

MIOCENE GASTROPODS AND SCAPHOPODS FROM TRINIDAD, BRITISH WEST INDIES¹

By WENDELL C. MANSFIELD

Of the United States Geological Survey

INTRODUCTION

The object of this paper is to describe some inadequately known Miocene gastropods and scaphopods from a few localities in Trinidad, British West Indies, and to determine, in so far as practicable, their stratigraphic position with respect to the standard section of the Atlantic and Gulf Coastal Plain and the West Indies.

PRINCIPAL PUBLICATIONS ON THE GEOLOGY AND PALEONTOLOGY OF TRINIDAD

WALL, G. P., and SAWKINS, J. G., Report on the Geology of Trinidad: London, 1860.

In the treatise on the descriptive geology the rocks are separated into three groups—Caribbean group, the Older Parian group, and the Newer Parian group. The Newer Parian group is again separated into five divisions or series, arranged in stratigraphic age sequence from the lowest up as follows: Nariva series, Naparima marl, Tamana or calcareous series, Caroni or Carbonaceous series, and Moruga or arenaceous series. The age of the Caribbean group is uncertain but is regarded as antedating the Older Parian; the Older Parian is tentatively assigned to the Lower Cretaceous; and the Newer Parian is questionably assigned to the Miocene. The geologic map accompanying the report is the only one now available.

Although some of the results outlined are not conclusive, the report is an admirable example of scientific work on pioneer geology in an area beset with many difficulties.

GUPPY, R. J., LECHMERE and DALL, W. H., Descriptions of Tertiary fossils from the Antillean region: U. S. Nat. Mus. Proc., vol. 19, No. 1110, pp. 303-331, 4 pls., 1896. In this publication fifteen new species of mollusks are described by Guppy from Trinidad.

Guppy was intensely interested in the geology of Trinidad as well as other areas, and his contributions to both paleontology and stratigraphy are a val-

¹ Dr. Carlotta Joaquina Maury's paper "A further contribution to the Paleontology of Trinidad" (Miocene horizons), published as Bulletin 42 of American Paleontology, volume 10, appeared while my paper was in corrected page-proof form and in the hands of the editor; consequently the page proof was recalled and necessary revisions made.

The principal revisions consisted in the substitution of nine names of Doctor Maury's species for the names of the same forms which I had described as new, but retained my own descriptions. References to her descriptions were inserted in the synonymy.

The "Outline of results" in my paper was not changed. In this connection, however, Doctor Maury has placed in the lower Miocene the fauna at Brasso Creek, which I infer is the locality represented by my station numbers 8302 and 9212, and at Guaiaca-Tamana Road, thirteenth milepost, which appears to be the locality represented by my station 9219; the former she referred to the Manzanilla Miocene and the latter to the stratigraphically lower Machapoorie Miocene. Doctor Maury's interpretation of the age of the faunas, based on her study of both the gastropods and the pelecypods, suggests to me a stronger probability that the fauna at my station 9219, and perhaps some of the possibly mixed faunas from the stream wash 1 mile south of Brasso, belong to the lower Miocene, though I regard the fauna at station 9219 as a little higher stratigraphically than that at Machapoorie Quarry.

uable asset to geology. For about half a century he investigated and reported upon the fossil faunas of Trinidad, Tobago, Antigua, Jamaica, and other Antillean islands. In this paper references pertinent to the text are made to some of his publications. Dr. G. D. Harris² has published a reprint of Guppy's more inaccessible paleontological writings.

MAURY, C. J., A contribution to the Paleontology of Trinidad: Acad. Nat. Sci., Phila. Journ., vol. 15, 2d ser., pp. 23-112, 9 pls., 1912.

"The specimens were collected from Tertiary beds at Brighton, on the Island of Trinidad, and from the small outlying islets, Soldado and Farallon Rocks. A few are also included from Cretaceous shales and Pleistocene raised beaches, both on the opposite Venezuelan mainland."

None of the species occurring in the above deposits were found in the material examined for my report.

A number of other writers have contributed valuable information to the geology and paleontology of Trinidad, and their names should be included in a complete bibliography.

Fossils studied.—Most of the fossils studied were collected by F. W. Penny and J. A. Bullbrook. The localities of the fossil collections are distributed through the east and west-central part of the island in a narrow area on the north slope of the Central Mountain Range. The gastropod fauna is meager from all localities except that obtained from a flood-wash in the vicinity of Brasso.

Many of Guppy's type specimens from Trinidad are deposited in the United States National Museum and were found useful for comparison.

Outline of results.—As the molluscan fauna is poorly represented in most instances, the study of the other organisms and a knowledge of the field relations of these faunal deposits are essential to accurately construct the local stratigraphic column and to correlate its units with outside deposits.

For this reason I have only tentatively assigned the groups of fossils to positions in the stratigraphic column. I have endeavored, when possible, to determine the nearest relative of the species studied in outside deposits.

A general outline of results is about as follows:

All the faunas considered in this paper are believed to be Miocene.

The fauna at station 8301, Machapoorie Quarry, and at station 8299, Cumuto Road, 17 miles, is believed to be the oldest and is referred to the lower Miocene.

The fauna collected from the flood-wash in the vicinity of Brasso is very similar to that at station 9219, Guaico-Tamana Road, 2 chains east of mile 13, is stratigraphically higher than that at Machapoorie Quarry, and is tentatively referred either to the upper part of the lower Miocene or to the lower part of the middle Miocene.

The bed from which the specimens collected on the Manzanillan coast were obtained is not stated on the labels, but certain species indicate a middle Miocene age rather than older.

² Harris, G. D., Bull. Amer. Paleont., vol. 8, pp. 149-346, 1921.

The fauna at Springvale is believed to be much younger than that in the Brasso beds and is assigned to the upper Miocene.

LIST OF LOCALITIES AND FOSSILS

LOWER MIOCENE

List of stations

8299. (Loc. 3) Caroni County, San Rafael Ward, Cumuto Road, 17 miles from the Eastern Main Road (61° 13' 25" W.; 10° 28' 30" N.). F. W. Penny, collector.

8301. (Loc. 5) Nariva County, Charuma Ward, Machapoorie Quarry (61° 14' 35" W.; 10° 27' 25" N.). F. W. Penny and J. A. Bullbrook, collectors.

The gastropod fauna at the above two stations shows close relationship and is believed to be the oldest fauna studied, the age of which strongly indicates lower Miocene.

Turritella machapoorensis Maury, is closely related to *T. tampae*; and *T. caparonis* Maury, is closely related to *T. chipolana*. *Amauropsis trinitatensis*, new species, resembles an Anguilla form; *Modulus tamanensis* Maury (a much larger form also occurs at station 9219) is related to *M. wilcozii*, a Chipola species.

Faunal list

	Stations		Remarks
	8299	8301; 9220	
<i>Cypraea trinitatensis</i> , new species.....	×		
<i>Modulus tamanensis</i> Maury.....		×	Closely related to <i>M. wilcozii</i> Dall (Chipola). Also at sta. 9219.
<i>Turritella machapoorensis</i> Maury.....	×	×	Aff. <i>T. tampae</i> Heilprin (The "silex beds" of the Tampa formation, Florida).
<i>Turritella caparonis</i> Maury.....		×	Aff. <i>T. chipolana</i> Dall.
<i>Turritella</i> aff. <i>T. perattenuata praecellens</i> Pilsbry and Brown.....		×	
<i>Amauropsis trinitatensis</i> , new species.....	×		Resembles an undescribed form from Anguilla.
<i>Calliostoma atrina</i> , new species.....	×		
<i>Liotia machapoorensis</i> , new species.....		×	
<i>Mostly poorly preserved specimens</i>			
<i>Conus</i> , species.....		×	
<i>Ancilla</i> , species.....		×	
<i>Clava</i> , species.....		×	
<i>Cerithium</i> , 2 species.....		×	
<i>Serpulorbis</i> , species.....		×	
<i>Natica</i> , species.....		×	
<i>Sinum</i> , species.....		×	
<i>Eunaticina</i> , species.....		×	
<i>Dentalium</i> , species.....		×	

MIDDLE OR LOWER MIOCENE

List of stations

9027. Caroni County, Montserrat Ward, Brasso-Gran Couva Road, 100-200 yards west of Brasso. Fossiliferous clay immediately overlying *Turritella*-bearing limestone. J. A. Bullbrook, collector.

9196. Caroni County, Montserrat Ward, junction of Gran Couva and Brasso-Tabaquite roads. J. A. Bullbrook, collector.

9215. Caroni County, Montserrat Ward, Brasso railway station. Steam wash. J. A. Bullbrook, collector.

8302. (Loc. 6.) Caroni County, Montserrat Ward, 1 mile south of Brasso railway station (61° 19' 18" W.; 10° 23' 45" N.). Flood-wash from stream bank. F. W. Penny, collector.

9212. About one mile south of Brasso. Flood-wash from stream. J. A. Bullbrook, collector. (Same locality as 8302 but later collection.)
9219. St. Andrew County, Turure Ward, Guaico-Tamana Road, 2 chains east of mile 13 from junction with Eastern Main Road at Guaico railway station, Brasso clays. J. A. Bullbrook, collector.
8300. (Loc. 4.) Caroni County, San Rafael Ward, Four Roads Quarry (61° 12' 55" W.; 10° 28' 55" N.). F. W. Penny, collector. Also a later collection from the same quarry obtained by J. A. Bullbrook.

Faunal list

	Stations							Remarks
	9027	9212	8302	9215	9219	8300	9196	
Mollusca:								
<i>Ringicula</i> aff. <i>R. tridentata</i> Guppy.	×	---	---	---	---	---	---	
<i>Terebra (Strioterebra) trinitatensis</i> , new species.	---	×	---	---	---	---	---	
<i>Terebra (Strioterebra) brassoensis</i> , new species.	---	×	---	---	---	---	---	
<i>Conus trinitatensis</i> , new species.	---	---	---	---	×	---	---	Somewhat similar to a Shoal River, Fla., form.
<i>Conus multiliratus walli</i> , new subspecies.	---	×	---	---	×	---	---	<i>C. multiliratus</i> more characteristic of middle Miocene.
<i>Turris brassoensis</i> , new species.	---	×	×	---	---	---	---	Similar to a new species from the Shoal River marl member of the Alum Bluff formation.
<i>Turris vaningeni</i> var. <i>machaoporensis</i> (Maury).	---	---	---	---	×	---	---	
<i>Drillia consors bullbrooki</i> , new subspecies.	---	---	---	---	×	---	---	Apparently occurs in Baitoa formation, Dominican Republic.
<i>Drillia consors trinitatensis</i> , new subspecies.	---	×	---	---	---	---	---	Very similar to <i>Pleurotoma alisedota</i> var. <i>magna</i> Böse.
<i>Drillia pennyi</i> , new species.	---	×	×	---	---	---	---	
<i>Drillia pennyi acaria</i> , new subspecies.	---	×	---	---	---	---	---	
<i>Drillia tridatina</i> , new species.	---	×	×	---	---	---	---	
<i>Drillia daditrina</i> , new species.	---	×	---	---	---	---	---	
<i>Drillia propefusiformis</i> , new species.	---	---	---	---	×	---	---	Somewhat similar to <i>D. senaria</i> Woodring (Ms.) Bowden.
<i>Drillia inniada</i> , new species.	---	×	×	---	---	---	---	Aff. <i>D. fusiformis</i> (Gabb) from Gurabo formation, Dominican Republic.
<i>Drillia nitrina</i> , new species.	---	×	---	---	---	---	---	
<i>Drillia niadrina</i> , new species.	---	×	---	---	---	---	---	
<i>Drillia inadrino</i> , new species.	---	×	×	---	---	---	---	
<i>Glyphostoma caronensis</i> , new species.	---	×	---	---	---	---	---	
<i>Glyphostoma (?) triniada</i> , new species.	---	×	---	---	---	---	---	
<i>Glyphostoma amieta rintriada</i> , new subspecies.	---	---	×	---	---	---	---	<i>Glyphostoma amieta</i> (Guppy) is a Bowden species.
<i>Glyphostoma (?) adrina</i> , new species.	---	×	×	---	---	---	---	
<i>Microdrillia trina</i> , new species.	---	×	---	---	---	---	---	Similar to a form from Monkey Hill, Panama, and to a Chipola species.
<i>Microdrillia propetrina</i> , new species.	---	---	×	---	---	---	---	
<i>Borsonia (Paraborsonia) brassoensis</i> , new species.	---	×	---	---	---	---	---	Similar to <i>Borsonia varicosa</i> (Sowerby).
<i>Cancellaria bullbrooki</i> , new species.	---	---	---	---	×	---	---	
<i>Ancilla paralamellata</i> , new species.	---	×	---	---	---	---	---	
<i>Ancilla brassica</i> Maury.	---	---	---	---	×	---	---	
<i>Marginella (Faba) bullbrooki</i> , new species.	---	×	×	---	---	---	---	
<i>Marginella (Faba) brassoensis</i> , new species.	?	×	×	---	---	---	---	
<i>Marginella guaica</i> Maury.	---	×	---	---	×	---	---	Resembles <i>M. sowerbyi</i> Gabb from Cerado and Gurabo formations, Dominican Republic.
<i>Marginella solitaria montserratensis</i> , new subspecies.	---	---	×	---	---	---	---	<i>M. solitaria</i> Guppy is from Point-à-Pierre.
<i>Marginella (Closia) nitrina</i> , new species.	---	---	×	---	---	---	---	Resembles <i>M. oculiformis</i> Orbigny, Pliocene to Recent.

Faunal list—Continued

	Stations							Remarks
	9027	9212	8302	9215	9219	8300	9196	
Mollusca—Continued.								
<i>Marginella (Gibberula) trinitatensis</i> , new species.		×						Somewhat resembles <i>M. cercadensis</i> Maury, Cercado.
<i>Vezillum bristolii</i> (Maury)		×						Aff. <i>Vezillum tortuosellum</i> (P. & J.) from Dominican Republic.
<i>Phos bullbrooki</i> , new species.					×			
<i>Phos trinitatensis</i> , new species.		×			×			Very close to 5883e near basal section at Bananito River, Costa Rica.
<i>Alectrion brassoënsis</i> , new species		×	×					Aff. <i>A. cercadensis</i> Maury, Cercado formation.
<i>Metulella caronensis</i> , new species		×						Resembles <i>S. costaricensis</i> Olsson from Gatun formation.
<i>Strombina walli</i> , new species.		×	×					Resembles <i>S. chiriquiensis</i> Olsson, Gatun formation, also <i>S. pseudohaitiensis</i> Maury, Cercado formation.
<i>Typhis sawkinsi</i> , new species					×			Recalls <i>T. gabbi</i> B. & P., Gatun, Panama.
<i>Modulus tamanensis</i> Maury.					×			Closely related to <i>M. wilcoxi</i> Dall, Chipola.
<i>Caecum propretulare</i> , new species			×					Closely resembles a form from Shoal River, Fla.
<i>Turritella gatunensis caronensis</i> , new subspecies.		×	×	×				<i>T. gatunensis</i> referred to Gatun formation, Panama and Costa Rica
<i>Turritella</i> sp. aff. <i>T. altilira</i> var. <i>chiriquiensis</i> Olsson.		×	×	×	×			Reported by Olsson from Gatun formation in Panama and Costa Rica.
<i>Turritella montserratensis</i> , new species.							×	Resembles <i>T. altilira costaricensis</i> Olsson, Gatun.
<i>Turritella</i> cf. <i>T. altilira</i> Conrad (typical).		×		(?)		×		
<i>Natica canrena</i> (Linnaeus)	×		×		×		×	
<i>Calliostoma rhombotum</i> , new species.		×						
<i>Trinostoma caronensis</i> , new species.	×							
<i>Adeorbis guppyi</i> , new species		×						
<i>Cadulus caronensis</i> , new species		×	×					Recalls an Eocene sp. <i>C. abruptus</i> Meyer and Aldrich.
<i>Dentalium cossmannianum</i> Pilsbry and Sharp?			×					
Genera either poorly preserved or require a specialized study to determine their specific relationship								
<i>Olivella</i> , 2 species (yo.)		×	×					
<i>Mitra</i> , species (yo.)		×			×			
<i>Strombina</i> , species (yo.)			×					
<i>Strombina</i> , species (frag.)		×						
<i>Typhis</i> , species (frag.)		×	×	×	×			
<i>Epitonium</i> , species (yo.)		×	×					
<i>Acrilla</i> , species (frag.)		×	×					
<i>Melanella</i> , species		×	×					
<i>Turbonilla</i> , several species.		×	×					
<i>Pyramidella</i> , several species.		×	×					
<i>Ostomia</i> , species		×						
<i>Strombus</i> (frag.)					×			
<i>Cerithium</i> , species						×		
<i>Clara</i> , species (yo.)		×						
<i>Bittium</i> , 2 species		×						
<i>Serpulorbis</i> , species (frag.)		×						
<i>Rissoina</i> , species		×						
<i>Calyptrea</i> , species		×						
<i>Architectonica</i> , species (yo.)		×	×					
<i>Bryozoa</i> ¹								
<i>Cupularia umbellata</i> DeFrance		×			×			
<i>Cupuladria canariensis</i> Busk		×						
Crustacea ²								
<i>Callinectes</i> , species		×						
<i>Thaumastoplax prima</i> Rathbun				×				Described from station 6020a. Lower part of the upper half of Culebra formation, Panama.

¹ Identified by Dr. Ray Bassler, of the U. S. National Museum.² Identified by Dr. Mary J. Rathbun, of the U. S. National Museum.

The fauna listed above at stations 9027, 9196, and 8300 is represented by only a few species and its relationship to the larger fauna at the other stations is uncertain. That at 9027 and 9196 indicates a little higher stratigraphic position. About one-half the species at station 9219 are represented in the collection from the flood-wash near Brasso—stations 8302, 9212, and 9215—and its fauna indicates the same stratigraphic horizon to some part if not the whole of these beds. The material from the flood-wash may represent the assemblage of species from more than one stratum or perhaps horizon. Some of the species from station 9219 and from the flood-wash at Brasso indicate a horizon a little lower stratigraphically than that of the Bowden marl of Jamaica or that of the Gurabo formation of the Dominican Republic, but others are closely related to species in those formations. Consequently this fauna may have lived either during the latter part of the lower Miocene or the early part of the middle Miocene.

The following species apparently show a close relationship to the Bowden and Gurabo formations—now referred to the middle Miocene:

Conus multiliratus, subspecies *walli*, new subspecies. *Conus multiliratus* is more characteristic of the middle Miocene.

Drillia propefusiformis, new species.

Glyphostoma amicta rintriada, new subspecies. *Glyphostoma amicta* is a Bowden species.

Phos trinitatenses, new species. In Costa Rica a very similar form is found in a fauna carrying *Sconsia laevigata*.

Species related to species now referred to the lower Miocene are:

Turris brassocensis, new species—very close to a species in the Shoal River marl member of the Alum Bluff formation, Florida.

Drillia consors bullbrooki, new subspecies. Apparently the same form occurs in the Baitoa formation, D. R.

Microdrillia trina, new species. Related to a Chipola species.

Marginella trinitatensis, new species. Resembles *M. cercadensis* Maury, Cercado formation.

Vexillum bristoli (Maury). Related to a Chipola species.

Alectrion brassocensis, new species. Aff. *A. cercadensis* Maury, Cercado formation, D. R.

Strombina walli, new species. Resembles *pseudohaitensis* Maury from Cercado formation.

Modulus tamaucensis Maury. Aff. *M. wilcoxi* Dall from the Chipola marl member of the Alum Bluff formation. Also occurs at Machapoorie Quarry.

Thaumatoplax prima Rathbun. Type from Culebra formation, Panama.

FAUNA FROM MANZANILLA COAST

Station and faunal list

9197. St. Andrew County, Manzanilla Ward, Manzanilla Coast. J. A. Bullbrook, collector. (The matrix adhering to the specimens is indicated as follows: (a) ferruginous matrix; (b) gray sandy matrix; (c) indurated gray matrix.)

- a. *Conus manzanillaensis*, new species. Resembles in a general way an unpublished species from the Paitoa and Cercado formation, D. R., but with a different type of nucleus.
- c. *Turricula* (?), species, indeterminable. In a general way, resembles *Surcula vicksburgensis* Casey (Oligocene).
- e. *Drillia manzanillaensis*, new species.
- a. *Aneilla lamellata* (Guppy).
- c. *Marginella guppyana*, new species.
- b. (?) *Alectrion brassoensis*, new species.
- Bryozoa.
- Microporella*, species.

Guppy's types from Manzanilla not in the above list:

Cylichnella ovum-lacerti (Guppy).

- a. *Leda guppyi* Dall (*Cercomya ladaeformis* Guppy) aff. *L. dalliana* Olsson. Gatun formation, Port Limon. A closely allied form occurs at Brasso (9212).
- a. *Leda illectu* Guppy, aff. *L. Guppyi* but with finer concentric sculpture.
- b. *Arca trinitaria* Guppy. Group of *A. macdonaldi* Dall, Gatun.
- b. *Arca flicata* Guppy. Group of *A. pittieri* Dall, Gatun.
- a. *Cardium castum* Guppy. Badly eroded specimens. Perhaps nearer to a Bowden form.
- Dosinia cyclica* Guppy. A *Lucinopsis* according to Dall (U.S.N.M. Proc., vol. 19, p. 329, 1896). Specimen not seen.
- a. *Venus walli* Guppy. (A *Chione*), aff. *C. chipolana* Dall, from Chipola marl member of Alum Bluff formation.
- a. *Corbula vieta* Guppy. Close to *C. heterogena* Dall. A Bowden species.
- a. *Erycina tensa* Guppy—probably the left valve of *Corbula vieta* Guppy.
- a. *Mactrinula muccescens* Guppy=*Mactra* (*Mactrotoma*). Closely related to *Mactra* (*Mactrotoma*) *cymata* Dall from the Oak Grove sand member of Alum Bluff formation.

The matrix adhering to the specimens indicates that they came from several different beds. Wall and Sawkins³ in their detailed sections—sheet 2, figure 1—show different fossiliferous beds along the coast above Manzanilla Point. I do not know the stratigraphic position of the fossils listed from Manzanilla coast. *Arca trinitaria* Guppy and *Arca flicata* Guppy are closely related to species probably of middle Miocene age in Costa Rica. It appears highly probable that some of the beds in this area are of middle Miocene age.

UPPER MIOCENE

List of stations

9195. Caroni County, Couva Ward, Springvale, near Couva, Mount Pleasant Road, about $\frac{3}{4}$ to 1 mile south of Milton. J. A. Bullbrook, collector.
9224. Caroni County, Couva Ward, Springvale, same locality as 9195 but later collection. J. A. Bullbrook, collector.

³ Report on the Geology of Trinidad, 1860.

Faunal list

	9195	9224	
Mollusca:			
<i>Conus springvaleensis</i> , new species.....	×	-----	Resembles <i>C. chipolanus</i> Dall in a general way.
<i>Turricula springvaleensis</i> , new species.....	×	-----	Suggests <i>T. lavinoides</i> Olsson, Gatun formation, Banana River, Costa Rica.
<i>Drillia</i> aff. <i>D. riogurabonis</i> Maury.....	-----	×	
<i>Oliva cylindrica</i> Sowerby.....	×	-----	
<i>Pseudoliva guppyi</i> , new species.....	-----	×	
<i>Cancellaria springvaleensis</i> , new species.....	×	-----	Resembles an unpublished form from the Chipola marl member of Alum Bluff formation of Florida.
<i>Ancilla caroniana</i> Maury.....	×	-----	
<i>Ancilla caroniana springvalensis</i> , new subspecies.....	×	-----	
<i>Marginella springvalensis</i> Maury.....	×	-----	Recalls <i>M. aurora</i> Dall-Chipola marl.
<i>Marginella calypsonis</i> Maury.....	×	-----	Similar to <i>M. macdonaldi</i> Dall, Miocene, Costa Rica, and <i>M. cincta</i> , a Recent species.
<i>Marginella</i> (<i>Closia</i>) <i>lachrimula</i> Gould?	-----	×	The species reported, Miocene to Recent.
<i>Marginella</i> (<i>Persicula</i>) <i>propobesa</i> , new species.....	×	-----	
<i>Mitra longa</i> var. <i>covensis</i> Maury.....	×	-----	
<i>Solenosteira semiglobosa</i> Guppy.....	×	-----	Closer related to a Miocene than Recent species.
<i>Turbonilla</i> , species.....	-----	×	
<i>Bittium</i> , species.....	-----	×	
<i>Vermicularia</i> , species.....	×	×	Resembles a Recent species of the West coast.
<i>Petalocochus alcinus</i> , new species.....	×	-----	
<i>Turritella planigyrate</i> Guppy.....	×	-----	
<i>Natica youngi</i> Maury.....	×	-----	
<i>Natica canrena</i> (Linnaeus).....	×	-----	
<i>Fissuridea</i> , species.....	-----	×	
Described from Springvale:			
<i>Capulus effluens</i> Guppy (not figured).....	-----	-----	Specimen not seen.
<i>Solenosteira cochlearis</i> Guppy.....	-----	-----	Do.
<i>Raeta meridionalis</i> Guppy.....	-----	-----	Do.
Bryozoa: ¹			
<i>Cupularia umbellata</i> DeFrance.....	-----	×	
<i>Cupuladria canariensis</i> Bush.....	-----	×	
<i>Acanthodesia savartii</i> Savigny.....	-----	×	
<i>Hemiseptella</i> , species.....	×	-----	
<i>Terebripora</i> , species.....	×	-----	
<i>Aimulosa</i> , species.....	×	-----	

¹ Identified by Dr. Ray Bassler, of the U. S. National Museum.

The fauna from Springvale is tentatively referred to the upper Miocene. This fauna is of special interest because it contains certain species that indicate a closer relationship to the Recent fauna of the Pacific side than to the Atlantic. The two forms especially noted among the gastropods that indicate this relationship are *Turritella planigyrate*, a species analogous to *Turritella broderipiana* Orbigny; and *Vermicularia*, species, a form analogous to *Vermicularia eburneus* Reeve. Not only do the gastropods indicate this analogy but the pelecypods as well.

Only one of the species in my list from Springvale occurs in the list from Brasso. Guppy⁴ records the species occurring at Springvale, illustrates by diagram the general relation of the stratum carrying this fauna to the other beds, and gives a brief discussion of the faunal characteristics. He assigns the fauna collected at Springvale to the Miocene.

⁴ Fossils from Springvale, near Couva, Second Report Agr. Soc. Trinidad and Tobago. (Society Paper No. 454), 1911.

DESCRIPTIONS OF SPECIES

Class GASTROPODA

Genus CYLICHNELLA Gabb

CYLICHNELLA OVUM-LACERTI (Guppy)

Plate 1, figs. 7, 9

Cylichna ovum-lacerti GUPPY, Sci. Assoc. Trinidad Proc., vol. 1, pt. 3, p. 168, 1867, (Described).

Cylichna ovum-lacerti GUPPY, Geol. Mag., vol. 1, p. 407, pl. 18, fig. 22, 1874.

Törnatina (Cylichnella) ovum-lacerti GUPPY, Dall. U. S. Nat. Mus. Proc., vol. 18, p. 27, 1896.

Not *Cylichnella ovum-lacerti* (Guppy), PILSBRY, Acad. Nat. Sci. Phila. Proc., pt. 2, p. 311, text-fig. 7, 1921.

“Shell small, cylindrical-subovate, minutely striate transversely; spire small, sunken; aperture as long as the shell, dilated anteriorly; outer lip straight, blunt; columella callus with a strong tortuous fold.”

“Lower Miocene, Manzanilla.” (Guppy, 1867). U. S. Nat. Mus. Cat. No. 115435.

The shell of this species possesses a more cylindrical outline, a greater median compression than the form figured by Pilsbry,⁵ or specimens in the United States National Museum collection from the Dominican Republic. However, it is quite similar.

Genus RINGICULA Deshayes

RINGICULA, species indeterminable

Ringicula, doubtful species, junior, DALL, U. S. Nat. Mus. Proc., vol. 19, p. 305, 1896.

The following is an original description of this doubtful species:

“Oblong-ovate, turritid; whorls five, spirally ribbed by rounded costae with narrow (linear) interstices; aperture suboval; columella with two strongly twisted folds; spire conic; apex smooth, blunt. Length 3 mm., breadth 2 mm.” [G.]

“Ditrupa bed, Pointapier, Trinidad, Guppy (2270). No. 107108, U.S.N.M. Shells all incomplete and too young to name or discriminate, but useful as establishing the presence of this genus in the beds” [Dall], 1896.

RINGICULA, species aff. R. TRIDENTATA Guppy

Shell is ovate, four whorled; whorls inflated, slightly depressed in front of the grooved suture. Sculpture consists of spiral striae only visible on the penultimate and body whorls; on the penultimate

⁵Acad. Nat. Sci. Phila. Proc., pt. 2, p. 311.

whorl, two to three striae are behind the suture; and on the body whorl, about seven striae occur on the anterior one-half the whorl. Columella with three strong, sharp, twisted folds, the anterior one being much stronger.

Measurements of the larger specimen: Altitude 1.8 mm.; greatest diameter 1.2 mm.

The indeterminate form is related to *Ringicula tridentata* Guppy.

Occurrence.—There are two immature and corroded specimens from station 9027, Brasso-Gran Couva Road, 100–200 yards west of Brasso.

Genus **TEREBRA** Adanson

TEREBRA (STRIOTEREBRA) TRINITATENSIS, new species

Plate 1, fig. 8

Shell small, moderately slender, surface glazed, with two and one-half nuclear and seven postnuclear whorls; nuclear whorls smooth, inflated, constricted at the suture; outline of postnuclear whorls nearly flat on the earlier whorls but gradually rounding out on the later whorls. Suture shallowly grooved, constricting the later whorls. Subsutural band narrow. Axial sculpture consists of about 16 prominent, narrow, cordlike, riblets, offset, keeled and retractive over the subsutural band, arched centrally and protractive behind the suture. Spire whorls without distinct spiral sculpture. Base both axially and spirally sculptured—the spiral sculpture consists of about twelve wide bands becoming nodulous at the intersection with the riblets. Anterior canal long and twisted. Outer lip broken away; inner lip smooth. Siphonal fasciole provided with raised bands.

Dimensions: Type (U. S. Nat. Mus. Cat. No. 352622) measures: Altitude 9 mm.; maximum diameter 3 mm. Species based upon a single specimen.

Occurrence.—Middle or lower Miocene: In flood-wash, one mile south of Brasso, Trinidad, British West Indies.

TEREBRA (STRIOTEREBRA) BRASSOËNSIS, new species

Plate 1, fig. 5.

Shell small, stout, tip broken off, only five whorls remaining; most prominent feature of sculpture consists of two subsutural bands of equal width, separated by a narrow sulcus, nodulus on the earlier whorls and ridged on later where overrun by stronger axials, both bands occupying more than one-half the area between the sutures. Axial sculpture consists of moderately strong, narrow riblets continuous with the nodules and extending from suture to suture, retractive over the nodules and protractive forward, and also of finer rib-

lets between the stronger ones. Spiral sculpture consists of many narrow bands separated by a narrower sulcus; base similarly sculptured to spire, ornamentation extending to keel of siphonal fasciole. Anterior canal twisted; outer lip partly broken away; inner lip covered with callus; columella smooth with only a slight trace of biplication, the anterior fold well developed; the anterior keel of siphonal fasciole moderately developed.

Dimensions: Type (U. S. Nat. Mus. Cat. No. 352623) measure: Altitude 6.2 mm.; maximum diameter 2.4 mm.

The sculpture of the new species resembles that of *Terebra sulcifera* Sowerby. The second subsutural band is weaker in Sowerby's species, but the biplication on the columella is much more strongly developed.

Occurrence.—Middle or lower Miocene: Flood-wash, 1 mile south of Brasso, Trinidad, British West Indies.

TEREBRA, species indeterminable

There are several fragments of the genus *Terebra* from station 9212 whose specific relationship can not be definitely determined. In so far as can be observed, they are similar to forms occurring in the Gurabo formation of the Dominican Republic.

Genus CONUS Linnaeus

CONUS SPRINGVALEËNSIS, new species

Plate 1, figs. 3, 6

Shell rather small, moderately slender, eight whorled including a small erect nucleus. Spire slightly concave in contour, altitude 5 mm. above the plane of the spire. Whorls excavated and indistinctly marked within by growth lines and bordered in front by a sharp, weakly denticulated carina. Suture loosely appressed. Last whorl gradually tapers to near the base where it is slightly incurved dextrally and reflected. Spiral sculpture on the lower half consists of about eleven flat bands, wide above and separated by striae, and narrower below with interspaces equal in width to the bands. Outer lip sharp. Aperture 2 mm. in greatest width, slightly wider below. Columella slightly inflected and reflected.

Dimensions: Type (U. S. Nat. Mus. Cat. No. 352644) measures: Altitude 27 mm.; alt. of spire 5 mm.

In a general way, the new species resembles *C. chipolanus* Dall from the Chipola marl member of the Alum Bluff formation of Florida, but differs from this species in possessing a more excavated and carinated spire whorl and a less tapering body whorl.

Occurrence.—Upper Miocene: Springvale, near Couva, Trinidad, British West Indies.

CONUS TRINITATENSIS, new species

Plate 1, figs. 1, 4

Shell small, moderately stout, diameter about one-half length of shell, eight and one-half whorled. Last two whorls of spire nearly flat, the rest rising rather steeply to an altitude 4 mm. above the plane of the spire. Nucleus small, smooth, with one and one-half whorls. First two postnuclear whorls carinated and turrited. Suture of the earlier whorls shallowly channeled and somewhat appressed, on later whorls less appressed and deeper channeled. Last three whorls moderately medially concave. Sculpture of spire consists of a strong, flat, raised spiral band in front of the suture closely followed by three small, rounded, equally spaced spiral threads occupying two-thirds of the remaining space. Concave arcuate growth lines overrun spirals and extend from suture to suture. Last whorl with low carina at the shoulder and sculptured mainly on the lower two-thirds with narrow bands with wider interspaces occasionally carrying an intermediate thread. Outer lip broken away. Aperture moderately narrow. Columella nearly straight, slightly incurved and dorsally reflected.

Dimensions: Type (U. S. Nat. Mus. Cat. No. 352645) measures: Altitude 20 mm.; maximum diameter 10 mm.; altitude of spire, 4 mm.

The most prominent character of the new species is the strong spiral band in front of the suture of the spire. It is somewhat similar to *C. submonilifera* Gardner (Ms.), a species occurring in the Shoal River marl member of the Alum Bluff formation of Florida, but possesses a proportionally lower spire and different arrangement of spirals.

Occurrence.—Middle or lower Miocene: Guaico-Tamana Road, 2 chains east of mile 13 from junction with Eastern Main Road, Trinidad, British West Indies.

CONUS MANZANILLAËNSIS, new species

Plate 2, figs. 5, 10

Shell of medium size, broadly conic, last three postnuclear whorls flat, remainder rising rather steeply to an elevation 5 mm. above the plane of the spire, with eight postnuclear and one and one-half nuclear whorls. Nuclear whorls slightly corroded but apparently smooth. First four postnuclear whorls spirally coronate and carinate behind the channeled suture, remaining whorls sculptured with faint concave growth lines and faint concentric lines lying within the shallowly excavated anal fasciole. Last whorl slightly rounded below the carinated shoulder; below gradually sloping to

base. Sculpture on the lower two-thirds of last whorl consists of sharp, low, spiral threads with interspaces more than twice their width. Columella channelled near the base; below a sharp fold borders the canal. The specimen is partly crushed on the lower half and part of the shell is missing.

Dimensions: Type (U. S. Nat. Mus. Cat. No. 352646) measures: Altitude about 40 mm.; maximum diameter 22 mm.

This new species very closely resembles an undescribed species occurring in both the Baitoa and Cercado formations of the Dominican Republic and the Thomonde formation of the Republic of Haiti; but differs from these in possessing a coronate-carinate spiral on the early whorls and the absence of strong spirals within the anal fasciole.

Occurrence.—Middle of lower Miocene: Manzanilla Coast, Trinidad, British West Indies.

CONUS MULTILIRATUS WALLI, new subspecies

Plate 2, figs. 1, 9

The new subspecies differs from *Conus multiliratus* Böse in the following respects: The shell is less biconic, and has a proportionally shorter and more evenly conic spire; the spire is less attenuated toward the apex; the whorls less excavated and marked by a less prominent carina behind the suture; the body whorl tapers more evenly to the base and is less concave at its lower part.

Dimensions: Type (U. S. Nat. Mus. Cat. No. 352647) measures: Altitude 21 mm.; greatest diameter 11 mm.; altitude of spire 6 mm.

Type locality: 9219, Guaico-Tamana Road, 2 chains east of mile 13 from junction with Eastern Main Road, Trinidad, British West Indies. J. A. Bullbrook, collector.

Occurrence.—Middle of lower Miocene: In flood-wash; 9212, 1 mile south of Brasso.

The new subspecies is named in honor of G. P. Wall, a pioneer geologist in Trinidad.

CONUS, species indeterminable

Fragments and casts of the genus *Conus* occur at stations 9197-a, 8301, 8299, 9205, 9212, 9219, 9220, and 9221. These are too poorly preserved for specific comparison.

Genus TURRICULA Schumacher

TURRICULA SPRINGVALEËNSIS, new species

Plate 2, fig. 2

The species is founded upon a single mutilated specimen, the early whorls and part of the body whorl being broken away. Shell is large, fusiform, turritid, strongly axially and spirally sculptured,

with a high spire and a long anterior canal. Whorls uniformly enlarging in size, strongly constructed at the suture, concave at the anal fasciole, and strongly shouldered a little below the middle of the volution. Body whorl strongly shouldered above, and steeply sloping to the nearly straight canal. Suture shallowly grooved and wavy. Axial sculpture consists of seven strong, somewhat nodular ribs in front of the anal fasciole; ribs are more prominent on the earlier whorls and lower on the body whorl—scarcely extending down the basal slope. Spirally sculptured with about seven strong cords, overrunning the axials and valleys, and by three or four weak spirals in the anal fasciole; on the body slope and canal, the spirals continue with equal strength; a weak spiral is in front and marginates the suture. Aside from the axials and spirals, fine, close-set growth lines overrun the sculpture, arcuate in the anal fasciole and somewhat irregular over the rest of the shell. The anterior canal is long and slightly reflected anteriorly.

Dimensions: Type (U. S. Nat. Mus. Cat. No. 352627) measures: Altitude 44 mm.; greatest diameter 15 mm.

This species suggests *Turricula lavinoides* Olsson from the Gatun Stage, Banana River, Costa Rica, but the new species here described is a more slender shell and has a less inflated body whorl.

Occurrence.—Upper Miocene: Springvale, near Couva, Trinidad, British West Indies.

TURRICULA (?), species indeterminate

There are two specimens from station 9197, Manzanilla Coast, which are too poorly preserved for specific determination. In a general way they resemble *Surcula vicksburgensis* (Casey), a species from the Oligocene of the Gulf Coastal Plain. The shell is fusiform, turrated, high spired, and has a long anterior canal. Whorls strongly constricted at the suture with the prominent periphery in front of the anal fasciole. Sculpture mainly consists of narrow spiral keels.

Genus TURRIS Bolton

TURRIS BRASSOËNSIS, new species

Plate 2, figs. 7, 8

Shell fusiform, moderately slender, prominently spirally sculptured, nine to ten whorled; spire high, weakly constricted at the suture. Nuclear whorls distinctly set off from the postnuclear whorls. First two nuclear whorls rather small, slightly inflated and very minutely axially sculptured; four following whorls, strongly inflated and each rapidly enlarging. Sculpture of nucleus consists of many prominent, nearly vertical, narrow axials extending from

suture to suture, and much finer spirals overrunning the axials and situated on the anterior third of the whorl. Postnuclear whorls with a wide, rounded-bottomed sulcus behind the suture and another narrower sulcus at the posterior third of the whorl. Spiral sculpture consists of a prominent, sharp, smooth ridge, adjacent and anterior to the suture, and two strong cords overrunning the ribs on the anterior half of the whorl; besides these, there is a single spiral thread just in front of the suture, two in the sulcus behind the ribs and a stronger and sharper one in front of the ribs. Axial sculpture consists of many, weakly nodular ribs occupying the anterior half of the whorl, and many, evidently growth lines, retractive over the posterior part of the whorl and mainly protractive over the anterior part. The base and pillar are sculptured with spiral cords and close-set growth lines. Outer lip broken away at the margin, within there are six sharp spiral threads extending nearly to the margin. Anterior part of canal broken off. Columella smooth, covered with callus.

The description is made from two specimens, a larger specimen showing the nature of the sculpture and a smaller specimen possessing a well preserved protoconch.

Dimensions of the larger cotype (U. S. Nat. Mus. Cat. No. 352626): Length 16 mm.; greatest diameter 6 mm.

Type locality: Station 9212. In flood-wash, one mile south of Brasso, Trinidad, British West Indies.

J. A. Bullbrook, collector.

The new species here described is similar to *Pleurotoma pontonensis* Dall (Ms.) from Ponton, Santo Domingo, but the latter species possesses a different type of nucleus, a more excavated sulcus behind the ribs and more fine spirals in front of the carinate spiral just anterior to the suture.

The nature of the sculpture is very similar to a new unpublished species from the Shoal River marl member of the Alum Bluff formation, Florida. The described species is also related to *Pleurotoma (Gemmula) vaningeni* Brown and Pilsbry⁶ from the Gatun formation, Panama. The latter species has a smaller apical angle and apparently lacks the paired spiral cords over the ribs.

Drillia vaningeni var. *sancti andrae* Maury⁷ is related to the new species and may prove to be a very closely related species when complete forms are obtained.

Occurrence.—Middle or lower Miocene: S302.

TURRIS VANINGENI var. MACHAPOORENSIS (Maury)

Drillia vaningeni var. *machapoorensis* MAURY, Bull. Amer. Paleont., vol. 10, no. 42, p. 191, pl. 32, figs. 5, 9, 1925.

Occurrence.—Middle or lower Miocene: station 9219.

⁶Acad. Nat. Sci. Phila. Proc., vol. 64, p. 505, pl. 22, fig. 4, 1913.

⁷Bull. Amer. Paleont., vol. 10, no. 42, p. 191, pl. 32, figs. 1, 14, 1925.

TURRIS, aff. *T. ALBIDA* Perry

There are from stations 8302, 9212, 9219, 9220, and 107146 (U. S. Nat. Mus. Cat. No.), Ditrupa bed (Guppy), several either young or poorly preserved specimens apparently belonging to the group of *Turris albida* Perry. The condition of preservation hardly justifies a specific comparison.

Genus DRILLIA Gray

DRILLIA CONSORS BULLBROOKI, new subspecies

Plate 3, fig. 10

Drillia consors MAURY, Bull. Amer. Paleont., vol. 10, no. 42, p. 190, pl. 32, fig. 10, 1925.

Shell rather small, moderately stout, fusiform, with five remaining whorls, nucleus decollate; whorls slightly inflated, anterior ones more so than posterior; weakly constricted at the suture; spiral sculpture stronger than axial. Suture shallowly grooved and wavy. Anal fasciole wide, shallow, and sculptured with three rounded spiral threads. Axial sculpture (20 on the penultimate whorl) on the spire whorls consists of slightly protractive, nodulous at the intersections of the spirals, ribs separated by interspaces one-half their width and extending from the anal fasciole forward to the suture. Spirally sculptured with a strong keel just in front of the suture and two or three microscopic threads on the lower border of the suture, and in front of the anal fasciole with four narrow prominent bands separated by interspaces of about equal width in which there are two fine microscopic threads. Base similarly cancellate-sculptured except that there are one or two more microscopic threads in the interspaces between the spiral bands. Outer lip broken away at the margin. Inner lip covered with callus, a heavier patch being just underneath the suture. Pillar nearly straight; slightly concave medially.

Dimensions: Type (U. S. Nat. Mus. Cat. No. 352628) measures Height 18 mm.; greatest diameter 6 mm.

The type locality of *Drillia consors* Sowerby is Santo Domingo. This differs from the subspecies here described in possessing more spiral threads, and the absence of secondary microscopic spirals and nodules at the intersection of the axials and spirals. One specimen at each station, 8558 and 8668, collected from the Baitoa formation in the Dominican Republic and designated "*Drillia consors* Sowerby n. sub. sp. a,"⁸ apparently belongs to the same new subspecies as here described.

Pleurotoma alesidota, var. *magna* Böse, from Paso Real cerca de Tuxtepec, Oaxaca, resembles the new subspecies but the sculpture of

⁸ Woodring, W. P., and Mansfield, W. C., A geological reconnaissance of the Dominican Republic, Geol. Survey Mem., vol. 1, p. 113, 1921.

the latter is more open and possesses nodules at the intersection of the axials and spirals.

Occurrence.—Middle or lower Miocene; Guaico-Tamana Road, 2 chains east of mile 13 from junction with Eastern Main Road, Trinidad, British West Indies.

DRILLIA CONSORS TRINITATENSIS, new subspecies

Plate 3, figs. 12, 13

Shell rather small, moderately stout, fusiform, with five remaining whorls on the larger cotype, smaller cotype with anterior whorl of nucleus partly intact; spire whorls slightly inflated; suture shallowly grooved and loosely appressed; anal fasciole rather wide, shallow and marked by two to three spiral threads and close-set arcuate growth lines. Nucleus, as revealed, inflated and smooth. Axial sculpture of postnuclear whorls (12 on the penultimate whorl of larger cotype but other specimens have up to 17) slightly protractive, rounded ribs, stronger than the spirals, and extending from the anal fasciole forward to the suture. Spirally sculptured in front of the suture with a keel and, between the anal fasciole and forward suture on the earlier whorls, with four close-set threads and, on the latter whorls, with four low, close-set threads separated by stria, all scarcely overrunning the axials. Base similarly sculptured except that the striae between the spiral threads shallowly incise the ribs. Outer lip broken away at the margin; pillar with wash of callus, nearly straight and slightly reflexed anteriorly.

Dimensions: Larger cotype (U. S. Nat. Mus. Cat. No. 352629) measures: Height 13 mm.; greatest diameter 4.3 mm.

The new subspecies here described is represented at only one locality and differs from *Drillia consors*, subspecies *bullbrookii* in possessing close-set crowded spiral sculpture and the absence of nodules at the intersections of the axials and spirals.

Pleurotoma alesidota, var. *magna* Böse, from Paso Real cerca de Tuxtepec, Oaxaca, is very closely related to the new subspecies, but it is a larger and stouter shell than the Trinidad form.

Occurrence.—Middle or lower Miocene: In flood-wash, 1 mile south of Brasso, Trinidad, British West Indies.

DRILLIA PENNYI, new species

Plate 3, fig. 2

Shell small, solid, surface glazed; axial sculpture over the body of the whorl more prominent than spiral; with two and one-half nuclear and seven postnuclear whorls; whorls inflated and tightly constricted at the suture. Suture moderately appressed and wavy; anal fasciole wide, undulating, slightly inclined posteriorly. Nu-

clear whorls smooth, rather large, moderately constricted at the suture. Postnuclear whorls axially sculptured (nine on the last whorl) with strong, rather sharp ribs over the anterior two-thirds of the whorl, almost suppressed over the anal fasciole, nodular and protractively offset on the subsutural band; spirally sculptured with a strong, nodular, subsutural band and anteriorly, between the anal fasciole and suture on the five later whorls, marked by five interaxial bands, separated on the earlier whorls by narrow striae and on the later whorls by interspaces one-half their width. On the base, the axials gradually diminish in size and terminate halfway across the canal; below, the spirals continue to the end of the canal. Outer lip broken away. Inner lip smooth, borders overlapping the pillar. Anterior canal rather short and slightly curved dextrally. The species is named in honor of F. W. Penny, the collector.

Dimensions: Type (U. S. Nat. Mus. Cat. No. 352630) measures: Altitude 9.3 mm.; greatest diameter 3 mm.

This species is characterized by its nodulous, subsutural band.

Occurrence.—Middle or lower Miocene: In flood-wash, 1 mile south of Brasso railway station.

DRILLIA PENNYI ACARIA, new subspecies

Plate 1, fig. 2

Shell, small, slender, glazed, prominently axially sculptured, marked by a strong subsutural band and consists of one and one-half nuclear and seven postnuclear whorls. Spire whorls constricted at the suture; suture moderately appressed and wavy. Nucleus small, globular, and smooth. Postnuclear whorls with strong ribs (13 on the last whorl), nodular on the early whorls and rounded on the later, suppressed within the indistinct anal fasciole and protractively offset and nodular on the subsutural band. Spirally sculptured between the axials with striae, indistinct on the earlier whorls and distinct on the later whorls, separated by low, narrow, flat bands. On the base, the axials terminate at the posterior part of canal; the spirals at first overrun the axials, but later continue alone to the end of the canal. A strong varix is situated behind the outerlip. Inner lip formed of a thin wash of callus, exteriorly it loosely overlaps the pillar; anterior canal short.

Dimensions: Type (U. S. Nat. Mus. Cat. No. 352631) measures: Altitude 5.2 mm.; greatest diameter 2 mm.

The new subspecies here described differs from *Drillia pennyi*, new species, in possessing a smaller and shorter nucleus. It is also a more slender shell and has a less distinct anal fasciole.

Occurrence.—Middle or lower Miocene: In flood-wash, 1 mile south of Brasso, Trinidad, British West Indies.

DRILLIA TRIDADINA, new species

Plate 3, fig. 11

Shell small, stout, solid, glazed, strongly constricted at the suture, strongly axially sculptured and consists of two and one-half nuclear and six and one-half postnuclear whorls. Suture appressed and wavy. Nucleus rather small, glassy, smooth with whorls moderately inflated between the grooved sutures. Postnuclear whorls constricted by a low-lying, flat, wide band bordered anteriorly by a microscopic stria and posteriorly by the suture. Axial sculpture consists of strong, rather sharp, slightly protractive ribs (10 on the penultimate whorl), extending from the anal fasciole forward to the suture. Spiral sculpture—only visible on the anterior whorls—faint, consisting of five or six wide-spaced, shallow striae, separated by wide, nearly flat areas. The posterior one-half of the canal is sculptured with three spiral bands and subdued axials forming a reticulate ornamentation; anteriorly, the ribs become obsolete and the sculpture consists of fine, unequally spaced spirals forming the siphonal fasciole. Margin of outer lip broken away. Inner lip consists of a thin callus and externally loosely overlaps the pillar. Canal short and dextrally curved.

Dimensions: Type (U. S. Nat. Mus. Cat. No. 352632) measures: Altitude 7.5 mm.; greatest diameter 2.5 mm.

The new species here described is characterized by its cingulum situated anterior to the suture, strong axials, and faint spirals.

Occurrence.—Middle or lower Miocene: In flood-wash, 1 mile south of Brasso, Trinidad, British West Indies.

DRILLIA DADITRINA, new species

Plate 3, figs. 1, 5

Shell rather slender, solid, semiporcellaneous, strongly axially sculptured, with one and one-half nuclear and six moderately inflated postnuclear whorls; anal fasciole wide, undulating, without spiral striae; suture narrow and shallowly grooved. Nuclear whorls smooth, inflated, of medium size. Postnuclear whorls axially sculptured with strong, broad, rounded, nearly vertical ribs (six on the penultimate whorl) extending across the whorl from the subsutural cord forward to the suture, suppressed across the anal fasciole and strong over the middle of the whorl; on the last whorl, the axials terminate on reaching the canal. Spirally sculptured on the earlier whorls by two, strong, rather wide-spaced, paired cords, the posterior one bordering the anal fasciole—both overrunning the axials; on the later whorls an intermediate cord of equal strength comes in; in addition to these cords, there is another cord in front of and marginat-

ing the suture, and behind it a smaller one. On some specimens, a little larger than the type and believed belonging to the same species, the spirals on the later whorls increase to four, the one behind the suture becoming stronger; the front of last whorl has 14 spirals below the anal fasciole. Outer lip sharp. Anal sinus deep. Inner lip smooth, closely adhered to body wall above and loosely overlaps the pillar below. Anterior canal short, arcuate, anterior end twisted a little backward and dextrally.

Dimensions: Type (U. S. Nat. Mus. Cat. No. 352633) measures: Altitude 8.4 mm.; greatest diameter 2.8 mm.

The new species is similar to *Drillia winchesterae* Pilsbry from Santo Domingo, but when compared with the figure it appears to have a shorter anterior canal and lacks the spiral striae in the anal fasciole and between the spiral cords. The new species is also somewhat similar to *Drillia senaria* Woodring (Ms.) from the Bowden marls, Jamaica.

Occurrence.—Middle or lower Miocene: In flood-wash, 1 mile south of Brasso, Trinidad, British West Indies.

DRILLIA PROPEFUSIFORMIS, new species

Plate 2, figs. 3, 4

Shell large, slender, solid, fusiform, strongly axially and spirally sculptured and consists of about one and one-half rather small, apparently smooth, corroded nuclear and ten slightly inflated post-nuclear whorls; suture closely adherent, flexuous, and shallowly channeled. Postnuclear whorls sculptured with four strong, broad, rounded, vertical ribs, separated by broad valleys, undulating the broad anal fasciole, strongest over the middle of the whorl; on the last whorl the ribs become obsolete at the base. Spirally sculptured by a strong subsutural carina, closely marginating the anal fasciole and also spirally sculptured between the anal fasciole and the following suture on the earlier whorls by two and on the later whorls by four strong, equal-sized, semirounded, broadly spaced cords overrunning the axials and valleys; the postsutural spiral on the later whorls marginates the suture and at times overlaps it. On the front of the last whorl there are 16 primary spirals from the anal fasciole to the end of the anterior canal. Besides these primary spirals, there are sharp, secondary spiral threads overrunning the whole surface of the shell—about seven in the anal fasciole and about five between the primary spirals. Aperture moderately wide medially, slightly narrower above and gradually narrowing below. Outer lip sharp, not lirate within. Anal sulcus deep and moderately wide. Inner lip callus closely adhered to body wall above and loosely overlapping pillar below. Anterior canal short. Anterior extremity slightly recurved and dextrally twisted.

Dimensions: Type (U. S. Nat. Mus. Cat. No. 352634) measures: Altitude 34 mm.; greatest diameter 9 mm.

This new species resembles in a general way *Drillia fusiformis* (Gabb) from the Gurabo formation, Dominican Republic, but differs from that species in possessing fewer axial ribs, a less constricted suture, a narrower aperture, and a smooth interior outer lip.

A very closely related form to the new species occurs at station 8519, Dominican Republic, a horizon referred to the Gurabo formation.

The Recent analogue appears to be *Drilla grundlachi* Dall and Simpson from Mayaguez Harbor, Porto Rico.

Occurrence.—Middle or lower Miocene: Guaico-Tamana Road, 2 chains east of mile 13 from junction with Eastern Main Road, Trinidad, British West Indies.

DRILLIA, species, aff. D. FUSIFORMIS (Gabb)

Several young and fragmental adult specimens from stations 9212 and 9219 apparently belong to the group of *Drilla fusiformis* (Gabb), but these are considered inadequate for definite specific comparison.

DRILLIA INNIADDA, new species

Plate 3, figs. 4, 9

Shell small, stout, semiporcellaneous, strongly axially sculptured and consists on the larger cotype of four slightly inflated whorls, the nucleus and early whorls broken off, and on the smaller cotype of one and one-half nuclear and six postnuclear whorls. Suture distinct, grooved, not appressed. Nucleus rather small, apical whorl minute; whorls smooth and rounded. Postnuclear whorls sculptured with about ten, strong, arcuate, triangular, sharp-edged ribs, separated by narrow grooved interspaces. At the base of the last whorl, the ribs diminish in size and are replaced on the canal by small, rounded, crowded growth lines which twist dextrally and overrun the lower part of the pillar. In addition to the axials, there are many, close-set, irregular, microscopic growth lines overrunning the sides of the axils and interspaces. Spiral sculpture is very obscure, consisting only of a narrow subsutural band and a faint interaxial stria on the posterior third of the whorl. Aperture rather wide. Anal sulcus apparently wide and situated near the suture. Margin of inner lip erect and partly overlaps the pillar. Canal rather short and slightly twisted.

Dimensions: Cotypes (U. S. Nat. Mus. Cat. No. 352635) measure: (Larger cotype) altitude 9 mm.; greatest diameter 3.3 mm.; (smaller cotype) altitude 6 mm.; greatest diameter 2.1 mm.

Occurrence.—Middle or lower Miocene: In flood-wash, 1 mile south of Brasso, Trinidad, British West Indies.

DRILLIA NITRINA, new species

Plate 3, fig. 3

Shell small, rather stout, semiporcellaneous, strongly axially sculptured, six whorled including one nuclear whorl. Nucleus large, smooth and bulbous. Postnuclear whorls slightly inflated; suture distinct, shallowly grooved, with a low poorly defined band below. Anal fasciole moderately wide, not depressed, undulating. Sculpture consists of about eleven, vertical ribs extending with equal strength across the whorl, separated by rounded interspaces of about equal width; on the body whorl, the ribs become obsolete on reaching the canal. Spirally sculptured on the later whorls, between the axials, with five striae separated by flat rather wide bands; on the body whorl and overrunning the canal, there are 15 of these bands separated by wider interspaces, especially those over the canal. Outer lip broken away. Pillar smooth. Siphonal canal short and anteriorly, dextrally twisted.

Dimensions: Type (U. S. Nat. Mus. Cat. No. 352637) measures: Altitude 6.5 mm.; greatest diameter 2.5 mm.

Occurrence.—Middle or lower Miocene: In flood-wash, 1 mile south of Brasso, Trinidad, British West Indies.

DRILLIA INADRINA, new species

Plate 3, fig. 6

Shell small, moderately slender, porcellaneous, strongly axially sculptured and consists of one and one-half nuclear and six post-nuclear whorls. Suture closely appressed and wavy—the scallops entering the interaxial hollows. Nucleus quite small, smooth and inflated. Postnuclear whorls sculptured with strong, semiacute, widely spaced, sigmoid ribs (eight on the penult whorl), strongest anteriorly and weakest posteriorly, extending from just in front of the sutural margin forward to the following suture; the axials on each whorl are opposite the wide, concave, interaxial spaces on the adjoining whorl. Over the base, the axials gradually diminish in size and become obsolete at the juncture of the anterior canal. In front of the suture and between the axials, there is a slightly raised area. Whorls without spiral sculpture except for a single, indistinct stria midway between the sutures. Outer lip sharp. Inner lip smooth, the exterior margin overlapping the canal; canal short, arcuate and incurved. The siphonal fasciole is bounded above by a spiral thread.

Dimensions: Type (U. S. Nat. Mus. Cat. No. 352638) measures: Altitude 6.6 mm.; greatest diameter 2.2 mm.

Occurrence.—Middle or lower Miocene: In flood-wash, 1 mile south of Brasso, Trinidad, British West Indies.

The new species is similar to *Drillia orthopleura* Pilsbry and Johnson, from Santo Domingo, but the latter species has a larger shell with a longer anterior canal.

DRILLIA MANZANILLAËNSIS, new species

Plate 2, fig. 6

A single, poorly preserved specimen was collected at station 9197, Manzanilla Coast, Trinidad. The shell is strongly axially sculptured, consisting of (10 on the penultimate whorl) seminodulous ribs. Suture is closely appressed and overlaps the preceding whorl. Anal fasciole broad and deeply depressed, below which is the prominent shoulder. Spiral sculpture of wide-spaced, fine, raised threads overrunning the axials and interspaces and extending over the base and canal. Canal rather long; extremity gone.

Dimensions: Type (U. S. Nat. Mus. Cat. No. 352639) measures: Length 13 mm.; greatest diameter 5.5 mm.

Horizon: Middle or lower Miocene.

I am unable to find a very close relative to the described species.

DRILLIA NIADDRINA, new species

Plate 4, figs. 6, 8

Shell rather small, turritid, strongly axially sculptured and consists of seven, inflated, rapidly enlarging whorls on the larger cotype—tip broken away—and two and one-half nuclear and five post-nuclear whorls on the smaller cotype. Suture appressed, distinct and wavy. Nuclear whorls smooth, rounded; apical one minute and glassy. Postnuclear whorls constricted at the suture and below it and strongly shouldered in front of the anal fasciole. Axial sculpture consists of 16 on the larger specimen and 14 on the smaller, narrow, rather sharp, sigmoid ribs, extending from suture to suture and separated by rounded bottomed interspaces. Spiral sculpture consists of a low subsutural band and seven interradianal striae below this band, being separated by low, flat narrow bands. On the body whorl, the ribs become obsolete at the base, overrun the axials, and are separated by wider interspaces; forward they continue with equal strength over the canal. In addition to the spirals and axials, growth lines occur on the subsutural band and anal fasciole and between the ribs over the base. The outer lip and lower part of the canal are broken away.

Dimensions: Cotypes (U. S. Nat. Mus. Cat. No. 352636) measure: (Larger cotype) altitude 11 mm.; greatest diameter 5.3 mm.; (smaller cotype) altitude 7.6 mm.; greatest diameter 3.1 mm.

Occurrence.—Middle or lower Miocene: In flood-wash, 1 mile south of Brasso, Trinidad, British West Indies.

DRILLIA RITANIDA, new species

Plate 4, fig. 10

Shell small, moderately stout, six and one-half whorled including one and one-half nuclear whorls. Nucleus smooth and bulbous. Post-nuclear whorls with a strong subsutural cord marginating the rather loosely appressed suture; anal sulcus wide, slightly undulated, roundly excavated and marked with two or three low spiral threads and axially with arcuate growth lines. Axial sculpture of (13 on the last whorl) strong, semicarinate, vertical ribs, strongest at and abruptly rising from the anal fasciole, and continuing slightly reduced forward to the suture, separated by rounded excavated interspaces of about equal width to the ribs; on the last whorls, these ribs continue to the siphonal fasciole. Spiral sculpture of about six, flat, interaxial, narrow bands with equal interspaces; on the back of the body whorl, there are 15 spirals between the anal fasciole and the siphonal fasciole—those over the base and canal being much stronger and wider spaced. Aperture obovate. Sinus rounded, moderately wide and deep and situated below the subsutural cord. Canal short and slightly recurved.

Dimensions: Type (U. S. Nat. Mus. Cat. No. 115581) measures: Altitude 8.5 mm.; greatest diameter 4 mm. The species is founded upon a single specimen.

Type locality: Trinidad, British West Indies. Guppy.

This specimen with another belonging to a different species is deposited in the U. S. National Museum and was labeled *Pleurotoma luctuosa* Orbigny, Pliocene, Guppy. The locality may be Matura as *P. luctuosa* is listed from Matura by Guppy.⁹

The new species is somewhat similar to *Drillia ebenina* Dall, a species reported by Dall¹⁰ from the Pliocene to Recent, but Dall's species has a greater apical angle, a smaller nucleus, and more crowded spirals overrunning the base and canal than the new species here described.

DRILLIA, species, aff. D. RIOGURABONIS Maury

Plate 3, fig. 8

There is a single worn specimen from station 9224, Springvale, which, in a general way, resembles *Drillia riogurabonis* Maury from

⁹ Sci. Asso. Proc., Trinidad, p. 159, 1867.

¹⁰ Wagner Free Inst. Sci., vol. 3, pt. 1, p. 33, 1890.

the Gurabo formation, Dominican Republic. Unfortunately the specimen is too corroded for exact specific comparison.

Genus *MANGILIA* Risso

MANGILIA MICROPLEURA Guppy

Plate 3, fig. 7

Mangilia micropleura GUPPY, Sci. Assoc. Trinidad Proc., p. 171, 1867 (described); Geol. Mag. London, new ser., decade 2, vol. 1, p. 410, pl. 18, fig. 6, 1874.

The following is Guppy's original description of this species:

"Subfusiform, longitudinally ribbed, the ribs crossed by numerous striae, of which a prominent one forms an angle on the upper part of the whorls; last whorl longer than the spire; aperture rather narrow, lanceolate, with a sinus on the posterior part of the thickened peristome."

"Pliocene, Matura. Allied to *M. pulchella*. The ribs vary considerably as to size and distance apart. It was denominated *M. taeniata* in my list of 1864." [Unable to find it in this list.]

Redescribed:

There are in the United States National Museum (Cat. No. 115583) six specimens labeled *Mangilia micropleura* Guppy (types). Matura, Trinidad (Guppy), all of which bear the same specific characterization. The shell is subfusiform, rather stout, solid, strongly axially sculptured and possesses about two nuclear and four post-nuclear whorls. Nuclear whorls are strongly inflated; the second one is sculptured with many threadlike, intrasutural axials and a fine, anterior medial, spiral thread. Postnuclear spire whorls with a central, angled periphery: suture narrowly and shallowly grooved. Axial sculpture consists of about nine, strong, slightly arcuate, sharp, intrasutural ribs, intercalated by rounded valleys wider than the ribs. Spirally sculptured with a strong intra-axial cord at the periphery of the whorl and by about two smaller equally spaced cords between the peripheral cord and the anterior suture. Body whorl longer than spire, sculptured axially with strong ribs extending along the canal into the siphonal fasciole; spirally sculptured with 10 to 12 low cords, widely spaced over the slope and prominent and closely spaced over the siphonal fasciole. Aperture uniformly rather narrow. Outer lip sharp with a strong varix behind and near the margin. Anal sinus deep, wide, rounded, obliquely placed and situated near the suture. Anterior canal short and wide.

Dimensions: Largest specimen: Altitude 6 mm.; greatest diameter 2.5 mm.; length of aperture 2.5 mm.

This species is similar to *Mangilia plicosa* C. B. Adams, a species reported from the Pliocene to the Recent.

CYTHARA, species indeterminable

There is a single specimen from station 9212 which is too poorly preserved for specific comparison. In a general way, it resembles *Cythara cercadica* Maury from Bluff 1, Cercado de Mao, Dominican Republic.

Genus GLYPHOSTOMA Gabb

GLYPHOSTOMA CARONENSIS, new species

Plate 4, fig. 1

Shell small, slender, fusiform, solid, stronger axially sculptured than spirally, and consists of two and one-half nuclear and five post-nuclear whorls; whorls inflated and constricted at the suture; suture loosely appressed and wavy. Apical whorl minute, succeeding one larger, inflated and smooth; anterior nuclear whorl faintly sculptured with fine, close-set axials and fine spiral threads. Postnuclear whorls sculptured with arcuate ribs—seven on the penultimate whorl; strong and rounded over the lower half of the whorl and narrower and lower over the anal fasciole. Spirally sculptured in front of the wide and slightly depressed anal fasciole with three narrow bands separated by about equal interspaces and overrunning both the axials and interspaces. On the back of the body whorl, there are 14 of these spiral bands with wider interstices extending from the anal fasciole across the canal. In addition to the axials and spirals, microscopic spiral striae overrun the shell between the spiral bands, and arcuate growth lines cross the anal fasciole. Aperture long and moderately wide. Anal sulcus, deep, well rounded and situated at the posterior extremity of the aperture. Outer lip with a heavy varix behind, upper and middle margin being broken away; columella, within, covered with thin wash of callus. Anterior canal moderately long, slightly expanded in front and twisted.

Dimensions: Type (U. S. Nat. Mus. Cat. No. 352640) measures: Altitude 8.6 mm.; greatest diameter 3.3 mm.; length of aperture 4.0 mm.

The type is founded upon a single specimen.

Occurrence.—Middle or lower Miocene: In flood-wash 1 mile south of Brasso, Trinidad, British West Indies.

GLYPHOSTOMA (?) TRINIADA, new species

Plate 4, fig. 4

Shell rather small, turritid, strongly axially and spirally sculptured and consists of two and one-half nuclear and five postnuclear whorls. Whorls rapidly enlarging, inflated, strongly constricted at the suture. Suture appressed, wavy, and margined below by a small cord. Nucleus of moderate size; apical whorl minute, smooth,

and inflated. The sculpture on the first postnuclear whorl begins with a faint arcuate intersutural axial and by two spirals on the anterior part of the whorl; soon another spiral appears above giving the first postnuclear whorl a cancellate sculpture. Axially sculptured on the anterior whorls with about seven, small, arcuate riblets extending with equal strength from the subsutural cord forward to the suture, and separated by interspaces of more than twice their width. On the last whorl the ribs are a little stronger and extend down the steeply inclined basal slope to the canal. Spirally sculptured on the earlier whorls by two and on the later whorl by three, prominent cords overrunning the axials and extending from the excavated anal fasciole forward to the suture. In addition to these primary spirals, there are three or four secondary spirals on the anal fasciole and two or three between the primary spirals. On the back of the body whorl and over the canal, there are eleven primary spirals with one or two interspiral threads. Aperture of about equal length of spire; margin of outer lip broken away; anterior canal not long and slightly arcuate.

Dimensions: Type (U. S. Nat. Mus. Cat. No. 352641) measures: Altitude 5.2 mm.; greater diameter 2 mm.; length of aperture 2.5 mm.

Occurrence.—Middle or lower Miocene: In stream-wash, 1 mile south of Brasso, Trinidad, British West Indies.

GLYPHOSTOMA AMICTA RINTRIADA, new subspecies

Plate 4, figs. 2, 3

Shell small, solid, moderately slender, turrated, strongly axially and spirally sculptured and consists of four nuclear and four post-nuclear whorls; whorls moderately inflated with periphery at lower one-half; suture loosely appressed. Apical whorl minute, smooth and inflated; following nuclear whorls with a strong spiral keel on the lower half of the whorl. Postnuclear whorls sculptured with about ten arcuate riblets separated by interspaces about twice their width, and extending from the suture behind the sloping anal fasciole to succeeding suture; on the body whorl, these axials extend nearly across the canal. Spirally sculptured with two rather prominent cords in front of the anal fasciole; the posterior one is a little stronger, corresponding to the keel on the nuclear whorl; the spirals overrun the axials and are nodular at the intersection with the ribs: anal fasciole with four or five smaller spiral threads. On the back of the body whorl, about twelve rather uniform sized spirals extend from the anal fasciole across the canal. Aperture rather long, with a deep and wide posterior sinus. Outer lip with a strong varix behind, marked within with three or four lirae below the anal sinus. Pillar with thin wash of callus. Siphonal canal short, recurved.

Dimensions: Cotypes (N. S. Nat. Mus. Cat. No. 352642) measure: (Larger cotype) altitude 4.3 mm.; greatest diameter, 1.8 mm. (est.); length of aperture, 1.5 mm.; (smaller cotype) altitude 3.2 mm.; greatest diameter 1.4 mm.; length of aperture 1.3 mm.

This new subspecies differs from *Glyphostoma amicta* (Guppy), a Bowden species, in having stronger nodules at the intersection of the ribs and spirals and the two spirals in front of the anal fasciole of more equal size.

Occurrence.—Middle or lower Miocene: In flood-wash, 1 mile south of Brasso railway station, Trinidad, British West Indies.

GLYPHOSTOMA (?) ADDRINA, new species

Plate 4, fig. 9

Shell small, solid, semiporcellaneous, strongly axially and spirally sculptured and consists of two and one-half nuclear and four post-nuclear whorls. Whorls slightly inflated and rapidly enlarging; suture appressed, flexuous, bordered below by a strong semikeeled cord; anal fasciole wide, undulating, depressed, marked with indistinct spirals and arcuate growth lines. Nucleus large, smooth, and inflated. Postnuclear whorls axially sculptured with about seven strong rounded ribs, strongest below the anal fasciole, with interspaces of about equal width; on the body whorl, the axials become obsolete on reaching the canal. Spiral sculpture consists of, aside from the subsutural cord, two on the earlier whorls and three on the later whorls, cords which are a little stronger over the ribs and separated by a little wider interspaces. On the back of the body whorl, 14 spirals extend from the anal fasciole across the canal. Aperture wide and well-rounded above. Anal sinus wide, deep, and situated just anterior to the subsutural band; outer lip with a heavy varix near and behind the margin. Inner lip consists of a thin wash of callus with its lower external margin erect. Canal slightly expanded and recurved at its anterior extremity.

Dimensions: Type (U. S. Nat. Mus. Cat. No. 352643) measures: Altitude 6.2 mm.; greatest diameter 2.5 mm.; length of aperture 2.5 mm.

Occurrence.—Middle or lower Miocene: In flood-wash, 1 mile south of Brasso, Trinidad, British West Indies.

Genus MICRODRILLIA Casey

MICRODRILLIA TRINA, new species

Plate 4, fig. 5

Shell slender, rather solid, high spired, consisting of about four nuclear and four postnuclear whorls. Apical whorl blunt, scarcely inflated, and smooth; following nuclear whorls gradually enlarg-

ing, moderately inflated, constricted at the suture by a spiral thread, and axially sculptured with about twelve narrow, protractive, intrasutural ribs. Postnuclear whorls with a shallow, grooved suture and sculptured mainly with the semikeeled, spiral raised cords; a low keel is adjacent to and in front of the suture, followed by two stronger, wide-spaced raised cords; the anterior one is stronger and constitutes the periphery of the whorl, and is situated on the lower half of the whorl, in front of which is a wide rounded valley, bordered in front by a small postsutural keel. Axial sculpture consists of many threadlike, mainly protractive, growth lines, intercalating the spirals and extending up their slopes. On the body whorl, there are in all about seven spirals extending from the suture forward to the siphonal fasciole. Aperture rather wide; anal sinus apparently quite wide and shallow; margin of outer lip broken away, lirate within; inner lip consisting of callus, the lower margin is erect and forms the border of the short, reflected and dextrally twisted siphonal canal. Siphonal fasciole prominent, overrun by four spirals; a small chink is behind the siphonal fasciole.

Dimensions: Type (U. S. Nat. Mus. Cat. No. 352624) measures: Altitude 6 mm.; greatest diameter 2 mm.; length of aperture 2 mm.

An undescribed form in the United States National Museum collection from Monkey Hill, Panama, is very similar to the new species here described. It also belongs to the group of *Microdrillia hebetika* Gardner (Ms.) from the Chipola marl member of the Alum Bluff formation.

Occurrence.—Middle or lower Miocene: In flood-wash, 1 mile south of Brasso, Trinidad, British West Indies.

MICRODRILLIA PROPETRINA, new species

Plate 4, fig. 7

Shell small, solid, rather stout consisting of two and one-half nuclear and three postnuclear whorls. The first one and one-half nuclear whorls broadly conical, porcellaneous, smooth, except for a minute subsutural thread; anterior nuclear whorl with a subsutural band and marked with sharp arcuate riblets. Postnuclear whorls weakly constricted at the suture and slightly inflated between them; sculptured with three semikeeled, raised, spiral cords intercalated by rather wide rounded valleys, the posterior one marginates the suture, the medial and stronger one forms the periphery of the whorl, and the third stands midway between the second and the suture. Axially sculptured with fine, threadlike, arcuate, growth lines between the spirals and extending up their slope. On the back of the body whorl there are seven spirals extending from the anal fasciole forward to the siphonal fasciole. Aperture apparently wide; margin of outer

lip broken away; pillar with two oblique, rounded threads; anterior canal short, partly broken away.

Dimensions: Type (U. S. Nat. Mus. Cat. No. 352625) measures: Altitude 3.6 mm.; greatest diameter 1.5 mm.

The new species is very similar to *Microdrillia trina* but is much stouter than that species and possesses a much shorter nucleus.

Occurrence.—Middle or lower Miocene: In flood-wash, 1 mile south of Brasso railway station, Trinidad, British West Indies.

Genus BORSONIA Bellardi

Subgenus PARABORSONIA Pilsbry

BORSONIA (PARABORSONIA) BRASSOËNSIS, new species

Plate 5, fig. 8

Borsonia varicosa MAURY (not of Sowerby), Bull. Amer. Paleont., vol. 10, no. 42, p. 192, pl. 34, fig. 7, 1925.

Shell of medium size, biconic, solid, elaborately sculptured, seven and one-half whorled including one and one-half nuclear whorls. Nucleus smooth and globular. Postnuclear spire whorls gradually enlarging, in outline nearly straight, and only slightly constricted at the shallowly grooved suture. Sculpture consists of three primary spiral bands, finely tuberculate on the earlier whorls, coarsely elongate-tuberculate on the later whorls; the posterior band is widest and nearly marginates the suture except for two spiral threads just anterior to the suture, and separated in front by a rather wide channel in which are irregular axial growth lines; the two anterior bands are narrow, closely spaced, axially crossed and connected by elongate tubercles or short ribs and occupy the low periphery of the whorl; one or two granulose spiral threads are between the peripheral bands and the forward suture. Sculpture of the body whorl, below the peripheral bands and extending to the end of the canal, consists of about thirteen narrow, semituberculate, wide-spaced, spiral bands intercalated by a varying number of fine, spiral threads. Margin of outer lip broken, lirate within; columella with three plications—the posterior one is strong, the anterior one weak.

Dimensions: Type (U. S. Nat. Mus. Cat. No. 352661) measures: Altitude 14.3 mm. (end of canal slightly broken away); greatest diameter 6.5 mm.

The new species closely resembles *Borsonia (Paraborsonia) varicosa* (Sowerby). Sowerby's species, however, possesses a higher peripheral bilirate band, and a lower and more granulose subsutural band.

Occurrence.—Middle or lower Miocene: In flood-wash, 1 mile south of Brasso, Trinidad.

Genus *CANCELLARIA* Lamarck*CANCELLARIA* SPRINGVALEËNSIS, new species

Plate 2, fig. 12

Shell of medium size, solid, strongly axially and spirally sculptured and consists of two and one-half nuclear and four postnuclear whorls. Nucleus smooth, naticoid, whorls rapidly enlarging, initial turn minute. Postnuclear whorls strongly shouldered and moderately tabulated in front of the channeled suture. Axial sculpture of (12 on the penultimate whorl) rounded, rather narrow, retractive ribs, extending posteriorly nearly to the suture; ribs becoming nearly obsolete over the body whorl on reaching the base; spiral sculpture of two slightly weaker bands over the slope below the suture and of four stronger, widely spaced, flat bands extending from the periphery forward to the suture—the one at the periphery is slightly stronger and seminodulous at the intersection with the ribs; body whorl with 14 spiral bands, with intercalations of about twice their width. Aperture rather narrow, hemispherical; outer lip with a strong varix behind and near the margin, within ornamented with 11 sharp lirae; parietal wall with a thin wash of callus insufficient to conceal the spirals. Columella triplicate, posterior one sharp and strong, nearly horizontally placed and externally continuous with the posterior border of the fasciole; anterior two obliquely placed, anterior one continuous with the inner margin of the canal. Between the two posterior plications, three short plications intervene. Siphonal fasciole separated from the pillar plate by a small chink and is overrun by three or four spiral threads.

Dimensions: Type (U. S. Nat. Mus. Cat. No. 352662) measures: Altitude 21 mm.; greatest diameter 13 mm.; length of aperture 11 mm.; width 4 mm.

The species is founded upon a single specimen. The new species here described closely resembles *C. paramoorei* Gardner (Ms.) from the Chipola marls, Florida. *C. paramoorei* has a more inflated body whorl and possesses slightly heavier ribs, especially on the earlier whorls—otherwise it is very similar. It less closely resembles *C. moorei* Guppy, a species described from the Bowden marls of Jamaica.

Occurrence.—Upper Miocene: Springvale, near Couva, Trinidad.

CANCELLARIA BULLBROOKI, new species

Plate 5, fig. 3

Shell small, rather slender, strongly constricted at the suture and consists of two and one-half nuclear and three and one-half post-

nuclear whorls. Nucleus obliquely situated, whorls smooth, inflated, rapidly enlarging and slightly tabulated below the suture. Postnuclear whorls distinctly set off from the nuclear whorls, both axially and spirally sculptured, whorls strongly shouldered anteriorly and posteriorly. Axial sculpture of strong, slightly retractive, rounded, intrasutural ribs (eighth on the penultimate whorl). Spiral sculpture of (two on the first whorl and three on the second whorl) wide-spaced cords overrunning the axials with equal strength and occupying the periphery of the whorl; on the base and the canal, there are 11 of these major spirals; aside from these major spirals, there are two spiral threads on the slope below the suture on the penultimate whorl and three on the body whorl. Aperture wide and slightly oblique; outer lip with a strong varix bordering the margin, within ornamented with six tubercles situated a little below the margin; inner lip biplicate, the posterior plication much stronger.

Dimensions: Type (U. S. Nat. Mus. Cat. No. 352663) measures: Altitude 7.3 mm.; greatest diameter 4 mm.; length of aperture 3 mm.; width 1.6 mm.

The species is represented by a single specimen. I find no close relative to this new species. The species is named in honor of J. A. Bullbrook, the collector.

Occurrence.—Middle or lower Miocene: Guaico-Tamana Road, 2 miles east of mile 13 from junction with Eastern Main Road, Trinidad.

Genus PSEUDOLIVA Swainson

PSEUDOLIVA GUPPYI, new species

Plate 5, fig. 6

Shell subovate, solid, rather low spired, one-fifth length of shell, with four and one-half whorls in all. Last two and one-half whorls quite strongly shouldered a little nearer the lower suture, behind which the whorls slope rather steeply to the suture and in front are nearly vertical. The upper whorls are rounded in outline. Suture loosely appressed on the early whorls but grooved on the later whorls. Apical one and one-half turns, smooth, polished, and semihemispherical in outline. Sculpture on subsequent whorl begins with very fine punctostriate spiral threads overspreading the first whorl and lying behind the shoulder on the two remaining whorls. Broad and elongate tubercles occupy the periphery of the last two whorls. Body whorl marked with a distinct sulcus which encircles the whorl shortly below the upper lip commissure on the body wall to the lower part of the outer lip. About twelve spiral plicate bands lie below this sulcus. In addition to the above sculpture ornamentations, there are rather indistinct, raised, narrow bands lying between the shoulder and the sulcus on the body whorl, and irregular growth lines crossing

the whorls, being more prominent on the last whorl. Aperture about one-half the length of the shell, semiovate in outline; its anterior extremity forms a wide, short, rounded, reflected canal emarginating the anterior extremity. A small chink is behind the smooth calloused columella.

Dimensions: Type (U. S. Nat. Mus. Cat. No. 352664) measures: Altitude 10.5 mm.; greatest diameter 6.5 mm.; length of aperture 6.5 mm.

The genus is found in the Recent fauna along the western coast of Africa.

Occurrence.—Upper Miocene: Caroni County, Springvale, near Couva.

Genus ANCILLA Lamarck

ANCILLA LAMELLATA (Guppy)

Ancillaria lamellata GUPPY, Geol. Soc. London, Quart. Journ., vol. 22, 1866, p. 579, pl. 26, fig. 9.

Type locality: "Lower Miocene, Manzanilla, Trinidad, Guppy, 1866." There are in the United States National Museum (Cat. No. 115568) four specimens designated as types.

This species is separated from *Ancilla paralamellata*, new species collected from the Brasso beds by its more evenly conic spire and by the undulating spirals on the early whorls. I find no close relative to this species in outside deposits. Two specimens of this species were collected from Manzanilla coast, station 9197, by J. A. Bullbrook.

ANCILLA PARALAMELLATA, new species

Plate 5, figs. 2, 7

? *Ancilla lamellata* MAURY (? in part), Bull. Amer. Paleont., vol. 10, no. 42, p. 197, 1925.

Shell rather small for the group, semiovate, highly polished, spire acuminate, slightly depressed behind the anterior suture, larger co-type probably with about six whorls. Entire shell covered with a thin wash of callus except for a narrow area encircling the lower half of the body whorl, beginning opposite the pillar and extending to the margin of the outer lip; a heavier callus on the body whorl marginates the uncalloused area and extends parallel with the axis of the whorl from the suture to the upper margin of the aperture. Nucleus apparently consists of about one whorl. Spirally sculptured mainly on the spire whorls—early whorls of about two or three striae separated by slightly raised areas; on the later whorls the striae increase in number and the interstices flatten out. Behind

the pillar is the usual deep, rounded-bottom furrow, behind which are two calloused plications; the margin of the posterior plate marks the lower boundary of the uncalloused area; a spiral stria is near the lower part of the uncalloused area. Aperture wide, elliptical, with a posterior chink at the commissure of the outer lip and body whorl; outer lip arcuate; pillar concave and twisted, provided with a thin, sharp, high, and oblique plication above; base of pillar splayed and scored with 12 to 15 sulci. Anterior canal, short, rounded, wide, and deep.

Dimensions: Larger cotype (U. S. Nat. Mus. Cat. No. 352667) measures: Altitude 27.5 mm.; greatest diameter 12 mm.; length of aperture 12 mm.

The new species here described is very closely related to *A. lamellata* Guppy, but it has less undulating spiral bands on the earlier whorls than Guppy's species.

Type locality: 9212. One mile south of Brasso, Trinidad, in flood-wash.

ANCILLA CARONIANA Maury

Plate 5, fig. 4

Ancilla caroniana MAURY, Bull. Amer. Paleont., vol. 10, no. 42, p. 198, pl. 33, figs. 4, 10, 12, 1925.

Shell of medium size, semiovate, solid, spire moderately acuminate and about as long as aperture, slightly grooved at the suture, about six whorled. Surface of shell with a thin wash of callus except for a banded area encircling the lower half of the body whorl, beginning opposite the pillar and extending to the margin of the outer lip; a heavier longitudinal callus on the body whorl marginates the uncalloused area and unites with the posterior extremity of the columellar plate just below the posterior commissure of the aperture. Apical whorl rounded; following whorls gradually and evenly enlarging with a low shoulder behind the shallowly grooved suture. Spire sculptured only with two or three spiral striae on the scarp behind the suture. Aperture elliptical, a little longer than wide; outer lip arched, moderately thin; pillar a little longer than body of the shell, concave, twisted, provided with a strong plication, decidedly oblique within, margin backward curved and unites with the body wall below the posterior commissure of the aperture; base of pillar splayed and scored with about four striae. A prominent, deep, furrow is between the columellar plate and the body wall, below it is shallow, rounded and twists with the pillar and extends nearly to its anterior end. Behind the pillar, is the usual deep, rounded-bottom furrow, behind which are two heavy plicated bands separated by a narrow furrow extending anteriorly to the siphonal

emargination; the upper margin of the posterior plication marks the lower boundary of the uncalloused area; a spiral stria is near the lower part of the uncalloused area. Anterior canal short, wide, rounded, and deep.

Dimensions: Figured specimen (U. S. Nat. Mus. Cat. No. 352665) measures: Altitude 41 mm.; diameter 18 mm.; length of aperture 19 mm.; diameter about 8 mm.

The species has a general resemblance to *Ancilla shepardi* Dall, from the "silex bed" of the Tampa formation of Florida, but it is a heavier shell and has a greater apical angle than Dall's species. Although apparently related to the Jamaican species, *A. pinguis* Guppy, it is easily separated. The Jamaican species is a smaller shell and is roundly excavated at the suture. Guppy reports "*Ancillaria lamellata*" Guppy from Springvale.¹¹ If his form is the same as in our collection from Springvale, it was wrongly identified with his species from Manzanilla.

Occurrence.—Upper Miocene: Springvale, near Couva, Trinidad.

ANCILLA CARONIANA Maury, subspecies **SPRINGVALENSIS**, new subspecies

Plate 5, fig. 5

There are two specimens from station 9195 and several specimens from Montserrat, Trinidad (Guppy), deposited in the United States National Museum which appear to be a subspecies of *A. caroniana*. The Montserrat specimens are labelled *Ancillaria glandiformis* Lamarck. The shell is shorter and stouter and the whorls more inflated than *A. caroniana*, otherwise it is very similar.

Dimensions: Type (U. S. Nat. Mus. Cat. No. 352666) measures: Altitude 35 mm.; greatest diameter 17 mm.; length of aperture 19 mm.; width about 8 mm.

Type locality: 9195. Springvale, near Couva, Trinidad.

Occurrence.—Upper Miocene: Montserrat, Trinidad (U. S. Nat. Mus. Cat. No. 115566).

ANCILLA BRASSICA Maury

Ancilla brassica MAURY, Bull. Amer. Paleont., vol. 10, no. 42, p. 199, pl. 33, figs. 1, 8, 9, 1925.

There are in the United States National Museum two specimens collected from Guaico-Tamana Road, 2 chains east of mile 13 from junction with eastern main road that compare with figure 9.¹²

¹¹ Agr. Soc. Trin. and Tobago Proc., vol. 10 (Paper 440), p. 452, 1910.

¹² Figures 1 and 8 appear to represent two different forms and may represent two different species.

Genus *MARGINELLA* Lamarck*MARGINELLA (FABA) BULLBROOKI*, new species

Plate 5, fig. 1

Shell small, solid, stout, semibiconic, highly polished, prominently axially sculptured, and three and one-half whorled. Spire less than one-fourth length of shell, broadly conic; last whorl gradually sloping from the peripheral shoulder to the broad base. Apical whorl smooth, bluntly rounded and partly concealed by callus. Suture of following whorls appressed and overlapping the preceding whorl nearly to the periphery; suture bordered below by a faint spirally-sculptured, wide, raised, slightly anteriorly-depressed, nearly flat plication, below which the shoulder steeply ascends. Axial sculpture of about twelve strong, rather sharp, triangular ribs, extending from the base of the shoulder behind to the suture on the spire whorls and forward on the body whorl nearly to the anterior extremity. Aperture moderately narrow, linear, shallowly channeled posteriorly, rounded and slightly expanded at the canal; outer lip with a prominent varix, inner margin ornamented with about nine denticles—denticles reduced at either extremity; pillar provided with four blunt-edged plications, the posterior two nearly transverse, anterior two oblique and the anterior one marginates the canal and joins the lip-varix.

Dimensions: Type (U. S. Nat. Mus. Cat. No. 352648) measures: Length 4.3 mm.; greater diameter 2.7 mm.; length of aperture, 3.4 mm.

The new species is unique. In a general way it is similar to a recent species *Marginella faba* Linnaeus from Senegambia, west coast of Africa. This very interesting species is named in honor of the collector, J. A. Bullbrook.

Occurrence.—Middle or lower Miocene: In flood-wash, 1 mile south of Brasso.

MARGINELLA (FABA) BRASSOËNSIS, new species

Plate 6, fig. 4

Shell small, polished, prominently axially sculptured, four whorled. Spire high, about one-third length of shell, whorls moderately inflated; body whorl inflated, roundly shouldered in front of the suture and evenly sloping to the base. Apical whorl smooth, short and bluntly rounded; following whorls with a low subsutural spiral line marginating the appressed suture, below which is the whorl constriction. Spire and body whorl axially sculptured by about thirteen sharp, vertical ribs, separated by rounded interspaces and extending

on the spire-whorls from suture to suture and on the body whorl forward to a little below the base. Aperture rather narrow, linear, posterior extremity rounded and commissure shallowly furrowed; anterior extremity well rounded; outer lip with a strong marginal varix, anchored posteriorly above the suture; inner margin ornamented with six denticles which do not enter beyond the varix; the posterior one is about one-fifth of the margin length from the end and about the same distance from the following anterior one, the others are closer-spaced and slightly reduced in size anteriorly. Pillar provided with four equal-sized and equally-spaced plications—the posterior two transverse and the anterior two oblique.

Dimensions: Type (U. S. Nat. Mus. Cat. No. 352649) measures: Length 3.5 mm.; greatest diameter 1.8 mm.; length of aperture 1.8 mm.

Type locality: Station 8302, in flood-wash, Caroni County, Montserrat Ward, 1 mile south of Brasso.

The new species here described differs from *M. (Faba) bullbrookii*, new species, in having a much longer spire and fewer denticles along the inner margin of the outer lip.

Occurrence.—Middle or lower Miocene: 9212, (?) 9027 (one imperfect specimen).

MARGINELLA GUPPYANA, new species

Plate 6, figs. 1, 2, 3

Shell of moderate size, pyriform, spire short and acuminate, about four whorled. Suture appressed. Whorls marked by a spiral stria below and near the suture. Surface of body whorl slightly depressed behind the rounded shoulder and marked by wide-spaced, axial ridges extending from the spiral stria forward to the periphery of the whorl. On smaller specimens assigned to this species, these ridges extend nearly across the body whorl; the interspaces on the spire slope are deeply excavated. The posterior end of the outer lip is a little higher than spire and its margin is anchored to the spire by a wash of callus; margin arcuate and bordered by a strong lip-varix. Columella medially concave and provided with four strong plications—posterior two transverse and terminating farther within, anterior two oblique and extending externally upon the prominent siphonal fasciole. The anterior one marginates the canal and fuses with the lip-varix.

Dimensions: Type (U. S. Nat. Mus. Cat. No. 352650) measures: Altitude 18 mm.; greatest diameter 14 mm.

I am unable to find a close relative to this new species.

Occurrence.—Middle or lower Miocene: St. Andrew County, Manzanilla Ward, Manzanilla coast.

MARGINELLA GUAICA Maury

Plate 6, fig. 12

Marginella guaiaca MAURY, Bull. Amer. Paleont., vol. 10, no. 42, p. 200, pl. 34, figs. 2, 4, 1925.

Shell of medium size, biconic, polished, and five whorled. Spire acuminate and about one-fourth the length of shell. Body whorl strongly shouldered below the suture, below which it slightly expands and then gradually tapers to the base. Apical whorl highly polished, bluntly rounded and partly concealed by callus. Last two whorls more inflated than the preceding and provided with a prominent, rounded, subsutural spiral band below which the shoulder is ornamented with short, rounded axials or folds. Aperture about three-fourths length of shell, medially a little wider, deeply notched posteriorly, and expanded at the anterior canal. Outer lip with a strong well-defined varix, ornamented within but not extending beyond the varix or over the posterior one-fifth of the margin, with 18 denticulations; pillar concave and provided with four grooved plates—the posterior two are nearly transverse and the anterior two oblique; the anterior one forms the margin of the canal and is continuous with the outer lip varix.

Dimensions: Figured specimen (U. S. Nat. Mus. Cat. No. 352656) measures: Length 13.6 mm.; greatest diameter 6.5 mm.; length of aperture, 9 mm.

The species resembles *M. sowerbyi* Gabb, a species occurring in both the Cercado and Gurabo formations of the Dominican Republic, but it differs from this species in being a more slender shell and possessing short axials at the shoulder of the spire below the suture.

Locality of figured specimen: 9219. Guaico-Tamana Road, 2 chains east of mile 13 from junction with Eastern Main Road.

Occurrence.—Middle or lower Miocene: 9212, 1 mile south of Brasso.

MARGINELLA SPRINGVALENSIS Maury

Plate 6, fig. 13

Marginella springvalensis MAURY, Bull. Amer. Paleont., vol. 10, no. 42, p. 200, pl. 34, figs. 10, 14, 1925.

Shell large, ovate, solid, and probably polished (surface corroded), and about four whorled. Spire acuminate and extending 5 mm. above outer lip; body whorl strongly and roundly inflated at the posterior third, and in front provided with a moderately thick wash of callus. Aperture 2 mm. wide above and 6 mm. below; outer lip slightly arcuate, outer margin with a wide and strong varix, inner margin smooth. Columella concave, provided with four equal-sized plications—anterior two are closer-set and more oblique. The lower extremity of the aperture is broken away.

Dimensions: Figured and only specimen (U. S. Nat. Mus. Cat. No. 352653) measures: Length 36 mm.; greatest diameter 21 mm.; length of aperture 30 mm.

The shape of the species recalls *Marginella aurora* Dall from the Chipola River, Florida, but the Chipola species has a narrower aperture and a denticulated outer lip along its inner margin.

Occurrence.—Upper Miocene: Springvale, near Couva, Trinidad, British West Indies.

MARGINELLA CALYPSONIS Maury

Plate 6, fig. 11

Marginella calypsonis MAURY, Bull. Amer. Paleont., vol. 10, no. 42, p. 199, pl. 34, figs. 12, 13, 1925.

Shell of medium size, ovatecylindrical, solid, polished, and about four whorled. Spire low, extending 3 mm. above the outer lip, partly concealed by callus; body whorl on the dorsal side of the shell, ovate with the periphery at the posterior one-third of its length; in front, the shell is slightly flattened and covered by a thick wash of callus; on the left side this callus forms a low rounded shoulder, and posteriorly nearly overlaps the spire and then encircles the aperture and extends a little below the shoulder of the whorl. Aperture moderately narrow, linear, and a little wider below; outer lip nearly straight, outer margin with a strong, distinct varix, inner margin smooth. Columella slightly concave, provided with four rounded, nearly equal-sized plications—the posterior two are transversely placed, the anterior two oblique.

Dimensions: Figured specimen (U. S. Nat. Mus. Cat. No. 352654) measures: Length 20 mm.; greatest diameter 11 mm.; length of aperture 17 mm.

The nearest fossil ally to the species is *Marginella macdonaldi* Dall, a species recorded by Olsson,¹³ who writes:

“This large *Marginella* is one of the most common and characteristic species of the Gatun beds of Costa Rica.” *Marginella macdonaldi*, however, is a larger shell with a proportionately shorter spire and a more expanded aperture at the posterior extremity.

The nearest recent ally, and, indeed, a very similar species is *Marginella cincta* Kiener. *Marginella cincta* is a proportionately broader shell, and has a more abrupt and steeper shoulder on the body whorl.

Occurrence.—Upper Miocene: Springvale, near Couva, Trinidad, British West Indies.

MARGINELLA SOLITARIA MONTSERRATENSIS, new subspecies

Plate 6, figs. 5, 6

The new subspecies differs from *Marginella solitaria* Guppy¹⁴ from the Ditrupa bed, Point-à-Pierre, Trinidad, in the following re-

¹³ Bull. Amer. Paleont., vol. 9, p. 267, 1922.

¹⁴ Proc. U. S. Nat. Mus., vol. 19, p. 308, pl. 29, fig. 14, 1896.

spects: The spire is a little longer and the apical whorl less truncate; the body whorl is more shouldered below the suture and more depressed at the posterior third; the outer lip possesses a stronger marginal varix, and the inner margin one more denticle at the anterior end. Otherwise the variety is very similar to Guppy's species, which may not be quite adult. The length of Guppy's type is 2.6 mm. and diameter is 1.6 mm.

Dimensions: Type (U. S. Nat. Mus. Cat. No. 352658) measures: Length 2.7 mm.; greatest diameter 1.6 mm.

Occurrence.—Middle or lower Miocene: In flood-wash, Caroni County, Montserrat Ward, 1 mile south of Brasso railway station.

MARGINELLA (CLOSIA) NITRINA, new species

Plate 6, fig. 7

Shell minute, broadly ovate, polished, maximum diameter about four-fifths of the length of the shell and falling a little behind the middle of the vertical axis; back of body whorl slightly depressed below the periphery. Aperture slightly longer than the body whorl both posteriorly and anteriorly, narrow, nearly vertical, expanding a little at either extremity; outer lip with a strong, marginal varix which surrounds the anterior and posterior extremities of the aperture and merges with the callus wash over the face of the body whorl; inner margin coarsely granulose. Columella with four equally spaced, externally papillate plications—anterior two stronger and more oblique, terminal one sharp and marginates the inner wall of the canal.

Dimensions: Type (U. S. Nat. Mus. No. 352652) measures: Length 2 mm.; greatest diameter 1.5 mm.

The new species resembles *Marginella (Closia) oculiformis* Orbigny, a species reported from the Pliocene to Recent, but it is a proportionately shorter shell with a body whorl anteriorly more acuminate and is a more cypraeiform shell than Orbigny's species.

Occurrence.—Middle or lower Miocene: In flood-wash, Caroni County, Montserrat Ward, 1 mile south of Brasso.

MARGINELLA (CLOSIA) LACHRIMULA Gould ?

Plate 6, fig. 9

There are two specimens from station 9224, Caroni County, Springvale, near Couva, that are somewhat corroded and incapable of exact specific determination. In all characters discernible, they compare with "*M. (Gibberula) lachrimula*" Gould,¹⁵ a species that has been reported from the Miocene to Recent, especially abundant in the latter.

The larger and better preserved specimen (U. S. Nat. Mus. Cat. No. 352655) measures: Altitude 3 mm.; greatest diameter 2.1 mm.

¹⁵ Boston Soc. Nat. Hist. Proc., vol. 8, p. 281, 1862.

MARGINELLA (GIBBERULA) TRINITATENSIS, new species

Plate 6, fig. 8

Shell small, ovate-cylindrical, solid, polished; spire about 0.2 mm. higher than outer lip; body whorl marked with microscopic bands (color ?), and a prominent rounded sulcus about 1 mm. from the anterior end. A heavy wash of callus overruns the spire and extends forward over the face of the body whorl to the anterior sulcus. Aperture narrow, linear, with a reflected anterior canal which emarginates the base of the whorl. Outer lip nearly vertical, margin slightly inflected medially, moderately curved in below and reflected above; serrated within below the margin. Columella provided with a strong oblique plication below the sulcus, and four weaker, equally spaced, transverse plications above. Lower border of inner lip provided with a thin, nearly erect plication.

Dimensions: Type (U. S. Nat. Mus. Cat. No. 352657) measures: Length 4 mm.; greatest diameter 2.3 mm.

Not all the specimens assigned to this species show spiral bands, probably due to the thickened porcelainlike layer and enamel. The nearest fossil ally to the new species appears to be *Marginella cercadensis* Maury, a species occurring in the Cercado formation of the Dominican Republic. The Dominican species, however, has a larger shell and has a much more expanded outer lip.

Occurrence.—Middle or lower Miocene: In flood-wash, Caroni County, Montserrat Ward, 1 mile south of Brasso.

MARGINELLA (PERSICULA) PROPEOBESA, new species

Plate 6, fig. 10

Shell ovate, rather fragile, posterior extremity well rounded, periphery at the posterior third of length, spire about 1 mm. higher than the margin of the outer lip. Spire whorls concealed by callus; number of whorls indeterminable; body whorl with a callus ridge overrunning the spire and extending parallel with and external to the aperture over the front of the body whorl for half its length; aperture moderately wide, arcuate and slightly expanding anteriorly with a recurved, short, rather wide anterior canal; outer lip arcuate, margin broken away. Columella convex, ornamented with eight plications, the posterior six transverse, equally spaced, gradually enlarging anteriorly and extending posteriorly over one-half the length of the columella, following plication much stronger, slightly biplicate and overruns the pillar externally, anterior one somewhat smaller, oblique, and marginates the canal.

Dimensions: Type (U. S. Nat. Mus. Cat. No. 352651) measures: Length 10 mm.; greatest diameter 7 mm.

The specimens from Montserrat are more mature than the Springvale specimen—the outer lip is entire, revealing a moderately strong

margin-varix and a serrated inner lip. The Montserrat specimens are mentioned¹⁶ by Dall who states "In looking over the Guppy collection, now in the National Museum, I find a species from Cumana, labeled *M. coniformis*, but which can not be distinguished from *M. cincta* Kiener (No. 115599, U.S.N.M.); and another similarly named from Montserrat, Trinidad, which is a *Persicula*, closely related to *P. obesa*. Redfield."

The new species here described is very closely related to *M. (Persicula) arcuata* Guppy described from "Ditrupa bed, Pointapier, Trinidad," but that species though it may be an immature specimen, is a proportionally wider shell and possesses an outer lip with lirae far within its inner margin.

The closest fossil ally is *M. gravida* Dall, a species described from the Caloosahatchee formation (Pliocene) of Florida. The closest recent ally, *M. obesa* Redfield, has a more sloping posterior shoulder than the new species.

Marginella (Persicula) couviana Maury¹⁷ is closely related to the new species but Maury's species has fewer plications on the columella.

Type locality: Station 9195. Springvale, near Couva.

Occurrence.—Upper Miocene: Montserrat, Trinidad (Guppy), (U. S. Nat. Mus. Cat. No. 115600).

Genus MITRA Lamarck

MITRA LONGA Gabb var. COUVENSIS Maury

Plate 7, figs. 9, 11

Mitra henekeni SOWERBY, Guppy, Scient. Assn. Proc., Trinidad, p. 160, 1867; Agr. Soc. Trinidad and Tobago, vol. 10, Society Paper No. 440, p. 452 and p. 454, 1910.

Mitra longa GABB var. *couvensis* MAURY, Bull. Amer. Paleont., vol. 10, no. 42, p. 203, pl. 35, figs. 1, 4, 1925.

Unfortunately the specimen is not entire—three or more of the early whorls and the extremity of the canal are missing. The spire is moderately acuminate and the body whorl much longer than the spire. Whorls convex in outline, and constricted at the excavated sutural area. Sculpture on the spire whorls of three to four, sharp, narrow, well-separated raised, primary spiral lines, intercalated with three to four secondary spirals which are axially crossed by growth lines of about equal strength, giving the area a cancellated appearance. Last whorl similarly sculptured, having 16 primary spirals intercalated with 3 to 4 secondary ones. Aperture apparently about one-half length of shell. Columella with five oblique folds, the

¹⁶ U. S. Nat. Mus. Proc., vol. 19, p. 310, 1896.

¹⁷ Bull. Amer. Paleont., vol. 10, no. 42, p. 202, pl. 34, fig. 11, 1925.

posterior one strongest and the following ones gradually diminishing in size.

Dimensions: Figured specimen (Cat. No. U. S. Nat. Mus. 352659) measures: Length 55 mm.; greatest diameter 15 mm.

Locality figured specimen: 9195. Caroni County. Couva Ward, Springvale, near Couva. J. A. Bullbrook, collector.

The nature of the sculpture of the variety differs from both that of *Mitra henekeni* and *Mitra longa* Gabb. It has more folds on the columella than *M. henekeni*. Perhaps it is closer related to *M. longa* than *M. henekeni*, but it is a much stouter shell than that species.

Occurrence.—Upper Miocene: "Savanetta" (Guppy), U. S. Nat. Mus. Cat. No. 11595, labeled "*Mitra henekeni* Sow."

Genus VEXILLUM Bolten

VEXILLUM BRISTOLI (Maury)

Plate 8, fig. 2

Turricula bristoli MAURY. Bull. Amer. Paleont., vol. 10, no. 42, p. 205, pl. 35, fig. 5, 1925.

Shell subfusiform, solid, moderately stout, turritid, last whorl a little longer than spire, with one and one-half nuclear and six post-nuclear whorls. Nucleus smooth, apical turn small, succeeding one slightly inflated and much larger. Postnuclear whorls gradually enlarging, shouldered adjacent to and below the distinct suture. Axially sculptured with about fourteen nearly vertical, rounded and smooth ribs, extending from suture to suture over the spire whorls and continuing weaker over the canal on the last whorl. Spirally sculptured with impressed lines (six on penult whorl) lying in the interaxial valleys, separated by square-topped interspaces of about equal width. Over the canal, three to four spirals are wider spaced and stand out in relief. Aperture rather narrow. Canal short. Outer lip sculptured within with seven slender, keeled, spiral lines. Columella with four plications, beginning a little above the center of the aperture, successively diminishing in size anteriorly. A single plication is on the body wall just below the commissure of the outer lip.

Dimensions: Figured specimen (U. S. Nat. Mus. Cat. No. 352660) measures: Altitude 7.5 mm.; greatest diameter 2.6 mm.; length of aperture 3 mm.

The species is a smaller, stouter, and more turritid shell than the species *Vexillum tortuosellum* (Pilsbry and Johnson) described from the Dominican Republic.

Mitra barnardensis Maury from the Chipola marl member of the Alum Bluff formation of Florida belongs in this same group. It is a larger shell with more acuminate spire than the species here described.

Occurrence.—Middle or lower Miocene: In flood-wash, Caroni County, Montserrat Ward, 1 mile south of Brasso.

Genus SOLENOSTEIRA Dall

SOLENOSTEIRA SEMIGLOBOSA Guppy

Solenosteira semiglobosa GUPPY, Agr. Soc. Trinidad and Tobago, Proc., vol. 11, 1911, p. 200, pl. 2, figs. 5, 6.

Solenosteira semiglobosa MAURY, Bull. Amer. Paleont., vol. 10, no. 42, p. 209, pl. 36, fig. 1, 1925.

This species is more closely related to *Solenosteira vaughani* Dall, a Miocene species of Coe's Mill Run, Florida, than *S. mengeana* Dall, a Pliocene species from Caloosahatchee River, Florida. However, it is a much larger form and more globose in outline than either of these species. In a general way, it resembles *S. anomala* Reeve of the West Coast ranging from Magdalena Bay to Panama, but that species has a much higher spire and more angled whorls. There is one specimen in our collection from station 9195, Springvale, near Couva, that agrees with Guppy's figures.

Genus PHOS Montfort

PHOS TRINITATENSIS, new species

Plate 7, fig. 5

Shell rather slender, solid, spire one-third length of last whorl, consisting of about two smooth convex and constricted nuclear and six moderately inflated and gradually enlarging postnuclear whorls. Suture of postnuclear whorls flexuous and close-fitting. Axial sculpture of postnuclear whorls of (seven on the penultimate and eight on the last whorl) strong, rounded ribs extending forward on the last whorl to the siphonal canal. Aside from these, there is one on the early whorls and increasing to two on the later whorls small axials between the major ribs, being nodulous at the intersection with the spirals. Spiral sculpture of (about six or seven on the spire whorls and fifteen on the last whorl) keeled, raised, backward-reflected, prominent primary lines overrunning the axials and valleys with about equal strength. Medially between these, there is a very fine spiral thread. Outer lip marked internally with 11 long, entering, sharp lirae. Columella biplicate at its lower extremity. Siphonal fasciole well developed, marked off behind by a groove, and sculptured with five spirals.

Dimensions: Type (U. S. Nat. Mus. Cat. No. 352669) measures: Altitude 22 mm.; greatest diameter, 11 mm.; length of aperture 10 mm.

The new subspecies differs mainly from *Phos semicostatus* in having strong axials on the body whorl and a longer canal. *Phos fasciolatus* Dall appears to be a distinct species and not "a form or variety" of *P. costatus* as stated by Pilsbry.¹⁸ Dall's species has a different type of sculpture and nucleus.

Type locality: Station 9219, Guaico-Tamana Road, 2 chains east of mile 13 from junction with Eastern Main Road.

Occurrence.—Middle or lower Miocene: In flood-wash, 9212 (var.); 1 mile south of Brasso.

PHOS BULLBROOKI, new species

Plate 7, fig. 4

Shell small, solid, turritid, with acute spire, seven whorled including three nuclear whorls. Nuclear whorls porcellaneous, smooth except for a faint spiral below and near the suture, constricted, and shouldered below the suture. Apical turn minute, third one large. Following whorls strongly shouldered and excavated below the flexuous and moderately appressed suture. Axial sculpture of (11 on the penultimate and 8 on the body whorl) strong, rounded ribs, projecting behind over the subsutural sulcus and extending forward on the spire whorls to the suture and on the body whorl to the base. A small axial, nodulous at the intersection with the spiral, lies in the major interaxial valleys. Spiral sculpture of (7 on the penultimate whorl and 17 on the last whorl and canal) broadly-rounded, prominent lines, beginning above at the shoulder and continuing on the last whorl with equal strength over the axials and valleys forward to the carina of the siphonal fasciole. Faint secondary spirals intercalate the primary ones. Aperture about one-half the length of the shell; canal twisted. Margin of outer lip broken away. Columella with two folds—the posterior one is external and marks off the siphonal fasciole behind and the anterior one marginates the canal. Six spirals intercalate these folds.

Dimensions: Type (U. S. Nat. Mus. Cat. No. 352670) measures: Altitude 13.4 mm.; greatest diameter 7.3 mm.; length of aperture 6.5 mm.

The new species is based upon one specimen, perhaps immature, but it is well characterized. I am unable to find a very close relative to this new species.

Occurrence.—Middle or lower Miocene: Guaico-Tamana Road, 2 chains east of mile 13 from junction with Eastern Main Road.

¹⁸ Pilsbry, H. A., Revision of W. M. Gabb's Tertiary mollusca of Santo Domingo, Acad. Nat. Sci. Phila. Proc., pt. 2, p. 349, 1922.

Genus **ALECTRION** Monfort**ALECTRION BRASSOËNSIS**, new species

Plate 7, fig. 3

Shell small, solid, acute, with three nuclear and three and one-half postnuclear whorls. Apical turn minute and papillose. Following nuclear whorls broadly conical, smooth, and inflated. Periphery of postnuclear whorls situated well forward and marginating the depressed presutural area of the following whorl; body whorl broadly rounded. Suture undulated and shallowly grooved. Axial sculpture of about twelve strong, rounded ribs extending from suture to suture on the spire and to the siphonal fasciole on the body whorl. Spiral sculpture of two to three close-set threads adjacent to and in front of the suture; four stronger, equally spaced threads extend forward to the periphery of the whorl; and two small threads lie within the depressed presutural area. Body whorl with about twelve major spirals. All spirals overrun the ribs and valleys with nearly equal strength. Aperture ovate. Outer lip with a strong varix; within, ornamented with five or six long lirae alternating near the margin with small denticles. Inner lip with a wash of callus, marked by two lirae on the body wall and roughened at its lower border. Canal short, reflected and slightly expanded anteriorly. Siphonal fasciole marked with six spirals.

Dimensions: Type (U. S. Nat. Mus. Cat. No. 352668) measures: Altitude 5.2 mm.; greatest diameter 3.4 mm.

Occurrence.—Middle or lower Miocene: In flood-wash, station 9212, Caroni County, Montserrat Ward, 1 mile south of Brasso. ? Occurs also at station 9197.

The new species differs from Maury's species, *Alectrion cercadensis*, in having fewer and stronger spirals on the body whorl. *Alectrion cercadensis* appears to be confined to the Cercado formation.

Genus **METULELLA** Gabb**METULELLA CARONENSIS**, new species (? "**STROMBINA COSTARICENSIS**" Olsson, new subspecies)

Plate 7, figs. 7, 8

Shell solid, elongate-ovate, turritid, with a long attenuated upper spire; lower spire whorls nearly straight in outline, last whorl medially flattened above. Whorls probably about ten in number (early ones broken off) of which the first three are smooth, constricted at the suture, but not tabulated below and form an attenuated upper spire. Following whorls tabulated below the suture. Axial sculpture precedes the spiral and consists, at the initiation,

of faint axials and on the following whorls of (fifteen to seventeen on the penultimate whorl) moderately strong, slightly protracted ribs extending across the spire whorls and to the basal shoulder on the body whorl. Spiral sculpture of equal strength to axial and consists of slightly rounded, narrow cords, four to five in number on the spire whorls and fifteen on the body whorl and canal, being weakly nodulous at the intersection with the ribs. Outer lip broken away. Inner lip apparently bearing a callus. Columella medially enlarged, tapering below and bearing oblique cords.

Dimensions: Cotypes (U. S. Nat. Museum Cat. No. 352672) measures: Specimen A (with better preserved upper whorls), altitude 16.5 mm.; greatest diameter 6 mm. Specimen B, altitude 14.5 mm.; greatest diameter 6 mm.; length of aperture 6 mm.

The description and figures of *Strombina costaricensis* Olsson from the Gatun formation, Headwater of Middle Creek, Costa Rica, appear to match closely the Trinidad form. However, the diameter of Olsson's species is proportionately greater and the spirals weaker.

Occurrence.—Middle or lower Miocene: In flood-wash, Caroni County, Montserrat Ward, 1 mile south of Brasso.

Genus STROMBINA Mörch

STROMBINA WALLI, new species

Plate 8, figs. 5, 7

Shell small, solid, with a moderately short spire and a broad body whorl, eight whorled. Nucleus large, smooth, broadly conical, whorls convex and weakly constricted at the suture. Following whorls tabulated below the suture, spire whorls nearly straight in outline. Axial sculpture only on the three postnuclear spire whorls of (about twelve on the penultimate whorl) indistinct, rather broad axials, being more prominent at the base of the whorl. On some specimens, the axials are almost indiscernible. Last whorl smooth and flattened dorsally between a broadly rounded ridge on the left side and the very large outer lip. Aperture narrowly ovate, deeply incised behind with a short reflected anterior canal. Outer lip heavy, depressed behind the margin of facial surface and provided with seven denticles within; upper ones strong, lower ones very weak. Inner lip heavily calloused and provided with four denticles along the columellar border. Base of body whorl and columella spirally sculptured with about twelve cords.

Dimensions: Type (U. S. Nat. Mus. Cat. No. 352671) measures: Altitude 6 mm.; greatest diameter 3.4 mm.; length of spire 2.2 mm.; length of aperture 3 mm. A larger specimen with a missing outer lip

measures: Altitude 7.5 mm.; length of spire 2.7 mm.; length of aperture 4.2 mm.

The new species very closely resembles *Strombina chiriquiensis* Olson from the Gatun formation, Water Cay, Panama. It differs mainly from that species in having weaker axials on the spire whorls. Its closest ally among the Dominican fauna is *Strombina pseudohaitensis* Maury, Cercado formation. but this species is larger, has heavier radials on the spire and has a weak spiral ridge directly below the suture.

The new species is named in honor of G. P. Wall, a pioneer geologist in Trinidad.

Occurrence.—Middle or lower Miocene: In flood-wash, Caroni County, Montserrat Ward, 1 mile south of Brasso.

Genus TYPHIS Montfort

TYPHIS SAWKINSI, new species

Plate 2, fig. 11

Typhis linguiferus MAURY (not of Dall), Bull. Amer. Paleont., vol. 10, no. 42, p. 214, pl. 36, figs. 4, 5, 1925. Identification not certain.

Shell small, solid, fusiform, strongly axially sculptured, with five remaining whorls, tip broken off. Early whorls carinated, later strongly shouldered below the suture. Axial sculpture of (four on the penultimate whorl and five including the strong lip varix on the body whorl) strong varices alternating with weaker axials bearing at their summits moderately strong, protractive tubes. The varices are very strong on the three anterior whorls, offset to the left at the suture and overlap the preceding whorl, terminating at the base of the intervarical tube and lying between the varix and the rib. Between the varices the deep recessed suture is revealed. Each varix bears on its right margin and directly over the suture a short tube. The intervarical ribs extend on the spire whorls from the shoulder to the following suture, and on the last whorl to the base. A few minute axial growth lines overrun the surface. Aperture elongate-ovate, bordered by a raised rim. Anterior canal curved to the right and on the left side strengthened by three anterior-converging varices.

Dimensions: Type (U. S. Nat. Mus. Cat. No. 352673) measures: Altitude 15 mm.; greatest diameter 7.5 mm.

This species recalls *Typhis gabbii* Brown and Pilsbry from the Gatun formation, Panama, but that species possesses wrinkled and pitted sculpture markings on the last whorl not seen on the new species. The new species is named in honor of J. G. Sawkins, a pioneer geologist in Trinidad.

Occurrence.—Middle or lower Miocene: Guaico-Tamana Road, 2 chains east of mile 13 from junction with Eastern Main Road.

Genus CYPRAEA Linnaeus ·

CYPRAEA TRINITATENSIS, new species

Plate 8, fig. 10

Shell solid, subelliptical and smooth. Spire broadly conic, consisting of three inflated whorls, apical turn broken off. Aperture narrow above and wide at the anterior end. Teeth equally prominent on both lips, rising vertically from within. There are about 25 teeth on the outer lip. Anterior canal narrow, fortified above by a single tooth on either side. The specimen is preserved as a cast. The spire as now revealed may have been concealed by enamel, but there is no indication of this.

Dimensions: Type and only specimen (U. S. Nat. Mus. Cat. No. 352686) measures: Length 39 mm.; lateral diameter 21 mm.; ventral diameter 16 mm.

The new species in general aspect recalls *C. exanthema* Linnaeus, a recent species, but Linnaeus's species has a pinched or contracted anterior lateral extremity, while the new species has a broader and less attenuated anterior region.

Occurrence.—Lower Miocene; Station 8299 (loc. 3), Cumuto Road, 17 miles from Eastern Main Road, Trinidad.

Genus MODULUS Gray

MODULUS TAMANENSIS Maury

Plate 7, figs. 1, 2

Modulus tamanensis MAURY, Bull. Amer. Paleont., vol. 10, no. 42, p. 237, pl. 40, figs. 2, 3, 1925.

Shell large and strong with about one smooth, broadly coiled nucleus and seven prominent spirally sculptured subsequent whorls; spire whorls broadly conic; body whorl slightly compressed above the periphery; base subconic and full. Spire sculpture of six, high, thin, marginally reflected and undulated spirals, the posterior one being strongest and overhangs the suture; base with eight similar subequal spirals. Surface of whorl crossed by retractive growth lines which overrun the summits of the spirals, crenulate them on the later whorls and produce a cancellate ornamentation on the early whorls. Aperture subquadrate; outer lip sharply liriate within, harmonizing with the spiral sculpture; body wall and lower columella with a moderately heavy wash of callus; columella short, bearing a thin revolving lamella which forms the left side of the anterior, deep but narrow channel. A small chink is behind the columellar callus.

Dimensions: Figured specimen (U. S. Nat. Mus. Cat. No. 352686) measures: Altitude 29 mm.; maximum diameter 19 mm.

Locality of figured specimen: Station 9219. Guaico-Tamana Road, 2 chains east of mile 13 from junction with Eastern Main Road.

The species is closely related to *Modulus wilcoxii* Dall from the Chipola marl member of the Alum Bluff formation, Florida, but it differs mainly from Dall's species in having stronger spiral sculpture and lacking the blunt duplex and undulating carina at the shoulder of the body whorl. When compared with *M. basileus* (Guppy) from the Bowden marls of Jamaica, that species is found to have much weaker spirals over the middle part of the whorl and a proportionally heavier carina on the basal whorl.

Occurrence.—Lower or middle Miocene: Nariva County, Charuma Ward, Machapoorie Quarry.

Genus CAECUM Fleming

CAECUM PROPEREGULARE, new species

Plate 8, fig. 6

Shell small, solid, strongly curved, moderately tapering; periphery at anterior one-fifth of length; anterior extremity smooth and contracted, sloping forward from the periphery. Sculpture of (about 24) rounded, close-set threads, separated by shallow stria; posterior annulation a little wider and more prominent and marginating the posterior end. Plug not extending much above the margin of the shell; mucro small, situated at the margin on the convex side.

Dimensions: Type (U. S. Nat. Mus. Cat. No. 352675) measures: Length 1.5 mm.; diameter of anterior end 0.3 mm.; diameter of posterior end 0.2 mm.

The new species belongs to the group of *Caecum regulare* Carpenter, but that species has sharper spiral annulations. It more closely resembles an unpublished new species from the Shoal River marl member of the Alum Bluff formation of Florida.

Occurrence.—Middle or lower Miocene: In flood-wash, Caroni County, Montserrat Ward, 1 mile south of Brasso Station.

Genus VERMICULARIA Lamarck

VERMICULARIA, species

There are specimens of the Genus *Vermicularia* from Springvale, near Couva, station 9195, that resemble *Vermicularia eburneus* Reeve, a Recent species of the west coast geographically ranging from San Diego, Calif., to Panama, but the material at hand is hardly adequate for specific determination.

Genus **PETALOCONCHUS** H. C. Lea**PETALOCONCHUS ALCIMUS**, new species

Plate 9, figs. 2, 3, 4

Petalococonchus sculpturatus [not H. C. Lea] GUPPY, Agr. Soc. Trinidad Proc., vol. 10, p. 451, 1910. (In his list from Springvale.)

Petalococonchus sculpturatus, var. *domingensis* MAURY (not of Sowerby), Bull. Amer. Paleont., vol. 10, no. 42, p. 226, pl. 41, figs. 2, 4, 7, 1925.

Shell solid, strong, thick walled, and large. Early part of shell forms a loose and irregular spiral coil, which is angled with the succeeding part. The following part up to about an inch in length is more regularly spirally coiled, with gradually enlarging volutions. The terminal part is usually coiled but the turns are very irregular and loose. Whorl contour of the more regularly coiled part nearly straight, slightly depressed medially and carinated at its lower margin. The terminal tube is more rounded in outline. Sculpture on the earliest coils of wide spaced, incremental transverse riblets, and of two to three longitudinal lines being weakly nodulous at the intersection with the ribs. The sculpture on the following more regular coils not strong, consisting of incremental rugae and low longitudinal lines. The two internal laminae are high, rounded at the summits, and arched toward each other.

Petalococonchus sculpturatus H. C. Lea is a much smaller shell and possesses stronger and more beaded, longitudinal sculpture lines, the whorl contour on the more regular and closely coiled spire is more rounded than in the new species.

Type and locality (U. S. Nat. Mus. Cat. No. 352674): Station 9195, Springvale near Couva, Trinidad.

Occurrence.—Upper Miocene: "Montserrat (Guppy), U. S. Nat. Mus. Cat. No. 115456, and "Corona series" (Guppy) U. S. Nat. Mus. Cat. No. 115457.

Genus **TURRITELLA** Lamarck**TURRITELLA GATUNENSIS CARONENSIS**, new subspecies

Plate 8, figs. 12, 13, 14

Turritella gatunensis MAURY, Bull. Amer. Paleont., vol. 10, no. 42, p. 229, pl. 42, fig. 12, 1925.

The specimens assigned to this new subspecies largely consist of fragments, either of the early or later whorls of the shell. When the form of the new subspecies is compared with *Turritella gatunensis* Conrad it is found to be less attenuated, slightly more constricted and less roundly excavated at the suture, and the two primary spirals on the lower half of the whorl to be less distinct than on the latter species. The early whorls on both are very similar. The number of whorls is not known. The nucleus of the new subspecies

consists of one and one-half whorls; the apical turn is minute, the following much larger, smooth, and inflated. A low indistinct medial carina and minute spiral threads appear on the following whorl, becoming gradually stronger in ascending the spire. On the fourth whorl, another primary spiral appears at the base of the whorl. At first, this is weak but gradually strengthens and on the later whorls becomes nearly as strong as the medial one. On the anterior whorls, the two primary spirals continue but are not prominent. Four or five rather strong secondary spiral lines intervene behind the medial primary and the suture, two or three lie between the primary spirals and about two behind the suture; very fine tertiary spiral threads overrun the interspaces.

Cotypes (U. S. Nat. Mus. Cat. No. 352678).

Type locality: In flood-wash, station 9212, Caroni County, Montserrat Ward, 1 mile south of Brasso.

Occurrence.—Middle or lower Miocene; Stations 8302, 9215.

TURRITELLA MACHAPOORENSIS Maury

Plate 7, fig. 10

Turritella machapoorensis MAURY, Bull. Amer. Paleont., vol. 10, no. 42, p. 234, pl. 42, fig. 11, 1925.

Shell acuminate and solid, whorls medially compressed, suture very shallow and indistinct. Early whorls with a broad medial concavity, marginated above and below by a rounded raised cord, the lower being a little stronger and forming the periphery of the whorl. Another spiral, small at first but gradually increases in size in ascending the whorl until it equals in strength the one above, lies behind the suture. On the later whorls, the three primary spirals continue, the lower two becoming more prominent and the presutural one being a little stronger and forms the periphery of the whorl. Rather close-set, carinate spirals intervene the primary, about three lie between the suture and the following primary, three to four lie in the shallow concavity and one between the basal primaries. Very fine irregular spirals overrun the shell, being especially evident on the larger whorls. The anterior part of the specimen is broken away.

Dimensions: Figured specimen (U. S. Nat. Mus. Cat. No. 352680) measures: Length 29 mm.; greatest diameter 12 mm.

This species closely resembles *Turritella tampae* Heilprin from the "silex bed" of the Tampa formation of Florida. The upper spiral whorls on the latter species are more drawn out, the suture more distinct and interval between the basal cords smooth or feebly sculptured. The species also resembles *Turritella anguillana* Cooke from the Oligocene, Anguilla, but the latter species possesses a stronger paired basal spirals and less ornamentation above

them. A similar type of shell occurs at station 5853, Panama Canal Zone, apparently from the Culebra formation.

Locality of figured specimen: 9220, Nariva County, Charuma Ward, Machapoorie Quarry, Trinidad.

Occurrence.—Lower Miocene: 8299, Caroni County, San Rafael Ward, Cumuto Road, 17 miles from Eastern Main Road.

TURRITELLA CAPARONIS Maury

Plate 9, figs. 10, 11

Turritella caparonis MAURY, Bull. Amer. Paleont., vol. 10, no. 42, p. 234, pl. 42, figs. 1, 2, 1925.

Shell strong, acute-conic, of eighteen whorls (estimated); nucleus decollate; whorls slightly convex in outline; sutural area shallow, roundly concave; suture close-fitting, distinct on earlier whorls and partly concealed on the later whorls by the preceding spiral ridge. Sculpture mainly of four equally spaced primary spirals of equal strength, save the presutural one, which is weaker, being lower-lying, rounded, finely spirally marked and projecting over the suture. The three other primary spirals begin on the earliest whorls as distinct, weakly beaded, fine, raised cords, but in ascending the whorl these gradually become more prominent, consisting of high, thin, denticulated, erect ridges, resembling the threads on a screw, the forward third forming the periphery of the whorl. Another beaded spiral lies near the upper base of the posterior ridge, faint on the early whorls but gradually increasing in strength in ascending the whorl. On the later whorls, a much finer spiral thread lies shortly below the suture. Weak, arcuate growth threads cross the spiral interspaces.

Dimensions: Synthesis of two specimens (U. S. Nat. Mus. Cat. No. 352681) measures: Length 28 mm.; greatest diameter 16 mm.

The species resembles *Turritella chipolana* Dall, from the Chipola marl member of the Alum Bluff formation, Florida. The species has four spirals on the earliest whorl, the Chipola species has three, and has much higher and thinner spiral ridges than the Chipola form.

Occurrence.—Lower Miocene: Station 8301 (loc. 5, F. W. P.), Nariva County, Charuma Ward, Machapoorie Quarry.

TURRITELLA MONTSERRATENSIS, new species

Plate 9, figs. 5, 6

Turritella attilira var. *tornata* MAURY (part), Bull. Amer. Paleont., vol. 10, No. 42, p. 230, pl. 42, fig. 3, 1925. (Not *Turritella tornata* Guppy.)

The cotypes consist of the lower five whorls of an adult specimen and the lower three whorls of a young specimen, the nuclei of both are

broken off. Shell of medium size and solid; whorls loosely coiled, medially concave, and rapidly enlarging in ascending the spire. Suture deep. Spiral sculpture on the early whorls of two low, weakly nodulous cords bordering the upper and lower shoulder of the whorl and separated by a shallow, broadly rounded concavity marked within with two smaller, weakly nodulous spiral cords. Lower spire whorls spirally sculptured with two moderately high cords serrated at their summits and occupying the upper and lower third of the whorl; these cords are separated by a broad, shallow concavity marked with two secondary spirals. The upper primary spiral weakly coronates the whorl. Another low spiral lies behind the suture and forms behind it on the basal slope a narrow and shallow sulcus which becomes more prominent on the body whorl. On the body whorl, the two primary spirals are low and rounded and the median band is shallow: the surface is roughened by imbricated, flexuous growth structures which almost conceal the median spirals.

Dimensions: Larger cotype (U. S. Nat. Mus. Cat. No. 352682) measures: Length 39 mm.; greatest diameter 15 mm.

The new species resembles *Turritella attilira costaricensis* Olsson from Gatun formation, Upper Hone and Boucary Creeks, Costa Rica, but the primary spirals on Olsson's species are weaker than on the new species.

Occurrence.—Caroni County, Montserrat Ward, junction of Gran-Couva and Brasso-Tabaquite Roads.

TURRITELLA, species cf. T. ALTILIRA, var. CHIRIQUIENSIS Olsson

Plate 10, figs. 2, 5

Turritella attilira chiriquiensis OLSSON, Bull. Amer. Paleont., vol. 9, p. 322, pl. 7, figs. 4, 8, 9, 14, 1922.

Turritella attilira var. *tornata* MAURY (part), Bull. Amer. Paleont., vol. 10, no. 42, p. 230, pl. 42, figs. 4, 5. (Not *Turritella tornata* Guppy.)

The form compared with this variety in our collection consists either of young individuals or fragments of the lower whorl of adult specimens. It differs mainly from *Turritella attilira* (typical) in being a slightly less attenuated shell and having more delicate sculpture ornamentations, and spiral sculpture markings on the upper slope of the posterior spiral cord. Of all specimens of *Turritella attilira* examined, the summit of the posterior spiral cord on the adult whorls is posteriorly reflected and the presutural area in front of it is very weakly spirally sculptured or bare. The lower member of the posterior spiral when doubled is the last to appear and gradually increases in strength in ascending the whorl. Some of the Trinidad specimens show a double posterior spiral but the

anterior member is always stronger and originates first while the posterior one is borne upon the upper slope of the lower and is the last to appear. The median concavity is marked with about two beaded secondary spirals and by tertiary ones between and on either side of the secondaries. The two primary spirals are crenulated at their summits and in strength are about equal. The type of *Turritella tornata* Guppy from Cumana, Venezuela, may be a young individual. This differs mainly from my specimens in having a much weaker spiral thread on the upper slope of the posterior spiral and two within the median concavity.

Figured specimens: U. S. Nat. Mus., Cat. No. 352676.

Occurrence.—Middle or lower Miocene: In flood-wash, 8302, Caroni County, Montserrat Ward, 1 mile south of Brasso; 9215, Caroni County, Montserrat Ward, Brasso railroad station, stream wash; 9219, Guaico-Tamana Road, 2 chains east of mile 13 from junction with Eastern Main Road.

TURRITELLA aff. T. PERATTENUATA PRAECELLENS Pilsbry and Brown

Plate 9, figs. 7, 8

Turritella perattenuata praecellens PILSBRY and BROWN. Acad. Nat. Sci. Phila. Proc., vol. 69, p. 36, pl. 5, fig. 12, 1917.

Turritella attilira var. *tornata* MAURY (part), Bull. Amer. Paleont., vol. 10, no. 42, p. 230. (Not *Turritella tornata* Guppy.)

There are several imperfect specimens that appear closely related to *T. perattenuata praecellens* Pilsbry and Brown from the Dominican Republic. They all possess two equally strong, crenulated primary spiral cords, the posterior one being double, with its posterior member being a little weaker. The median concavity is rather narrow and is usually spirally marked with one very fine thread. In the latter feature it differs from the Dominican form, as that is marked with several cords within the median concavity. These specimens tentatively compared with the Dominican species may prove to be distinct species when better material is procured but at present they hardly warrant a specific designation.

Occurrence.—Lower Miocene: Narviva County, Charuma Ward, Machapoorie Quarry; Figured specimens (U. S. Nat. Mus. Cat. No. 352677).

TURRITELLA PLANIGYRATA Guppy

Plate 9, figs. 1, 9

Turritella planigyrate GUPPY, Sci. Assoc. Trinidad Proc., vol. 1, pt. 3, pp. 169-170, 1867, (described).

Turritella planigyrate GUPPY, Geol. Mag. London, vol. 1, n. s., p. 408, pl. 18, fig. 5, 1874 (very poor figure).

Turritella planigyrate GUPPY, Geol. Soc. London, Quart. Journ., vol. 32, p. 519, 1876.

Turritella planigyrate GUPPY, Agr. Soc. Trinidad and Tobago, (Society Paper No. 444), vol. 10, p. 451, 1910.

Not *Turritella planigyrate* GUPPY, Maury, Bull. Amer. Paleont., vol. 5, p. 293, pl. 48 fig. 14, 1917.

Turritella planigyrate MAURY, Bull. Amer. Paleont., vol. 10, no. 42, p. 232, pl. 42, figs. 6, 7, 8, 1925.

“Conic cylindrical, striate by fine spiral lines, whorls very slightly convex, the later ones nearly flat; aperture subquadrate. Caroni series, Savanetta. A very distinct species, remarkable for its almost entire want of ornamentation, and the flatness of its whorls. I have lately received another specimen of *Turritella* from Mr. LeRoy, which is more like *T. imbricata*” (Guppy 1867),

There are in the United States National Museum four specimens (U. S. Nat. Mus. Cat. No. 115626), Montserrat (Guppy), and one specimen (U. S. Nat. Mus. Cat. No. 115452), Caroni series, Savanetta (Guppy), designated as types. All of these bear the same specific characterization. In addition, there are five specimens in the collection from Springvale (station 9195), one of which represents the lower whorls of a specimen larger than any forms in Guppy's types.

None of the specimens possess the earliest whorls. The earliest whorls on the specimens at hand are slightly convex at the equator, gradually sloping to the upper and lower suture. In ascending the spire the whorls gradually flatten out and gently ascend from the upper part of the whorl to the base. It is quite probable that the very earliest whorls are medially carinate. The spiral sculpture is very unique, consisting of very narrow, flat-topped bands promiscuously alternating either with narrower bands or fine spiral lines. On the earlier whorls, these spirals are very close-set, separated by spiral striae but on the later whorls these intervals widen. On the earlier whorls, the sutural area is broadly concave, interrupted only by the small presutural spiral, but on the lower and adult whorls the preceding whorl weakly overhangs the lower suture. The base of the whorl is similarly sculptured, except for a narrow, roundly excavated furrow situated a little below the angled shoulder.

Dimensions: Larger specimen of Guppy's types (U. S. Nat. Mus. Cat. No. 115626) measures: Length—tip broken off—41 mm.; diameter 15 mm. The diameter of a larger specimen from station 9195 (U. S. Nat. Cat. No. 352679) measures 23 mm.

This species is very closely related to *T. cartagenensis* Pilsbry and Brown from the Republic of Colombia, South America, but the latter species has a slight concavity in the upper half of the larger whorls, and the spiral sculpture is a little more open than in Guppy's species.

The recent analogue is *T. broderipiana* Orbigny, a species on the west coast extending from the Gulf of California to Peru, but the recent species in general is more medially compressed on the later whorls than the Trinidad species.

TURRITELLA, species cf. T. ALTILIRA Conrad (Typical)

- Turritella altilira* CONRAD, Pacific R. R. reports, vol. 6, p. 72, pl. 5, fig. 19, 1857.
Turritella gabbi TOULA, Jahrb. kk. Geol. Reichsanstalt, p. 695, pl. 25, fig. 5, 1909.
Turritella altilira BROWN and PILSBRY, Acad. Nat. Sci. Phila. Proc., vol. 63, p. 358, pl. 27, figs. 2, 3, 1911.
Turritella altilira OLSSON (typical), Bull. Amer. Paleont., vol. 9, p. 322, pl. 17, figs. 6, 7, 1922.

There are a few poorly preserved specimens that appear to represent *Turritella altilira* (typical). When better specimens are procured they may prove closely allied species or a varietal form.

Occurrence.—Stations, (?) 9215, 8300, 9212.

Genus NATICA Scopoli

NATICA YOUNGI Maury

- Natica youngi* MAURY, Bull. Amer. Paleont., vol. 5, p. 299, pl. 49, figs. 11, 12, 1917.
Natica finitima PILSBRY and JOHNSON, Acad. Nat. Sci. Phila. Proc., p. 173, 1917 (described).
Natica youngi MAURY, Pilsbry, Acad. Nat. Sci. Phila. Proc., pl. 34, fig. 21, 1921.
Natica youngi MAURY, Bull. Amer. Paleont., vol. 10, no. 42, p. 239, pl. 40, fig. 4, 1925.

Occurrence in Trinidad, station 9195, Caroni County, Couva Ward, Springvale, near Couva.

NATICA CANRENA (Linnaeus)

- Nerita canrena* LINNAEUS, Syst. Nat., ed. 10, p. 776, 1758.
Natica canrena LINNAEUS, Gabb, Amer. Philos. Soc. Trans., vol. 15, p. 223, 1873.
Natica canrena LINNAEUS, Guppy, Geol. Soc. London Quart. Journ., vol. 32, p. 518, 1876.
 Cf. *Natica cuspidata* GUPPY, Agr. Soc. Trinidad and Tobago Proc., vol. 11, p. 198, pl. 2, fig. 4, 1911.
Natica canrena (Linnaeus), BROWN and PILSBRY, Acad. Nat. Sci., Phila., Proc., p. 508, 1912.
Natica canrena (Linnaeus), MAURY, Bull. Amer. Paleont., vol. 5, p. 298, pl. 49, fig. 10, 1917.
Natica canrena (Linnaeus), PILSBRY, Acad. Nat. Sci. Phila. Proc., p. 386, 1921.
Natica canrena LINNAEUS, OLSSON, Bull. Amer. Paleont., vol. 9, p. 327, pl. 16, fig. 9, 1922.
Natica canrena MAURY, Bull. Amer. Paleont., vol. 10, no. 42, p. 238, pl. 40, fig. 8, 1925.

Occurrence in Trinidad.—Station 9195, Caroni County, Couva Ward, Springvale, near Couva. Station 9196, Caroni County, Montserrat Ward, junction of Gran Couva and Brasso-Tabaquite Roads.

Station 9219, Guaico-Tamana road, 2¹/₂ chains east of mile 13. Station 8302, Caroni County, Montserrat Ward, 1 mile south of Brasso railway station. Flood-wash (young). Station 9027, Caroni County, Montserrat Ward, Brasso-Gran Couva Road, 100–200 yards west of Brasso (young). (?), 9220, Nariva County, Charuma Ward, Macha-poorie Quarry (casts).

Genus AMAUOPSIS Mörch

AMAUOPSIS TRINITATENSIS, new species

Plate 10, figs. 4, 6

Shell large, subovate, with four remaining whorls, early whorls decollate; spire high for genus with gradually enlarging whorls. Whorls inflated with a low posterior shoulder; suture, as indicated, narrow and shallowly depressed.

Dimensions: Type (U. S. Nat. Mus. Cat. No. 352684) measures: Altitude 45 mm.; greatest diameter 33 mm.

The new species resembles in outline specimens of an undescribed form from station 6894, Crocus Bay, Anguilla, whose fauna has been referred to the Oligocene.

The high spire of the new species with its gradually enlarging and low-shouldered whorls distinguishes it from *A. guppyi* (Gabb).

Occurrence.—Lower Miocene: Station 8299, Cumuto Road, 17 miles from the Eastern Main Road, Trinidad.

Genus CALLIOSTOMA Swainson

CALLIOSTOMA ATTRINA, new species

Plate 10, figs. 7, 8

Shell rather small, conic, with seven remaining whorls—nucleus missing; whorls convex; shoulder of body whorl narrowly rounded; sutural area depressed on later whorls. Spire whorls sculptured with about six strongly beaded, primary spirals and two to three scattered intermediate secondary beaded spirals or crenulated threads—a smaller beaded spiral precedes the suture. About fourteen primary spirals extend from the periphery of the body whorl across the base. Margin of outer lip broken. Aperture apparently subovate. A small chink lies behind the aperture.

Dimensions: Type (U. S. Nat. Mus. Cat. No. 352688) measures: Altitude 13 mm.; greatest diameter 12 mm.

Occurrence.—Lower Miocene: Station 8299, Cumuto Road, 17 miles from the Eastern Main Road, Trinidad.

CALLIOSTOMA RHOMBOTUM, new species

Plate 8, figs. 4, 8

Shell very small, conic, four and one-half whorled; whorls rapidly expanding, nearly straight in outline; sutural area distinct and open on spire whorls, indistinct on body whorl; base nearly flat. Apical one-half turn small, globular, glazed and pearly, smooth and concentric. Subsequent whorl much larger, tabulate above and sculptured with three small granulose threads, the upper one very small and situated in front of the suture, the second one situated at the upper shoulder, and the lower one marginates the lower suture; indistinct axials cross the whorl connecting the granules. Following whorls more prominently sculptured, consisting of three on the two subsequent whorls and four (the basal one being doubled) on the last whorl, beaded spiral cords, the anterior third being a little stronger; beads connected axially by retractive threads giving the whorl a cancellate ornamentation and the interspiral space a rhombic pattern. Base of shell with a thin wash of callus but distinctly shows five subequal crenulated spirals lying within a wider, undulated and spirally striated peripheral band. About one-fourth of the last volution is broken away. Columella strong and enameled with a wash of callus.

Dimensions: Type and only specimen (U. S. Nat. Mus. Cat. No. 352689) measures: Altitude 3 mm.; greatest diameter 2.5 mm.

Occurrence.—Middle or lower Miocene: In flood-wash, Caroni County, Montserrat Ward, 1 mile south of Brasso, Trinidad.

Genus LIOTIA Gray**LIOTIA MACHAPOORIEËNSIS, new species**

Plate 8, figs. 1, 3

Shell large, solid, perforate, diameter a little greater than altitude, four whorled; whorls rapidly expanding, later ones well rounded; sutural area excavated; suture close-fitting; base nearly flat. Apical whorl flat and broadly coiled. Sculpture of subsequent whorl begins with two weakly nodulous spirals situated at the upper and lower shoulder of the whorl. Soon another median spiral appears. In ascending the whorl, these spirals increase in strength and are adorned with strong, protracted nodules. On the upper half of the body whorl, two other intermediate spirals appear, making five in number. Base with five lowly-nodulous spirals. Aperture subcircular in outline. Outer lip strongly crenulate harmonizing with the exterior sculpture.

Dimensions: Type and only specimen (U. S. Nat. Mus. Cat. No. 352687) measures: Altitude 6 mm.; greatest diameter 6.5 mm.

Occurrence.—Lower Miocene: Nariva County, Charuma Ward, Machapoorie Quarry, Trinidad.

Genus TEINOSTOMA A. Adams

TEINOSTOMA (PSEUDOROTELLA ?) CARONENSIS, new species

Plate 8, figs. 9, 11

Shell small, solid, subhemispherical, three and one-half whorled and consists largely of the last whorl; whorls inflated; suture distinct but shallowly depressed on spire whorls, and cross-fitting and less distinct on body whorl; periphery of body whorl rounded, base slightly rounded. Sculpture on last whorl of close-set, microscopic, spiral striae, being less distinct on the base. Aperture subovate, narrowly and shallowly grooved and pointed at the upper commissure. Umbilical area nearly filled with a heavy wash of callosus, transgressing only a little beyond the center of the base. Margin of the inner lip indistinct.

Dimensions: Type and only specimen (U. S. Nat. Mus. Cat. No. 452690) measures: Altitude 1.4 mm.; greatest diameter 2.2 mm.

The new species recalls *Teinostoma vitreum* (Gabb) collected from Santo Domingo, the horizon of which has not been determined, but when compared with Gabb's figured type, the new species has little higher and more domed spire and less constricted whorls and the margin of the inner lip much less distinctly set off.

Occurrence.—Caroni County, Montserrat Ward, Brasso-Gran Couva Road, 100-200 yards west of Brasso, Trinidad. Fossiliferous clay immediately overlying the Turritella-bearing limestone.

Genus ADEORBIS S. Wood

ADEORBIS GUPPYI, new species

Plate 10, figs. 1, 3

Shell fragile, subdiscoidal, spire nearly flat, about four whorled, one-third of last whorl broken off; body whorl with two widely separated spiral carini, the upper one high and thin, and situated near the middle of the whorl forming the periphery, the lower one less prominent and marginates the flat base; area between the carini straight and anteriorly sloping; area in front of the suture depressed. Nucleus smooth; initial turn minute. Subsequent whorl sculptured with three raised primary spiral threads; one is at the upper shoulder, another at the lower shoulder, and the intermediate

one occupies the median part of the whorl; on the following whorl, another spiral begins. Body whorl with seven primary spirals above the peripheral carina and four on the base between the lower carina and the umbilicus. Aside from the primary spirals, there are minute spiral threads—two at first, increasing to four in the depressed sub-sutural area, many below the carini, and one to two lying between the primary spirals. Umbilicus deep and wide and spirally marked with small threads. A few very fine axials cross the last whorl and enter the umbilicus.

Dimensions: Type and only specimen (U. S. Nat. Mus. Cat. No. 352691) measures: Altitude 1.7 mm.; greatest diameter 4.5 mm.

Occurrence.—Middle or lower Miocene: In flood-wash, Caroni County, Montserrat Ward, 1 mile south of Brasso, Trinidad.

Class SCAPHOPODA

Genus CADULUS Philippi

CADULUS CARONENSIS, new species

Plate 7, fig. 6

The shell is rather small, solid, evenly and quite strongly curved with its greatest diameter 0.7 mm. from the anterior end where the shell is slightly bulged. The convex arc is quite evenly and broadly rounded posteriorly forward to the equator, the posterior fourth forming a little narrower curve. The convex arc is slightly more curved than the concave side, the posterior region being a little more so. Dorsal slope, at anterior end, is more steeply inclined than on the ventral side. Surface marked by faint, wide-spaced, narrow, low spirals, anteriorly increasing in width. Anterior aperture is broadly elliptical, the lateral axis being the greater; peristome minutely denticulate. Apical aperture nearly round, margins slightly undulated and indistinctly denticulated.

Dimensions: Type (U. S. Nat. Mus. Cat. No. 352692) measures: Length 5.8 mm.; maximum diameter 1.3 mm.; diameter of anterior aperture, 0.9 mm.; diameter apical aperture, 0.5 mm.

The new species at first inspection recalls *Cadulus parianus* Guppy collected from the "Ditrupa bed," Pointe-à-pierre, Trinidad; but when closely compared is found to be a larger shell, with no marked contraction at its posterior end, and its maximum caliber more anteriorly situated than in Guppy's species. The Eocene species *Cadulus abruptus* Meyer and Aldrich, is quite similar in general aspect to the new species, but that is a larger shell and has a less curved outline.

Occurrence.—Middle or lower Miocene: In flood-wash, Caroni County, Montserrat Ward, 1 mile south of Brasso railway station.

CADULUS PARIANUS Guppy

Cadulus parianus GUPPY, U. S. Nat. Mus. Proc., vol. 19, p. 325, pl. 30, fig. 7, 1896.

Cadulus parianus MAURY, Bull. Amer. Paleont., vol. 10, no. 42, p. 182, 1925.

"Tube round, tapering, suddenly constricted near the broader end. Lon. 3, diam. 0.75 mm." (Guppy 1896).

The figured type well portrays the character of the species. The posterior end is suddenly contracted as shown in the photograph. On all specimens received with the type from Pointe-à-Pierre, the type locality, this feature is present, and is one of the outstanding characters of the species. One specimen belonging to this species was received with the later collection, station 8586, Pointe-à-Pierre.

Genus DENTALIUM Linnaeus

DENTALIUM COSSMANNIANUM Pilsbry and Sharp?

Dentalium dissimile, variety, GABB, Amer. Philos. Soc. Trans., vol. 15, p. 244, 1873.

Dentalium cossmannianum PILSBRY and SHARP, Acad. Nat. Sci. Phila. Proc., vol. 49, p. 467, pl. 10, fig. 11; pl. 11, figs. 10, 11, 1897 (1898).

Dentalium cossmannianum PILSBRY and SHARP, Maury, Bull. Amer. Paleont., vol. 5, p. 323, pl. 52, fig. 3, 1917.

Dentalium cossmannianum PILSBRY and SHARP, Pilsbry, Acad. Nat. Sci. Phila. Proc., p. 399, 1922.

There are a number of fragments, collected at station 8302, one mile south of Brasso, that appear to belong to this species. One larger fragment is marked with very faint interaxial longitudinal threads, a feature not shown on the Dominican species, otherwise it agrees with that species.

The Dominican species was collected from the Gurabo formation during the U. S. Geological Survey reconnaissance to that island in 1919.

Dentalium bocasensis Olsson, referred to the Gatun stage and collected from Bocas del Toro, Panama, possesses intermediate longitudinal ribs aside from the six primary ones. The indeterminate species may be closer to that species.

DENTALIUM, species

There are several fragments of *Dentalium* at station 8301, Machapoorie Quarry, representing mainly only the early part of the shell. In general, they recall *Dentalium gabbi* Pilsbry and Sharp, and may prove when better specimens are obtained to be closely related to that species. The very earliest part is hexagonal in outline. The upper extremity is well rounded and reveals indistinct axials, perhaps being obliterated by corrosion. Their relationship to the forms at station 8302 apparently is very close.

DENTALIUM, species (2 species?)

FIGS. 1, 9. *Conus multiliratus walli*, new subspecies. Fig. 9, type; alt. 21 mm.;

There are a number of fragments of the genus *Dentalium* from station 8302, one mile south of Brasso, that may represent one or two new species. They all belong to the group having an early hexagonal shell. They indicate a rather slender and nearly straight shell, the posterior extremity being more curved than the later part. Irregular, spiral swellings give the shell an undulated appearance. An interaxial appears early on the shell between the six primary ones; soon other interaxials come in rounding out the surface in ascending.

The forms are apparently related to *Dentalium gabbi* Pilsbry and Sharp from Santo Domingo. A very similar form occurs at station 6033-c, Canal Zone, a horizon assigned to the Gatun formation.

EXPLANATION OF PLATES

PLATE 1

- FIGS. 1, 4. *Conus trinitatensis*, new species; type; alt. 20 mm.; page 12.
 2. *Drillia pennyi acarria*, new subspecies; type; alt. 5.2 mm.; page 18.
 3, 6. *Conus springvaleënsis*, new species; type; alt. 27.0 mm.; page 11.
 5. *Terebra (Strioterebra) brassoënsis*, new species; type; alt. 6.2; page 10.
 7, 9. *Cylichnella ovum-lacerti* (Guppy): figured cotype; alt. 3.3 mm.; page 9.
 8. *Terebra (Strioterebra) trinitatensis*, new species; type; alt. 9 mm.; page 10.

PLATE 2

- FIGS. 1, 9. *Conus multiliratus walli*, new subspecies. Fig. 9, type; alt. 21 mm.;
 Fig. 1, specimen from same station as type; alt. 16 mm.; page 13.
 2. *Turricula springvaleënsis*, new species; type; alt. 44 mm.; page 13.
 3, 4. *Drillia propefusiformis*, new species. Fig. 3, type; alt. 34 mm.;
 fig. 4, specimen from same station as type; alt. 13 mm.; page 20.
 5, 10. *Conus manzanillaënsis*, new species; type; alt. 40 mm.; page 12.
 6. *Drillia manzanillaënsis*, new species; type; alt. 13 mm. page 23.
 7, 8. *Turris brassoënsis*, new species; cotype. Fig. 8, alt. 16 mm.; page 14.
 11. *Typhis sauckinsi*, new species; type; alt. 15 mm.; page 48.
 12. *Cancellaria springvaleënsis*, new species; type; alt. 21 mm.; page 31.

PLATE 3

- FIGS. 1, 5. *Drillia daditrina*, new species. Fig. 1, type; alt. 8.4 mm.; fig. 5,
 specimen from same station as type; alt. 10 mm.; page 19.
 2. *Drillia pennyi*, new species; type; alt. 9.3 mm.; page 17.
 3. *Drillia nitrina*, new species; type; alt. 6.5 mm.; page 22.
 4, 9. *Drillia inniadda*, new species; cotypes. Fig. 4, alt. 9 mm.; fig. 9,
 alt. 6 mm.; page 21.
 6. *Drillia inadrina*, new species; type; alt. 6.6 mm.; page 22.
 7. *Mangilia micropleura* Guppy. Figured specimen of largest cotype;
 alt. 6 mm.; page 25.

8. *Drillia*, species aff. *D. riogurabonis* Maury; alt. 10 mm. Station 9224, Springvale near Couva; page 24.
10. *Drillia consors bullbrooki*, new subspecies; type; alt. 18 mm.; page 16.
11. *Drillia tridadina*, new species; type; alt. 7.5 mm.; page 19.
- 12, 13. *Drillia consors trinitatensis*, new subspecies; cotypes. Fig. 12, alt. 6.5 mm.; fig. 13, alt. 13 mm.; page 17.

PLATE 4

- FIG. 1. *Glyphostoma caronensis*, new species; type; alt. 8.6 mm.; page 26.
- 2, 3. *Glyphostoma amicta rintriada*, new subspecies. Fig. 2, alt. 3.2 mm.; fig. 3, alt. 4.3 mm.; page 27.
4. *Glyphostoma? triniada*, new species; type; alt. 5.2 mm.; page 26.
5. *Microdrillia trina*, new species; type; alt. 6 mm.; page 28.
- 6, 8. *Drillia niadrina*, new species: cotypes. Fig 6, alt. 11 mm.; fig. 8, alt. 7.6 mm.; page 23.
7. *Microdrillia propetrina*, new species; type; alt. 3.6 mm.; page 29.
9. *Glyphostoma? addrina*, new species; type; alt. 6.2 mm.; page 28.
10. *Drillia ritanida*, new species; type; alt. 8.5 mm.; page 24.

PLATE 5

- FIG. 1. *Marginella (Faba) bullbrooki*, new species; type; alt. 4.3 mm.; page 36.
- 2, 7. *Ancilla paralamellata*, new species; cotypes. Fig. 2, alt. 10 mm.; fig. 7, alt. 27.5 mm.; page 33.
3. *Cancellaria bullbrooki*, new species; type; alt. 7.3 mm.; page 31.
4. *Ancilla caroniana* Maury; figured specimen; alt. 41 mm.; page 34.
5. *Ancilla caroniana springvaleënsis*, new subspecies; alt. 35 mm.; page 35.
6. *Pseudoliva guppyi*, new species; type; alt. 10.5 mm.; page 32.
8. *Borsonia (Paraborsonia) brassoënsis*, new species; type; alt. 14.3 mm.; page 30.

PLATE 6

- FIGS. 1, 2, 3. *Marginella guppyana*, new species. Figs. 1, 3 type; alt. 18 mm.; fig. 2, apical view of another specimen from type locality; alt. 9 mm.; page 37.
4. *Marginella (Faba) brassoënsis*, new species; type; alt. 3.5 mm.; page 36.
- 5, 6. *Marginella solitaria montserratensis*, new subspecies; type; alt. 2.7 mm.; page 39.
- FIG. 7. *Marginella (Closia) nitrina*, new species; type; alt. 2 mm.; page 40.
8. *Marginella (Gibberula) trinitatensis*, new species; type; alt. 4 mm.; page 41.
9. *Marginella (Closia) lachrimula* Gould? Alt. 3 mm.; page 40.
10. *Marginella (Persicula) propcobesa*, new species; type; alt. 10 mm.; page 41.
11. *Marginella calypsonis* Maury; figured specimen; alt. 20 mm.; page 39.
12. *Marginella guinea* Maury; figured specimen; alt. 13.6 mm.; page 38.
13. *Marginella springvaleënsis* Maury; figured specimen; alt. 36 mm.; page 38.

PLATE 7

- FIGS. 1, 2. *Modulus tamancensis* Maury; Fig. 2, figured specimen, alt. 29 mm.; fig. 1, specimen from station 8301, Machapoorie Quarry, showing better preserved nucleus, alt. 10.0 mm.; page 49.
3. *Alectrion brassoënsis*, new species; type; alt. 5.2 mm.; page 46.
4. *Phos bullbrooki*, new species; type; alt. 13.4 mm.; page 45.
5. *Phos trinitatensis*, new species; type; alt. 22 mm.; page 44.
6. *Cadulus caronensis*, new species; type; length, 5.8 mm.; page 61.
- 7, 8. *Metulella caronensis*, new species (? "*Strombina*" *costaricensis* Olsson, new subspecies); cotypes; Fig. 7, early whorls of specimen A, enlarged about six times; fig. 8, specimen B, alt. 14.5, page 46.
- 9, 11. *Mitra longa* var. *couvensis* Maury; figured specimen; alt. 55 mm.; page 42.
10. *Turritella machapoorensis* Maury; figured specimen; alt. 29 mm.; page 52.

PLATE 8

- FIGS. 1, 3. *Liotta machapooriënsis*, new species; type; alt. 6 mm.; page 59.
2. *Vexillum bristoli* (Maury), figured specimen; alt. 7.5 mm.; page 43.
- 4, 8. *Calliostoma rhombotum*, new species; type; alt. 3 mm.; page 59.
- 5, 7. *Strombina walli*, new species; type; alt. 6.0 mm.; page 47.
6. *Caecum properegulare*, new species; type; length 1.5 mm.; page 50.
- 9, 11. *Tcinostoma (Pseudorotella?) caronensis*, new species; type; alt. 1.4 mm.; page 60.
10. *Cypraca trinitatensis*, new species; type; length 39 mm.; page 49.
- 12, 13, 14. *Turritella gatunensis caronensis*, new subspecies; cotypes. Fig. 12 ($\times 5$); fig. 13 ($\times 4$); fig. 14 ($\times 8$); page 51.

PLATE 9

- FIGS. 1, 9. *Turritella planigyrate* Guppy. Fig. 1, cotype; alt. 41 mm.; U. S. Nat. Mus. Cat. No. 115626; fig. 9, basal whorls of a specimen from station 9195, Springvale, near Couva; diameter 23 mm.; page 55.
- 2, 3, 4. *Petalococonchus alcimus*, new species; cotypes. Fig. 2, early spiral coils; fig. 3, later spirals; fig. 4, shows two internal laminae, page 51.
- 5, 6. *Turritella montserratensis*, new species; cotypes. Length of specimen (fig. 5), 10 mm.; fig. 6, 39 mm.; page 53.
- 7, 8. *Turritella* aff. *T. perattenuata praecellens* Pilsbry and Brown; page 55.
- 10, 11. *Turritella caparouis* Maury; figured specimens; page 53.

PLATE 10

- FIGS. 1, 3. *Adcorbis guppyi*, new species; type; greatest diameter, 4.5 mm.; page 60.
- 2, 5. *Turritella*, species cf. *T. atillira*, var. *chiriquiensis* Olsson ($\times 3$), page 54.
- 4, 6. *Amauropsis trinitatensis*, new species; type; alt. 45 mm., page 58.
- 7, 8. *Calliostoma attrina*, new species; type; alt. 13 mm.; page 58.



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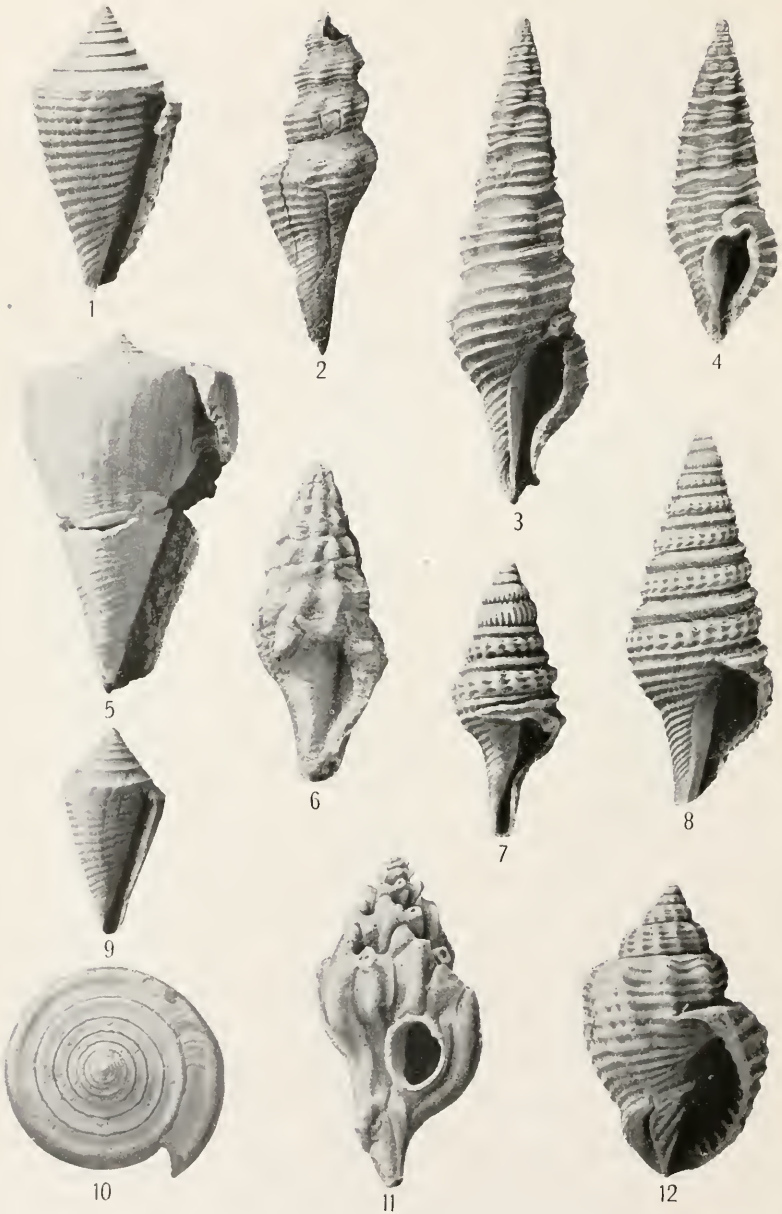
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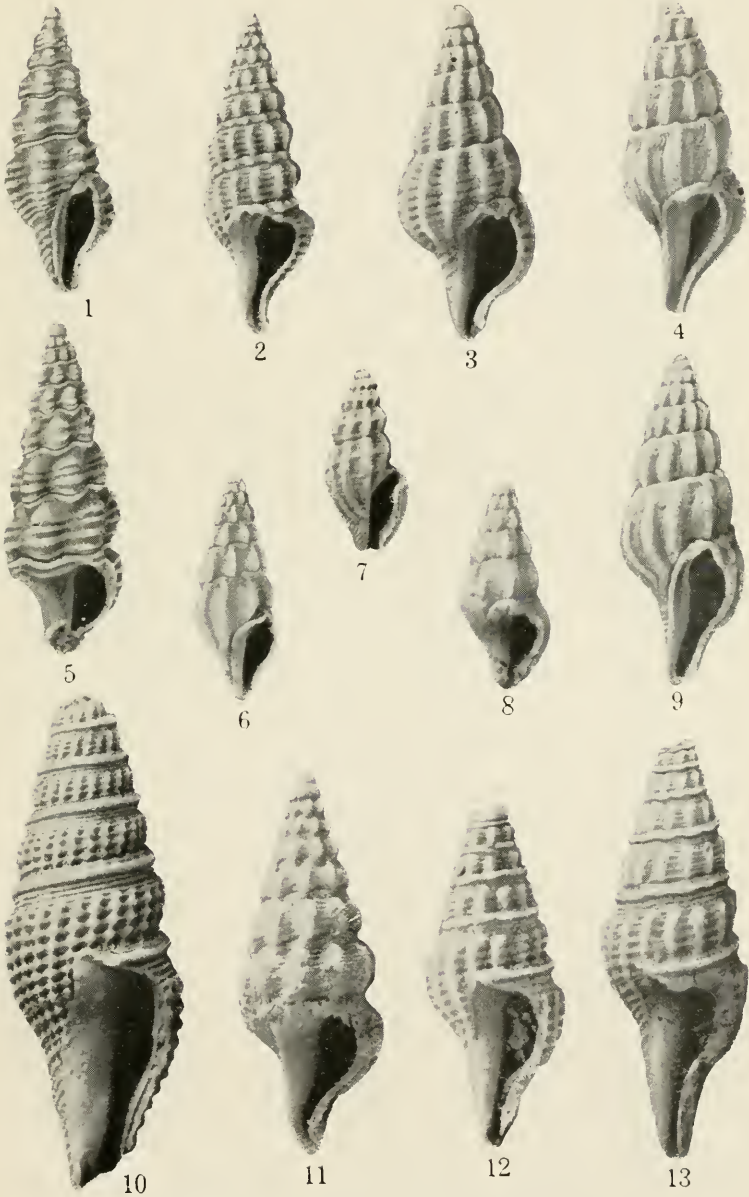
MIOCENE GASTROPODS FROM TRINIDAD

FOR EXPLANATION OF PLATE SEE PAGE 63



MIocene GASTROPODS FROM TRINIDAD

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MIocene GASTROPODS FROM TRINIDAD

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MIocene GASTROPODS FROM TRINIDAD

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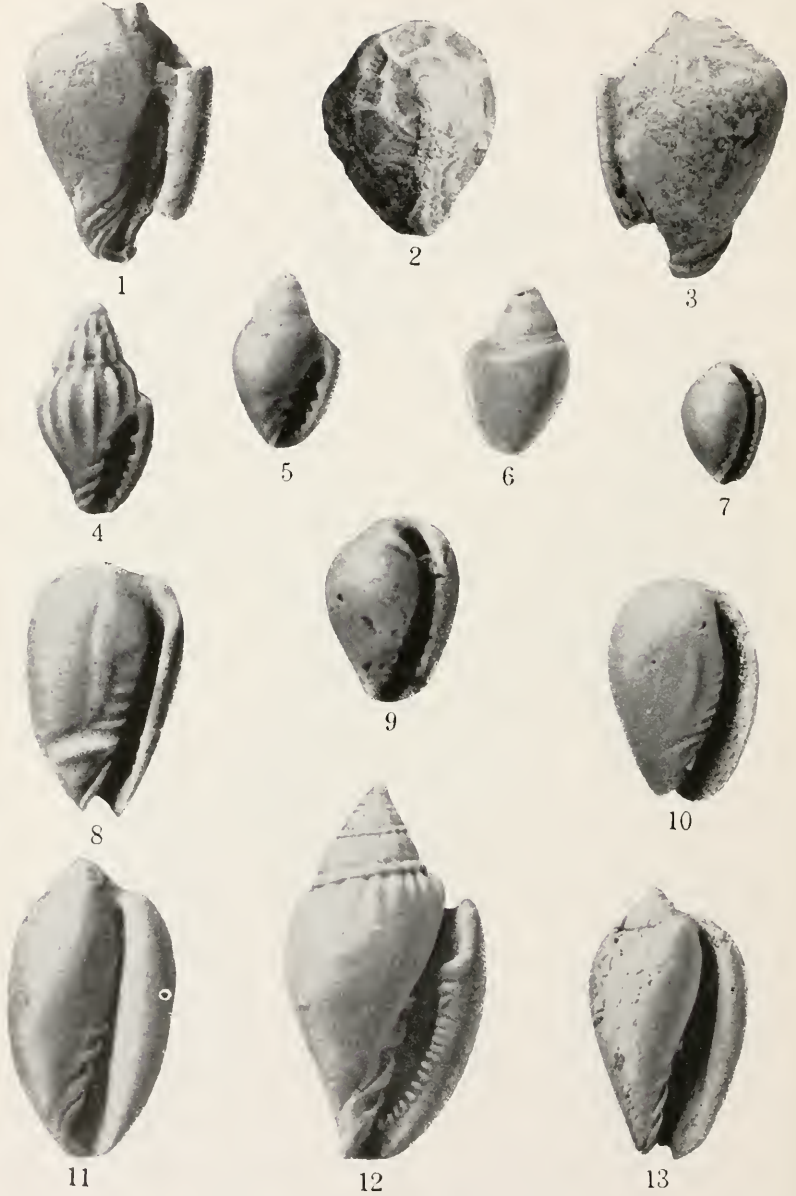
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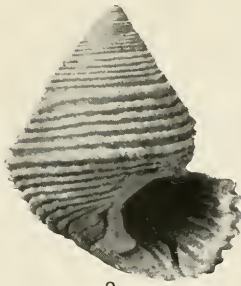


MIocene GASTROPODS FROM TRINIDAD

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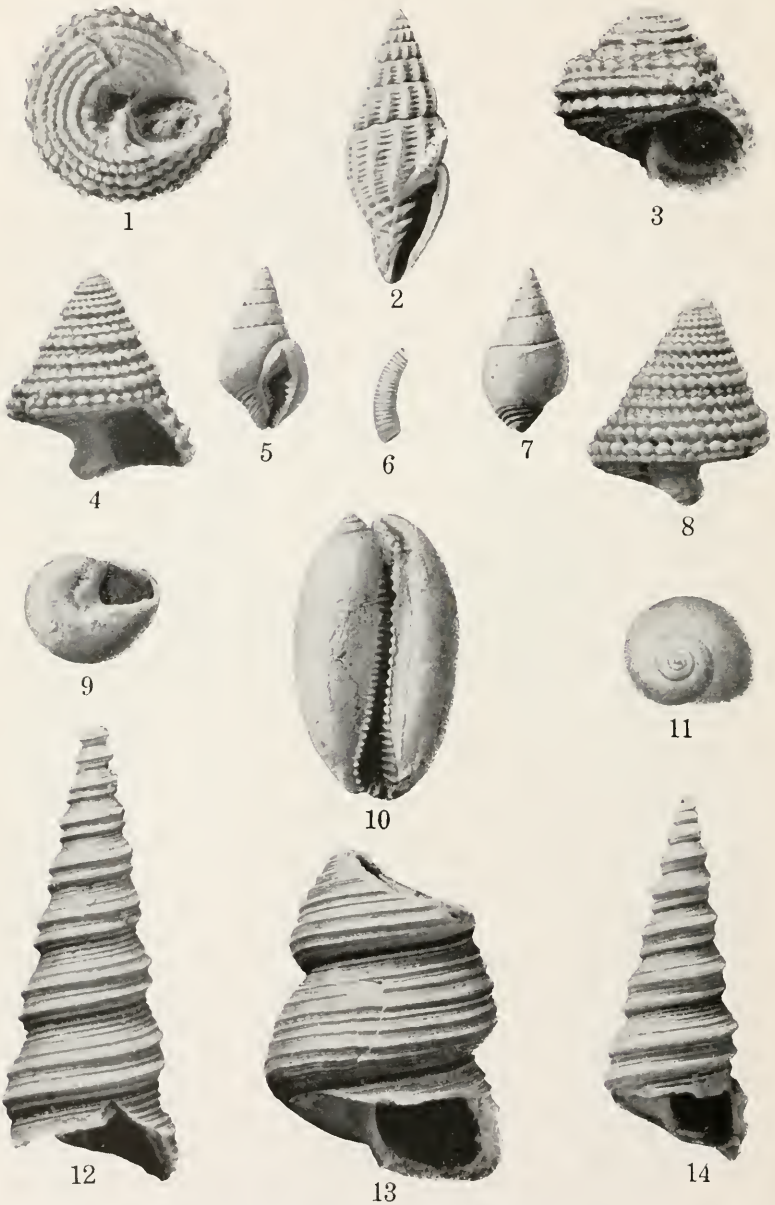
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MIOCENE GASTROPODS AND SCAPHOPODS FROM TRINIDAD

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