specimens studied for this report were obtained at different times during a number of years by several collectors, as shown by the list of stations on pages 18-19. Collections were made by Mr. Herman Gunter, State Geologist of Florida, and his associates, and I spent two months in the field in 1925 and obtained specimens from nearly all the fossiliferous beds. About 207 species of gastropods and 7 species of scaphopods were collected from the Choctawhatchee formation. The types of the new species are deposited in the United States National Museum. A set of named gastropods and scaphopods from the Choctawhatchee marl, representing most of the species and including topotypes insofar as practicable, has been deposited with the Florida State Geological Survey. Considerable difficulty was experienced in assigning certain peculiar forms to genera, and a few of these forms may have been misplaced. The inferences drawn as to the significance and the relations of the faunas are only tentative; they may be modified by later studies.

I desire to thank the officials of the United States National Museum for the use of the former collections.

The photographs used for the illustrations were made in the laboratory of the United States Geological Survey by Mr. W. O. Hazard and the prints were retouched by Miss Frances Wieser of that Survey. Valuable assistance was rendered by Mr. Willis P. Popenoe of the same Survey in preparing part of the collections for study.

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HISTORICAL REVIEW

In 1892¹ Dall referred to the Chesapeake group all the beds in Florida that were then considered of newer Miocene age. He recognized two subdivisions, the "Jacksonville limestone" in the eastern part of Florida and the "Ecphora bed" in the western part. He writes:² "At Alum Bluff the group is represented by what I have termed the *Ecphora* bed, of gray marl, with over 100 species of fossils, many of which are common to North Carolina, Virginia, and Maryland. It has a thickness here of 30 feet or more." Later Dall³ applied the name "aluminous clay" to a 25-foot bed of grayish clay overlying the "*Ecphora* bed." In 1909 Matson and Clapp⁴ included both the "*Ecphora* bed" and the "aluminous clay" of Dall in their Choctawhatchee formation, which takes its name from Choctawhatchee River, with type locality in the vicinity of Red Bay, a small settlement about 18 miles southeast of DeFuniak Springs, Walton County, Florida.

In 1916 Mansfield⁵ described the outcrop at Red Bay, listed the fauna, and described and illustrated the following new forms: *Arca* (*Scapharca*) *staminea rubisiniana*, *Leda choctawhatcheënsis*, *Phacoides* (*Pleurolucina*) *choctawhatcheënsis*, *Astarte* (*Ashtarotha*) *vaughani*, and *Diplodonta waltonensis*. On page 603 he writes: "On account of the small collections and the unidentifiable character of some specimens it is not possible to determine the exact synchronism of the fauna with that of the upper bed at Alum Bluff; however, the species present indicate that the beds represent nearly the same if not precisely the same horizon." I now believe, as will be shown later on in this paper, that this fauna is older than that in the upper bed at Alum Bluff.

¹Dall, W. H., and Harris, G. D., Neocene of North America: U. S. Geol. Survey Bull. 84, pp. 123, 124, 1892.

²Idem, p. 124.

³Dall, W. H., and Stanley-Brown, Joseph, Cenozoic geology along the Apalachicola River: Geol. Soc. America Bull., vol. 5, pp. 168, 169, 1894.

⁴Matson, G. C., and Clapp, F. G., Florida Geol. Survey Second Ann. Rept., pp. 108, 114, 1909.

⁵Mansfield, W. C., Mollusks from the type locality of the Choctawhatchee marl: U. S. Nat. Mus. Proc., vol. 51, pp. 599-607, pl. 113, 1916.

DIVISIONS OF THE CHOCTAWHATCHEE FORMATION

For the present purpose the fossiliferous beds in the Choctawhatchee formation are separated into three zones, as follows: *Arca staminea rubisiniana* zone, referred to in this paper as the *Arca* zone; *Ecphora quadricostata umbilicata* zone, referred to in this paper as the *Ecphora* zone; and *Cancellaria propevenusta* zone, referred to in this paper as the *Cancellaria* zone.

ARCA ZONE

Typical exposure.—The *Arca* zone is exposed in two beds near Red Bay, Walton County. The lower bed consists of a very fossiliferous gray marl about 21 feet thick. Its entire thickness is unknown, as its contact with the underlying formation is concealed, but it is probably somewhat more than 21 feet thick. The upper bed, about 27 feet thick, consists of a rather plastic clay carrying impressions of *Leda*, *Lucina*, and *Corbula*.

Fauna.—The fauna contains two indeterminable species of gastropods, one species of scaphopod, and about 20 genera of pelecypods. The gastropods and scaphopod are of little value for correlation. The pelecypods are more abundant, both in number of species and individuals. The pelecypod fauna evidently lived at a time later than that of the Shoal River formation and earlier than that of the *Ecphora* zone at Alum Bluff. The fauna of the *Arca* zone is probably nearly synchronous with that of some part of the Chesapeake group of Maryland. A more definite statement of the relation of this fauna to distant faunas must be deferred until the study of the pelecypods is completed.

ECPHORA ZONE

Typical exposure.—The *Ecphora* zone is typically exposed in the upper fossiliferous bed unconformably overlying the Chipola formation at Alum Bluff, Apalachicola River. The bed ranges in thickness from 15 to 25 feet at different places along the bluff. It consists of very fossiliferous, sandy clay, which is bluish where unweathered.

Fauna.—Dall¹ listed 45 gastropods and 4 scaphopods from this bed and adjacent outcrops. Among these, *Cerithium burnsii* Dall, *Modulus compactus* Dall, and *Tuba acutissima* Dall appear to have come from the Chipola formation. In this paper I have listed 48 gastropods and 3 scaphopods collected from the *Ecphora* zone at Alum Bluff.

¹Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 6, pp. 1596, 1597, 1903.

The following species of gastropods and scaphopods appear to be confined to the *Ecphora* zone:

<i>Aurinia mutabilis</i> (Conrad)	<i>Epitonium alumensis</i> Mansfield
<i>Fasciolaria sparrowi</i> Emmons	<i>Turritella alumensis</i> Mansfield
<i>Busycon maximum alumense</i> Mansfield	<i>Turritella alumensis gardnerae</i> Mansfield
<i>Busycon maximum tudiculatum</i> Dall	<i>Polinices internus</i> (Say)
<i>Busycon pyrum propeincile</i> Mansfield	<i>Calliostoma aluminium</i> Dall
<i>Busycon pyrum libertiense</i> Mansfield	<i>Teinostoma nanum umbilicatum</i> (H. C. Lea)
<i>Busycon pyrum aepynotum</i> Dall	<i>Fissuridea cattiliformis alumensis</i> Mansfield
<i>Ecphora quadricostata umbilicata</i> (Wagner)	<i>Cadulus floridanus</i> Dall
<i>Ptychosalpinx laqueata</i> (Conrad)	<i>Dentalium carolinense</i> Conrad
<i>Alectrion alumensis</i> (Olsson)	(nearly confined)
<i>Eupleura miocenica</i> Dall	

The fauna of the *Ecphora* zone, as pointed out by Dall, evidently lived in cold water. The presence of *Ecphora quadricostata umbilicata*, *Polinices internus*, as well as other gastropods, and the scaphopod, *Dentalium carolinense*, indicates this environment.

Distribution and correlation.—This zone is represented in a cut in an old road leading to Watsons Landing, about 2 miles north of Alum Bluff (station 1/962); near Clarksville (station 8862); Darlings Slide (station 1/672), Abes Spring (station 1/959), and below Baileys Ferry (station 3418), on Chipola River; on Choctawhatchee River near Red Head Still (station 1/951); lower upper Miocene bed at Jackson Bluff, Ochlockonee River (station 3423). The highest part of this zone is represented at the last locality. The fauna of the *Ecphora* zone is nearly related to that in the bed underlying the fragmental series of the Yorktown formation of Virginia.

CANCELLARIA ZONE

Typical exposure.—The *Cancellaria* zone is typically exposed in the highest fossiliferous beds along Harveys Creek, Leon County, Fla. The total thickness of the zone in this area is 25 to 30 feet. The sediments composing this zone consist of a fine to coarse grained clayey sand containing many fossils. The beds of this zone were probably laid down after the deposition of the "aluminous clay" of Dall, which is not found along Ochlockonee River.

Fauna.—The following list includes some of the characteristic species in the *Cancellaria* zone.

<i>Conus floridanus</i> Gabb	" <i>Cerithium</i> " <i>harveyensis</i> Mansfield
<i>Cancellaria reticulata leonensis</i> Mansfield	<i>Modulus woodringi</i> Mansfield
<i>Cancellaria propevenusta</i> Mansfield	<i>Vermicularia spirata</i> (Philippi)
<i>Cancellaria tenera</i> Philippi	<i>Turritella etiwanensis</i> (Tuomey and Holmes)
<i>Marginella popenoei</i> Mansfield	<i>Turritella cookei</i> Mansfield
<i>Fasciolaria gigantea harveyensis</i> Mansfield	<i>Turritella cookei harveyensis</i> Mansfield
<i>Busycon perversum</i> (Linnaeus)	<i>Turritella duplinensis</i> Gardner and Aldrich
<i>Dorsanum? plicatilum</i> (Böse)	<i>Xenophora delecta floridana</i> Mansfield
<i>Phos sloani floridanus</i> Mansfield	<i>Natica canrena</i> (Linnaeus)
<i>Alectrion cornelliana</i> (Olsson)	<i>Polinices coënsis</i> Dall
<i>Alectrion floridana</i> Mansfield	<i>Turbo castaneus</i> var. <i>crenulatus</i> Gmelin
<i>Strombina gunteri</i> Mansfield	
<i>Strombus pugilis floridanus</i> Mansfield	
<i>Cerithium floridanum leonensis</i> Mansfield	

The fauna of the *Cancellaria* zone evidently lived in rather warm water, an environment indicated by the presence of such species as *Natica canrena*, *Vermicularia spirata*, and of the genera *Caecum*, *Strombus*, *Xenophora*, and others.

At station 3421, Harveys Creek, half a mile above an abandoned mill, the gastropod fauna is represented by 123 species, nearly three times as many as in the *Ecphora* zone. From stations 3671 and 3672, near Hosford, 57 gastropods were recognized. The following species were found only near Hosford: *Acteocina coënsis*, *Mitra hosfordensis*, *Solenosteira vauhani*, and *Phos vauhani*. The deposits around Hosford are believed to carry the earliest fauna referred to this zone.

Distribution and correlation.—The fauna of the *Cancellaria* zone is represented at the following other localities: The "Deadens," Washington County (stations 8176, 1/422, 1/706); Econfinia River, 1 mile below highway bridge, Bay County (station 1/953); on Mr. S. D. Johnson's place, near Woods, Liberty County (station 1/961); highest bed at Jackson Bluff, Leon County (stations 3422, 11732).

The fauna of the *Cancellaria* zone is closely allied to the fauna of the Duplin marl of the Carolinas and appears to have lived at approximately the same time.

LIST OF STATIONS

LEON COUNTY

3421 (T. W. Vaughan, 1900); 1/946 (W. C. Mansfield, 1925); Florida Geological Survey, 1925 and later. Harveys Creek, about half a mile above abandoned mill, SW. $\frac{1}{4}$ sec. 9, T. 1 S., R. 3 W. (*Cancellaria* zone.)

3422 (T. W. Vaughan, 1900); 1/963 (W. C. Mansfield, 1925). Jackson Bluff, left bank of Ochlockonee River. Highest fossiliferous upper Miocene bed. (*Cancellaria* zone.)

11732. Borrow pit, about 600 feet from the wagon bridge over river at Jackson Bluff. Fossils from upper part of the marl and directly beneath the unfossiliferous surface material. Collected by Florida Geological Survey, 1927. (*Cancellaria* zone.)

3423 (T. W. Vaughan, 1900); 1/967 (W. C. Mansfield, 1925). Just above wagon bridge at Jackson Bluff, left bank of Ochlockonee River. Lower upper Miocene bed. (*Ecphora* zone.)

4993. One mile west of Holland post office. Fossils taken from well, 28 feet deep. G. C. Matson, collector, 1908. (Mainly *Ecphora* zone.)

1/964. Highest bed at abandoned mill on Harveys Creek, about half a mile above the highway bridge on road to Bloxham. W. C. Mansfield, collector, 1925. (*Cancellaria* zone.)

1/965. Lower upper Miocene bed at abandoned mill on Harveys Creek, about half a mile above highway bridge on road to Bloxham. W. C. Mansfield, collector, 1925. (*Ecphora* zone.)

1/966. Double Branch, just above highway bridge on road to Bloxham. W. C. Mansfield, collector, 1925. (*Cancellaria* zone.)

LIBERTY COUNTY

2210 (Frank Burns, 1889); 2569 (W. H. Dall and J. S. Brown, 1893); 3417 (T. W. Vaughan, 1900); 7081 (C. W. Cooke and W. C. Mansfield, 1914); 1/670 (J. A. Gardner, 1923); 1/956 (W. C. Mansfield, 1925); 1/1056 (C. W. Cooke and D. S. Mossom, 1926). Upper bed at Alum Bluff, left bank of Apalachicola River. (*Ecphora* zone, typical.)

3671. Hosford (formerly Coe's Mill). T. W. Vaughan, collector, 1902. (*Cancellaria* zone.)

3672. (T. W. Vaughan, 1902); 1/958 (W. C. Mansfield, 1925). At abandoned mill about 1 mile northwest of Hosford. (*Cancellaria* zone.)

1/961. On Mr. S. D. Johnson's place, near Woods, about 6 miles below Bristol. W. C. Mansfield, collector, 1925. (*Cancellaria* zone.)

1/962. Cut in old road to Watsons Landing, about 2 miles north of Alum Bluff and about the same distance from Apalachicola River. Base of bed about 40 feet above the river terrace. W. C. Mansfield, collector, 1925. (*Ecphora* zone.)

CALHOUN COUNTY

3418. Bailey post office, about 5 miles below Baileys Ferry. Fossils taken from well. T. W. Vaughan, collector, 1900. (*Ecphora* zone.)

8862. From high cliff half a mile northeast of Clarksville. F. G. Clapp, collector, 1920. (*Ecphora* zone.)

1/954. From lowest fossiliferous bed exposed on Four-mile Creek, about half a mile northwest of Clarksville. W. C. Mansfield, collector, 1925. (*Ecphora* zone.)

1/672 (J. A. Gardner, 1923); 1/960 (W. C. Mansfield, 1925). Darlings Slide, east side of Chipola River, about $2\frac{1}{2}$ miles southeast of Clarksville. (*Ecphora* zone.)

BAY COUNTY

1/953. On Econfinia River about 1 mile below highway bridge over river. Sec. 4, T. 1 S., R. 13 W. Fossils about 8 feet above river level and directly above an indurated and porous limestone. W. C. Mansfield, collector, 1925. (*Cancellaria* zone.)

WASHINGTON COUNTY

8176. The "Deadens," about 5 miles southeast of Greenhead. E. H. Sellards, collector, 1918. (*Cancellaria* zone.)

1/422. Hamlin Pond, southeast of Greenhead. C. W. Cooke and J. A. Gardner, collectors, 1921. (*Cancellaria* zone.)

1/706 (C. W. Cooke and J. A. Gardner, 1921); 1/955 (W. C. Mansfield, 1925). Gully Pond, southeast of Greenhead. (*Cancellaria* zone.)

1/951. Uppermost fossiliferous bed overlying the lower Miocene bed near Rocky Landing, on Choctawhatchee River, and about 1 mile from Red Head Still. W. C. Mansfield, 1925. (*Ecphora* zone.)

WALTON COUNTY

4975 (G. C. Matson, 1908); 1/671 (J. A. Gardner, 1923); 1/947, 1/948, and 1/949 (W. C. Mansfield, 1925). Bluffs about 1 mile east and southeast of Red Bay. (*Arca* zone.)

7152 (C. W. Cooke, 1914); 1/673 (J. A. Gardner, 1923); 1/950 (W. C. Mansfield, 1925). E. Gomillion's field, a quarter of a mile south of Red Bay. (*Arca* zone.)

DISTRIBUTION OF SPECIES FROM THE CHOCTAWHATCHEE FORMATION

Those marked C are from the *Cancellaria* zone; E from *Ecphora* zone; A from *Arca* zone; D from the Duplin marl of the Carolinas. The asterisk denotes the persistence of the species to the Recent fauna of the coast.

GASTROPODA

- Acteon vauhani* Mansfield, n. sp. C, D.
Acteocina canaliculata (Say) C, E, D, *.
 coënsis Mansfield, n. sp. C.
Sulcularia sulcata harveyensis Mansfield, n. subsp. C.
Cylichnella jacksonensis Mansfield, n. sp. C, E.
Volvula oxytata hosfordensis Mansfield, n. subsp. C, D.
Ringicula (*floridana* var.?) *guppyi* Dall C.
 (*floridana* var.?) *guppyi* Dall (more typical) C.
Bullaria sp. C.
Myurella binodosa Mansfield, n. sp. C.
 dislocata (Say) C, D, *.
 dislocata indenta (Conrad) C, D.
 protexta (Conrad)? C.
Conus adversarius Conrad C, E, D.
 floridanus Gabb C, *.
 testudinarius leonensis Mansfield, n. subsp. C.
 harveyensis Mansfield, n. sp. C.
Cymatosyrinx lunata (H. C. Lea) C, E, D.
 lunata aepyptuberculata Mansfield, n. subsp. C.
 lunata porrecta Mansfield, n. subsp. C.
 propeaepynota Mansfield, n. sp. C.
 propeaepynota libertiensis Mansfield, n. subsp. C, E.
 sp. aff. *C. eburnea* (Conrad) E.
Clathrodrillia? *emmonsi* (Olsson) C, E, D.
 emmonsi hosfordensis Mansfield, n. subsp. C.
 anteaphanitoma Mansfield, n. sp. C.
 gracilina (Dall ms.) Mansfield, n. sp. C, E.
 podagrina (Dall) C.
Crassispira antealesidota Mansfield, n. sp. C.
Bellaspira? n. sp.? C.
Mangilia harveyensis Mansfield, n. sp. C, D.
 coënsis Mansfield, n. sp. C.
 gardnerae Mansfield, n. sp. C, E.
 sp. aff. *M. magnoliana* Olsson C.
Brachycythara turrita Mansfield, n. sp. C.
 "Cythara" *balteata* (Reeve)? C.
Acmaturris metria (Dall) C.
Glyphostoma watsoni leonensis Mansfield, n. subsp. C.
Cancellaria (*Cancellaria*) *tabulata* Gardner and Aldrich C, E, D.
 reticulata leonensis Mansfield, n. subsp. C.
 (*Cancellaria*?) *propevenusta* Mansfield, n. sp. C, D.
 (*Narona*) *agria* Mansfield, n. sp. C, E.

- (Narona) coënsis Mansfield, n. sp. C, E.
 (Trigonostoma) perspectiva alumensis Mansfield, n. subsp. C, E.
 (Trigonostoma) tenera Philippi C, D.
 carolinensis Emmons? E.
 Oliva sayana Ravenel C, E, D, *.
 Olivella mutica (Say) Dall C, E, D, *.
 mutica coënsis Mansfield, n. subsp. C.
 floridana Mansfield, n. sp. C.
 jacksonensis Mansfield, n. sp. E.
 Marginella popenoei Mansfield, n. sp. C.
 sp. aff. *M. contracta* Conrad E.
 sp. cf. *M. gravida* Dall E.
 minuta Pfeiffer C, E, D, *.
 bella tersa Mansfield, n. subsp. C.
 bella hosfordensis Mansfield, n. subsp. C.
 denticulata clarksvillensis Mansfield, n. subsp. C?, E.
 aureocincta Stearns C, D, *.
 precursor Dall C.
 Cypraeolina daeria (Dall) C, D.
 Cypraeolina sp. cf. *C. ovuliformis* (d'Orbigny) C.
 Aurinia mutabilis (Conrad) E, D.
 Maculopeplum trenholmii (Tuomey and Holmes) C?, E, D.
 Mitra stephensoni Mansfield, n. sp. C.
 wandoensis (Holmes) C, D, *.
 hosfordensis Mansfield, n. sp. C.
 hosfordensis libertiensis Mansfield, n. subsp. C, E.
 Vasum? sp. C.
 Fasciolaria sparrowi Emmons E, D.
 gigantea harveyensis Mansfield, n. subsp. C.
 rhomboidea Rogers C, E, D.
 Peristernia filicata (Conrad) C, E, D.
 Fusinus dalli Mansfield, n. sp. C?, E.
 caloosaensis gunteri Mansfield, n. subsp. C.
 Busycon maximum alumense Mansfield, n. subsp. E.
 maximum tudiculatum Dall E.
 maximum rapum (Heilprin) C, D (var.?).
 scalarispira Conrad? E.
 pyrum propeincile Mansfield, n. subsp. E.
 pyrum libertiense Mansfield, n. subsp. E.
 Busycon pyrum aepynotum Dall E.
 sp. aff. *B. canaliculatum* (Linnaeus) C.
 perversum (Linnaeus) C, D, *.
 Solenosteira vaghani Dall C.
 Euphora quadricostata umbilicata (Wagner) E.
 Cantharus watsonensis Mansfield, n. sp. E.
 Ptychosalpinx laqueata (Conrad) E.
 Dorsanum? plicatulum (Böse) C, D.
 Phos sloani floridanus Mansfield, n. subsp. C.
 vaghani Mansfield, n. sp. C.
 Aletrion alumensis (Olsson) E.
 cornelliana (Olsson) C, D?.

- floridana* Mansfield, n. sp. C.
quadridentata Mansfield, n. sp. C, E.
consensa harveyensis Mansfield, n. subsp. C.
consensa leonensis Mansfield, n. subsp. C.
Anachis camax coënsis Mansfield, n. subsp. C, E, D.
clappi Mansfield, n. sp. E.
wieserae Mansfield, n. sp. C.
Strombina gunteri Mansfield, n. sp. C.
gunteri leonensis Mansfield, n. subsp. C.
Typhis harrisi Olsson C, E, D.
Murex pomum Gmelin C.
Purpura marshalli Mansfield, n. sp. C.
Eupleura miocenica Dall E.
caudata brevispira Mansfield, n. subsp. C.
caudata leonensis Mansfield, n. subsp. C.
Urosalpinx trossulus (Conrad)? C.
Muricea floridana libertiensis Mansfield, n. subsp. C, E.
floridana conradi Mansfield, n. subsp. C.
Epitonium sayanum Dall, n. subsp.? C.
turriculum (Sowerby) C, *.
alumensis Mansfield, n. sp. E.
Melanella (*Melanella*) *bartschi* Gardner and Aldrich C, E, D.
(*Melanella*) *magnoliana* Gardner and Aldrich C, D.
Strombiformis leonensis Mansfield, n. sp. C.
leonensis harveyensis Mansfield, n. subsp. C.
Niso willcoxiana gunteri Mansfield, n. subsp. C.
Pyramidella sp. *a* C.
sp. *b* C.
sp. *c* C.
Turbonilla (*Chemnitzia*) sp. *a* E.
(*Chemnitzia*) sp. *b* C.
(*Pyrgiscus*) sp. *c* C.
(*Pyrgiscus*) sp. *d* C.
(*Pyrgiscus*) sp. *e* C.
(*Strioturbonilla*) sp. *f* C.
Sconsia hodgei (Conrad) E?, C, D.
Fiscus aff. *F. papyratium* (Say) C.
Cypraea carolinensis Conrad C, D.
Cymatium (*Linatella*) *floridanum* Mansfield, n. sp. C.
Strombus pugilis floridanus Mansfield, n. subsp. C.
Triphora sp. indet. C.
Cerithiopsis, sp. *a* C.
sp. *b* C.
sp. *c* C.
Seila clavulus (H. C. Lea) C, E, D.
Cerithium floridanum leonensis Mansfield, n. subsp. C.
"Cerithium" *harveyensis* Mansfield, n. sp. C.
Alabina adamsi floridana Mansfield, n. subsp. C.
adamsi leonensis Mansfield, n. subsp. C.
adamsi harveyensis Mansfield, n. subsp. C.
Modulus woodringi Mansfield, n. sp. C.

- Caecum cooperi* S. Smith C, D, *.
 floridanum compactum Dall C.
 coronellum Dall C.
 regulare Carpenter C, *.
Meioceras nitidum (Stimpson) Carpenter C. *.
 sp. aff. *M. cingulatum* Dall C.
Serpulorbis granifera (Say) Dall C?, D.
Vermicularia spirata (Philippi) Dall C, *.
Petalocoenchus sculpturatus H. C. Lea C, E, D.
Turritella aluminensis Mansfield, n. sp. E.
 aluminensis gardnerae Mansfield, n. subsp. E.
 etiwanensis (Tuomey and Holmes) C, E?, D.
 cookei Mansfield, n. sp. C.
 cookei harveyensis Mansfield, n. subsp. C.
 cookei clarksvillensis Mansfield, n. subsp. E.
 duplinensis Gardner and Aldrich C, D.
 subannulata jacksonensis Mansfield, n. subsp. E.
 subannulata ochlockoneënsis Mansfield, n. subsp. E.
Architectonica granulata (Lamarck) C, E, D, *.
 nupera watsonensis Mansfield, n. subsp. E.
Fossarus (Isapir) *anomala floridana* Mansfield, n. subsp. C.
Rissoina (Zebina) *johnsoni* Dall E.
 (Zebina) *clarksvillensis* Mansfield, n. sp. E.
 (Zebina) *tersa* Mansfield, n. sp. C, D.
 (Phosinella) *cancellata* Philippi? C.
Rissoa lipeus floridana Mansfield, n. subsp. C, E?.
Crepidula aculeata var. *costata* Morton C?, E, D.
 aculeata var. *spinosa* Conrad C, E, D.
 plana Say C, E, D, *.
 fornicata var. *ponderosa* H. C. Lea E, D.
 fornicata var. *cymbaeformis* Conrad E.
 fornicata var. *rostrata* Conrad E, D.
 aesop Dall C.
Crucibulum auriculum (Gmelin) C, *.
 auriculum imbricatum Sowerby C, E, D, *.
 constrictum (Conrad) E, A?.
 multilineatum (Conrad) C, D.
Calyptraea centralis (Conrad) C, E, D, *.
Xenophora delecta floridana Mansfield, n. subsp. C.
Amnicola sp. aff. *A. floridana* var. *convexa* Pilsbry C.
Natica canrena (Linnaeus) C, D, *.
Tectonatica pusilla Say C, E, D, *.
Polinices coënsis (Dall) C.
 (Euspira) *internus* (Say) E, D.
 (Neverita) *duplicatus* (Say) C, E, D, *.
 (Mammillaria?) *caroliniana* (Conrad) C, D.
Turbo castaneus var. *crenulatus* Gmelin C, *.
Molleria duplinensis parva Mansfield, n. subsp. C.
Calliostoma aluminium Dall E.
 philanthropus pontoni Mansfield, n. subsp. C.
Solariella vauhani Mansfield, n. sp. E.

Tegula (*Omphalius*) *exoleta* (Conrad) C, D.

Cyclostrema bartschi Mansfield, n. sp. C.

Circulus gunteri Mansfield, n. sp. C.

Circulus? *leonensis* Mansfield, n. sp. C.

Teinostoma carinatum (H. C. Lea) E.

nanum umbilicatum (H. C. Lea) E, D.

harveyensis Mansfield, n. sp. C.

 (*Pseudorotella?*) *washingtonensis* Mansfield, n. sp. C.

Fissuridea nucula Dall C, D.

cattiliformis alumensis Mansfield, n. subsp. E.

SCAPHOPODA

Dentalium (*Dentalium*) *attenuatum* Say E?, A.

 (*Dentalium*) *carolinense* Conrad C, E.

 (*Dentalium?*) *disparile leonense* Mansfield, n. subsp. C, D?

 (*Graptacme?*) *pleiocenum* Tuomey and Holmes? C.

Cadulus floridanus Dall E.

thallus (Conrad) Dall C, E, D.

 sp. aff. C. (*Polyschides*) *quadridentatus* Dall C.

DESCRIPTIONS OF SPECIES

Phylum MOLLUSCA
Class GASTROPODA
Subclass ANISOPLEURA
Superorder EUTHYNEURA
Order OPISTHOBRANCHIATA
Suborder TECTIBRANCHIATA
Family ACTEONIDAE
Genus ACTEON Montfort, 1810
Acteon vauhani Mansfield, n. sp.

Plate 1, figure 1

Shell small, ovate, with 4 whorls, a short spire and a large body whorl. Suture loosely appressed. Apical whorl smooth, rather large, with an immersed tip. Two subsequent whorls small, smooth, weakly inflated, and posteriorly beveled. Body whorl large, roundly cylindrical, gently beveled posteriorly and anteriorly broadly rounded into the base. Sculptured only on the lower fourth of body whorl with feebly punctate spiral striae or very narrow channels. Upper striae shallow and narrow, with wide interspaces; lower striae deeper, wider, with narrower interspaces. Aperture inverted ear-shaped. Body wall with a thin wash of callus. Columella nearly straight, provided with one strong, twisted, carinated plication. A small chink lies behind the reflected columellar border.

Type (U.S.N.M. Cat. No. 369881) measures: Altitude, 4.2 mm.; greatest diameter, 2.5 mm.; length of aperture, 2.8 mm.

Some of the specimens from near Mayesville, S. C., referred to this species are a little larger than the Florida specimens, one specimen having an altitude of 7 mm. and a diameter of 4 mm.

Perhaps the nearest related northern Miocene species is *A. shilohensis* Whitfield; but when the new species is compared with the New Jersey species the latter is found to have a proportionally wider shell, a more turritid spire, and a different type of nucleus.

In comparison with *A. riomaensis* Maury, a species described from Bluff 3, Cercado de Mao, Dominican Republic, the new species reveals a stouter shell ornamented with fewer spiral striae.

The new species is closely related to a probably new Recent species from Long Island Sound.

Occurrence: Upper Miocene: Station 3422, uppermost bed at Jackson Bluff, Ochlockonee River, Leon County, Fla., type locality

(rare); station 3421, Harveys Creek, about half a mile above abandoned mill, Leon County Fla. (rare).

Outside occurrence: Station 4000, near Mayesville, S. C. (abundant).

The species is named in honor of Dr. T. W. Vaughan, who collected the holotype.

Family ACTEOCINIDAE

Genus ACTEOCINA Gray, 1847

Acteocina canaliculata (Say)

Plate 1, figure 2

1826. *Volvaria canaliculata* Say, Acad. Nat. Sci., Philadelphia Jour. 1st ser., vol. 5, p. 211.
1832. *Bullina canaliculata* Say, Am. Conchology, No. 4, pl. 39.
1903. *Tornatina canaliculata* Say, Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 6, p. 1596 (listed with fauna from upper bed at Alum Bluff, Fla.); p. 1599 (listed from Duplin well or adjacent village of Magnolia, N. C.); p. 1605 (listed with fauna of Floridian Pliocene); p. 1615 (listed with Pleistocene fauna of North Creek, Fla.)
1917. Not *Acteocina canaliculata* (Say). Maury, Bull. Am. Paleontology, vol. 5, p. 177, pl. 29, fig. 2.
1919. *Acteocina canaliculata* (Say). Gardner and Aldrich, Academy Nat. Sci. Philadelphia Proc., vol. 71, p. 17. (Listed with molluscan fauna obtained near Mayesville, S. C.)
1924. *Acteocina canaliculata* (Say). Mansfield, Florida State Geol. Survey, 15th Ann. Rept. (Faunal list opp. p. 28.)

The synonymy given above is not complete.

This species ranges from the upper Miocene to the Recent.

Occurrence: In the Floridian upper Miocene: Upper bed at Alum Bluff, Liberty County (rare); station 1/953, Econfinia River, 1 mile below Econfinia bridge, Bay County (rare); station 1/706, Gully Pond (abundant) and station 1/422, Hamlin Pond (common), Washington County; station 3421, Harveys Creek, about half a mile above abandoned mill (abundant); station 1/964, Harveys Creek, highest bed at abandoned mill (rare); stations 3422 and 3423, Jackson Bluff, Ochlockonee River, upper and lower beds of upper Miocene (abundant).

Acteocina coënsis Mansfield, n. sp.

Plate 1, figures 3, 4

Shell small, cylindrical, rather solid, with short spire. Apex small, smooth, projecting, arched and twisted, with an immersed tip. Suture shallowly channeled. Spire whorls medially depressed, earlier whorls more so than the later; whorls with spiral thread below suture and a low spiral carination below and at the shoulder. Microscopic axial

growth lines cross the whorls. Back of body whorl and outer lip medially constricted. Aperture nearly as long as shell, moderately narrow above and expanded and rounded below. Aperture acutely angled posteriorly at commissure of outer lip and body callus. Columella with a single weak fold. Columellar border reflected.

Type (U.S.N.M. Cat. No. 369896) measures: Altitude, 3.5 mm.; greatest diameter, 2.0 mm.

The new species differs mainly from *Acteocina canaliculata* (Say) in having a much shorter shell and shorter spire.

Occurrence: Upper Miocene: Station 3671, Hosford (formerly called Coe's Mill), Liberty County, Fla., type locality; station 3672, at abandoned mill 1 mile northwest of Hosford. Abundant at both stations.

Genus *SULCULARIA* Dall, 1921

Sulcularia sulcata harveyensis Mansfield, n. subsp.

Plate 1, figures 6, 7

Shell minute, subcylindric, medially constricted, axially sulcate, involute, perforate at the apex, and with an aperture a little longer than body whorl. Anterior end wider than posterior and rather steeply sloping to the rounded edge surrounding the perforation. Sculpture of very close axial sulcations, separated by fine, sharp lines. Sulcations cover the whole surface of the shell and enter the summit perforation. Microscopic spiral lines lie in the sulci. Outer lip thin and simple. Aperture narrow above and rounded below. Columella short, nearly straight, with a reflexed border.

Cotypes (U.S.N.M. Cat. No. 369900) measure: (Larger specimen) Altitude, 2.4 mm., greatest diameter 1.2 mm.; (smaller specimen) altitude, 2.0 mm., greatest diameter, 1.0 mm.

The new subspecies is closely related to *Sulcularia sulcata* (d'Orbigny), a Recent species from Cuba, but differs mainly from that species in having a less cylindrical shell and a proportionately narrower and more sloping posterior extremity.

Occurrence: Upper Miocene: Station 1/946, Harveys Creek, about half mile above abandoned mill, Leon County, Fla., type locality; station 1/422, Hamlin Pond, Washington County; station 1/955, Gully Pond, Washington County; station 1/961, near Woods, Liberty County; station 11732, borrow pit, Jackson Bluff, Leon County. Rare at all stations.

Genus CYLICHNELLA Gabb, 1872

Cylichnella jacksonensis Mansfield, n. sp.

Plate 1, figure 11

Shell small, subovate, and solid. Vertex slightly depressed and surrounded by a very low, rounded keel formed by the continuation of the margin of outer lip. Spire concealed by a wash of callus. Body whorl subelliptical, tapering toward both extremities. Sculptured only on the base with fine, shallow, spiral striae. Outer lip margin rounded above and below and nearly vertical medially. Aperture narrow above and wide below. Body wall and columella provided with a wash of callus—thin over body wall and thick and externally reflected over columella. Columella biplicate. Posterior fold semicarinate, moderately strong, diagonally situated and extends to margin of columellar border; anterior fold small, short, axially directed, and situated at lower extremity of columella.

Type (U.S.N.M. Cat. No. 369906) measures: Altitude, 3.2 mm.; greatest diameter, 2.0 mm.

The new species is related to both the Recent species, *Cylichnella bidentata* (Orb.) and the fossil species "*Acteocina (Cylichnella)*" *triticum-tritonis* Maury. However, the new species differs from both of these in possessing a less cylindrical shell. It is more closely related to the fossil than to the Recent species.

Occurrence: Upper Miocene: Station 3422, uppermost bed at Jackson Bluff, Ochlockonee River, Leon County, Fla., type locality (abundant); station 3423, lower upper Miocene bed at Jackson bluff (rare); station 3421, Harveys Creek, about half a mile above abandoned mill, Leon County (rare at 3421 and identification uncertain).

Genus VOLVULA A. Adams, 1850

Volvula oxytata hosfordensis Mansfield, n. subsp.

Plate 1, figure 9

1919. *Volvula oxytata* Bush. Gardner and Aldrich, Acad. Nat. Sci. Philadelphia Proc., vol. 71, p. 17.

Shell small, solid, and ovate cylindrical. Posterior extremity conic, not tapering, terminating in a very short spire. Sculpture of 8 to 10 microscopic striae over the lower fourth of shell. Outer lip a little longer than spire, weakly constricted medially behind border. Aperture narrow above and expanded and rounded below. Columella simple with a reflected external border behind which is a minute chink.

Type (U.S.N.M. Cat. No. 369910) measures: Altitude, 2.7 mm.; greatest diameter, 1.2 mm.

The new subspecies differs from *Volvula oxytata* Bush in lacking the pronounced spike-like apex and the tapering posterior extremity. It also differs in the same respects from a Chipola species, which Dall¹ united with the Recent species *Volvula oxytata* Bush.

Occurrence: Upper Miocene: Station 3672, 1 mile northwest of Hosford, Liberty County, Fla., type locality; 3421, Harveys Creek, about half a mile above abandoned mill, Leon County, Fla. Rare at both Florida localities.

Outside occurrence: Near Mayesville, S. C. Near Magnolia, N. C.

Family RINGICULIDAE

Genus RINGICULA Deshayes, 1838

Ringicula (*floridana* var.?) *guppyi* Dall

Plate 1, figure 5

1889. *Ringicula floridana* var. *guppyi* Dall, Harvard Coll. Mus. Comp. Zool. Bull., vol. 18, p. 44.

1890. *Ringicula* (*floridana* var.?) *guppyi* Dall. Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 1, p. 14, pl. 3, fig. 7.

Two specimens representing two localities compare in general aspect with Dall's species from the Caloosahatchee River, Alligator Creek, and Shell Creek localities of Florida. The nucleus of the Miocene form is a little flatter than the Pliocene species, but the similarity of the shell in other respects hardly warrants a new specific designation.

Figured specimen (U.S.N.M. Cat. No. 369912) measures: Altitude, 2.0 mm.; greatest diameter, 1.3 mm.

Occurrence: Upper Miocene: Station 1/946, Harveys Creek, about half a mile above abandoned mill, Leon County (rare); station 1/955, Gully Pond, Washington County (rare); station 11732, borrow pit, Jackson Bluff, Leon County, Fla. (rare).

Ringicula (*floridana* var.?) *guppyi* Dall (more typical)

Plate 1, figure 8

Specimens from four localities are in aspect more typical of Dall's species *Ringicula* (*floridana* var.?) *guppyi*. The shell possesses more spirals and is smaller in size than the preceding form.

Figured specimen (U.S.N.M. Cat. No. 369914) measures: Altitude, 1.5 mm.; greatest diameter, 1.0 mm.

Occurrence: Upper Miocene: Station 3421, Harveys Creek, about half a mile above abandoned mill, Leon County (abundant); station 1/706, Gully Pond, Washington County (common); station 1/422,

¹Wagner Free Inst. Sci. Trans., vol. 3, pt. 6, p. 1576, 1903.

Hamlin Pond, Washington County (common); station 1/953, Econfin River, 1 mile below Econfin bridge, Bay County (common).

Family BULLARIIDAE

Genus BULLARIA RAFINESQUE, 1815

Bullaria sp.

One rather small and broken specimen of the genus *Bullaria* was collected by Mr. Herman Gunter from the upper Miocene at Harveys Creek, about half a mile above an abandoned mill, Leon County, Fla. The specific determination of this form is deferred until more and better preserved specimens are obtained from this horizon.

Superorder STREPTONEURA

Order CTENOBANCHIATA

Suborder ORTHODONTA

Superfamily TOXOGLOSSA

Family TEREBRIDAE

Genus MYURELLA Hinds, 1844

Myurella binodosa Mansfield, n. sp.

Plate 2, figure 2

Shell small, solid, subacute, both axially and spirally sculptured and consisting of 2 nuclear and 9 postnuclear whorls. First nuclear whorl (tip decollated) smooth, rounded in outline, and loosely joined to the smooth nearly straight-sided succeeding whorl. Postnuclear whorls uniformly enlarging, constricted medially by a wide channel, and separated by a distinct and grooved suture. Subsutural band poorly defined by a narrow sulcus. Axial sculpture of prominent elongate nodules at the summit and base of all the whorls (19 on the summit of the penultimate whorl), of equal strength and connected by feeble or nearly obsolete axials. Axials on adjacent whorls usually opposite and extend along the shell nearly parallel to its axis. Spiral sculpture on the subsutural band and median constriction of very indistinct striae; and on the base of 7 to 8 quite distinct striae, which overrun the nodules and interspaces and are separated by narrow raised bands. Base of body whorl and neck to keel of siphonal fasciole spirally sculptured with striae and axially, below the periphery, with feeble ribs. Outer lip broken away. Siphonal canal rather short, markedly twisted and reflexed. Columella internally has a deep and rounded-bottomed siphonal groove, bordered posteriorly by a rounded thread behind which is a shallow groove, thus revealing a biplicate pillar.

Type (U.S.N.M. Cat. No. 369919) measures: Altitude 18 mm.; greatest diameter, 5.0 mm.

This species belongs to the same group as *M. concava* (Say), a species ranging from the Duplin Miocene to the Recent. It also is related to *M. neglecta* (Emmons) but differs from the latter in strength and nature of the pillar and the presence of the prominent elongate nodules at the base of each volution.

Occurrence: Station 3671, Hosford, Liberty County, Fla., type locality (abundant); station 3672, 1 mile northwest of Hosford (abundant); station 11732, borrow pit, Jackson Bluff, Leon County, Fla. (common).

Myurella dislocata (Say)

Plate 2, figure 1

1822. *Cerithium dislocatum* Say, Acad. Nat. Sci. Philadelphia Jour., vol. 2, p. 235. [Described.]

1838. *Terebra petiti* Kiener, Mon. Ter., p. 37, pl. 13, fig. 32.

This species, probably including some subspecies, began in the upper Miocene and continued to the Recent.

Occurrence: Station 3671, Hosford; station 3672, 1 mile northwest of Hosford, Liberty County, Fla.; station 1/422 Hamlin Pond, Washington County, Fla.; station 1/706, Gully Pond, Washington County, Fla. At the last two localities the specimens are slimmer than at the first two localities.

Myurella dislocata indenta (Conrad)

1841. *Cerithium dislocatum* (not Say), Conrad, Am. Jour. Sci. and Arts, vol. 41, p. 343.

1863. *Terebra indenta* Conrad, Acad. Nat. Sci. Philadelphia Proc. for 1862, p. 565.

1864. *Terebra (Acus) indentata* Conrad. Meek, Miocene check list, p. 18, No. 603.

1896. *Terebra (Acus) dislocata* Say, var. *indenta* Conrad. Dall, U. S. Nat. Mus. Proc. for 1895, vol. 18, p. 40.

1903. Not *Terebra (Oxymoris) dislocata* Say. var. *indenta* Conrad. Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 6, pl. 59, fig. 7, [Apparently the specimens figured came from the Florida Pliocene.]

Type locality: Natural Well, Duplin County, N. C.

Occurrence: Upper Miocene: Station 3421, Harveys Creek, about half a mile above abandoned mill, Leon County, Fla. (rare).

Myurella protexta (Conrad)?

1846. *Cerithium protextum* Conrad, Acad. Nat. Sci. Philadelphia Proc., vol. 3, p. 26.

1889. *Acus protextus* Conrad. Dall, Rept. Blake Gastr., pp. 63, 65.

1890. *Terebra (Acus) protexta* (Conrad). Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 1, p. 25.

1917. ?*Terebra protexta* (Conrad). Maury, Bull. Am. Paleontology, vol. 5, p. 192, pl. 30, fig. 1.

A single fragment from station 3421, Harveys Creek, about half a mile above abandoned mill, Leon County, Fla., may belong to this species.

Family CONIDAE

Genus CONUS Linnaeus, 1758

Conus adversarius Conrad

Plate 1, figure 15

Conus adversarius Conrad, Am. Jour. Sci., vol. 39, p. 388, 1840 [Described]: vol. 41, p. 345, pl. 2, fig. 3, 1841.

Type locality: Natural Well, Duplin County, N. C.

Occurrence: Upper Miocene: Florida, stations 3422 and 3423, upper and lower upper Miocene beds at Jackson Bluff, Leon County (rare); upper bed at Alum Bluff, Liberty County (rare); Harveys Creek, about half mile above abandoned mill, Leon County, Fla. (rare). Virginia, 3 miles west of Franklin, Southampton County. South Carolina, Mayesville, Sumter County, and Darlington, Darlington County. Pliocene: Waccamaw, S. C., Caloosahatchee River, Shell Creek, and Alligator Creek, Fla.

Conus floridanus Gabb

Plate 1, figure 13

1869. *Conus floridanus* Gabb, Am. Jour. Conchology, vol. 4, p. 195, pl. 15, fig. 4, 1868.

Habitat: Tampa Bay, Florida (Gabb).

Occurrence: Upper Miocene: Florida, station 1/946, Harveys Creek, about half a mile above abandoned mill, Leon County (rare); station 3422, uppermost bed at Jackson Bluff, Leon County (rare). Pliocene: Cronly, N. C., and Caloosahatchee River and Shell Creek, Florida. Recent: Reported from Cape Hatteras to Florida Keys but much more common along the Florida coast.

Conus testudinarius leonensis Mansfield, n. subsp.

Plate 1, figure 14

The face of the type and only specimen is broken away, but the back is entire and reveals the following characters:

Shell of medium size, subpyriform, with a moderately low spire, and consists of about 10 whorls in all. Spire very broadly conical. Suture channeled and undulating on early whorls but appressed and less undulating on later whorls. Early spire whorls ornamented with weak tubercles on the presutural margin. Body whorl rounded at the shoulder and narrow at the anterior end. Sculpture of poorly defined spiral lines.

Type and only specimen (U.S.N.M. Cat. No. 370103) measures: Altitude, 40 mm.; greatest diameter, 11 mm.

The new species differs from the Recent species, *Conus testudinarius* Reeve, in having a more rounded-shouldered body whorl and a more attenuated anterior extremity.

Occurrence: Upper Miocene: Harveys Creek, half a mile above abandoned mill, Leon County, Fla. Collected by Florida Geological Survey.

Conus harveyensis Mansfield, n. sp.

Plate 1, figure 12

Shell small, subbiconic, and consists of 3 nuclear and 8 postnuclear whorls. Spire turrited, weakly concave in outline, early part narrowly conical, later broadly conical, and constitutes about one-third shell length. Nuclear whorls smooth, porcellaneous, and rounded in outline. Early spire whorls medially carinate. Spire ornamented with arcuate growth lines and faint microscopic spiral threads. Body whorl and canal below shoulder carina marked with 17 flat, smooth, wide spiral bands, which are separated by deep grooves about one-third the width of the bands. The bands are broader above and narrower below. Lower columella nearly straight.

Type (U. S. Nat. Mus. Cat. No. 370102) measures: Altitude, 21 mm.; greatest diameter, 10.5 mm.; altitude of spire, 7 mm.

Conus stimpsoni Dall, obtained in 60 fathoms off Key West, Fla., is related to the new species but differs from it in having a beaded carina on the early whorls and a more tapering body whorl.

Conus burckhardtii Böse, a Miocene species from the State of Oaxaca, Mexico, is nearly related to the new species but apparently differs from my species in having a longer body whorl and spiral granules on the early spire whorls.

Occurrence: Upper Miocene, Harveys Creek, half a mile above abandoned mill, Leon County, Fla., type and only locality. Collected by Florida Geological Survey.

Family TURRITIDAE

Subfamily TURRITINAE

Genus CYMATOSYRINX Dall, 1889

Cymatosyrinx lunata (H. C. Lea)

Plate 2, figure 9

1845. *Pleurotoma lunatum* H. C. Lea, Am. Philos. Soc. Trans., new ser., vol. 9, p. 269, pl. 37, fig. 93.

1856. *Turris lunatum* (Lea). Tuomey and Holmes, Pleiocene fossils of South Carolina, p. 132, pl. 27, fig. 16.

1863. *Drillia lunata* H. C. Lea. Conrad, Acad. Nat. Sci. Philadelphia Proc. for 1862, p. 562.
1889. *Drillia (Cymatosyrinx) lunata* Lea. Dall, Harvard College Mus. Comp. Zool. Bull., vol. 18, p. 95.
1890. *Drillia (Cymatosyrinx) lunata* Lea. Dall. Wagner Free Inst. Sci. Trans., vol. 3, pt. 1, p. 29.
1903. *Drillia (Cymatosyrinx) lunata* H. C. Lea. Dall, op. cit., pt. 6, p. 1596.
1903. *Pleurotoma (Cymatosyrinx) lunata* Lea. Dall, op. cit., pt. 6, p. 1599.
1919. *Drillia limatula* Lea. Gardner and Aldrich, Acad. Nat. Sci. Philadelphia Proc., vol. 71, p. 17.

Occurrence: Upper Miocene: Florida, station 1/946, Harveys Creek, about half a mile above abandoned mill, Leon County (common); station 3422, uppermost bed at Jackson Bluff, Leon County (rare); stations 3671, 3672, Hosford, and 1 mile northwest of Hosford, Liberty County (rare); upper bed at Alum Bluff, Liberty County (rare); station 8176, the "Deadens," Washington County (rare).

Outside occurrence: Virginia, Petersburg, Yorktown, and near Suffolk. North Carolina, Duplin marl. South Carolina, near Mayesville. Pliocene of the Carolinas and Caloosathatchee marl of Florida.

Cymatosyrinx lunata aepytuberculata Mansfield, n. subsp.

Plate 2, figure 12

This subspecies differs from the typical *Cymatosyrinx lunata* (Lea) in having a shell with a more acute spire and more constricted and shorter whorls. The whorls have stronger and shorter tuberculate axials and a more sloping presutural area.

Type (U.S.N.M. Cat. No. 369944) measures: Altitude, 20.5 mm.; diameter, 8 mm.

Occurrence: Upper Miocene, station 3671, Hosford, Liberty County, Fla., type locality (abundant); station 3672, 1 mile northwest of Hosford (rare).

Cymatosyrinx lunata porrecta Mansfield, n. subsp.

Plate 2, figure 5

Specimens from stations 3422 (uppermost bed at Jackson Bluff) and station 11732 (borrow pit near Jackson Bluff, Leon County, Fla.), differ from *Cymatosyrinx lunata* (Lea) in having a much more slender shell, shorter whorls, and a more depressed suture. They are larger and have a more slender shell than *Cymatosyrinx lunata aepytuberculata*. Otherwise they are very similar.

Type (U.S.N.M. Cat. No. 370105) measures: Altitude, 27 mm. (tip lost); diameter, 8 mm.

Type locality: Station 11732, borrow pit, near Jackson Bluff, Leon County.

Similar forms occur in the Yorktown formation at Yorktown and at Fergusons Wharf, James River, Va.

Cymatosyrinx propeaepynota Mansfield, n. sp.

Plate 2, figure 6

Shell small, rather slender, moderately acute, polished, strongly axially sculptured, without any engraved or raised spirals, and composed of 9 whorls. Anal fasciole smooth, shallowly concave, gently undulating. Suture slightly appressed. Nucleus composed of about 2 whorls. Initial half turn minute, terminally immersed. Succeeding whorl smooth, globose, followed by a submedially angulated whorl ornamented at first with small tubercles adjacent and behind the suture and later with stronger and elongate ones. Ribs on later spire whorls (8 on the penultimate whorl) strong and rounded, occupying the lower half of the whorl and separated by broad rounded-bottomed interspaces. Ribs on body whorls terminate at the base, below which the upper part of the canal is constricted. Outer lip margin broken away on type and all other specimens. Columella with a heavy wash of callus and with a heavier patch on the parietal wall near the commissure of the inner and outer lips. Canal rather short and wide and terminally recurved. Larger cotype (U.S.N.M. Cat. No. 369948) measures: Altitude, 13 mm.; diameter, 4.4 mm.

The new species is more remotely related to *Cymatosyrinx aepynota* (Dall) and more closely related to *Cymatosyrinx aepynota* var. *acilia* (Dall), from the Pliocene of Florida. It differs from both the species and variety in having a smaller shell with a smaller nucleus and weaker and sharper axials.

Occurrence: Upper Miocene: Station 3672, 1 mile northwest of Hosford, Liberty County, Fla., type locality; station 3671, Hosford. Abundant at both stations.

Cymatosyrinx propeaepynota libertiënsis Mansfield, n. subsp.

Plate 2, figure 3

1903. *Drillia aepynota* var. *acilia* Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 6, p. 1596.

This subspecies differs from *Cymatosyrinx propeaepynota*, n. sp., in having a little different nucleus. The second whorl on the specimens referred to the subspecies is angulated while that of the species is rounded. The subspecies contains 12 axials, while the species contains about 8 and is marked with faint incised spiral lines.

Type (U.S.N.M. Cat. No. 369951) measures: Altitude, 17 mm.; diameter, 5.6 mm.

Occurrence: Upper Miocene: Station 3671, Hosford, Liberty County, type locality; upper bed at Alum Bluff, Liberty County (U.S.N.M. Cat. No. 113143). Rare at both stations.

Cymatosyrinx sp. aff. *C. eburnea* (Conrad)

One incomplete specimen collected at station 1/960, Darlings Slide, Calhoun County, Fla., agrees in a general way with Conrad's description of *Drillia eburnea*.¹ Closely allied forms occur in the northern upper Miocene at Yorktown, Petersburg, Sycamore, and in the basal bed at Fergusons Wharf, James River, Va.

Cymatosyrinx, species indeterminable

One immature specimen from station 3672, 1 mile northwest of Hosford, and one broken specimen collected from the upper bed at Alum Bluff (U.S.N.M. Cat. No. 124969) are similar and may belong to the same species. The latter specimen may be the form referred by Dall² to "*Drillia pusilla*" Ravenel, but it does not appear to belong to that species.

Genus CLATHRODRILLIA Dall, 1918

Clathrodrillia? *emmonsi* (Olsson)

Plate I, figure 10

- 1858. *Pleurotoma tuberculata* Emmons, North Carolina Geol. Survey Rept., p. 265, fig. 147. (Not *Pleurotoma tuberculata* Pusch, 1837.)
- 1863. *Drillia* (*Pleurot.*) *tuberculata* (Emmons) Conrad, Acad. Nat. Sci. Philadelphia Proc. for 1862, p. 562.
- 1864. *Drillia tuberculata* (Emmons) Conrad. Meek, Check list of the invertebrate fossils of North America, Smithsonian Misc. Coll., vol. 7, No. 183, p. 21, No. 718.
- 1892. *Drillia tuberculata* (Emmons). Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 2, p. 220.
- 1916. *Drillia emmonsi* Olsson, Bull. Am. Paleontology, vol. 5, p. 147. (Name proposed for preoccupied name, *Pleurotoma tuberculata* Emmons, 1858.)
- 1919. *Drillia tuberculata* Emmons. Gardner and Aldrich, Acad. Nat. Sci. Philadelphia Proc., vol. 71, p. 17.

The specimens that I have assigned to *Clathrodrillia?* *emmonsi* from the Florida Miocene have slightly smaller nuclei and fainter spirally sculptured anal fascioles than the forms referred to this species in the Miocene and Pliocene of the Carolinas, but in general aspect they are very similar.

Occurrence: Upper Miocene: Florida, station 3672, 1 mile northwest of Hosford, Liberty County; station 3671, Hosford (rare); sta-

¹Conrad, T. A., Acad. Nat. Sci. Philadelphia Proc. for 1862, vol. 14, pp. 285, 562, 1863.

²Dall, W. H., Wagner Free Inst. Sci. Trans., vol. 3, pt. 6, p. 1596, 1903.

tion 3421, Harveys Creek, Leon County, half a mile above abandoned mill (rare); upper bed at Alum Bluff, Liberty County (common); station 1/962, old road cut leading to Watsons Landing, Liberty County (rare); station 8176, the "Deadens," Washington County (rare); 1/422, Hamlin Pond, Washington County (fragment, identification uncertain); borrow pit, near Jackson Bluff, Leon County (rare).

Clathodrillia? emmonsii hosfordensis Mansfield, n. subsp.

Plate 2, figure 7

A few specimens from station 3672, 1 mile northwest of Hosford, one specimen from station 3671, Hosford, Liberty County, and three specimens from borrow pit, near Jacksons Bluff, Leon County, Fla., differ somewhat in aspect and character of sculpture from the specimens here referred to *Clathodrillia? emmonsii*. The nuclei, however, are very similar. The initial turn is small and smooth. On the following whorl the sculpture begins with 4 spiral threads, the basal thread forming the low periphery. On the later spire whorls 2 spiral bands lie in the anal fasciole—the posterior band being the stronger—and 1 weaker and narrower band lies behind the suture. Base of spire whorls and shoulder of body whorl are sculptured with strong elongate-tuberculate axials, usually medially incised by a spiral thread. On the body whorl the axials attenuate forward from the shoulder and terminate at the base. On the body whorl and canal are about 8 spiral bands, which become lowly tuberculate at the intersection with the axials. Aperture short and wide. Anal notch wide and deep. Canal very short, terminally a little recurved.

Type (U.S.N.M. Cat. No. 369961) measures: Altitude, 10 mm.; diameter, 3.5 mm.

Type locality: Station 3672.

The new subspecies appears to be closely related to "*Drillia gastrophilia*" Olsson, described from the Duplin marl of the Natural Well, N. C., but it possesses a higher-shouldered and shorter body whorl than Olsson's species.

Clathodrillia? anteaphanitoma Mansfield, n. sp.

Plate 2, figure 11

Shell small, rather solid, seven-whorled, with a pointed spire and a moderately large body whorl. Nucleus large, smooth, and globular. Subsequent whorl rounded at first, later becoming medially carinated. Initial sculpture of 6 fine rounded spiral threads, shortly followed with fine axials entirely crossing the whorl. Following whorls low below the suture and high on lower half. Suture shallow, narrowly

channeled, not appressed. Axially sculptured on the lower half of whorl with strong elongate-tuberculate ribs (9 on penultimate whorl), fading out posteriorly, forming on the upper part only low undulations. Ribs on the body whorl terminate at the base. Spirally sculptured, mainly on and in front of the ribs, with primary and secondary spirals. On the early whorls there are 2 low, narrow spiral bands and on the body whorl and canal 10. One to two threads intervene the primaries. Surface on the upper part of whorl with very faint spiral threads. Aperture rather wide, expanded medially. Margin of outer lip broken. Anterior canal short and reflected. Siphonal fasciole well developed, ornamented with 6 roughed, crowded, spiral threads.

Type (U.S.N.M. Cat. No. 369964) measures: Altitude, 12.5 mm.; diameter, 5 mm.

This species is closely related to "*Drillia aphanitoma* var. *oxia*" Dall, described from Cape Fear River, N. C., but differs from this variety in having much stronger tuberculate axials, a more depressed presutural area, and fewer secondary spiral threads.

Occurrence: Upper Miocene: Station 3672, 1 mile northwest of Hosford, Liberty County, Fla., type locality (rare); station 8176, the "Deadens," Washington County, Fla. (common).

Clathrodrillia? gracilina (Dall MS.) Mansfield, n. sp.

Plate 2, figure 8

1903. *Drillia gracilina* Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 6, p. 1596.
[In list as occurring at Alum Bluff, upper bed.]

Shell moderately slender, high-spired, strongly axially and weakly spirally sculptured, with about 8 whorls. Body whorl about half the shell length. Whorls low over the roundly excavated and wide anal fasciole and moderately high at lower two-thirds of length, separated by a loosely appressed suture. Apical turn small, smooth, and hemispherical. Following volution inflated, marked at initiation by 5 minute spiral threads, shortly followed by faint axials, giving under magnification a reticulate sculpture. Axials uniformly increase in strength on the advancing whorls. Spire whorls axially sculptured with strong roundly crested ribs (9 on the penultimate whorl) occupying the lower two-thirds of the whorl and separated by rounded-bottomed interspaces. Spiral sculpture of primary narrow bands and secondary threads. About 3 primaries occupy the periphery and base on the early whorl, increasing to 7 on the penultimate whorl. Secondary threads lie in the anal fasciole and usually one or two between the primaries. On body whorls, axials terminate at the base but spirals continue over the canal. Primary spirals over the periphery similar to those of spire whorls but forward consist of widely spaced semi-

rounded strong threads with intercalated weaker threads. Aperture short and wide. Anal fasciole moderately deep and wide. Outer lip arched, bordered by a varix. Canal very short, wide, and terminally reflected. Siphonal fasciole ornamented with closely-set spiral lines.

Type (U.S.N.M. Cat. No. 112708) measures: Altitude, 13.5 mm.; (tip decollate); diameter, 5.5 mm.

The description is made from two specimens, a type with broken-off nucleus and a paratype with a well-preserved nucleus.

The species is related to "*Drillia sumterensis*" Gardner and Aldrich, described from near Mayesville, S. C., but differs from that species in possessing a less slender shell with whorls stronger-shouldered in front of the anal fasciole. It is also closely related to "*Drillia ecphorae*" Olsson, described from the Duplin marl at the Natural Well, N. C., but the new species has a more depressed anal fasciole with fainter spiral sculpture and more subdued entering axials.

Occurrence: Upper Miocene: Station 2210, upper bed at Alum Bluff, Liberty County, Fla., type locality; station 3421, Harveys Creek, about half a mile above abandoned mill, Leon County, Fla., paratype locality; ?station 3422, upper bed at Jackson Bluff, Leon County, Fla. Rare at all localities.

This species does not appear to have been described or figured, but specimens designated by a catalogue number and the retained name are in the U. S. National Museum collection.

Clathrodrillia? podagrina (Dall)

Plate 2, figure 4

1890. *Drillia podagrina* Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 1, p. 34, pl. 2, fig. 9.

One small specimen collected at station 3422, uppermost Miocene bed at Jackson Bluff, Leon County, Fla., agrees in detail with "*Drillia podagrina*" Dall, described from the Pliocene of Caloosahatchee River, Fla.

Genus *CRASSISPIRA* Swainson, 1840

Crassispira antealesidota Mansfield, n. sp.

Plate 2, figure 10

Shell large, solid, subbiconic, with 8 remaining whorls (nucleus and 1 or 2 early whorls missing). Spiral and axial sculpture of about equal strength. Whorls nearly straight in outline, lowly shouldered below anal fasciole, separated by an appressed and shallow suture. Anal fasciole narrow, shallow, ornamented with 1 strong medial spiral cord and on either side with 1 small carinate spiral thread. Spirally sculptured on the spire whorls with 2 cords on the raised

border lying between the suture and anal fasciole, and usually 4 equally spaced spirals between the anal fasciole and the forward suture, becoming stronger and weakly nodulous at their intersection with the axials. Body whorl and canal with 21 spirals, those on the siphonal fasciole being more closely-set, sharper, and without nodules. Axial sculpture on the spire and body whorl of protractive rounded ribs, extending on the spire from the anal fasciole forward to the suture and on the body whorl (about 37 ribs in all) to the base of the whorl. Margin of outer lip broken. Aperture long, apparently narrow, and weakly expanded medially. Columella nearly straight, with thin wash of callus. Anterior canal short, diverted to the right. Siphonal fasciole not elevated, ornamented with semicarinate marginally reflected cords.

Type (U.S.N.M. Cat. No. 369970) measures: Altitude, 53 mm.; diameter, 15 mm.

"*Drillia alesidota* var. *perspirata*" Dall, from the Floridian Pliocene, is closely related to the new species, but the new species differs from the Pliocene species in having a larger shell with a more evenly conic spire, a shallower and narrower anal fasciole and lower-shouldered whorls below anal fasciole, a weaker siphonal fasciole, and in being ornamented with finer spirals and axials. "*Drillia*" *consors* Sowerby has a more slender shell than the new species. My new species is closely related to *Drillia alesidota* var. *magna* Böse, from Paso Real, cerca de Tuxtepec, Mexico, but appears to differ from the latter in having less crowded and narrower spiral sculpture and a little longer body whorl and canal.

Occurrence: Upper Miocene: Station 1/946, Harveys Creek, about half a mile above abandoned mill, Leon County, Fla., type locality (rare); borrow pit, near Jackson Bluff, Leon County (1 specimen collected by the Florida Geological Survey).

Genus BELLASPIRA Conrad, 1867

Bellaspira?, n. sp.?

One imperfect specimen from station 8176, the "Deadens," Washington County, Fla., may belong to the genus *Bellaspira* Conrad and represent a new species. The most nearly related form appears to be an unpublished new species in the Duplin marl at the Natural Well, N. C.

Subfamily MANGILIINAE

Genus MANGILIA Risso, 1826

Mangilia harveyensis Mansfield, n. sp.

Plate 3, figures 10, 11

1890. *Mangilia quadrata eritima* Bush. Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 1, p. 40 (part).

1919. *Mangilia eritima* Bush. Gardner and Aldrich, Acad. Nat. Sci. Philadelphia Proc., vol. 71, p. 17.

Shell small, solid, about six-whorled, strongly axially sculptured. Nucleus of about 2 whorls, smooth and inflated. Postnuclear whorls, except first, strongly angulated near middle of whorl. Suture weakly appressed and occupying the deep constriction. First postnuclear whorl lowly angled, sculpture of fine arcuate riblets overrun by fine spirals, forming a faint reticulate ornamentation. Following whorls axially sculptured with moderately strong ribs (10 on the penultimate whorl), extending on the spire whorls from suture to suture and on the body whorl forward to the base. Spirally sculptured on spire whorls with a moderately strong cord at the medial periphery and 2 or 3 weaker and primary threads below the periphery, and on the body whorl below the periphery and on the canal with 10 to 12 similar threads. Whole surface of shell spirally sculptured with microscopic granulose threads. Aperture narrowly ovate. Anal notch wide and posteriorly rounded. Canal rather long and straight.

Larger cotype (U.S.N.M. Cat. No. 369973) measures: Altitude, 4.4 mm.; diameter, 2 mm.

The nearest related Recent species appears to be *Mangilia limonitella* Dall.

The new species has stronger axials behind the periphery and stronger and wider-spaced spiral threads than *Mangilia magnoliana* Olsson, described from the Duplin marl at the Natural Well, N. C.

Occurrence: Upper Miocene: Florida, station 3421, Harveys Creek, half a mile above abandoned mill, Leon County, type locality (common); ?station 1/706, Gully Pond, Washington County; station 3422, upper bed at Jackson Bluff, Leon County (rare).

Outside occurrence: North Carolina, near Magnolia. South Carolina, Muldrow's place, near Mayesville. Pliocene: Florida, Caloosahatchee marl.

Mangilia coënsis Mansfield, n. sp.

Plate 3, figure 9

Shell solid, moderately slender, high-spired—spire about two-fifths shell length—strongly axially sculptured, and consists of $1\frac{1}{2}$ nuclear and 5 postnuclear whorls. Apical half-turn minute, following turn

much larger, rounded in outline, and smooth. Postnuclear whorls strongly angled submedially. Suture appressed and wavy. Sculpture of first postnuclear whorl of 10 to 12 fine arcuate riblets. Axial sculpture of following whorls of (7 on the penultimate whorl) rather sharply crested riblets, on the earlier whorls, and strong and rounded ribs on the last two whorls. Spiral sculpture of a prominent narrow band at the periphery of each whorl, becoming lowly nodulous over the ribs; above this band, of very minute threads, and below the band and over the base of the body whorl and canal, of very narrow bands. Minute growth lines intervene the axials and produce a faint reticulate ornamentation. Aperture elongate and expanded medially. Canal short, nearly straight. Inner surface of columella provided with a thin wash of callus.

Type (U.S.N.M. Cat. No. 369977) measures: Altitude, 10 mm.; diameter, 3 mm.; aperture length, 4.4 mm.

This species evidently belongs to the section *Kurtziella*, of Dall, 1918.

Occurrence: Upper Miocene: Station 3671, Hosford (formerly called Coe's Mill), Liberty County, Fla., type locality; station 3672, 1 mile northwest of Hosford. Rare at both localities.

Mangilia gardnerae Mansfield, n. sp.

Plate 3, figure 6

Shell small, somewhat turritid, with subangulated whorls constricted at the suture, and consisting of $1\frac{1}{2}$ nuclear and $5\frac{1}{2}$ postnuclear whorls. Nuclear whorls small and smooth. Following whorl inflated and ornamented with fine, granulose spiral threads, giving it under magnification a faint reticulate appearance. Following whorls subangulated—the periphery being a little nearer the upper suture. Axially sculptured with vertical riblets on the earlier whorls and ribs on the later spire whorls and body whorls. Ribs cross the spire whorls and on the body whorl extend to the canal. Spiral sculpture on spire whorls of 4 primary threads and from 2 or 3 microscopic threadlets between the primaries and several in front of the suture. The first primary is weaker and lies in front of the periphery, the second occupies the periphery, the third lies on the anterior slope, and the fourth lies behind the suture. The finely granulose spirals and minute connecting bars give the shell under magnification a frosty appearance. Canal short. Margin of outer lip broken. Inner surface of columella provided with a thin wash of callus.

Type (U.S.N.M. Cat. No. 369979) measures: Altitude, 5.5 mm.; diameter, 2.1 mm.

The species is described from two specimens, the larger specimen, with missing nucleus, constituting the type and the smaller specimen, with a well preserved nucleus, the paratype.

The nearest related Recent species appears to be *Mangilia atrostyla* Dall.

The new species is named in honor of Dr. Julia A. Gardner, of the U. S. Geological Survey.

Occurrence: Upper Miocene: Station 1/670, upper bed at Alum Bluff, Liberty County, Fla., type locality; station 1/955, Gully Pond, Washington County, paratype locality; 1/964, Harveys Creek, at abandoned mill, highest bed; station 3423, Jackson Bluff, Leon County, lower upper Miocene bed. Rare at all localities.

Mangilia sp. aff. *M. magnoliana* Olsson

A few immature specimens of the genus *Mangilia* from station 3421, Harveys Creek, about half a mile above abandoned mill, Leon County, Fla., are related to *Mangilia magnoliana* Olsson¹, a species described from the Duplin marl at the Natural Well, N. C. Similar forms, which appear referable to *Mangilia magnoliana*, occur at Muldrow's place, 5 miles southeast of Mayesville, S. C.

Genus BRACHYCYTHARA Woodring, 1928

Brachycythara turrita Mansfield, n. sp.

Plate 3, figure 8

Shell solid, subbiconic, strongly axially and finely spirally sculptured, six-whorled. Nucleus small and smooth. Postnuclear whorls turrited, with periphery nearer the lower suture. Suture inconspicuous, closely appressed and undulating with the contour of whorl. First postnuclear whorl axially sculptured, with many closely-set arcuate riblets. Axials on following whorls of strong seminodulous ribs (8 on the penultimate whorl), stronger at the periphery and a little weaker on the anal fasciole. Spiral sculpture of many uniform weakly punctate closely-set striae separated by flat, smooth bands. On the body whorl the ribs terminate at the siphonal fasciole, but the spirals continue to the end of the canal. Aperture uniformly narrow. Anal notch slightly contracted and posteriorly rounded. Margin of outer lip thin and inflected. Pillar callus smooth. Canal short and moderately reflected.

Type (U.S.N.M. Cat. No. 369984) measures: Altitude, 12 millimeters; diameter, 5.5 millimeters; aperture length, 7 millimeters.

¹Olsson, A. A., Bull. Am. Paleontology, vol. 5, p. 124, pl. 25, fig. 11, 1916.

This species possesses a much more turritid shell than "*Cythara*" *terminula* Dall, a Pliocene species, or "*Cythara*" *terminula costaricensis* Olsson, a species described from the Miocene of Banana River, Costa Rica.

Occurrence: Upper Miocene: Station 3671, Hosford, Liberty County, Fla., type locality (common); station 3421, Harveys Creek, about half mile above abandoned mill, Leon County, Fla. (rare).

"*Cythara*" *balteata* (Reeve)?

A fragment of the genus "*Cythara*" from station 3421, Harveys Creek, about half a mile above abandoned mill, Leon County, Fla., closely agrees with "*Mangilia balteata*" Reeve¹, a species reported by Dall² in the Caloosahatchee marl. In the Recent fauna this species is more common along the Florida Keys, where it lives at a moderate depth.

Genus ACMATURRIS Woodring, 1928

Acmaturris metria (Dall)

Plate 3, figure 5

1903. *Cythara metria* Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 6, pl. 60, fig. 13.

This species, figured from the Pliocene of Shell Creek, Fla., does not appear to have been described.

Following is a description of the Pliocene species:

Shell rather small, elongated, turritid, strongly sculptured, axials being a little stronger than spirals, and consists of 7 whorls in all. Nucleus of about 2 rounded, smooth whorls; apical turn minute, following one much larger. Spire whorls shouldered below anal fasciole and gently sloping on early whorls to anterior suture. Body whorl three-fifths length of shell. Sculpture on spire and body whorl of moderately strong, rounded, slightly arcuate ribs (12 on the penultimate whorl), extending across the spire whorls and to the base on the body whorl, and separated by little wider interspaces. Spiral sculpture of very narrow, flat bands (4 or 5 on the spire whorls) and threads; one thread usually intercalates the bands and 4 to 5 threads lie on the slope of the anal fasciole. The spiral below the anal fasciole is a little stronger and weakly angulates the whorl. All spirals overrun the axials with equal strength. First spire whorl carinated and marked at first by closely-set arcuate axials. Aperture less than half the length of shell. Outer lip arcuate; border incurved by terminal rib; anal notch rounded and rather deep and wide. Columella

¹Reeve, L. A., *Conchologia Iconica*, *Mangilia*, pl. 7, fig. 57, 1846.

²Dall, W. H., *Wagner Free Inst. Sci. Trans.*, vol. 3, pt. 1, p. 37, 1890.

straight. Siphonal fasciole marked with 8 closely-set, oblique, spiral lines.

Type (U.S.N.M. Cat. No. 163985) measures: Altitude, 7.5 mm.; greatest diameter, 2.5 mm.; length of aperture, 3.4 mm.

In the upper Miocene of Florida there is one specimen from station 8176, the "Deadens," Washington County, one fragment from station 3421, Harveys Creek, about half a mile above abandoned mill, Leon County, and one fragment from station 1/961, near Woods, Liberty County, that appear referable to this species. The largest Miocene specimen has a smaller shell with a weaker intercalary spiral thread than the Pliocene form, but this slight difference hardly warrants a new specific or subspecific designation.

The species appears to have survived into the Pliocene without any marked change and is represented in the Recent fauna by "*Daphnella*" *elata* Dall.

The figured specimen (U.S.N.M. Cat. No. 369988) was collected at station 8176, the "Deadens," Washington County, by Dr. E. H. Sellards, former State Geologist of Florida.

Genus GLYPHOSTOMA Gabb 1873

Glyphostoma watsoni leonensis Mansfield, n. subsp.

Plate 3, figure 7

The new subspecies is closely allied to *Glyphostoma watsoni* Dall¹ and bears mainly the same characteristics. It differs, however, from Dall's species in the following respects: The shell is larger and has a higher and more prominent peripheral keel, has fewer and wider axials, and lacks the primary spiral threads below the peripheral keel.

Type (U.S.N.M. Cat. No. 369990) measures: Altitude, 9.2 millimeters; diameter, 4 millimeters; length of aperture, 4 millimeters.

Occurrence: Upper Miocene: Station 3422, upper bed at Jackson Bluff, Leon County, type locality; station 3421, Harveys Creek, about half a mile above abandoned mill, Leon County; station 3671, Hosford, and 3672, 1 mile northwest of Hosford, Liberty County, Fla. Rare at all localities.

TURRITIDAE—Appendix

The assignment of the *Turritidae* in this paper to the different genera is based upon the present knowledge of the classification. When a classification of the Recent Atlantic Coast and Gulf Turritidae is completed it will form a better basis of comparison for our late

¹Dall, W. H., Wagner Free Inst. Sci. Trans., vol. 3, pt. 1, p. 40, pl. 2, fig. 7, 1890.

Tertiary group, and will permit an easier assignment of the species to their proper genera.

The following species are listed by Dall¹ as occurring in the upper bed at Alum Bluff, Fla., but were not found by the writer among the fossil material from there:

Drillia distans Conrad,
Drillia ostrearum Stearns,
Drillia, like *D. hoplophorus* Dall.

Family CANCELLARIIDAE

Genus CANCELLARIA Lamarck, 1799

Subgenus CANCELLARIA S. S.

Cancellaria tabulata Gardner and Aldrich

Plate 3, figure 2

1919. *Cancellaria tabulata* Gardner and Aldrich. Acad. Nat. Sci. Philadelphia Proc., vol. 71, p. 23, pl. 1, fig. 9.

The type locality of this species is 5 miles northeast of Smithfield, James River, Isle of Wight County, Va., from the Yorktown formation. This species apparently is very rare in the Virginia Miocene, as it is not represented in the U. S. National Museum collections made either by former collectors or me. In North Carolina this species occurs in the Duplin marl at the Natural Well and in South Carolina at Muldrow's place, 5 miles southeast of Mayesville. In Florida it is represented in the upper Miocene at Alum Bluff, Liberty County, upper bed (common); station 3671, Hosford, and station 3672, 1 mile northwest of Hosford, Liberty County (common); station 1/960, Darlings Slide, Calhoun County (rare); station 3422, Jackson Bluff, Leon County, uppermost bed (rare); station 3421, Harveys Creek, about half a mile above abandoned mill (common); station 1/964, Harveys Creek at abandoned mill, highest bed exposed (rare?).

The type specimen of this species has fewer spirals on the body whorl than most specimens in the Duplin marl of the Carolinas or those in the upper Miocene of Florida but does not differ in other features.

Cancellaria reticulata leonensis Mansfield, n. subsp.

Plate 3, figure 12

1856. Cf. *Cancellaria reticulata* Tuomey and Holmes (?not of Linné), Pleiocene fossils of South Carolina, p. 142, pl. 28, fig. 16 (Pee Dee).

The new subspecies is closely allied to *Cancellaria reticulata* Linné but differs from it as follows: The new subspecies has a lighter and more elongate shell and possesses a more delicate and finer sculpture

¹Dall, W. H., Wagner Free Inst. Sci. Trans., vol. 3, pt. 6, p. 1596, 1903.

ornamentation, a feature that is shown on the early whorls where the axials are narrow and weak.

The Pliocene species, *Cancellaria conradiana* Dall, has a much longer and narrower shell than the new subspecies.

Type (U.S.N.M. Cat. No. 370106) measures: Altitude, 48 mm.; diameter, 26 mm.; length of aperture, 30 mm.

Occurrence: Upper Miocene, Harveys Creek, about half a mile above the abandoned mill, Leon County, type locality; station 3422, uppermost bed at Jackson Bluff, Leon County; station 3671, Hosford, Liberty County. Small at the last locality. Rare at all localities.

Cancellaria (*Cancellaria*?) *propevenusta* Mansfield, n. sp.

Plate 17, figure 2

1919. ?*Cancellaria venusta* Tuomey and Holmes. Gardner and Aldrich, Acad. Nat. Sci. Philadelphia Proc., vol. 71, p. 17 (part).

1929. *Cancellaria propevenusta* Mansfield (MS). Cooke and Mossom, Florida Geol. Survey Twentieth Ann. Rept., pl. 16, fig. 2.

Shell rather large, thin and fragile, turritid, and consists of 5 whorls. Nucleus smooth, flatly coiled. Following whorls rounded, strongly constricted at the profound, grooved suture. Spiral sculpture of equidistant, nearly flat-topped narrow bands (8 on the penultimate and 19 on the body whorl and canal), roughened by growth lines and poorly defined axials. Axial sculpture of weak ribs and closely crowded growth lines overrunning the surface and giving the shell a roughened but not a distinctly cancellate appearance. Aperture ear-shaped, slightly produced submedially. Outer lip thin, marked within with 15 carinate lirations, which are located opposite to the external spiral interspaces. Canal short, rather wide, and reflected. Posterior part of a parietal wall with a spiral, rounded ridge. Columellar lip marginally reflected and provided with 2 plications, anterior plication more oblique than posterior. A large perforation is behind the lower part of the columellar lip. Siphonal fasciole prominent, ornamented with 3 to 4 closely-set coarse spiral lines.

Type (U.S.N.M. Cat. No. 370006) measures: Altitude, 35 mm.; greatest diameter, 20 mm.; length of aperture, 22 mm.; greatest width, 10 mm.

The new species is closely allied to *Cancellaria venusta* Tuomey and Holmes, a species occurring both in the Waccamaw and Caloosahatchee Pliocene, but differs from this species in having a much larger shell, much more inflated and tabulated early spire whorls, and in lacking the coarse cancellate ornamentation possessed by the Pliocene species.

Occurrence: Upper Miocene: Florida, station 1/946, Harveys Creek, about half a mile above abandoned mill, Leon County, type locality (common); station 3671, Hosford, Liberty County (rare); borrow pit, near Jackson Bluff, Leon County (rare); station 8176, the "Deadens," Washington County (rare).

Outside occurrence: North Carolina, Natural Well. South Carolina, Muldrow's place, 5 miles southeast of Mayesville; Darlington.

Subgenus NARONA H. and A. Adams, 1853

Cancellaria (Narona) agria Mansfield, n. sp.

Plate 3, figure 1

Shell small, solid, turritid, strongly axially sculptured, with only 3 remaining whorls. Whorls inflated, strongly constricted at the grooved suture. Body whorl much larger than preceding whorl. Axial sculpture (on the body whorl 10) strong, high, rounded, retractive ribs extending on the spire whorls from suture to suture and on the body whorl to the canal and separated by a little wider rounded-bottomed interspaces. Spiral sculpture of strong subrounded threads, or weak cords, and weaker threads occupying the posterior shoulder slope, all neatly overrunning the axials and interspaces with equal strength and separated by interspaces about three times the width of the spirals. On the earliest preserved whorl there are 3 stronger spirals on the periphery and 1 weaker spiral on the posterior slope; on the following whorl 2 weaker spirals occupy the posterior slope; and on the back of the body whorl 2 weaker spirals occupy the posterior slope and 11 stronger spirals extend forward from the posterior shoulder to the siphonal fasciole. Aperture ear-shaped. Outer lip thin, marked within with 5 short lirae, the posterior being farther separated from the second than the others. Canal short, rather wide, weakly gyrate. Parietal wall with reduced re-entering spirals. Columella provided with 2 rounded oblique plications, the anterior one marginating the canal. A small chink lies between the columellar wash and the columella.

Type (U.S.N.M. Cat. No. 370010) measures: Altitude, 11 mm.; (early whorls broken away); diameter 6 mm.; length of aperture, 5.5 mm.

Occurrence: Upper Miocene: Station 1/962, cut in old road leading to Watsons Landing, Liberty County, Fla., type locality; station 3671, Hosford, Liberty County, Fla. Rare at both localities.

Cancellaria (Narona) coënsis Mansfield, n. sp.

Plate 3, figures 3, 4

Shell small, rather fragile, turritid, with a large body whorl, and $5\frac{1}{2}$ whorls in all. Nucleus corroded but apparently consisting of 2 inflated smooth whorls, the apical one minute, followed by a much larger turn. Following whorls moderately rounded in outline and constricted at the suture. Sculptured with strong axials and weaker spirals. Axial sculpture of (on the body whorl 10) strong, weakly protracted, rounded ribs, crossing the whorl from suture to suture. Spiral sculpture on spire whorls of 2 widely separated nearly flat lines occupying the posterior and anterior shoulders; back of body whorl and canal with 6 stronger spirals and 1 finer spiral intercalating near the lip margin the first and second and second and third stronger threads. A faint spiral is adjacent and posterior to suture on the penultimate whorl. Aperture ear-shaped. Outer lip, within, with 3 short lirations. Columella provided with 2 oblique plications, the posterior being the stronger. Canal short and weakly gyrate. Siphonal fasciole rather prominent, ornamented with 3 spiral threads.

Type (U.S.N.M. Cat. No. 370012) measures: Altitude, 7 mm.; diameter, 3.5 mm.; length of aperture, 3.5 mm.

The type and two other specimens are imperfect. *C. coënsis* is closely related to *Cancellaria agria*, n. sp., but it is separated from that species by its fewer and wider-spaced spirals and shallower suture.

Occurrence: Upper Miocene: Station 3672, 1 mile northwest of Hosford, Liberty County, Fla., type locality; station 1/962, cut in old road leading to Watsons Landing, Liberty County, Fla.

Subgenus TRIGONOSTOMA Blainville, 1826

Cancellaria (Trigonostoma) perspectiva alumensis Mansfield, n. subsp.

Plate 4, figure 5

The type locality of *Cancellaria perspectiva* Conrad, described¹ in 1834 and figured² in 1866, is near Smithfield, James River, Va.

The new subspecies is closely allied to the species but differs from the figured type in that the body whorl is more sloping toward the upper shoulder and is sculptured with weaker and more closely-set axials. The spiral sculpture of the species, judging from the description, is very similar to that of the subspecies. The spiral sculpture of the subspecies consists of narrow bands alternating with fine threads separated by striae. *Cancellaria (Trigonostoma) perspectiva* Conrad

¹Acad. Nat. Sci. Philadelphia Jour., vol. 7, 1st ser., p. 136, 1834.

²Am. Jour. Conchology, vol. 2, pl. 3, fig. 6, 1866.

is reported by Dall¹ from the Miocene of Duplin County, N. C. A specimen so labeled in the U. S. National Museum collection and obtained from the Miocene of North Carolina agrees with my new subspecies and probably is the same specimen referred to by Dall.

The figured specimen² referred to *Cancellaria perspectiva* Conrad and obtained from the St. Marys formation, Maryland, does not appear to compare very closely with Conrad's figured type and may belong to another species or subspecies.

Type (U.S.N.M. Cat. No. 370014) measures: Altitude, 18 mm.; diameter, about 13 mm.; length of aperture, 10 mm.

Occurrence: Upper Miocene: Florida, station 7081, upper bed at Alum Bluff, type locality; station 3671, Hosford, Liberty County; station 3423, lower upper Miocene bed at Jackson Bluff, Leon County; borrow pit, Jackson Bluff. Specimens at the first two localities are rare and at the last two localities imperfect or small.

Cancellaria (*Trigonostoma*) *tenera* Philippi

Plate 4, figure 7

1848. *Cancellaria tenera* Philippi, Zeitsch. für Mal., vol. 5, p. 24.

1878. *Cancellaria stimpsoni* Calkins, Davenport Acad. Nat. Sci. Proc., vol. 2, p. 250, pl. 8, figs. 4, 5.

1890. *Cancellaria* (*Trigonostoma*) *tenera* Philippi. Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 1, p. 43, pl. 10, fig. 8.

1919. *Cancellaria* (*Trigonostoma*) *tenera* Philippi. Gardner and Aldrich, Acad. Nat. Sci. Philadelphia Proc., vol. 71, p. 17.

Occurrence: Upper Miocene: Florida, 1/946, Harveys Creek, half a mile above abandoned mill, Leon County (Gunter and Mansfield).

Outside occurrence: Upper Miocene: South Carolina, Muldrow's Place, 5 miles southeast of Mayesville, Sumter County. Pliocene: Florida, Caloosahatchee marl. Recent: Gulf of Mexico.

Cancellaria carolinensis Emmons?

A fragment of the genus *Cancellaria* in the U. S. National Museum collection (No. 124971), representing the lower part of the body whorl surrounding the large umbilicus, collected from the upper bed at Alum Bluff, Liberty County, Fla., is identified as *Cancellaria carolinensis* Emmons. This species is recorded from this locality by Dall³.

The type of *Cancellaria carolinensis* Emmons was collected at Mr. Flowers's marl bed on the Cape Fear River, Bladen County, N. C.

¹Dall, W. H., Wagner Free Inst. Sci. Trans., vol. 3, pt. 1, p. 43, 1890.

²Maryland Geol. Survey, Miocene, pl. 43, fig. 9, 1904.

³Dall, W. H., Wagner Free Inst. Sci. Trans., vol. 3, pt. 6, p. 1596, 1903.

Superfamily RHACHIGLOSSA

Family OLIVIDAE

Genus OLIVA Martyn, 1786

Oliva sayana Ravenel

Plate 4, figure 4

1811. *Oliva litterata* Lamarck, Ann. Mus. XVI, p. 315. (Not *Porphyria litterata* Bolten, 1789.)
1830. *Oliva litterata* Lam. Say, Am. Jour. Conchology, vol. 1, pt. 1, pl. 3.
1834. *Oliva sayana* Ravenel, Cat., p. 19.
1856. *Strephona literata* (Lam.). Tuomey and Holmes, Pleiocene fossils of South Carolina, p. 140, pl. 28, fig. 13.
1858. *Oliva literata* Say. Emmons, North Carolina Geol. Survey Rept., pp. 259, 264, fig. 130.
1859. ?*Strephona literata* (Lam.) Tuomey and Holmes. Holmes, Post-Pleiocene fossils of South Carolina, p. 75, pl. 12, fig. 7.
1863. *Dactylus carolinensis* Conrad, Acad. Nat. Sci. Philadelphia Proc. for 1862, vol. 14, p. 563.
1864. *Oliva carolinensis* Conrad. Meek, Check list of the invertebrate fossils of North America, Smithsonian Misc. Coll. (183), p. 20, No. 660.
1890. *Oliva litterata* Lamarck. Dall (part), Wagner Free Inst. Sci. Trans., vol. 3, pt. 1, p. 44.
1899. *Oliva* (*Neocylindricus*) *carolinensis* Conrad. Cossmann, Essais de paleoconchologie comparee, vol. 3, p. 46, pl. 2, figs. 20, 24.
1904. *Oliva litterata* Lamarck. Martin, Maryland Geol. Survey, Miocene, p. 169, pl. 44, figs. 1a, 1b.
1919. *Oliva litterata* Lamarck. Gardner and Aldrich, Acad. Nat. Sci. Philadelphia Proc., vol. 71, p. 17.

Occurrence in Florida: Upper Miocene: Upper bed at Alum Bluff, Liberty County (common); station 1/960, Darlings Slide, Chipola River, Calhoun County (rare); station 8176, the "Deadens," Washington County; station 1/962, cut in old road to Watsons Landing, Liberty County (rare); station 3422, upper bed at Jackson Bluff, Leon County (common); station 1/946, Harveys Creek, about half a mile above abandoned mill, Leon County (common); station 1/964, highest bed at abandoned mill on Harveys Creek (common); station 1/966, Double Branch, Leon County (rare).

This species begins in the Calvert formation of the Chesapeake group and ranges upward to the Recent.

Genus OLIVELLA Swainson, 1831

Olivella mutica (Say) Dall

Plate 4, figure 1

1822. *Oliva mutica* Say, Acad. Nat. Sci. Philadelphia Jour., vol. 2 (1st ser.), p. 228.
1843. *Oliva duplicata* Conrad, Acad. Nat. Sci. Philadelphia Proc., vol. 1, p. 309.
1858. *Oliva* sp., Emmons, North Carolina Geol. Survey Rept. p. 259, fig. 131a.
1859. *Oliva mutica* Say. Holmes, Post-Pleiocene fossils of South Carolina, p. 76, pl. 12, fig. 8.

1890. *Olivella mutica* (Say). Dall (part), Wagner Free Inst. Sci. Trans., vol. 3, pt. 1, p. 45.
1903. *Olivella mutica* Say. Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 6, pp. 1596, 1599.
1919. *Olivella mutica* (Say). Gardner and Aldrich, Acad. Nat. Sci. Philadelphia Proc., vol. 71, p. 17.
1924. *Olivella mutica* (Say). Mansfield, Florida Geol. Survey Fifteenth Ann. Rept., in faunal list opposite p. 28.

Occurrence in Florida: Upper Miocene: Station 3672, 1 mile northwest of Hosford, Liberty County (abundant); station 3671, Hosford (abundant); station 2210, Alum Bluff, Liberty County, upper bed (rare); station 1/962, cut in old road to Watsons Landing, Liberty County (rare); station 3422, Jackson Bluff, Leon County, uppermost bed (rare); station 3421, Harveys Creek, about half a mile above abandoned mill, Leon County (rare).

Olivella duplicata (Conrad), from Wilmington, N. C., was described but not figured. Its length as given by Conrad is half an inch. Although this description indicates a larger shell than the general run of *O. mutica*, I have placed *O. duplicata* in synonymy with *O. mutica*. Further study may prove that they are distinct species.

All the specimens referred to *O. mutica* in my upper Miocene of Florida are small.

Olivella mutica coënsis Mansfield, n. subsp.

Plate 4, figure 2

Shell small, rather solid, subcylindrical, consisting of about 5 whorls. Posterior extremity broadly conical. Apical whorl small, following spire whorls submedially depressed. Body whorl cylindrical and depressed a little above the middle. Suture narrow and shallowly channeled. Aperture half the length of body whorl, narrow above and gradually widening below. Outer lip margin sharp. Inner lip provided with callus, which extends upon the body whorl to medial depression. A callus fold superposes the lip callus at the base of the columella. Inner lip without lirations.

Type (U.S.N.M. Cat. No. 370033) measures: Altitude, 6 mm.; diameter, 2.6 mm.; length of aperture, 2.7 mm.

Occurrence: Upper Miocene: Station 3672, 1 mile northwest of Hosford, Liberty County, type locality (common); station 3671, Hosford (rare).

The new subspecies is separated from the form referred to *O. mutica* by its more cylindrical shell, its medially depressed whorls, and the absence of lirations on the inner lip callus. In comparison with the more slender forms referred to *O. mutica* in the Recent fauna, the new subspecies has a heavier shell and a medial depression.

Section DACTYLIDELLA Woodring, 1928

Olivella (*Dactylidella*) *floridana* Mansfield, n. sp.

Plate 4, figure 3

Shell small, solid, subovate, five-whorled, with a very short broadly conic spire and a large semi-elliptical body whorl. Apical whorl minute. Following spire whorls rapidly enlarging. Suture narrow and shallowly channeled. Aperture narrow and oblong above and expanded at anterior end. Margin of outer lip broken. Outer lip, within, with ten entering lirations. Base of body whorl provided with the usual callus. Callus covers the inner lip and a part of the face of the body whorl to the suture, heavy on the inner lip and lighter and tapering on the body whorl. Another heavy and narrow callus, ornamented with six lirations, superposes the lip callus and extends posteriorly to upper third of aperture length and anteriorly unites with the border of the emargination.

Type (U.S.N.M. Cat. No. 370036) measures: Altitude, 7 mm.; diameter, 3.8 mm.; length of aperture, 3.4 mm.

Occurrence: Upper Miocene: Station 3671, Hosford, Liberty County, type locality; station 3421, Harveys Creek, about half a mile above abandoned mill, Leon County. Rare at both localities.

In respect to the lirations on the inside of the outer lip, the new species shows a relationship to *O. galvestonensis* Harris, a species described from the deep well at Galveston, Texas, and taken at a depth of 2410-2871 feet. However, the new species has a much shorter and heavier shell than Harris's species. Three specimens in the U. S. National Museum collection, labeled *O. mutica* var., were collected at the same depth in this well but are of different color, and appear identical with my new species. These probably were not included by Harris under *O. galvestonensis*.

I do not find any species of the genus *Olivella* in the East Coast Recent fauna possessing lirations on the inside of the outer lip.

Olivella jacksonensis Mansfield, n. sp.

Plate 4, figure 6

Shell small, thin, subovate, about four-whorled, with a moderately short and blunt spire. Whorls inflated. Suture very narrowly channeled and weakly appressed. Apical half-turn smooth, large, and hemispherical. Following spire whorls inflated, the periphery being a little below the middle of the whorl. Body whorl subelliptical and composing three-fourths of the shell length. Aperture narrow above and wide below. Outer lip thin, simple; margin nearly straight except at lower part where it gently incurves. Parietal wall, columella and anterior extremity of shell provided with a thin wash of callus. Lower

end of columella biplicate. Columella above the biplication smooth.

Type (U.S.N.M. Cat. No. 370039) measures: Altitude, 6.5 mm.; diameter, 3.2 mm.; length of aperture, 3.5 mm.

Occurrence: Station 3423, Jackson Bluff, Leon County, from lower upper Miocene bed.

The new species is founded upon one specimen.

The biplicate columella recalls *O. biplicata* Sowerby, a Recent species occurring on the west coast of California, but this species has a much larger shell than the new species.

O. biplicata is the type of the subgenus *Callianax* of H. and A. Adams.

Family MARGINELLIDAE

Genus MARGINELLA Lamarck, 1799

Marginella popenoei Mansfield, n. sp.

Plate 4, figures 9, 11

Shell large, rather fragile, elongate-ovate. Posterior end truncate and moderately depressed at the vertex. Area at vertex slightly broken but indicates a concealed nucleus. Aperture longer than body whorl, uniformly narrow in upper two-thirds, wider below opposite columellar plications. Outer lip strongly curved at both extremities; between, gently arched; within, strongly denticulated except at posterior end. Columella provided with four plications, anterior two strong and oblique, posterior two weak and less oblique.

Type (U.S.N.M. Cat. No. 370040) measures: Altitude, 44 mm.; maximum diameter, 22 mm.

One immature specimen obtained at station 1/946 shows the very minute nucleus projecting above the truncated posterior end.

The new species is closely related to *Marginella taylora* Olsson, a species described from the Yorktown formation, Chocowinity, N. C., but when compared with the illustration of Olsson's species my species shows a shorter and proportionally wider shell with a wider aperture at the anterior part, resulting from the more tapering and narrower anterior part of the body whorl.

The new species is separated from *Marginella antiqua* Redfield by its truncated posterior end.

The nearest allied Recent species is *M. bullata* Born, from Brazil.

The new species is named in honor of Mr. Willis P. Popenoe, of the U. S. Geological Survey.

Occurrence: Upper Miocene: Station 1/964, highest bed exposed at abandoned mill on Harveys Creek, Leon County, Fla., type locality; station 1/946, Harveys Creek, about half a mile above abandoned mill; borrow near Jackson Bluff, Leon County. Rare at all localities.

Marginella sp. aff. *M. contracta* Conrad

There are two imperfect specimens from station 3423, lower upper Miocene bed at Jackson Bluff, Leon County, Fla., that are related to *Marginella contracta* Conrad.¹

Marginella sp. cf. *M. gravaida* Dall

Two imperfect specimens from station 3423, lower upper Miocene bed at Jackson Bluff, Leon County, Fla., compare with *Marginella gravaida* Dall.²

Marginella minuta Pfeiffer

Plate 4, figure 8

1840. *Marginella minuta* Pfeiffer, Archiv. für. Naturgeschichte, I, p. 259.
 1845. ?*Marginella conulus* H. C. Lea, Am. Philos. Soc. Trans., vol. 9, p. 273, pl. 37, fig. 102.
 1863. ?*Porcellana* (*Marginella*) *conulus* H. C. Lea. Conrad Acad. Nat. Sci. Philadelphia Proc. for 1862, vol. 14, p. 563. [Name only.]
 1864. ?*Marginella* (*Volutella*) *conulus* H. C. Lea. Meek, Check list Invertebrate fossils of North America, Smith. Misc. Coll. (183), p. 19.
 1890. *Marginella minuta* Pfeiffer, Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 1, p. 57. [Range only.]
 1904. *Marginella minuta* Pfeiffer. Martin, Maryland Geol. Survey, Miocene, p. 170, pl. 44, fig. 4.
 1919. *Marginella minuta* Pfeiffer. Gardner and Aldrich, Acad. Nat. Sci. Philadelphia Proc., vol. 71, p. 17.

I have not seen the type of *M. conulus* H. C. Lea, described from Petersburg, Va., and am uncertain of its identity with *M. minuta* Pfeiffer.

The upper Miocene forms from Florida compare more closely with specimens that range from the Duplin marl of the Carolinas to the Recent.

Occurrence in Florida: Upper Miocene: Station 8862, half a mile northwest of Clarksville, Calhoun County (rare); station 7081, upper bed at Alum Bluff, Liberty County (rare); stations 3671 and 3672, Hosford, Liberty County, and 1 mile northwest of Hosford (common); station 3421, Harveys Creek, about half a mile above abandoned mill, Leon County (common); station 3422, uppermost bed at Jackson Bluff, Leon County (common).

Marginella bella tersa Mansfield, n. subsp.

Plate 4, figure 10

The type locality of *Marginella bella bella* (Conrad)³ is Days Point, James River, Va. I have collected good specimens from Vir-

¹Conrad, T. A., Am. Jour. Conchology, vol. 6, p. 78, 1870.

²Dall, W. H., Wagner Free Inst. Sci. Trans., vol. 3, pt. 1, p. 55, pl. 5, fig. 3, 1890.

³Conrad, T. A., Am. Jour. Conchology IV, p. 67, pl. 6, fig. 4, 1868.

ginia near, if not at, the same place from which Conrad's type came. The new subspecies differs from *M. bella bella* in the following respects: The shell is smaller, more cylindrical in outline, with a less broadly conical spire and less shouldered body whorl. In other characters it closely corresponds to Conrad's species. Dall¹ designated a varietal name, *bellula*² for a thinner, more oval form with a straighter outer lip; and *inepta*³ for a smaller form with a relatively higher spire, a more evenly tapering shell, and the outer lip less convex in the middle on the inside. In 1915 Dall⁴ raised these varieties to specific rank and showed that the types came from "silex beds," of the Tampa limestone.

The nearest related Recent species appears to be *Marginella veliei* Pilsbry, a species described from Dog Island, on the Gulf coast of Florida.

Type (U.S.N.M. Cat. No. 370050) measures: Altitude, 8.3 mm.; greatest diameter, 3.7 mm.; length of aperture, 6 mm.

Occurrence: Upper Miocene: Station 1/955, Gully Pond, Washington County, Fla., type locality; station 3421, Harveys Creek, about half a mile above abandoned mill, Leon County, Fla. Rare at both localities.

Marginella bella hosfordensis Mansfield, n. subsp.

Plate 5, figure 8

The form referred to this new subspecies differs from *Marginella bella bella* Conrad or *Marginella bella tersa*, n. subsp., in having a much shorter and more cylindrical shell. The shoulder of the body whorl is rounded, not angulated. The spire is very short and broadly conic.

Type (U.S.N.M. Cat. No. 370052) measures: Altitude, 6.6 mm.; greatest diameter, 4 mm.; length of aperture, 5 mm.

Occurrence: Upper Miocene: Station 3671, Hosford, Liberty County, Fla., type locality; station 3421, Harveys Creek, about half a mile above abandoned mill, Leon County, Fla. Rare at both localities.

Marginella denticulata clarksvillensis Mansfield, n. subsp.

Plate 5, figure 6

The new subspecies is characterized by its strong shoulder above and moderately depressed area below the suture and its thin outer lip weakly denticulated within near the middle. The shoulder is sub-

¹Dall, W. H., Wagner Free Inst. Sci. Trans., vol. 3, pt. 1, p. 53, 1890.

²Op. cit., pl. 4, fig. 8e.

³Op. cit., pl. 4, fig. 8d.

⁴Dall, W. H., U. S. Nat. Mus. Bull., 90, p. 53, 1915.

carinate on the spire whorls and subrounded on the body whorl. In other features the new subspecies agrees with *Marginella denticulata* Conrad.

The new subspecies is closely related to *Marginella schmidtii* Olsson, described from the Duplin marl at the Natural Well, N. C., but, when compared with the description and illustration of Olsson's species, my subspecies possesses a stronger shoulder without the spiral line below, and a wider aperture.

Type (U.S.N.M. Cat. No. 370054) measures: Altitude, 7.6 mm.; greatest diameter, 3.5 mm.; length of aperture, 4.5 mm.

Occurrence: Upper Miocene: Station 1/954, half a mile northeast of Clarksville, Calhoun County, Fla., type locality; (?) 1/961, near Woods, Liberty County, Fla. (fragments); (?) 1/706, Gully Pond, Washington County, Fla. (fragments).

Marginella aureocincta Stearns

Plate 5, figure 9

1872. *Marginella* (*Glabella*) *aureocincta* Stearns, Boston Soc. Nat. Hist. Proc., vol. 15, p. 22.
 1885. *Marginella virginiana* Verrill (not of Conrad), Connecticut Acad. Sci. Trans., vol. 6, p. 420.
 1885. *Marginella smithii* Verrill, idem., p. 452.
 1885. *Marginella smithii* Verrill. Bush, idem., p. 462.
 1890. *Marginella aureocincta* Stearns. Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 1, p. 52.
 1919. *Marginella aureocincta* Stearns. Gardner and Aldrich, Acad. Nat. Sci. Philadelphia Proc., vol. 71, p. 17.

Occurrence in Florida: Upper Miocene: Station 3422, upper bed at Jackson Bluff, Leon County (rare); station 3421, Harveys Creek, about half a mile above abandoned mill, Leon County (abundant); station 8176, the "Deadens," Washington County (rare).

This species occurs in the Duplin marl of North Carolina; in the Pliocene of the Carolinas and Florida; and in the Recent fauna ranging from Virginia to Florida. I have not seen it from the Yorktown formation in Virginia.

Marginella precursor Dall

Plate 5, figure 11

1890. *Marginella precursor* Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 1, p. 47, pl. 5, fig. 4.

Marginella precursor Dall was described from the Pliocene, Caloos-hatchee marl, Florida.

In the upper Miocene of Florida there are two specimens from Harveys Creek, about half a mile above the abandoned mill, Leon

County, that appear referable to *M. precursor* and three specimens from the "Deadens," Washington County, that may belong to this species. The individuals from the latter place have only four plaits on the columella while *Marginella precursor* has five, the posterior one being very weak.

Genus CYPRAEOLINA Cerulli-Irelli, 1911

Cypraeolina dacria (Dall)

Plate 5, figure 5

1892. *Marginella (Volutella) dacria* Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 2, p. 226, pl. 14, fig. 5.
 1919. *Marginella (Volutella) dacria* Dall, Gardner and Aldrich, Acad. Nat. Sci. Philadelphia Proc., vol. 71, p. 17.

Occurrence in Florida: Station 3671, Hosford, Liberty County, 1 specimen; borrow pit, near Jackson Bluff, Leon County, 1 specimen, collected by Florida State Geological Survey.

The specimen from station 3671 is smaller and more globose than the Pliocene form from the Waccamaw marl or Croatan sand. I observe that specimens referred to this species from the Duplin marl of the Carolinas are usually shorter and more globose than the later Pliocene form and compare with my Floridian Miocene form. However, the Miocene and Pliocene specimens are so nearly alike that a subspecific separation is hardly warranted.

The species begins in the Duplin Marl (upper Miocene), or beds of equivalent horizon, and ranges upward into the Pliocene.

Cypraeolina sp. cf. *C. ovuliformis* (d'Orbigny)

Two immature specimens from station 3421, Harveys Creek, Leon County, Fla., about half a mile above the abandoned mill, compare with *Cypraeolina ovuliformis* (d'Orbigny.¹)

Family VOLUTIDAE

Genus AURINIA H. and A. Adams, 1853

Aurinia mutabilis (Conrad)

Plate 5, figure 10

1829. *Voluta lamberti* Sowerby. Morton, Acad. Nat. Sci. Philadelphia Jour., vol. 6, 1st ser., p. 119. (Not *V. lamberti* Sowerby, 1818.)
 1830. *Voluta lamberti* Sowerby. Conrad, Acad. Nat. Sci. Philadelphia Jour., 1st ser., vol. 6, p. 210. (Not *V. lamberti* Sowerby, 1818.)
 1834. *Fasciolaria mutabilis* Conrad, Acad. Nat. Sci. Philadelphia Jour., vol. 7, p. 135.
 1841. *Fasciolaria mutabilis* [Conrad]. Conrad, Am. Jour. Sci., vol. 41, pp. 343, 346, pl. 2, fig. 7.

¹d'Orbigny, A., Mollusques de Cuba, vol. 2, p. 101, pl. 20, figs. 33-35, 1853.

1843. *Fasciolaria mutabilis* Conrad. Conrad, Am. Assoc. Geologists and Naturalists Trans., p. 109, pl. 5, fig. 7.
1845. *Voluta mutabilis* [Conrad]. Lyell, Geol. Soc. London Quart. Jour., vol. 1, p. 421.
1846. *Voluta mutabilis* [Conrad]. Lyell, Geol. Soc. London Proc., vol. 4, p. 555.
1856. *Voluta mutabilis* (Conrad). Tuomey and Holmes, Pleiocene Fossils of South Carolina, p. 128, pl. 27, figs. 5, 6.
1863. *Voluta (Volutifusus) mutabilis* Conrad. Conrad, Acad. Nat. Sci. Philadelphia Proc. for 1862, vol. 14, p. 563.
1864. *Voluta (Volutifusus) mutabilis* Conrad. Meek, Miocene Check List. Smithsonian Misc. Colls. (183), p. 19.
1890. *Scaphella (Aurinia) mutabilis* Conrad. Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 1, p. 80.
1892. *Scaphella (Aurinia) mutabilis* Conrad. Dall, op. cit., pt. 2, p. 227.
1899. *Scaphella (Aurinia) mutabilis* Conrad. Cossmann, Essais de Paleoconch. Comp., vol. 3, p. 129.
1903. *Aurinia mutabilis* Conrad. Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 6, p. 1600.
1904. *Scaphella (Aurinia) mutabilis* (Conrad). Martin, Maryland Geol. Survey, Miocene, p. 174, pl. 45, figs. 8, 9.
1919. *Aurinia mutabilis* (Conrad). Gardner and Aldrich, Acad. Nat. Sci. Philadelphia Proc., vol. 71, p. 17.

Occurrence in Florida: Upper Miocene: Upper bed at Alum Bluff, Liberty County (common); station 3423, lower upper Miocene bed, Jackson Bluff, Leon County (rare).

Aurinia mutabilis begins in the St. Marys formation in Maryland and ranges upward into the Pliocene.

Genus MACULOPEPLUM Dall, 1906

Maculopeplum trenholmii (Tuomey and Holmes)

Plate 5, figure 12

1856. *Voluta trenholmii* Tuomey and Holmes, Pleiocene fossils of South Carolina, p. 128, pl. 27, figs. 7, 8.
1890. *Scaphella trenholmii* (Tuomey and Holmes). Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 1, p. 88, pl. 6, fig. 10.
1903. *Scaphella trenholmi* Tuomey and Holmes. Dall, op. cit., pt. 6, pp. 1596, 1600.

Occurrence in Florida: Upper Miocene: Upper bed at Alum Bluff, Liberty County (2 imperfect specimens); (?) Harveys Creek, about half a mile above abandoned mill, Leon County (fragment).

This species has not been found in beds older than the Duplin marl in the Carolinas. It appears to be confined to the upper Miocene.

Family MITRIDAE

Genus MITRA Martyn, 1784

Mitra stephensoni Mansfield, n. sp.

Plate 5, figure 4

Shell of moderate size, subbiconic, strongly spirally sculptured, with $6\frac{1}{2}$ remaining whorls; nucleus and early whorls lost. Whorls slightly convex in outline and weakly tabulated below the suture. Suture indistinct, close-fitting. Spiral sculpture of (on spire whorls 4 and on body whorl 12) strong, erect, thin subacute, equidistant, primary lirations; 2 to 3 small rounded secondary lines intercalating the primary lirations; and, under magnification, tertiary threadlets intercalating the secondary lines. Axial sculpture of quite regularly spaced, flat, narrow bands—a little narrower than their interspaces—lying in the valleys and slopes between the primary spirals and over-run by the secondary spiral sculpture.

Aperture narrow, about half the length of the shell. Outer lip gently arched, inner margin crenulated opposite primary spirals. Columella bearing 4 folds, posterior two strong, anterior two weak. Siphonal fasciole ornamented with 4 moderately strong, oblique spirals.

Type (U.S.N.M. Cat. No. 370067) measures: Altitude, 31 mm.; greatest diameter, 11 mm.; length of aperture, 18 mm.

This species belongs with the same group as *M. henekeni* Sowerby, a species occurring abundantly in the Gurabo formation in the Dominican Republic, and *M. dariensis* Brown and Pilsbry, a species occurring in the Gatun formation, Canal Zone; but the new species has a relatively wider shell with a more acute spire than these species.

The new species is named in honor of Dr. L. W. Stephenson, of the U. S. Geological Survey.

Occurrence: Upper Miocene: Station 3671, Hosford, Liberty County, Fla., type locality (3 specimens); station 3672, 1 mile north-west of Hosford (2 specimens); borrow pit, near Jackson Bluff, Leon County (4 specimens).

Mitra wandoensis (Holmes)

Plate 5, figure 7

1858. ?*Pyramidella reticulata* Emmons, North Carolina Geol. Survey Rept., p. 268, fig. 155. (Specific name preoccupied.)
1859. *Volutomitra wandoensis* Holmes, Post-Pleiocene Fossils of South Carolina, p. 77, pl. 12, figs. 10, 10A.
1887. ?*Mitra rushii* Dall, Conch. Exchange, vol. 2, p. 9.
1889. ?*Mitra* (*Costellaria*?) *rushii* Dall, Harvard College Mus. Comp. Zool. Bull., vol. 18, p. 160.

1890. *Mitra wandoensis* (Holmes). Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 1, p. 92.

1919. *Mitra wandoensis* (Holmes). Gardner and Aldrich, Acad. Nat. Sci. Philadelphia Proc., vol. 71, p. 17.

Mitra mauryi Olsson, from the Yorktown formation, James River, north of Smithfield, Va., is closely allied to *M. wandoensis* (Holmes).

Occurrence in Florida: Upper Miocene: Station 3421, Harveys Creek, about half a mile above the abandoned mill, Leon County (1 specimen). This species ranges from the Duplin marl (upper Miocene) in North Carolina to the Recent.

Mitra hosfordensis Mansfield, n. sp.

Plate 5, figure 3

Shell small, rather slender, high-spired, with $1\frac{1}{2}$ nuclear and 6 postnuclear whorls. Nucleus somewhat corroded, small, bulbous, initial turn minute. Following whorls turritated at upper shoulder, in outline nearly straight. Suture impressed. Body whorl about two-fifths shell length. Spirally sculptured with a rather wide subsutural band and below it with (on the spire whorls 4) flat, narrow bands separated by slightly narrower interspaces and occupying the interaxial spaces. Spirals on the periphery of body whorl nearly obscure. Axial sculpture of (on the body whorl 14) nearly straight, rather prominent, rounded ribs, persisting across the whorl and separated by rounded-bottomed interspaces twice as wide. Aperture short, somewhat crescentic. Outer lip arched, margin broken. Columella provided with 3 plaits—the posterior one strongest.

Type (U.S.N.M. Cat. No. 370072) measures: Altitude, 6.2 mm.; greatest diameter, 2.3 mm.; aperture length, 2 mm.

The type, the only specimen, occurs in the upper Miocene at station 3671, Hosford, Liberty County, Fla.

Mitra hosfordensis libertienseis Mansfield, n. subsp.

Plate 5, figures 1, 2

1903. *Mitra willcoxii* Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 6, p. 1596. (Not *Mitra willcoxii* Dall, idem., pt. 1, p. 93, 1890.)

The subspecies is similar to *M. hosfordensis*, n. sp., in a general way, but differs from it in the following respects: The shell has a greater apical angle and a larger nucleus. The sutural area is deeper and the whorls more tabulated at the upper shoulder. The subsutural band is much narrower and the spirals consist of threads instead of narrow bands and are more distally separated from the subsutural band.

Type (U.S.N.M. Cat. No. 370073) measures: Altitude, 5 mm.; diameter, 2.6 mm. The type specimen may not be mature but it is the only one that has a preserved nucleus.

Occurrence: Upper Miocene: Station 3671, Hosford, Liberty County, Fla., type locality; station 3672, 1 mile northwest of Hosford; upper bed at Alum Bluff, Liberty County; borrow pit, near Jackson Bluff, Leon County, Fla. Rare at all localities.

Family XANCIDAE

Genus VASUM ("Bolten") Roeding, 1798

Vasum? sp.

A fragment of a shell consisting of the lower columella, collected by Mr. Herman Gunter from Harveys Creek about half a mile above the abandoned mill, Leon County, Fla., may belong to this genus.

Family FASCIOLARIIDAE

Genus FASCIOLARIA Lamarek, 1799

Fasciolaria sparrowi Emmons

Plate 8, figure 2

1858. *Fasciolaria sparrowi* Emmons, North Carolina Geol. Survey Rept., p. 253, fig. 115.
 1890. *Fasciolaria sparrowi* Emmons. Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 1, p. 104.
 1892. *Fasciolaria sparrowi* Emmons. Dall, idem., pt. 2, p. 230.
 1903. *Fasciolaria sparrowi* Emmons. Dall, idem., pt. 6, p. 1596.

Dall¹ placed *F. sparrowi* in synonymy with *F. acuta* Emmons and questioningly considered the latter a variety of the former. As the two fragments from the Floridian Miocene more closely agree with the description and illustration of *F. sparrowi* Emmons, I prefer to place the Florida specimens under this specific name. However, the Florida specimens have stronger and more persistent ribs and finer and wider spaced spirals than the specimens in the U. S. National Museum collection referred to *F. sparrowi* from the Duplin marl of North Carolina.

Occurrence in Florida: Upper Miocene: Upper bed at Alum Bluff, Liberty County (fragment of a lower whorl, collected by Frank Burns); station 1/960, Darlings Slide, Calhoun County (fragment of a spire, collected by W. C. Mansfield).

¹Dall, W. H., Wagner Free Inst. Sci. Trans., vol. 3, pt. 2, p. 229, 1892.

Fasciolaria gigantea harveyensis Mansfield, n. subsp.

Plate 6, figure 1

The shape and general aspect of this new subspecies closely resemble those of *Fasciolaria gigantea* Kiener, a species occurring in the Recent fauna and in the Pliocene of Florida. The difference consists mainly in the nature of the spiral sculpture. In the new subspecies the secondary and tertiary spirals are fewer and coarser, filling up the interspaces between the primaries and consequently making these spaces shallower than in *F. gigantea*. The spirals and surface of the shell are crenulated by axial growth lines. The outer lip, within, is marked by many closely-set, fine, entering lirations.

When compared with the Florida form identified as *F. sparrowi*, the new subspecies shows a much slenderer shell ornamented with fewer, shorter, and less angulated axials and weaker secondary spirals. The new subspecies appears to be an intermediate form between *F. acuta* Emmons from the Duplin marl of North Carolina and *F. gigantea* in the Pliocene and Recent faunas.

Type (U.S.N.M. Cat. No. 370081) measures: Altitude, 73.5 mm.; greatest diameter, 30 mm.

Occurrence: Upper Miocene: Harveys Creek, about half a mile above abandoned mill, Leon County, Fla., type and only locality (T. W. Vaughan (1900), and H. Gunter (1925), collectors).

Fasciolaria rhomboidea Rogers

Plate 6, figures 2, 3

- 1839. *Fasciolaria rhomboidea* Rogers, Am. Philos. Soc. Trans., new ser., vol. 6, p. 376, pl. 30, fig. 3.
- 1856. *Fasciolaria distans* Tuomey and Holmes, Pleiocene fossils of South Carolina, p. 151, pl. 30, fig. 8. (Not of Lamarck.)
- 1858. *Fasciolaria distans* Emmons, North Carolina Geol. Survey Rept., p. 252, fig. 113. (Not of Lamarck, in part.)
- 1863. *Fasciolaria rhomboidea* Rogers, Conrad, Acad. Nat. Sci. Philadelphia Proc. for 1862, p. 561.
- 1890. *Fasciolaria* (*distans* subsp.?) *rhomboidea* Rogers, Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 1, p. 102.
- 1903. *Fasciolaria rhomboidea* Rogers, Dall, idem, pt. 6, pp. 1596, 1600.
- 1919. *Fasciolaria rhomboidea* Rogers, Gardner and Aldrich, Acad. Nat. Sci. Philadelphia Proc., vol. 71, p. 17.

The type of *Fasciolaria rhomboidea* came from Surry County, Va.

Occurrence: Upper Miocene: Florida, upper bed at Alum Bluff, Liberty County; Harveys Creek, half a mile above abandoned mill, Leon County. Carolinas, Duplin marl. Virginia, Yorktown formation. The only specimens from Virginia in the United States National Museum were collected by me from the highest part of the Yorktown formation. The species probably does not occur in the Pliocene.

The Florida specimens are either imperfect or young. The specimens from Alum Bluff show more fine impressed spiral lines on the spire whorls and on the body whorl below the suture than specimens of this species from Harveys Creek, Fla., or from Virginia or the Carolinas. This difference appears to be only of minor importance.

Genus *PERISTERNIA* Mörch, 1852

Peristernia filicata (Conrad)

Plate 17, figure 4

1843. *Buccinum* (*Polia*) *filicatum* Conrad, Acad. Nat. Sci. Philadelphia Proc., vol. 1, p. 308.
 1844. ?*Fusus*? *cannabinus* Conrad, Acad. Nat. Sci. Philadelphia Proc., vol. 1, p. 326.
 1863. *Peristernia* (*Bucc.*) *filicata* (Conrad). Conrad, Acad. Nat. Sci. Philadelphia Proc. for 1862, p. 561.
 1901. *Lathyrus* (*Peristernia*) *filicatus* (Conrad). Cossman, Essais Paleonch. Comp., vol. 4, p. 47, pl. 2, fig. 16.
 1903. *Latirus filicatus* Conrad. Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 6, p. 1597.
 1919. *Peristernia filicata* Conrad. Gardner and Aldrich, Acad. Nat. Sci. Philadelphia Proc., vol. 71, p. 18.
 1929. *Peristernia filicata* (Conrad). Cooke and Mossom, Florida Geol. Survey Twentieth Ann. Rept., pl. 16, fig. 4.

The type of *Peristernia filicata* came from James River, Va.

Peristernia insula Olsson¹ from Gatun stage, Water Cay, Panama, as pointed out by Olsson, is somewhat like the young specimens of *P. filicata* Conrad, differing from the latter in having a more pointed spire and stronger sculpture.

Occurrence: Upper Miocene: Florida, upper bed at Alum Bluff, Liberty County (common); station 3672, Hosford, Liberty County (rare); station 3671, 1 mile northwest of Hosford (common); station 3421, Harveys Creek, about half a mile above abandoned mill, Leon County (common); station 1/965, lower upper Miocene bed at abandoned mill, Harveys Creek, Leon County (rare); station 1/960, Darlings Slide, Calhoun County (common); station 8176, the "Deadens," Washington County (rare); station 1/962, cut in old road to Watsons Landing, Liberty County (rare); borrow pit near Jackson Bluff, Leon County (rare).

Outside occurrence: Upper Miocene: North Carolina, Duplin marl; Virginia, Yorktown formation.

¹Olsson, A. A., Bull. Am. Paleontology, vol. 9, p. 282, pl. 11, fig. 11, 1922.

Genus FUSINUS Rafinesque, 1815

Fusinus dalli Mansfield, n. sp.

Plate 6, figures 5, 6

1903. *Fusinus exilis* Conrad. Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 6, p. 1597. Not *Fusinus exilis* (Conrad), 1832.

Shell of moderate size with a conic, stout, uniformly expanding, high spire and a long canal, consisting of $1\frac{1}{2}$ nuclear and 6 post-nuclear whorls. Suture rather deep, closely fitting but not appressed. Nucleus slightly corroded at apical end, first volution flatly coiled, and sculptured only with (10 on whorl preceding conch) axials. Following whorls evenly rounded in outline, sculpture of (5 to 6 on spire whorls and 11 on body whorl) thin, erect, usually roundly crested prominent cords and finer medial spiral threads. The spiral sculpture begins as a submedial thread, slightly angulating the whorl, shortly followed below by one and above by two threads. Axial sculpture only on spire whorls of (11 on the penultimate whorl) prominent rounded ribs persisting across the whorl. Whole surface of shell roughed by axial growth lines. Aperture ovate. Outer lip thin, crenulated within. Canal long and nearly straight.

Type (U.S.N.M. Cat. No. 97493) measures: Altitude, 85 mm.; greatest diameter, 32 mm. Some of the imperfect specimens referred to this species show a shell one-third longer than the type specimen.

Fusinus exilis (Conrad) has a more slender shell and much shorter canal and possesses more primary cords on the whorls than the new species. The length of the spire on the new species compares with that of *Fusinus equalis* Emmons, a species occurring in the Duplin marl in the Carolinas, but the shell of the latter species has a relatively greater diameter and has feeble secondary spiral threads.

Occurrence: Upper Miocene: Upper bed at Alum Bluff, Liberty County, Fla., type locality (common); station 1/965, Harveys Creek, Leon County, Fla., lower upper Miocene bed at abandoned mill (rare).

Fusinus caloosaensis gunteri Mansfield, n. subsp.

Plate 6, figure 4

The new subspecies is related to *Fusinus caloosaensis* (Dall) from the Pliocene Caloosahatchee marl of Florida, but is more closely related to *Fusinus caloosaensis carolinensis* (Dall), from the Pliocene Waccamaw marl of South Carolina. The nucleus closely resembles the nuclei of those forms, consisting of two erect, rather finely axially sculptured whorls. It has a much stouter shell than *F. caloosaensis*. In shape it resembles *F. caloosaensis carolinensis* but differs from that form in the following respects: The outline of the upper spire

whorls is more conic and less drawn out; the suture is deeper and not appressed; the spirals consist almost entirely of prominent primaries with only an occasional secondary intermediate thread.

Type (U.S.N.M. Cat. No. 370112) measures: Altitude, 58 mm.; greatest diameter, 27 mm.

Occurrence: Upper Miocene: Harveys Creek, about half a mile above abandoned mill, Leon County, Fla., type locality (Herman Gunter, collector); station 3671, Hosford, Liberty County, Fla. Rare at both localities.

Genus BUSYCON Bolten, 1798

Busycon maximum alumense Mansfield, n. subsp.

Plate 7, figures 3, 4

1890. *Fulgur maximum* Conrad. Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 1, pt. 115 (part).

1903. *Busycon maximum* Conrad. Dall, idem., pt. 6, p. 1596.

The new subspecies is very similar to *Busycon maximum* (Conrad), illustrated on plate 47.¹ It differs from Conrad's species in the following respects: The shell is smaller and broader; the shoulder on the body whorl is more rounded; there is less tendency to develop tubercles on the periphery of the two anterior spire whorls and body whorls, only low undulations being present. I have collected a number of specimens from the different beds at Yorktown, Va. The specimens that compare with the description and figured specimen of Conrad's species occur in the comminuted series at Yorktown and in beds of the same horizon at other localities in Virginia. The individuals collected from this horizon are usually without tubercles on the later spire whorls, although some of the specimens indicate a tendency to have developed them.

The new subspecies has a higher spire and a much wider canal directly below the base of the last whorl than *Busycon maximum rapum* (Heilprin), a species occurring in the Florida Pliocene.

Type (U.S.N.M. Cat. No. 370114) measures: Altitude, 127 mm.; greatest diameter, 65 mm.

Occurrence: Upper Miocene: Upper bed at Alum Bluff, Liberty County, Fla., type locality (abundant); station 1/962, cut in old road to Watsons Landing, Liberty County, Fla. (rare).

¹Conrad, T. A., Fossils of the Medial Tertiary United States, 1861.

Busycon maximum tudiculatum (Dall)

Plate 7, figure 2

1890. *Fulgur maximum* var. *tudiculatum* Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 1, p. 115.

"Spire very low, base constricted, last whorl greatly inflated; shoulder rounded, without keel or tubercles in the adult, excavated somewhat in front of the suture, which is bordered by a tuberculate or wavy elevated band formed by the thickened margin of the whorl being laid over the tuberculated shoulder of the young shell; canal slender, rather long, the pillar with a rather thick callus, but not grooved. Lon. (about) 60; lat. 35 mm. (Upper bed at Alum Bluff.)" (Dall, 1890.)

This subspecies is very rare, being represented only from the type locality by two specimens, the type collected by Frank Burns and another young specimen collected by me.

Type (U.S.N.M. Cat. No. 112016) has never been figured before.

Busycon maximum rapum (Heilprin)

Plate 8, figure 5

1887. *Fulgur rapum* Heilprin, Wagner Free Inst. Sci. Trans., vol. 1, p. 71. fig. 4.
1890. *Fulgur maximum* var. *rapum* Heilprin. Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 1, p. 115.

There are several immature specimens and two fragments representing larger specimens, collected at Harveys Creek, half a mile above abandoned mill, Leon County, Fla., that appear nearly if not identical with *Busycon maximum rapum* (Heilprin), a subspecies described from the Florida Pliocene. The shoulder on the Florida Miocene specimens is usually less rounded than on the Pliocene specimens but in other features the specimens at hand are so nearly alike that their separation is hardly warranted. Specimens from the Duplin marl of the Carolinas that have been referred to this subspecies have a little higher spire and a less constricted basal body whorl than *B. maximum rapum* but agree with it in other features.

Busycon scalarispira Conrad?

1890. *Fulgur scalarispira* Conrad. Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 1, p. 111. (Not of Conrad, 1863?)

Dall identified an imperfect specimen from the upper bed at Alum Bluff, Florida, as *Busycon scalarispira* (Conrad), a species described from the Miocene marls at Shiloh, New Jersey (Shiloh marl member of Kirkwood sand). This fragment, when compared with *B. scalarispira*, reveals much feebler tubercles on the angled periphery and a less depressed area between the suture and anterior

peripheral angle. I am uncertain of the specific identity of the Florida fragment with the form from the Shiloh marl but am inclined to believe that when perfect specimens are procured from Alum Bluff they will show a different species.

Busycon pyrum propeincile Mansfield, n. subsp.

Plate 9, figure 5

Shell of moderate size, solid, pyriform, having a low spire and a long body whorl. Spire broadly conic. Subsutural area deeply but narrowly channeled. Whorls shallowly depressed immediately below the low carina bordering the subsutural channel. Nucleus lost. Spiral sculpture of low, rounded tubercles on the periphery of the spire whorls, reduced to low and weak undulations on the body whorl, and rather closely-set, unequally spaced, rounded raised lines usually interposed by finer lines or threads.

Type (U.S.N.M. Cat. No. 112030) measures: Altitude, 130 mm.; greatest diameter, 71 mm. The new subspecies is related to *Busycon pyrum incile* (Conrad) but differs from the latter subspecies in lacking the scalariform spire and having much finer spiral sculpture.

Occurrence: Upper Miocene: Upper bed at Alum Bluff, Fla. (1 specimen).

Busycon pyrum libertiense Mansfield, n. subsp.

Plate 10, figure 3

1903. *Busycon* var. *incile* Conrad. Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 6, p. 1596.

Two imperfect specimens from the upper bed at Alum Bluff, Liberty County, Fla., resemble in general aspect *Busycon pyrum incile* (Conrad) from the Yorktown formation but are not exactly like that form. The principal difference is in the greater strength of the spiral sculpture and the more angulated shoulder. The sculpture of the Alum Bluff form consists of rather closely set fine spiral lines while the sculpture of the Yorktown form consists of rather coarse bands with finer intermediate threads. A strong raised spiral line lies in the subsutural channeled area of the Alum Bluff form.

Occurrence: Upper Miocene: Upper bed at Alum Bluff, Fla., type and only locality. U. S. N. M. Cat. No. 112029.

Busycon pyrum aepynotum (Dall)

Plate 8, figures 1, 6

1890. *Fulgur pyrum* var. *aepynotum* Dall, Wagner Free Inst. Sci., Trans., vol. 3, pt. 1, p. 113.

According to Dall this form "has a medium sutural canal, an excavated, keeled shoulder, undulate or subtuberculate and very coarse, broad spirals with wider interspaces."

This subspecies, though much smaller, is closely related to *Busycon pyrum incile*, a form occurring in the Yorktown formation of Virginia. The keeled shoulder suggests a close relationship with *Busycon canaliculatum* (Linné).

The type has not been figured before. Type (U.S.N.M. Cat. No. 112026) measures: Altitude, 46 mm.; greatest diameter, 25 mm.

Occurrence: Upper Miocene: Upper bed at Alum Bluff, Fla., type locality.

Busycon sp. aff. *B. canaliculatum* (Linné)

Plate 7, figure 1

Several young specimens from stations 3671 and 3672, Hosford and 1 mile northwest of Hosford, Liberty County, Fla., and one specimen from Harveys Creek, half a mile above the abandoned mill, Leon County, appear to be closely related to *Busycon canaliculatum* (Linné). When better specimens are procured the form may prove to be that species or closely related to it.

Busycon perversum (Linnaeus)

Plate 10, figure 5

1766. *Murex perversa* Linnaeus, Systema naturae, p. 1222.

A synonymy and discussion of this species are given by Dall.¹

One immature specimen from Harveys Creek, about half a mile above the abandoned mill, and four specimens from borrow pit, near Jackson Bluff, Leon County, were collected by the Florida Geological Survey.

The species ranges from the Miocene of the Duplin marl of the Carolinas to the Recent.

I have not found this species in the upper Miocene in Virginia.

¹Dall, W. H., Wagner Free Inst. Sci. Trans., vol. 3, pt. 1, p. 116, 1890.

Genus SOLENOSTEIRA Dall, 1890

Solenosteira vauhani Dall

Plate 17, figure 5

1903. *Solenosteira vauhani* Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 6, p. 1596, pl. 60, fig. 18.

1929. *Solenosteira vauhani* Dall. Cooke and Mossom, Florida Geol. Survey Twentieth Ann. Rept., pl. 16, fig. 5.

Following is a description of the undescribed species:

Shell solid, subovate, stronger axially sculptured than spirally, with a broadly conic spire less than one-third the shell length, and with $4\frac{1}{2}$ remaining whorls on type specimen—in all probably about 7 or 8 whorls. Whorls convex in outline and separated by a deep but not appressed suture. Axial sculpture of (12 on the body whorl) rounded, moderately strong ribs, rather closely set on the spire and persisting across the whorls, wider on the body whorl and terminating at its base. Spiral sculpture of (5 on the spire whorls and 17 on the face of the body whorl and canal) raised primary cords with 4 to 6 intermediate threads lying on the primary spiral slopes. On the spire the medial secondary is usually stronger, with usually one smaller thread above and below. Aperture oval. Canal rather short. Outer lip, within, with about 13 sharp entering lirations. Inner lip and parietal wall with a wash of callus and provided with 3 weak rounded folds, opposite the upper part of the umbilicus. Siphonal fasciole strongly developed.

Type (U.S.N.M. Cat. No. 109266) measures: Altitude, 32 mm.; greatest diameter, 20 mm.; length of aperture, 19 mm.

The form most closely allied to *Solenosteira vauhani* is *S. vauhani* var. *medioamericana* Olsson, from Toro and Water Cay, Panama, and Hill 1a, Banana River, Costa Rica. The shell of Olsson's variety differs from that of Dall's species in having angulated whorls, fewer axials, and weaker secondary spirals.

Occurrence: Upper Miocene: Hosford, Liberty County, Fla., type and only locality.

Family CHRYSODOMIDAE

Genus ECPHORA Conrad, 1845

Ecphora quadricostata umbilicata (Wagner)

Plate 17, figure 7

1839. *Fusus umbilicatus* Wagner, pl. 2, fig. 2.

1848. *Fusus umbilicatus* Wagner, Bronn, Hand. Gesch. Nat. Index Pal., pt. 1, p. 517. Questioningly places *F. umbilicatus* in synonymy with *F. quadricostatus* Say (Acad. Nat. Sci. Philadelphia Jour., vol. 4, p. 127, pl. 7, fig. 5, 1824.).

1849. *Fusus quadricostatus* var. *umbilicatus* Wagner. Bronn, Hand. Gesch. Nat. Index Pal., pt. 2, p. 455.
1898. *Ecphora quadricostata* var. Dall, Wagner Free Inst. Sci. Trans., vol. 5, No. 2, p. 9, pl. 2, fig. 2.
1903. *Ecphora quadricostata* Say. Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 6, p. 1596.
1904. Not *Ecphora quadricostata* var. *umbilicata* (Wagner). Martin, Maryland Geol. Survey, Miocene, p. 209, pl. 52, fig. 4.
1929. *Ecphora quadricostata umbilicata* Wagner. Cooke and Mossom, Florida Geol. Survey Twentieth Ann. Rept., pl. 16, fig. 7.

A full synonymy of this variety probably is not included here. Definite citations to *Ecphora* from the Yorktown formation of Virginia probably should be included.

The figure of the type of "*Fusus umbilicatus*" Wagner agrees with later specimens collected from the Yorktown formation in Virginia. Other species figured by Wagner on the same plate with "*Fusus umbilicatus*" and the two other accompanying plates are believed to occur in Virginia and North Carolina.

Ecphora quadricostata (Say) is characterized by four strong revolving equal-sized marginally T-shaped costae on the body whorl. This species occurs in the St. Marys formation of Maryland and Virginia and in the later Miocene of North Carolina and South Carolina. At Natural Well and Magnolia, N. C., it is very small and rare. It is represented in the U. S. National Museum by more and larger specimens from Darlington and Mayesville, S. C., than from the Duplin marl of North Carolina. *Ecphora quadricostata umbilicatus* differs from the typical *E. quadricostata* in having thin costae without the T-shaped margins. The form from the Choptank formation, in Maryland, referred to this variety by Martin appears to belong to another variety or species. The specimen figured by Martin as well as other specimens from the Choptank formation, have strong spiral lines between the costae and on the anterior slope of the posterior costae of the earlier whorls. On the early whorls the anterior slope of the upper costae assumes nearly a vertical position. Forms with weaker spiral lines grade into forms with heavier spiral lines, which overrun the shell between the costae. These characters are not found on specimens I have seen in St. Marys Miocene or later.

Occurrence: Upper Miocene: Florida, Alum Bluff, upper bed Virginia, Yorktown formation.

Family BUCCINIDAE

Genus CANTHARUS ("Bolten") Roeding, 1798

Cantharus watsonensis Mansfield, n. sp.

Plate 9, figure 6

Shell of moderate size, solid, semioval, axially and spirally sculptured, consisting of 5 whorls, nucleus broken off. Spire broadly conical and about one-third shell length. Whorls rounded in outline—later more so than earlier—separated by a moderately deep and flexuous suture. Axial sculpture of (12 on penultimate whorl) rounded, moderately strong retractive ribs, persisting across spire whorls and terminating a little below the periphery on last whorl, and separated by narrower interspaces. The ribs are weaker on anterior half turn of body whorl. Spiral sculpture of (8 on penultimate whorl and 18 on last whorl and canal) narrow, semiacute lines separated by interspaces twice as wide and overrunning ribs and valleys with about equal strength. Spiral interspaces ornamented with a medial thread and usually by a threadlet on either side of this thread. Fine and closely-set axial growth lines overrun the surface of shell. Margin of outer lip broken, within marked with short and rather coarse lirations. Columella, medially, weakly concave, and bearing on the lower border a single fold, furrowed above. Siphonal fasciole moderately strong and marked with 3 or 4 oblique spirals.

Type (U.S.N.M. Cat. No. 370131) measures: Altitude, 37 mm.; greatest diameter, 21.5 mm.; length of aperture, 20 mm.

The nearest related Recent species is *Cantharus cancellaria* (Conrad), a species ranging from Jupiter Inlet, southern Florida, to Darien; but the fossil species has a much larger shell with more inflated whorls than the Recent species.

Occurrence: Upper Miocene: Station 1/962, cut in old road to Watsons Landing, Liberty County, Fla., type and only locality.

Genus PTYCHOSALPINX Gill, 1867

Ptychosalpinx laqueata (Conrad)

Plate 17, figure 1

- 1832. *Buccinum laqueatum* Conrad, Fossil shells of the Tertiary formations of North America, p. 19, pl. 4, fig. 5.
- 1863. *Tritia* (*Bucc.*) *laqueata* (Conrad). Conrad, Acad. Nat. Sci. Philadelphia Proc. for 1862, p. 562.
- 1864. *Tritia laqueata* (Conrad). Meek, Check list of the invertebrate fossils of North America, Smithsonian Misc. Coll. (183), p. 20, No. 685.
- 1892. *Ptychosalpinx* (*Buccinum*) *laqueata* (Conrad). Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 2, p. 237.
- 1901. *Cominella* (*Ptychosalpinx*) *laqueata* (Conrad). Cossmann, Essais de paléontologie comparée, vol. 4, p. 151, pl. 6, fig. 8.

1903. *Ptychosalpinx laqueata* Conrad. Dall, op. cit., pt. 6, p. 1597.
 1929. *Ptychosalpinx laqueata* Conrad. Cooke and Mossom, Florida Geol. Survey
 Twentieth Ann. Rept., pl. 16, fig. 1.

The type locality of *Ptychosalpinx laqueata* (Conrad) is near Smithfield, James River, Va.

Occurrence: Upper Miocene: Florida, Alum Bluff, upper bed; station 1/962, cut in old road to Watsons Landing, Liberty County.

Outside occurrence: Virginia, Yorktown formation, mainly from the bed underlying the comminuted series.

The spiral sculpture on the specimens from Florida is a little different from that on the specimens from Virginia, being more delicately ornamented with finer and more numerous threads intercalating the coarser lines. However, this difference is believed to be due to a geographical rather than to a stratigraphical factor.

Genus DORSANUM Gray, 1847

Dorsanum? *plicatilum* (Böse)

Plate 17, figure 3

1906. *Cominella plicatilis* Böse, Instituto Geologico de Mexico Bol. 22, p. 39,
 pl. 4, figs. 22-24.
 1929. *Dorsanum?* *plicatilum* (Böse). Cooke and Mossom, Florida Geol. Survey
 Twentieth Ann. Rept., pl. 16, fig. 3.

"*Cominella*" *plicatilis* is reported¹ from Paso Real cerca de Tuxtepec, Oaxaca, Mexico.

I am uncertain as to the generic position of this species. It appears to lie between *Ptychosalpinx* and *Alectrion*, probably nearer *Alectrion*. It may belong to the genus *Dorsanum* and is most nearly related to "*Buccinum*" *veneris* Faujas from the European Miocene, a species referred to the genus *Dorsanum* by Cossmann.²

Tritia golfayaquensis Maury³ from Bluff 3, Cercado de Mao, Dominican Republic, appears to belong to the same genus as "*Cominella*" *plicatilis* Böse.

Occurrence: Upper Miocene: Station 1/946, Harveys Creek, half a mile above abandoned mill, Leon County (common); borrow pit, near Jackson Bluff, Leon County (rare).

Outside occurrence: Duplin marl, near Natural Well, N. C.

¹Böse, Emilio, op. cit.

²Cossmann, M., Essais Paleoconchologie Comparee, vol. 4, p. 220, 1901.

³Maury, C. J., Bull. Am. Paleontology, vol. 5, p. 256, pl. 41, figs. 24, 25, 1917.

Family COLUMBRARIIDAE

Genus PHOS Montford, 1810

Phos sloani floridanus Mansfield, n. subsp.

Plate 9, figure 4; Plate 10, figure 4

Shell slender, high-spired, stronger axially than spirally sculptured, about 9-whorled. Whorls nearly flat between axials, separated by a shallow, distinct, closely fitting, gently undulated suture. Nucleus of $2\frac{1}{2}$ smooth whorls; apical turn small and flattened, following turn larger and globose. Axial sculpture on conch of 6 to 8 prominent rounded ribs separated by wide, deep, and rounded valleys, and extending across the spire whorls and to the anterior fasciole on the last whorl, being a little lower below the suture. Spiral sculpture of (on spire whorls, 3, on body whorl and canal, 10) low, narrow bands, narrower than interspaces, occupying the lower two-thirds of the spire whorls. Three very narrow bands or flat spiral threads lie on the upper third of the spire whorls and usually one finer median thread intercalates the primaries on the spire whorls and on the face of the body whorl above the aperture. Aperture elongate-ovate. Canal rather short, recurved, emarginate. Outer lip arched, marked submarginally within with 8 strong elongate denticles. Inner lip callus, bearing on the outer margin 9 to 10 short denticles of about equal strength to opposing set. Siphonal fasciole strong, marked with 6 strong oblique spirals.

The description of the new species is made from two specimens, the smaller specimen having a well-preserved nucleus.

Cotypes (U.S.N.M. Cat. No. 370139) measure: Larger specimen, altitude, 21 mm.; greatest diameter, 8.5 mm.; length of aperture, 9 mm. Smaller specimen, altitude, 16.5 mm.; greatest diameter, 6.6 mm.; length of aperture, 7 mm.

The type locality of *Phos sloani* Gardner and Aldrich is Muldrow's place, 5 miles southeast of Mayesville, Sumter County, S. C., Duplin marl.

The new subspecies differs from *Phos sloani* in having much narrower spiral bands and well-developed denticles on the border of columellar lip callus.

Phos galvestonensis Harris, taken from a depth of 2158 to 2871 feet in the deep well at Galveston, Texas, is related to the new subspecies, differing mainly in having larger nuclear whorls, a stronger shoulder below the suture, and in being ornamented with more axials.

Occurrence: Upper Miocene: Station 3671, Hosford, Liberty County, Fla., type locality (common); station 3421, Harveys Creek,

about half a mile above abandoned mill, Leon County, Fla. (rare); station 1/955, Gully Pond, Washington County, Fla. (1 fragment and identity uncertain).

Phos vaughani Mansfield, n. sp.

Plate 9, figures 1, 8

Shell slender, solid, high-spired, rather strongly axially and spirally sculptured, consisting of 9 whorls. Whorls moderately inflated and evenly and gradually enlarging anteriorly. Suture close-fitting and weakly undulating. Nucleus conical, small, with $2\frac{1}{2}$ smooth whorls; apical turn minute, terminally shallowly immersed; succeeding nepionic half-turn sculptured with 8 arcuate, sharp riblets. Axial sculpture on following whorls of about 12 arched, moderately strong ribs, persisting across the spire whorls and to the fasciole on the body whorl and separated by valleys about equal in width to axials. Axials on the anterior part of last whorl more closely-set and finer. Spiral sculpture of (3 on spire whorls and 9 on last whorl and canal) narrow equally spaced bands, occupying the area from the upper shoulder to the forward suture on the spire whorls and to the siphonal fasciole on the last whorl and overriding the axials and valleys with equal strength. Two smaller spirals lie on the shoulder slope behind the suture and a median spiral thread intercalates all the primary bands except those on the base of the body whorl. Outer lip arched, thin, weakly marginally crenulated and internally marked below the margin with 7 sharp equally spaced lirations. Columellar lip callus, weakly sculptured with irregular oblique elevations. Canal short, reflexed, and deeply emarginate. Siphonal fasciole strongly developed, marked with poorly defined spirals and incrementals.

The description is based on two specimens. The smaller specimen has a well-preserved nucleus.

Dimensions: Larger cotype (U.S.N.M. Cat. No. 370143) measures: Altitude, 13.5 mm.; diameter, 5 mm.

Phos parvus var. *intricatus* Dall, a variety, according to Dall, occurring in the Pliocene and Recent faunas, is related to the new species, but the latter has a different type of nucleus and a less crowded sculpture ornamentation.

Occurrence: Upper Miocene: Florida, station 3671, Hosford, Liberty County (common), station 3672, 1 mile northwest of Hosford.

Family ALECTRIONIDAE

Genus ALECTRION Montford, 1810

Alectrion alumensis (Olsson)

Plate 8, figure 3

1916. *Nassa alumensis* Olsson, Bull. Am. Paleontology, vol. 5, p. 133, pl. 25, fig. 5.

This species is characterized by three smooth nuclear whorls, the anterior whorl being large and strongly inflated; moderately strong and widely spaced axials; fine and widely spaced spirals; short and broadly conical spire; and weakly angulated whorls.

Figured topotype: U. S. Nat. Mus. No. 113159.

Occurrence: Upper Miocene: Upper bed at Alum Bluff, Liberty County, Fla. (common).

Alectrion cornelliana (Olsson)

Plate 8, figure 4

1914. *Nassa cornelliana* Olsson, Bull. Am. Paleontology, vol. 5, p. 45, pl. 11, fig. 11.

The type locality of *Alectrion cornelliana* (Olsson) is Currie, Pender County, N. C. This species, as pointed out by Olsson, is related to *Alectrion caloosaensis* (Dall), a Pliocene species described from the Caloosahatchee marl, Florida, but differs from that species in its more elongate form, the lack of shoulder on its whorls, and its larger size. *Alectrion caloosaensis* also possesses a much stronger and more pointed nodule cresting the rib at the upper shoulder.

Figured specimen (U. S. Nat. Mus. Cat. No. 370147) from station 3671, Hosford, Liberty County, Fla.

Occurrence: Upper Miocene: Station 3672, 1 mile northwest of Hosford; station 3421, Harveys Creek, about half a mile above abandoned mill, Leon County.

Outside occurrence: Specimens that have usually been referred to *Alectrion caloosaensis* occur at the Natural Well and at Mrs. Guion's marl bed, North Carolina, and near Mayesville, South Carolina. These specimens are more closely related to *A. cornelliana* than to *A. caloosaensis*, being not more remotely related to the former than a subspecies.

Alectrion floridana Mansfield, n. sp.

Plate 9, figure 7

Shell small and solid, consisting of 2 nuclear and 5 gradually expanding and nearly flat postnuclear whorls. Body whorl about half the length of the shell, not proportionally enlarged, nor constricted at the base by a spiral sulcus. Nuclear whorls smooth; first half-turn minute and flatly coiled, following $1\frac{1}{2}$ turns moderately inflated and

gradually enlarging. Initial sculpture of postnuclear whorl of retractive riblets, soon followed by the introduction of the subsutural tuberculate spiral band and anterior spirals. Axial sculpture of weakly retractive narrow ribs (12 on body whorl). On the base of the body whorl the ribs gradually attenuate anteriorly to the siphonal fasciole. Spiral sculpture on spire whorls of 3 narrow bands, the posterior and anterior bands being tuberculate and of about equal strength, the medial band smaller and separated from the posterior band by a narrow sulcus. Body whorl with 8 spirals, the anterior five being more closely set. Aperture subovate; outer lip with a thin margin, strengthened behind with a varix and marked within with 3 equally spaced denticles, the upper one being much stronger and medially placed, the anterior one lying near the canal entrance; inner lip callus, heavy, provided with 3 to 4 denticles, one of which lies near the posterior commissure and 2 to 3 at the anterior part. Siphonal fasciole weak, marked with 3 to 4 spiral lines. Canal very short and wide.

Type (U. S. Nat. Mus. Cat. No. 370151) measures: Altitude, 6 mm.; greatest diameter, 2.7 mm.

Occurrence: Upper Miocene: Station 3671, Hosford, Liberty County, type locality (abundant); station 3672, 1 mile northwest of Hosford (abundant); station 3422, uppermost bed at Jackson Bluff, Leon County (rare); station 3421, Harveys Creek, about half a mile above abandoned mill, Leon County (abundant); station 8176, the "Deadens," Washington County (rare).

Other occurrence: Upper Miocene: Station 5016, deep well at Kissimmee, Osceola County, Fla., at a depth of 65 to 100 feet (1 fragment).

Alectrion quadridentata Mansfield, n. sp.

Plate 9, figure 3

Shell small, solid, moderately slender, with 2 smooth nuclear whorls and 4 strongly axially and spirally sculptured subsequent whorls. Suture rather deep, closely fitting, and flexuous. Body whorl about half the shell length. First nuclear whorl small, terminally flattened; following turn much larger and globular. Postnuclear whorls equally shouldered above and below. Axial sculpture of (10 on body whorl including strong lip varix) strong, rounded ribs, which persist across the whorl and are separated by little wider, smooth, and rounded-bottomed valleys. Spiral sculpture of (2 on spire whorls and 6 on body whorl) rather narrow, widely spaced bands, being a little heavier over the ribs and located at the upper and lower shoulder on the spire whorl. Another fine spiral usually lies on the

posterior shoulder slope. Aperture subelliptical, weakly sulcated at the posterior commissure. Outer lip marginally thin, sculptured within with 4 widely separated, elongate denticles or short lirae, the anterior of which marginates the canal. Pillar lip callus with 1 weak denticle adjacent to the upper commissure and 3 to 4 weak denticles over the columella. Canal short, wide, and recurved. Siphonal fasciole strongly developed, marked off above with a strong constriction, and sculptured with 3 to 4 strong spiral lines.

Type (U. S. Nat. Mus. Cat. No. 370160) measures: Altitude, 6.6 mm.; greatest diameter, 3.7 mm.

The new species is related to *Alectrion bidentata* (Emmons), but it has a more slender shell and has four instead of two denticles on the inside of the outer lip.

The specimens from the Pliocene of Florida referred by Dall¹ to *Alectrion bidentata* (Emmons) are closely related to my new species. The Pliocene form has three spirals on the spire whorls, instead of two, and has more ribs.

Occurrence: Upper Miocene: Station 3671, Hosford, Liberty County, type locality (abundant); station 3672, 1 mile northwest of Hosford (abundant); station 8862, half a mile northeast of Clarks-ville, Calhoun County (rare); station 3422, upper bed at Jackson Bluff, Leon County (common); station 3421, Harveys Creek, half a mile above abandoned mill, Leon County (rare); station 8176, the "Deadens," Washington County (rare).

Alectrion consensa harveyensis Mansfield, n. subsp.

Plate 11, figures 1, 3

Shell rather small, solid, with $2\frac{1}{2}$ smooth nuclear whorls and 4 axially and spirally sculptured postnuclear whorls. Nucleus conical, with rapidly enlarging inflated whorls. Postnuclear whorls weakly inflated, last whorl more than spire whorls, with periphery about midway between sutures. Suture distinct, close-fitting, and flexuous. Axials of (9 on the penultimate whorl) strong rounded ribs, persisting across the whorl, separated by a little wider rounded-bottomed valleys. Axials on half turn of nepionic whorl of closely-set crescentic riblets. Spiral sculpture of wide, flat bands separated by incised lines over nearly the whole surface, and about 10 flat, wavy threads over the posterior shoulder slope. Aperture subovate; outer lip, within, marked with 10 lirations, equally spaced, and continuous over the entire length. Inner lip callus rather thin, marked with 1 denticle near the upper commissure and 2 weak denticles on the anterior part.

¹Dall, W. H., Wagner Free Inst. Sci. Trans., vol. 3, pt. 1, p. 133, pl. 9, fig. 9, 1890.

Canal short, strongly recurved. Siphonal fasciole strongly developed, bordered behind by a sulcus and marked with spiral lines and incrementals.

Cotype (U. S. Nat. Mus. Cat. No. 370168) measures: Altitude, 7.7 mm.; diameter, 3.5 mm.

This new subspecies differs from the Recent shell, usually referred to *Alectrion consensa* (Ravenel), in having a smaller and more slender shell marked with more widely spaced incised spiral lines and flatter interspaces. *A. consensa* does not appear to have been figured.

A. ambigua (Montagu) has a different type of nucleus and sculpture than the new subspecies.

Alectrion consensoides (Olsson), described from the Duplin marl at the Natural Well, N. C., is closely related to the new subspecies but differs from it in having fewer axials and more distinct and more widely separated spirals.

Occurrence: Upper Miocene: Station 3421, Harveys Creek, about half a mile above abandoned mill, Leon County, type locality (common); station 1/966, Double Branch, Leon County (1 fragment).

Alectrion consensa leonensis Mansfield, n. subsp.

Plate 10, figure 2

The new subspecies resembles *Alectrion consensa harveyensis* in all characters except spiral sculpture. The spiral sculpture of *A. consensa leonensis* consists of very narrow, raised, flat-topped threads with interspaces of about equal width to threads.

Type (U. S. Nat. Mus. Cat. No. 370172) measures: Altitude, 6.5 mm.; diameter, 4.5 mm.

Occurrence: Upper Miocene: Station 3421, Harveys Creek, about half a mile above abandoned mill, Leon County, type locality (common); station 3422, uppermost bed at Jackson Bluff, Leon County (1 fragment).

Family COLUMBELLIDAE

Genus ANACHIS H. and A. Adams, 1853

Anachis camax coënsis Mansfield, n. subsp.

Plate 9, figure 2

Shell small, moderately slender, with $2\frac{1}{2}$ to 3 smooth inflated nuclear whorls and 6 stronger axially than spirally sculptured subsequent whorls. Nucleus conical, apical turn minute, anterior much larger. Postnuclear whorls weakly turritid and slightly inflated at posterior third, separated by a close-fitting suture. Axial sculpture of (19 on the penultimate whorl) rounded, rather narrow, arcuate ribs,

continuous across the spire whorls and terminating near the base on the body whorl. Spiral sculpture of 4 to 5 flat closely set bands, posterior two and those below the periphery on body whorl stronger; other bands not distinct. Aperture moderately short and narrow; outer lip with varix, within provided with 6 moderately strong, equally spaced lirations or elongate denticles, extending from the upper third to canal entrance. Inner lip callus nearly smooth. Canal short and reflexed. Siphonal fasciole not distinctly marked off above, sculptured with closely set, rounded, oblique spirals.

Dimensions: Type (U. S. Nat. Mus. Cat. No. 370176) measures: Altitude, 11 mm.; greatest diameter, 4.5 mm.

This new subspecies differs from *Anachis camax* Dall, *sensu stricto*, in having a smaller shell with slightly inflated whorls instead of flat, in the absence of reticulate sculpture on the face of the body whorl below the periphery, and in the presence of much stronger denticles within the outer lip.

Occurrence: Upper Miocene: Station 3671, Hosford, Liberty County, type locality (rare); station 2210, upper bed at Alum Bluff, Liberty County (1 fragment); station 3421, Harveys Creek, about half a mile above abandoned mill, Leon County (7 specimens); borrow pit, near Jackson Bluff, Leon County (1 specimen).

Outside occurrence: Duplin marl: Natural Well, N. C., and near Mayesville, S. C.

Anachis clappi Mansfield, n. sp.

Plate 10, figure 1

Shell of medium size, solid, strongly axially sculptured, with only 5 remaining whorls, nucleus broken off. Spire conical. Whorls weakly depressed above and weakly inflated below. Suture distinct and narrowly grooved. Axial sculpture of about 16 rounded, slightly protractive ribs, separated by little wider interspaces, stronger over the periphery and weaker above and extending across the spire whorls but terminating at the base of the body whorl. Spirally sculptured only on canal and siphonal fasciole with 7 to 8 narrow raised bands. Outer lip within with 6 long denticles. Inner lip callus heavy and nearly smooth. Canal terminally broken off but apparently short.

Dimensions: Type (U. S. Nat. Mus. Cat. No. 370180) measures: Altitude, 14 mm.; greatest diameter, 6 mm.

Anachis styliola obsoleta Gardner and Aldrich, described from the Natural Well, N. C., is related to the new species, but the latter is a shorter and proportionally wider shell and is marked with fewer and stronger ribs.

Occurrence: Upper Miocene: Station 8862, Calhoun County, half a mile northeast of Clarksville, type and only locality.

The species is named in honor of the collector, Mr. F. G. Clapp.

Anachis wieserae Mansfield, n. sp.

Plate 10, figures 6, 7

Shell rather small, subfusiform, axially and spirally sculptured, with about 7 whorls in all. Earliest whorls on type lost in handling, but observations and sketch of shell while complete indicate that these 4 earliest whorls are smooth, rounded in outline, and separated by a channeled suture. A young specimen showing the nuclear whorls and believed to belong to this species was later collected by the Florida Geological Survey. The character of the nuclear whorls corresponds to the lost nuclear whorls of the type. Following whorls weakly convex in outline. Suture appressed and marked below by a narrow and weak band. Axial sculpture, retractive above and protractive below, consists of narrow ribs separated by much narrower incised spiral lines. Axials and interspaces sculptured by narrow spiral bands which are more prominent in the interspaces and on the anterior part of last whorl. Aperture narrowly ovate. Canal short and moderately expanded below. Much of the upper part of the outer lip is broken away, but an unbroken part reveals a rounded anal notch at the posterior border, which extends backward to the subsutural band. The inside of anterior part of outer lip is smooth. Inner lip is provided with a smooth callus.

Type (U. S. Nat. Mus. Cat. No. 370181) measures: Altitude, 8 mm. (estimated); greatest diameter, 3 mm.

Occurrence: Station 3421, Harveys Creek, half a mile above abandoned mill, Leon County, type and only locality.

I have tentatively referred the new species to genus *Anachis*, although when perfect specimens are procured it may be found that it should be referred to some genus under the family *Turritidae*. I have named the species in honor of Miss Frances Wieser, of the United States Geological Survey, who retouched the prints of the illustrations for this paper.

Genus STROMBINA Mörch, 1852

Strombina gunteri Mansfield, n. sp.

Plate 12, figure 2

Shell small, solid, turritid, with a broadly acute spire and a moderately large body whorl, consisting of 3 smooth nuclear whorls and 6 axially prominent and spirally subordinate sculptured subsequent whorls. Nucleus narrowly conical, apical turn minute and terminally

flattened, following turn larger and moderately inflated. Postnuclear whorls tabulated below the distinct, close-fitting but not appressed suture. Axial sculpture of (17 on penultimate whorl) rounded, retractive ribs, continuous across the spire whorls and to the base on body whorl but absent on terminal third of body whorl. Spiral sculpture of a strong subsutural line, weakly nodulous over the ribs; 5 to 6 somewhat weaker widely separated lines on the basal slope and base of last whorl; and about 6 closely-set strong lines on the siphonal fasciole. Aperture wide opposite upper columella, constricted at posterior extremity. Outer lip with strongly inflexed margin, within ornamented with 5 to 6 denticles, the posterior denticle, located at the upper third of length, being strongest. Inner lip callus provided with 4 rounded lirations, the upper three short and marginal, the lowest stronger and longer. A rounded callus knob lies on the face of the body whorl opposite the subsutural raised line. Siphonal fasciole strongly developed. Canal short and reflexed.

Dimensions: Type (U. S. Nat. Mus. Cat. No. 370184) measures: Altitude, 10.7 mm.; greatest diameter, 6 mm.

Strombina sincola Olsson, from Hill 1a and Hill 3, Banana River, Costa Rica, is related to the new species, differing from it mainly in the more flattened area behind the outer lip and in the character of the posterior extremity of the aperture.

Occurrence: Upper Miocene: Leon County, Harveys Creek, about half a mile above abandoned mill, type and only locality.

The species is named in honor of Mr. Herman Gunter, State Geologist of Florida, the collector of the type specimen.

Strombina gunteri leonensis Mansfield, n. subsp.

Plate 12, figure 1

Shell small, stout, turrated, with 3 smooth nuclear whorls and 4 mainly axially sculptured postnuclear whorls. Body whorl proportionately large, about two-thirds length of shell. Two early post-nuclear whorls nearly smooth. Axial sculpture on subsequent whorls of rather strong ribs, weakly nodulous below the suture. Spirally sculptured only on the base of body whorl and canal with closely-set low threads. Aperture similar to *Anachis gunteri* but without callus knob on face of body whorl.

Dimensions: Type (U. S. Nat. Mus. Cat. No. 370186) measures: Altitude, 4.2 mm.; greatest diameter, 2 mm.

This subspecies differs from *Strombina gunteri* in having a smaller shell with less acute spire and in being more strongly sculptured axially.

Occurrence: Upper Miocene: Station 3421, about half a mile above abandoned mill, Leon County, type and only locality (rare).

Family MURICIDAE

Genus TYPHIS Montfort, 1810

Typhis harrisi Olsson

Plate 11, figure 6

1914. *Typhis harrisi* Olsson, Bull. Am. Paleontology, vol. 5, p. 46, pl. 9, figs. 7, 9.

This species is closely allied to *Typhis floridanus* Dall, a species occurring in the Pliocene beds of Caloosahatchee River, Fla., differing mainly from the latter in having a much stronger intervarical rib below the shoulder, produced by the tube.

Occurrence: Upper bed at Alum Bluff, Liberty County (rare); station 3671, Hosford, Liberty County (rare); station 8176, the "Deadens," Washington County (rare).

Outside occurrence: Duplin marl at Natural Well, N. C.

Genus MUREX Linnaeus, 1758

Murex pomum Gmelin

Plate 11, figure 9

1792. *Murex pomum* Gmelin, Systema naturae, p. 3527.

A single specimen of *Murex pomum* was collected by the Florida Geological Survey from Harveys Creek, half a mile above the abandoned mill, Leon County, Fla.

Murex globosa Emmons (= *M. pomum* Gmelin) was reported by Emmons¹ from the Miocene of Cape Fear River, N. C. I know of no confirmed record that this species has been collected from the Duplin marl at the Natural Well or at Wilmington, N. C.

This species occurs in the Bowden marl of Jamaica and is a common species in the Pliocene of Florida.

In the Recent fauna it ranges from Beaufort, N. C., to Venezuela.

Genus PURPURA Martyn, 1784

Purpura fluviana Dall

Plate 11, figure 7

1903. *Pterorhytis (conradiana* Dall, var.?) *fluviana* Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 6, p. 1633, pl. 60, figs. 20, 21.

Following is a description of the apparently undescribed species:

Shell of moderate size, solid, with about $1\frac{1}{2}$ corroded nuclear and 4 strongly angulated postnuclear whorls. Whorls rapidly enlarging; body whorl about three-fourths the shell length. Suture deep, not

¹Emmons, Ebenezer, North Carolina Geol. Survey Rept., p. 247, fig. 105 A, 1858.

appressed. Axial sculpture of 4 reflected, rather thin, facially undulated, marginally sinuate varices on the later whorls and of about 9 ribs on the early whorls. Face of varices with thin marginally crenulated laminae which are very faint between the varices. Spiral sculpture of about 3 faint, rounded lines situated at and below the periphery. Aperture broadly ovate; outer lip with a small denticle situated at anterior part. Canal closed, moderately twisted.

Figured type (U. S. N. M. Cat. No. 163801) measures: Altitude, 34 mm.; greatest diameter, 25 mm.

Type locality: Pliocene of Shell Creek, Fla.

This species differs from *Purpura conradi* (Dall) in lacking the strong spirals and cancellate ornamentation between the varices. *Purpura conradi* (Dall)¹ is reported from the St. Marys formation, Maryland, and from Goose Creek, South Carolina. One specimen recorded as from Maryland is in the United States National Museum collection and appears to be the specimen figured by Dall.

Purpura marshalli Mansfield, n. sp.

Plate 11, figure 4

Shell rather large, solid, with $1\frac{1}{2}$ nuclear and 6 postnuclear whorls. Spire broadly conical and about one-fifth shell length. Suture moderately deep and on later whorls well appressed. Nuclear whorls small, smooth, and rounded in outline. Axial sculpture on three early postnuclear whorls of about 10 lamellar ribs and on the following whorls of 4 thin, nearly erect, facially imbricated and marginally crenulated varices. Spiral sculpture on the two early whorls of 2 spirals, the anterior of which is much stronger and forms the periphery of the whorl. Following whorls with a strong, rounded, feebly imbricated spiral at the angled periphery, 3 to 4 weaker spirals below the periphery, and fewer and weaker spirals above the periphery. Aperture narrowly ovate. Outer lip with a denticulate margin and a strong spike at the anterior third; within provided with a single row of low, elongate elevations. Canal closed, weakly reflected.

Type (U. S. N. M. Cat. No. 370227) measures: Altitude, 52 mm.; maximum diameter, 30 mm.

This species differs from *Purpura fluviana* Dall in having a much shallower and more appressed suture and more erect and thinner varices.

This species is named in honor of Mr. William B. Marshall, Assistant Curator of Mollusks, U. S. National Museum.

¹Dall, W. H., Wagner Free Inst. Sci. Trans., vol. 3, pt. 1, p. 143, pl. 12, fig. 11, 1890.

Occurrence: Borrow pit near Jackson Bluff, Leon County, Fla., type locality (rare); station 3671, Hosford, Liberty County, Fla. (rare).

Genus EUPLEURA H. and A. Adams, 1853

Eupleura miocenica Dall

Plate 17, figure 6

1890. *Eupleura miocenica* Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 1, p. 146, pl. 12, fig. 9.

1929. *Eupleura miocenica* Dall. Cooke and Mossom, Florida Geol. Survey Twentieth Ann. Rept., pl. 16, fig. 6.

This species is separated from *Eupleura miocenica* var. *intermedia* Dall, a form from the Caloosahatchee Pliocene, Florida, by its lower and less angulated shoulder, weaker spiral sculpture, and much shorter canal.

Occurrence: Upper Miocene: Upper bed at Alum Bluff, type locality; station 1/960, Darlings Slide, Chipola River, Calhoun County. Common at both localities.

Eupleura caudata brevispira Mansfield, n. subsp.

Plate 11, figure 5

Shell small, with a short, broadly conical spire and rather long body whorl and canal, consisting of about $6\frac{1}{2}$ whorls in all; two apical whorls broken off. Whorls tabulated below the suture. Axial sculpture of (9 on the last whorl) rather strong ribs. Each rib is crested with a hemiconical, rather stout spine, the base of which crosses the tabulated subsutural area to the suture as a slightly raised lamella. Spirally sculptured only below the shoulder of the last whorl with about 9 rounded threads, which are weaker in the valleys than over the ribs. Aperture narrowly ovate. Inner margin of outer lip marked with 6 rounded denticles. One rounded denticle lies on the parietal wall and two or three irregularly-spaced, small, rounded elevations lie on the middle part of the columellar callus. Canal rather long and straight.

Type (U. S. N. M. Cat. No. 370195) measures: Altitude, 12.5 mm.; greatest diameter, 7 mm.

The new subspecies differs from *Eupleura caudata* (Say) or *E. caudata* var. *sulcidentata* Dall in having a shorter spire and in the absence of the spiral line connecting the ribs at the upper shoulder.

Occurrence: Station 3671, Hosford, Liberty County, Fla., type and only locality.

Eupleura caudata leonensis Mansfield, n. subsp.

Plate 11, figure 2

Eupleura caudata leonensis closely resembles both *Eupleura caudata sulcidentata* Dall and *E. caudata brevispira*, new subspecies. It differs from the former in having more tabulated whorls and fewer and weaker spiral lines on the body whorl. *E. caudata brevispira* has a less acute spire. In other features the two Miocene subspecies closely agree.

The shell is rather large and consists of about seven whorls.

Type (U. S. N. M. Cat. No. 370197) measures: Altitude, 36 mm.; greatest diameter, 20 mm.

Occurrence: Upper Miocene: Harveys Creek, half a mile above abandoned mill, Leon County, Fla., type and only locality. The type was collected by the Florida State Geological Survey.

Genus UROSALPINX Stimpson, 1865

Urosalpinx trossulus (Conrad)?

A fragment of a shell consisting of the body whorl was collected by Mr. Herman Gunter from Harveys Creek, about half a mile above an abandoned mill, Leon County, Fla. This fragment may belong to *Urosalpinx trossulus* (Conrad). The type locality of *Urosalpinx trossulus* (Conrad) is James River, near Smithfield, Va. This species occurs in the Yorktown formation of Virginia, in and above the comminuted series; in the Duplin marl of the Carolinas; and in the Pliocene beds of Florida.

Genus MURICIDEA (Swainson) Mörch, 1852

Muricidea floridana libertiënsis Mansfield, n. subsp.

Plate 11, figure 8

None of the specimens referred to this new subspecies are perfect. The description of the specimen selected for the type is as follows:

Shell of moderate size, solid, stronger axially sculptured than spirally, with 6 remaining whorls. Whorls uniformly expanding, inflated, nearly flat below the strongly appressed suture. Axial sculpture of (on the body whorl 8) broad, rounded ribs, which extend over the lower two-thirds of the whorl. Spiral sculpture of rather strong, rounded, widely-spaced lines, of which 2 lie on the upper shoulder slope, 2 on the periphery of the spire whorls, and 6 on the last whorl to the canal. A weaker spiral intercalates the first and second posterior primaries of the body whorl. Margin of outer lip broken, within marked with 7 entering lirations. End of canal broken off.

Type (U. S. N. M. Cat. No. 370230) measures: Altitude, 22 mm.; greatest diameter, 12 mm.

The new subspecies differs from *Muricidea floridana* (Conrad) in having a wider and flatter subsutural area, a less steeply inclined posterior shoulder slope, and wider and stronger axials.

Occurrence: Upper bed at Alum Bluff, Liberty County, Fla., type locality; station 3672, 1 mile northwest of Hosford, Liberty County, Fla. Rare at both localities.

Muricidea floridana conradi Mansfield, n. subsp.

Plate 12, figure 3

Shell of moderate size, solid, stronger axially sculptured than spirally, and consists of 5 whorls, tip decollate. Whorls enlarging rather uniformly, constricted below the suture on the later whorls and at the base of the body whorl. Suture more appressed on the earlier than later whorls. Axial sculpture of (9 on the body whorl) prominent rounded ribs separated by rounded-bottomed interspaces equal in width to ribs. Spiral sculpture of rather strong, weakly crenulated, rounded primary lines which are usually intercalated with slightly weaker secondaries. Outer lip, within, strongly marked with 9 entering lirations. Pillar large, end provided with a large perforation.

Type (U. S. N. M. Cat. No. 370203) measures: Altitude, 30 mm.; greatest diameter, 16 mm.

The new subspecies differs mainly from *Muricidea floridana* (Conrad), a species described from the Recent fauna of Tampa Bay, Fla., in having less angulated whorls and a much more constricted pillar at the junction of the body whorl. *Muricidea floridana libertiensis* has a more slender shell and lacks the secondary spiral sculpture lines.

Occurrence: Upper Miocene: Harveys Creek, half a mile above the abandoned mill, Leon County, Fla., type and only locality. Collected by the Florida Geological Survey.

Suborder STREPTODONTA

Superfamily PTENOGLOSSA

Family EPITONIIDAE

Genus EPITONIUM ("Bolten") Roeding, 1798

Epitonium sayanum (Dall), n. subsp.?

A fragment of a shell consisting of the three lower whorls, belonging to the genus *Epitonium*, collected at station 3421, Harveys Creek, half a mile above abandoned mill, Leon County, Fla., may prove to

be the same as *Epitonium sayanum* (Dall)¹ or a new subspecies, when better specimens are procured.

The fragment has 7 thin, reflected, posteriorly angled, continuous and contiguous, rather high costae. On the base of the last whorl faint spiral striae intercalate the costae.

Dall² reports *Epitonium sayanum* from the "Pliocene of the Caloosahatchee. Post Pliocene of South Carolina. Recent from Texas to Key West, and northward to Virginia."

Epitonium turriculum (Sowerby)

Plate 12, figure 6

1847. *Scaloria turricula* Sowerby, Thesaures, "Scaloria." p. 92, pl. 33, fig. 61; pl. 34, fig. 88.

1876. *Scala (Amoea) turricula* (Sowerby). Mörch, Acad. Nat. Sci. Jour., 2d ser. vol. 8, p. 200. pl. 29, fig. 7.

1890. *Scala turricula* (Sowerby). Dall, Wagner Free Inst. Sci. Trans., vol. 1, p. 157.

This species is mainly characterized by having microscopic axial lines between the spirals.

Occurrence: Upper Miocene: Station 8176, the "Deadens," Washington County (rare); ?3671, Hosford, Liberty County; ?1/961, near Woods, Liberty County.

Outside occurrence: Upper Miocene, Petersburg, Va. (1 fragment). Pliocene, Caloosahatchee River and Shell Creek, Fla. Living in the eastern Antilles and northward to Cape Hatteras.

Epitonium duplinianum (Olsson), described from the Duplin marl, Natural Well, N. C., is very closely related to *E. turriculum*, differing from the latter in having more secondary spiral lines between the primaries.

Epitonium alumensis Mansfield, n. sp.

Plate 12, figure 5

Scala, near *acricula* Lea, Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 6, p. 1597, 1903.

Shell rather small, fragile, consisting of 5 whorls; apex broken off. Whorls roundly angulated at the periphery and separated by a deep and distinct suture. Body whorl much larger than preceding and more strongly angulated. Axial sculpture of fine, weakly arcuate, low, and rather sharp costae crossing the whorl with equal strength. Base with a slightly raised area, restricted above by a low ridge and marked with costae. Aperture not entire in the holotype, subcircular in out-

¹Dall, W. H., Harvard College Mus. Comp. Zool. Bull., vol. 18, p. 309, 1889.

²Dall, W. H., Wagner Free Inst. Sci. Trans., vol. 3, pt. 1, p. 158, 1890.

line. Margin of outer lip broken away. The holotype may not be adult, but it is well characterized by a rather large body whorl and rounded angled whorls.

Type (U. S. Nat. Mus. Cat. No. 112711) measures: Altitude, 5.5 mm.; greatest diameter, 3 mm.

The new species is related to an undescribed new species from the Yorktown formation of Virginia but differs from that species in having finer costae and whorls more strongly angulated. "*Scalarina*" *acicula* Lea, as indicated by the illustration, has rounded whorls and a different aperture.

Occurrence: Upper bed at Alum Bluff, Liberty County, type and only known locality.

Superfamily GYMNOGLOSSA

Family MELANELLIDAE

Genus MELANELLA Bowdich, 1822

Subgenus MELANELLA Bowdich

Melanella (*Melanella*) *bartschi* Gardner and Aldrich

Plate 12, figure 7

1919. *Melanella bartschi* Gardner and Aldrich, Acad. Nat. Sci. Philadelphia Proc., vol. 71, p. 37, pl. 2, fig. 1.

This species is characterized by its elongate-conic shell, full, rather short, and evenly rounded basal whorl, and short, obliquely subovate aperture.

Magnolia, Duplin County, N. C., is the type locality of this species.

Occurrence in Florida: Upper Miocene: Station 3671, Hosford, Liberty County (abundant); station 3672, 1 mile northwest of Hosford (abundant); station 3421, Harveys Creek, half a mile above abandoned mill, Leon County (rare); 3423, lower upper Miocene bed at Jackson Bluff, Leon County (rare); ?3422, uppermost bed at Jackson Bluff (1 fragment); ?1/422, Hamlin Pond, Washington County (fragments); station 8176, the "Deadens," Washington County; borrow pit, near Jackson Bluff (rare).

Figured specimen (U. S. Nat. Mus. Cat. No. 370215) is from station 3671, Hosford, Liberty County, Fla.

Melanella (*Melanella*) *magnoliana* Gardner and Aldrich

Plate 12, figure 12

1919. *Melanella magnoliana*, Gardner and Aldrich, Acad. Nat. Sci. Philadelphia Proc., vol. 71, p. 38, pl. 2, fig. 8.

This species is closely related to *Melanella bartschi* Gardner and Aldrich, differing mainly in having a smaller and stouter shell.

Magnolia, Duplin County, N. C., is the type locality of this species.

Occurrence in Florida: Upper Miocene: Station 3421, half a mile above abandoned mill, Leon County (common); station 1/706, Gully Pond, Washington County (common).

Figured specimen (U. S. Nat. Mus. Cat. No. 370223) is from station 3421, Harveys Creek, half a mile above abandoned mill, Leon County, Fla.

Genus STROMBIFORMIS Da Costa, 1778

Strombiformis leonensis Mansfield, n. sp.

Plate 12, figures 4, 8

Shell imperforate, polished, slender, consisting of about 11 whorls in all; only seven remaining on the type. Three early whorls weakly inflated and separated by a distinct suture, following whorls nearly straight in outline, later whorls more so than earlier. Suture appressed and shallowly depressed. Base broadly rounded. Aperture elongate-ovate; posterior angle acute, outer lip thin, weakly contracted above. Inner lip closely appressed to the parietal wall and reflexed over the columella below. Very faint spiral color bands are indicated on the shell. The description is based on the holotype with a broken-off apex and a paratype with a preserved nucleus.

Type (U. S. Nat. Mus. Cat. No. 370229) measures: Altitude, 9.5 mm.; greatest diameter, 2.2 mm.; length of aperture, 2.8 mm.; width of aperture, 1.2 mm.

Strombiformis dalli Gardner and Aldrich,¹ described from the Pliocene of Caloosahatchee River, Fla., is probably a descendant of my new species and consequently closely related. *Strombiformis dalli* has a more slender shell with more depressed whorls below the suture and a longer and narrower aperture than my new species. Gardner and Aldrich² reported the occurrence of *S. dalli* in the Yorktown formation of Virginia and the Duplin marl of North and South Carolina. There are specimens in the U. S. National Museum collection from the Yorktown formation of Virginia and the Duplin marl of the Carolinas that compare with my new species and I have assigned them to it.

Occurrence in Florida: Upper Miocene: Station 3421, Harveys Creek, half a mile above abandoned mill, Leon County, type locality (common); station 3422, uppermost bed at Jackson Bluff, Leon County (rare); station 1/706, Gully Pond, Washington County (rare); station 3671, Hosford, Liberty County (one fragment and identification uncertain).

¹Gardner, J. A., and Aldrich, T. H., Acad. Nat. Sci. Philadelphia, vol. 71, pp. 39, 40, pl. 2, fig. 5, 1919.

²Op. cit., p. 40.

Strombiformis leonensis harveyensis Mansfield, n. subsp.

Plate 12, figure 11

One specimen collected at station 3421, Harveys Creek, half a mile above abandoned mill, Leon County, is a little different from *Strombiformis leonensis*, n. sp. The subspecies differs from the species in having a less slender shell with spire whorls slightly enlarged below the suture and body whorl lowly angled at the periphery.

Type (U. S. Nat. Mus. Cat. No. 166382) measures: Altitude, 9.3 mm.; greatest diameter, 2.4 mm.; length of aperture, 2.9 mm.; width of aperture, 1 mm.

Genus NISO Risso, 1826

Niso willcoxiana gunteri Mansfield, n. subsp.

Plate 12, figure 9

Shell polished, elongate-conic, rather narrowly umbilicated, consisting of $12\frac{1}{2}$ whorls, nucleus broken off. Earliest two whorls slightly rounded, following whorls nearly straight in outline and uniformly increasing in size. Suture distinct, shallowly depressed. Periphery of body whorl angulated, with a very narrow and low brownish-color band at the angulation. Surface of whorls marked with very faint axial striae. Spiral sculpture above the periphery and on the base of body whorl of widely spaced very weak threads. Aperture subovate; margin broken off. Umbilicus about two-fifths of greater diameter of shell.

Type (U. S. N. M. Cat. No. 370231) measures: Altitude, 16.7 mm.; greatest diameter, 6.2 mm.

The new subspecies differs from *Niso willcoxiana* Dall, a species described from the Pliocene of Caloosahatchee River, Fla., in having a more slender shell with more uniformly expanding whorls and a narrower umbilicus.

Occurrence in Florida: Upper Miocene: Harveys Creek, half a mile above abandoned mill, Leon County, type locality (2 specimens including holotype); station 1/422, Hamlin Pond, Washington County (1 specimen); station 8176, the "Deadens," Washington County (2 specimens).

Outside occurrence: Very small specimens at Natural Well, N. C., and near Mayesville, S. C., may belong to this new subspecies.

Family PYRAMIDELLIDAE¹

Genus PYRAMIDELLA Lamarck, 1799

Pyramidella species *a*

A juvenile specimen belonging to the genus *Pyramidella* was collected at station 1/955, Gully Pond, Washington County, Fla. This is designated species *a*.

Pyramidella species *b*

A single young specimen belonging to the genus *Pyramidella* was collected on Harveys Creek, half a mile above the abandoned mill, Leon County, Fla., by Mr. Herman Gunter, State Geologist of Florida. This apparently belongs to the subgenus *Triptychus* and is designated species *b*.

Pyramidella species *c*

A single specimen representing four lower whorls, belonging to the genus *Pyramidella*, was collected by the Florida Geological Survey at borrow pit, near Jackson Bluff, Leon County, Fla. This specimen is designated species *c*.

Genus TURBONILLA Risso, 1826

Turbonilla (Chemnitzia) species *a*

Occurrence: Station 1/672, Darlings Slide, Chipola River, Calhoun County; station 1/954, half a mile northeast of Clarksville, Calhoun County; station 1/670, upper fossiliferous bed at Alum Bluff, Liberty County.

Turbonilla (Chemnitzia) species *b*

Occurrence: Station 1/946, Harveys Creek, half a mile above abandoned mill, Leon County; station 1/955, Gully Pond, Washington County; station 11732, borrow pit, near Jackson Bluff, Leon County.

Turbonilla (Pyrgiscus) species *c*

Occurrence: Station 1/946, Harveys Creek, half a mile above abandoned mill, Leon County; station 1/422, Hamlin Pond, Washington County; station 1/706, Gully Pond, Washington County; station 11732, borrow pit, near Jackson Bluff, Leon County.

Turbonilla (Pyrgiscus) species *d*

Occurrence: Station 1/706, Gully Pond, Washington County; station 1/422, Hamlin Pond, Washington County; station 11732, borrow pit, near Jackson Bluff, Leon County (var.?).

¹The species referred to the genera *Pyramidella* and *Turbonilla* are separated into species and designated by alphabetical symbols.

Turbonilla (*Pyrgiscus*) species *e*

Occurrence: Station 1/953, 1 mile below Econfinia bridge, Bay County; station 1/946, Harveys Creek, half a mile above abandoned mill, Leon County; station 11732, borrow pit, near Jackson Bluff, Leon County.

Turbonilla (*Strioturbonilla*) species *f*

Occurrence: Station 1/946, Harveys Creek, half a mile above the abandoned mill, Leon County.

Suborder PECTINIBRANCHIATA

Superfamily TAENIOGLOSSA

Family CASSIDIDAE

Genus SCONSIA Gray, 1847

Sconsia hodgei (Conrad)

1841. *Cassia Hodgii* Conrad, Am. Jour. Sci., 1st ser., vol. 41, p. 346, pl. 2, fig. 10.
 1856. *Galeodia Hodgii* Conrad. Tuomey and Holmes, Pleiocene fossils of South Carolina, p. 138, pl. 28, fig. 10.
 1858. *Galeodia Hodgii* Conrad. Emmons, North Carolina Geol. Survey Rept., p. 257, text-fig. 128.
 1863. *Sconsia* (*Cassia*) *Hodgii* Conrad. Conrad, Acad. Nat. Sci. Philadelphia Proc. for 1862, vol. 14, p. 564.
 1864. *Sconsia Hodgei* Conrad. Meek, Check list of the invertebrate fossils of North America, Smithsonian Misc. Coll. (183), p. 19, No. 639.
 1903. *Cassia* (*Sconsia*) *Hodgei* Conrad. Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 6, p. 1597. (Listed from upper bed at Alum Bluff, Fla.)
 1903. *Sconsia Hodgei* Conrad. Dall, idem, p. 1600.
 1919. *Cassia Hodgei* Conrad. Gardner and Aldrich, Acad. Nat. Sci. Philadelphia Proc., vol. 71, p. 18.

This species has a large, thin, rather finely spirally sculptured shell with inflated whorls.

Occurrence in Florida: A fragment of the anterior part of the last whorl collected at station 2210, upper bed at Alum Bluff, probably should be referred to *Sconsia hodgei*. A perfect specimen of this species was collected at borrow pit, Jackson Bluff, Leon County, by the Florida Geological Survey after the plates for this paper had been made up.

Outside occurrence: Duplin marl, North and South Carolina.

Family FICIDAE

Genus FICUS ("Bolten") Roeding, 1798

Ficus aff. *F. papyratium* (Say)

One fragment of the genus *Ficus* collected by Mr. Herman Gunter from Harveys Creek, about half a mile above the abandoned mill, Leon County, Fla., appears to be closely related to *Ficus papyratium* (Say), a species ranging from the Pliocene into the Recent.

Family CYPRAEIDAE

Genus CYPRAEA Linnaeus, 1758

Cypraea carolinensis Conrad

1841. *Cypraea carolinensis* Conrad, Am. Jour. Sci., ser. 1, vol. 41, p. 346, pl. 2, fig. 6.

A nearly perfect specimen of *Cypraea carolinensis* was collected in the borrow pit, Jackson Bluff, Leon County, by the Florida Geological Survey, after the plates for this paper had been prepared. Fragments of a shell, probably representing *C. carolinensis*, were collected by me at station 1/946, Harveys Creek, half a mile above the abandoned mill, Leon County.

The type locality of *C. carolinensis* is the Natural Well, Duplin County, N. C. This species appears to be confined to the upper Miocene deposits in the Carolinas.

Family CYMATIIDAE

Genus CYMATIUM ("Bolten") Roeding, 1798

Subgenus LINATELLA Gray, 1857

Cymatium (Linatella) floridanum Mansfield, n. sp.

Plate 12, figure 10

Shell small, rather fragile, subovate, mainly spirally sculptured, and consists of 2 preserved nuclear and 3 postnuclear whorls. Nucleus distinct, smooth, porcelainous, and erect. Postnuclear whorls inflated, body whorl and canal about four-fifths of shell length. Spiral sculpture of flat bands usually alternating in width. Axial sculpture of faint incremental threads. Aperture semicircular in outline, outer lip crenulated within. Lower columella provided with 6 weak plications shortening in length anteriorly.

Type (U. S. N. M. Cat. No. 370465) measures: Altitude, 26 mm.; greatest diameter, 16 mm.; length of aperture, 18 mm.

The shell of the new species may not be adult. The new species apparently belongs to the subgenus *Linatella* Gray and is most nearly related to the form referred by Tryon¹ to *Triton (Linatella) cingulatus* Lamarck, a species reported on the Atlantic side at St. Thomas, W. I.

Occurrence: Station 11732, borrow pit near Jackson Bluff, Leon County, Fla. Type and only specimen collected by the Florida Geological Survey.

¹Tryon, G. W., Manual of Conchology, (1st ser.) vol. 3, p. 15, pl. 8, figs. 55, 56, 1881.

Family STROMBIDAE

Genus STROMBUS Linnaeus, 1799

Strombus pugilis floridanus Mansfield, n. subsp.

Plate 13, figures 9, 10

Shell of moderate size, rather stout, consisting of 2 corroded, apparently smooth, nuclear and about 8 sculptured subsequent whorls. First five postnuclear whorls narrowly conical; succeeding, broadly conical. First and second postnuclear whorls weakly inflated, not shouldered; third, fourth, and fifth shouldered; sixth and seventh not shouldered; body whorl roundly shouldered. Spiral sculpture of narrow raised bands over the whole surface except on the back of the body whorl of adult specimens. Axial sculpture of arcuate riblets on the early whorls, which become gradually shorter on ascending the spire, and on the penultimate whorl are rather low, rounded tubercles situated behind the suture. Body whorl without tubercles. Angled color bands are visible on the back of the body whorl. The apices of the angles of the color bands point backward and originate near the middle of the whorl. The description of the subspecies is based upon two specimens, type and paratype.

Type (U. S. Nat. Mus. Cat. No. 370260) measures: Altitude, 62 mm.; greatest diameter, 36 mm. Paratype (U. S. Nat. Mus. Cat. No. 370259) measures: Altitude, 45 mm.; greatest diameter, 24 mm.

The new subspecies is closely related to *Strombus pugilis alatus* Gmelin but differs from the latter in having a shorter shell with a lower and less turritid spire, and fewer nodules or tubercles. In the new subspecies, the suture winds upon or above the spiral row of tubercles except on the earliest whorls and on the last half of the body whorl. On *S. pugilis alatus* the suture falls below the tuberculate shoulder.

Occurrence: Upper Miocene: Harveys Creek, half a mile above abandoned mill, Leon County, type locality (common); station 3422, uppermost Miocene bed at Jackson Bluff, Leon County, paratype locality (rare).

Family TRIPHORIDAE

Genus TRIPHORA Blainville, 1828

Triphora, species indeterminable

The genus *Triphora* is represented at three localities by three fragments, which may represent two species.

Occurrence: Upper Miocene: Station 1/706, Gully Pond, Washington County, Fla.; station 3421, Harveys Creek, half a mile above abandoned mill, Leon County, Fla.; station 11732, borrow pit near Jackson Bluff, Leon County, Fla.

Family CERITHIOPSIDAE

Genus CERITHIOPSIS Forbes and Hanley, 1853

Cerithiopsis, species a

A revision of the Recent species of the genus *Cerithiopsis* of our east coast and Gulf has not been completed, and until it is the species from the upper Miocene of Florida can not be readily named. Consequently the forms are separated and designated by alphabetical symbols.

Cerithiopsis species a agrees very closely to a form from the Duplin marl at the Natural Well, North Carolina, and from the Pliocene of Florida, a form that has usually been referred to *Cerithiopsis subulata* Montagu, differing only from the latter in having a slightly more slender shell.

Occurrence: Station 3421, Harveys Creek, half a mile above abandoned mill, Leon County, Fla.

Cerithiopsis species b

Cerithiopsis species b is related to *Cerithiopsis greenii* (C. B. Adams). *Cerithiopsis greenii* has been reported by Dall¹ from the Pliocene of Florida to the Recent. Specimens in the U. S. National Museum collection from the Natural Well, North Carolina, labeled "*Cerithiopsis greenii*," agree more closely with *Cerithiopsis* sp. b, differing from it mainly in having a more slender shell.

Occurrence: Station 3421, Harveys Creek, half a mile above abandoned mill, Leon County, Fla.

Cerithiopsis species c

Cerithiopsis sp. c. is represented by two small, perhaps immature, specimens. It is related to *Cerithiopsis* sp. b but has a much stouter shell.

Occurrence: Upper Miocene: Station 1/966, Double Branch, just above highway bridge, Leon County, Fla.

Genus SEILA A. Adams, 1861

Seila clavulus (H. C. Lea)

Plate 13, figure 7

1843. *Cerithium clavulus* H. C. Lea, Am. Philos. Soc. Proc., vol. 3, p. 164 (List, nomen nudum).
1845. *Cerithium clavulus* H. C. Lea, Am. Philos. Soc. Trans., vol. 9, p. 268, pl. 37, fig. 89.
1858. *Cerithium annulatum* Emmons, North Carolina Geol. Survey Rept., p. 269, text-fig. 161.

¹Dall, W. H., Wagner Free Inst. Sci. Trans., vol. 3, pt. 2, p. 269, 1892.

1863. *Cerithiopsis* (*Cerithium*) *annulatum* Emmons. Conrad, Acad. Nat. Sci. Philadelphia Proc. for 1862, vol. 14, p. 566.
1863. *Cerithiopsis* (*Cerithium*) *clavulus* H. C. Lea. Conrad, idem.
1864. *Cerithiopsis annulata* (Emmons) Conrad. Meek, Check List invertebrate fossils of North America. Miocene: Smithsonian Misc. Coll. No. 183, p. 17, No. 574.
1864. *Cerithiopsis clavula* (H. C. Lea) Conrad. Meek, idem., No. 575.
1892. *Seila adamsii* Dall (not H. C. Lea, part), Wagner Free Inst. Sci. Trans., vol. 3, pt. 2, p. 267.
1903. *Seila adamsi* Dall (not H. C. Lea), idem., pt. 6, p. 1600.
- ?1904. *Seila adamsii* Martin (not H. C. Lea), Maryland Geol. Survey, Miocene, p. 228, pl. 55, fig. 6.
1919. *Seila clavulus* (H. C. Lea). Gardner and Aldrich, Acad. Nat. Sci. Philadelphia Proc., vol. 71, p. 18.

The type locality of *Seila clavulus* (H. C. Lea) is Petersburg, Va. There are in the U. S. National Museum a number of individuals of the genus *Seila* from Petersburg, Va., that compare with the description and illustration of *Seila clavulus*. When the Petersburg form is compared with *Seila adamsii* (H. C. Lea), a Recent species from the New England coast (New Bedford, Mass.), the two forms do not appear to be identical and cannot be united under one specific name. The fossil shell differs from the Recent in having a more slender shell with whorls more deeply depressed at the sutural area and a longer canal.

Occurrence in Florida: Upper Miocene: Station 3421, Harveys Creek, half a mile above abandoned mill, Leon County (common); station 3423, lower upper Miocene bed at Jackson Bluff, Leon County (rare); station 1/706, Gully Pond, Washington County (rare); ?station 1/422, Hamlin Pond, Washington County; station 1/953, 1 mile below Econfina bridge, Bay County (rare). Pliocene of Caloosahatchee River and Shell Creek.

Outside occurrence: Upper Miocene: Yorktown formation, Virginia; Duplin marl, North and South Carolina. Pliocene: Waccamaw marl, South Carolina.

Family CERITHIIDAE

Genus CERITHIUM Bruguiere, 1792

Cerithium floridanum leonensis Mansfield, n. subsp.

Plate 13, figures 1, 4

Shell rather small and solid, with a moderately acute spire, consisting of 9 whorls, apex broken off. Whorls weakly constricted at the upper third, medially enlarged, separated by an appressed suture. Spiral sculpture of impressed lines on spire and body, separated by slightly raised primary, secondary, and tertiary interspaces. Axial sculpture of strong rounded ribs on the earlier whorls, but on the

later spire whorls these ribs become gradually shorter and higher until they are represented by elongate nodules occupying the periphery of the whorl. Spire whorls ornamented with a single row of low spiral nodules slightly below the suture and a similar and stronger row at the periphery. The basal whorl, aside from its 2 stronger nodulous bands, has 4 smaller beaded bands, one lying behind the periphery and three below it. Aperture ovate with a sinus at the posterior end. Subsutural ridge strong. Canal short and recurved.

Type (U. S. N. M. Cat. No. 370275) measures: Altitude, 26 mm.; greatest diameter, 10.5 mm.

Occurrence: Upper Miocene: Station 1/946, Harveys Creek, half a mile above abandoned mill, Leon County, Fla., type locality; borrow pit, near Jackson Bluff, Leon County.

Cerithium floridanum leonensis is the ancestor of *Cerithium floridanum* Mörch and differs from the latter in having a slightly more slender shell, which is ornamented on the earlier whorls with weaker and farther separated beads or nodules on the subsutural band.

“*Cerithium*” *harveyensis* Mansfield, n. sp.

Plate 13, figure 8

Shell subovate, moderately solid with acute spire, consisting of about 7 whorls. Whorls rounded in outline, later whorls more so than earlier. Suture appressed and shallowly depressed. Sculpture on the spire whorls of rather closely-set spiral incised lines, marking the entire surface of the shell, and three rows of spiral beads or low nodules connected by a very low spiral band. The beads composing the subsutural row are lower than those in the other two rows, one of which is at the upper third and the other at the lower third of the whorl. Face of body whorl reveals six rows of beads. Outer lip and lower columella broken off. Posterior sinus deep and narrow. Subsutural ridge rather strong.

Type and only specimen (U. S. N. M. Cat. No. 370278) measures: Altitude, 22 mm.; greatest diameter, 11.5 mm.

Occurrence: Upper Miocene: Harveys Creek, half a mile above abandoned mill, Leon County, Fla. Mr. Herman Gunter, collector.

“*Cerithium*” *harveyensis* is perhaps related to *Cerithium literatum* Born, a Recent species geographically ranging on the east coast from Florida southward. It differs from the latter species in having much more inflated whorls with different sculpture features. The new species apparently belongs to the same group with *Theridium maculosum* (Kiener), a west coast Recent species geographically ranging from Lower California to Panama and Galapagos.

Genus ALABINA Dall, 1902

Alabina adamsi floridana Mansfield, n. subsp.

Plate 13, figures 2, 5

Shell rather small, moderately thin, with 3 smooth, narrowly conic, inflated nuclear whorls and 6 angulated, axially and spirally sculptured subsequent whorls. Suture narrowly channeled. Early whorls of spire more strongly angled than later, the body whorl being nearly rounded at the periphery. Axial sculpture of arcuate ribs, weak and closely-set on first postnuclear whorl, becoming gradually stronger and wider spaced on the later whorls, extending across the spire whorls and terminating at the upper base on the body whorl. Spiral sculpture of narrow, rounded threads overrunning the axials, the spiral at the periphery and those on the lower half of the body whorl being stronger. Aperture elliptical.

Type (U. S. N. M. Cat. No. 370279) measures: Altitude 4.6 mm.; greatest diameter, 1.7 mm.

The new subspecies differs mainly from *Alabina adamsi* (Dall), described from a Recent species, in the character of the early whorls. The Recent species has fewer and stronger axials and a more reticulate sculpture on the early whorls than the Miocene fossil species. The latter differs from the Pliocene of Caloosahatchee River and Shell Creek, Fla., in having finer sculpture ornamentation. A form closely allied to the new subspecies occurs in the upper Miocene at Petersburg, Va. The latter is also closely allied to the Pliocene form.

Occurrence: Upper Miocene: Station 3421, Harveys Creek, half a mile above abandoned mill, Leon County, type locality (abundant); station 1/966, Double Branch, above highway bridge, Leon County (rare); station 3422, highest upper Miocene bed at Jackson Bluff, Leon County (rare); station 1/955, Gully Pond, Washington County (common).

Alabina adamsi leonensis Mansfield, n. subsp.

Plate 13, figure 3

This form differs from *Alabina adamsi floridana* in having fewer and coarser axials. It has 3 smooth, narrow-conical, inflated nuclear whorls and 5 axially and spirally sculptured subsequent whorls. The two earliest postnuclear whorls have 2 spiral threads; on the later whorls the posterior thread forms the periphery of the whorls.

Type (U. S. N. M. Cat. No. 370286) measures: Altitude, 3.2 mm.; greatest diameter, 1.3 mm.

Occurrence: Upper Miocene: Station 1/964, Harveys Creek, highest bed at abandoned mill, Leon County, type locality (rare); station

3421, Harveys Creek, half a mile above abandoned mill, Leon County (common); station 3422, highest bed at Jackson Bluff, Leon County (rare); station 1/961, near Woods, Liberty County (rare).

Alabina adamsi harveyensis Mansfield, n. subsp.

Plate 13, figure 6

This form differs from *Alabina adamsi floridana* and *Alabina adamsi leonensis* in having a more slender shell and weaker angulated whorls. The type has 3 smooth, narrowly conic, inflated nuclear whorls and 7 axially and spirally sculptured subsequent whorls. Spirals little stronger than axials and consist of narrow threads. Aperture broadly ovate.

Type (U. S. N. M. Cat. No. 370291) measures: Altitude, 3.8 mm.; greatest diameter, 1.4 mm.

Occurrence: Upper Miocene: Station 1/946, Harveys Creek, half a mile above abandoned mill, Leon County, type and only locality.

Family MODULIDAE

Genus MODULUS Gray, 1847

Modulus woodringi Mansfield, n. sp.

Plate 14, figures 1, 2, 3

Shell small, turbate, low-spined, axially and spirally sculptured, consisting of 5 whorls. Posterior three whorls broadly conical, anterior two weakly tabulated below the suture, last whorl more so than preceding. Whorls weakly depressed behind the suture. Nucleus corroded. Axial sculpture of (11 on the last whorl) strong, short, rounded ribs, situated mainly at the periphery. Spiral sculpture of a strong flat-topped band at the periphery of the whorl, 2 rounded threads above, one being at the upper shoulder and the other below, and 1 or 2 very faint threads lying between the shoulder thread and suture. Base ornamented with 8 nearly flat-topped, narrow, raised bands. A wider space separates the posterior band from the peripheral band and the posterior series of four from the anterior. Surface of shell overrun by retractive impressed growth lines and microscopic incised spirals. Border of outer lip and lower columella broken away.

Type (U. S. N. M. Cat. No. 370293) measures: Altitude, 7 mm.; greatest diameter, 9 mm.

The new species is most closely related to *Modulus floridanus* Conrad, differing from the latter in having shorter axials and finer and more numerous spirals on the base.

Occurrence: Upper Miocene: Station 3421, Harveys Creek, half a mile above abandoned mill, Leon County, Fla., type and only locality.

The new species is named in honor of Dr. Wendell P. Woodring.

Family CAECIDAE

Genus CAECUM Fleming, 1813

Caecum cooperi S. Smith

Plate 14, figure 7

1860. *Caecum cooperi* S. Smith, Lyceum Nat. Hist. New York Annals, vol. 7, p. 154.
1870. *Caecum cooperi* S. Smith. Smith and Prime, idem, vol. 9, p. 393, fig. 3.
1872. *Caecum smithii* Cooper, Acad. Nat. Sci. Philadelphia Proc., vol. 24, p. 154.
1872. *Caecum costatum* Verrill, Am. Jour. Sci., 3d ser., vol. 3, p. 283, pl. 6, fig. 6.
1886. *Caecum cooperi* S. Smith. Tryon, Manual of Conchology, vol. 8, p. 221, pl. 67, figs. 84, 85.
1892. *Caecum cooperi* S. Smith. Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 2, p. 299.
1903. *Caecum cooperi* S. Smith. Dall, idem, pt. 6, p. 1600.
1919. *Caecum cooperi* S. Smith. Gardner and Aldrich, Acad. Nat. Sci. Philadelphia Proc., vol. 71, p. 18.

Occurrence: Upper Miocene: Station 3421, Harveys Creek, half a mile above abandoned mill, Leon County, Fla. (rare).

Outside occurrence: Yorktown formation (comminuted series), Virginia; Duplin marl, North and South Carolina; Pliocene of Florida; living from Vineyard Sound, Mass., to Florida and the Antilles, being more abundant from Cape Hatteras north.

Caecum floridanum compactum Dall

Plate 14, figure 9

1892. *Caecum floridanum compactum* Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 2, p. 298, pl. 20, fig. 9b.

A single specimen from station 3421, Harveys Creek, half a mile above abandoned mill, Leon County, Fla., is referred to *Caecum floridanum compactum* Dall, a form reported by Dall from Cape Fear River, N. C., and the Pliocene Caloosahatchee marl, Fla.

Caecum coronellum Dall

1892. *Caecum coronellum* Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 2, p. 298, pl. 20, fig. 11a.

One young individual and two fragments of a shell collected from the upper Miocene at station 3421, Harveys Creek, half a mile above abandoned mill, Leon County, Fla., appear to be *Caecum coronellum* Dall. The type locality of Dall's species is Mrs. Purdy's marl pit, Cape Fear River, N. C. The species occurs rather abundantly in the Pliocene of Florida and is living 20 miles off the coast from Cape Hatteras, N. C., in 15 fathoms of water.

Caecum regulare Carpenter

Plate 14, figure 5

1858. *Caecum regulare* Carpenter, Zool. Soc. London Proc., p. 16, No. 22.1892. *Caecum regulare* Carpenter. Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 2, p. 299.

Occurrence: Upper Miocene: Station 3421, Harveys Creek, half a mile above abandoned mill, Leon County, Fla. (figured specimen); station 1/706, Gully Pond, Washington County, Fla.

Outside occurrence: Pliocene of Florida and living in the Antilles.

Genus *MEIOCERAS* Carpenter, 1858*Meioceras nitidum* (Stimpson) Carpenter

Plate 14, figure 6

1851. *Caecum nitidum* Stimpson, Boston Soc. Nat. Hist. Proc., vol. 4, p. 112.1858. *Meioceras nitidum* (Stimpson). Carpenter, Zool. Soc. London Proc., p. 26.1892. *Meioceras nitidum* (Stimpson). Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 2, p. 302.

Four specimens collected from the upper Miocene of Florida at station 3421, Harveys Creek, half a mile above abandoned mill, Leon County, appear referable to *Meioceras nitidum* (Stimpson).

This species occurs in the Pliocene of Florida and is living from Tampa Bay, Fla., to the West Indies.

Meioceras sp. aff. *M. cingulatum* Dall

Plate 14, figure 8

Four specimens collected from the upper Miocene of Florida, at station 3421, Harveys Creek, half a mile above abandoned mill, Leon County, are related to *Meioceras cingulatum* Dall, a species described from the Pliocene of the Caloosahatchee River, Fla. The Miocene form is less strongly arched and is less tumid at the equator than the Pliocene form.

Family VERMETIDAE

Genus *SERPULORBIS* Sassi, 1827*Serpulorbis granifera* (Say) Dall

Plate 14, figure 4

1824. *Serpula granifera* Say, Acad. Nat. Sci. Philadelphia Jour., vol. 4, 1st ser., p. 154, pl. 8, fig. 4.1873. *Vermetus decussatus* Gabb (not Gmelin), Am. Philos. Soc. Trans., vol. 15, p. 240.1892. *Serpulorbis granifera* Say. Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 2, p. 303 (In part?).1894. *Anguinella virginiana* Whitfield (not Conrad), U. S. Geol. Survey Mon. 24, p. 132, pl. 24, figs. 1-5.1903. *Serpulorbis granifera* Say. Dall, op. cit., pt. 6, p. 1600.

1904. *Vermetus graniferus* (Say). Martin, Maryland Geol. Survey, Miocene, p. 232, pl. 55, figs. 14, 15.
 1917. *Serpulorbis granifera* Say. Maury, Bull. Am. Paleontology, vol. 5, p. 291, pl. 48, fig. 9.

Occurrence: Upper Miocene of Florida: Station 4993, from well 1 mile west of Holland post office, Leon County; station 3421, Harveys Creek, half mile above abandoned mill, Leon County (a young specimen, identification doubtful).

Outside occurrence: Chesapeake group of Maryland and Virginia. Duplin marl of the Carolinas. Oak Grove sands of Florida. Miocene, Dominican Republic.

Serpulorbis granifera (Say) was reported to have come from Maryland, but no specific locality was given. Therefore the formation from which the type was obtained is not known. The specimens from the Calvert formation are large and sculptured with rather coarse and poorly defined markings. I am not certain that the forms referred to this species, ranging in age from the Calvert formation to the upper Miocene, should be united under one species.

Genus VERMICULARIA Lamarck, 1799

Vermicularia spirata (Philippi) Dall

Plate 14, figure 11

1835. *Vermetus lumbricalis* Conrad (not Lamarck), Am. Jour. Sci., vol. 28, p. 109 (name only).
 1836. *Vermiculus spiratus* Philippi, Arch. für Naturg., p. 224, pl. 7, fig. 1.
 1841. *Vermetus lumbricalis* Gould (not Lamarck), Invertebrata Massachusetts, p. 246.
 1862. *Vermetus*, Conrad, Acad. Nat. Sci. Philadelphia Proc., vol. 14, p. 288.
 1863. *Vermetus carolinensis* Conrad, Idem, p. 568.
 1889. *Vermicularia spirata* Philippi. Dall, U. S. Nat. Mus. Bull. 37, p. 144, pl. 51, fig. 4.
 1892. *Serpulorbis* (*Vermicularia*) *spirata* Philippi. Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 2, p. 304.
 1928. *Vermicularia spirata* (Philippi). Woodring, Carnegie Inst. Washington, Pub. No. 385, p. 344, pl. 26, fig. 5.

This species is characterized by an early turritid and later open and irregularly coiled whorls. The sculpture on the turritid part consists of two medial spiral threads, the anterior thread being a little stronger. On the irregularly coiled part the sculpture consists of primary, secondary, and tertiary spiral markings.

Occurrence: Upper Miocene: Station 3421, Harveys Creek, half a mile above abandoned mill, Leon County (abundant); station 1/966, Double Branch, just above highway bridge, Leon County (abundant).

Outside occurrence: Miocene, Bowden marl, Jamaica, and Miocene of Dominican Republic. Pliocene of Carolinas and Florida. Recent, New England to Santa Cruz.

Genus PETALOCONCHUS H. C. Lea, 1845

Petaloconchus sculpturatus H. C. Lea

Plate 14, figure 10

1845. *Petaloconchus sculpturatus* H. C. Lea, Am. Philos. Soc. Trans., 2d ser., vol. 9, p. 233, pl. 34, fig. 3.
1849. *Petaloconchus domingensis* Sowerby, Geol. Soc. London Quart. Jour., vol. 6, p. 51, pl. 10, fig. 9.
1858. *Petaloconchus sculpturatus* Lea. Emmons, North Carolina Geol. Survey Rept., p. 271, fig. 169.
1864. *Petaloconchus sculpturatus* H. C. Lea. Meek, Check list of the invertebrate fossils of North America, Smithsonian Misc. Coll. (183), p. 16, No. 527.
1873. *Petaloconchus sculpturatus* H. C. Lea. Gabb, Am. Philos. Soc. Trans., vol. 15, p. 240.
1876. *Petaloconchus sculpturatus* Lea. Guppy, Geol. Soc. London Quart. Jour., vol. 32, p. 519.
1902. *Vermetus (Petaloconchus) sculpturatus* H. C. Lea. Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 2, p. 305.
1906. *Vermetus (Petaloconchus) pulcher* Böse, Inst. geol. Mexico Bol., numero 22, p. 32, pl. 3, figs. 22, 23.
1911. *Petaloconchus domingensis* Sowerby. Brown and Pilsbry, Acad. Nat. Sci. Philadelphia Proc., vol. 63, p. 359.
1917. *Petaloconchus domingensis* Sowerby. Pilsbry and Brown, Acad. Nat. Sci. Philadelphia Proc., vol. 69, p. 37.
1917. *Petaloconchus domingensis* Sowerby. Maury, Bull. Am. Paleontology, vol. 5, p. 292, pl. 48, fig. 11.
1919. *Vermetus (Petaloconchus) sculpturatus* H. C. Lea. Gardner and Aldrich, Acad. Nat. Sci. Philadelphia Proc., vol. 71, p. 18.
1920. *Petaloconchus domingensis* Sowerby. Hubbard, New York Acad. Sci. Sci. Survey Porto Rico and Virgin Islands, vol. 3, pt. 2, p. 139.
1922. *Petaloconchus sculpturatus* H. C. Lea. Olsson, Bull. Am. Paleontology, vol. 9, p. 318, pl. 17, figs. 10, 15.

The type locality of *Petaloconchus sculpturatus*, as described by H. C. Lea, is Petersburg, Va. This species is the type of the genus and it is well characterized by its peculiar turritid spire and ornate sculpture. On some whorls the internal laminae are absent or are very obscure, while on other specimens they are well developed and continuous throughout the spire.

The Antillean fossil was described by Sowerby as *P. domingensis*. By some writers it has been considered a synonym of *P. sculpturatus*, while by other writers it has been given the rank of a full species. I am unable to find any specific character by which to separate the Antillean form from the Chesapeake form so have placed the name

of the Antillean form in synonymy with Lea's name for an earlier described species.

Occurrence: Station 8862, half a mile northeast of Clarksville, Calhoun County (common); station 1/706, Gully Pond, Washington County (rare); station 3423, Jackson Bluff, lower upper Miocene bed, Leon County (abundant); station 1/966, Double Branch, just above highway bridge, Leon County (rare?); station 3421, Harveys Creek, half a mile above abandoned mill, Leon County (abundant).

Outside occurrence: Yorktown formation, Virginia. Duplin marl, the Carolinas. Oak Grove sand and Shoal River formation of Florida. In the Antillean region and elsewhere it has been reported from the Miocene at a number of localities.

Family TURRITELLIDAE

Genus TURRITELLA Lamarck, 1799

Turritella alumensis Mansfield, n. sp.

Plate 15, figures 1, 2, 5

Turritella variabilis Conrad. Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 6, p. 1597, 1903. (In list from upper bed at Alum Bluff, Fla.)

Shell large, solid, moderately stout, probably of about 25 whorls on complete specimens. Suture impressed. Whorls nearly flat, medially depressed between primary spirals, upper whorls more so than later. Apical whorl rather large, flatly coiled, tip shallowly immersed. Spiral sculpture, on the earliest whorls, of a sharp basal keel. On ascending the whorl, another spiral begins below the suture, weak at first but later nearly equals in strength the basal one. Sculpture on later whorls of 3 primary spirals, one at the upper fourth and two at the anterior fourth and base. The basal spiral is weakest, the other two being of about equal strength. Aside from the primaries, flat secondary threads, usually intercalated by threadlets, overrun the surface.

Larger cotype with earlier whorls missing (U. S. Nat. Mus. Cat. No. 370319) measures: Altitude, 115 mm.; greatest diameter, 24 mm.

Occurrence: Upper Miocene: Upper bed at Alum Bluff, Liberty County, type locality (abundant); station 1/962, near Watsons Landing, Liberty County (rare?); station 1/960, Darlings Slide, Calhoun County (rare); station 3423, lower upper Miocene bed at Jackson Bluff, Leon County (common).

Turritella aguilerae Böse from near Tuxtepec, Mexico, is closely related to *T. alumensis*.

Specimens collected from the lower bed at Rushmere Wharf, James River, Va., are also nearly related to the Alum Bluff species.

Turritella alumensis gardnerae Mansfield, n. subsp.

Plate 15, figure 4

A number of specimens from the upper Miocene at Alum Bluff, Fla., differ from *Turritella alumensis*. The specimens are stained a reddish brown, indicating that they may not have been collected from the same position in the upper Miocene as *T. alumensis*. The subspecies differs from the species in having whorls less medially depressed and more constricted at the suture and in being ornamented with a weaker posterior and anterior primary spiral. The subspecies differs from *T. etiwanensis* in having a less slender shell and being sculptured with coarser and more closely-set secondary spirals.

Type (U. S. Nat. Mus. Cat. No. 370328) measures: Altitude, 52 mm.; greatest diameter, 12 mm. Other specimens are a little larger than the type.

Occurrence: Upper Miocene: Upper bed at Alum Bluff, Liberty County, Fla.

Turritella etiwanensis (Tuomey and Holmes)

Plate 15, figure 3

1856. *Terebellum etiwanensis* Tuomey and Holmes, Pleiocene fossils of South Carolina, p. 122, pl. 26, figs. 9, 10.

1892. *Turritella etiwanensis* (Tuomey and Holmes). Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 2, p. 313 (in part).

1919. *Turritella etiwanensis* (Tuomey and Holmes). Gardner and Aldrich, Acad. Nat. Sci. Philadelphia, vol. 71, p. 18.

Turritella etiwanensis is reported by Tuomey and Holmes¹ from Pee Dee [River] and Goose Creek, S. C., being represented at the latter place by casts. The figured specimens evidently came from the Pee Dee River. Figure 9 does not agree very closely with the description of the species, as it represents a specimen with four to five spirals of about equal strength, whereas the description states that the two spirals equidistant from the sutures are intercalated by fine striae. Specimens in the United States National Museum from Darlington and near Mayesville, S. C., agree in detail and evidently should be referred to *T. etiwanensis*.

This species differs from *T. alumensis* in having a more slender shell ornamented with weaker primary spirals.

Occurrence: Upper Miocene: Station 3422, uppermost fossil bed at Jackson Bluff, Leon County (abundant); station 3421, Harveys Creek, half a mile above abandoned mill, Leon County (common); station 1/953, 1 mile below Econfinia bridge, Bay County (abundant); station 1/422, Hamlin Pond, Washington County (abundant); station

¹Op. cit.

3671, Hosford, Liberty County (abundant); station 3672, 1 mile northwest of Hosford; station 1/964, highest bed at abandoned mill, Harveys Creek, Leon County (common); station 4993, well 1 mile northwest of Holland post office (abundant); ?station 1/965, lower bed at abandoned mill, Harveys Creek, Leon County (1 specimen); Polk Creek, Leon County (common).

Turritella cookei Mansfield, n. sp.

Plate 16, figures 1, 10

Shell rather large, moderately stout, not strongly turritid, consists of 21 whorls on type; nucleus not preserved. Whorls subtrapezoidal in outline, weakly constricted at suture on earlier whorls and more strongly on later whorls. Apical turn smooth, rounded in outline, following three to four volutions carinated by a basal spiral. Sculpture on later whorls of 3 prominent, rounded, raised spirals; the upper spiral lies at the upper third; the following and strongest spiral lies at the lower third, being separated from the above spiral by a broad, slightly concave area; and the anterior spiral lies at the base of the whorl and weakly overhangs the suture. The two upper spirals are elongate-beaded or crenulated and the basal spire is nearly bare. Two to three very faint spirals lie in the medial area. A weak spiral lies between the posterior spiral and the upper suture. Base excavated below the basal spiral. Whole surface marked by microscopic incised spiral lines.

Type (U. S. Nat. Mus. Cat. No. 370345) measures: Altitude, 85 mm.; greatest diameter, 20 mm. The description is based upon two specimens, the type and a paratype from a different locality, the latter with a well-preserved nucleus.

Turritella cookei, n. sp., is closely related to *Turritella tuxtepecensis* Böse but appears to have a much weaker spiral between the posterior primary and the upper suture than Böse's species.

The new species is named in honor of Dr. C. W. Cooke, of the U. S. Geological Survey.

Occurrence: Upper Miocene: Station 3421, Harveys Creek, half a mile above abandoned mill, Leon County, type locality (common); station 1/422, Hamlin Pond, Washington County, paratype locality (abundant); station 1/955, Gully Pond, Washington County (rare).

Turritella cookei harveyensis Mansfield, n. subsp.

Plate 16, figures 2, 4

Shell rather large, moderately stout, not strongly turritid, consists of 12 whorls; earlier whorls not preserved. Whorls subtrapezoidal in outline, moderately constricted at the suture. Sculpture of (4 on the

spiral whorls and 5 on the basal whorl) crenulated spirals. In ascending the whorl, the spiral below the suture is weak, the following and closely lying one is stronger, the third is weak but stronger than the first, and the fourth is the strongest and most prominent spiral on the whorl. Whole surface marked by microscopic incised spirals.

Type (U. S. Nat. Mus. Cat. No. 370352) measures: Altitude, 60 mm. (early whorls broken off); greatest diameter, 12 mm.

This subspecies differs from *Turritella cookei* in having more spirals. In *T. cookei* the medial area has only three to four fine spirals, whereas *T. cookei harveyensis* is centrally ornamented by a rather strong spiral.

The new subspecies is closely related to *Turritella burdenii* (Tuomey and Holmes) but has less crowded spiral sculpture and has a slimmer shell than the latter species.

Occurrence: Station 1/946, Harveys Creek, half a mile above abandoned mill, Leon County, type locality (rare); station 1/422, Hamlin Pond, Washington County (abundant); borrow pit, near Jackson Bluff, Leon County (common).

Turritella cookei clarksvillensis Mansfield, n. subsp.

Plate 15, figure 9

This subspecies differs from *Turritella cookei harveyensis* in having a less slender shell and stronger and more closely crenulated spirals. The posterior primary spiral is usually doubled, the sub-sutural one being weaker. The secondary medial spiral is usually weak but varies in strength on different specimens. No specimens at hand are so large as *Turritella cookei harveyensis*.

Type (U. S. Nat. Mus. Cat. No. 370355) measures: Altitude, 40 mm.; greatest diameter, 11 mm.

Turritella cookei harveyensis and *T. cookei clarksvillensis* are closely related to *T. burdenii* (Tuomey and Holmes), differing mainly in having a more slender shell and in being ornamented with fewer and less crowded spirals.

Occurrence: Upper Miocene: Station 8862, half a mile northeast of Clarksville, Calhoun County, type locality (rare); station 1/951, Red Head still, Washington County (rare); station 3418, Bailey post office on Chipola River, Calhoun County (rare).

Turritella duplinensis Gardner and Aldrich

Plate 15, figure 7

1919. *Turritella duplinensis* Gardner and Aldrich, Acad. Nat. Sci. Philadelphia Proc., vol. 71, p. 41, pl. 2, fig. 4.

This species is sculptured with from 3 to 4 primary spirals intercalated by spiral threads. The whorls are nearly flat in outline and gradually increase in size between the upper and lower suture. Some specimens have weak axial undulations on the whorls.

Occurrence: Upper Miocene: Station 3421, Harveys Creek, half a mile above abandoned mill, Leon County (rather rare); station 1/966, Double Branch, Leon County; borrow pit, near Jackson Bluff, Leon County.

Outside occurrence: Duplin marl, Natural Well, N. C., type locality; near Mayesville, S. C.; Porters Landing, Savannah River, Ga., highest bed. This species appears to be confined to the upper Miocene.

Turritella subannulata jacksonensis Mansfield, n. subsp.

Plate 15, figure 8

Shell moderately stout, uniformly enlarging, only spirally sculptured, and consists of 10 whorls; nucleus not preserved. Whorls strongly constricted at the suture, moderately inflated, rather steeply sloping at the posterior fourth, and very gently inclined at the anterior fourth. Sculpture of 3 sharp, narrow, uniformly spaced primary spirals, anterior and medial spirals being of about equal size; the anterior marginates the suture and the medial one is situated at the periphery; the posterior spiral is weaker and is situated at the shoulder slope. Secondary spirals consisting of fine, uniformly spaced threadlets lie between the primaries and on the base of the last whorl. Body whorl gently undulating.

Type (U. S. Nat. Mus. Cat. No. 370362) measures: Altitude, 20 mm.; greatest diameter, 7 mm.

The new species differs from *T. subannulata* or varieties in having a less slender shell and stronger primary spirals on the early whorls.

Occurrence: Station 3423, lower upper Miocene bed at Jackson Bluff, Leon County, Fla., type and only known locality.

Turritella subannulata ochlockoneënis Mansfield, n. subsp.

Plate 16, figure 3

Shell rather slender, uniformly enlarging, axially wrinkled, spirally sculptured, constricted at the suture, and consists of 11 whorls, nucleus not present. Early whorls strongly carinated, later whorls weakly inflated, being more strongly inclined at the posterior third. Whorls strongly axially undulated, the undulations assuming the nature of broad, rounded ribs separated by broad, rounded-bottomed valleys. Spirals of 4 to 5 narrow, raised bands on the later whorls and threadlets overrunning the whole surface. The medial spiral is weakly elongate-tuberculate and is situated at the periphery of the whorl.

Type (U. S. Nat. Mus. Cat. No. 370363) measures: Altitude, 26 mm.; greatest diameter, 7 mm.

This subspecies differs from *T. subannulata* (typical) and varieties in having a more axially wrinkled sculpture and more strap-like primary spirals.

Occurrence: Station 3423, lower upper Miocene bed at Jackson Bluff, Leon County, Fla., type and only known locality.

Turritella sp.

1916. *Turritella variabilis* Conrad, variety? Mansfield, U. S. Nat. Mus. Proc., vol. 51, p. 601.

A number of small specimens and one whorl of a larger specimen have been obtained from the Miocene at Red Bay, Walton County, Fla. The material at hand does not warrant a specific determination. This undetermined form appears to belong to the group of *Turritella variabilis* Conrad, a species described from the St. Marys formation of Maryland. The young individuals are more slender than other species described in this paper and have lower paired primary spirals.

Family ARCHITECTONICIDAE

Genus ARCHITECTONICA ("Bolten") Roeding, 1798

Architectonica granulata (Lamarck)

Plate 18, figures 1, 2

- 1822. *Solarium granulatum* Lamarck, Animaux sans vertebres, vol. 7, p. 3.
- 1856. *Architectonica prespectiva* Tuomey and Holmes (not Linnaeus). Pleiocene fossils of South Carolina, p. 120, pl. 26, fig. 6.
- 1892. *Solarium granulatum* Lamarck. Dall (part), Wagner Free Inst. Sci. Trans., vol. 3, pt. 2, p. 329.
- 1903. *Solarium granulatum* Lamarck. Dall, idem, pt. 6, p. 1601. (Listed from Duplin formation.)
- 1919. *Architectonica granulata* Lamarck. Gardner and Aldrich, Acad. Nat. Sci. Philadelphia Proc., vol. 71, p. 18. (In list with Mayesville, S. C., fossils.)

Olsson¹ placed *A. gatunense* (Toula) and a form from the Dominican Republic identified as *S. granulatum* Lamarck by Maury as well as his Costa Rica fossil form in synonymy with *A. granulata* (Lamarck). *A. gatunense* (Toula) has a flatter base and smoother, flatter, wider, and more closely-set spiral bands on the last whorl than *A. granulata*. The form from the Gurabo formation in the United States National Museum collection from Santo Domingo compares with Maury's figured specimens from Santo Domingo. This form is very similar to the Gatun species but differs from it in having a little lower shell which is sculptured with finer granules.

¹Olsson, A. A., The Miocene of northern Costa Rica with notes on its general stratigraphic relations, Bull. Am. Paleontology, vol. 9, p. 326, 1922.

Because of these differences I have not placed *A. gatunense* (Toula) in synonymy with *A. granulata*. I see no specific or sub-specific difference between the Recent species and the form from the upper Miocene of Florida and the Carolinas.

Occurrence: Upper Miocene: Station 3421, Harveys Creek, half a mile above abandoned mill (common); station 3423, lower upper Miocene bed, Jackson Bluff, Leon County (1 specimen); station 3672, 1 mile northwest of Hosford, Liberty County (2 specimens); station 1/422, Hamlin Pond, Washington County (1 fragment); station 3417, upper fossiliferous bed, Alum Bluff (1 specimen); borrow pit, near Jackson Bluff, Leon County (common).

Outside occurrence: Duplin marl of the Carolinas. Recent, from Cape Hatteras, on the north, southward through the West Indies; and, on the Pacific side, from Magdalena Bay to Panama.

Architectonica nupera watsonensis Mansfield, n. subsp.

Plate 16, figures 5, 6

Shell small, thin, low-spired, consisting of 4 whorls; specimen not entire. Suture distinct, channeled, running along periphery of last whorl. Earliest three whorls flat, carinated anteriorly by a raised spiral. Body whorl narrowly rounded. Nucleus small, smooth, flatly and loosely coiled. Sculpture on following whorls of 4 nearly equally spaced spirals ornamented by narrow, elongate, and erect axial ridges, which cross the early spire whorls but are broken at the interspaces on later whorls. The third anterior spiral is threadlike, while the others are stronger and consist of narrow bands. Body whorl with 3 prominent, axially nodose spiral lines at the periphery. Between suture and upper peripheral line the area is marked by 3 spirals; the posterior two are banded and the one following is threadlike. Base ornamented with 7 spirals, the upper four of which are weaker and minutely crenulated by axial lines; the anterior three are stronger, banded and strongly nodose. Umbilicus large, scalar, and strongly ornamented with spirals marked similarly to those surrounding the umbilicus. Aperture broken.

The type and only specimen (U. S. Nat. Mus. Cat. No. 370380) measures: Altitude, 4 mm.; greatest diameter, 9 mm.

Type locality: Station 1/962, cut in old road to Watsons Landing, Liberty County.

The new subspecies differs from *Architectonica nupera* (Conrad), a species described from the Yorktown formation of Virginia, in having coarser ornamentation.

Family FOSSARIDAE

Genus FOSSARUS (Adanson) Philippi, 1841

Subgenus ISAPIS H. and A. Adams

Fossarus (Isapis) anomala floridana Mansfield, n. subsp.

Plate 15, figure 6

Shell small, ovate, strongly spirally sculptured, and composed of about 2 whorls, the last whorl comprising nearly all the shell. Suture distinct and shallowly channeled. Initial half-turn large, smooth, with an immersed tip. Following whorl rounded in outline, sculptured with 3 strong, uniformly spaced, equal-sized rounded spirals. Body whorl broadly rounded in outline, weakly depressed in front of the suture, sculptured with 7 strong, nearly uniformly spaced rounded spirals and with rather strong axial threads, or bars, lying mainly in the interspiral spaces. The first spiral lies on the weakly tabulated area in front of the suture, and the following one which is at the upper shoulder, is the strongest spiral on the whorl. Aperture entire, elongate-ovate, margin broken away. Umbilicus of moderate size and marked at its entrance by 2 small spirals.

Type and only specimen (U. S. Nat. Mus. Cat. No. 370381) measures: Altitude, 1.7 mm.; greatest diameter, 1.4 mm.

Occurrence: Station 3421, Harveys Creek, half a mile above abandoned mill, Leon County, Fla.

Dall¹ gives the following occurrences of *Fossarus (Isapis) anomala* (C. B. Adams): "Miocene (or Pliocene?) of North Carolina, Emmons; of the Cape Fear River, at Mrs. Purdy's marl bed, Johnson; Pliocene of the Caloosahatchee beds, Dall and Willcox; Recent in the Antilles (Jamaica), Adams."

I do not find specimens of *F. anomala* from North Carolina in the National Museum collection. The specimen identified and figured as "*Dolium octocostatum*" by Emmons is placed in synonymy with *F. anomala* by Dall². The locality of Emmons's specimen is unknown.

My new subspecies, though small, differs from *F. anomala* in having a smaller and more globose shell and a larger umbilicus.

¹Dall, W. H., Wagner Free Inst. Sci. Trans., vol. 3, pt. 2, p. 322, 1892.

²Dall, W. H., idem.

Family RISSOINIDAE

Genus RISSOINA d'Orbigny, 1840

Subgenus ZEBINA H. and A. Adams, 1854

Rissoina (Zebina) johnsoni Dall

Plate 16, figure 7

1892. *Rissoina johnsoni* Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 2, p. 342, pl. 20, fig. 1.
1919. *Rissoina johnsoni* Dall. Gardner and Aldrich, Acad. Nat. Sci. Philadelphia Proc., vol. 71, p. 18. (Listed from near Mayesville, S. C.)
1921. *Rissoina (Zebina) johnsoni* Dall. Cossmann, Essais de Paleoonchologie comparee, vol. 12, p. 91.

This species, according to Dall¹, is distinguished "by its short, blunt nucleus of a single whorl, its larger size and more conspicuously contracted last whorl, from *R. laevigata* and other smooth species of *Rissoina* so far described."

The type of *Rissoina johnsoni* came from the "Newer Miocene of Cape Fear River, N. C."

Figured specimen, U. S. Nat. Mus. Cat. No. 370387.

Occurrence: Upper Miocene, station 3423, lower bed of upper Miocene at Jackson Bluff, Leon County, Fla. (1 specimen).

Rissoina (Zebina) clarksvillensis Mansfield, n. sp.

Plate 16, figure 8

Shell rather small, solid, smooth, turritid, consisting of 2 nuclear and 6 postnuclear whorls. Nuclear whorls large, constricted by an impressed suture, apical whorl hemispherical, following whorl moderately inflated and in size about double the apical. Early postnuclear whorls nearly straight in outline, later concave with a subsutural spiral, rounded keel. Face of body whorl with a rounded keel at the basal shoulder. Base precipitous. Aperture subovate, acutely angled at posterior end. Inner lip smooth within.

Type (U. S. N. M. Cat. No. 370388) measures: Altitude, 5 mm.; greatest diameter, 2 mm.; length of aperture, 1.7 mm.

Occurrence: Upper Miocene, station 8862, half a mile northeast of Clarksville, Calhoun County, Fla., type and only locality.

Rissoina (Zebina) tersa Mansfield, n. sp.

Plate 16, figure 9

Shell small, smooth, thick, narrowly ovate, consisting of 1½ nuclear and 4 subsequent whorls. Nuclear whorls inflated and separated by an impressed suture; initial half-turn moderately large, following turn much larger. Postnuclear whorls nearly straight in outline. Back

¹Idem, p. 342.

of body whorl weakly depressed between the suture and the forward roundly angled shoulder. Basal slope rather steep. Aperture subovate, posterior end acutely angled. Outer lip without, with a thickened border; within, marked at the upper third with a transverse elongate elevation.

Type (U. S. N. M. Cat. No. 370389) measures: Altitude, 3.2 mm.; greatest diameter, 1.5 mm.; length of aperture, 1.3 mm.

Rissoina laevigata (C. B. Adams) described from a Recent species from Jamaica has a more attenuated upper spire and more numerous, more loosely coiled and smaller nuclear whorls than the new species.

Occurrence: Upper Miocene, station 3421, Harveys Creek, half a mile above abandoned mill, Leon County, Fla., type locality.

Outside occurrence: Duplin marl, Natural Well, N. C.

Subgenus PHOSINELLA Mörch, 1876

Rissoina (Phosinella) *cancellata* Philippi?

A single imperfect specimen consisting of four later whorls, collected at station 3421, Harveys Creek, half a mile above the abandoned mill, Leon County, Fla., closely agrees with *Rissoina cancellata* Philippi, a species described from the Recent fauna of the West Indies, and may prove to be that species when perfect specimens are obtained.

Family RISSOIDAE

Genus RISSOA Fremerville, 1814

Rissoa lipeus floridana Mansfield, n. subsp.

Plate 19, figure 8

The type of *Rissoa lipeus* Dall¹ came from the Pliocene Caloosahatchee marl of Caloosahatchee River, Fla., and is known only by the holotype from this locality. The new subspecies is closely allied to *Rissoa lipeus* but differs from the latter species in having a smaller and plumper shell and in having very fine striae in the intercostal spaces. In other features both appear to agree. *Rissoa* (*Alvania*) *proavia* Pilsbry and Johnson² is similar to the new subspecies, but the former species has a more acuminate summit and stronger sculpture on the penult and body whorls than my form.

Type (U. S. Nat. Mus. Cat. No. 370382) measures: Altitude, 1 mm.; greatest diameter, 0.6 mm.

Occurrence: Station 3421, Harveys Creek, half a mile above abandoned mill, Leon County, type locality; station 1/955, Gully Pond, Washintgon County; station 1/961, near Woods, Liberty County; sta-

¹Dall, W. H., Wagner Free Inst. Sci. Trans., vol. 3, pt. 2, p. 339, pl. 20, fig. 8b, 1892.

²Pilsbry, H. A., and Johnson, C. W., Acad. Nat. Sci. Philadelphia Proc., p. 173, 1917.

tion 1/967, lower upper Miocene bed at Jackson Bluff, Leon County (one immature specimen with more axials than others; may be another subspecies). Rare at all localities.

Family CREPIDULIDAE

Genus CREPIDULA Lamarck, 1799

Crepidula aculeata var. *costata* Morton

1829. *Crepidula costata* Morton, Acad. Nat. Sci. Philadelphia Jour., vol. 6, p. 115, pl. 7, figs. 2, 3.
 1856. *Crypta costata* (Morton). Tuomey and Holmes, Pleiocene fossils of South Carolina, p. 112, pl. 25, fig. 11.
 1892. *Crepidula aculeata*, var. *costata* Morton. Dall (part), Wagner Free Inst. Sci. Trans., vol. 3, pt. 2, p. 357.
 1903. *Crepidula costata* Morton. Dall, idem, pt. 6, p. 1597.
 1919. *Crepidula aculeata*, subsp. *costata* Morton. Gardner and Aldrich, Acad. Nat. Sci. Philadelphia Proc., vol. 71, p. 18.

The shell of *Crepidula aculeata costata* is larger and more finely radially sculptured than the Pliocene and Recent species *Crepidula aculeata* Gmelin.

Morton states that *Crepidula costata* was obtained from St. Marys County, Md., but subsequent collections from Maryland do not verify that this species occurs in Maryland. The type locality probably is somewhere in Virginia.

Occurrence: Station 2210, upper bed at Alum Bluff, Liberty County (rare); station 4993, 1 mile west of Holland post office, Leon County (1 young specimen taken from well); station 8862, 1 mile northeast of Clarksville, Calhoun County (1 young specimen, may be var. *spinosa*); station 3671, Hosford, Liberty County (young specimen, may be var. *spinosa*).

Outside occurrence: Very rare in upper part St. Marys formation, Virginia; Yorktown formation, Virginia. Duplin marl of the Carolinas.

Crepidula aculeata var. *spinosa* Conrad

1843. *Crepidula spinosa* Conrad, Acad. Nat. Sci. Philadelphia Proc., vol. 1, p. 307.
 1856. *Crypta spinosa* (Conrad). Tuomey and Holmes, Pleiocene fossils of South Carolina, p. 111, pl. 25, fig. 10.
 1892. *Crepidula aculeata*, var. *costata* Morton. Dall (part), Wagner Free Inst. Sci. Trans., vol. 3, pt. 2, p. 357.

The type of *Crepidula spinosa* came from James River, near Smithfield, Va. The shell of this variety is elevated, rather narrow, and compressed on the left side. The beak is strongly twisted. The surface is usually ornamented over the middle and right side with strong spines. Some specimens are ornamented only with radial lines and do not possess spines.

Crepidula aculeata, var. *spinosa* and var. *costata* Morton are varietal forms of the same species. The variety *costata* is a flatter form and the surface of the shell is devoid of spines. Variety *costata* also appears to begin a little earlier in time than the variety *spinosa*.

Occurrence: Station 3423, Jackson Bluff, lower upper Miocene bed, Leon County (abundant); station 1/706, Gully Pond, Washington County (1 fragment and identification uncertain); station 8176, the "Deadens," Washington County (common).

Crepidula plana Say

- 1822. *Crepidula plana* Say, Acad. Nat. Sci. Philadelphia Jour., vol. 2, pt. 2, p. 226.
- 1842. *Crepidula protea* d'Orbigny, Mollusks of Cuba, vol. 2, p. 192, pl. 24, figs. 30-33.
- 1845. *Crepidula lamina* H. C. Lea, Am. Philos. Soc. Trans., vol. 9, p. 250, pl. 35, fig. 42.
- 1856. *Crypta plana* (Say). Tuomey and Holmes, Pleiocene fossils of South Carolina, p. 111, pl. 25, fig. 12.
- 1858. *Crepidula plana* Say. Emmons, North Carolina Geol. Survey Rept., p. 276, fig. 195.
- 1864. *Crypta lamina* (H. C. Lea) Conrad. Meek, Check list of the invertebrate fossils of North America, Smithsonian Misc. Coll. (183), p. 16, No. 517.
- 1864. *Crypta plana* Say?, idem, No. 518.
- 1889. *Crepidula protea* d'Orbigny. Dall, Blake gastropods, Harvard College Mus. Comp. Zool. Bull., vol. 18, p. 285.
- 1892. *Crepidula plana* Say. Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 2, p. 358.
- 1903. *Crepidula plana* Say. Dall, idem, pt. 6, pp. 1597, 1601.
- 1919. *Crepidula plana* Say. Gardner and Aldrich, Acad. Nat. Sci. Philadelphia Proc., vol. 71, p. 18.

Occurrence: Upper Miocene, station 1/962, cut in old road to Watsons Landing, Liberty County (rare); station 1/960, Darlings Slide, Chipola River, Calhoun County (very young specimen); station 3671, Hosford, Liberty County (quite rare); station 3421, Harveys Creek, half-mile above abandoned mill, Leon County (quite common); station 3423, Jackson Bluff, lower upper Miocene bed, Leon County (1 specimen). Reported by Dall¹ from upper bed at Alum Bluff but not found in the collections.

This species appears to range in time from the lower Miocene into the Recent.

Crepidula fornicata (Linné) and varieties

This species shows great variability, as is the case in perching mollusks. Dall² has given a synonymy of *Crepidula fornicata*, uniting under this name a number of names later proposed by other authors

¹Dall, W. H., Wagner Free Inst. Sci. Trans., vol. 3, pt. 6, p. 1597, 1903.

²Dall, W. H., Wagner Free Inst. Sci. Trans., vol. 3, pt. 2, p. 356, 1892.

for supposed new species. Dall also points out how the shell of this species assumes different shapes, in accordance with the character of the object upon which it perches.

In literature these different forms have been assigned names, and in the following discussion of the forms in Florida Miocene I have employed these as varietal names of *Crepidula fornicata*.

Crepidula fornicata var. *ponderosa* H. C. Lea

1845. *Crepidula ponderosa* H. C. Lea, Am. Philos. Soc. Trans., vol. 9, pt. 2, p. 249, pl. 35, fig. 40.

This variety assumes a subglobose form and usually is weakly laterally compressed. The beak is laterally bent and reclines upon the body of the shell.

There are a number of specimens from station 3423, Jackson Bluff, lower upper Miocene bed, Leon County, Fla., that appear to belong to *Crepidula fornicata*, var. *ponderosa* H. C. Lea, a form described from the Tertiary of Petersburg, Va.

The same form occurs in the Miocene Duplin marl of the Carolinas, in the Pliocene Waccamaw marl of South Carolina, in the Pliocene Caloosahatchee marl of Florida and, in the Recent fauna of the east coast.

Crepidula fornicata cymbaeformis Conrad

1845. *Crepidula cymbaeformis* Conrad, Acad. Nat. Sci. Philadelphia Proc., vol. 2, p. 173.
1861. *Crypta cymbaeformis* (Conrad). Conrad, Fossils Medial Tert., p. 81, pl. 45, fig. 7.

One specimen collected at station 1/962, cut in old road to Watsons Landing, Liberty County, Fla., appears to be closely allied to *Crepidula fornicata*, var. *cymbaeformis* Conrad, a form described from the Miocene at Petersburg, Va. The specimen figured by Conrad has a much thicker area below the beak than the Florida form but in other features appears to agree.

A form very closely allied to the Florida form occurs in the Yorktown formation of Virginia, the Duplin marl of the Carolinas, and the Pliocene of the Carolinas and Florida.

Crepidula fornicata rostrata Conrad

1870. *Crepidula rostrata* Conrad, Am. Jour. Conch., vol. 6, p. 77.

This form is oval in outline, has a nearly smooth surface and rather strong and slightly protruding beak.

Occurrence: Station 2210, upper bed at Alum Bluff, Liberty County (rare).

Outside occurrence: Yorktown formation of Virginia; Duplin marl of the Carolinas.

Crepidula aesop Dall (? *Crepidula fornicata* var. *rostrata* Conrad)

1903. *Crepidula aesop* Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 6, p. 1610, pl. 55, figs. 6, 7.

Crepidula aesop does not appear to have been described by Dall. This form is very closely allied to *Crepidula fornicata*, var. *rostrata* Conrad, and may be a varietal form of *C. fornicata*. Dall figured a young specimen for his type. A much larger specimen from Shell Creek—type locality—is in the United States National Museum collection.

Following is a brief description of this form:

Shell high, rather narrow, laterally compressed. Beak prominent, laterally compressed, weakly carinate, protruding. Apex with about one coil, widely spaced from margin of the shell. Surface rather rough and medially weakly lirate. This form differs from *Crepidula fornicata*, var. *rostrata* in having a more laterally compressed shell, a more elevated beak, and a rougher surface.

Type locality, Shell Creek, Fla.

Other occurrence: Upper Miocene, station 3421, Harveys Creek, half-mile above abandoned mill (common); station 3422, Jackson Bluff, uppermost bed (common); station 3671, Hosford, Liberty County (common); station 3672, 1 mile northwest of Hosford (1 young specimen); station 1/422, Hamlin Pond, Washington County (1 fragment, identification uncertain); station 8176, the "Deadens" Washington County (common).

Family CALYPTRAEIDAE

Genus CRUCIBULUM Schumacher, 1817

Section CRUCIBULUM s. s.

Crucibulum auriculum (Gmelin)

1792. *Patella auricula* Gmelin, Syst. Nat., p. 3694.

1892. *Crucibulum auricula* (Gmelin). Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 2, p. 349.

This species is usually rather depressed, and is ornamented on the upper surface with rather fine radiating, often divided, lines. The fossil form usually has finer radiating lines than the living, but in other features both are identical.

Occurrence: Station 3671, Hosford, Leon County (rare); station 3672, 1 mile northwest of Hosford (rare); 1/706, Gully Pond, Washington County (1 fragment, identification uncertain); borrow pit, Leon County (1 specimen).

Outside occurrence: Pliocene, South Carolina and Florida. Living on west coast of Florida and southward to northern Brazil in 25 to 100 fathoms.

Crucibulum auriculum imbricatum Sowerby

1824. *Calyptra imbricata* Sowerby, Genera, XXIII, fig. 5.
 1842. *Disputaea ramosa* Conrad, Acad. Nat. Sci. Philadelphia Jour., vol. 8, pt. 2, p. 187.
 1845. *Disputaea ramosa* Conrad. Conrad, Foss. Medial Tert., p. 79, pl. 45, fig. 3.
 1856. *Crucibulum ramosa* (Conrad). Tuomey and Holmes, Pleiocene fossils of South Carolina, p. 108, pl. 25, fig. 5.
 1892. *Crucibulum auricula* var. *imbricatum* Sowerby. Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 2, p. 349.
 1919. *Crucibulum auriculum* subsp. *imbricatum* (Sowerby). Gardner and Aldrich, Acad. Nat. Sci. Philadelphia Proc., vol. 71, p. 18.

This species is characterized by its radiating threads over the ribs, which are very prominent on the fossil form.

Occurrence: Upper Miocene: Station 3417, Upper bed at Alum Bluff, Liberty County (1 specimen); station 3423, lower upper Miocene bed, Jackson Bluff, Leon County (4 specimens); station 3421, Harveys Creek, half a mile above abandoned mill, Leon County (abundant); borrow pit, Leon County (rare).

Outside occurrence: Yorktown formation, Virginia, not known lower than fragmental series. Duplin marl of the Carolinas. Pliocene Caloosahatchee marl of Florida, radiating threads on the ribs very obscure. Living on the west coast from Cerros Island, Lower California to Peru.

Section DISPOTAEA (Say) Conrad

Crucibulum constrictum (Conrad)

1842. *Disputaea constricta* Conrad, Nat. Inst. Promotion Sci. Proc., Bull. 2, p. 194, pl. 1, fig. 2.
 1845. *Disputaea constricta* Conrad. Conrad, Fossils Medial Tert., p. 80, pl. 45, fig. 4.
 1864. *Crucibulum constrictum* (Conrad). Meek, Check list Invertebrate fossils North America, Smithsonian Misc. Coll. (183), p. 15, No. 499.
 1892. *Crucibulum constrictum* Conrad. Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 2, p. 350.
 1904. *Crucibulum costatum* Martin (not Say), Maryland Geol. Survey, Miocene, p. 244, pl. 58, figs. 7a, 7b.
 1904. *Crucibulum constrictum* Conrad. Martin, idem, p. 246, pl. 58, fig. 11.
 1919. *Crucibulum constrictum* Conrad. Gardner and Aldrich, Acad. Nat. Sci. Philadelphia Proc., vol. 71, p. 18.

This species has rather coarse radiating ribs, especially prominent on the upper part of the shell. About half of the margin of the internal cup adheres to the wall.

Occurrence: Upper bed at Alum Bluff, Liberty County (rare); station 4993, 1 mile west of Holland post office, Leon County (1 specimen from well); station 1/962, cut in old road to Watsons Landing, Liberty County (1 immature specimen); ? station 7162, Red Bay, Walton County.

This species appears to range in age throughout the Chesapeake group.

Crucibulum multilineatum (Conrad)

- 1841. *Disputaea multilineata* Conrad, Am. Jour. Sci., vol. 41, p. 346, pl. 2, fig. 8.
- 1845. *Disputaea multilineata* Conrad. Conrad, Fossils Medial Tert., p. 80.
- 1856. *Crucibulum multilineata* Conrad. Tuomey and Holmes, Pleiocene Fossils South Carolina, p. 107, pl. 25, fig. 7.
- 1892. *Crucibulum multilineatum* Conrad. Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 2, p. 351.
- 1903. *Crucibulum multilineatum* Conrad. Dall, Idem, pt. 6, p. 1601.
- 1919. *Crucibulum multilineatum* Conrad. Gardner and Aldrich, Acad. Nat. Sci. Philadelphia Proc., vol. 71, p. 18.

This species is small in size and sculptured with rather fine radiating lines and spines. One side of the free portion of the internal cup is bent inward.

Occurrence: Station 3421, Harveys Creek, half a mile above abandoned mill, Leon County (abundant); station 1/422, Hamlin Pond, Washington County (rare); station 1/955, Gully Pond, Washington County (rare); station 3422, Jackson Bluff, upper bed, Leon County (rare); station 3671, Hosford, Liberty County (rare).

Outside occurrence: Duplin marl of the Carolinas. This species appears to be confined to the upper Miocene. The form identified as this species by Martin¹ from the Choptank formation of Maryland appears to be wrongly identified.

Genus CALYPTRAEA Lamarck, 1799

Calyptraea centralis (Conrad)

- 1841. *Infundibulum centralis* Conrad, Am. Jour. Sci., 1st ser. vol. 41, p. 348.
- 1845. *Infundibulum centralis* Conrad. Conrad, Fossils of the Medial Tertiary of the United States, p. 80, pl. 45, fig. 5.
- 1845. *Calyptraea (Infundibulum) concentricum* H. C. Lea, Am. Philos. Soc. Trans., vol. 9, p. 249, pl. 35, fig. 39.
- 1856. *Trochita centralis* (Conrad). Tuomey and Holmes, Pleiocene fossils of South Carolina, p. 109, pl. 25, fig. 8.
- 1858. *Trochita centralis* (Conrad). Emmons, North Carolina Geol. Survey Rept., p. 276, fig. 193.
- 1863. *Trochita (Infundibulum) concentrica* H. C. Lea. Conrad, Acad. Nat. Sci. Philadelphia Proc. for 1862, vol. 14, p. 568.
- 1863. *Trochita (Infundibulum) centralis* (Conrad). Conrad, idem.

¹Maryland Geol. Survey, Miocene, p. 246, pl. 58, figs. 12a, 12b, 1904.

1864. *Trochita centralis* (Conrad). Meek, Check list of the invertebrate fossils of North America, Smithsonian Misc. Coll. (183), p. 15, No. 505.
1864. *Trochita concentrica* (H. C. Lea) Conrad. Meek, idem, No. 507.
1892. *Calyptraea centralis* (Conrad). Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 2, p. 353.
1903. *Calyptraea centralis* Conrad. Dall, idem, pt. 6, p. 1601.
1904. *Calyptraea centralis* (Conrad). Martin, Maryland Geol. Survey, Miocene, p. 248, pl. 59, figs. 2a, 2b, 2c.
1919. *Calyptraea centralis* Conrad. Gardner and Aldrich, Acad. Nat. Sci. Philadelphia Proc., vol. 71, p. 18.

The type of this species came from the Natural Well, Duplin County, N. C. The species is characterized by a sort of umbilicus on the pillar and the arching forward of the free edge of the septum. The exterior is slightly roughened by concentric growth lines.

Occurrence: Upper Miocene: Station 3671, Hosford, Liberty County; station 3672, 1 mile northwest of Hosford; station 1/955, Gully Pond, Washington County; station 1/953, 1 mile below Econfinia bridge, Bay County; stations 3423, 3422, Jackson Bluff, upper and lower upper Miocene beds, Leon County; station 3421, Harveys Creek, half mile above abandoned mill, Leon County. Rare at all localities.

Outside occurrence: Fossil in the lower Miocene of the Alum Bluff group; St. Marys formation, Maryland; Duplin marl of the Carolinas; Pliocene Caloosahatchee marl of Florida; Pleistocene at Simmons Bluff, S. C., and living on the coast of the United States from Cape Hatteras southward, and in the Antilles.

Family XENOPHORIDAE

Genus XENOPHORA Fischer de Waldheim, 1807

Xenophora delecta floridana Mansfield, n. subsp.

Plate 18, figures 5, 6

The new subspecies is more closely related to *Xenophora delecta* (Guppy) than to *Xenophora conchyliophora* (Born). It differs from *X. delecta* (Guppy) in having a proportionately higher shell and a less granulose ornamentation on the base. The shell is more profusely loaded with shells and other objects than *X. delecta* and reveals far less protractive undulating or wrinkled lines. The new subspecies differs from *X. conchyliophora* in having a larger umbilicus and stronger, more persistent concentric weakly beaded spiral on the base.

The new subspecies attains a rather large size. The largest and most nearly perfect shell is about 40 mm. high and 50 mm. in diameter. The umbilicus is rather large and is partly concealed by the expanded margin of the inner lip.

Type (U. S. N. M. Cat. No. 370438) measures: Altitude, 30 mm.; greatest diameter, 38 mm.

Occurrence: Harveys Creek, half a mile above abandoned mill, Leon County, Fla. (common), type locality (collections by T. W. Vaughan, the Florida Geological Survey, and W. C. Mansfield); borrow pit, near Jackson Bluff, Leon County (1 immature specimen, collected by the Florida Geological Survey).

Family HYDROBIIDAE

Genus AMNICOLA Gould and Haldeman, 1841

Amnicola aff. *A. floridana* var. *convexa* Pilsbry

Five small specimens, perhaps representing two species, from station 3421, Harveys Creek, half a mile above abandoned mill, Leon County, Fla., are probably related to *Amnicola floridana*, var. *convexa* Pilsbry, a variety reported by Dall¹ as occurring in the Pliocene of Florida and in the Recent fauna.

Family NATICIDAE

Genus NATICA Scopoli, 1777

Natica canrena (Linnaeus) Mörch

Plate 19, figure 2

- 1758. *Nerita canrena* Linnaeus, *Systema naturae*, 10th ed., p. 776.
- 1841. *Natica canrena*. Conrad, *Am. Jour. Sci.*, 1st ser., vol. 41, p. 344.
- 1863. *Natica plicatella* Conrad, *Acad. Nat. Sci. Philadelphia Proc.* for 1862, p. 564.
- 1867. *Natica plicatella* Conrad. Conrad, *Am. Jour. conchology*, vol. 3, p. 259, pl. 24, fig. 3.
- 1873. *Natica canrena* Linnaeus. Gabb, *Am. Philos. Soc. Trans.*, vol. 15, p. 223.
- 1876. *Natica canrena* Linnaeus. Guppy, *Geol. Soc. London Quart. Jour.*, vol. 32, p. 518.
- 1892. *Natica canrena* (Linnaeus) Mörch. Dall, *Wagner Free Inst. Sci. Trans.*, vol. 3, pt. 2, p. 364 (in part).
- 1895. *Natica canrena* Lam. Harris, *Bull. Am. Paleontology*, vol. 1, p. 106.
- 1913. *Natica canrena* (Linnaeus). Brown and Pilsbry, *Acad. Nat. Sci. Philadelphia Proc.* for 1912, vol. 64, p. 508.
- 1917. *Natica canrena* (Linnaeus) Mörch. Maury, *Bull. Am. Paleontology*, vol. 5, p. 298, pl. 49, fig. 10.
- 1919. *Natica canrena* Linnaeus. Gardner and Aldrich, *Acad. Nat. Sci. Philadelphia Proc.*, vol. 71, p. 18.
- 1922. *Natica canrena* (Linnaeus). Pilsbry, *Acad. Nat. Sci. Philadelphia Proc.* for 1921, p. 386.
- 1922. *Natica canrena* Linnaeus. Olsson, *Bull. Am. Paleontology*, vol. 9, p. 327, pl. 16, fig. 9.
- 1925. *Natica canrena* (Linnaeus) Mörch. Maury, *Bull. Am. Paleontology*, vol. 10, No. 42, p. 238, pl. 40, fig. 8.

¹Dall, W. H., *Wagner Free Inst. Sci. Trans.*, vol. 3, pt. 2, p. 338, 1892.

1925. *Natica canrena* (Linnaeus). Mansfield, U. S. Nat. Mus. Proc., vol. 66, art. 22, p. 57.

Dall¹ retained *plicatella* as a varietal name to cover the older Miocene form, in which the operculum differs slightly from that of the newer Miocene and later time. As the type locality of *Natica plicatella* Conrad is at the Natural Well, North Carolina, this name should not be used to designate the older Miocene form. The older Miocene form probably represents a subspecies of the upper Miocene and later form. Unless the opercula of the allied forms are known their separation is very difficult, if not impossible. Some of the references in the above synonymy may include subspecies.

Occurrence: Upper Miocene: Station 3421, Harveys Creek, half a mile above abandoned mill, Leon County (common); station 1/964, Harveys Creek, highest bed at abandoned mill (1 specimen); station 3422, Jackson Bluff, Leon County, uppermost bed (1 specimen); station 3671, Hosford, Liberty County (2 specimens and 1 operculum).

Outside occurrence: Specimens that compare more closely with the Recent species occur in the Miocene Duplin marl of the Carolinas, in the Pliocene Waccamaw marl of the Carolinas, and in the Pliocene Caloosahatchee marl of Florida.

Genus TECTONATICA Sacco, 1890

Tectonatica pusilla (Say)

Plate 19, figure 4

1822. [*Natica*] *pusilla* Say, Jour. Acad. Nat. Sci. Philadelphia, vol. 2, p. 257.
 1889. *Natica pusilla* Say. Dall, U. S. Nat. Mus. Bull. 37, p. 154, pl. 50, fig. 21.
 1892. *Natica* (*Cryptonatica*) *pusilla* Say. Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 2, p. 367.
 1919. *Natica pusilla* Say. Gardner and Aldrich, Acad. Nat. Sci. Philadelphia Proc., vol. 71, p. 18.
 1927. *Natica* (*Cryptonatica*) *pusilla* Say. Dall, U. S. Nat. Mus. Proc., vol. 70, art. 18, p. 119.
 1928. *Tectonatica pusilla* (Say). Woodring, Carnegie Inst. Washington Pub. No. 385, p. 384, pl. 30, fig. 12.

The shell of this species never attains a large size. The spire is usually low and the umbilicus is concealed by callus.

Occurrence: Upper Miocene: Station 3671, Hosford, Liberty County (rare); 1/422, Hamlin Pond, Washington County (rare); station 1/955, Gully Pond, Washington County (rare); station 1/953, 1 mile below Econfina bridge, Bay County (rare); station 3423, lower

¹Dall, W. H., Wagner Free Inst. Sci. Trans., vol. 3, pt. 2, p. 364, 1892.

upper Miocene bed at Jackson Bluff, Leon County (rare); station 3422, uppermost bed at Jackson Bluff; station 3421, Harveys Creek, half a mile above abandoned mill, Leon County (abundant).

Outside occurrence: Miocene: Duplin marl of the Carolinas; Bowden marl, Jamaica; Cercado and Gurabo formations of Dominican Republic. Pliocene Caloosahatchee marl of Florida. Pleistocene of Simmons Bluff, S. C. Living on the east coast from Cape Cod to Bahia, Brazil.

Genus *POLINICES* Montford, 1810

New subgenus *DALLITESTA* Mansfield

Polinices (*Dallitesta*) *coënsis* (Dall)

Plate 17, figure 8

1903. *Neverita coënsis* Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 6, p. 1597 (in list), pl. 60, fig. 19.

1929. *Polinices coënsis* Dall. Cooke and Mossom, Florida Geol. Survey Twentieth Ann. Rept., pl. 16, fig. 8.

This species does not appear to have been described.

The following is a description of this species:

Shell rather large, moderately solid, and high-spined. Nucleus smooth, broadly coiled, and consists of about two whorls. Following whorls weakly depressed below appressed suture. Body whorl large and rounded in outline. Surface of shell ornamented with faint spiral threads, resembling those on the genus *Sinum*. Aperture nearly semi-circular in outline, the anterior part more broadly rounded than the posterior. Pillar marked with coarse oblique wrinkles and terminally provided with a carinate and inflexed callus, which is continuous with the parietal callus. Parietal callus moderately heavy and shallowly channeled near its lower margin. Umbilicus not large.

Type (U. S. Nat. Mus. Cat. No. 109269) measures: Altitude, 25 mm.; greatest diameter, 20 mm.

Dall¹ gives 34 mm. as the altitude of this species; but in the National Museum collection a specimen marked "figured type" has an altitude of 25 mm. A much larger specimen of this species, from Harveys Creek, measures, altitude, 45 mm.; diameter, 37 mm.

The most closely allied fossil species appears to be *Polinices stanislas-meunieri* Maury, a species originally reported from Rio Cana, Cerro Gordo to Mao road (Guayubin to Mao telephone line), Dominican Republic. Maury reports² her species from the upper Miocene at Springvale, Trinidad, British West Indies. Olsson reports³ this species

¹Op. cit., p. 1633.

²Maury, C. J., Bull. Am. Paleontology, vol. 10, p. 392, pl. 51, fig. 7, 1925.

³Olsson, A. A., Bull. Am. Paleontology, vol. 9, p. 329, pl. 16, fig. 7, 1922.

from Hill 1a, 2, and 3, Banana River, Costa Rica. *Polinices coënsis* Dall has, however, a higher spire than *P. stanislas-meunieri*.

The nearest Recent species appears to be an unnamed form in the National collection from the Bahamas.

Polinices coënsis (Dall) is the type of the new subgenus *Dallitesta*.

Occurrence: Upper Miocene: Station 3671, Hosford (formerly Coe's Mill), Liberty County, type locality (abundant); station 3672, 1 mile northwest of Hosford (common); station 3421, Harveys Creek, half a mile above abandoned mill, Leon County (abundant); station 3422, uppermost bed at Jackson Bluff, Leon County (1 specimen).

Subgenus EUSPIRA Agassiz

Polinices (Euspira) *internus* (Say)

Plate 19, figure 6

1824. *Natica interna* Say, Acad. Nat. Sci. Philadelphia Jour., 1st ser., vol. 4, p. 125, pl. 7, fig. 2.

I make no attempt, at present, to include a full synonymy of this species. The type locality, according to Say, is Maryland, but it may be Virginia or one of the Carolinas.

Dall¹ believed that *Polinices internus* and *Polinices heros* (Say) represent distinct species, but Martin² found it impossible to separate the specimens from Maryland and united *Polinices heros* and *Polinices internus* under *P. heros*.

Judging from Say's description and illustration of *Polinices internus*, this species appears to have a more turritid spire and more quadrate body whorl than *Polinices heros*. The umbilicus in a well-preserved shell possesses an ascending sulcus and an obscure rib. For this reason I have referred the specimens indicating the above characters to *P. internus*.

All the specimens I have seen from the Miocene Chesapeake group of Maryland and some specimens from the Miocene of Virginia appear to be more closely related to *Polinices heros*, a species that extends in the living fauna from Nova Scotia to North Carolina.

Occurrence: Upper bed at Alum Bluff, Liberty County.

Outside occurrence: Specimens that agree with the Florida specimens occur in the Yorktown formation of Virginia, the Duplin marl of the Carolinas, and the Pliocene at Tillys Lake, South Carolina.

¹Dall, W. H., Wagner Free Inst. Sci. Trans., vol. 3, pt. 2, pp. 372, 373, 1892.

²Martin, G. C., Maryland Geol. Survey, Miocene, pp. 253, 254, 1904.

Subgenus NEVERITA Risso

Polinices (Neverita) duplicatus (Say)

Plate 19, figure 3

1822. *Natica duplicata* Say, Acad. Nat. Sci. Philadelphia Jour., vol. 2, pt. 2, p. 247.
 1830. *Natica duplicata* Say. Conrad, Acad. Nat. Sci. Philadelphia Jour., vol. 6, p. 211.
 1841. *Natica percallosa* Conrad, Am. Jour. Sci., 1st ser., vol. 41, p. 348.
 1842. *Natica duplicata* Say. Conrad, Nat. Inst. Promotion of Sci. Proc., Bull. 2, pp. 185, 186.
 1858. *Natica duplicata* Say. Emmons, North Carolina Geol. Survey Rept., p. 266, fig. 150.
 1858. *Natica*, Emmons, idem, p. 266, fig. 151.
 1864. *Neverita duplicata* Say?. Meek, Check list of the invertebrate fossils of North America, Miocene: Smithsonian Misc. Coll., vol. 7, No. 183, p. 19, No. 623.
 1864. *Neverita percallosa* Conrad. Meek, idem, No. 624.
 1867. *Neverita emmonsii* Conrad, Am. Jour. Conchology, vol. 3, p. 259, pl. 24, fig. 2.
 1867. *Neverita densata* Conrad, idem, p. 266, pl. 24, fig. 5.
 1868. *Neverita percallosa* (Conrad). Conrad, Am. Jour. Conchology, vol. 4, p. 66, pl. 6, fig. 6.
 1892. *Polynices (Neverita) duplicatus* (Say). Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 2, p. 368.
 1904. *Polynices (Neverita) duplicatus* (Say). Martin, Maryland Geol. Survey, Miocene, p. 252, pl. 60, fig. 1.
 1919. *Polynices (Neverita) duplicatus* Say. Gardner and Aldrich, Acad. Nat. Sci. Philadelphia Proc., vol. 71, p. 18.

This species, according to Dall¹, is a variable shell, which accounts in part for the numerous synonyms.

Occurrence: Upper Miocene: Station 2210, upper fossiliferous bed at Alum Bluff, Liberty County (rare); station 3671, Hosford, Liberty County (1 specimen); 3672, 1 mile northwest of Hosford (2 specimens); station 1/953, 1 mile below Econfinia bridge, Bay County (1 specimen); station 3422, uppermost bed at Jackson Bluff, Leon County (2 specimens); station 3421, half a mile above abandoned mill, Leon County (rare).

Outside occurrence: This species ranges throughout the Chesapeake group, passes into the Pliocene and Pleistocene, and extends in the living state from New England to Barbados.

¹Dall, W. H., Wagner Free Inst. Sci. Trans., vol. 3, pt. 2, p. 369, 1892.

Subgenus MAMMILLARIA Swainson, 1840

Polinices (*Mammillaria*?) *caroliniana* (Conrad)

Plate 19, figure 1

1841. *Natica caroliniana* Conrad, Am. Jour. Sci., 1st ser., vol. 41, p. 347, pl. 2, fig. 18.

1868. *Natica caroliniana* Conrad. Conrad, Am. Jour. Conchology, vol. 4, p. 65, pl. 6, fig. 3.

The type locality of "*Natica caroliniana*" is Natural Well, N. C.

Following is Conrad's original description of the species:

"Obliquely suboval, with obsolete spiral lines; umbilicus large, with a central rounded prominent thick carina; apex prominent." Conrad, 1841.

The shell of this species is rather solid and subovate in outline. The suture is closely and well appressed. The umbilicus is large and provided with a strong central spiral rib.

Dall¹ placed "*Natica caroliniana*" in synonymy with "*Natica perspectiva*" Rogers. As the figured specimen² of "*Natica perspectiva*" as well as specimens obtained from Virginia by subsequent collectors and referred to this species do not exactly agree with the form under Conrad's name, I retain *Polinices* (*Mammillaria*?) *caroliniana* for the Carolinian form.

Polinices caroliniana belongs to the same group as *Polinices brunnea* Link, but it has a much stronger spiral rib than the Recent species.

Occurrence: Borrow pit, near Jackson Bluff, Leon County. Two specimens collected by the Florida Geological Survey.

Outside occurrence: Natural Well, N. C.

Order ASPIDOBANCHIA

Superfamily RHIPIDOGLOSSA

Family TURBINIDAE

Genus TURBO Linnaeus, 1758

Turbo castaneus var. *crenulatus* Gmelin

Plate 19, figure 5

1792. *Turbo crenulatus* Gmelin, Systema naturae, p. 3595.

1892. *Turbo castaneus* var. *crenulatus* Gmelin. Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 2, p. 382.

Turbo castaneus Gmelin and the variety *crenulatus* are reported by Dall³ to range in time from the Pliocene into the Recent.

¹Dall, W. H., Wagner Free Inst. Sci. Trans., vol. 3, pt. 2, p. 373, 1892.

²Am. Philos. Soc. Trans., vol. 6, pl. 26, fig. 3, 1839.

³Idem.

Turbo castaneus occurs in the Recent fauna from southwest of Cape Hatteras to Haiti and in the Gulf of Mexico, but it is more common and abundant in the waters off the southeast shore of Florida and southward. According to Dall¹ this species ranges in depth from 25 to 295 fathoms. The latter number is probably a mistake and should be 95. Two temperature records with the specimens in the National Museum collection give 66° and 77°, Fahrenheit.

Turbo castaneus var. *crenulatus* is a shallower water form than *T. castaneus* and ranges in depth² from 2 to 30 fathoms. Although this variety has been collected southwest of Cape Hatteras, it is much more common on the southeast coast of Florida and southward. Three temperature records with the specimens in the United States National Museum give 53.5°, 75°, and 79°, Fahrenheit.

The Miocene specimens indicate slightly weaker beaded spirals below the suture than those of the Pliocene and Recent faunas; but this feature appears hardly to warrant a varietal separation.

The occurrence of this variety at this horizon in the upper part of the Miocene indicates that it lived in comparatively warm water and near shore line.

Occurrence: Harveys Creek, half a mile above abandoned mill, Leon County (4 specimens); borrow pit, near Jackson Bluff, Leon County (2 specimens). Collected at both localities by the Florida Geological Survey.

Family LIOTIIDAE

Genus MOLLERIA Jeffreys, 1865

Molleria duplinensis parva Mansfield, n. subsp.

Plate 19, figure 9

Shell minute, turbinate, delicate, low-spined, with $3\frac{1}{2}$ whorls in all. Suture weakly channeled. Apical turn almost flatly coiled, following whorls rounded in outline and slightly depressed in front of the suture. Sculpture of feeble axial incised lines which are stronger on the base. Umbilical rib weak. Umbilicus sculptured with spiral threads. Aperture subcircular, internally with a well-marked opercular shelf.

Type (U. S. Nat. Mus. Cat. No. 370476) measures: Altitude, 0.8 mm.; greatest diameter, 0.8 mm.

The type of *Molleria duplinensis* Dall came from the Natural Well, Duplin County, N. C. The surface of the type of this species is worn and does not clearly reveal the true character of the sculpture. Be-

¹Dall, W. H., U. S. Nat. Mus. Bull. 37, p. 158, 1889.

²Dall, op. cit.

cause of the condition of preservation, the identity of perfect specimens from outside localities with Dall's species is somewhat uncertain. However, the new subspecies appears to differ from *Molleria duplinensis* in having a much smaller shell, a weaker umbilical rib, and stronger axial sculpture.

Occurrence: Upper Miocene: Station 3421, Harveys Creek, half a mile above abandoned mill, Leon County, type locality (rare); station 1/961, near Woods, Liberty County (rare); station 1/953, 1 mile below Econfinia bridge, Bay County (rare); station 1/955, Gully Pond, Washington County (rare).

Family TROCHIDAE

Genus CALLIOSTOMA Swainson, 1840

Calliostoma aluminium Dall

Plate 19, figures 11, 12

1892. *Calliostoma (virginicum* var.?) *aluminium* Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 2, p. 396.

1903. *Calliostoma aluminium* Dall, idem, pt. 6, p. 1597 (in list from upper bed at Alum Bluff, Fla.).

Dall questioningly identified this form as a variety of *C. virginicum* (Conrad). He had only one specimen—the holotype. I have before me two specimens, aside from the holotype, from the upper bed at Alum Bluff, the type locality, and one specimen from Darlings Slide, on Chipola River, that bear characters sufficiently different from the Virginia species to unquestioningly raise *aluminium* to full specific rank. *C. aluminium* differs from *C. virginicum* in having the peripheral keel beaded or strongly rippled, and the flattish basal spirals intercalated by fine spirals. The Floridian and Virginian species are related and probably represent about the same geologic horizon. *C. virginicum* occurs just below the comminuted series in the Yorktown formation, Virginia. A form closely allied to *C. aluminium* occurs in the Duplin marl, near Mayesville and at Darlington, S. C.

Calliostoma philanthropus pontoni Mansfield, n. subsp.

Plate 19, figures 7, 10

Shell of medium size, rather solid, consisting of about 7 whorls (early whorls corroded). Suture is weakly appressed and falls below the periphery of the whorl. Spiral sculpture, between the suture and periphery, of 4 weakly beaded primary lines and usually 1 fine secondary thread intercalating the primaries. A nearly smooth narrow band is at the periphery and a similar but narrower band lies in front of the periphery and behind the suture. Base ornamented with 12 nearly flat low bands separated by about equal interspaces. The

two bands lying in the umbilical region are very weakly crenulated by growth lines; the other spirals are smooth.

Type (U. S. N. M. Cat. No. 370482) measures: Altitude, 17 mm.; greatest diameter, 17 mm.

The new subspecies differs from *Calliostoma philanthropus* (Conrad), the type of which came from James River, Va., in having less depressed whorls, and a less expanding body whorl.

Calliostoma willcoxianum Dall, the type of which is from the Pliocene of Florida, is nearly related to the new subspecies, but the former has much stronger and more rounded spirals on the base. *C. willcoxianum* probably does not occur in the Miocene.

The subspecies is named in honor of Mr. Gerald M. Ponton, Assistant State Geologist of Florida.

Occurrence: Harveys Creek, half a mile above abandoned mill, Leon County, type locality (rare), collected by the Florida Geological Survey; station 3671, Hosford, Liberty County (2 juvenile specimens and identification uncertain).

Genus SOLARIELLA S. Wood, 1842

Solariella vaghani Mansfield, n. sp.

Plate 18, figures 3, 4

Shell of medium size, subscalar in outline, with a moderately elevated spire, consisting in all of $5\frac{1}{2}$ whorls. Suture very weakly channeled, not appressed. Earliest $1\frac{1}{2}$ whorls slightly corroded, rounded in outline, apparently smooth. Following whorls tabulated in front of suture. Sculpture of two nodulous or elongate beaded spirals; the posterior one, which is a little stronger, occupies the upper shoulder; the anterior one lies midway between the upper spiral and lower suture. Retractive incremental axials ornament the upper part of the whorls. Base narrowly rounded and ornamented with 4 nearly flat bands, which increase in width toward the umbilicus. Umbilical carina prominent and strongly annulated. Aperture subcircular in outline, inner lip thin and closely adhering to shell. Umbilicus large, deep, and scalariform.

Type (U. S. Nat. Mus. Cat. No. 370484) measures: Altitude, 10 mm.; greatest diameter, 10.5 mm.

The new species is related to *Solariella major* (Gardner and Aldrich), a species described from the Muldrow Place, 5 miles southeast of Mayesville, Sumter County, S. C. It differs from the Mayesville species in lacking the medial spiral line and in having fewer and stronger nodules on the spiral bands.

Occurrence: The type and only specimen is from station 3423, the lower upper Miocene bed at Jackson Bluff, Leon County, Fla. It was collected by Dr. T. W. Vaughan.

Genus *TEGULA* Lesson, 1834

Subgenus *OMPHALIUS* Philippi

Tegula (Omphalius) exoleta (Conrad)

Plate 17, figures 9a, 9b

- 1843. *Monodonta exoluta* (sic) Conrad, Acad. Nat. Sci. Philadelphia Proc., vol. 1, p. 309 (typogr. error for *exoleta*).
- 1856. (?) *Monodonta kiaawahensis* Tuomey and Holmes, Pleiocene fossils of South Carolina, p. 116, pl. 26, fig. 1.
- 1863. *Monilia (Monodonta) exoluta* Conrad, Acad. Nat. Sci. Philadelphia Proc. for 1862, p. 569.
- 1887. *Turbo heliciformis* Heilprin, Wagner Free Inst. Sci. Trans., vol. 1, p. 113, pl. 16, fig. 55.
- 1892. *Chlorostoma (Omphalius) exoletum* (Conrad). Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 2, p. 388, pl. 17, figs. 4, 4a.
- 1903. *Chlorostoma exoletum* Conrad, Dall, Wagner Free Inst. Sci. Trans., vol. 3,
- 1915. *Tegula (Omphalius) exoleta* (Conrad). Dall, U. S. Nat. Mus. Bull. 90, p. pt. 6, p. 1601. (In list from Duplin and Cape Fear River, N. C.)
111, pl. 16, figs. 15, 16.
- 1919. *Chlorostoma (Omphalius) exoleta* Conrad, Gardner and Aldrich, Acad. Nat. Sci. Philadelphia Proc., vol. 71, p. 18. (In list of fossils from 5 miles S.E. of Mayesville, S. C.)
- 1929. *Tegula exoleta* (Conrad). Cooke and Mossom, Florida Geol. Survey Twentieth Ann. Rept., pl. 16, fig. 9.

The type locality of this species is unknown.

The sculpture consists of spiral lines or narrow bands intercalated by closely-set threads. The lower columella is provided with two teeth, which are separated by a rather deep pit. The inner margin of the aperture has a single series of elongate denticles. On the narrow spiral bands are broken brownish color-markings.

Occurrence: Upper Miocene: Station 3421, Harveys Creek, half a mile above abandoned mill, Leon County (common); station 1/966, Double Branch, near highway, Leon County (2 specimens); station 3671, Hosford, Liberty County (1 specimen); station 1/422, Hamlin Pond, Washington County (1 specimen); station 1/961, near Woods, Liberty County (1 specimen).

Outside occurrence: Lower Miocene: "Silex beds" of Tampa limestone, Florida. Upper Miocene: Yorktown formation, lower part, Virginia; Duplin marl of the Carolinas.

The Recent species of the genus *Tegula* range from southern Florida southward into the Antilles, showing that this genus lives in warm water.

Family VITRINELLIDAE

Genus CYCLOSTREMA Marryatt, 1818

Cyclostrema bartschi Mansfield, n. sp.

Plate 20, figures 13, 14, 15

Shell minute, glossy, discoidal, umbilicated, axially and spirally sculptured, and consists of $3\frac{1}{2}$ whorls. Nucleus rather small, smooth, and consists of about one flatly coiled, rounded whorl. Suture of body whorl channeled and with a broad, anteriorly inclined area in front of it. Sculpture of 4 strong, equally spaced, keeled spirals—two of these form the external border of the whorl; one is midway between the upper carina and the posterior suture; and the basal one surrounds the umbilicus. Axial sculpture of narrow protractive ribs, which are separated by interspaces about equal in width to ribs. These overrun both spirals and interspaces. Umbilicus large, scalar, marked with faint spiral lines. Aperture entire and strongly reflecting external sculpture.

Type (U. S. N. M. Cat. No. 370493) measures: Altitude, 0.2 mm.; greatest diameter, 1.0 mm.

The species belongs to the same genus as the form identified as *Cyclostrema panamensis* C. B. Adams.

Occurrence: Upper Miocene, station 3421, Harveys Creek, half a mile above abandoned mill, Leon County (rare), type and only locality.

This species is named in honor of Dr. Paul Bartsch, of the United States National Museum.

The foregoing form and the following forms, which I have included under the family *Vitrinellidae*, belong to a very difficult group and I am not positive that I have assigned some of them to the right genus. When the Recent species of our East coast are fully worked up and classified the assignment of the fossil species to their right place will be much easier.

Genus CIRCULUS Jeffreys, 1865

Circulus gunteri Mansfield, n. sp.

Plate 20, figures 16, 17, 18

Shell minute, fragile, low-spined, operculate, delicately sculptured, and consists of $3\frac{1}{2}$ whorls. Suture channeled on early whorls but only weakly depressed on body whorl. Earliest two whorls smooth, rounded in outline, trochoid, and elevated. Following whorls turritid, with sides nearly vertical and upper surface nearly flat. Body whorl bicarinate—the lower and basal carina is stronger and forms the periphery of the whorl. Base rounded in outline. Sculpture on upper

surface of body whorl of fine, closely-set, nearly uniform, finely beaded spiral threads. The spiral at the upper and lower carina is much larger and is faintly annulated. Area between the carini and over the base and within the umbilicus sculptured with stronger spirals than upper surface. These stronger spirals are intercalated with 4 or 5 fine, finely granulated threadlets. A few very weak and nearly indistinct axials are on the lower base and enter the umbilicus. Aperture entire and in outline subquadrate. Umbilicus large, deep, and scalar.

Type (U. S. Nat. Mus. Cat. No. 370495) measures: Altitude, 0.8 mm.; greatest diameter, 1.6 mm.

Circulus gunteri corresponds closely to the description of *Circulus schmidtii* Olsson, a species from the Duplin marl at Natural Well, N. C. Olsson states that the shell of his species is flattened below. My species has a rounded base. The spirals on my species are finely beaded, especially on the upper surface, but Olsson does not mention this feature.

The nearest related Recent species appears to be *Circulus trilix* (Bush).

Occurrence: Upper Miocene, Harveys Creek, half a mile above abandoned mill, Leon County, type and only locality.

This species is named in honor of Mr. Herman Gunter, State Geologist of Florida, who collected the most nearly perfect specimen, which constitutes the holotype of this species.

This species was also collected by Dr. T. W. Vaughan in 1900 and by the writer in 1925.

Circulus? leonensis Mansfield, n. sp.

Plate 21, figures 1, 2, 3

Shell minute, glossy, sculptured mainly at the periphery and on the base of the body whorl, and consists of 3 whorls. Upper part of shell lowly domed, base nearly flat. Suture distinct and moderately depressed. Nucleus rather large, smooth, loosely coiled, and consists of about 1 whorl. Following whorl rounded and sculptured by a few faint axials near the initiation of body whorl. Body whorl constituting nearly all of the shell, large, broadly rounding to periphery, and ornamented with a strong carina, which separates the base from the upper surface. Near and above this carina are 2 low spiral lines. Below the periphery and on the upper base are 3 spiral cords—the posterior one is nearly as strong as the peripheral cord and is minutely beaded on the lower surface; the anterior two spirals are smaller,

paired, and of about equal strength. The broad area surrounding the umbilicus and the umbilicus are a little roughened by faint axials. Umbilicus large.

Type (U. S. Nat. Mus. Cat. No. 370499) measures: Altitude, 0.6 mm.; greatest diameter, 1.3 mm.

Occurrence: Upper Miocene: Station 3421, Harveys Creek, half a mile above abandoned mill, Leon County (rare), type and only locality.

Genus TEINOSTOMA A. Adams, 1853

Teinostoma carinatum (H. C. Lea)

Plate 20, figures 10, 11, 12

1846. *Rotella carinata* H. C. Lea, Am. Philos. Soc. Trans., new ser., vol. 9, p. 263, pl. 36, fig. 78.

1919. *Teinostoma carinatum* (H. C. Lea). Gardner and Aldrich, Acad. Nat. Sci. Philadelphia Proc., vol. 71, p. 18. (In list from near Mayesville, S. C.)

The type locality of *Teinostoma carinatum* is Petersburg, Va. *Teinostoma carinatum* appears to have a more carinate body whorl than *Teinostoma lenticulare* (H. C. Lea). The type of both species came from the same place.

Occurrence: Station 8862, half a mile northeast of Clarksville, Calhoun County, Fla. (1 specimen).

Outside occurrence: Yorktown formation of Virginia. Duplin marl of the Carolinas.

Teinostoma nanum umbilicatum (H. C. Lea)

Plate 20, figures 1, 2, 3

1846. *Rotella umbilicata* H. C. Lea. Am. Philos. Soc. Trans., vol. 9, p. 264, pl. 36, fig. 80.

Teinostoma nanum was described by Lea¹ from the Miocene of Maryland. In subsequent collections obtained from Maryland this species has been found only in the St. Marys formation. Martin² placed *Teinostoma umbilicatum* (H. C. Lea) in synonymy with *Teinostoma nanum* (Lea).

Teinostoma nanum has a less concealed spire and a more impressed line marginating the callus on the base than the species from Petersburg, Va., described by Lea under the name of *Rotella umbilicata*. Because of this difference I have placed *Teinostoma umbilicatum* (H. C. Lea) as a subspecies of *Teinostoma nanum* (Lea).

Teinostoma nanum umbilicatum (H. C. Lea) has a polished shell. The outline of the early whorls is nearly concealed. The umbilical

¹Lea, Isaac, Contributions to Geology, p. 214, pl. 6, fig. 225, 1833.

²Martin, G. C., Maryland Geol. Survey, Miocene, p. 263, 1904.

callus is depressed and the external margin is marked by a very faint impressed line. The umbilical callus is angled and weakly sulcated at the lower margin opposite the lower aperture.

Occurrence: Station 1/670, upper bed at Alum Bluff, Liberty County (rare); station 8862, half a mile northeast of Clarksville, Calhoun County (common).

Outside occurrence: Yorktown formation, Virginia. Duplin marl, North Carolina (rare).

Teinostoma harveyensis Mansfield, n. sp.

Plate 20, figures 4, 5, 6

Shell small, porcelaneous, and consists of about $3\frac{1}{2}$ whorls. Sculpture of weak axial growth lines. Suture appressed, visible but not very distinct. Upper surface of shell nearly flat. Body whorl large, shallowly depressed in front of the suture, narrowly rounded at the upper shoulder and at the base. Umbilicus completely filled with a heavy and low-domed callus. Another thin callus underlies the umbilical callus and is externally marked off on the base of the whorl by an indistinct, shallowly incised line. Aperture semicircular in outline; lower margin of columellar lip rounded evenly with the basal margin.

The new species differs from *Teinostoma nanum umbilicatum* (H. C. Lea) in having a heavier and larger umbilical callus and in lacking the shallow sulcus at the lower margin of this callus. The line of demarcation of the external callus is also less well defined.

The new species is allied to *Teinostoma thompsoni* Olsson, a species described from the Duplin marl at Natural Well, N. C., but Olsson's species has strong radial grooves and growth lines on the basal surface which are lacking on my species.

Type (U. S. Nat. Mus. Cat. No. 370506) measures: Altitude, 1.2 mm.; greatest diameter, 2.3 mm.

Occurrence: Station 3672, 1 mile northwest of Hosford, Liberty County, type locality; station 3671, Hosford (common); station 3421, Harveys Creek, half a mile above abandoned mill, Leon County (abundant); station 1/706, Gully Pond, Washington County (1 immature specimen, determination uncertain); borrow pit, near Jackson Bluff, Leon County (rare).

Teinostoma (*Pseudorotella*?) *washingtonensis* Mansfield, n. sp.

Plate 20, figures 7, 8, 9

Shell thin, porcelaneous, of medium size, and consists of $3\frac{1}{2}$ whorls. Spire elevated. Suture distinct and closely appressed. Apical turn distinct, roundly coiled, and a little elevated. Following whorls rounded in outline, moderately depressed in front of the suture, body

whorl more so than preceding. Sculpture of axial growth lines, which are strongest near the end of the body whorl. Umbilicus of the holotype and adult specimens completely filled with a depressed callus, which is thin except at the lower area opposite the columellar lip. An incised line externally parallels the columellar lip.

Type (U. S. Nat. Mus. Cat. No. 370512) measures: Altitude, 1.6 mm.; greatest diameter, 2.6 mm.

The spire of the new species resembles that of *Teinostoma collinus* Dall, a species described from Cape Fear River, N. C., but the umbilicus is plainly visible on the latter species and the umbilical region is externally bordered by a distinct groove.

Pseudorotella bushi Olsson, a species obtained at the Natural Well, N. C., is allied to my new species, but Olsson's species has a more open umbilicus and an incised line surrounding the umbilical region.

Teinostoma milium Dall, described from the Pliocene Caloosahatchee marl of Florida is also allied to my new species, but the former has a smaller shell and a more depressed spire.

Occurrence: Station 1/955, Gully Pond, Washington County, type locality (rare); station 3421, Harveys Creek, half a mile above abandoned mill, Leon County (rare).

Superfamily ZYGORANCHIA

Family FISSURELLIDAE

Genus FISSURIDEA Bruguiere, 1791

Fissuridea nucula Dall

Plate 21, figures 5, 7

1892. *Fissuridea nucula* Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 2, p. 426, pl. 19, figs. 9, 12.
1903. *Fissuridea nucula* Dall. Dall, idem, pt. 6, p. 1601 (in Miocene list from near Magnolia, N. C.); p. 1610 (in Pliocene list from Caloosahatchee River).
1919. *Fissuridea nuclea* Dall. Gardner and Aldrich, Acad. Nat. Sci. Philadelphia Proc., vol. 71, p. 18. (In list from Mayesville, S. C.)

The figured type of *Fissuridea nucula* came from the Pliocene Caloosahatchee marl, Florida. The specimens from the Miocene are more sharply sculptured than the Pliocene specimens, but in other features they appear to be identical.

Occurrence: Station 3421, Harveys Creek, half a mile above abandoned mill, Leon County (rather common); station 1/422, Hamlin Pond, Washington County (rare); station 1/955, Gully Pond, Washington County (rare); station 1/961, near Woods, Liberty County (rare).

Outside occurrence: Miocene, Duplin marl of the Carolinas. Pliocene of Caloosahatchee River, Fla.

Fissuridea cattiliformis alumensis Mansfield, n. subsp.

Plate 21, figure 10

1903. *Fissuridea cattiliformis* Rogers. Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 6, p. 1597. (In list from upper bed at Alum Bluff, Fla.)

There are two specimens, neither of which is perfect, from the upper bed at Alum Bluff, Fla., that appear slightly different from *Fissuridea cattiliformis* (Rogers). *F. cattiliformis* (Rogers)¹ came from "Shell Banks," Prince George County, Va. A form that agrees most closely with the description and illustration of Rogers's species occurs in the upper part of the St. Marys formation at Urbanna and along James River, Va.

The new subspecies differs from *F. cattiliformis* in having a higher shell and in the character of the sculpture. The sculpture of the subspecies consists of narrow ribs alternating with riblets. The sculpture on *F. cattiliformis* consists of nearly equal-sized ribs.

The foramen is rather large and is elliptical in outline.

Type (U. S. Nat. Mus. Cat. No. 370521) measures: Altitude, 16 mm.; greatest diameter, 40 mm.

A specimen collected by me from Cherry Point, Tar River, about 6 miles below Greenville, N. C., agrees very closely with the new subspecies.

Class SCAPHOPODA

Order SOLENOCONCHIA

Family DENTALIIDAE

Genus DENTALIUM Linnaeus, 1758

Subgenus DENTALIUM Linnaeus

Dentalium (*Dentalium*) *attenuatum* Say

1824. *Dentalium attenuatum* Say, Acad. Nat. Sci. Philadelphia Jour., 1st ser., vol. 4, p. 154, pl. 8, fig. 3.

It is impracticable to give a full synonymy of names applied to this species or references to its correct identification without first examining the specimens.

The following is the original description of this species by Say:

"Arcuated; surface marked with from 12 to 16 rounded ribs, intervening grooves simple; lines of growth numerous, distinct; aperture orbicular. Length nearly one inch and seven-tenths."

The type apparently came from Maryland, but the exact locality and formation are unknown. It probably came from the St. Marys formation. Martin² states that *D. attenuatum* occurs in the Calvert,

¹Rogers, H. D., Am. Philos. Soc. Trans., vol. 5, new ser., p. 332, 1837 (described); idem, vol. 6, pl. 26, fig. 4, 1839.

²Martin, G. C., Maryland Geol. Survey, Miocene, p. 271, 1904.

Choptank, and St. Marys formations in Maryland, but I am unable to confirm this geological range from the large amount of material from these formations in the United States National Museum. The specimens that agree both with the description and illustration of this species are found only in the St. Marys formation in Maryland. The specimens from the Calvert formation compare more closely with the form referred to *D. danai* Meyer by Martin.¹

The species apparently ranges in the Miocene from the St. Marys formation (middle Miocene) into the Duplin marl (upper Miocene).

Occurrence in Florida: Red Bay, Walton County (abundant). Clarksville, Calhoun County (fragments, identification uncertain). The specimen identified by Dall² as *D. attenuatum* and said to come from the upper bed at Alum Bluff, Fla., is another species and probably came from the lower Miocene at that locality.

Dentalium (Dentalium) carolinense Conrad

Plate 21, figures 9, 11

1862. *Dentalium carolinense* Conrad, Acad. Nat. Sci. Philadelphia Proc., vol. 14, p. 288.

1863. *Dentalium carolinense* Conrad. Conrad, idem, p. 570.

1892. *Dentalium carolinense* Conrad. Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 2, p. 439.

1919. ?*Dentalium carolinense* Conrad. Gardner and Aldrich, Acad. Nat. Sci. Philadelphia., vol. 71, p. 18.

Dentalium carolinense Conrad³ was described as follows:

"Regularly curved, ribs 9 to 11, narrow and laterally flattened. Locality, North Carolina."

The type specimen of this species was not figured and the type locality is unknown.

Specimens from the Floridian Miocene that are especially well represented by many individuals in the upper bed at Alum Bluff have 7 to 10 (usually 8 or 9) strong ribs with wide and nearly flat interspaces, and indicate little tendency for interpolation of medial ribs. In respect to the number of ribs, the Floridian specimens usually have fewer than specimens that appear referable to this species from the Miocene of North Carolina. This, however, may be only a local variation of the same species. The Recent species *D. (Dentalium) laqueatum* Verrill may be a descendant of this species.

Occurrence: Upper bed at Alum Bluff (abundant); station 1/962, cut in old road to Watsons Landing, Liberty County (abundant); station 1/960, Darlings Slide, Chipola River, Calhoun County (com-

¹Idem, p. 272, pl. 64, fig. 4.

²Dall, W. H., Wagner Free Inst. Sci. Trans., vol. 3, pt. 2, p. 439, 1892.

³Conrad, T. A., idem, 1862.

mon); station 8862, half a mile northeast of Clarksville, Calhoun County (rare); station 3423, lower upper Miocene bed at Jackson Bluff, Leon County (rare); station 4993, from well 1 mile west of Holland post office, Leon County (common); station 1/965, lower upper Miocene bed at abandoned mill on Harveys Creek, Leon County (rare); station 1/964, upper bed at preceding locality (rare).

Outside occurrence: Specimens that appear referable to *D. carolinense* and closely resemble the Florida specimens occur in North Carolina at Shiloh Mills, Tar River, near Greenville, and at Palmyra Bluff, Roanoke River. Specimens from Mayesville and Darlington, S. C., have about 16 ribs and grade toward *D. attenuatum* Say.

Dentalium (*Dentalium*?) *disparile leonense* Mansfield, n. subsp.

Plate 21, figure 8

Shell resembling *Dentalium disparile* d'Orbigny in size, shape, and curvature but differing in having 8 ribs on the apical extremity instead of 6, thus giving the posterior region a more rounded outline. One intermediate secondary riblet appears at the posterior third and gradually increases in strength until, at the anterior end, it nearly equals in strength the primaries. In a few instances one tertiary riblet intercalates the secondaries at the anterior extremity.

Type (U. S. Nat. Mus. Cat. No. 370542) measures: Length, 21.5 mm.; diameter of anterior end, 2.3 mm.

Occurrence: Station 3422, uppermost Miocene bed at Jackson Bluff, Leon County, Fla., type locality; station 3672, 1 mile northwest of Hosford, Liberty County (rare).

Outside occurrence: Miocene Duplin marl, North Carolina (one fragment, identity uncertain). Pliocene of Shell Creek, Fla. (specimens smaller but appear to be the same as my subspecies).

Subgenus GRAPTACME Pilsbry and Sharp, 1897

Dentalium (*Graptacme*?) *pleiocenum* Tuomey and Holmes?

Two small specimens collected at station 3421, Harveys Creek, half a mile above abandoned mill, Leon County, Fla., appear to be closely related to *Dentalium pleiocenum* Tuomey and Holmes,¹ from the Pee Dee River, S. C.

The initial apical aperture in my specimens is not revealed. The shell is thin, moderately slender, and sculptured on the anterior region with fine riblets. The specimens agree very closely with a form from the Pliocene of Caloosahatchee River, identified by Dall² as

¹Tuomey, M., and Holmes, F. S., Pliocene fossils of South Carolina, p. 105, pl. 25. fig. 2, 1856.

²Dall, W. H., Wagner Free Inst. Sci. Trans., vol. 3, pt. 2, p. 440, 1892.

Dentalium calamus Dall and with specimens from the upper Miocene near Mayesville and near Darlington, S. C. *D. calamus* Dall, the type of which was collected from Turtle Harbor, Fla., in 4 fathoms of water, has a more slender shell than my form.

Dentalium sp. a, ? aff. *Dentalium* (*Laevidentalium*) *callipeplum* Dall

Six fragments of the genus *Dentalium* occur at station 3421, Harveys Creek, half a mile above abandoned mill, Leon County, Fla., that are incapable of specific determination but may be related to *Dentalium* (*Laevidentalium*) *callipeplum* Dall,¹ the type of which was collected between the Mississippi River delta and Cedar Keys, in 169 fathoms of water. Dall² reported one specimen of this species from the Pliocene of the Caloosahatchee River, Fla.

The fragments at hand have a thin, moderately slender, and sculptureless shell.

Family SIPHODONTALIIDAE

Genus CADULUS Philippi, 1844

Cadulus floridanus Dall

Plate 21, figure 6

1892. *Cadulus floridanus* Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 2, p. 446, pl. 23, fig. 26.

The type of *Cadulus floridanus* came from the upper bed at Alum Bluff, Liberty County, Fla. The shell of the type and topotypes is of moderate size, dorso-ventrically compressed, weakly depressed behind and in front of the slightly inflated equatorial region, the inflation being more emphasized on the ventral side.

Dall³ gave the varietal name *burnsii* to a smaller form with a more pronounced equatorial region. This appears to be a juvenile form of *C. floridanus*.

Specimens from Darlings Slide, Chipola River, that I have assigned to this species have a more prominent equatorial region than specimens from the type locality. These can be readily separated but hardly warrant a new subspecific designation. I find no specimens that show the apical characters.

Occurrence: Upper bed at Alum Bluff, Liberty County (abundant); station 1/960, Darlings Slide, Calhoun County (common); station 8862, near Clarksville, Calhoun County (rare); station 3423, lower upper Miocene bed at Jackson Bluff, Leon County (1 specimen).

¹Dall, W. H., Harvard Coll. Mus. Comp. Zoology Bull., vol. 18, p. 419, pl. 27, fig. 12b, 1889.

²Dall, W. H., Wagner Free Inst. Sci. Trans., vol. 3, pt. 2, p. 442, 1892.

³Idem.

Cadulus thallus (Conrad) Dall

Plate 21, figure 4

1834. *Dentalium thallus* Conrad, Acad. Nat. Sci. Philadelphia Jour., vol. 7, p. 142.
1845. *Dentalium thallus* Conrad. Conrad, Fossils of the Medial Tertiary of the United States, No. 3, p. 78, pl. 44, fig. 5.
1845. *Dentalium thallus* Conrad. H. C. Lea, Am. Philos. Soc. Trans., vol. 9, p. 230.
1856. *Dentalium thallus* Conrad. Tuomey and Holmes, Pleiocene fossils of South Carolina, p. 106, pl. 25, fig. 3.
1858. *Dentalium thallus* Conrad. Emmons, North Carolina Geol. Survey Rept., p. 274, fig. 189.
1863. *Dentalium thallus* Conrad. Conrad, Acad. Nat. Sci. Philadelphia Proc. for 1862, vol. 14, p. 570.
1864. *Dentalium* [?] *thallus* Conrad. Meek, Check list of invertebrate fossils of North America; Miocene: Smithsonian Misc. Coll. No. 183, p. 14.
1892. *Cadulus thallus* (Conrad). Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 2, p. 445.
1904. *Cadulus thallus* (Conrad). Martin, Maryland Geol. Survey, Miocene, p. 273, pl. 64, fig. 6.
1919. *Cadulus thallus* Conrad. Gardner and Aldrich, Acad. Nat. Sci. Philadelphia Proc., vol. 71, p. 18.

The following is the original description of this species:

"Shell slightly curved, smooth, highly polished; swelling below the middle; aperture very regularly oval. Locality, Suffolk, Va." Conrad, 1834.

Occurrence: Upper Miocene, station 3421, Harveys Creek, half a mile above abandoned mill, Leon County (abundant); station 3422, uppermost bed at Jackson Bluff, Leon County (abundant); station 3671, Hosford, Liberty County (abundant); station 3672, 1 mile northwest of Hosford (abundant); station 1/706, Gully Pond, Washington County (common); station 1/422, Hamlin Pond, Washington County (common); station 1/953, 1 mile below Econfinia bridge, Bay County (1 specimen); upper bed at Alum Bluff, Liberty County (1 specimen).

Outside occurrence: This species ranges in time from the Calvert formation of Maryland (middle Miocene) into the Duplin marl of the Carolinas (upper Miocene).

Cadulus aff. *C.* (Polyschides) *quadridentatus* Dall

Specimens collected at station 3422, uppermost bed at Jackson Bluff, Leon County, Fla., appear to be closely related to *Cadulus* (*Polyschides*) *quadridentatus* Dall, the type of which came from the west coast of Florida in 30 fathoms. Henderson¹ placed *Cadulus incisus* Bush in synonymy with *C. quadridentatus* Dall. The apex of one of

¹Henderson, J. B., A monograph of the East American Scaphopod mollusks: U. S. Nat. Mus. Bull. 111, p. 97, 1920.

my specimens is cut by four slits. My specimens have a slightly more slender shell and a less deeply incised apex than *C. quadridentatus*. Specimens from the Pliocene at Cronly, N. C., and from Caloosahatchee River and Shell Creek, Fla., agree more closely with the Recent form than with my specimens.

PLATES 1-21

PLATE 1

- FIGURE
1. *Acteon vaughani* Mansfield, n. sp.; type; altitude, 4.2 millimeters (p. 25).
 2. *Acteocina canaliculata* (Say). Figured specimen from station 3421, Harveys Creek, half a mile above abandoned mill. Leon County, Fla.; U. S. Nat. Mus. No. 369884; altitude, 3.7 millimeters (p. 26).
 - 3, 4. *Acteocina coënsis* Mansfield, n. sp. (p. 26). 3, Type; altitude, 3.5 millimeters. 4, Topotype; altitude, 2.6 millimeters.
 5. *Ringicula (floridana var.?) guppyi* Dall. Figured specimen from Harveys Creek, half a mile above abandoned mill, Leon County, Fla.; altitude, 2 millimeters (p. 29).
 - 6, 7. *Sulcularia sulcata harveyensis* Mansfield, n. subsp. Cotypes (p. 27). 6, altitude, 2.0 millimeters; 7, altitude, 2.4 millimeters.
 8. *Ringicula (floridana var.?) guppyi* Dall (more typical). Figured specimen from Gully Pond, Washington County, Fla.; altitude, 1.5 millimeters (p. 29).
 9. *Volvula oxytata hosfordensis* Mansfield, n. subsp.; type; altitude, 2.7 millimeters (p. 28).
 10. *Clathrodrillia? emmonsii* (Olsson). Figured specimen from cut in old road to Watsons Landing, Liberty County, Fla.; U. S. Nat. Mus. No. 369956; altitude, 11.4 millimeters (p. 36.)
 11. *Cylichnella jacksonensis* Mansfield, n. sp.; type; altitude, 3.2 millimeters (p. 28).
 12. *Conus harveyensis* Mansfield, n. sp.; type; altitude, 21 millimeters (p. 33). (The number was accidentally omitted from the plate.)
 13. *Conus floridanus* Gabb. Figured specimen from Harveys Creek, half a mile above abandoned mill, Leon County, Fla.; U. S. Nat. Mus. No. 370104; altitude, 42 millimeters (p. 32).
 14. *Conus testudinarius leonensis* Mansfield, n. subsp.; type; altitude, 40 millimeters (p. 32).
 15. *Conus adversarius* Conrad. Figured specimen from Harveys Creek, half a mile above abandoned mill. Leon County, Fla.; U. S. Nat. Mus. No. 369929 (p. 32).

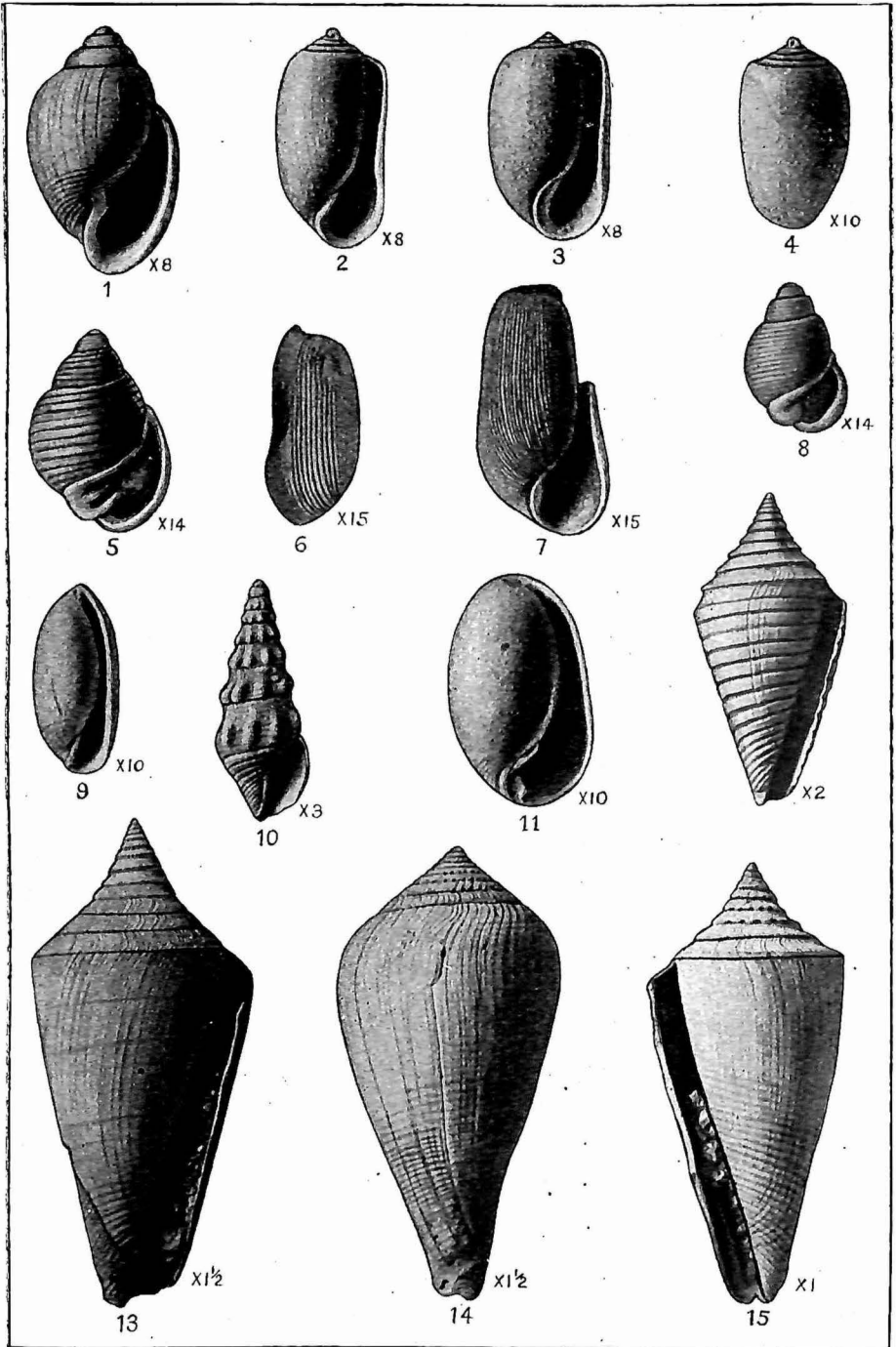


PLATE 2

- FIGURE
1. *Myurella dislocata* (Say). Figured specimen from station 3671, Hosford, Liberty County, Fla.; U. S. Nat. Mus. No. 369922; altitude, 14 millimeters (p. 31).
 2. *Myurella binodosa* Mansfield, n. sp.; type; altitude, 18 millimeters (p. 30).
 3. *Cymatosyrinx propeaepynota libertiënsis* Mansfield, n. subsp.; type; altitude, 17 millimeters (p. 35).
 4. *Clathrodrillia? podagrina* (Dall). Figured specimen from station 3422, uppermost bed at Jackson Bluff, Leon County, Fla.; U. S. Nat. Mus. No. 369969; altitude, 5.2 millimeters (p. 39).
 5. *Cymatosyrinx lunata porrecta* Mansfield, n. subsp.; type; altitude, 27 millimeters (p. 34).
 6. *Cymatosyrinx propeaepynota* Mansfield, n. sp.; type; altitude, 13 millimeters (p. 35).
 7. *Clathrodrillia? emmonsi hosfordensis* Mansfield, n. subsp.; type; altitude, 10 millimeters (p. 37).
 8. *Clathrodrillia? gracilina* (Dall, (MS.) Mansfield, n. sp.; type; altitude, 13.5 millimeters (p. 38).
 9. *Cymatosyrinx lunata* (H. C. Lea). Figured specimen from Harveys Creek, half a mile above abandoned mill, Leon County, Fla.; U. S. Nat. Mus. No. 369936; altitude, 58 millimeters (p. 33).
 10. *Crassispira antealesidota* Mansfield, n. sp.; type; altitude, 53 millimeters (p. 39).
 11. *Clathrodrillia? anteaphanitoma* Mansfield, n. sp.; type; altitude, 12.5 millimeters (p. 37).
 12. *Cymatosyrinx lunata aepy tuberculata* Mansfield, n. subsp.; type; altitude, 20.5 millimeters (p. 34).

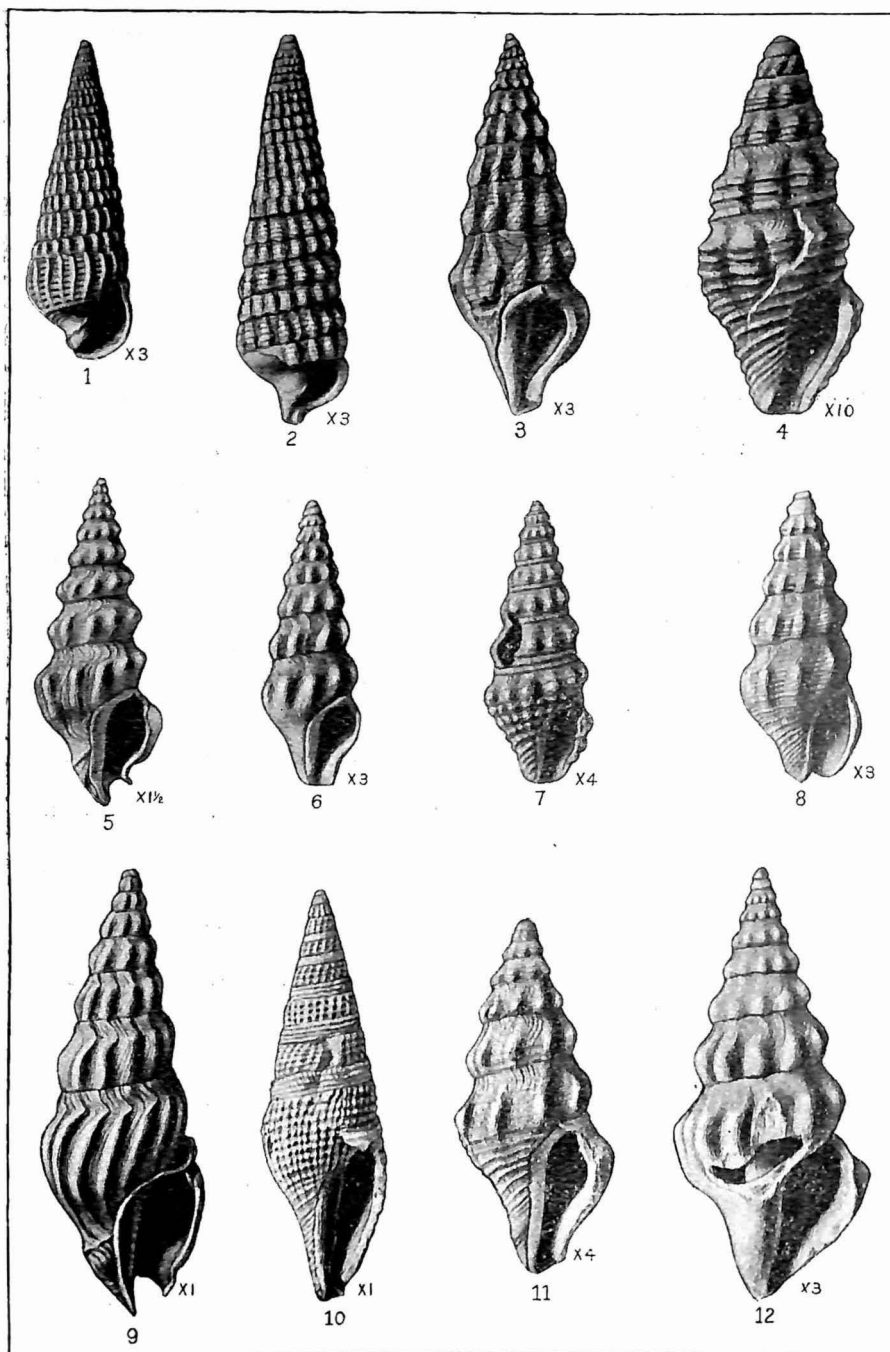


PLATE 3

- FIGURE
1. *Cancellaria (Narona) agria* Mansfield, n. sp.; type; altitude, 11 millimeters (p. 48).
 2. *Cancellaria (Cancellaria) tabulata* Gardner and Aldrich. Figured specimen from Harveys Creek, half a mile above abandoned mill, Leon County, Fla.; U. S. Nat. Mus. No. 369994; altitude, 35 millimeters (p. 46).
 - 3, 4. *Cancellaria (Narona) coënsis* Mansfield, n. sp.; type; altitude, 7 millimeters (p. 49).
 5. *Acmauris metria* (Dall). Figured specimens from station 8176, the "Deadens," Washington County, Fla.; altitude, 6 millimeters (p. 44).
 6. *Mangilia gardnerae* Mansfield, n. sp.; type; altitude, 5.5 millimeters (p. 42).
 7. *Glyphostoma watsoni leonensis* Mansfield, n. subsp.; type; altitude, 9.2 millimeters (p. 45).
 8. *Brachycythara turrita* Mansfield, n. sp.; type; altitude, 12 millimeters (p. 43).
 9. *Mangilia coënsis* Mansfield, n. sp.; type; altitude, 10 millimeters (p. 41).
 - 10, 11. *Mangilia harveyensis* Mansfield, n. sp.; type; altitude, 4.4 millimeters (p. 41).
 12. *Cancellaria reticulata leonensis* Mansfield, n. subsp.; type; altitude, 48 millimeters (p. 46).

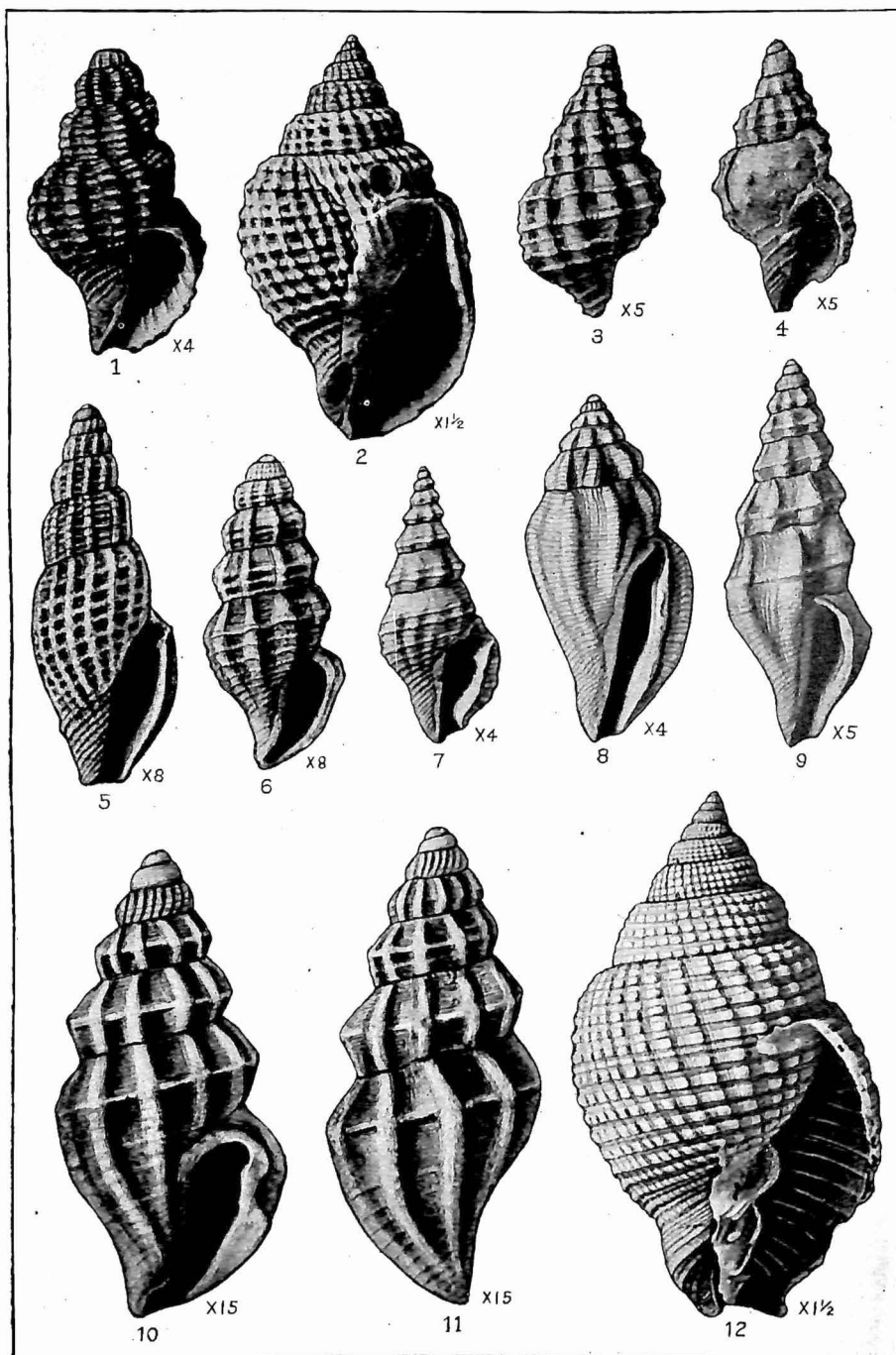


PLATE 4

FIGURE

1. *Olivella mutica* (Say) Dall. Figured specimen from station 3671, Hosford, Liberty County, Fla.; U. S. Nat. Mus. No. 370028; altitude, 7 millimeters (p. 51).
2. *Olivella mutica coënsis* Mansfield. n. subsp.; type; altitude, 6 millimeters (p. 52).
3. *Olivella (Dactylidella) floridana* Mansfield, n. sp.; type; altitude, 7 millimeters (p. 53).
4. *Oliva sayana* Ravenel. Figured specimen from station 1/962, cut in old road to Watsons Landing. Liberty County, Fla.; U. S. Nat. Mus. No. 370019; altitude, 51 millimeters (p. 51).
5. *Cancellaria (Trigonostoma) perspectiva aluensis* Mansfield, n. subsp.; type; altitude, 18 millimeters (p. 49).
6. *Olivella jacksonensis* Mansfield, n. sp.; type; altitude, 6.5 millimeters (p. 53).
7. *Cancellaria (Trigonostoma) tenera* Philippi. Figured specimen from Harveys Creek, half a mile above abandoned mill, Leon County, Fla.; U. S. Nat. Mus. No. 370017; altitude, 15 millimeters (p. 50).
8. *Marginella minuta* Pfeiffer. Figured specimen from station 8862, half a mile northwest of Clarksville, Calhoun County, Fla.; U. S. Nat. Mus. No. 370044; altitude, 3.5 millimeters (p. 55).
- 9, 11. *Marginella popenoei* Mansfield, n. sp.; type; altitude, 44 millimeters (p. 54).
10. *Marginella bella tersa* Mansfield, n. subsp.; type; altitude, 8.3 millimeters (p. 55).

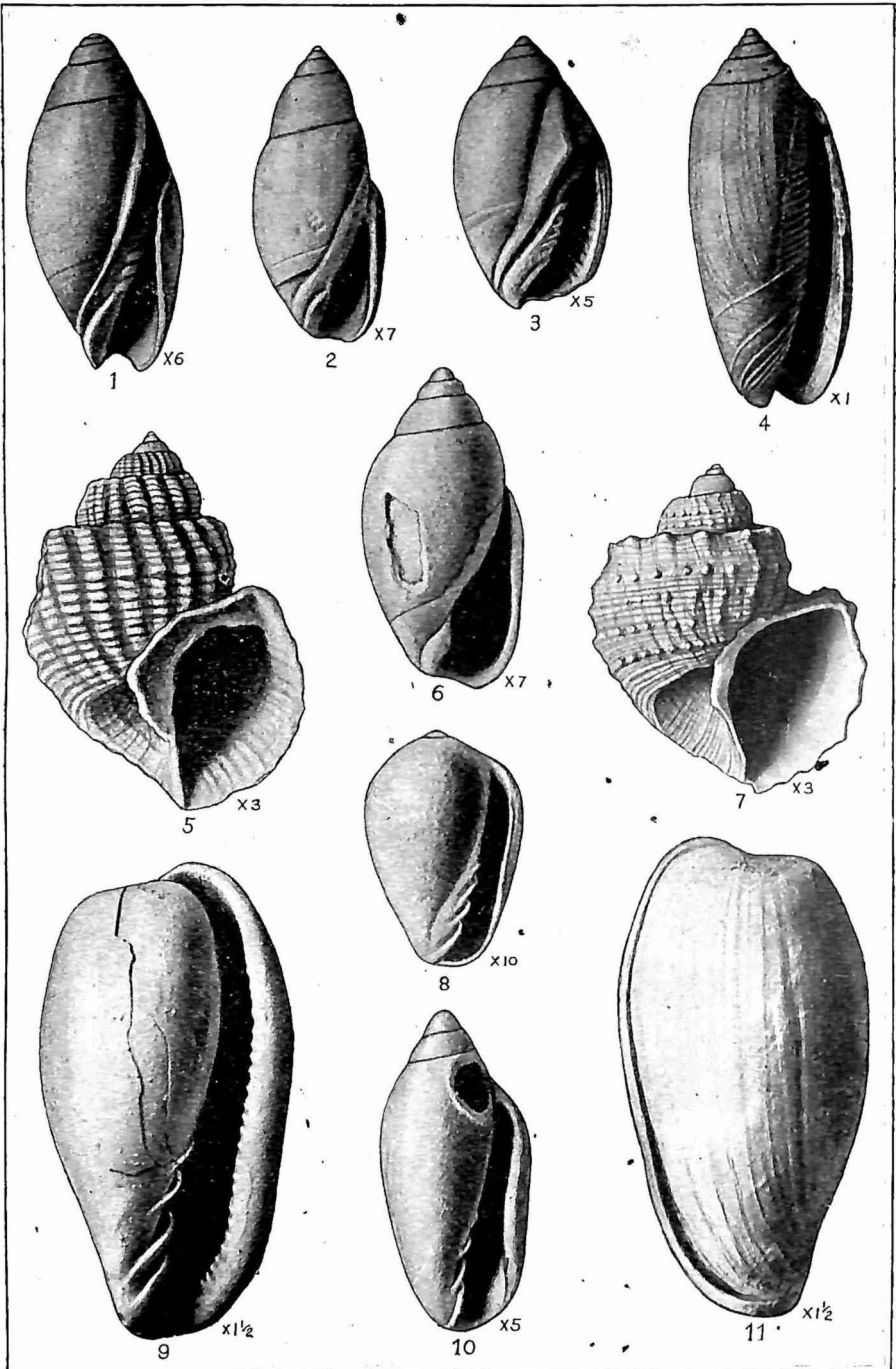


PLATE 5

- FIGURES 1, 2. *Mitra hosfordensis libertiensis* Mansfield, n. subsp. (p. 61). 1, type; altitude, 5 millimeters. 2, figured specimen from upper bed at Alum Bluff, Liberty County, Fla.; altitude, 7 millimeters.
3. *Mitra hosfordensis* Mansfield, n. sp.; type; altitude, 6.2 millimeters (p. 61).
4. *Mitra stephensoni* Mansfield, n. sp.; type; altitude, 31 millimeters (p. 60).
5. *Cypraeolina dacria* (Dall). Figured specimen from station 3671, Hosford, Liberty County, Fla.; U. S. Nat. Mus. No. 370063; altitude, 3.5 millimeters (p. 58).
6. *Marginella denticulata clarksvillensis* Mansfield, n. subsp.; type; altitude, 7.6 millimeters (p. 56).
7. *Mitra wandoensis* (Holmes). Figured specimen from station 3421, Harveys Creek, half a mile above abandoned mill, Leon County, Fla.; U. S. Nat. Mus. No. 370071; altitude, 5 millimeters (p. 60).
8. *Marginella bella hosfordensis* Mansfield, n. subsp.; type; altitude, 6.6 millimeters (p. 56).
9. *Marginella aureocincta* Stearns. Figured specimen from station 3421, Harveys Creek, half a mile above abandoned mill, Leon County, Fla.; U. S. Nat. Mus. No. 370057; altitude, 4.5 millimeters (p. 57).
10. *Aurinia mutabilis* (Conrad). Figured specimen from upper bed at Alum Bluff, Liberty County, Fla.; U. S. Nat. Mus. No. 111839; altitude, 66 millimeters (p. 58).
11. *Marginella precursor* Dall. Figured specimen from Harveys Creek, half a mile above abandoned mill, Leon County, Fla.; U. S. Nat. Mus. No. 370061; altitude, 15 millimeters (p. 57).
12. *Maculopeplum trenholmii* (Tuomey and Holmes). Figured specimen from station 2280, Magnolia, Duplin County, N. C.; U. S. Nat. Mus. No. 114314; altitude, 68 millimeters (p. 59).

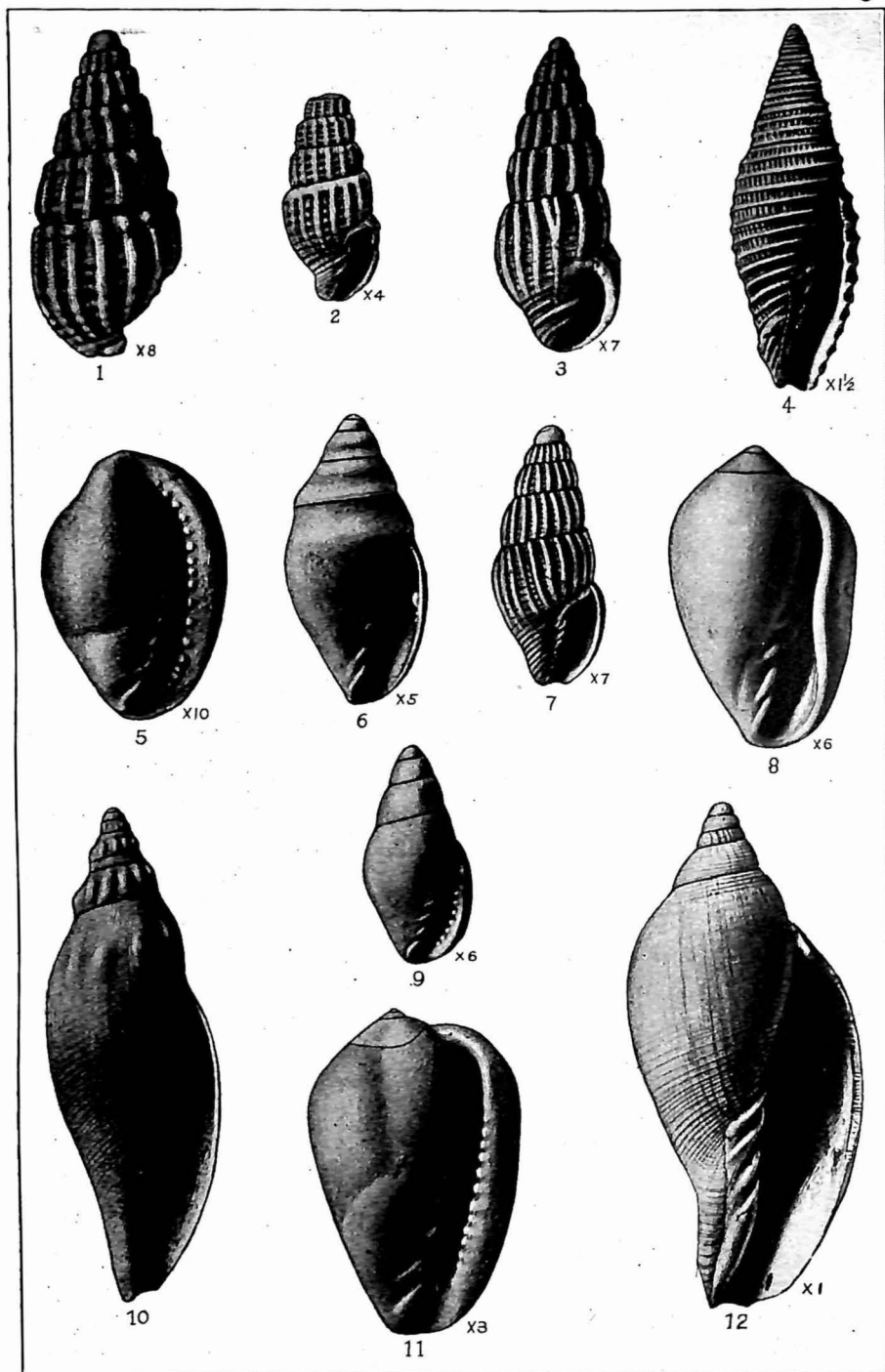


PLATE 6

- FIGURE 1. *Fasciolaria gigantea harveyensis* Mansfield, n. subsp.; type; altitude, 73.5 millimeters (p. 63).
- 2, 3. *Fasciolaria rhomboidea* Rogers. Figured specimens from Harveys Creek, half a mile above abandoned mill, Leon County, Fla.; U. S. Nat. Mus. No. 370083 (p. 63). 2. altitude, 54 millimeters. 3, altitude, 32.5 millimeters.
4. *Fusinus caloosaënsis gunteri* Mansfield, n. subsp.; type; altitude, 58 millimeters (p. 65).
- 5, 6. *Fusinus dalli* Mansfield, n. sp. (p. 65). 5, type; altitude, 85 millimeters. 6, topotype, showing nature of nuclear whorls; altitude, 27 millimeters.

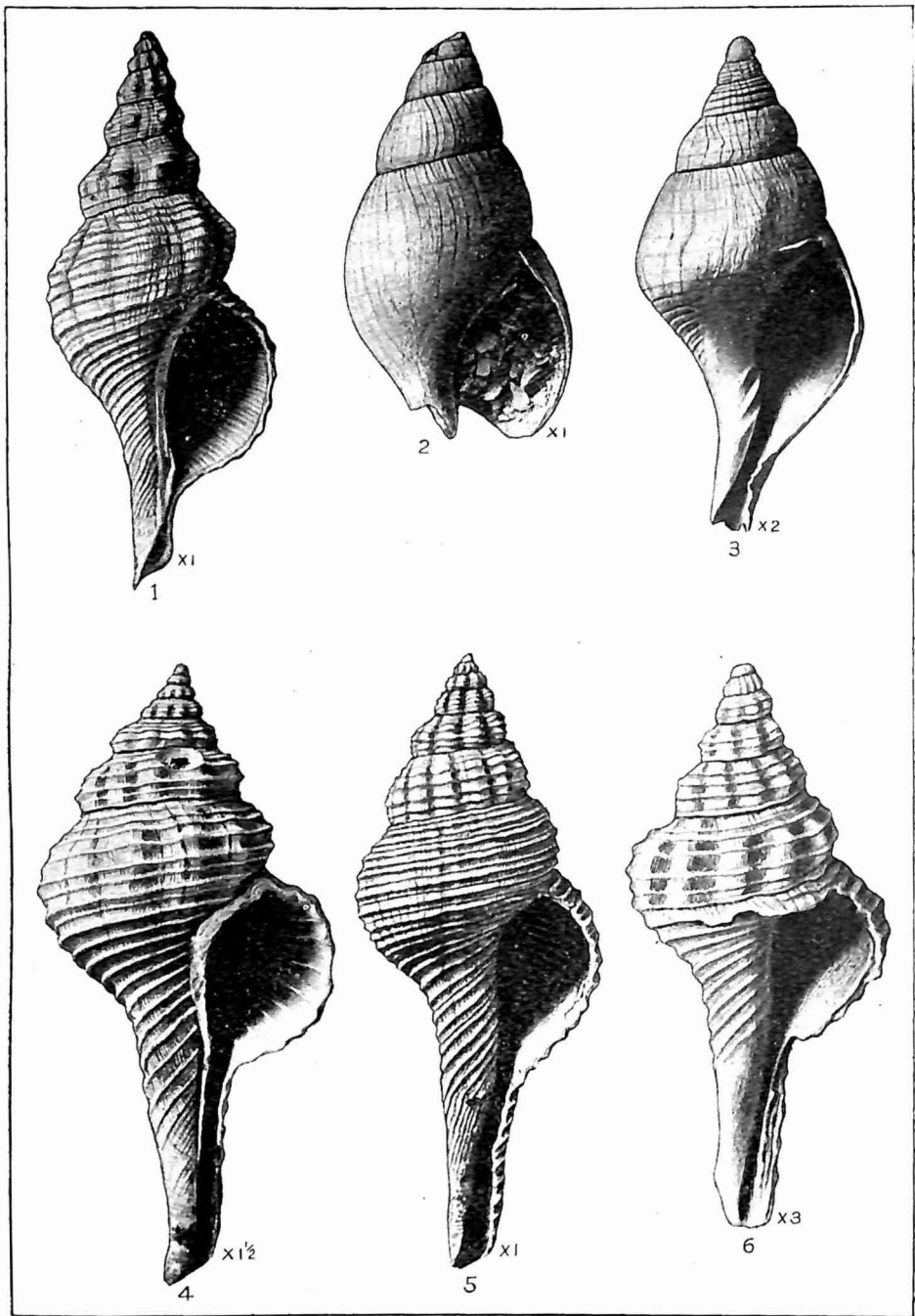


PLATE 7

- FIGURE 1. *Busycon* sp. aff. *B. canaliculatum* (Linné). Figured specimen from Harveys Creek, half a mile above abandoned mill, Leon County, Fla.; U. S. Nat. Mus. No. 370125; altitude, 89 millimeters (p. 69).
2. *Busycon maximum tudiculatum* (Dall). Type; altitude, 50 millimeters (p. 67).
- 3, 4. *Busycon maximum alumense* Mansfield, n. subsp. (p. 66). 3, type; altitude, 127 millimeters. 4, topotype; altitude, 63 millimeters.

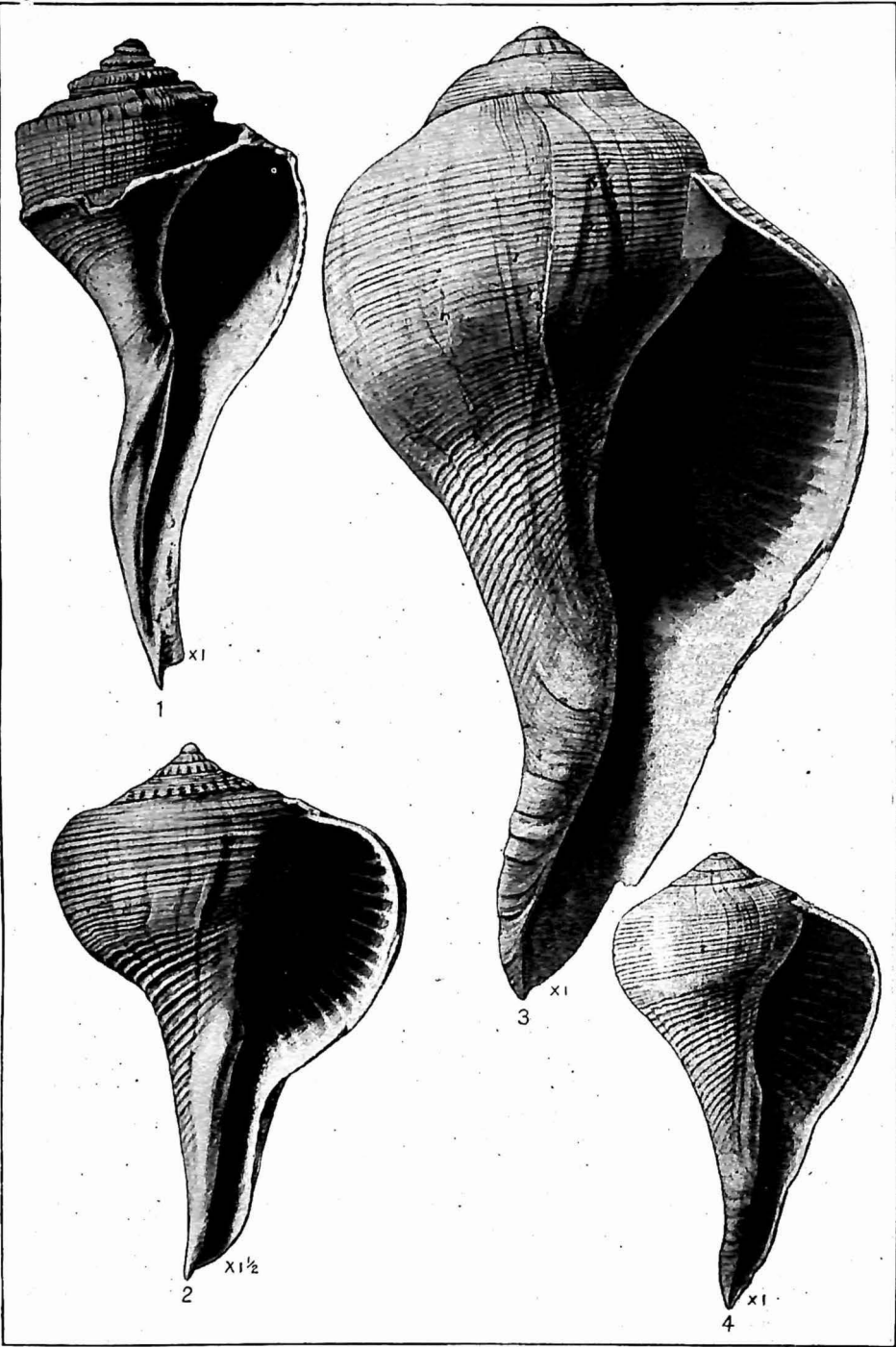


PLATE 8

- FIGURES 1, 6. *Busycon pyrum apynotum* (Dall) ; type; altitude, 46 millimeters (p. 69).
2. *Fasciolaria sparrowi* Emmons. Fragment of shell representing the early whorls of a specimen from Darlings Slide, Chipola River, Calhoun County, Fla.; U. S. Nat. Mus. No. 370080; altitude, 30 millimeters (p. 62).
3. *Alectrion alumensis* (Olsson). Figured topotype; altitude, 6 millimeters (p. 76).
4. *Alectrion cornelliana* (Olsson). Figured specimen from station 3671, Hosford, Liberty County, Fla.; U. S. Nat. Mus. No. 370147; altitude, 4.6 millimeters (p. 76).
5. *Busycon maximum rapum* (Heilprin). Figured specimen from Harveys Creek, half a mile above abandoned mill, Leon County, Fla.; U. S. Nat. Mus. No. 370122; altitude, 58 millimeters (p. 67).

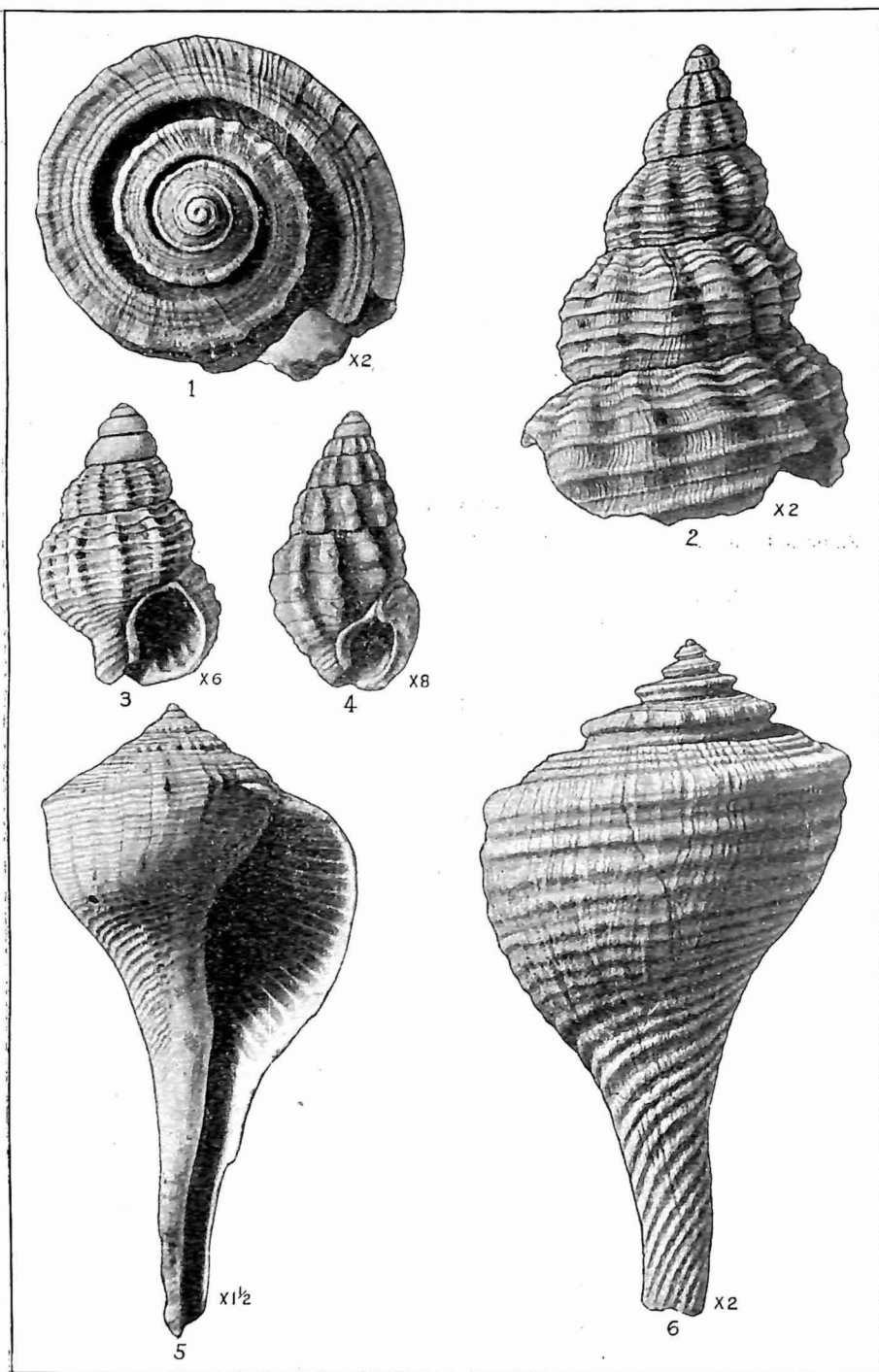


PLATE 9

- FIGURES 1, 8. *Phos vaughani* Mansfield, n. sp.; cotypes (p. 75). 1, altitude, 10.2 millimeters. 8, altitude, 13.5 millimeters.
2. *Anachis camax coënsis* Mansfield, n. subsp.; type; altitude, 11 millimeters (p. 79).
3. *Alectrion quadridentata* Mansfield, n. sp.; type; altitude, 6.6 millimeters (p. 77).
4. *Phos sloani floridanus* Mansfield, n. subsp.; cotype; altitude, 21 millimeters (p. 74).
5. *Busycon pyrum propeincile* Mansfield, n. subsp.; type; altitude, 130 millimeters (p. 68).
6. *Cantharus watsonensis* Mansfield. n. sp.; type; altitude, 37 millimeters (p. 72).
7. *Alectrion floridana* Mansfield, n. sp.; type; altitude, 6 millimeters (p. 76).

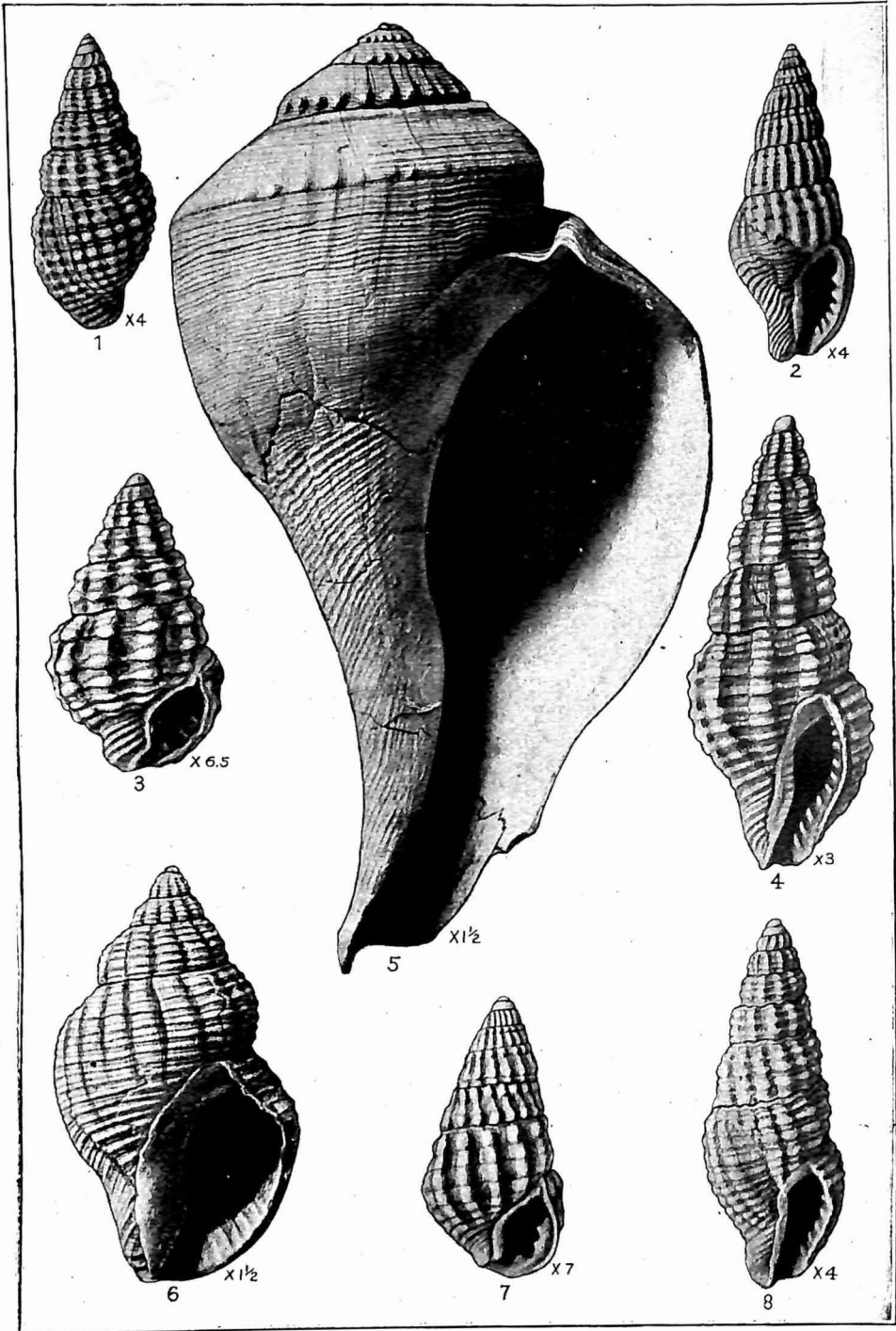


PLATE 10

- FIGURE
1. *Anachis clappi* Mansfield, n. sp.; type; altitude, 14 millimeters (p. 80).
 2. *Alectrion consensa leonensis* Mansfield, n. subsp.; type; altitude, 6.5 millimeters (p. 79).
 3. *Busycon pyrum libertiense* Mansfield; type; altitude, 85 millimeters (p. 68).
 4. *Phos sloani floridanus* Mansfield, n. subsp.; cotype; altitude, 16.5 millimeters (p. 74).
 5. *Busycon perversum* (Linnaeus). Figured specimen from borrow pit near Jackson Bluff, Leon County; U. S. Nat. Mus. No. 370128; altitude, 78 millimeters (p. 69).
 - 6, 7. *Anachis wieserae* Mansfield, n. sp. (p. 81). 7, type; altitude, 8 millimeters. 6, paratype, showing nuclear whorls; altitude, 2.7 millimeters.

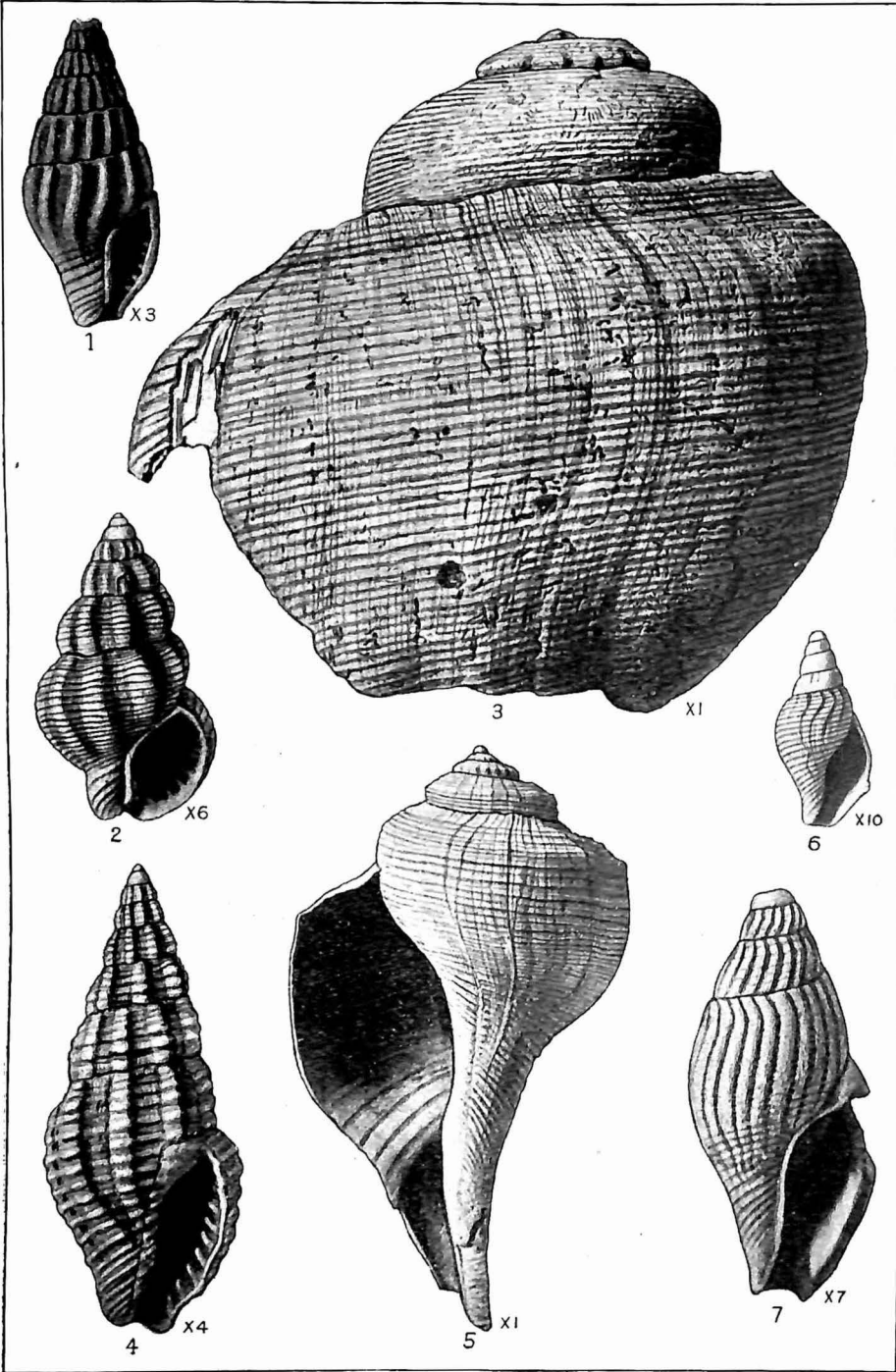


PLATE II

- FIGURES 1, 3. *Alectrion consensa harveyensis* Mansfield, n. subsp.; cotypes (p. 78). 1, altitude, 7.2 millimeters. 3, altitude, 7.7 millimeters.
2. *Eupleura caudata leonensis* Mansfield, n. subsp.; type; altitude, 36 millimeters (p. 86).
4. *Purpura marshalli* Mansfield, n. sp.; type; altitude, 52 millimeters (p. 84).
5. *Eupleura caudata brevispira* Mansfield, n. subsp.; type; altitude, 12.5 millimeters (p. 85).
6. *Typhis harrisi* Olsson. Figured topotype from station 7081, upper bed at Alum Bluff, Liberty County, Fla.; U. S. Nat. Mus. No. 370190; altitude, 19 millimeters (p. 83).
7. *Purpura fluviana* Dall. Type; altitude, 34 millimeters (p. 83).
8. *Muricidea floridana libertiënsis* Mansfield, n. subsp.; type; altitude, 22 millimeters (p. 86).
9. *Murex pomum* Gmelin. Figured specimen from Harveys Creek, half a mile above abandoned mill, Leon County, Fla.; U. S. Nat. Mus. No. 370189; altitude, 79 millimeters (p. 83).

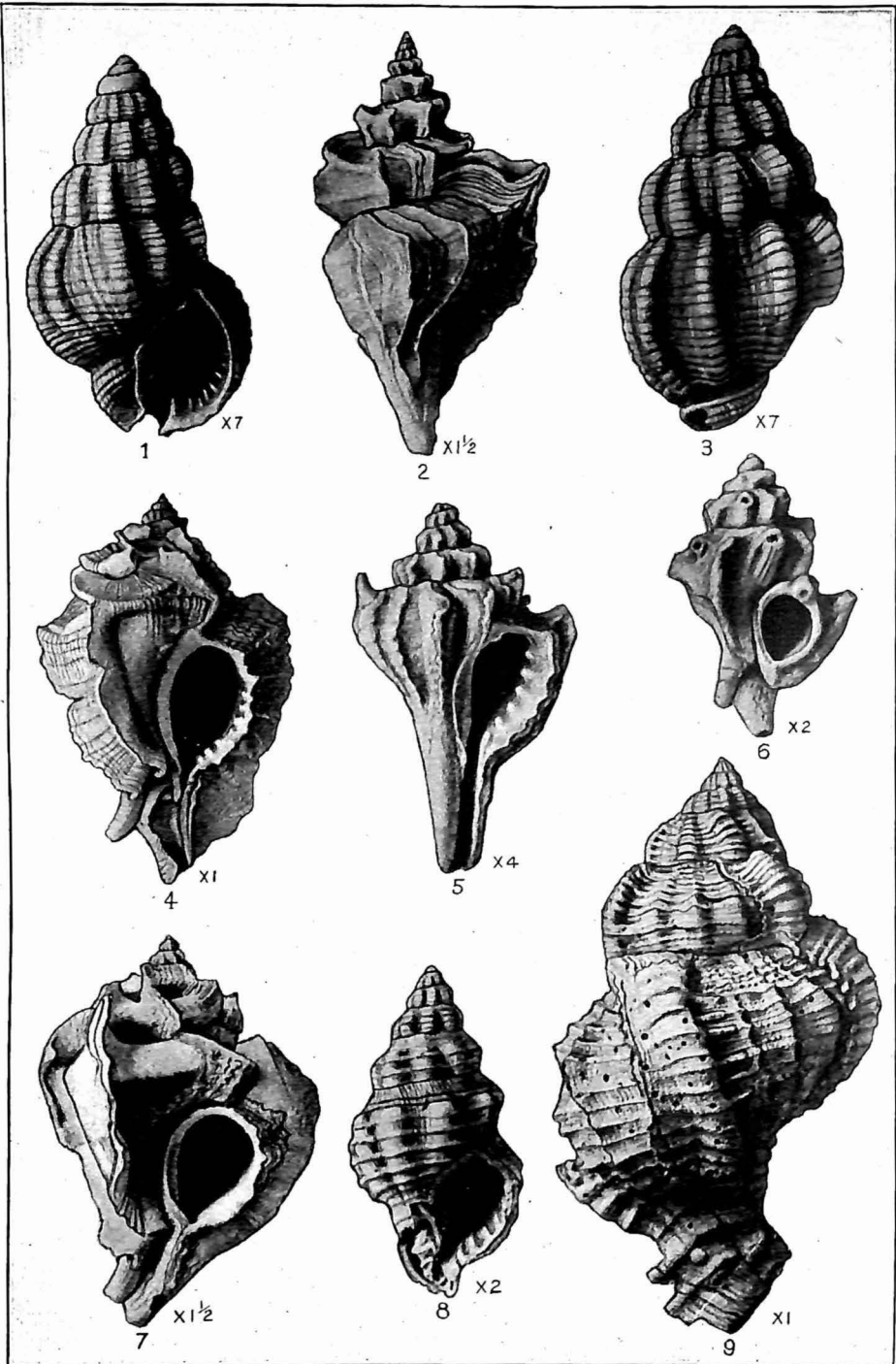


PLATE 12

- FIGURE
1. *Strombina gunteri leonensis* Mansfield, n. subsp.; type; altitude, 4.2 millimeters (p. 82).
 2. *Strombina gunteri* Mansfield, n. sp.; type; altitude, 10.7 millimeters (p. 81).
 3. *Muricidea floridana conradi* Mansfield, n. subsp.; type; altitude, 30 millimeters (p. 87).
 - 4, 8. *Strombiformis leonensis* Mansfield, n. sp. (p. 90). 4, type; altitude, 9.5 millimeters. 8, paratype; altitude, 7.8 millimeters.
 5. *Epitonium alumensis* Mansfield, n. sp.; type; altitude, 5.5 millimeters (p. 88).
 6. *Epitonium turriculum* (Sowerby). Figured specimen from station 8176, the "Deadens," Washington County, Fla.; U. S. Nat. Mus. No. 370206; altitude, 7.5 millimeters (p. 88).
 7. *Melanella (Melanella) bartschi* Gardner and Aldrich. Figured specimen from station 3671, Hosford, Liberty County, Fla.; altitude, 11 millimeters (p. 89).
 9. *Niso willcoxiana gunteri* Mansfield, n. subsp.; type; altitude, 16.7 millimeters (p. 91).
 10. *Cymatium (Linatella) floridanum* Mansfield, n. sp.; type; altitude, 26 millimeters (p. 94).
 11. *Strombiformis leonensis harveyensis* Mansfield, n. subsp.; type; altitude, 9.3 millimeters (p. 91).
 12. *Melanella (Melanella) magnoliana* Gardner and Aldrich; altitude, 6.7 millimeters (p. 89).

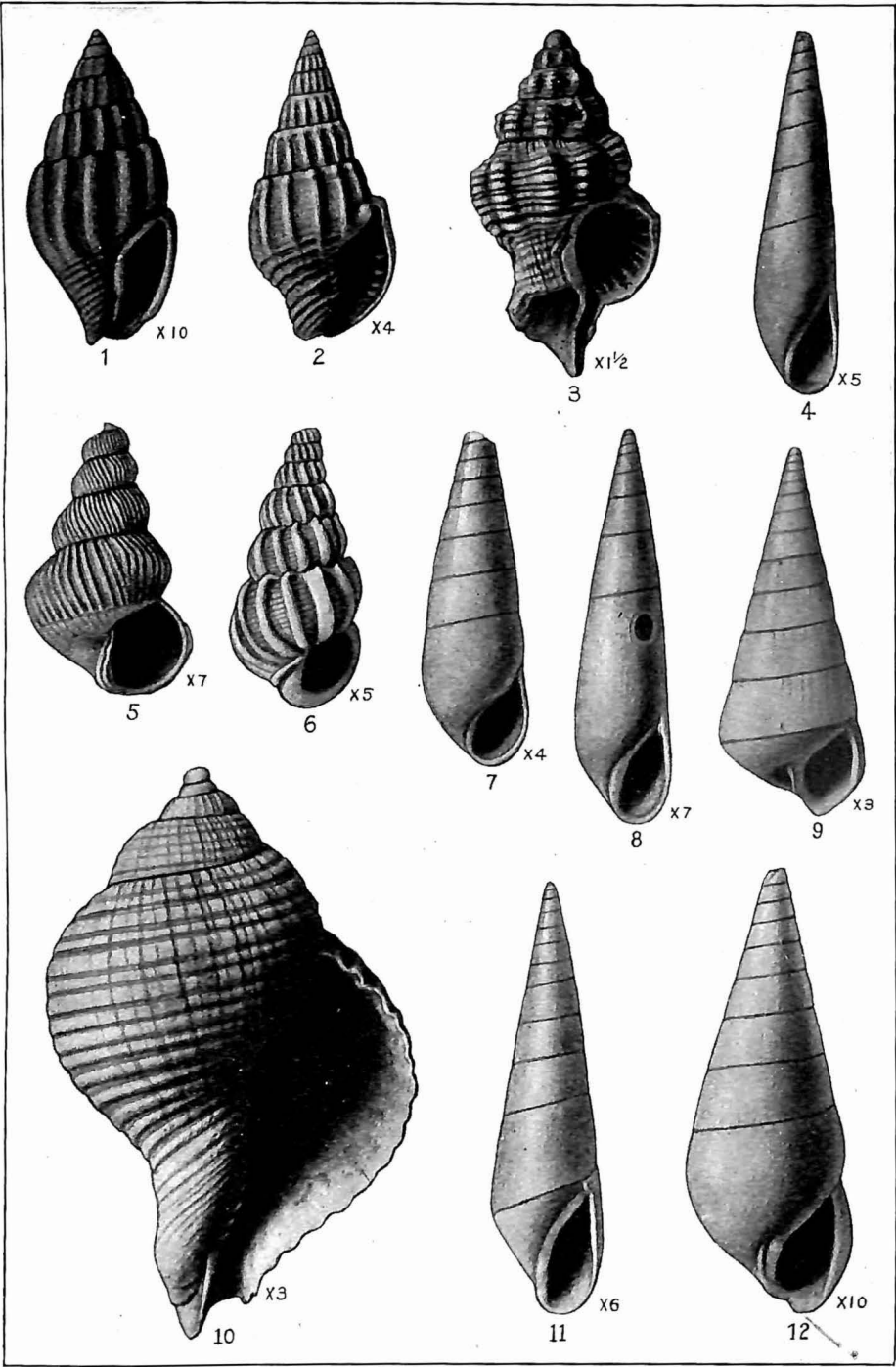


PLATE 13

- FIGURES 1, 4. *Cerithium floridanum leonensis* Mansfield, n. subsp. (p. 97). 4, type; altitude, 26 millimeters. 1, paratype; altitude, 31 millimeters.
- 2, 5. *Alabina adamsi floridana* Mansfield, n. subsp. (p. 99). 5, type; altitude, 4.6 millimeters. 2, paratype, showing nature of early whorls; altitude, 1.7 millimeters.
3. *Alabina adamsi leonensis* Mansfield, n. subsp.; type; altitude, 3.2 millimeters (p. 99).
6. *Alabina adamsi harveyensis* Mansfield, n. subsp.; type; altitude, 3.8 millimeters (p. 100).
7. *Seila clavulus* (H. C. Lea). Figured specimen from station 3421, Harveys Creek, half a mile above abandoned mill, Leon County, Fla.; U. S. Nat. Mus. No. 370269; altitude, 5.7 millimeters (p. 96).
8. "*Cerithium*" *harveyensis* Mansfield, n. sp.; type; altitude, 22 millimeters (p. 98).
- 9, 10. *Strombus pugilis floridanus* Mansfield, n. subsp.; type; altitude, 62 millimeters (p. 95).

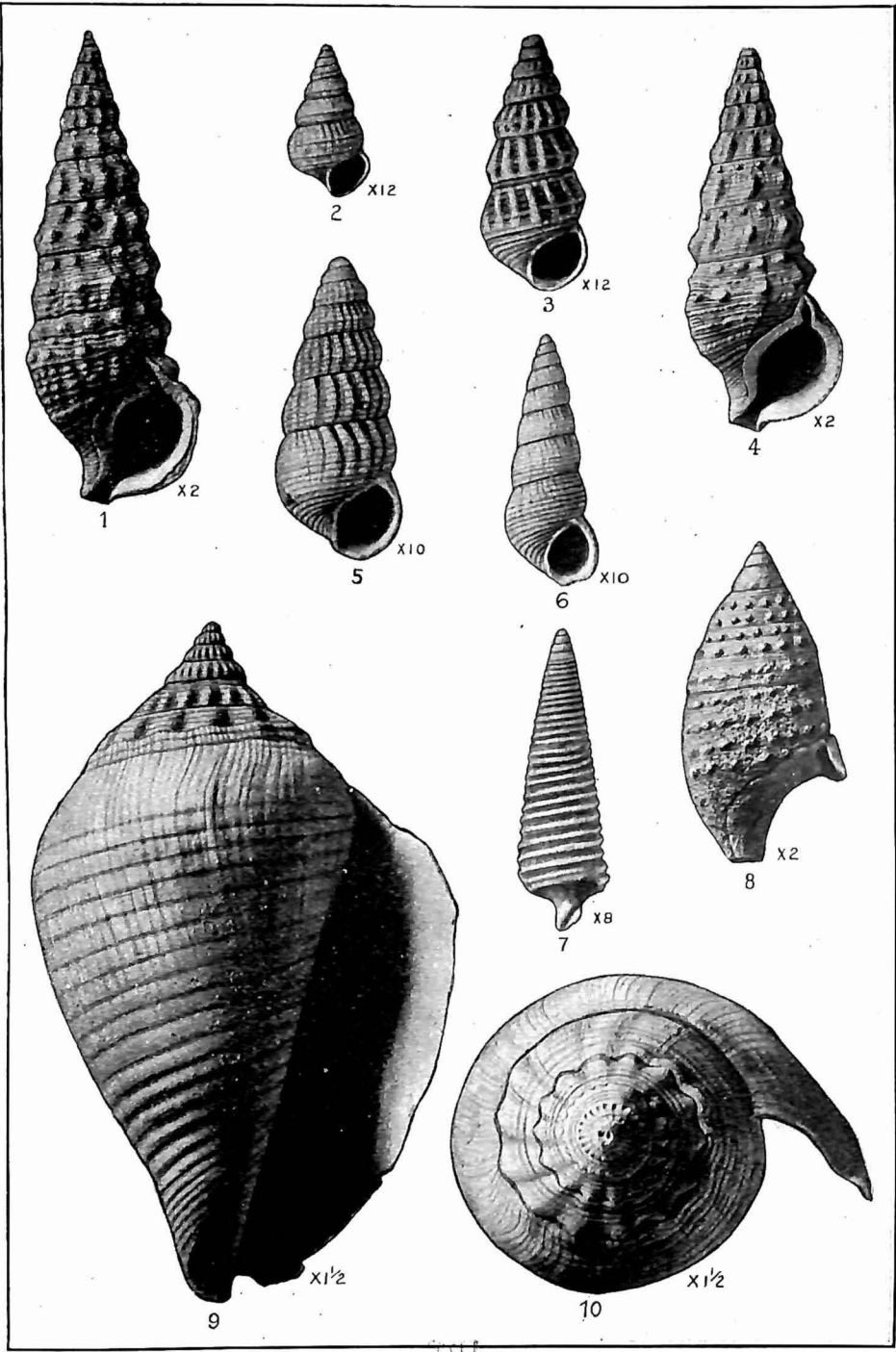


PLATE 14

FIGURES 1, 2, 3. *Modulus woodringi* Mansfield. n. sp.; type; altitude, 7 millimeters (p. 100).

4. *Serpulorbis granifera* (Say). Figured specimen from station 4993, well, 1 mile west of Holland, Leon County, Fla.; U. S. Nat. Mus. No. 370304 (p. 102).
5. *Caecum regulare* Carpenter. Figured specimen from station 3421, Harveys Creek, half a mile above abandoned mill, Leon County, Fla.; U. S. Nat. Mus. No. 370300; length, 2.5 millimeters (p. 102).
6. *Meioceras nitidum* (Stimpson). Figured specimen from station 3421, Harveys Creek, half a mile above abandoned mill, Leon County, Fla.; U. S. Nat. Mus. No. 370302; length, 2.2 millimeters (p. 102).
7. *Caecum cooperi* S. Smith. Figured specimen from station 3421, Harveys Creek, half a mile above abandoned mill, Leon County, Fla.; U. S. Nat. Mus. No. 370296; length, 2.6 millimeters (p. 101).
8. *Meioceras* sp. aff. *M. cingulatum* Dall. Figured specimen from station 3421, Harveys Creek, half a mile above abandoned mill, Leon County, Fla.; U. S. Nat. Mus. No. 370303; length, 2.2 millimeters (p. 102).
9. *Caecum floridanum compactum* Dall. Figured specimen from station 3421, Harveys Creek, half a mile above abandoned mill, Leon County, Fla.; U. S. Nat. Mus. No. 370298; length, 3.5 millimeters (p. 101).
10. *Petalconchus sculpturatus* H. C. Lea. Figured specimen from station 8862, near Clarksville, Calhoun County, Fla.; U. S. Nat. Mus. No. 370310; length, 43 millimeters (p. 104).
11. *Vermicularia spirata* (Philippi). Figured specimen from Harveys Creek, half a mile above abandoned mill, Leon County, Fla.; U. S. Nat. Mus. No. 370306 (p. 103).

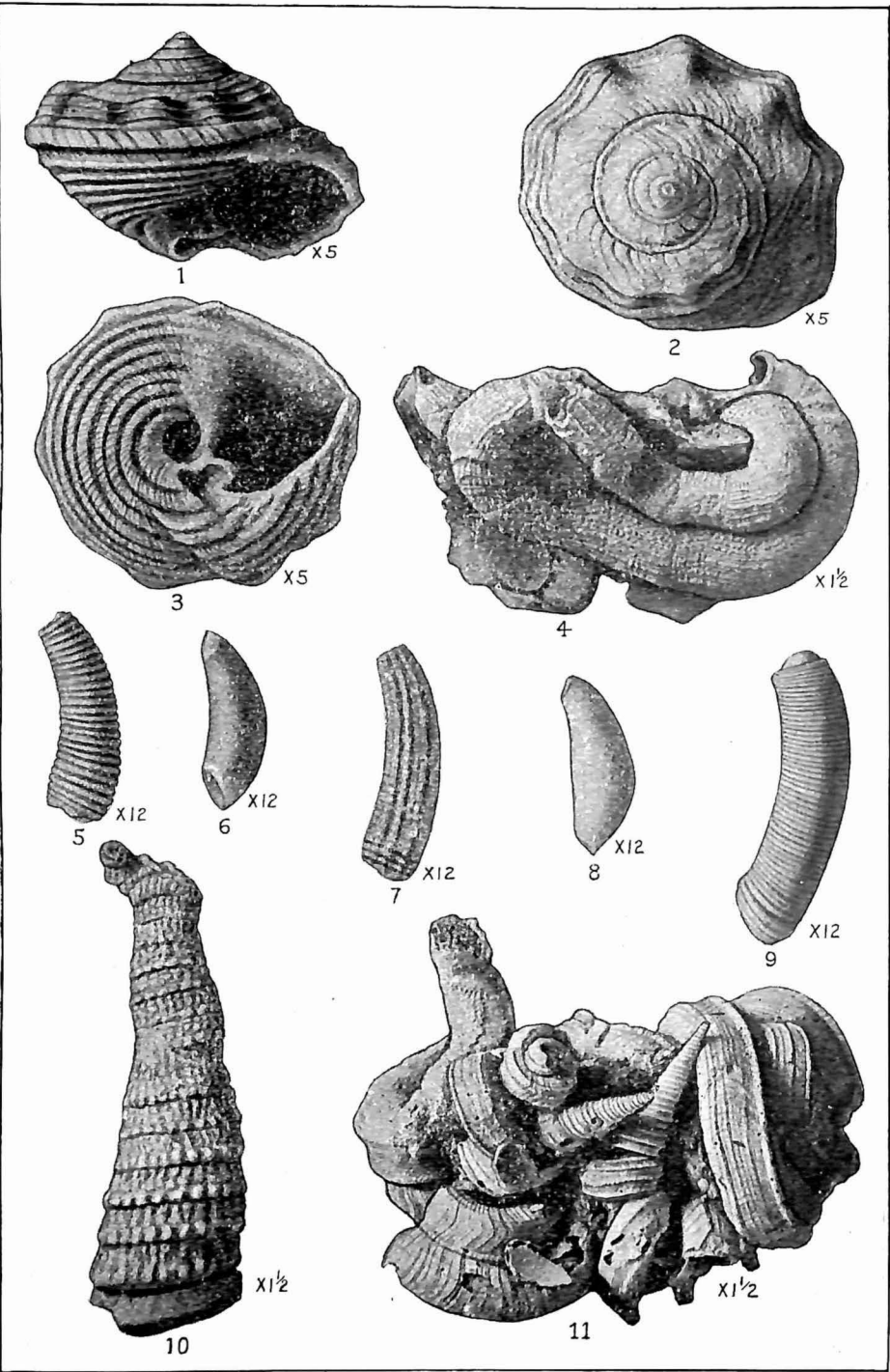


PLATE 15

- FIGURES 1, 2, 5. *Turritella alumensis* Mansfield, n. sp. (p. 105). 1, 2, cotypes. 1, altitude, 115 millimeters. 2, altitude, 66 millimeters. 5, paratype, showing early whorls; U. S. Nat. Mus. No. 370321.
3. *Turritella etiwanensis* (Tuomey and Holmes). Figured specimen from the borrow pit, near Jackson Bluff, Leon County; U. S. Nat. Mus. No. 370331; altitude, 100 millimeters (p. 106).
4. *Turritella alumensis gardnerae* Mansfield, n. subsp.; type; altitude, 52 millimeters (p. 106).
6. *Fossarus anomala floridana* Mansfield, n. subsp.; type; altitude, 1.7 millimeters (p. 112).
7. *Turritella duplinensis* Gardner and Aldrich. Figured specimen from station 3421, Harveys Creek, half a mile above abandoned mill, Leon County, Fla.; U. S. Nat. Mus. No. 370359; altitude, 27.5 millimeters (p. 108).
8. *Turritella subannulata jacksonensis* Mansfield, n. subsp.; type; altitude, 20 millimeters (p. 109).
9. *Turritella cookei clarksvillensis* Mansfield, n. subsp.; type; altitude, 40 millimeters (p. 108).

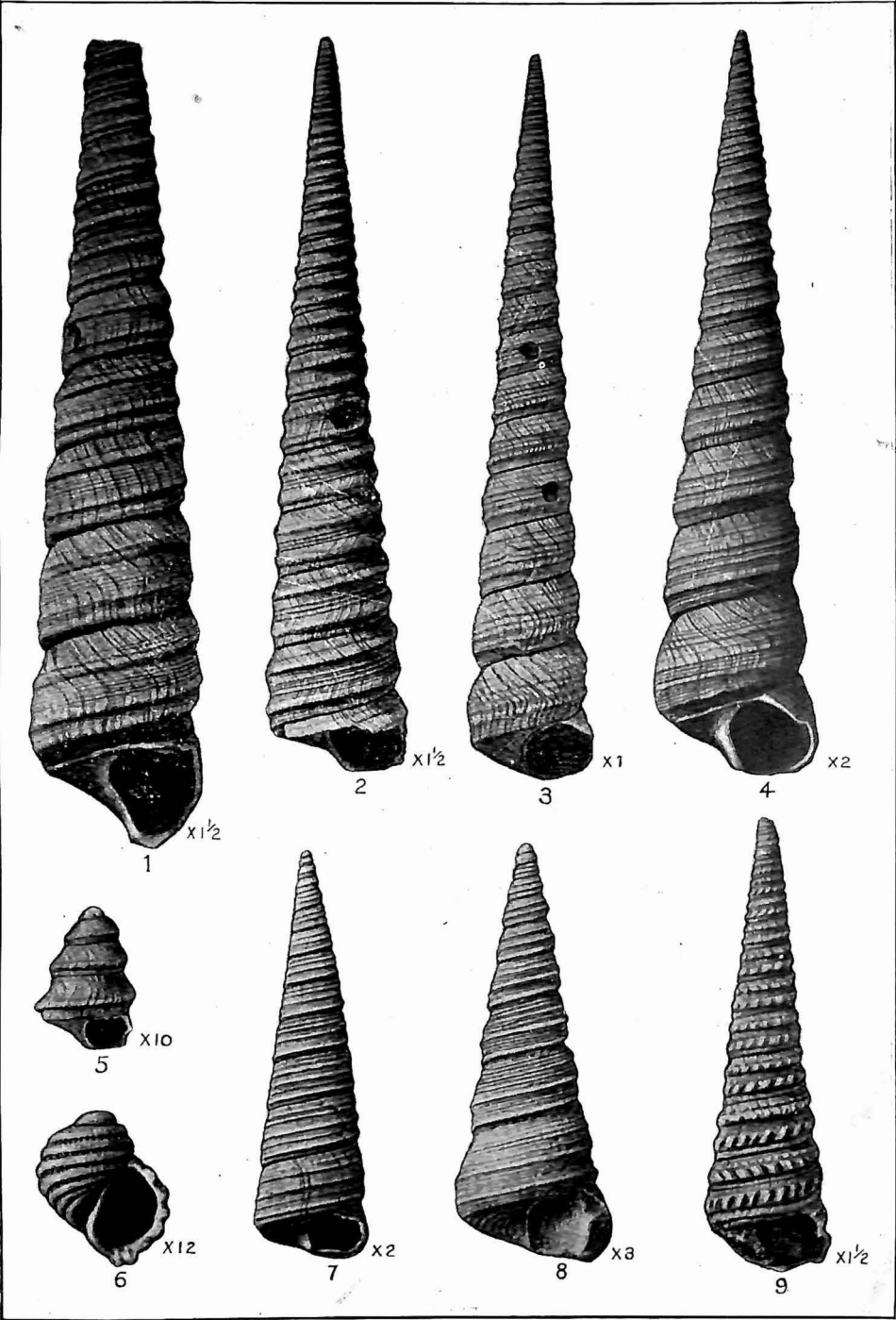


PLATE 16

- FIGURES 1, 10. *Turritella cookei* Mansfield, n. sp. (p. 107). 1, type; altitude, 85 millimeters. 10, paratype, showing early whorl on a specimen from Hamlin Pond, Washington County, Fla.; U. S. Nat. Mus. No. 370346 (p. 107).
- 2, 4. *Turritella cookei harveyensis* Mansfield, n. subsp. (p. 107). 4, type; altitude, 60 millimeters. 2, a larger specimen from borrow pit, near Jackson Bluff, Leon County, Fla.; U. S. Nat. Mus. No. 370353; altitude, 75 millimeters (p. 107).
3. *Turritella subannulata ochlockoneënsis* Mansfield, n. subsp.; type; altitude, 26 millimeters (p. 109).
- 5, 6. *Architectonica nupera watsonensis* Mansfield, n. subsp.; type (p. 111).
7. *Rissoina (Zebina) johnsoni* Dall. Figured specimen from station 3423, lower upper Miocene bed at Jackson Bluff, Leon County, Fla.; U. S. Nat. Mus. No. 370387; altitude, 4.5 millimeters (p. 113).
8. *Rissoina (Zebina) clarksvillensis* Mansfield, n. sp.; type; altitude, 5 millimeters (p. 113).
9. *Rissoina (Zebina) tersa* Mansfield, n. sp.; type; altitude, 3.2 millimeters (p. 113).

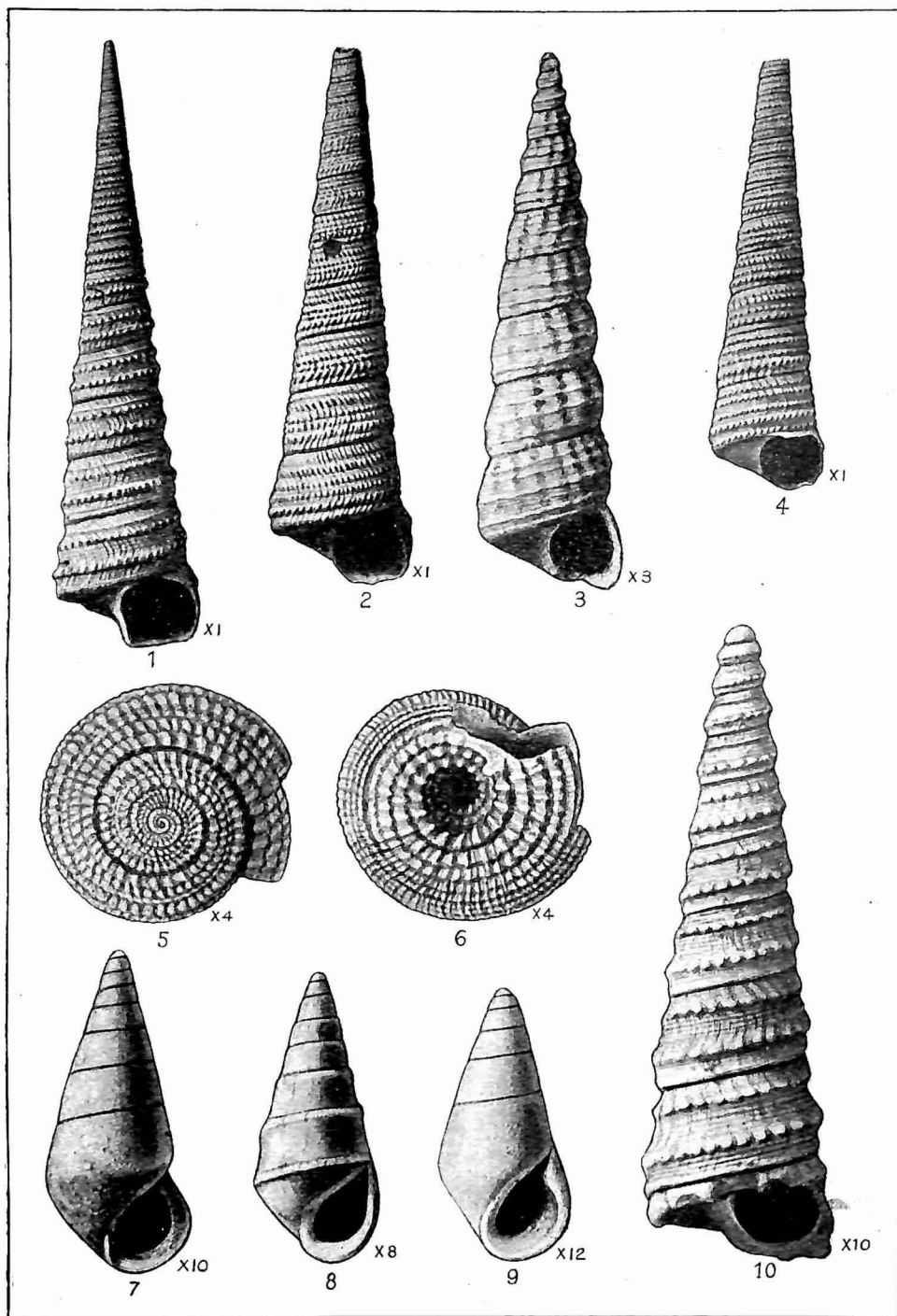


PLATE 17

FIGURE

1. *Ptychosalpinx laqueata* (Conrad). Figured specimen from station 2210, upper bed at Alum Bluff, Liberty County, Fla.; U. S. Nat. Mus. No. 124936; altitude, 42 millimeters (p. 72).
2. *Cancellaria propevenusta* Mansfield, n. sp.; type; altitude, 35 millimeters (p. 47).
3. *Dorsanum? plicatilum* (Böse). Figured specimen from Harveys Creek, half a mile above abandoned mill, Leon County, Fla.; U. S. Nat. Mus. No. 370135; altitude, 51 millimeters (p. 73).
4. *Peristernia filicata* (Conrad). Figured specimen from Hosford (formerly Coe's Mill), Liberty County, Fla.; U. S. Nat. Mus. No. 370084; altitude, 31 millimeters (p. 64).
5. *Solenosteira vughani* Dall. Figured type from Hosford (formerly Coe's Mill), Liberty County, Fla.; U. S. Nat. Mus. No. 109266; altitude, 32 millimeters (p. 70).
6. *Eupleura miocenica* Dall. Figured specimen from Darlings Slide, Chipola River, Calhoun County, Fla.; U. S. Nat. Mus. No. 370193; altitude, 25 millimeters (p. 85).
7. *Ephora quadricostata umbilicata* (Wagner). Figured specimen from station 2210, upper bed at Alum Bluff, Liberty County, Fla.; U. S. Nat. Mus. No. 112717; altitude, 55 millimeters (p. 70).
8. *Polinices (Dallitesta) coënsis* (Dall). Figured type from station 3671, Hosford (formerly Coe's Mill), Liberty County, Fla.; U. S. Nat. Mus. No. 109269; altitude, 25 millimeters (p. 124).
- 9a, 9b. *Tegula (Omphalius) exoleta* (Conrad). Figured specimen from Harveys Creek, half a mile above abandoned mill, Leon County, Fla.; U. S. Nat. Mus. No. 370485; altitude, 12 millimeters (p. 131).



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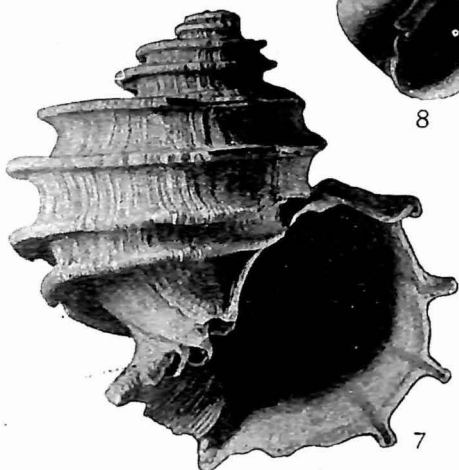
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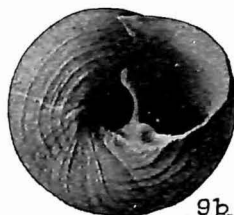
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9a



7



9b

PLATE 18

- FIGURES 1, 2. *Architectonica granulata* (Lamarck). Figured specimen from station 3421, Harveys Creek, half a mile above abandoned mill, Leon County, Fla.; U. S. Nat. Mus. No. 370373; diameter, 25 millimeters (p. 110).
- 3, 4. *Solariella vauhani* Mansfield, n. sp.; type; altitude, 10 millimeters (p. 130).
- 5, 6. *Xenophora delecta floridana* Mansfield, n. subsp.; type; altitude, 30 millimeters (p. 121).

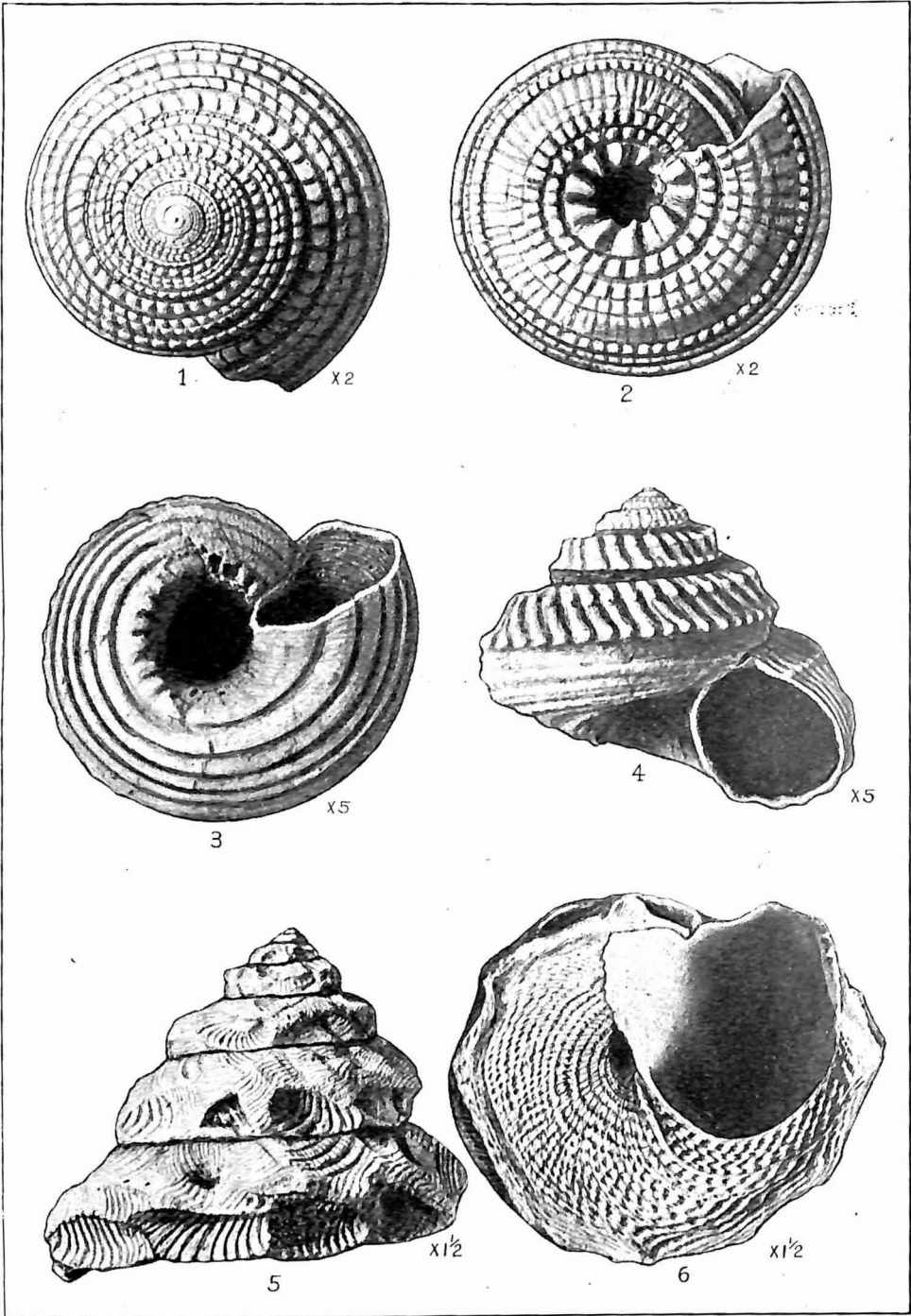


PLATE 19

- FIGURE**
1. *Polinices caroliniana* (Conrad). Figured specimen from borrow pit, near Jackson Bluff, Leon County, Fla.; U. S. Nat. Mus. No. 370473; altitude, 26 millimeters (p. 127).
 2. *Natica canrena* (Linnaeus). Figured specimen from Harveys Creek, half a mile above abandoned mill, Leon County, Fla.; U. S. Nat. Mus. No. 370443; altitude, 31 millimeters (p. 122).
 3. *Polinices* (*Neverita*) *duplicatus* (Say). Figured specimen from Harveys Creek, half a mile above abandoned mill, Leon County, Fla.; U. S. Nat. Mus. No. 370467; altitude, 23 millimeters (p. 126).
 4. *Tectonatica pusilla* (Say). Figured specimen from station 3421, Harveys Creek, half a mile above abandoned mill, Leon County, Fla.; U. S. Nat. Mus. No. 370447; altitude, 3 millimeters (p. 123).
 5. *Turbo castaneus crenulatus* Gmelin. Figured specimen from Harveys Creek, half a mile above abandoned mill, Leon County, Fla.; U. S. Nat. Mus. No. 370474; altitude, 21.5 millimeters (p. 127).
 6. *Polinices* (*Euspira*) *internus* (Say). Figured specimen from station 2210, upper bed at Alum Bluff, Liberty County, Fla.; U. S. Nat. Mus. No. 112713; altitude, 34 millimeters (p. 125).
 - 7, 10. *Calliostoma philanthropus pontoni* Mansfield, n. subsp.; type; altitude, 17 millimeters (p. 129).
 8. *Rissoa lipeus floridana* Mansfield, n. subsp.; type; altitude, 1 millimeter (p. 114).
 9. *Molleria duplinensis parva* Mansfield, n. subsp.; type; altitude, 0.8 millimeter (p. 128).
 - 11, 12. *Calliostoma aluminium* Dall; type; altitude, 10.5 millimeters; U. S. Nat. Mus. No. 113037 (p. 129).

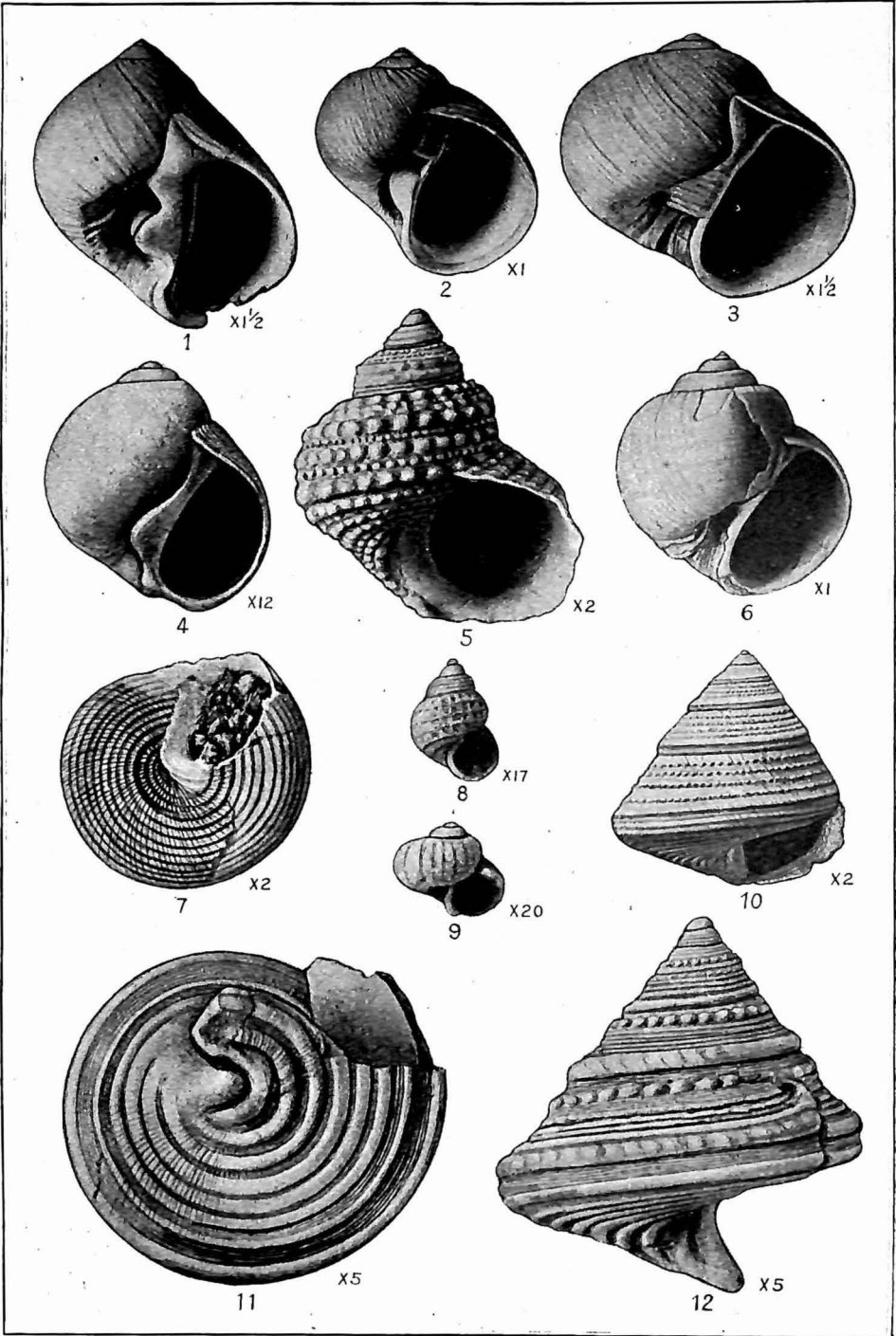


PLATE 20

- FIGURES 1, 2, 3. *Teinostoma nanum umbilicatum* (H. C. Lea). Figured specimen from station 8862, half a mile northeast of Clarksville, Calhoun County, Fla.; U. S. Nat. Mus. No. 370502; diameter, 1.9 millimeters (p. 134).
- 4, 5, 6. *Teinostoma harveyensis* Mansfield, n. sp.; type; diameter, 2.3 millimeters (p. 135).
- 7, 8, 9. *Teinostoma* (*Pseudorotella*?) *washingtonensis* Mansfield, n. sp.; type; diameter, 2.6 millimeters (p. 135).
- 10, 11, 12. *Teinostoma carinatum* (H. C. Lea). Figured specimen from station 8862, half a mile northeast of Clarksville. Calhoun County, Fla.; U. S. Nat. Mus. No. 370501; diameter, 1.8 millimeters (p. 134).
- 13, 14, 15. *Cyclostrema bartschi* Mansfield, n. sp.; type; diameter, 1 millimeter (p. 132).
- 16, 17, 18. *Circulus gunteri* Mansfield, n. sp.; type; diameter, 1.6 millimeters (p. 132).

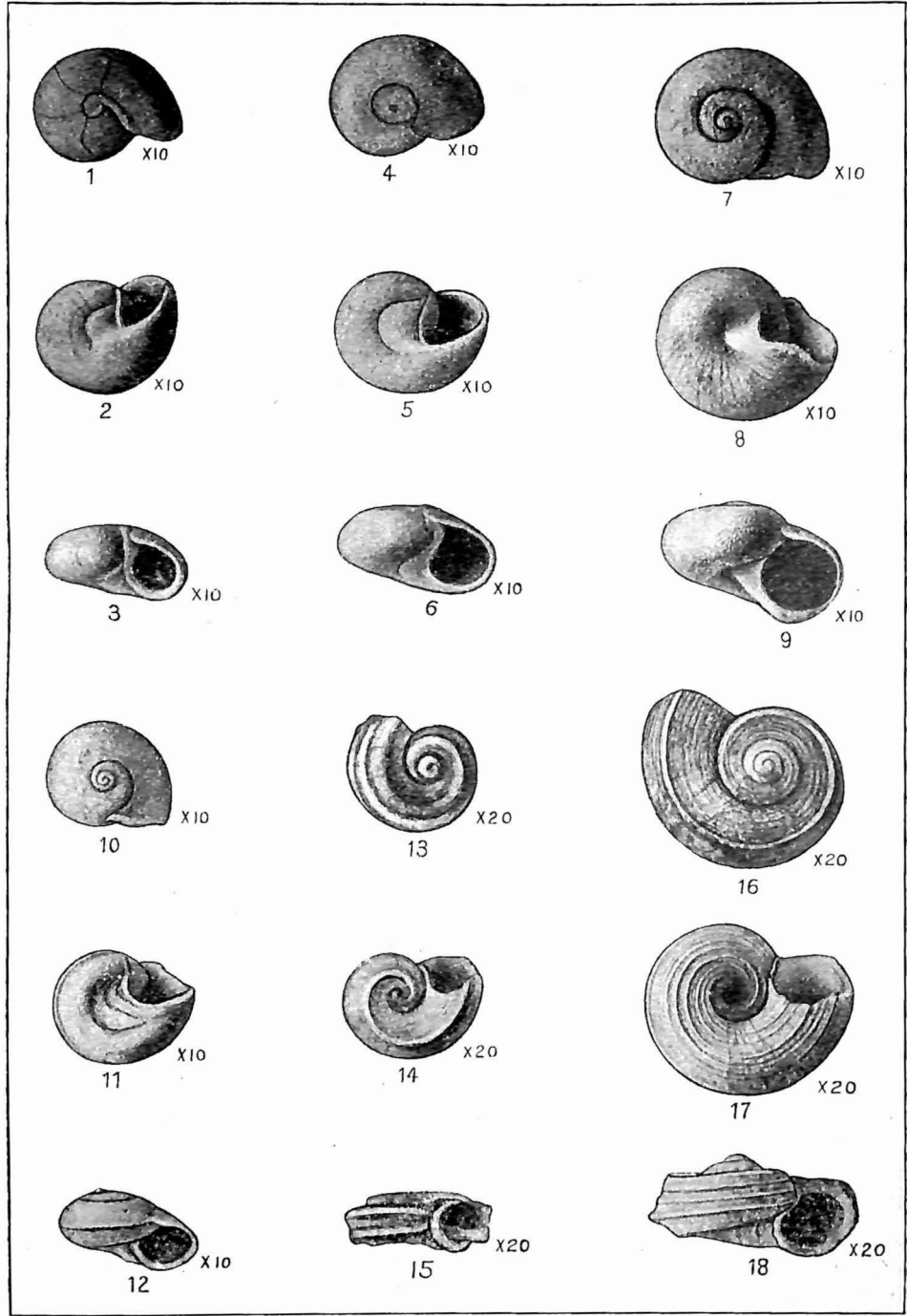
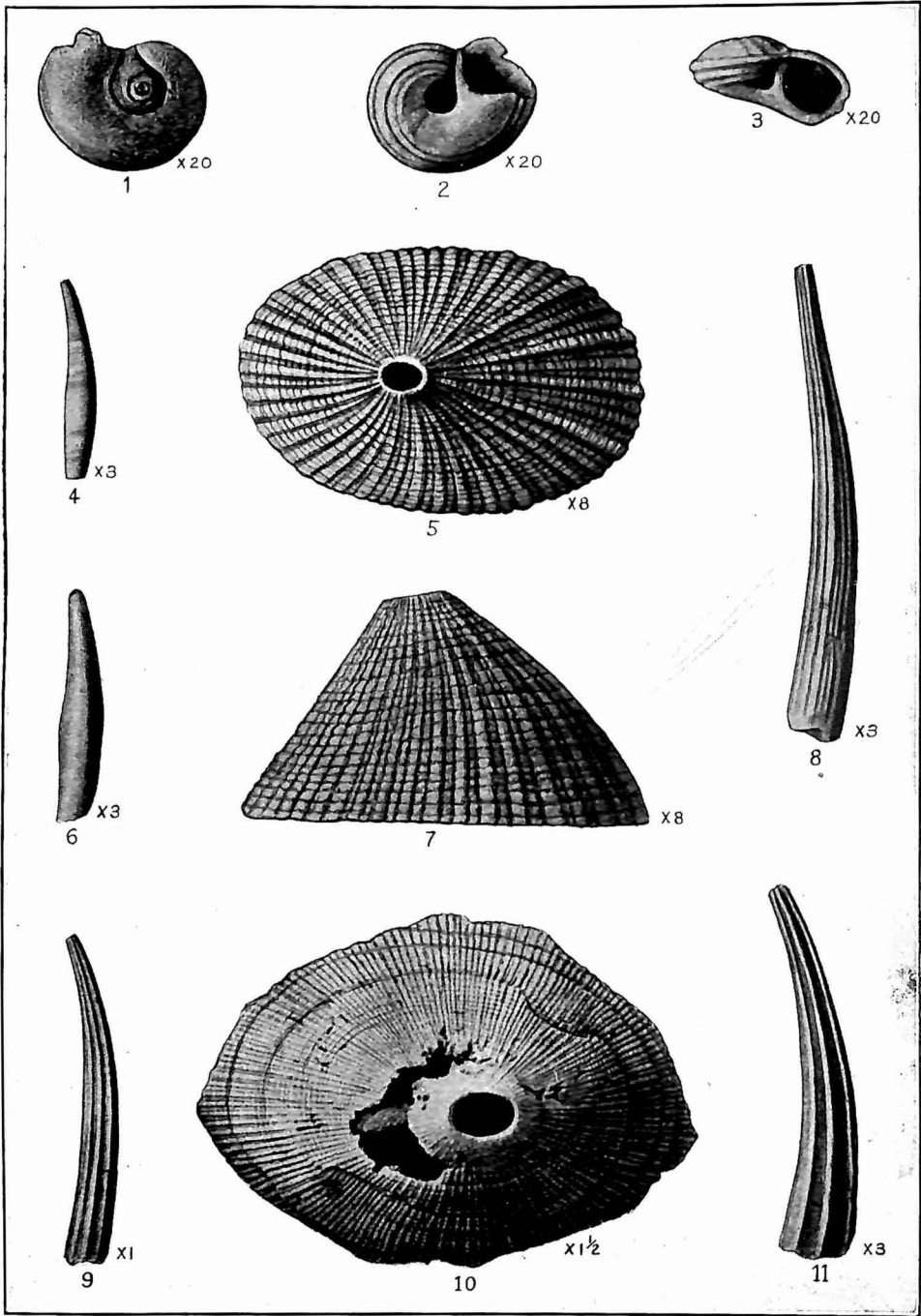


PLATE 21

- FIGURES 1, 2, 3. *Circulus? leonensis* Mansfield, n. sp.; type; diameter, 1.3 millimeters (p. 133).
4. *Cadulus thallus* (Conrad). Figured specimen from station 3421, Harveys Creek, half a mile above abandoned mill, Leon County, Fla.; U. S. Nat. Mus. No. 370555; length, 8.7 millimeters (p. 141).
- 5, 7. *Fissuridea nucula* Dall. Figured specimen from station 3421, Harveys Creek, half a mile above abandoned mill, Leon County, Fla.; U. S. Nat. Mus. No. 370516; altitude, 4.4 millimeters (p. 136).
6. *Cadulus floridanus* Dall. Figured topotype; length, 10.5 millimeters (p. 140).
8. *Dentalium disparile leonense* Mansfield, n. subsp.; type; length, 21.5 millimeters (p. 139).
- 9, 11. *Dentalium carolinense* Conrad. Figured specimens from station 2210, upper bed at Alum Bluff, Liberty County, Fla.; U. S. Nat. Mus. No. 112647 (p. 138). 9, length, 44 millimeters. 11, length, 17 millimeters.
10. *Fissuridea cattiliformis alumensis* Mansfield, n. subsp.; type; altitude, 16 millimeters (p. 137).



INDEX TO GENERA AND SUBGENERA

This index includes generic and subgeneric names only. The families are shown in the table of contents, and where there are two or more species of the same genus they are described on consecutive (seldom more than three) pages. The species and subspecies are all listed in systematic order on pages 20-24, and most of them are referred to in three other places, namely, in the introductory part (pp. 13-17), in the descriptive catalogue (pp. 25-142), and in the explanations of plates (pp. 143-185). Names in italics are synonyms; and numbers in italics refer to pages where an accepted generic name appears only as a synonym. Names of subgenera are in parenthesis.

A

Acmaturris 44-45, 148
Acteocina 17, 26-28, 144
Acteon 25-26, 144
Acus 31
Alabina 99-100, 168
Alectrion 16, 17, 76-79, 158, 160, 162, 164
Amnicola 122
 (*Amoea*) 88
Anachis 79-81, 160, 162
Anguinella 102
Arca 14, 15
Architectonica 110-111, 174, 178
Astarte (*Ashtarotha*) 14
Aurinia 16, 58-59, 152

B

Bellaspira 40
Brachycythara 43-44, 148
Buccinum 64, 72
Bullaria 30
Bullina 26
Busycon 16, 17, 66-69, 156, 158, 162

C

Cadulus 16, 140-142, 184
Caecum 101-102, 170
Calliostoma 16, 129-130, 180
Callyptrea 119, 120-121
Cancellaria 15-17, 46-50, 148, 150, 176
Cantharus 72, 160
Cassis 93
Cerithiopsis 96, 97
Cerithium 15, 17, 31, 96-98, 168
Circulus 132-134, 182, 184
 (*Chemnitzia*) 92
Chlorostoma 131
Clathrodrillia 36-39, 144, 146
Cominella 72, 73
Conus 17, 32-33, 144
Corbula 15

Crassispira 39-40, 146
Crepidula 115-118
Crucibulum 118-119
Crypta 115-117
Cyclostrema 132, 182
Cylichnella 28, 144
Cymatium 94, 166
Cymatosyrinx 33-36, 146
Cythara 44
Cypraea 94
Cypraelolina 58, 152

D

Dactylidella 53
Dactylus 51
 (*Dallitesta*) 124, 176
Dentalium 16, 137-141, 184
Diplodonta 14
 (*Dispotaea*) 119-120
Dolium 112
Dorsanum 17, 73, 176
Drillia 34-40, 46

E

Eephora 14, 15, 70-71, 176
Epitonium 16, 87-89, 166
Eupleura 16, 85-86, 164, 176
 (*Euspira*) 125

F

Fasciolaria 16, 17, 58, 59, 62-64, 154, 158
Ficus 93
Fissuridea 16, 136-137, 184
Fossarus 112, 172
Fulgur 66-69
Fusinus 65-66, 154
Fusus 64, 70

G

Galeodia 93
Glyphostoma 45, 148
 (*Graptacme*) 139

INDEX TO GENERA AND SUBGENERA

I

Infundibulum 120
(*Isapis*) 112

K

(*Kurtziella*) 42

L

(*Laevidentalium*) 140
Lathyrus, *Latirus*, 64
Leda 14, 15
(*Linatella*) 94
Lucina 15

M

Maculopeplum 59, 152
(*Mammillaria*) 127
Mangilia 41-43, 148
Marginella 17, 54-58, 150, 152
Meioceras 102, 170
Melanella 89-90, 166
Mitra 17, 60-62, 152
Modulus 15, 17, 100, 170
Molleria 128-129, 180
Monilia, *Monodonta*, 131
Murex 69, 83, 164
Muricidea 86-87, 164, 166
Myurella 30-31, 146

N

(*Narona*) 48-49
Natica 17, 122-123, (125-127), 180
(*Neocylindricus*) 51
Nerita 122
Neverita 124, 126, 180
Niso 91, 166

O

Oliva 51, 150
Olivella 51-54, 150
(*Omphalius*) 131, 176
Oxymuris 31

P

Patella 118
Peristernia 64, 176
Petalochonchus 104-105, 170
Phacoides 14
Phos 17, 74-75, 160, 162
(*Phosinella*) 114
Pleuroleucina 14
Pleurotoma 33, 36

Polinices 16, 17, 124-127, 176, 180

Polia 64

Polynices 126

(*Polyschides*) 141

(*Pseudorotella*) 135-136

Pterorhytis 83

Ptychosalpinx 16, 72-73, 176

Purpura 83-85, 164

Pyramidella 60, 92

(*Pyrgiscus*) 92-93

R

Ringicula 29, 144

Rissoa 114-115, 180

Rissoina 113-114, 174

Rotella 134

S

Scala, *Scalaria*, 88

Scapharca 14

Scaphella 59

Sconsia 93

Seila 96-97, 168

Serpula 102

Serpulorbis 102-103, 170

Solenosteira 17, 70, 176

Solariella 130-131, 178

Solarium 110

Strephona 51

(*Strioturbonilla*) 93

Strombiformis 90-91, 166

Strombina 17, 81-83, 166

Strombus 17, 95, 168

Sulcularia 27, 144

T

Tectonatica 123-124, 180

Tegula 131, 176

Teinostoma 16, 134, 182

Terebra 31

Tornatina 26

(*Trigonostoma*) 49-50

Triphora 95

Tritia 72, 73

Triton 94

Tuba 15

Turbo 17, 127-128, 131, 180

Turbonilla 92-93

Turris 33

Turritella 16, 17, 105-110, 172, 174

Typhis 83, 164

INDEX TO GENERA AND SUBGENERA

	U		X
Urosalpinx	86	Xenophora	17, 121-122, 178
	V		Z
Vasum	62	(Zebina)	113, 174
<i>Vermetus</i>	102-104		
Vermicularia	17, 103, 170		
<i>Voluta</i>	58-59		
(<i>Volutifusus</i>)	59		
<i>Volutomitra</i>	60		
<i>Volvaria</i>	26		
Volvula	28-29, 144		

Look up

Colinus A

Murex G

Murex pomum check it

Arca A

Purpura Marshalli check it

Busyon C

Arca B

Favosolaria A gigantea?

#54

Cerithium B 53 854 A

