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LATE CENOZOIC GASTROPODS FROM NORTHERN VENEZUELA

BY
NORMAN E. WEISBORD

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CONTENTS

LATE CENOZOIC GASTROPODS FROM NORTHERN VENEZUELA

NORMAN E. WEISBORD*

Department of Geology
The Florida State University

ABSTRACT

Two hundred and eighty-eight species of gastropods, ranging in age from late Miocene ? to Recent, are described, compared, and illustrated. Of the total, 163 species or subspecies are believed to be new, and among those are 5 new subgenera and 3 new genera. The fossil gastropods are from La Salina de Guaiguaza in the State of Carabobo, and from Cabo Blanco in the Distrito Federal. The Recent gastropods are from Cabo Blanco (at Playa Grande) and from Higuerote, in the State of Miranda. The largest number of fossils (224) are described from the Cabo Blanco group which, from bottom to top is made up of the following formations: Las Pailas, Playa Grande, Mare, and Abisinia. The lowest formation—the Las Pailas—is unfossiliferous. The overlying Playa Grande is divided into two members, the Catia below, and the Maiquetía above. Based solely on the evidence of the gastropods and stratigraphic position, it is tentatively suggested that the Catia member is of later Miocene age, the Maiquetía member upper Miocene—Pliocene, the Mare formation Pliocene, and the Abisinia Pleistocene.

Many of the fossil gastropods, though fully developed, are small in size (1-5 millimeters). Relatively little is known about Caribbean Cenozoic micromollusks, but it is anticipated that far from being exceptional in their occurrence, the micromollusks will eventually be found to be as numerous species-wise as are the larger Mollusca.

INTRODUCTION

This monograph, which deals exclusively with the Gastropoda, is the first of a contemplated series of papers on the late Cenozoic marine invertebrates from northern Venezuela.[1] The material described in the present paper was collected between 1955 and 1957 from three localities: La Salina de Guaiguaza, approximately six kilometers west of Puerto Cabello in the State of Carabobo; Cabo Blanco, about 17 kilometers northwest of Caracas in the Distrito Federal; and at Higuerote some 88 kilometers east of Caracas, in the State of Miranda. The fossil gastropods are from La Salina and Cabo Blanco, the Recent ones from Cabo Blanco (at Playa Grande) and Higuerote. Two hundred and eighty-eight species are described,

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[1]The writer is grateful to the National Science Foundation for its support in furthering this study through its Research Grant NSF-G5846 awarded 28 July 1958.

compared, and illustrated. The fossils from Cabo Blanco are tied in with the stratigraphy as worked out by the present writer (Weisbord, 1957), and the specific localities mentioned throughout this report may be ascertained by referring to the geologic map in the 1957 publication. The systematic study of the gastropods was started early in 1957 and completed the middle of 1960.

In dealing with the late Tertiary and Quaternary Mollusca of the Caribbean region it is essential that the paleontologist be familiar not only with the fossils of the circum-Caribbean belt but also with the living fauna in Western Atlantic and Eastern Pacific waters. It is now well established that there was intercommunication between the Atlantic Ocean and the Pacific Ocean through Central America during part of the Pliocene epoch, and there is little doubt that many of the Western Atlantic species and some of the Eastern Pacific ones are survivors of late Tertiary Caribbean species. Also, if one subscribes in principle to the tenet of Lyell, that the dating of the epochs within the Tertiary period can be based on the percentage of the species that are living to-day, then it is imperative that the fossil shells be compared with the analogous Recent ones. Accordingly, the fossils described in this work have been compared not only with the late Tertiary fossils from the area surrounding the Caribbean Sea and the Gulf of Mexico but also with the Recent gastropods along the east and west coasts of the Americas. Where possible the Venezuelan material has been compared with actual type specimens or with specimens whose identification has been established by our best authorities. During October and November of 1959, after the preliminary systematic work had been completed, the writer spent six weeks examining the collections at the Museum of Comparative Zoology, the Paleontological Research Institution, the American Museum of Natural History, the Academy of Natural Sciences of Philadelphia, and the United States National Museum. This study revealed the necessity for a number of revisions, and these have been made.

Although I suppose I should not have been, I must confess I was rather taken aback at the number of different species of exceedingly small but adult fossil gastropods that I found in the washed samples. Compounding the difficulty of working with these minute organisms was the paucity of individuals of a particular species so

that the variations it would normally exhibit in a suite of specimens could not be determined. Moreover, little has been written about the Cenozoic micromollusks of the Caribbean region, and a large majority of the small forms have not been described. There is every reason to believe that Caribbean Cenozoic sediments contain as many species of micromollusks as macromollusks, and it is hoped that the present work will call attention to this important and nearly virgin domain of investigation. The study of Caribbean micro-Mollusca should be as rewarding as the study of the larger Mollusca, and the ceiling is unlimited.

The synonymy of the known species dealt with in this monograph is, in effect, a list of references to that species, and rests on the authority of the one who has identified it. The synonymy is often not complete although I have entered most of the references coming to my attention. Under the heading Bibliography are included references not only to the Gastropoda but to other classes of invertebrates. The bibliography also contains the titles to literature on the geology, stratigraphy, and other fields related to the Caribbean province.

The collection on which this work is based is deposited in the Paleontological Research Institution at Ithaca, New York, United States.

ACKNOWLEDGMENTS

I wish first to express my appreciation to my colleagues[2] in the Department of Geology at Florida State University for their interest in and support of this work. Not only has their encouragement of my particular project been unflagging, but they have created a stimulating and exciting atmosphere for earth scientists to work in.

For permission to examine the collections in the museums with which they are affiliated, and for their counsel and splendid cooperation, I am indebted to William J. Clench, Ruth D. Turner, and Richard D. Foster of the Museum of Comparative Zoology; to Norman D. Newell of the American Museum of Natural History; to R. Tucker Abbott and Horace G. Richards of the Academy of

[2]B. Frank Buie, head, George W. DeVore, H. Grant Goodell, Donn S. Gorsline, John Kenneth Osmond, William F. Tanner, Lyman D. Toulmin, Stephen S. Winters.

Natural Sciences of Philadelphia; to G. Arthur Cooper, Harald A. Rehder, and Wendell P. Woodring of the U. S. National Museum; to Robert O. Vernon and Ruth Wilson of the Florida Geological Survey; and to Katherine Van Winkle Palmer of the Paleontological Research Institution. I am particularly beholden to Katherine Palmer for attending to the many tasks involved in bringing this paper to publication, and for her help and advice during the course of its preparation.

W. P. Woodring's Cabo Blanco collection of labeled specimens at the U. S. National Museum has been an invaluable guide to me in the study of my own fossils from that area, and although I must assume the responsibility for the determinations in the present monograph, I feel that the decisions are the more firmly rooted from reference to that authoritative source.

The photography was done by Hal F. Riehle and Werner Vagt of Florida State University, and I am obligated to them for having done so much so well. The drawings were made by Andrew R. Janson, artist with the Florida Geological Survey.

Finally I must record my thanks to my good friend Ely Mencher, now at the Massachusetts Institute of Technology but formerly professor of geology at the Universidad Central de Venezuela, who in 1943 accompanied me on a collecting trip to Cabo Blanco and pointed up the need for an integrated study of the stratigraphy and paleontology of the sedimentary complex now known as the Cabo Blanco group.

LOCALITIES

The localities from which the gastropods were obtained and the formations in which they occur are listed below. The letter preceding the locality name is the same as that prefixing the number given to each species in the explanation of plates. All of the localities, except La Salina in the State of Carabobo, are shown on the geologic map accompanying the writer's paper (Weisbord, 1957) on the geology of the Cabo Blanco area, Venezuela. On the 1957 map there are a number of field stations marked by the letter "W" to which the appropriate locality mentioned here refers.

A. Beach, at Playa Grande Yachting Club, Distrito Federal. Recent.

B. Beach, southeast of Higuerote, State of Miranda. Recent.
C. Near south shore of La Salina de Guaiguaza, 6 kilometers west of Puerto Cabello, State of Carabobo.
D. Eastern edge of Playa Grande village at W-30. Abisinia formation.
E. 115 meters south-southwest of the crossing of Quebrada Mare Abajo and coast road, and 90 meters southwest of W-12. Upper Mare formation.
F. Hillside above west bank of Quebrada Mare Abajo at W-14. Upper Mare formation.
G. Hillside above west bank of Quebrada Mare Abajo near W-14. Mare formation.
H. 15 meters south of axis of Punta Gorda anticline at W-25. Mare formation.
I. Hillside above west bank of Quebrada Mare Abajo at W-13. Lower Mare formation.
J. Small stream 100 meters west of Quebrada Mare Abajo and 125 meters west-southwest of the intersection of Quebrada Mare Abajo and the coast road. Lower Mare formation.
K. Bluff 125 meters west of the intersection of the Playa Grande Yachting Club road and coast road, and about 95 meters due south of the shoreline. Playa Grande formation (Catia member).
L. South side of Playa Grande road about 220 meters west of W-15. Playa Grande formation (Catia member).
M. South side of Playa Grande road 40 meters southeast of its intersection with the Playa Grande Yachting Club road. Playa Grande formation (Catia member).
N. Near W-21 and to the south of that station in stream flowing along the strike of the north flank of the Litoral anticline. Playa Grande formation (Catia member).
O. Dip slope 100 meters west of Costa fault and 130 meters south of shoreline at W-22. Playa Grande formation (Catia member).
P. North bank of Quebrada Las Pailas 35 meters south of Mare Abajo fault and 150 meters southwest of the intersection of the Mare Abajo fault and Maiquetía anticline. Playa Grande formation (Maiquetía member).

Q. Quebrada Las Pailas at, and in the vicinity of W-4. Playa Grande formation (Maiquetía member).

R. Quebrada Las Bruscas at W-26, approximately 125 meters upstream from junction with Quebrada Las Pailas. Playa Grande formation (Maiquetía member).

S. Near *Lithothamnium* reef at W-23, north flank of Punta Gorda anticline. Playa Grande formation (Maiquetía member).

T. Stream 250 meters south-southwest of the mouth of Quebrada Las Pailas and 255 meters east-northeast of wireless station. Mare formation.

U. South side of coast road at east end of the village of Catia La Mar. Playa Grande formation (Catia member).

V. Scarp at W-18 about 200 meters south of the intersection of the Costa fault with the shoreline. Playa Grande formation (Catia member).

X. In Quebrada Las Pailas at W-3, south side of Mare Abajo fault near its intersection with the Bruscas fault. Playa Grande formation (Maiquetía member).

GASTROPODS COLLECTED IN NORTHERN VENEZUELA

The gastropods described in the present work are listed on the following pages. Under the heading of "Formation" the abbreviations are these:

Re=Recent
Sal=La Salina
Ab=Abisinia formation
Ma=Mare formation
PGm=Playa Grande formation (Maiquetía member)
PGc=Playa Grande formation (Catia member)

Species	*Formation*	*Geologic range of known species*
Emarginula multiradiata Weisbord, n. sp.	Ma	
Emarginula mareana Weisbord, n. sp.	Ma	
Emarginula ? tropica Weisbord, n. sp.	PGm	
Hemitoma octoradiata (Gmelin)	Re	Pleistocene—Recent
Diodora cayenensis (Lamarck)	Re; Sal; Ma	Mid. Miocene—Recent

Diodora listeri (d'Orbigny)	Re	Pleistocene—Recent
Diodora meta (von Ihering)	Re; Sal; Ab	Recent
Diodora ? anomala Weisbord, n. sp.	PGm	
Diodora dorsenula Weisbord, n. sp.	Ma	
Diodora species	PGm	
Fissurella (Fissurella) nimbosa (Linnaeus)	Re	Recent
Fissurella (Cremides) angusta Gmelin	Re	Recent
Fissurella (Cremides) rosea (Gmelin)	Re	Recent
Fissurella (Cremides) rosea ? (Gmelin)	Ab	Recent
Fissurella (Cremides) longipora Weisbord, n. sp.	Ma	
Fissurella ? species	Ma	
Acmaea antillarum (Sowerby)	Re	Pleistocene—Recent
Acmaea cf. pustulata (Helbling)	Ab	Pliocene—Recent
Calliostoma caribbeanum Weisbord, n. sp.	Ma	
Calliostoma puntagordanum Weisbord, n. sp.	PGm	
Calliostoma curucutianum Weisbord, n. sp.	Ma; PGm	
Livona pica (Linnaeus)	Re	Pleistocene—Recent
Tegula (Agathistoma) maculostriata (C. B. Adams)	Re	Recent
Tegula (Agathistoma) viridula (Gmelin)	Re; Ab; Ma	Miocene—Recent
Tegula (Agathistoma) puntagordana Weisbord, n. sp.	Ma; PGm	
Tegula (Agathistoma) trilirata Weisbord, n. sp.	Ma	
Tegula phalera Weisbord, n. sp.	PGm	
Arene maiquetiana Weisbord, n. sp.	PGm	
Arene (Marevalvata) laguairana Weisbord, n. sp.	PGm	
Turbo caboblanquensis Weisbord, n. sp.	Ma; PGm	
Turbo (Taeniaturbo) marensis Weisbord, n. sp.	Ma	
Turbo (Marmorostoma) crenulatus venezuelensis Weisbord, n. subsp.	PGm	
Turbo species "a"	Ma; PGm	
Turbo species "b"	Ma; PGm	
Turbo species "c"	Ma; PGm	
Astraea (Astralium) brevispina (Lamarck)	Re	Pleistocene—Recent
Astraea (Liotiastralium) venezuelana Weisbord, n. subgen. and n. sp.	PGm	
Astraea (Lithopoma) tuber (Linnaeus)	Re; Ab	Pleistocene—Recent
Astraea (Lithopoma ?) diffidentia Weisbord, n. sp.	Ma	

Parviturbo venezuelensis Weisbord, n. sp.	Ma	
Tricolia affinis cruenta Robertson	Re	Recent
Tricolia rubrica Weisbord, n. sp.	Ma	
Tricolia mareana Weisbord, n. sp.	Ma	
Tricolia fasciata Weisbord, n. sp.	Ma	
Tricolia depressa Weisbord, n. sp.	Ma	
Tricolia maiquetiana Weisbord, n. sp.	PGm	
Tricolia tessellata (Potiez and Michaud)	Ab	Pleistocene—Recent
Gabrielona sphaera Weisbord, n. sp.	Ma	
Gabrielona bruscasensis Weisbord, n. sp.	PGm	
Nerita tessellata Gmelin	Re	Pleistocene—Recent
Nerita versicolor Gmelin	Re	Pleistocene—Recent
Nerita peloronta Linnaeus	Re	Pleistocene—Recent
Smaragdia viridis venezuelensis Weisbord, n. subsp.	PGm	
Littorina (Melarhaphe) nebulosa (Lamarck)	Re	Pleistocene—Recent
Rissoa trabeata Weisbord, n. sp.	Sal	
Rissoina (Phosinella) puntagordana Weisbord, n. sp.	PGm	
Rissoina (Eurissolina) bicrepida Weisbord, n. sp.	PGm	
Rissoina (Schwartziella ?) maiquetiana Weisbord, n. sp.	PGm	
Rissoina (Schwartziella) venezuelana Weisbord, n. sp.	Ma	
Rissoina (Cibdezebina) caribella Weisbord, n. sp.	PGm	
Alvania meridioamericana Weisbord, n. sp.	Ma	
Alvania playagrandensis Weisbord, n. sp.	PGm	
Alvania ? species	PGm	
Benthonella ? loriei Weisbord, n. sp.	Ma	
Teinostoma (Pseudorotella) antilleanum Weisbord, n. sp.	Ma; PGm	
Vitrinella mareana Weisbord, n. sp.	Ma	
Vitrinella (Striovitrinella) venezuelana Weisbord, n. sp.	Ma	
"Circulus" duracinus Weisbord, n. sp.	Ma	
Cyclostromella venezuelana Weisbord, n. sp.	Ma	
Cyclostremiscus (Ponocyclus) maiquetiensis Weisbord, n. sp.	PGm	
Cyclostremiscus salinensis Weisbord, n. sp.	Sal	
Cyclostremiscus caraboboensis Weisbord, n. sp.	Sal	
Cyclostremiscus puntagordensis Weisbord, n. sp.	PGm	

Otiomyllon venezuelanum Weisbord, n. gen. and n. sp.	PGm	
Turritella variegata (Linnaeus)	Re	Pleistocene—Recent
Turritella maiquetiana Weisbord, n. sp.	Ma; PGm	
Turritella species	PGc	
Springvaleia leroyi secunda Weisbord, n. subsp.	Ma; PGm	
Architectonica nobilis Röding	Ma; PGm	Low. Miocene—Recent
Serpulorbis catella Weisbord, n. sp.	Re; Ab; Ma	
Serpulorbis birugosus Weisbord, n. sp.	Re	
Serpulorbis cf. papulosus (Guppy)	Ma	Mid. Miocene—Pliocene
Serpulorbis incomptus Weisbord, n. sp.	Ma; PGm	
Serpulorbis aff. conicus (Dillwyn)	PGm	Recent
Serpulorbis pallidus Weisbord, n. sp.	Ma; PGc	
Caecum (Caecum) regulare Carpenter	Sal	Up. Miocene—Recent
Caecum (Caecum) marense Weisbord, n. sp.	Ma	
Caecum (Caecum) puntagordanum Weisbord, n. sp.	Ma; PGm	
Caecum (Defolinia) tomaculum Weisbord, n. subsp. and n. sp.	Ma	
Caecum (Fartulum) venezuelanum Weisbord, n. sp.	Ma	
Planaxis (Supplanaxis) nucleus? (Bruguière)	Ab	Recent
Cerithium litteratum playagrandensis Weisbord, n. subsp.	PGm	
Cerithium cf. eburneum Bruguière	Sal	Pleistocene—Recent
Portoricia salinensis Weisbord, n. sp.	Sal	
Bittium (Brachybittium) caraboboense Weisbord, new subgen. and n. sp.	Sal	
Bittium (Brachybittium) venezuelanum Weisbord, n. sp.	Sal	
Bittium (Brachybittium) salinae Weisbord, n. sp.	Sal	
Bittium (Brachybittium) palitoense Weisbord, n. sp.	Sal	
Bittiolum caribense Weisbord, n. sp.	Sal	
Cerithiopsis maiquetiensis Weisbord, n. sp.	PGm	
Cerithiopsis tela Weisbord, n. sp.	Ma	
Cerithiopsis (Laskeya) emersonii ? (C. B. Adams)	Ma	Up. Miocene—Recent
Alabina cereola Weisbord, n. sp.	PGm	
Alabina venezuelana Weisbord, n. sp.	Ma	
Alabina incerta ? (d'Orbigny)	Ab; PGm	Pleistocene—Recent
Alaba insculpta Weisbord, n. sp.	Ma	
Seila adamsii ? (H. C. Lea)	PGm	Mid. Miocene—Recent
Triphora (Cosmotriphora) decorata (C. B. Adams)	PGm	Mid. Miocene—Recent
Triphora (Cosmotriphora) caribbeana Weisbord, n. sp.	Ma	
Epitonium (Asperiscala) venezuelense Weisbord, n. sp.	Ma	

Epitonium (Asperiscala) laguairense Weisbord, n. sp.	Ma	
Epitonium (Asperiscala ?) marenum Weisbord, n. sp.	Ma	
Epitonium species	Ma	
Cheilea equestris (Linnaeus)	Re	Mid. Miocene—Recent
Hipponix antiquatus (Linnaeus)	Re	Up. Pliocene—Recent
Vanikoro antillensis Weisbord, n. sp.	Ma	
Capulus (Krebsia) incurvatus (Gmelin)	Re; Ab	Pleistocene—Recent
Crepidula phalaena Weisbord, n. sp.	Ma	
Crepidula avirostra Weisbord, n. sp.	Ma	
Crepidula corcovada Weisbord, n. sp.	Ma	
Crepidula plana triangula Weisbord, n. subsp.	Ma	
Crepidula juliella Weisbord, n. sp.		
Crepidula (Bostrycapulus) aculeata venezuelana Weisbord, n. subsp.	Ma Ma; PGm	
Crucibulum (Crucibulum) auricula (Gmelin)	Re; Ma	Mid. Miocene—Recent
Crucibulum (Dispotaea) marense Weisbord, n. sp.	Ma	
Crucibulum (Dispotaea) venezuelanum Weisbord, n. sp.	Ma	
Strombus pugilis pugilis Linnaeus	Ma	Pliocene—Recent
Strombus ? sp. indet. Brown and Pilsbry	PGc	Mid. Miocene
Erato venezuelana Weisbord, n. sp.	Ma	
Trivia pediculus (Linnaeus)	Re; Ab	Mid. Miocene—Recent
Cypraea (Luria) cinerea Gmelin	Re	Mid. Miocene—Recent
Cypraea (Luria) cinerea catiana Weisbord, n. subsp.	PGc	
Cypraea (Erosaria) spurca acicularis Gmelin	Re	Mid. Miocene—Recent
Cypraea (Trona) zebra Linnaeus	Re	Pliocene—Recent
Cypraea (Muracypraea) henekeni Sowerby	Ma; PGm	Low. Miocene—Up. Miocene
Polinices lacteus (Guilding)	Re	Pleistocene—Recent
Polinices hepaticus (Röding)	Re	Pliocene—Recent
Polinices subclausus (Sowerby)	Ma; PGm	Mid. Miocene—Pliocene
Natica (Naticarius) canrena (Linnaeus)	Re	Low. Miocene—Recent
Stigmaulax guppiana ? (Toula)	Ma; PGm	Mid. Miocene—Low. Pliocene
Tectonatica venezuelana Weisbord, n. sp.	Ma; PGm	
Tectonatica antilleana Weisbord, n. sp.	PGm	
Sinum ? peculiaris Weisbord, n. sp.	Ma	
Cassis aff. madagascariensis Lamarck	Ma	Recent
Cypraecassis testiculus (Linnaeus)	Re	Mid. Miocene—Recent
Semicassis (Tylocassis) granulata (Born)	Ma	Pliocene—Recent
Cymatium (Septa) pileare martinianum (d'Orbigny)	Re; Sal	Mid. Miocene—Recent

Cymatium (Septa) krebsii (Mörch)	Ma	Recent
Cymatium (Monoplex) parthenopeum (von Salis)	Ma	Up. Miocene—Recent
Cymatium ? species	Ma	
Charonia species	Ma	
Distorsio (Rhysema) clathrata (Lamarck)	Ab; Ma; PGm	Mid. Miocene—Recent
Malea ringens mareana Weisbord, n. subsp.	Ma	
Tonna galea ? (Linnaeus)	Ma	Pliocene—Recent
Tonna (Cadus) maculosa (Dillwyn)	Re	Pleistocene—Recent
Tonna (Cadus) maculosa catiana Weisbord, n. subsp.	PGc	
Murex (Murex) recurvirostris recurvirostris Broderip	Ma	Low. Miocene—Recent
Murex (Murex) chrysostomus Sowerby	Ma	Recent
Murex (Phyllonotus) pomum Gmelin	Ma	Mid. Miocene—Recent
Murex (Chicoreus) brevifrons Lamarck	Ma	Low. Miocene—Recent
Murex (Chicoreus ?) brevifrons ? Lamarck	Sal	Low. Miocene—Recent
Murex (Favartia) puntagordanum Weisbord, n. sp.	PGm	
Drupa (Morula) nodulosa (C. B. Adams)	Re; Ab	Mid. Miocene—Recent
Drupa (Morula) gilbertharrisi Weisbord, n. sp.	Ma	
Purpura patula (Linnaeus)	Re (?)	Recent
Thais (Stramonita) rustica (Lamarck)	Re	Pleistocene—Recent
Thais (Stramonita) haemastoma (Linnaeus)	Ab; Ma	Mid. Miocene—Recent
Thais (Stramonita) chocolata (Duclos)	Ma	Recent
Coralliophila caribaea Abbott	Re	Pleistocene?—Recent
Columbella mercatoria (Linnaeus)	Re; Ab	Pleistocene—Recent
Columbella williamgabbi Weisbord, n. sp.	Ma	
Columbella mareana Weisbord, n. sp.	Ma	
Anachis (Costoanachis) obesa (C. B. Adams)	Ab; Ma	Up. Miocene—Recent
Anachis (Costoanachis) plicatulum ? (Dunker)	Re; Ab	Recent
Anachis ? implumis Weisbord, n. sp.	Ma	
Anachis ? indistincta Weisbord, n. sp.	Ma	
Anachis (Litotrema) exuta Weisbord, n. subgen. and n. sp.	Ab; Ma	
Nitidella laevigata (Linnaeus)	Re; Ab	Recent
Nitidella nitida (Lamarck)	Re	Recent
Nitidella cf. ocellata (Gmelin)	Ma	Recent
Strombina caboblanquensis Weisbord, n. sp.	Ma; PGm	
Strombina ? galba Weisbord, n. sp.	Ma	
Alcira ? tropicana Weisbord, n. sp.	Ma	

Mazatlania aciculata (Lamarck)	Re; Ab; Ma	Recent
Pyrene (Eurypyrene) venezuelanum Weisbord, n. sp.	Ma	
Pyrene (Eurypyrene) occidentalis Weisbord, n. sp.	Ma	
Brachystyloma caribbeana Weisbord, n. gen. and n. sp.	Ab	
Streptorygma erugata Weisbord, n. gen. and n. sp.	Ma	
Engina ? species	Re	
Pisania pusio (Linnaeus)	Re	Pleistocene—Recent
Cantharus (Pollia) auritulus (Link)	Re	Pliocene—Recent
Cantharus (Pollia) tinctus ? Conrad	Ab	Pleistocene—Recent
Melongena melongena (Linnaeus)	Sal	Low. Miocene ?—Recent
Nassarius (Phrontis) vibex (Say)	Sal	Up. Miocene—Recent
Fasciolaria hollisteri Weisbord, n. sp.	Ma	
Fasciolaria semistriata mareana Weisbord, n. subsp.	Ma	
Fasciolaria (Pleuroploca) crassinoda Weisbord, n. sp.	Ma	
Fasciolaria (Pleuroploca ?) species	PGm	
Latirus (Polygona) recticanalis Weisbord, n. sp.	Ma; PGm	
Leucozonia ocellata (Gmelin)	Re	Recent
Leucozonia nassa (Gmelin)	Re; Ab	Pleistocene—Recent
Leucozonia caribbeana Weisbord, n. sp.	PGm	
Fusinus marensis Weisbord, n. sp.	Ma	
Fusinus closter caboblanquensis Weisbord, n. subsp.	Ma; PGm	
Oliva (Ispidula) recticularis Lamarck	Re	Mid. Miocene—Recent
Oliva (Ispidula) schepmani Weisbord, n. sp.	Ab; Ma; PGm	
Olivella (Olivella) petiolita ? (Duclos)	Re	Recent
Olivella (Olivella) venezuelensis Olsson	Ma; PGm	Pliocene ?
Olivella (Olivella) gracilis ternuculata Weisbord, n. subsp.	Ma	
Olivella (Olivella) spissilabiata Weisbord, n. sp.	Ab; Ma	
Olivella (Niteoliva) verreauxii (Ducros)	Ab	Recent
Olivella (Niteoliva) minuta (Link)	Ma	Pliocene—Recent
Olivella (Minioliva) fundarugata Weisbord, n. sp.	Sal; Ma; PGm	
Olivella (Minioliva) subfilifera Weisbord, n. sp.	Ma	
Olivella (Minioliva) maiquetiana Weisbord, n. sp.	PGm	
Olivella (Minioliva) salinae Weisbord, n. sp.	Sal	
Jaspidella caribbeana Weisbord, n. sp.	Ma	
Jaspidella ? praecipua Weisbord, n. sp.	Ma	
"Olivella" species	PGm	

Ancilla (Eburna) tankervillei (Swainson)	Re	Recent
Ancilla (Eburna) venezuelana Weisbord, n. sp.	Ma	
Mitra (Uromitra) nodulosa (Gmelin)	Re	Mid. Miocene—Recent
Voluta musica Linnaeus	Re	Pliocene—Recent
Cancellaria torula Weisbord, n. sp.	Ma	
Marginella (Marginella) prunum (Gmelin)	Re	Pliocene ?—Recent
Marginella (Egouana ?) laguairana Weisbord, n. sp.	Ma	
Marginella (Prunum) circumvittata Weisbord, n. sp.	Ma	
Persicula (Gibberula) glandula Weisbord, n. sp.	Ma	
Persicula (Gibberula) lavalleeana (d'Orbigny)	PGm	Miocene—Recent
Persicula (Rabicea) interruptelineata (Megerle von Mühlfeld)	Re; Ab	Recent
Persicula (Rabicea) interrupta mareana Weisbord, n. subsp.	Ab; Ma; PGm	
Persicula (Rabicea ?) hodsoni Weisbord, n. sp.	Ab; Ma	
Persicula (Rabicea) venezuelana lavelana (F. Hodson)	Ab; Ma	Mid. Miocene—Pliocene
Hyalina (Volvarina) lustra Weisbord, n. sp.	Ma	
Cysticus ? species	PGc	
Conus (Conus) mus Hwass	Re	Pleistocene—Recent
Conus (Conus) species	Re	
Conus (Conus) cf. regius Gmelin	Ab	Recent
Conus (Leptoconus) jaspideus caboblanquensis Weisbord, n. subsp.	Ab; Ma; PGm	
Conus (Dendroconus) planitectum Weisbord, n. sp.	PGm	
Conus (Lithoconus) cf. daucus Hwass	Ab	Pliocene—Recent
Conus (Chelyconus) federalis Weisbord, n. sp.	PGm	
Terebra (Strioterebrum) gatunensis kugleri Rutsch	Ma; PGm	Up. Miocene—Pliocene
Terebra (Strioterebrum) trispiralis Weisbord, n. sp.	Ma	
Terebra (Strioterebrum) quadrispiralis Weisbord, n. sp.	Ma	
Terebra (Hastula) cinerea (Born)	Re; Ab	Pleistocene—Recent
Terebra (Hastula) hastata mareana Weisbord, n. subsp.	Ma	
Clathodrillia gibbosa (Born)	Ma	Recent
Clathodrillia mareana Weisbord, n. sp.	Ma; PGm	
Kurtziella tropica Weisbord, n. sp.	Ma	
Kurtziella caribbeana Weisbord, n. sp.	PGm	
Kurtziella venezuelana Weisbord, n. sp.	Ma	

Kurtziella ? morona Weisbord, n. sp.	Sal	
Mangelia (Agathotoma) aff. fusca (C. B. Adams)	Ab	Recent
Syntomodrillia ? biconica Weisbord, n. sp.	Ma	
"Drillia" species "a"	Ma	
"Drillia" species "b"	PGm	
Acteon ? species	Ma	
Ringicula (Ringiculella) maiquetiana Weisbord, n. sp.	PGm	
Bulla amygdala Dillwyn	Re; PGm	Pleistocene—Recent
Bulla occidentalis A. Adams	Re	Pliocene—Recent
Bulla striata Bruguière	Re; Ab; Sal	Mid. Miocene ?—Recent
Rhizorus bruscasensis Weisbord, n. sp.	PGm	
Cylichnella mareana Weisbord, n. sp.	Ma	
Orinella ? salinae Weisbord, n. sp.	Sal	
Orinella ? (Cricolophus) humboldti Weisbord, n. subgen. and n. sp.	Sal	
Eulimella ? binata Weisbord, n. sp.	PGm	
Odostomia playagrandensis Weisbord, n. sp.	PGm	
Odostomia ? ambigua Weisbord, n. sp.	Ma	
Odostomia (Evalea) antilleana Weisbord, n. sp.	Ma	
Odostomia (Evalea) mareana Weisbord, n. sp.	Ma	
Odostomia (Parthenina) meridio-americana Weisbord, n. sp.	PGm	
Chrysallida caribbeana Weisbord, n. sp.	PGm	
Chrysallida salinensis Weisbord, n. sp.	Sal	
Chrysallida cribrata Weisbord, n. sp.	Ma	
Turbonilla marella Weisbord, n. sp.	Ma	
Turbonilla (Chemnitzia) pustulella Weisbord, n. sp.	Sal	
Turbonilla (Nisiturris) pupapicula Weisbord, n. sp.	Ma	
Pyrgiscus magnacrista Weisbord, n. sp.	PGm	
Turbonilla (Chemnitzia ?) species	PGm	
Pyrgiscus granadensis Weisbord, n. sp.	Ma	
Pyrgiscus facetus Weisbord, n. sp.	PGm	
Pyrgiscus bruscasensis Weisbord, n. sp.	PGm	
Pyrgiscus curucutiensis Weisbord, n. sp.	PGm	
Melanella (Polygireulima) spatha Weisbord, n. sp.	PGm	
Melanella species	Ma	
Melampus flavus (Gmelin)	Re	Recent
Pachychilus caboblanquensis Weisbord, n. sp.	Ma	
Incertae sedis "a"	Ma	
Incertae sedis "b"	PGm	

THE RECENT GASTROPODS

Recent gastropods were collected on the beach at two localities, Playa Grande and Higuerote.

The Playa Grande waterfront, now the property of the Playa Grande Yachting Club, is in the Distrito Federal 18.5 kilometers northwest of the approximate center of Caracas, the capital of Venezuela, and 2.7 kilometers west of the low rounded cape of Cabo Blanco. On the elevated terrace immediately south of the Yachting Club is the village of Playa Grande. The strand at Playa Grande faces the open Caribbean and is made up of horizontally disposed beachrock covered by, or alternating with, stretches of medium-grained sand. The beachrock extends interruptedly seaward, landward, and laterally along the shore, and, as might be expected, the littoral mollusks are mostly gastropods.

Higuerote, in the State of Miranda, lies about 88 kilometers due east of Caracas, and is in that section of Venezuela known as the "Barlovento" (Windward). The Recent shells were collected along the stretch of beach that adjoins the east end of the town. The beach here is a fine gray to tan sand, made up mostly of grains of colorless glassy quartz, dark femic minerals, and muscovite flakes in that order of abundance, as well as bits of shell fragments and minute shell-bearing organisms such as Foraminifera in sparse amounts. The beach faces the open sea, shelves gently seaward, and is studded here and there with large isolated boulders. Of the mollusks along the shore, the pelecypods far outnumber the gastropods, although locally the periwinkle *Littorina (Melarhaphe) nebulosa* (Lamarck) is abundent on logs periodically covered with water from the advancing tide. The shells at Higuerote were collected 22 February 1955 around midday at median tide.

The gastropods collected at Playa Grande are the following:

Hemitoma octoradiata (Gmelin)
Diodora cayenensis (Lamarck)
Diodora listeri (d'Orbigny)
Diodora meta (von Ihering)
Fissurella (Fissurella) nimbosa (Linnaeus)
Fissurella (Cremides) angusta Gmelin
Fissurella (Cremides) rosea (Gmelin)
Acmaea antillarum (Sowerby)

Tegula (Agathistoma) maculostriata (C. B. Adams)
Tegula (Agathistoma) viridula (Gmelin)
Astraea (Lithopoma) tuber (Linnaeus)
Tricolia affinis cruenta Robertson
Nerita tessellata Gmelin
Nerita versicolor Gmelin
Nerita peloronta Linnaeus
Serpulorbis catella Weisbord, n. sp.
Serpulorbis birugosus Weisbord, n. sp.
Cheilea equestris (Linnaeus)
Hipponix antiquatus (Linnaeus)
Capulus (Krebsia) incurvatus (Gmelin)
Crucibulum (Crucibulum) auricula (Gmelin)
Trivia pediculus (Linnaeus)
Cypraea (Luria) cinerea Gmelin
Cypraea (Erosaria) spurca acicularis Gmelin
Cypraea (Trona) zebra Linnaeus
Polinices lacteus (Guilding)
Polinices hepaticus (Röding)
Natica (Naticarius) canrena (Linnaeus)
Cypraecassis testiculus (Linnaeus)
Cymatium (Septa) pileare martinianum (d'Orbigny)
Tonna (Cadus) maculosa (Dillwyn)
Drupa (Morula) nodulosa (C. B. Adams)
Purpura patula (Linnaeus)
Thais (Stramonita) rustica (Lamarck)
Coralliophila caribaea Abbott
Columbella mercatoria (Linnaeus)
Anachis (Costoanachis) plicatulum? (Dunker)
Nitidella laevigata (Linnaeus)
Nitidella nitida (Lamarck)
Mazatlania aciculata (Lamarck)
Engina ? species
Pisania pusio (Linnaeus)
Cantharus (Pollia) auritulus (Link)
Leucozonia ocellata (Gmelin)
Leucozonia nassa (Gmelin)
Oliva (Ispidula) reticularis Lamarck
Olivella (Olivella) petiolita ? (Duclos)
Ancilla (Eburna) tankervillei (Swainson)
Mitra (Uromitra) nodulosa (Gmelin)
Voluta musica Linnaeus
Persicula (Rabicea) interruptelineata (Megerle von Mühlfeld)
Conus (Conus) mus Hwass
Conus (Conus) species
Terebra (Hastula) cinerea (Born)
Bulla amygdala Dillwyn
Bulla striata Bruguière

The gastropods collected at Higuerote are the following:

Livona pica (Linnaeus)
Astraea (Astralium) brevispina (Lamarck)
Littorina (Melarhaphe) nebulosa (Lamarck)
Turritella variegata (Linnaeus
Marginella (Marginella) prunum (Gmelin)
Bulla occidentalis A. Adams

LA SALINA DE GUAIGUAZA

La Salina de Guaiguaza is a marine pond in the State of Carabobo, situated some six kilometers or so west-northwest of the city of Puerto Cabello. The salina is oriented north and south, with a maximum length of 1,250 meters and a maximum width of 575 meters. The north shore is about 400 meters inland from the coastline, and from the brine which is periodically replenished from the nearby waters of the Caribbean Sea, salt is extracted. The country around the south end of the pond is flat to a little hilly, and the area has been subjected to late marine planation. Bleached white mollusks are strewn on the surface, but the fossils were collected at a depth of about one meter below the flat surface near the south end of La Salina in a drainage ditch. The fossils are embedded in gray and brown clays at a point 1000 meters N 25°E (magnetic) from the cross on the entrance gate of the cemetery on the south side of the main road between Puerto Cabello and El Palito. The near-surface clays seem to be flat-lying and to cover an extensive tract near the coast. The fossils were collected on 22 February 1956 by the writer and by Donald A. Taylor, geologist with Mobil Oil Company de Venezuela. Mr. Taylor was also good enough to have the clays washed and the micromollusks picked out from the residue.

Following are the fossil gastropods collected near the south shore of La Salina de Guaiguaza:

Species	*Geologic range of known species*	*Geologic range of nearest related species*
Diodora cayenensis (Lamarck)	Mid. Miocene—Recent	
Diodora meta (von Ihering)	Recent	
Rissoa trabeata Weisbord, n. sp.		Mid. Miocene
Cyclostremiscus salinensis Weisbord, n. sp.		?
Cyclostremiscus caraboboensis Weisbord, n. sp.		Recent
Caecum (Caecum) regulare Carpenter	Up. Miocene—Recent	
Cerithium cf. eburneum Bruguière	Pleistocene—Recent	

Portoricia salinensis Weisbord, n. sp.		Mid.-Up. Oligocene
Bittium (Brachybittium) caraboboense Weisbord, n. subgen. and n. sp.		?
Bittium (Brachybittium) venezuelanum Weisbord, n. sp.		?
Bittium (Brachybittium) salinae Weisbord, n. sp.		?
Bittium (Brachybittium) palitoense Weisbord, n. sp.		Mid. Miocene
Bittiolum caribense Weisbord, n. sp.		Mid. Miocene—Pliocene
Cymatium (Septa) pileare martinianum (d'Orbigny)	Mid. Miocene—Recent	
Murex (Chicoreus ?) brevifrons ? Lamarck	Low. Miocene—Recent	
Melongena melongena (Linnaeus)	Low. Miocene ?—Recent	
Nassarius (Phrontis) vibex (Say)	Up. Miocene—Recent	
Olivella (Minioliva) fundarugata Weisbord, n. sp.		Recent
Olivella (Minioliva) salinae Weisbord, n. sp.		Recent
Kurtziella ? morona Weisbord, n. sp.		?
Bulla striata Brugière	Mid. Miocene—Recent	
Orinella ? salinae Weisbord, n. sp.		Pliocene
Orinella ? (Cricolophus) humboldti Weisbord, n. subgen. and n. sp.		?
Chrysallida salinensis Weisbord, n. sp.		Up. Miocene—Pliocene
Turbonilla (Chemnitzia) pustulella Weisbord, n. sp.		Pliocene

Of the 25 species recorded, 9, or 36 percent are known to be still extant. Most of the remainder are comparable to species ranging from Miocene to Recent, and on the assumption that some of the new species (which are micromollusks) will eventually be found in the living fauna, the age of the La Salina fossils is tentatively presumed to be Pliocene.

THE CABO BLANCO GROUP

Except for the 25 species from La Salina de Guaiguaza, all of the other fossil gastropods described in this monograph were col-

lected from the Cabo Blanco group at its type locality in the Distrito Federal. The formations comprising the group are exposed along the coast at Cabo Blanco in an area 7.5 kilometers long and 2 kilometers wide, the approximate center of the area being the Cabo Blanco Lighthouse some 17 kilometers or so northwest of Caracas.

STRATIGRAPHY

The Cabo Blanco group, summarizing from the account of Weisbord (1957), consists, from the bottom upward, of the following formations: Las Pailas, Playa Grande, Mare, and Abisinia. The youngest rock unit in the Cabo Blanco area is the sub-Recent conglomerate or beachrock on the coast proper.

The lowest formation is the Las Pailas. This is an unfossiliferous sequence of interbedded light gray mudstones, siltstones, sandstones, and conglomerates, with a maximum thickness of at least 375 meters (1230 feet). An angular unconformity separates the Las Pailas formation from the overlying Playa Grande formation.

The Playa Grande formation consists of a diversified assemblage of rocks starting with a basal conglomerate of variable thickness not exceeding 20 meters (65 feet), and thinning out to as little as a foot or two. Because the normal succession of strata within the Playa Grande formation from north to south is interrupted by faulting or otherwise obscured, the formation is divided into two members, the Catia and the Maiquetía. The Catia member, which is much the thicker of the two, is exposed north of the Bruscas fault, and consists of light-colored siltstones, sandstones and conglomerates interbedded with which are limestones (often with a yellowish cast), a few coquinas, and an occasional mudstone. Macroscopic and microscopic fossils are generally present in greater or less abundance. The maximum measured thickness is 235 meters (770 feet), but the total thickness is probably greater. The Maiquetía member, which is exposed on the south side of the Las Bruscas—Mare Abajo fault, is made up of shales, siltstones, sandstones, and conglomerates in a series lying unconformably below the Mare formation. The rocks are generally drab gray and dull tan in appearance, but they are associated here and there with yellowish brown knobby limestones similar to those of the Catia member. Fossils are relatively abundant,

and there are a number of bioherms of calcareous algae. The maximum thickness exposed is 26 meters (85 feet). Since the basal conglomerate of the Catia member immediately overlies the Las Pailas formation, it may well be that the Catia member occupies the lower part of the Playa Grande formation, whereas the Maiquetía beds, which unconformably underlie the Mare formation, occupy the upper part of the Playa Grande formation. However, nowhere is there a continuous section across the grain of the Playa Grande formation, and inasmuch as there is some interfingering of rock types, this relationship of the two members is suggestive rather than definitive.

The type locality of the Mare formation is the area adjacent to Quebrada Mare Abajo where it constitutes part of the hills overlooking this small stream. The Mare formation is about 12 meters (40 feet) thick at the type locality but attains a maximum thickness of perhaps 18 meters (60 feet) elsewhere. The lower three or four meters are made up of incoherent grits and sands containing many well-preseved fossils. The upper nine meters or so of the formation consist of tan homogeneous slightly compacted silts which conformably overlie the lower grits and sands but are rather sharply defined from them. The silts are also highly fossiliferous, albeit more so below than above, and, at the top of the Mare formation the silts may be barren of fossils. At the type locality where the Mare formation is in contact with the Maiquetía member of the Playa Grande formation, the unconformity is markedly angular. At its upper boundary, the Mare formation is overlain disconformably by nearly horizontal deposits of the Abisinia formation.

The Abisinia formation comprises several of the terraces in the Cabo Blanco area. The deposits are probably not over 12 meters (40 feet) thick in any one terrace, and, depending on locality, they consist of clays or silts, or of sands, or of pebble to boulder gravels. The formation is accordant or slightly disconformable with the underlying Mare formation where that is present, and slightly unconformable with the Playa Grande formation where the Mare is absent. The higher marine terraces are, of course, a little older than the lower ones, but the time interval between them as reckoned geologically was relatively short. Marine fossils are present locally in the finer, red-stained gravels, and there is the suggestion, from the char-

acter of their preservation, that some of the shells were derived from the Mare and Playa Grande formations and washed into and incorporated with the Abisinia fauna during Abisinia time.

The sub-Recent beachrock occurring along the present shore of the Cabo Blanco area is a tabular, seaward-shelving bench of conglomerate (containing occasional present-day shells) formed through the cementation of beach debris. This bench is awash during high tide, and is an important determinant of the type of littoral marine biota that can accommodate to this bottom material. Thus, where the beachrock is present off shore, the molluscan fauna is made up principally of rock-dwelling gastropods.

GASTROPODS OF THE ABISINIA FORMATION

The gastropods collected from the Abisinia formation all come from the same locality (W-30) immediately east of the east side of the village of Playa Grande. The material here is a horizontally disposed red pebbly sand or granule gravel at the base of the formation, grading upward to a red sandy clay. The top of the formation is a planed surface produced by marine scour, and this surface is approximately 62 meters (207 feet) above sea level. The fossils occur in the red pebbly sand, and this gravelly sand overlies a low-dipping, light tan marlstone of the Catia member of the Playa Grande formation. There is an irregular contact here between the Playa Grande and Abisinia formations, and this indicates a period of erosion prior to the accumulation of the Abisinia deposit.

The following gastropods have been identified:

Species	*Geologic range of known species*	*Geologic range of nearest related species*
Diodora meta (von Ihering)	Recent	
Fissurella (Cremides) rosea ? Gmelin	Recent	
Acmaea cf. pustulata (Helbling)	Pliocene—Recent	
Tegula (Agathistoma) viridula (Gmelin)	Miocene—Recent	
Astraea (Lithopoma) tuber (Linnaeus)	Pleistocene—Recent	
Tricolia tessellata (Potiez and Michaud)	Recent	

Serpulorbis catella Weisbord, n. sp.	[Also Recent]	Miocene—Recent
Planaxis (Supplanaxis) nucleus (Bruguière)	Recent	
Capulus (Krebsia) incurvatus (Gmelin)	Recent	
Trivia pediculus (Linnaeus)	Mid. Miocene—Recent	
Distorsio (Rhysema) clathrata (Lamarck)	Mid. Miocene—Recent	
Drupa (Morula) nodulosa (C. B. Adams)	Mid. Miocene—Recent	
Thais (Stramonita) haemastoma (Linnaeus)	Mid. Miocene—Recent	
Columbella mercatoria (Linnaeus)	Pleistocene—Recent	
Anachis (Costoanachis) obesa (C. B. Adams)	Up. Miocene—Recent	
Anachis (Costoanachis) plicatulum ? (Dunker)	Recent	
Anachis (Litotrema) exuta Weisbord, n. subgen. and n. sp.		Pliocene
Nitidella laevigata (Linnaeus)	Recent	
Mazatlania aciculata (Lamarck)	Recent	
Brachystyloma caribbeana Weisbord, n. gen. and n. sp.		?
Cantharus (Pollia) tinctus ? Conrad	Pleistocene—Recent	
Leucozonia nassa (Gmelin)	Pleistocene—Recent	
Olivella (Ispidula) schepmani Weisbord, n. sp.		Miocene—Recent
Olivella (Olivella) spissilabiata Weisbord, n. sp.		?
Olivella (Niteoliva) verreauxii (Ducros)	Recent	
Persicula (Rabicea) interruptelineata (Megerle von Mühlfeld)	Recent	
Persicula (Rabicea) interrupta mareana Weisbord, n. subsp.		Mid. Miocene—Recent
Persicula (Rabicea) hodsoni Weisbord, n. sp.		Mid. Miocene—Recent
Persicula (Rabicea) venezuelana lavelana (F. Hodson)	Mid. Miocene—Pliocene	
Conus (Conus) cf. regius Gmelin	Recent	
Conus (Leptoconus) jaspideus caboblanquensis Weisbord, n. subsp.		Recent

Conus (Lithoconus) cf. daucus Hwass	Pliocene—Recent
Terebra (Hastula) cinerea (Born)	Pleistocene—Recent
Mangelia (Agathotoma) aff. fusca (C. B. Adams)	Recent
Bulla striata Bruguière	Mid. Miocene—Recent

Of the 35 species recorded, 27 or 77 per cent are living to-day. Four of the remaining forms might be considered by some paleontologists to be the same as living species, and this would increase the number of Recent gastropods to 31 or 88 percent. The high percentage of Recent gastropods, taken in conjunction with its high stratigraphic position, suggests that the Abisinia formation is Pleistocene in age.

THE MARE FORMATION

Although the Mare formation was first named by Frances de Rivero in 1956, it was first described in 1888 by the eminent Dutch geologist [Johann] Karl [Ludvig] Martin. Dr. Martin, professor of geology and paleontology at the University of Leiden, visited Venezuela in 1885 while engaged on a scientific mission to the West Indian colonies of The Netherlands. During his stay in Venezuela he briefly studied the geology of the Cabo Blanco area and published the results of that investigation in the Appendix to his "Bericht über eine Reise nach Nederlandisch West-Indien und darauf gegründete Studien" in 1888. Adolf Ernst, a prominent Venezuelan scientist who had accompanied Martin to Cabo Blanco, later translated Martin's account in the Appendix into Spanish and published this in 1913 in the Revista Técnica del Ministro de Obras Públicas, año 3, número 34, páginas 692-693. The English version of this account, omitting Martin's references, is as follows:

The Quaternary System of Cabo Blanco

Cabo Blanco is situated on the coast of Venezuela west of La Guaira; it is an eminence of more or less 80 meters in height, and juts out a little toward the sea. According to Humboldt it is composed of gneiss; according to the map of Wall it consists of crystalline schists. Humboldt relates that this rock outcrops only on the western slopes, and indeed I observed on the eastern slopes nothing but sandstones and conglomerates of early origin dipping toward the land [Las Pailas and Playa Grande formations (?), N. E. W.] and in every

way resembling the late deposits that cover the lower slopes of the chain dominated by the Silla de Caracas. The southern continuation of the Cabo is made up of material that has the reddish color of the laterite so common in the environs of La Guaira. Seen from the roadstead of that point the cape restricts the view to the west.

To the east of the Cabo, there terminates at the back margin of the many indentations that the sea has produced, a plain composed of horizontal strata whose elevation near the sea I estimate at 30 meters, becoming somewhat higher toward the south. Cutting into this are numerous stream-courses, dry in the summer months, in which there are exposed strata rich in fossils. The lower level is occupied by a conglomerate composed of fragments pertaining to the old system, whose cement is a kind of very fine-grained, friable sandstone of light gray color containing numerous small lamellae of muscovite and producing with the acids a quite vigorous effervescense [Lower Mare formation; N. E. W.]. The exposed part of this stratum in the bottom of the streams is but one meter in thickness; above it comes a deposit of very fine sand of considerable thickness [Upper Mare formation; N.E.W.]. Both deposits are essentially of the same age as is demonstrated by the following list of fossils in which the letter "i" after the name indicates the lower deposit, the letter "s" the upper; also one "a" signifies that the species is common and the double "aa" that it is very abundant. For the identification of the fossils collected there I am indebted to M. Schepman.

Balanus sp.—s
Pectunculus sp. (?)—s
Leda acuta Conrad (?)—i
Cardita sp. (?)—s
Venus cancellata Lam.—s
Cytherea maculata Lin.—aa, i, s
Turritella variegata Lin.—a, s
Turritella imbricata Lin.—a, s
Triton Antillarum d'Orb.—s
Columbella recurva Sow.—s
Purpura haemastoma Lin.—s
Murex sp. (?)—i
Marginella marginata Born—i, s
Marginella interrupta Lam.—aa, i, s
Oliva jaspidea Gmel.—i
Oliva nitidula Dillw.—i, s
Oliva fusiformis Lam.—i, s
Oliva reticularis Lam.—i
Terebra rudis Gray—s
Terebra cosenti Phil.—s
Conus Columba Brug.—s
Conus echinulatus Kien.—a, i, s
Conus pygmaeus Reeve—a, s

All these species of mollusks pertain to the present-day fauna of the sea of the West Indies (with the sole exception of the *Columbella recurva* Sow. which is from the Rio de La Plata). It follows therefore that this deposit is Quaternary.

Humboldt classified the fossiliferous sediments of Cabo Blanco as Tertiary, and viewed the conglomerates of that area as representing the oldest of the Venezuelan Tertiary strata, including in the latter various other sediments that are now also correlated with the Cabo Blanco deposits by Karsten. The

latter, in agreement with Humboldt, maintains that some of the strata in the hills of San Antonio near Cumaná, and in the Peninsula of Araya, are equivalent to those of Cabo Blanco, and says the same of others that outcrop at the southern foot of the highlands of Cumaná, near Mujucucual, and along the banks of the Capaya and Tuy Rivers, it being probable, according to Karsten that the sediments of the Morro de Unare and of Clarines also pertain to said group. He observes that these sediments 'contain only the remains of recent marine animals', and it thus seems to him that the aforementioned beds of Cumaná and of other localities which resemble the fossiliferous breccias of the northern coast of New Granda 'pertain to a Quaternary period'. Elsewhere in his writings Karsten calls the Cabo Blanco sediments Tertiary, the limestones of Cumaná and of Araya 'Tertiary or perhaps Quaternary, at least in part', those of San Antonio Tertiary; and notwithstanding, he insists in classifying all of the sediments mentioned as equivalent.

Wall shows the presence in Araya and near Cumaná of a terrane which he names the 'Newer Parian' and which he refers, albeit with some doubt, to the Miocene, without stating on what he founds this supposition. Furthermore the identity of that terrane with the 'Newer Parian' of Trinidad is not sufficiently demonstrated. And, even if the respective deposits in Venezuela and Trinidad were truly equivalent, it would by no means signify that they are both Tertiary since, according to Etheridge, the 'Newer Parian' of the neighboring island also includes, in all probability, Quaternary sediments. It seems equally unlikely that the Llanos are younger than the limestones of Cumaná and Araya as Wall surmises.

If they are truly equivalent in the geologic sense, the deposits included by Humboldt and later by Karsten must all be called Quaternary as are those at Cabo Blanco; yet their equivalency is not a fact clearly demonstrated. It would undoubtedly be an interesting work to study those sediments with greater exactitude with respect to fossils; and if at the same time the elevation and dip of the strata were carefully determined, no little light might be shed on the several tectonic changes that the region of the Coast Range of Venezuela has experienced.

In the second paragraph of the above account, Martin's description of the fossil-bearing beds leaves little doubt that he was dealing with what is known to-day as the Mare formation (Rivero, 1956; Weisbord, 1957). Martin's fossils were identified by Schepman who related nearly all of the 23 species listed to living ones, and not having a more comprehensive view of the stratigraphy, it is understandable that he should have considered the Mare formation as Quaternary, However, the only Quaternary (Pleistocene) fossils in the Cabo Blanco area are those in the Abisinia formation, and although the Abisinia formation overlies the Mare at Martin's Mare locality, it is unfossiliferous at that point. Some of the Mare gastropods are indeed identical with Recent species, but as will be seen in the list of Mare gastropods the percentage is clearly not high enough to be considered Quaternary. Schepman's identifications would suggest that practically all of Martin's gastropods occur in the Recent

fauna, but a number of them, although closely related are, I think, either new or distinct. A comparison of Schepman's identifications and mine are given below:

Identifications by Schepman (in Martin, 1888)	*Identification of what is thought to be the same form (in this paper)*
Turritella variegata Linnaeus Turritella imbricata Linnaeus	Turritella maiquetiana Weisbord, n. sp.
Triton antillarum d'Orbigny [= Cymatium (Gutturnium) muricinum (Röding)]	Not found
Columbella recurva Sowerby	Strombina caboblanquensis Weisbord, n. sp.
Purpura haemastoma Linnaeus	Thais (Stramonita) haemastoma (Linnaeus)
Murex sp. (?)	?
Marginella marginata Born	Marginella (Prunum) circumvittata Weisbord, n. sp.
Marginella interrupta Lamarck	Marginella (Rabicea) interrupta mareana Weisbord, n. subsp.
Oliva jaspidea Gmelin	Jaspidella caribbeana Weisbord, n. sp.
Oliva nitidula Dillwyn [=Olivella minuta (Link)]	Olivella (Niteoliva) minuta (Link)
Oliva fusiformis Lamarck Oliva reticularis Lamarck	Oliva (Ispidula) schepmani Weisbord, n. sp.
Terebra rudis Gray	Terebra (Strioterebrum) gatunensis kugleri Rutsch
Terebra cosenti Philippi	?
Conus Columba Hwass	?
Conus echinulatus Kiener Conus pygmaeus Reeve	Conus (Leptoconus) jaspideus caboblanquensis Weisbord, n. subsp.

Martin's collection of fossils from the Mare formation were also submitted to Dr. J. Lorié for identification and description, and in 1889 Lorié presented the results of his study in a paper titled "Fossile Mollusken von Curaçao, Aruba, und der Kueste von Venezuela" (Samml. Geol. Reichs-Mus. Leiden, ser. 2, vol. 1, pp. 111-149, pls. 1-2). Most of the Mare fossils are given the same name as those by Schepman, but there are some differences as shown in the following table in which Lorié's identifications of the gastropods are compared with ours.

Identifications by Lorié, 1889	*Identification of what is thought to be the same form (in this paper)*
Turritella imbricata Linnaeus	Turritella maiquetiana Weisbord, n. sp.
Purpura haemastoma Linnaeus	Thais (Stramonita) haemastoma (Linnaeus)
Marginella bivaricosa Lamarck	Marginella (Prunum) circumvittata Weisbord, n. sp.

Marginella interrupta Lamarck	Marginella (Rabicea) interrupta mareana Weisbord, n. subsp.
Columbella recurva Sowerby	Strombina caboblanquensis Weisbord, n. sp.
Mitra aff. Gruneri Reeve	Not found
Oliva venulata Lamarck [=Oliva spicata Röding]	Oliva (Ispidula) schepmani Weisbord, n. sp.
Oliva orhyza Lamarck	?
Terebra cf. specillata Hinds	?
Conus pygmaeus Reeve	Conus (Leptoconus) jaspideus caboblanquensis Weisbord, n. subsp.
Conus echinulatus Kiener	
Conus columba Hwass	?

Loríe referred to the Mare formation of Venezuela as the "Muschelbank Cabo Blanco," and on pages 141-142 listed *all* of the "Muschelbank" gastropods as having survived to the present. However, having carefully compared the Mare fossils with the Recent shells, I am persuaded that the percentage of Recent species in the Mare formation as given by Lorié is much too high, and that Lorié, like Schepman, may have mistaken likeness for identicality in many cases. On page 113, Lorié wrote:

> In addition to those in the deposits of Curaçao and Aruba, we include a small number of fossil mollusks which were found on the north coast of Venezuela in a quartz sand a few meters above the present sea level. The age equivalency with the younger reef limestones of Curaçao and Aruba seems very probable, so that here also the north coast of Venezuela has undergone uplift as have both the islands.

The last statement does not square Lorié's own list of species occurring in both the "Muschelbank" of Cabo Blanco and the reef limestones of Curaçao and Aruba, as only *one* of the species, identified as *Turritella imbricata* Linnaeus, is listed as common to both formations. The younger reef limestones of Curaçao and Aruba are now known to be Quaternary (Pleistocene to sub-Recent) and are younger than the Mare formation which I think on the basis of zoology and stratigraphy will eventually prove to be pre-Pleistocene.

The gastropods I have collected from the Mare formation are the following:

Species	*Geologic range of known species*	*Geologic range of nearest related species*
Emarginula multiradiata Weisbord, n. sp.		Pleistocene—Recent
Emarginula mareana Weisbord, n. sp.		Pleistocene—Recent
Diodora cayenensis (Lamarck)	Mid. Miocene—Recent	

Diodora dorsenula Weisbord, n. sp.		Recent
Fissurella (Cremides) longipora Weisbord, n. sp.		Pleistocene—Recent
Fissurella ? species		?
Calliostoma caribbeana Weisbord, n. sp.		Pliocene
Calliostoma curucutianum Weisbord, n. sp.		Low.-Mid. Miocene
Tegula (Agathistoma) viridula (Gmelin)	Miocene—Recent	
Tegula (Agathistoma) puntagordana Weisbord, n. sp.		Pleistocene—Recent
Tegula (Agathistoma) trilirata Weisbord, n. sp.		Pleistocene—Recent
Turbo caboblanquensis Weisbord, n. sp.		Recent
Turbo (Taeniaturbo) marensis Weisbord, n. sp.		Mid. Miocene—Recent
Turbo species "a"		Miocene—Recent
Turbo species "b"		Miocene—Recent
Turbo species "c"		Pliocene
Astraea (Lithopoma ?) diffidentia Weisbord, n. sp.		Mid. Miocene
Parviturbo venezuelensis Weisbord, n. sp.		Pliocene—Recent
Tricolia rubrica Weisbord, n. sp.		Mid. Miocene; Recent
Tricolia mareana Weisbord, n. sp.		Mid. Miocene—Recent
Tricolia fasciata Weisbord, n. sp.		Mid. Miocene—Recent
Gabrielona sphaera Weisbord, n. sp.		Mid. Miocene; Recent
Rissoina (Schwartziella) venezuelana Weisbord, n. sp.		Pliocene—Recent
Alvania meridioamericana Weisbord, n. sp.		Recent
Benthonella ? loriei Weisbord, n. sp.		Miocene
Teinostoma (Pseudorotella) antilleanum Weisbord, n. sp.		Low. Miocene—Recent
Vitrinella mareana Weisbord, n. sp.		Pleistocene
Vitrinella (Striovitrinella) venezuelana Weisbord, n. sp.		Mid. Miocene; Recent
"Circulus" duracinus Weisbord, n. sp.		Up. Miocene
Cyclostromella venezuelana Weisbord, n. sp.		Recent

Turritella maiquetiana Weisbord, n. sp.		Miocene—Recent
Springvaleia leroyi secunda Weisbord, n. subsp.		Up. Miocene
Architectonia nobilis Röding	Low. Miocene—Recent	
Serpulorbis catella Weisbord, n. sp.	[also Recent]	Miocene—Recent
Serpulorbis cf. papulosus (Guppy)	Mid. Miocene—Recent	
Serpulorbis incomptus Weisbord, n. sp.		?
Serpulorbis pallidus Weisbord, n. sp.		Mid. Oligocene—Miocene
Caecum (Caecum) marense Weisbord, n. sp.		Recent
Caecum (Caecum) puntagordanum Weisbord, n. sp.		Miocene—Recent
Caecum tomaculum Weisbord, n. sp.		Mid. Miocene—Pliocene
Caecum (Fartulum) venezuelanum Weisbord, n. sp.		Up. Miocene—Pliocene
Cerithiopsis tela Weisbord, n. sp.		Pliocene
Certithiopsis (Laskeya) emersonii ? (C. B. Adams)	Up. Miocene—Recent	
Alabina venezuelana Weisbord, n. sp.		Recent
Alaba insculpta Weisbord(n. sp.		Mid. Miocene
Triphora (Cosmotriphora) caribbeana Weisbord, n. sp.		Pliocene—Recent
Epitonium (Asperiscala) venezuelense Weisbord, n. sp.		Mid. Miocene—Recent
Epitonium (Asperiscala) laguairense Weisbord, n. sp.		Mid. Miocene—Recent
Epitonium (Asperiscala ?) marenum Weisbord, n. sp.		?
Epitonium species		Up. Miocene—Recent
Vanikoro antillensis Weisbord, n. sp.		Recent
Crepidula phalaena Weisbord, n. sp.		Miocene—Recent
Crepidula avirostra Weisbord, n. sp.		Miocene—Recent
Crepidula corcovada Weisbord, n. sp.		Recent
Crepidula plana triangula Weisbord, n. subsp.		Miocene—Recent
Crepidula juliella Weisbord, n. sp.		Miocene—Recent

Crepidula (Bostrycapulus) aculeata venezuelana Weisbord, n. subsp.		Mid. Miocene—Recent
Crucibulum (Crucibulum) auricula (Gmelin)	Mid. Miocene—Recent	
Crucibulum (Dispotaea) marense Weisbord, n. sp.		Low. Miocene—Recent
Crucibulum (Dispotaea) venezuelanum Weisbord, n. sp.		Miocene—Pliocene
Strombus pugilis pugilis Linnaeus	Pliocene—Recent	
Erato venezuelana Weisbord, n. sp.		Mid. Miocene—Recent
Cypraea (Muracypraea) henekeni Sowerby	Low. to Up. Miocene	
Polinices subclausus (Sowerby)	Mid. Miocene—Pliocene	
Stigmaulax guppiana ? (Toula)	Mid. Miocene—Low. Pliocene	
Tectonatica venezuelana Weisbord, n. sp.		Mid. Miocene—Recent
Sinum ? peculiaris Weisbord, n. sp.		?
Cassis aff. madagascariensis Lamarck	Recent	
Semicassis (Tylocassis) granulata (Born)	Pliocene—Recent	
Cymatium (Septa) krebsii (Mörch)	Recent	
Cymatium (Monoplex) parthenopeum (von Salis)	Up. Miocene—Recent	
Cymatium ? species		?
Charonia species		Recent
Distorsio (Rhysema) clathrata (Lamarck)	Mid. Miocene—Recent	
Malea ringens mareana Weisbord, n. subsp.		Low. Pliocene—Recent
Tonna galea ? (Linnaeus)	Pliocene—Recent	
Murex (Murex) recurvirostris recurvirostris Broderip	Low. Miocene—Recent	
Murex (Murex) chrysostomus Sowerby	Recent	
Murex (Phyllonotus) pomum Gmelin	Mid. Miocene—Recent	
Murex (Chicoreus) brevifrons Lamarck	Low. Miocene—Recent	
Drupa (Morula) gilbertharrisi Weisbord, n. sp.		Recent
Thais (Stramonita) haemastoma (Linnaeus)	Mid. Miocene—Recent	
Thais (Stramonita) chocolata (Duclos)	Recent	
Columbella williamgabbi Weisbord, n. sp.		Mid. Miocene—Recent

Columbella mareana Weisbord, n. sp.		Mid. Miocene—Pliocene
Anachis (Costoanachis) obesa (C. B. Adams)	Up. Miocene—Recent	
Anachis ? implumis Weisbord, n. sp.		?
Anachis ? indistincta Weisbord, n. sp.		?
Anachis (Litotrema) exuta Weisbord, n. subgen. and n. sp.		Pliocene
Nitidella cf. ocellata (Gmelin)	Recent	
Strombina caboblanquensis Weisbord, n. sp.		Miocene—Recent
Strombina ? galba Weisbord, n. sp.		Mid. Miocene
Alcira ? tropicana Weisbord, n. sp.		?
Mazatlania aciculata (Lamarck)	Recent	
Pyrene (Eurypyrene) venezuelanum Weisbord, n. sp.		Mid. to Up. Miocene
Pyrene (Eurypyrene) occidentalis Weisbord, n. sp.		Mid. to Up. Miocene
Streptorygma erugata Weisbord, n. gen. and n. sp.		?
Fasciolaria hollisteri Weisbord, n. sp.		Miocene—Recent
Fasciolaria semistriata mareana Weisbord, n. subsp.		Middle Miocene
Fasciolaria (Pleuroploca) crassinoda Weisbord, n. sp.		Miocene—Recent
Latirus (Polygona) recticanalis Weisbord, n. sp.		Mid. Miocene—Recent
Fusinus marensis Weisbord, n. sp.		Mid to Up. Miocene; Recent
Fusinus closter caboblanquensis Weisbord, n. subsp.		Mid. Miocene—Recent
Oliva (Ispidula) schepmani Weisbord, n. sp.		Miocene—Recent
Olivella (Olivella) venezuelensis Olsson	Pliocene ?	
Olivella (Olivella) gracilis ternuculata Weisbord, n. subsp.		Up. Miocene—Recent
Olivella (Olivella) spissilabiata Weisbord, n. sp.		?

Olivella (Niteoliva) minuta (Link)	Pliocene—Recent	
Olivella (Minioliva) fundarugata Weisbord, n. sp.		Recent
Olivella (Minioliva) subfilifera Weisbord, n. sp.		Recent
Jaspidella caribbeana Weisbord, n. sp.		Mid. Miocene; Recent
Jaspidella ? praecipua Weisbord, n. sp.		Recent
Ancilla (Eburna) venezuelana Weisbord, n. sp.		Low. to Mid. Miocene; Recent
Cancellaria torula Weisbord, n. sp.		Low. Miocene—Recent
Marginella (Egouana ?) laguairana Weisbord, n. sp.		Up. Miocene
Marginella (Prunum) circumvittata Weisbord, n. sp.		Up. Miocene; Recent
Persicula (Gibberula) glandula Weisbord, n. sp.		Miocene—Recent
Persicula (Rabicea) interrupta mareana Weisbord, n. subsp.		Mid. Miocene; Recent
Persicula (Rabicea ?) hodsoni Weisbord, n. sp.		Mid. Miocene; Recent
Persicula (Rabicea) venezuelana lavelana (F. Hodson)	Mid. Miocene—Pliocene	
Hyalina (Volvarina) lustra Weisbord, n. sp.		Pliocene—Recent
Conus (Leptoconus) jaspideus caboblanquensis Weisbord, n. subsp.		Recent
Terebra (Strioterebrum) gatunensis kugleri Rutsch	Up. Miocene—Pliocene	
Terebra (Strioterebrum) trispiralis Weisbord, n. sp.		Mid. Miocene
Terebra (Strioterebrum) quadrispiralis Weisbord, n. sp.		Mid. to Up. Miocene
Terebra (Hastula) hastata mareana Weisbord, n. subsp.		Recent
Clathodrillia gibbosa (Born)	Recent	
Clathodrillia mareana Weisbord, n. sp.		Mid. Miocene; Recent
Kurtziella tropica Weisbord, n. sp.		Miocene—Recent
Kurtziella venezuelana Weisbord, n. sp.		Mid. Miocene—Recent

Syntomodrillia ? biconica Weisbord, n. sp.	Mid. Miocene
"Drillia" species "a"	?
"Drillia" species "b"	?
Acteon ? species	?
Cylichnella mareana Weisbord, n. sp.	Miocene—Recent
Odostomia ? ambigua Weisbord, n. sp.	?
Odostomia (Evalea) antilleana Weisbord, n. sp.	Recent
Odostomia (Evalea) mareana Weisbord, n. sp.	Recent
Chrysallida cribrata Weisbord, n. sp.	Miocene—Recent
Turbonilla marella Weisbord, n. sp.	Recent
Turbonilla (Chemnitzia ?) species	Pliocene
Pyrgiscus granadensis Weisbord, n. sp.	Pliocene
Melanella species	?
Pachychilus caboblanquensis Weisbord, n. sp.	?
Incertae sedis "a"	?

The total number of gastropods listed above is 144. Of this number, 114 are either new species or not recognizable as having been previously described because of poor preservation. Of the total number of gastropods, 25 or 17 per cent are living. Among the new species or subspecies described by this writer there are about 15 forms that might be considered by some paleontologists to be identical with known Recent species (happily, there still remains the subjective approach in our field), and if those are added to the list, the number of Recent gastropods in the Mare formation would come to 40 or 27 per cent. If we may be permitted to assume that 10 of the remainder of the new species will eventually be found as having survived to the present, that would bring the number of Recent species to about 50 or 34 per cent. This maximum is much too low for the Pleistocene but may be acceptable for the Pliocene when judged in relation to the range of the nearest related gastropods, which in the large majority of cases is middle Miocene to Recent.

THE PLAYA GRANDE FORMATION

Maiquetía member

The Maiquetía member of the Playa Grande formation unconformably underlies the Mare formation. This relationship may be observed in the east branch of Quebrada Mare Abajo, in the stream southeast of W-11, and in the small watercourse northeast of the wireless station (see geologic map in Weisbord, 1957). The Maiquetía member dips northward at an angle of 27-33 degrees, the overlying Mare at 2 to 4 degrees.

The gastropods collected from the Maiquetía member are listed below:

Species	*Geologic range of known species*	*Geologic range of nearest related species*
Emarginula ? tropica Weisbord, n. sp.		?
Diodora ? anomala Weisbord, n. sp.		?
Diodora species		Pleistocene—Recent
Calliostoma puntagordanum Weisbord, n. sp.		Up. Miocene
Calliostoma curucutianum Weisbord, n. sp.		Low.-Mid. Miocene
Tegula (Agathistoma) puntagordana Weisbord, n. sp.		Pleistocene—Recent
Tegula phalera Weisbord, n. sp.		Recent
Arene maiquetiana Weisbord, n. sp.		Pliocene—Recent
Arene (Marevalvata) laguairana Weisbord n. sp.		Up. Miocene—Recent
Turbo caboblanquensis Weisbord		Recent
Turbo (Marmorostoma) crenulatus venezuelensis Weisbord, n. sp.		Mid. Miocene—Recent
Turbo species "a"		Miocene—Recent
Turbo species "b"		Miocene—Recent
Turbo species "c"		Pliocene
Astraea (Liotiastralium) venezuelana Weisbord, n. subgen. and n. sp.		Mid. Miocene—Recent
Tricolia maiquetiana Weisbord, n. sp.		Mid. Miocene; Recent
Gabrielona bruscasensis Weisbord, n. sp.		Recent

Smaragdia viridis venezuelensis Weisbord, n. subsp.		Mid. Miocene—Recent
Rissoina (Phosinella) puntagordana Weisbord, n. sp.		Miocene—Recent
Rissoina (Eurissolina) bicrepida Weisbord, n. sp.		Mid. Miocene; Pliocene
Rissoina (Schwartziella ?) maiquetiana Weisbord, n. sp.		Pleistocene—Recent
Rissoina (Cibdezebina) caribella Weisbord, n. sp.		Mid. Miocene—Recent
Alvania playagrandensis Weisbord, n. sp.		Pliocene—Recent
Alvania ? species		?
Teinostoma (Pseudorotella) antilleanum Weisbord, n. sp.		Miocene—Recent
Cyclostremiscus (Ponocyclus) maiquetiensis Weisbord, n. sp.		Miocene—Recent
Cyclostremiscus puntagordensis Weisbord, n. sp.		Recent
Otiomyllon venezuelanum Weisbord, n. gen. and n. sp.		Miocene; Recent
Turritella maiquetiana Weisbord, n. sp.		Miocene—Recent
Springvaleia leroyi secunda Weisbord, n. subsp.		Up. Miocene
Architectonia nobilis Röding	Low. Miocene—Recent	
Serpulorbis incomptus Weisbord, n. sp.		?
Serpulorbis aff. conicus (Dillwyn)	Recent	
Serpulorbis pallidus Weisbord, n. sp.		Mid. Oligocene—Miocene
Caecum (Caecum) puntagordanum Weisbord, n. sp.		Miocene—Recent
Cerithium litteratum playagrandensis Weisbord, n. subsp.		Pliocene—Recent
Cerithiopsis maiquetiensis Weisbord, n. sp.		Recent
Alabina cereola Weisbord, n. sp.		Pliocene—Recent
Alabina incerta ? (d'Orbigny)	Pleistocene—Recent	
Seila adamsii ? (H. C. Lea)	Mid. Miocene—Recent	
Triphora (Cosmotriphora) decorata (C. B. Adams)	Mid Miocene; Recent	

Crepidula (Bostrycapulus) aculeata venezuelana Weisbord, n. subsp.		Mid. Miocene—Recent
Cypraea (Muracypraea) henekeni Sowerby	Low. to Up. Miocene	
Polinices subclausus (Sowerby)	Mid. Miocene—Pliocene	
Stigmaulax guppiana ? (Toula)	M. Miocene—L. Pliocene	
Tectonatica venezuelana Weisbord, n. sp.		Mid. Miocene; Recent
Tectonatica antilleana Weisbord, n. sp.		Mid. Miocene
Distorsio (Rhysema) clathrata (Lamarck)	Mid. Miocene—Recent	
Murex (Favartia) puntagordanum Weisbord, n. sp.		Pliocene—Recent
Strombina caboblanquensis Weisbord, n. sp.		Miocene—Recent
Fasciolaria (Pleuroploca ?) species		Pliocene
Latirus (Polygona) recticanalis Weisbord, n. sp.		Mid. Miocene—Recent
Leucozonia caribbeana Weisbord, n. sp.		Pleistocene—Recent
Fusinus closter caboblanquensis Weisbord, n. subsp.		Mid. Miocene—Recent
Oliva (Ispidula) schepmani Weisbord, n. sp.		Miocene—Recent
Olivella (Olivella) venezuelensis Olsson	Pliocene ?	
Olivella (Minioliva) fundarugata Weisbord, n. sp.		Recent
Olivella (Minioliva) maiquetiana Weisbord, n. sp.		Recent
"Olivella" species		?
Persicula (Gibberula) lavalleeana (d'Orbigny)	Miocene—Recent	
Persicula (Rabicea) interrupta mareana Weisbord, n. subsp.		Mid. Miocene; Recent
Conus (Leptoconus) jaspideus caboblanquensis Weisbord, n. subsp.		Recent
Conus (Dendroconus) planitectum Weisbord, n. sp.		Miocene—Recent
Conus (Chelyconus) federalis Weisbord, n. sp.		Recent
Terebra (Strioterebrum) gatunensis kugleri Rutsch	Up. Miocene—Pliocene	

Clathodrillia mareana Weisbord, n. sp.		Mid. Miocene; Recent
Kurtziella caribbeana Weisbord, n. sp.		Miocene—Recent
"Drillia" species "b"		?
Ringicula (Ringiculella) maiquetiana Weisbord, n. sp.		Miocene—Recent
Bulla amygdala Dillwyn	Pleistocene—Recent	
Rhizorus bruscasensis Weisbord, n. sp.		Miocene—Recent
Eulimella ? binata Weisbord, n. sp.		?
Odostomia playagrandensis Weisbord, n. sp.		Pliocene; Recent
Odostomia (Parthenina) meridioamericana Weisbord, n. sp.		?
Chrysallida caribbeana Weisbord, n. sp.		Recent
Turbonilla (Nisiturris) pupapicula Weisbord, n. sp.		Mid. Miocene
Pyrgiscus magnacrista Weisbord, n. sp.		Mid. Miocene
Pyrgiscus facetus Weisbord, n. sp.		Recent
Pyrgiscus bruscasensis Weisbord, n. sp.		Mid. Miocene; Pliocene
Pyrigiscus curucutiensis Weisbord, n. sp.		Pliocene
Melanella (Polygireulima) spatha Weisbord, n. sp.		Miocene—Recent
Incertae sedis "b"		?

Of the 82 species of gastropods collected from the Maiquetía member, 8 or 10 per cent of them are known also to be living. Another nine species are so close to living ones that some paleontologists might consider them identical. That would bring the total of Recent gastropods in the Maiquetía member to 17 or 20 per cent. If to that total we might reasonably add six of the new species on the assumption that they will be found eventually in the Recent Caribbean fauna, the total maximum number of Recent gastropods in the Maiquetía member would be 23 or about 28 per cent. Most of the other new species are related to forms ranging from Miocene to Recent. It is premature to render an age determination of the Maiquetía member on one class of organisms, but my tentative opinion would be, based solely on the gastropods and the stratigraphic position of the beds, that it is early Pliocene or late Miocene.

Catia member

The Catia member of the Playa Grande formation is exposed west of the Costa fault and in a narrow belt east of the south end of the Costa fault. In this area the Catia member unconformably overlies the Las Pailas formation and is marked by a conglomerate at the base. The contact between the Catia member and the Maiquetía member has not been observed, but it is inferred, from the spotted occurrence of similar limestones in both, that the Catia grades upward to the Maiquetía.

The gastropods collected from the Catia member are the following:

Species	*Geologic range of known species*	*Geologic range of nearest related species*
Turritella species		?
Serpulorbis pallidus Weisbord, n. sp.		Mid. Oligocene—Miocene
Strombus ? sp. indet. Brown and Pilsbry	Mid. Miocene	
Cypraea (Luria) cinerea catiana Weisbord, n. subsp.		Mid. Miocene—Recent
Tonna (Cadus) maculosa catiana Weisbord, n. subsp.		Pleistocene—Recent
Cysticus ? species		?

Of the six gastropods listed above, one is known from the middle Miocene of the Panama Canal Zone. Of the remainder, two species are unidentifiable, one is closest to forms ranging from middle Oligocene to Miocene, one is nearest to a species ranging from middle Miocene to Recent, and one is scarcely separable from *Tonna* (*Cadus*) *maculosa* (Dillwyn) which ranges from Pleistocene to Recent. The gastropods from the Catia member are in themselves too few in number to arrive at an age determination though on the basis of relationship and stratigraphic position they might be indicative of the later Miocene.

SYSTEMATIC DESCRIPTIONS

GASTROPODA

FISSURELLIDAE

Emarginula multiradiata, new species Pl. 1, figs. 4-6

Shell thin, polygonally ovate, the anterior end somewhat nar-

rower than the posterior. Apex moderately high, subcentral, a little hooked, inclined toward the posterior. Forward slope convex, the back slope steep immediately below the apex but flattening out considerably from there to the margin. Anterior slit prominent but short, its sides not quite parallel, continuing part way up the interior as a strongly channeled groove. Sculpture consisting of alternating larger and smaller radiating ribs crossed by concentric threads and lamellae which produce crenulations at the interceptions. Just below the apex the concentric and radial markings are about equal in prominence forming a cancellate or reticulate pattern, but farther down all of the radials are stronger than the concentrics. Among the primary radials, the fasciolar rib extending from the anterior fissure to the beak, is the most elevated. The next largest are the ones on either side of the fasciolar rib, whilst the weakest are the laterals and those on the posterior. There are three secondary ribs between each of the three frontal primaries. Laterally and posteriorly there is one secondary rib between the primaries, a tertiary on either side of the secondary, and, near the base, an occasional interstitial thread between the tertiaries. There are about 66 radials reaching the base of the holotype. The under side of the basal margin is flat and closely denticulate, the spaces between the denticles occurring as grooves under the radiating ribs of the surface. The fasciolar rib is built up by concentric incrementals which are strongly arched upward in contrast with the other radials which are crossed normally by the concentric striae. The interior is corroded revealing much of the middle layer of the shell which is seen to be composed of fine concentric lineations. The surface layer of the interior is smooth.

Dimensions.—Holotype, length 18.5 mm.; max. width 12.8 mm.; altitude 5.5 mm.

Type locality.—Mare formation at W-25, south flank of Punta Gorda anticline. Two specimens.

Comparisons.—Of the several living Western Atlantic species of *Emarginula*, the new *E. multiradiata* is nearest *E. pumila* (A. Adams), being distinguished from that, as shown by Pérez Farfante (1947a, pp. 107-109, pl. 45, figs. 1-5), by its larger size and smaller ribs. Superficially the Venezuelan fossil is also a good deal like the Pliocene *Hemitoma retiporosa* (Dall) illustrated by Olsson and

Harbison (1953, pp. 360-361, pl. 48, figs. 14, 14a) from St. Petersburg, Florida, but is readily distinguished from *H. retiporosa* in having single rather than tripartite primary ribs, and by its conspicuous slit which differentiates the genus *Emarginula* from *Hemitoma*. According to Turner (1959, pp. 340-342, pl. 177) *Hemitoma retiporosa* (Dall) is the same as *H. emarginata* (de Blainville).

Emarginula mareana, new species Pl. 1, figs. 7, 8

The following description applies to a single specimen with only a part of the front and side remaining. Shell solid, of medium size, moderately high, the slopes flat-sided. Sculpture consisting of broadish radiating ribs crossed by a few low concentric ridges and numerous concentric striae or lamellae. The fasciolar ridge down the middle of the anterior slope is the largest and most elevated of the radials and is formed of fused, upward-arched concentric lamellae. The anal fissure at the anterior extremity of the fasciole is short and U-shaped with a prominent groove ascending upward from it in the interior. At subequal intervals away from the fasciole every fourth rib is larger. Midway in the interspaces of these primaries is one secondary rib, and on each side of that is a slightly smaller tertiary riblet. The two primary ribs on the anterior slope are slightly larger than the ones on the sides. The concentric ridges are low, rounded, subequally spaced, and there are four of them from the middle of the slope down to the margin; at their crossing with the radial ribs low nodules are developed. The basal margin is strongly denticulate, and a few of the denticles are weakly bifid.

Dimensions.—Holotype, width across middle 13.8 mm.; altitude, base to middle, 8 mm.; length of anal slot 1.0 mm.

Type locality.—Lower Mare formation, in small stream 100 meters west of Quebrada Mare Abajo. One incomplete specimen, the holotype.

Comparisons.—Although half of the type specimen is missing, the shape and sculpture of that portion of the shell remaining are dissimilar to the relatively few species known. There is some resemblance to *E. pilsbryi* Dall (1892, pp. 429-430, pl. 21, figs. 8, 8a) from the Caloosahatchee beds of Florida, but that species has an

arched convex anterior slope, a longer anal slit, and wide alternating primary and secondary radial ribs. *E. mareana,* n. sp. is more nearly related to *E. pumila* (A. Adams) as described and illustrated by Pérez Farfante (1947a, pp. 107-109, pl. 47, figs. 1-5) but is larger and more sturdy than *E. pumila,* and has a shorter anal slot but much stronger fasciolar rib. The living *E. pumila* extends from southeast Florida through the Antilles to Cape São Roque, Brazil, at depths of 6 to 150 fathoms. The fossil form of *E. pumila* is reported in the Pleistocene of Cuba by Jaume and Pérez Farfante (1942, p. 40) at Guantánamo and Gibara.

Emarginula ? tropica, new species Pl. 1, figs. 9. 10

This species is represented by a single broken and immature specimen on which the anterior half and the apex are missing. The shell is thin, small, depressed-conical but with the summit area proper somewhat elevated. The posterior slope is slightly concave, and the knobby posterior margin is curled a little upward. The under side of the margin is fluted, and the corroded interior of the shell is seen to be made up of fine concentric lineations thinly enameled, toward the apex, with a smooth surficial veneer. External sculpture consisting of low broad rounded radiating ribs crossed by a few low concentric ridges and some lamellae which impart an undulating profile to the slopes. Every fourth radial rib is a primary. Midway between each primary is a slightly smaller secondary riblet, and on each side of the secondary is a still smaller tertiary one. The concentric ridges are unequal, becoming wider and flatter toward the base, the lower margin of the last one lamellate. There are about five of these ridges on the type specimen, and where the upper ones cross the radiating ribs the interceptions are nodulous. The outer surface is also covered with concentric growth striae.

Dimensions.—Holotype, max. width 3.4 mm.; length of posterior half of shell 3.3 mm.; altitude, excluding apex 1.7 mm.

Type locality.—Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. One incomplete specimen, the holotype.

Remarks.—The generic classification is inferred as the apex and anterior portion of the single example are missing. The species might

be referable to *Hemitoma* or even to *Diodora*. Both *Emarginula* and *Hemitoma* are sparsely represented in the Americas, and inasmuch as our shell, however incomplete, is unlike the few species known, the name *tropica* is proposed. The previously described *E. mareana*, n. sp. is more robust and higher, and *E. multiradiata*, n. sp. is more profusely ribbed and not turned up at the posterior margin. Nevertheless it is not precluded that *E. tropica* is an immature *E. multiradiata*, although the single specimen does seem to be distinct.

Hemitoma octoradiata (Gmelin) Pl. 1, figs. 11, 12

1791. *Patella octoradiata* Gmelin, Syst. Nat., ed. 13, p. 3699, No. 36.
1824. *Emarginula tricostata* Sowerby, The Genera of Recent and Fossil Shells, No. 21, *Emarginula*, fig. 6.
1839. *Emarginula listeri* Anton, Verzeichniss der Conchylien, p. 27 (refers to Lister, pl. 532, fig. 11).
1842. *Emarginula clausa* d'Orbigny, [in] La Sagra, Hist. phys., polit. nat. l'Ile de Cuba, Mollusques, vol. 2, p. 194, pl. 24, figs. 34-36.
1863. *Emarginula depressa* Sowerby, Thes. Conchyl., vol. 3, p. 219, pl. 247, figs. 64, 65, 68.
1863. *Emarginula guadaloupensis* Sowerby, Thes. Conchyl., vol. 3, p. 219, pl. 247, fig. 69.
1864. *Subemarginula octoradiata* (Gmelin), Krebs, The West Indian Marine Shells, p. 86.
1878. *Emarginula octoradiata* (Gmelin), Mörch, Catalogue of West-India Shells, p. 13.
1889. *Subemarginula octoradiata* (Gmelin), Dall, Mus. Comp. Zool., Bull., vol. 18, p. 407.
1889. *Subemarginula octoradiata* (Gmelin), Dall, U. S. Nat. Mus., Bull. 37, p. 170.
1890. *Subemarginula octoradiata* (Gmelin), Pilsbry, Man. Conch., vol. 12, p. 273, pl. 29, figs. 17, 18, 37.
1901. *Subemarginula octoradiata* (Gmelin), Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, p. 450.
1924. *Subemarginula octoradiata* (Gmelin), Emery, Nautilus, vol. 38, No. 2, p. 62.
1926. *Subemarginula octoradiata* (Gmelin), Weisbord, Nautilus, vol. 39, No. 3, p. 87.
1928. *Hemitoma octoradiata* (Gmelin), Woodring, Carnegie Inst. Washington Pub., No. 385, p. 457.
1935. *Subemarginula octoradiata* (Gmelin), Richards, Jour. Paleont., vol. 9, No. 3, p. 257.
1937. *Subemarginula octoradiata* (Gmelin), Smith, East Coast Marine Shells, p. 77, pl. 30, fig. 7.
1942. *Subemarginula octoradiata* (Gmelin), Jaume and Pérez Farfante, Soc. Cubana Hist. Nat. "Felipe Poey" Mem., vol. 16, No. 1, p. 40.
1950. *Hemitoma rubida* Verrill, Nautilus, vol. 63, No. 4, p. 126, pl. 9, figs. 2, 2a.
1958. *Hemitoma octoradiata* (Gmelin), Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 10.
1958. *Hemitoma* (*Hemitoma*) *octoradiata* (Gmelin), Abbott, Acad. Nat. Sci. Philadelphia, Mon. No. 11, p. 19, pl. 1a, b.

1958. *Subemarginula octoradiata* (Gmelin), Coomans, Caraibisch Marien-Biologisch Inst. Collected Papers 6, p. 52, pl. 2, 2 figs.
1959. *Hemitoma* (*Hemitoma*) *octoradiata* (Gmelin), Turner, Johnsonia, vol. 3, No. 39, pp. 336-339, pls. 176-177.
1959. *Hemitoma octoradiata* (Gmelin), Nowell-Usticke, A Check List of the Marine Shells of St. Croix, p. 21.

Shell low conical or hemispherical, the former polygonally ovate, the latter oval in basal outline. Apex slightly forward of center. Posterior slope flat, anterior slope slightly convex, lateral slopes flat to convex. Anal notch short, lying on the anterior margin just to the right of center where it forms the terminus of the fasciolar rib. From the notch, a groove extends upward in the interior of the aperture along the under side of the fasciolar rib. Attachment scar lobate, the larger posterior lobe broadly and bluntly V-shaped behind, the anterior lobe inset into the posterior, its forward margins extending as a line on either side of the anterior groove. Basal margin fluted and denticulate, the denticles often bifid and occurring in pairs. Interior dull white under the apex and around the basal margin, dark olive green, olive brown, or slaty gray around the sides, the external ribs showing through as rays of lighter tone. Externally, the ground is gray or cream, the ribs whitish. The specimen figured has eight elevated primary radiating ribs, with a smaller and slightly lower secondary rib between, and generally with a still smaller and much more depressed tertiary riblet on either side of the secondary. On the hemispherical form many of the secondary ribs are nearly as large as the primaries, and the eight-spoked arrangement of the principal ribs is not so apparent as in the more typical examples. On both variations the ribs tend to be grossly but weakly nodulous and are crossed by concentric growth markings which are dulled on our specimens.

Dimensions.—Octoradiate form (illustrated), length 16 mm.; max. width 12 mm.; altitude 7 mm.

Hemispherical form, length 19 mm.; max. width 14.5 mm.; altitude 10 mm.

Locality.—Recent on beach of Playa Grande Yachting Club, Distrito Federal. Three specimens.

Range and distribution.—The present-day range of this species is from the Florida Keys to northern South America. At Playa Grande it is associated with a shallow-water fauna, but Dall recorded

it from 450 fathoms off Havana, Cuba. As a fossil it occurs in the Pleistocene of Cuba on the west side of Matanzas Bay.

Diodora cayenensis (Lamarck) Pl. 2, figs. 15-20

1822. *Fissurella cayenensis* Lamarck, An. sans Vert., vol. 6, pt. 2, p. 12.
1822. *Fissurella alternata* Say, Acad. Nat. Sci. Philadelphia, Jour., Ser. 1, vol. 2, p. 224
1850. *Fissurella fumata* Reeve, Conch. Icon., vol. 6, *Fissurella,* pl. 9, sp. 63.
1850. *Fissurella cayenensis* (Lamarck), Reeve, Conch. Icon, vol. 6, *Fissurella,* pl. 12, sp. 82.
1850. *Fissurella larva* Reeve, Conch. Icon., vol. 6, *Fissurella,* pl. 13, sp. 98.
1850. *Fissurella viminea* Reeve, Conch. Icon., vol. 6, *Fissurella,* pl. 14, sp. 105.
1857. *Fissurella cayenensis* Lamarck, Fischer, Rev. Coloniale, p. 19, sp. 6.
1860. *Fissurella alternata* Say, Holmes, Post-Pleiocene Fossils of South Carolina, p. 94, pl. 14, fig. 10.
1862. *Fissurella cayenensis* Lamarck, Sowerby, Thes. Conchyl., pt. 21, vol. 3, p. 197, sp. 94.
1864. *Fissurella alternata* Say, Krebs, The West Indian Marine Shells, p. 86.
1864. *Fissurella sayennensis* [*sic*] Lamarck, Krebs, The West Indian Marine Shells, p. 87.
1867. *Fissurella cayennensis* Lamarck, Guppy, Sci. Assoc. Trinidad, Proc., pt. 3, p. 160.
1873. *Lucapina alternata* (Say), Gabb, Amer. Philos. Soc., Trans., vol. 15, p. 244.
1878. *Fissurella cayenensis* Lamarck, Mörch, Catalogue of West-India Shells, p. 13.
1886. *Fissurella* (*Lucapina*) *cayenensis* Lamarck, Watson, Voyage H. M. S. Challenger, Zoology, vol. 15, p. 34.
1889. *Fissurella alternata* Say, Dall, Mus. Comp. Zool., Bull., vol. 18, p. 407.
1889. *Fissurella cayennensis* Lamarck, Dall, Mus. Comp. Zool., Bull., vol. 18, p. 409.
1889. *Fissurella alternata* Say, Dall, U. S. Geol. Sur., Bull. 37, p. 170.
1889. *Fissurella cayennensis* Lamarck, Dall, U. S. Geol. Sur., Bul. 37, p. 170.
1890. *Fissurella alternata* Say, Pilsbry, Man. Conch., vol. 12, p. 211, pl. 37, figs. 50-53; pl. 61, figs. 24, 25.
1890. *Fissurella cayenensis* Lamarck, Pilsbry, Man. Conch., vol. 12, p. 212, ul. 37, fig. above 60.
1890. *Fissurella alternata* Say, Smith, Linnaean Soc., Jour., vol. 20, p. 494.
1891. *Glyphis alternata* (Say) Baker, Acad. Nat. Sci. Philadelphia Proc., vol. 43, p. 55.
1892. *Fissuridea alternata* (Say), Dall, Wagner Free Inst. Sci., Trans., vol. 3, pt. 2, pp. 213, 215, 427.
1901. *Fissurella alternata* Say, Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, p. 450.
1913. *Fissurella alternata* Say, Brown and Pilsbry, Acad. Nat. Sci. Philadelphia, Proc., vol. 65, p. 496.
1917. *Fissuridea alternata* (Say), Maury, Bull. Amer. Paleont., vol. 5, No. 29, pp. 321-322, pl. 24, fig. 22.
1922. *Fissuridea alternata* (Say), Maury, Bull. Amer. Paleont., vol. 9, No. 38, pt. 2, p. 166.
1922. *Fissuridea cayenensis* (Lamarck), Maury, Bull. Amer. Paleont., vol. 9, No. 38, pt., p. 166.
1923. *Fissuridea alternata* (Say), Clench, Nautilus, vol. 37, No. 2, p. 56.

1925. *Fissuridea alternata* (Say), Maury, Bull. Amer. Paleont., vol. 10, No. 42, pp. 401-402, pl. 43, fig. 1.
1926. *Fissuridea alternata* (Say), Weisbord, Nautilus, vol. 39, No. 3, p. 87.
1933. *Diadora alternata* (Say), Pilsbry and Aguayo, Nautilus, vol. 46, p. 121.
1935. *Fissurella alternata* Say, Richards, Jour. Paleant., vol. 9, No. 3, p. 257.
1937. *Diadora alternata* (Say), Smith, East Coast Marine Shells, p. 76, pl. 30, fig. 5.
1938. *Fissurella alternata* Say, Richards, Geol. Soc. Amer. Bull., vol. 49, p. 1292.
1939. *Diodora alternata* (Say), Mansfield, Florida Geol. Sur., Geol. Bull. No. 18, pp. 25, 39.
1942. *Diadora alternata* (Say), Jaume and Pérez Farfante, Soc. Cubana Hist. Nat. "Felipe Poey" Mem., vol. 16, No. 1, p. 40.
1943. *Diodora cayenensis* (Lamarck), Pérez Farfante, Johnsonia, vol. 1, No. 11, pp. 5-6, pl. 2, figs. 1-6.
1944. *Diadora cayenensis* (Lamarck), Hackney, Nautilus, vol. 58, No. 2, p. 60.
1952. *Diadora cayenensis* (Lamarck), Pulley, Texas Jour. Sci., vol. 4, No. 2, p. 170, pl. 1, fig. 1.
1953. *Diodora cayenensis* (Lamarck), Olsson and Harbison, Acad. Nat. Sci. Philadelphia, Mon. 8, p. 359, pl. 63, figs. 9, 9a.
1954. *Diodora cayenensis* (Lamarck), Abbott, American Seashells, p. 96, pl. 17m.
1955. *Diodora cayenensis* (Lamarck), Perry and Schwengel, Marine Shells of the Western Coast of Florida, p. 107, pl. 21, fig. 136.
1958. *Diodora alternata* (Say), DuBar, Florida Geol. Sur., Geol. Bull. No. 40, p. 215.
1958. *Diodora cayenensis* (Lamarck), Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 10.
1958. *Diodora cayenensis* (Lamarck), Coomans, Caraibisch Marien-Biologisch Inst. Collected Papers 6, p. 53, pl. 2, 2 figs.
1959. *Diodora cayenensis* (Lamarck), Nowell-Usticke, A Check List of the Marine Shells of St. Croix, p. 22.

Recent and fossil specimens of this species occur at several localities along the north coast of Venezuela. The following description pertains to the fossil specimens collected in calcareous clay from a drainage ditch a short distance inland from the south edge of La Salina de Guaiguaza west of Puerto Cabello in the State of Carabobo.

Shell of medium size, moderately thin, high conical, slightly narrower anteriorly, the base subovate to nearly oval. Front slope steep, straight above but usually slightly concave near the margin; posterior slope slightly to moderately convex. Apex forward, the orifice immediately in front of it and steeply inclined toward the anterior extremity. Orifice key-hole shaped, the rear wall thickened, the side walls with two callused denticles, one near the anterior third of the orifice, the other near the posterior third. Length of orifice about one-seventh that of the shell. Surface sculptured by numerous well-defined radiating ribs, every fourth one generally larger. Be-

tween the larger radiating ribs there is one secondary riblet, and on either side of the secondary there is a tertiary; often there is a quaternary radiating thread on either side of the tertiary riblet. The primary and secondary ribs reach the summit whereas the other interstitial riblets extend part way up the slopes from the base. One specimen with all the classes of radiating ribs present has about 93 of them around the base but another specimen of about the same size but with the quaternaries not developed has about 71 of them. Raised concentric threads cross the radiating ribs forming nodulations or small scales where the ribs are intercepted. Basal margin fluted and finely crenulate within, the flutings occurring under the primary ribs. Internal callus of the orifice prominent, thickened and truncated behind where it is also excavated obliquely. Muscle impression indistinct.

Dimensions.—Recent specimen (A164a) figured, length 10 mm.; max. width 6.4 mm.; altitude 5.2 mm.; external length of orifice about 1.5 mm.

Largest fossil specimen (T164b) from Mare formation of Cabo Blanco group, length 28.4 mm.; max. width 19.5 mm.; altitude 15.2 mm.; external length of orifice (including rear wall) about 4.4 mm.

Localities.—Recent, on beach of Playa Grande Yachting Club, Distrito Federal. Two specimens. One of these (Pl. 2, figs. 15-17) is colored black, cream, and a nondescript dull straw, the black dominant from the middle up. All of the primary ribs save the middle two on the posterior slope are cream-colored, the others straw and in various tones of black. The interior color is bluish gray within, bluish white around the margin, the external sculpture showing through as numerous narrow bluish white rays.

La Salina, west of Puerto Cabello, State of Carabobo. Five specimens.

Mare formation in stream 250 meters south-southwest of the mouth of Quebrada Las Pailas. One specimen (Pl. 2, figs. 18-20).

Mare formation at W-25, south flank of Punta Gorda anticline. One specimen.

Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. One specimen.

Remarks.—The name *cayenensis* Lamarck pre-dates *D. alternata* Say by about a month. Lamarck's name appeared in May 1822, Say's in June 1822.

Range and distribution.—D. cayenensis ranges from Miocene to Recent. The living species extends from Maryland on the east coast of the United States to the Gulf of Mexico and the Caribbean Sea as far south as Brazil. It inhabits the intertidal realm to depths of about 20 fathoms and occurs mainly on rocks. Dall recorded it as deep as 100 fathoms. As a fossil it has been reported from the Pleistocene of Florida, Cuba, Barbados, and the Isthmus of Panamá; from the Pliocene of North Carolina, South Carolina, Florida, Costa Rica, and Trinidad; and from the Miocene of the Dominican Republic.

Diodora listeri (d'Orbigny) **Pl. 3, figs. 1-3**

1842. *Fissurella listeri* d'Orbigny [in] La Sagra, Hist. phys., polit. nat. l'Ile de Cuba, Mollusques, vol. 2, p. 197, pl. 24, figs. 37-39.
1864. *Fissurella Listeri* d'Orbigny, Krebs, The West Indian Marine Shells, p. 87.
1878. *Fissurella Listeri* d'Orbigny, Mörch, Catalogue of West-India Shells, p. 13.
1889. *Fissurella listeri* Orbigny, Dall, U. S. Nat. Mus., Bull. 37, p. 170.
1890. *Fissurella* (*Glyphis*) *listeri* d'Orbigny, Pilsbry, Man. Conch., vol. 12, pp. 206-207, pl. 37, figs. 37-39; pl. 62, fig. above 31, 32.
1901. *Fissuridea listeri* (d'Orbigny), Dall and Simpson, U. S. Fish Com., Bull. vol. 20, for 1900, pt. 1, pp. 449-450.
1937. *Diadora listeri* (Orbigny), Smith, East Coast Marine Shells, p. 76, pl. 30, fig. 16.
1938. *Diadora listeri* (d'Orbigny), Schwengel, Sanderson, and Dranga, Nautilus, vol. 52, No. 1, p. 28.
1942. *Diadora listeri* (d'Orbigny), Jaume and Pérez Farfante, Soc. Cubana Hist. Nat. "Felipe Poey" Mem., vol. 16, No. 1, p. 40.
1943. *Diodora listeri* (d'Orbigny), Pérez Farfante, Johnsonia, vol. 1, No. 11, pp. 3-5, pl. 1, figs. 1-10.
1954. *Diodora listeri* (Orbigny), Abbott, American Seashells, pp. 96-97, pl. 17L.
1955. *Diodora listeri* (d'Orbigny), Perry and Schwengel, Marine Shells of the Western Coast of Florida, p. 107, pl. 45, fig. 317.
1958. *Diodora listeri* (d'Orbigny), Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 10.
1958. *Diodora* (*Diodora*) *listeri* (Orbigny), Abbott, Acad. Nat. Sci. Philadelphia, Mon. No. 11, p. 19.
1958. *Diodora listeri* (d'Orbigny), Coomans, Caraibisch Marien-Biologisch Inst. Collected Papers 6, p. 52, pl. 3, 3 figs.
1959. *Diodora listeri* (Orbigny), Nowell-Usticke, A Check List of the Marine Shells of St. Croix, p. 22.

The Venezuelan Recent shell referred to this species is moderately large and solid, low to high conical, with an ovate base which may be slightly narrowed anteriorly. Anterior slope usually straight but occasionally somewhat concave or slightly convex; posterior slope varying from moderately convex to straightish. Summit in

front of the middle, inclined toward the anterior extremity, pierced by a key-hole shaped orifice which is bounded by a blue-black line externally and stained blue within. Internal callus of the orifice truncated behind, also stained with blue, the margin of the callus often blue-black. Sculpture consisting of 40-42 strong rounded radiating ribs generally of alternating larger and smaller size, the interspaces deeply excavated, sometimes bearing intercalary riblets. Crossing the radials are 9 to 12 concentric ridges, the ones near the summit evenly spaced, the ones lower down unequally spaced and farther apart. The intercepts of the radiating ribs and concentric ridges are strongly nodulous or formed into thick low-vaulted arches. Between the main concentric ridges are smaller raised concentric threads which are more pronounced on smaller specimens than they are on larger. Basal margin crenulated by paired denticulations. The color of the interior is dull white, the colors of the surface showing through, generally in rays. The outside of the shell is dull cream or white, sometimes rayed with dull green. Muscle impression hardly discernible. Occurring on the surface of two specimens is a brick red Bryozoa, and one specimen is thickly coated with a calcareous alga. Adherent to many of the shells, on one or both sides is a species of *Serpulorbis*.

Dimensions.—Figured specimen, length 18.2 mm.; max. width 12.1 mm.; altitude 8.4 mm.; external length of orifice 2.2 mm.

Largest specimen, length 24 mm.; max. width 16 mm.; altitude 7 mm.; external length of orifice 3 mm.

Smallest specimen, length 11 mm.; width 7 mm.; altitude 4.5 mm.; external length of orifice 1.3 mm.

Locality.—Recent, on beach of Playa Grande Yachting Club, Distrito Federal. Ten specimens.

Range and distribution.—*Diodora listeri* inhabits stony shores and coral reefs from Florida, to the northern coast of South America. The fossil form has been reported from the Pleistocene at Gibara, Cuba, by Jaume and Pérez Farfante.

Diodora meta (von Ihering) Pl. 3, figs. 4-15

1927. *Lucapina meta* von Ihering, Archiv für Molluskenfunde, vol. 59, p. 98, pls. 1-4, 13, 14.
1943. *Diodora meta* (von Ihering), Pérez Farfante, Johnsonia, vol. 1, No. 11, pp. 13-14, pl. 4, figs. 9-14.

1946. *Lucapina meta* von Ihering, Pérez Farfante, Soc. Malac. "Carlos de La Torre" Rev., vol. 4, No. 1, p. 24, figs. 1-3.
1953. *Lucapina* (*Lucapina*) *meta* von Ihering, Haas, Fieldiana-Zoology, vol. 34, No. 20, p. 204.
1955. *Diodora meta* (von Ihering), Perry and Schwengel, Marine Shells of the Western Coast of Florida, p. 107, pl. 21, fig. 134.

Recent and fossil specimens of what is believed to be this species have been collected at several places along the north coast of Venezuela. The Recent shell is small, moderately thin, low conical, slightly narrowed anteriorly, the base a nearly perfect oval, the anterior and posterior margins evenly rounded, the lateral margins subparallel. Anterior slope straight, a little convex at the margin; left lateral slope (as viewed with the orifice up and the anterior end forward) slightly convex; right lateral slope straight; posterior slope nearly straight to the lower fourth of the body whence it becomes scarcely convex basalward. Apex a little forward of the middle. Orifice relatively small, suboval, situated in front of the apex, inclined slightly toward the anterior extremity. Sculpture consisting of 36 strong radiating ribs between each of which there is an intercalated riblet well below the level of all of the principal ribs. The principal ribs are more or less equally spaced but are alternating in size; one rib is a little larger and slightly higher than its alternate, and the ribs of each set are subequal in size. The radiating ribs are crossed by about 16 strong regularly spaced concentric ridges which unite with the main radiating ribs and produce nodes at the intersections, the two systems forming a reticulate pattern of deep, rectangular to nearly square pits. The minor intercalated radiating riblets are deeply embedded in the pits. In the interspaces of all of the radiating ribs, and between each concentric ridge, there are about five microscopic but rather sharp concentric threads or laminae which become obsolescent on the crest of the ribs themselves. Internal callus of the orifice wide, slightly thickened behind, polygonal in outline. Basal margin fluted within. Muscle impression indistinct. Color a faded white in the interior, a more or less uniform cream on the surface. The Recent Venezuelan shell is close to the form of *D. meta* occurring off Sanibel Island, Florida, as exemplified in collection No. 125769 in the Museum of Comparative Zoology.

The Venezuelan fossil shell is moderately small, generally thin, conical, somewhat elevated, the apex a little in front of the middle. Base suboval, slightly narrowed anteriorly, the anterior and posterior margins evenly rounded, the lateral margins raised slightly above a level line. Anterior slope usually slightly convex, sometimes straight; posterior slope generally moderately convex; lateral slopes straight. Orifice relatively small, more or less oval, situated directly forward of the apex, inclined a little toward the anterior extremity, but occasionally level. Surface sculptured by strong narrow rounded radiating ribs alternating with smaller and lower secondary ribs on either side of which there is often a finer tertiary riblet. In all there are about 75 radiating ribs or riblets around the base of the largest specimen. The primary ribs extend from the base to the summit, the secondaries to near the summit, the intercalaries part way up the slope. Crossing the radiating ribs are subequally spaced concentric lamellae which form nodules or become thickened at the intersections, and divide the surface into deep rectangular pits. Between each of the main concentric lamellae there are four or five fine concentric threads or laminae which are more pronounced within the pits than on the crest of the ribs where they are more subject to wear. Basal margin crenulated within by small flutings and paired denticles, the flutings occurring under the primary ribs and extending slightly beyond the margin. Internal callus of the orifice well defined and subtruncate posteriorly. Muscle impression indistinct or not discernible. The Venezuelan fossil is much like a Recent specimen labeled *Lucapina meta* von Ihering in the U. S. National Museum, No. 53883, collected off Marco, Florida, in two fathoms.

Dimensions.—Recent shell (A167a), length 10 mm.; max. width 6.1 mm.; altitude 3 mm.; external length of orifice 0.8 mm.

Fossil shell (H165a), length 12.8 mm.; max. width 8.7 mm.; altitude 4.8 mm.; external length of orifice 1.4 mm.

Localities.—Recent, on beach of Playa Grande Yachting Club, Distrito Federal. One specimen.

La Salina, west of Puerto Cabello, State of Carabobo. Seven specimens.

Abisinia formation at W-30, eastern edge of Playa Grande village. Two young specimens.

Mare formation at W-25, south flank of Punta Gorda anticline. One specimen.

Range and distribution.—*Diodora meta* has been reported previously from Itapema and Rio de Janeiro in Brazil, from the Island of Tobago, and from both coasts of Florida and the Dry Tortugas in 4 to 60 fathoms. If my identification is correct, this is the first record of the species in both its living and fossil state in Venezuela.

Diodora ? anomala, new species Pl. 3, figs. 16, 17

The back slope, on which a portion of the summit is intact, is the only remnant of a single specimen. Shell small, moderately thin, low conical. Orifice at summit, large, key-hole shaped or trilobate (anterior end broken away so that the true configuration is indeterminable), inclined a little toward the anterior extremity. Internal callus of orifice thick, truncated behind, excavated under the truncation. Posterior slope feebly concave near the apex, straight-sided at the middle, and slightly convex before the margin, the marginal area itself flattened into a narrow shelf which is turned up just a little at the rim. Under side of posterior margin smooth. Sculpture of back slope consists of rounded alternating larger and smaller radiating ribs crossed by subequally spaced concentric ridges that are about the same size as the smaller of the radiating ribs. There are seven well-developed concentric ridges and three weak ones, one of the latter situated between the first two primary concentrics near the summit, the other two situated near the base below the bottommost primary ridge. There are no concentric ridges on the marginal brim, although there are numerous fine concentric growth lamellae there as well as over the whole of the surface. At the intercepts of all radiating and concentric ribs there are prominent rounded nodules. The spaces between the radiating and concentric ribs are decussated into rectangular pits.

Dimensions.—Holotype, altitude 1.8 mm.; length of posterior slope from rear margin of orifice 4.5 mm.

Type locality.—Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. One broken specimen, the holotype.

Remarks.—The slightly upturned posterior edge, and the smooth inner margin of the base are the distinguishing characters of this interesting shell. Although little of the type specimen remains, what there is of it is unlike any of the Recent or fossil Fissurellidae I have seen and I, therefore, propose the specific name of *anomala*. The generic position of the species, however, is doubtful. The posterior truncation and excavation of the internal callus of the orifice suggest *Diodora*, although Pérez Farfante (in Johnsonia, 1943, vol. 1, No. 11, p. 1) stated that the basal margin of *Diodora* is never raised at the ends and that the margin is strongly crenulated. The genus *Fissurella* sometimes has the basal margin raised at the ends and the inner margin may be smooth, but on the other hand, and again according to Pérez Farfante (Johnsonia, vol. 1, No. 10, p. 2), the internal callus of the orifice is not truncated or excavated as it is on the present shell. *Lucapinella* may have the posterior end slightly raised, as on the Venezuelan specimen, but the orifice of *Lucapinella* is large and narrowed anteriorly whereas the orifice of *anomala* is relatively small and either keyhole-shaped or trilobate. On the assumption that the truncation and excavation of the internal callus are the critical criteria, *anomala* is referred to the genus *Diodora*.

With its smooth inner margin and with a somewhat similar surface sculpture *D.* ? *anomala*, n. sp. is not unlike *Fissurella* ? species described in this paper, the differences seeming to lie in the much lower conical shape of *anomala* and in its flattened posterior margin. The basal margin of *Fissurella* ? sp. conforms in contour with the rest of the slope.

Diodora dorsenula, new species Pl. 3, figs. 18, 19

Only the apical area of a single worn specimen remains, but this seems unlike that of any other species of *Diodora* I have compared it with. The shell is moderately solid, depressed conical, probably of medium size. Apical area broad, appressed, undulatingly tilted toward the anterior extremity. Orifice relatively large, irregularly keyhole-shaped, a little inclined toward the forward margin. Posterior slope immediately behind the orifice is obtusely humpbacked, the anterior slope immediately in front of the orifice gently

concave. Internal callus of orifice large, thick, swollen, and sharply truncated behind, the truncation excavated underneath by a slitlike groove. Externally the upper surface is sculptured by alternating larger and smaller radiating ribs, these crossed by concentric cords which produce nodulations at the intercepts.

Dimensions.—Holotype, length of specimen (of which only the apical area is present) 4 mm.; external length of orifice 1.6 mm.

Type locality.—Mare formation at W-25, south flank of Punta Gorda anticline. One broken specimen, the holotype.

Remarks.—This species is characterized by the sharp posterior truncation of the internal callus and by the low hump (to which the name *dorsenula* refers) immediately aft of the orifice. The orifice itself is like that of the Recent *D. sayi* (Dall) as illustrated by Pérez Farfante (1943, Johnsonia, vol. 1, No. 11, pp. 8-9, pl. 3, figs. 1-8), but that species lacks the apical hump and is sculptured by fine concentric threads instead of the larger nodulated spiral cords in the summit area of the Venezuelan form.

Diodora species Pl. 4, figs. 1, 2

A fragment of the slope of a single, broken, medium-sized thinnish shell suggests that the form is moderately high and conical. The slope as a whole is gently convex but is narrowly and slightly concave near the middle. Sculpture consisting of strong rounded radiating costae crossed by concentric ridges, the interceptions marked by nodules or occasional thick arches. The primary radiating ribs are subequal, each primary alternating with a strong secondary, the secondary ribs with a tertiary riblet on either side, the tertiaries strongly developed in some places, less so in others. The total number of costae at the basal margin of the circumference (with a chord of 4.2 mm.) is 19. From the top of the specimen to the base there are about 11 concentric ridges, these spaced somewhat unequally. The nodulation is pronounced throughout. Basal margin denticulate, the denticles arranged in pairs.

Dimensions.—Length of slope fragment 4 mm.

Locality.—Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. One fragment.

Remarks.—Although there is little to go on, the profile, mar-

ginal denticulation, and external markings of this shell suggest that it is related to *D. listeri* (d'Orbigny).

Fissurella (Fissurella) nimbosa (Linnaeus) Pl. 1, figs. 13-17

1758. *Patella nimbosa Linnaeus,* Syst. Nat., ed. 10, vol. 1, p. 785.
1822. *Fissurella nimbosa* Lamarck, An. sans Vert., vol. 6, pt. 2, p. 10.
1849. *Fissurella nimbosa* (Linnaeus), Reeve, Conch. Icon., vol. 6, *Fissurella,* pl. 5, sp. 29.
1850. *Fissurella balanoides* Reeve, Conch. Icon., vol. 6, *Fissurella,* pl. 10, sp. 66.
1862. *Fissurella nimbosa* (Linnaeus), Sowerby, Thes. Conchyl., p. 192, fig. 136.
1864. *Fissurella nimbosa* Lamarck, Krebs, The West Indian Marine Shells, p. 87.
1878. *Fissurella nimbosa* Lamarck, Mörch, Catalogue of West-India Shells, p. 13.
1890. *Fissurella nimbosa* (Linnaeus), Pilsbry, Man. Conch., vol. 12, pp. 163-164, pl. 36, fig. 32.
1943. *Fissurella* (*Fissurella*) *nimbosa* (Linnaeus), Pérez Farfante, Johnsonia, vol. 1, No. 10, pp. 2-3, pl. 1, figs. 1, 2.
1958. *Fissurella nimbosa* (Linnaeus), Coomans, Caraibisch Marien-Biologisch Inst. Collected Papers 6, p. 50, pl. 4, 3 figs.
1959. *Fissurella nimbosa* (Linnaeus), Voss [in] Rodriguez, Bull. Marine Sci. Gulf and Caribbean, vol. 9, No. 3, p. 276.
1959. *Fissurella nimbosa* (Linnaeus), Nowell-Usticke, A Check List of the Marine Shells from St. Croix, p. 23.

Shell moderately large, elevated, conical, a little narrowed anteriorly, the slopes straight or slightly convex, the base ovate. Apex central, the relatively large oblong orifice situated immediately forward of it and inclined toward the anterior extremity. Sculpture consisting of numerous radiating ribs, the primary ones larger and a little higher than the secondary ones, and fine, close, concentric growth striae which cross the radials without arching. With respect to coloration the best preserved specimen (A160a) displays 11 or 12 unequal rays of dull pink alternating with deep reddish brown, all of the rays broadening basalward. Interior tinged in various shades of pale green arranged in concentric bands, the narrow band around the central callus a darker shade of green. Basal margin crenulated.

Dimensions.—Specimen A160c, length 30 mm.; max. width 21.5 mm.; altitude 12 mm. Specimen A160a, length 18.8 mm.; max. width 13 mm.; altitude 8.5 mm.

Locality.—Recent, on beach of Playa Grande Yachting Club, Distrito Federal. Five specimens.

Range and distribution.—This rather uncommon species is living in Western Atlantic waters from Puerto Rico, south through the Antilles, to Ilha de Itaparica, and Reconcavo, Brazil.

Fissurella (Cremides) angusta Gmelin Pl. 2, figs. 1-3

1789. *Fissurella angusta* Gmelin, Syst. Nat., ed. 13, vol. 1, pt. 6, p. 3732.
1857. *Fissurella schrammii* Fischer, Jour. Conchyl., vol. 6, p. 383, pl. 11, figs. 5, 6.
1890. *Fissurella barbadensis* Gmelin var. *schramii* Fischer, Pilsbry, Man. Conch., vol. 12, p. 165, pl. 60, figs. 77-79.
1943. *Fissurella* (*Cremides*) *angusta* Gmelin, Pérez Farfante, Johnsonia, vol. 1, No. 10, pp. 7-8, pl. 2, figs. 1, 2, 6.
1954. *Fissurella* (*Cremides*) *angusta* Gmelin, Abbott, American Seashells, p. 100.
1958. *Fissurella angusta* Gmelin, Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 10.
1958. *Fissurella* (*Cremides*) *angusta* Gmelin, Abbott, Acad. Nat. Sci. Philadelphia, Mon. No. 11, p. 21.
1958. *Fissurella angusta* Gmelin, Coomans, Caraibisch Marien-Biologisch Inst. Collected Papers 6, p. 51, pl. 5, 2 figs.
1959. *Fissurella angusta* Gmelin, Voss [in] Rodriguez, Bull. Marine Sci. Gulf and Caribbean, vol. 9, No. 3, p. 276.
1959. *Fissurella angusta* Gmelin, Nowell-Usticke, A Check List of the Marine Shells of St. Croix, p. 24.

The single Recent shell referred to this species is of medium size, moderately solid, depressed, flattish on top, the slopes convex, the base subovate, bluntly attenuated in front, subtruncate behind. Summit a little in front of center, the oval but faintly trilobate orifice immediately before the summit. The internal callus of the orifice is about the same width throughout, the shape polygonally ovate and more or less conforming to the outline of the basal margin, the color brown. Around the callus the broad encircling veneer of shell deposit representing the area of attachment is a pale greenish white, and around that the interior is a faint green becoming faintly roseate at the margin. External sculpture consisting of nine irregular ribs radiating from the orifice and projecting a little beyond the basal margin, one of them situated at the median anterior line. Between the primary ribs there are secondary and tertiary riblets from one to six in number, all of them crenulate or nodulose and crossed by concentric threads and ridges. Basal margin fluted and denticulate. The color of the exterior is dark reddish brown around the orifice fading to rose down the slopes; the primary ribs are faded to buff or white.

Dimensions.—Figured specimen, length 18 mm.; width 11.1 mm.; altitude 5.1 mm.

Locality.—Recent, on beach of Playa Grande Yachting Club, Distrito Federal. One specimen.

Range and distribution.—The living *F. angusta* ranges from the Florida Keys through the West Indies to northern South America, and prefers rocks in the intertidal zone. I have not seen the species recorded as a fossil.

Fissurella (Cremides) rosea (Gmelin) Pl. 2, figs. 4-6

1796. *Patella rosea* Gmelin, Martini, Conchylien-Cabinet, vol. 1, pl. 12, fig. 105.
1791. *Patella rosea* Gmelin, Syst. Nat., ed. 13, vol. 1, pt. 6, p. 3730.
1822. *Fissurella rosea* (Gmelin), Lamarck, An. sans Vert., vol. 6, pt. 2, pp. 12-13.
1822. *Fissurella radiata* Lamarck, An. sans Vert., vol. 6, pt. 2, p. 13.
1862. *Fissurella rosea* (Gmelin), Sowerby, Thes. Conchyl., vol. 3, p. 190, figs. 91, 92, 150.
1864. *Fissurella rosea* Lamarck, Krebs, The West Indian Marine Shells, p. 88.
1890. *Fissurella rosea* (Gmelin), Pilsbry, Man. Conch., vol. 12, pp. 166-167, pl. 62, figs. 19-21.
1890. *Fissurella rosea* var. *sculpta* Pilsbry, Man. Conch., vol. 12, p. 166, pl. 60, figs. 80, 81.
1891. *Fissurella rosea* (Gmelin), Baker, Acad. Nat. Sci. Philadelphia, Proc., vol. 43, p. 55.
1901. *Fissurella rosea* (Gmelin), Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, p. 448.
1927. *Lucapina itapema* von Ihering, Archiv für Molluskenfunde, vol. 59, p. 102, pl. 6, figs. 5-8.
1933. *Fissurella rosea* (Gmelin), Pilsbry and Aguayo, Nautilus, vol. 46, No. 4, p. 121.
1953. *Fissurella* (*Cremides*) *rosea* (Gmelin), Haas, Fieldiana-Zoology, vol. 34, No. 20, p. 204.
1954. *Fissurella* (*Cremides*) *rosea* (Gmelin), Abbott, American Seashells, p. 100, pl. 17e.
1958. *Fissurella rosea* (Gmelin), Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 10.
1958. *Fissurella rosea* (Gmelin), Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, p. 51, pl. 4, 2 figs.
1959. *Fissurella rosea* (Gmelin), Nowell-Usticke, A Check List of the Marine Shells of St. Croix, p. 24.

The Recent shells from Playa Grande are of medium size, moderately thin, conical, more or less depressed, narrowed and a little attenuated anteriorly, the base ovate. Apex a little anterior to center. Orifice moderately small, elongate oval or oblong, weakly trilobate, inclined slightly toward the forward slope but sometimes nearly level. External sculpture consisting of numerous unequal to subequal radiating ribs (the largest specimen with 85 of them at

the base) and crowded concentric striae and lamellae. Generally every fourth rib is the primary one, but occasionally the larger rib is every second or sixth of a sequence. The concentric striae often coalesce and produce rather widely spaced, strongly convex vaulted arches or scales on the primary and secondary ribs, but where these are not formed the concentric striae cross the radials normally. Basal margin fluted and crenulate within, the larger flutings occurring under the larger external ribs. Internal callus more or less uniform in width, conforming in shape with the outline of the base. Muscle impression distinct to indistinct. Interior polished, the color arranged in concentric shades of pale green, the internal callus a slightly deeper green around the margin of the callus away from the orifice. Color of the exterior variable; one specimen is a drab olive green with narrow subsidiary rays of straw, another is marked with alternating rays of dark brown and straw (11 of each in number), and a third is a nondescript tan with vague rays of dull greenish gray. The apical area is often streaked with rose or pink descending part way down the slopes.

Dimensions.—Figured specimen, length 21.2 mm.; max. width 13.8 mm.; altitude 6.3 mm.; external length of orifice 2 mm.

Locality.—Recent, on beach of Playa Grande Yachting Club, Distrito Federal. Four specimens.

Remarks.—On none of the four Playa Grande specimens is the internal callus bounded by the pinkish line which is characteristic of *F. rosea* from certain localities. However, this pink border is not invariably present as attested by the many examples of *F. rosea* in the Museum of Comparative Zoology which exhibit no such line.

Range and distribution.—The living *F. rosea* ranges from southeastern Florida, through the Caribbean to Brazil. The species has not been reported previously as a fossil, but in the Abisinia formation (Pleistocene?) there is a fossil that is close to, if not identical, with *F. rosea.* This shell is next described and is illustrated on Plate 2, figures 7-9.

Fissurella (Cremides) rosea ? (Gmelin) Pl. 2, figs. 7-9

Shell small, thin, depressed, conical, a little narrowed anteriorly. Base ovate, the lateral margins straight, converging a little toward

the front, the right margin (as viewed with the summit up and the anterior extremity forward) converging somewhat more than the opposite. Summit elevated, a little anterior to center, slightly inclined toward the posterior extremity. Orifice about one-eighth the length of the shell, oblong-ovate, rendered trilobate by two small vertically produced nodes on both sides of the inner wall. Anterior slope hardly concave just below the summit, slightly convex basalward; posterior slope concave just below the summit, slightly convex medially, and then slightly turned up at the margin; lateral slopes straightish throughout. Surface sculpture consisting of about 16 unequally spaced primary radiating ribs of which those on the posterior and anterior slopes are larger and stronger than the ones on the sides, the posterior ribs much more divergent and farther apart than the anterior. Except in front, there is generally one secondary rib between the primaries and a tertiary riblet on either side of the secondary. Along the median line of the anterior slope there is a pair of primary ribs only; away from this pair but still on the anterior slopes there are two unequal interstitial riblets in the intercostal spaces of the primaries. In all there are about 52 radials around the base. Crossing the surface are concentric threads and lamellae, these forming rather widely spaced vaulted arches or scales on the primary and secondary ribs. Edge of base scalloped, the inner margin flattened and fairly broad, shallowly fluted, some of the flutings extending feebly up the interior. Internal callus of the orifice about the same width throughout, bluntly pointed anteriorly, subtruncate but not excavated behind. Muscle impression distinct, the posterior margin 2.1 mm. from the edge.

Dimensions.—Figured specimen, length 10 mm.; max. width 5.5 mm.; altitude 3 mm.; external length of orifice 1.2 mm. Unfigured specimen (D158a), No. 26398 PRI.

Locality.—Abisinia formation at W-30, eastern edge of Playa Grande village. Two specimens.

Remarks.—This young shell has a faint shelflike inner margin around the base, and the orifice is somewhat more distinctly trilobate than on many Recent specimens of *F. rosea.* The sculptural details and general configuration, however, are identical with *F. rosea,* and tentatively the fossil is referred to that species.

Fissurella (Cremides) longipora, new species Pl. 2, figs. 10-12

Shell small, thin, low conical, the base oval with little or no attenuation. Slopes straight above, gently concave below, curled slightly upward at the margin of the anterior and posterior extremities. Summit broad and appressed, subcentral, pierced by a large oblong orifice contracted slightly near the middle and sloping toward both extremities, the orifice one-fourth to one-fifth the length of the base, the rim of the orifice acutely saddle-shaped in profile. Sculpture consisting of about 17 subequal primary radiating ribs between each of which is a smaller and lower secondary rib. Concentrically the sculpture consists of about eight or nine raised lamellae becoming farther apart progressively from summit to base, and between the lamellae are fine striae. Where the lamellae cross the primary ribs they form slightly vaulted scales near the base and shingle-like imbrications farther up. Internal callus of the orifice narrowish, bluntly pointed anteriorly, subtruncate posteriorly where it is thickened and raised at one side probably due to a pathologic condition or to damage. Muscle impression fairly close to the margin, about 0.7 mm. on the holotype. Base scalloped irregularly around the rim, the inner margin alternately fluted and denticulate, the denticles bifid and occurring in pairs between the major flutings.

Dimensions.—Holotype, length 4.1 mm.; max. width 2.5 mm.; altitude 1.5 mm.; external length of orifice 0.9 mm.

Type locality.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. One specimen, probably immature, the holotype.

Comparisons.—The unique features of this interesting little shell are the long orifice which occupies the apex and upper slopes, and its oval margin. Superficially it resembles the low conical variant of *F. barbadensis* (Gmelin) but is immediately distinguished from that by its large, oblong orifice. The preceding species, *F. rosea* (Gmelin), is more attenuated anteriorly, has a smaller orifice, and is ornamented with elevated vaulted scales instead of the shingle-like imbrications of the present shell.

Fissurella ? species Pl. 2, figs. 13, 14

This is represented by a single fragment with only the posterior slope and margin intact. The shell is thin and smallish, the posterior

slope gently convex, the basal margin smooth within. Sculpture consisting of strong, alternating larger and smaller radiating ribs crossed by concentric ridges and threads. Between, and slightly lower than each of the primary radiating ribs, there is one secondary rib, and on each side of the secondary there is a tertiary rib, the tertiary ones the lowest. The concentric ridges are prominent, a little larger than the tertiary radials; they are unequally spaced, somewhat variable in size, and form nodulations at their intersections with all of the radiating ribs. There are about eight of these concentric ridges from near the apex to the base, and between them there are subsidiary concentric threads. The crossing of the larger radials and concentrics imparts a decussated pattern, the spaces so enclosed forming deep, oblong pits.

Dimensions.—Length of fragment 3.1 mm.

Locality.—Mare formation at W-25, south flank of Punta Gorda anticline. One specimen.

Remarks.—This fragile shell is smooth at the inner margin of the base. Among the Fissurellidae only the genus *Fissurella* is reported as having species with a simple margin and, therefore, this shell is questionably referred to that genus although the external sculpture is like that of *Diodora*. Species with a smooth margin are relatively rare and while it is possible that the margin of this particular specimen has been smoothed through weathering, my surmise is that it is naturally so.

ACMAEIDAE

Acmaea antillarum (Sowerby) Pl. 4, figs. 3-5

1834. *Lottia antillarum* Sowerby, The Genera of Recent and Fossil Shells, pt. 42.
1842. *Patella candeana* d'Orbigny, [in] La Sagra, Hist. phys., polit. nat. l'Ile de Cuba, Mollusques, vol. 2, p. 199, pl. 25, figs. 1-3.
1846. *Acmaea elegans* ? Philippi, Zeitschr. f. Malakozool., p. 24.
1849. *Patella antillarum* (Sowerby, Philippi, Abbild. Beschr. Conchyl., vol. 3, No. 5, p. 38.
1889. *Acmaea candeana* (d'Orbigny), Dall, U. S. Nat. Mus., Bull. 37, p. 156.
1889. *Acmaea antillarum* (Sowerby), Dall, Mus. Comp. Zool., Bull., vol. 18, p. 410 (part).
1891. *Acmaea candeana* (d'Orbigny), Tryon, Man. Conch., vol. 13, p. 38, pl. 5, figs. 93-95.
1901. *Acmaea candeana* (d'Orbigny), Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, p. 440.

1922. *Acmaea candeana* (d'Orbigny), Maury, Bull. Amer. Paleont., vol. 9, No. 38, p. 151.
1922. *Acmaea candeana* (d'Orbigny), Remington, Nautilus, vol. 35, No. 4, p. 121.
1937. *Acmaea candeana antillarum* (Sowerby), Smith, East Coast Marine Shells, p. 74, pl. 29, fig. 2.
1942. *Acmaea antillarum* (Sowerby), Jaume and Pérez Farfante, Soc. Cubana Hist. Nat. "Felipe Poey" Mem., vol. 16, No. 1, p. 40.
1952. *Acmaea antillarum* (Sowerby), Pulley, Texas Jour. Sci., vol. 4, No. 2, p. 170.
1954. *Acmaea antillarum* (Sowerby), Abbott, American Seashells, p. 106, pl. 17a.
1955. *Acmaea antillarum* (Sowerby), Perry and Schwengel, Marine Shells of the Western Coast of Florida, p. 105.
1958. *Acmaea antillarum* (Sowerby), Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 10.
1958. *Acmaea antillarum* (Sowerby), Coomans, Caraibisch Marien- Biologisch Inst. Collected Papers 6, p. 54, pl. 1, 2 figs.
1959. *Acmaea antillarum* (Sowerby), Nowell-Usticke, A Check List of the Marine Shells of St. Croix, pp. 24, 25.

The single Recent shell referred to *A. antillarum* (Sowerby) is rather thin, depressed, broadly suboval in outline, with the anterior end a little the narrower. Apex flattish, in front of the middle. Slopes slightly convex to straight, sculptured by small, low, closely spaced riblets alternating in size, crossed by numerous concentric growth striae. Surface whitish, marked with radial stripes of greenish brown, about nine of them occurring as pairs, and with two to four shorter stripes between the pairs; a few of the rays are divided near the basal margin. Interior with a rather broad, faintly bluish translucent border showing the external rays, the central area glossy and marbled with tan and white. Muscle impression white, horseshoe-shaped, marked with irregularly spaced slits which do not quite reach the outer margin. The scar of the mantle joins the anterior ends of the muscle impression.

Dimensions.—Figured specimen (A137a), length 17 mm., max. width 13.5 mm., altitude 4 mm.

Locality—Recent, on beach of Playa Grande Yachting Club, Distrito Federal. One specimen.

Remarks.—*A. candeana* (d'Orbigny) is generally considered the same as *A. antillarum* (Sowerby), and, according to Abbott, *A. tenera* of C. B. Adams (1845, p. 8) is also synonymous. *A. elegans* Philippi, reported from La Guaira, Venezuela, close to the locality my shell was collected, was likewise believed by Dall to be a

synonym of *A. candeana*. Krebs (1864, p. 75) listed both *A. antillarum* (Sowerby) and *A. palescens* Philippi as equivalent to *A. melanosticta* (Gmelin), but Dall (1889b, p. 410) was of the opinion that *A. melanosticta* was distinct [from *candeana*].

Range and distribution.—The living *A. antillarum* (Sowerby) ranges from Florida through the West Indies to northern South America. Jaume and Pérez Farfante reported the species as a fossil from the Pleistocene at Gibara, Cuba.

Acmaea cf. pustulata (Helbling) Pl. 4, figs. 6, 7

1779. *Patella pustulata* Helbling, Abhandl. Privatgesell. Böhm, vol. 5, p. 110, pl. 1, fig. 12.
1791. *Patella punctulata* Gmelin, Syst. Nat., ed. 13, p. 3705, No. 68; p. 3717, No. 132 (refers to Buonanni, pl. 1, fig. 7, and Martini, Conchylien-Cabinet, vol. 1, pl. 7, fig. 55.
1819. *Patella puncturata* Lamarck, An. sans Vert., vol. 6, p. 333 (refers to Lister, pl. 537, fig. 18.
1845. *Patella cubaniana* d'Orbigny, [in] La Sagra, Hist. Fís., Polít. y Nat. Isla de Cuba, Moluscos, vol. 5, p. 272, pl. 25, figs. 4-6.
1864. *Acmaea pustula* [*sic*] (Helbling), Krebs, The West Indian Marine Shells, p. 75.
1889. *Acmaea punctulata* (Gmelin), Dall, U. S. Nat. Mus., Bull. 37, p. 156.
1891. *Acmaea punctulata* (Gmelin), Pilsbry, Man. Conch., vol. 13, p. 37, pl. 5, figs. 11-13.
1891. *Acmaea confusa* (Guilding), Baker, Acad. Nat. Sci. Philadelphia, Proc. vol. 43, p. 54.
1892. *Acmaea punctulata* (Gmelin), Dall, Wagner Free Inst. Sci., Trans., vol. 3, pt. 2, p. 381.
1901. *Acmaea punctulata* (Gmelin), Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, p. 440.
1913. *Acmaea punctulata* (Gmelin), Brown and Pilsbry, Acad. Nat. Sci. Philadelphia Proc., vol. 65, p. 496.
1922. *Acmaea punctulata* (Gmelin), Maury, Bull. Amer. Paleont., vol. 9, No. 38, p. 151.
1924. *Acmaea punctulata* (Gmelin), Emery, Nautilus, vol. 38, No. 2, p. 60.
1927. *Acmaea pulcherrima* "Guilding", Dall. U. S. Nat. Mus., Proc., vol. 70. No. 2668, p. 3. Not Petit 1856.
1937. *Acmaea punctulata* (Gmelin), Smith, East Coast Marine Shells, p. 74, pl. 29, figs. 14a, 14c, 14d.
1942. *Acmaea pustulata* (Helbling), Jaume and Pérez Farfante, Soc. Cubana Hist. Nat. "Felipe Poey" Mem., vol. 16, No. 1, p. 40.
1946. *Acmaea pustulata* (Helbling), Jaume, Soc. Malac. "Carlos de La Torre" Rev., vol. 4, No. 3, p. 102.
1954. *Acmaea pustulata* (Helbling), Abbott, American Seashells, p. 106.
1958. *Acmaea pustulata* (Helbling), Olsson and McGinty, Bull. Amer. Paleont. vol. 39, No. 177, p. 10.
1958. *Acmaea* (*Collisella*) *pustulata* (Helbling), Abbott, Acad. Nat. Sci. Philadelphia, Mon. No. 11, pp. 21-22, map 9.

1958. *Acmaea pustulata* (Helbling), Coomans, Caraibisch Marien-Biologisch Inst. Collected Papers 6, p. 54, pl. 3, 2 figs .
1959. *Acmaea pustulata* (Helbling), Nowell-Usticke, A Check List of the Marine Shells of St. Croix, pp. 24-25.

The Venezuelan fossil referred tentatively to this species is badly corroded, thin, low conical, the small slightly bulbous apex well forward, the base suboval in outline, a little narrower at the anterior end. Ornamentation mostly worn off, but there is the suggestion that normally the exterior is sculptured by weakly developed radial riblets and rather prominent concentric lamellae. Outer surface marked with what seem to be faded orange-brown maculations on a white ground.

Dimensions.—Length 8.5 mm.; max. width 6 mm.; altitude 3.3 mm.

Locality.—Abisinia formation at W-30, eastern edge of Playa Grande village. One specimen.

Range and distribution.—The Recent *A. pustulata* ranges from the lower Florida Keys to northern South America. In the Pleistocene it is recorded from Cuba and the Panama Canal Zone, and in the Pliocene it has been reported by Dall (1892, p. 381) as occurring rarely in the Caloosahatchee[3] marl of Florida.

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[3]In the present paper the term "Caloosahatchee" is used to denote the marine Pliocene of Florida, and includes the remarkable shell accumulation lying 15-20 feet below the surface at North St. Petersburg. This loosely compacted shell deposit, uncovered by dredging on 23 February 1959, is located about 900 feet east of 9th Street and a short distance south of 70th Avenue in Pinellas County, Florida, west of Tampa Bay. The numerous well-preserved mollusks from this deposit have been described by Olsson and Harbison (1953) and, on the basis of the percentage of extinct species, the age of the deposit was assigned by them as Pliocene and correlated with the Caloosahatchee marl, which since the days of Heilprin (1887b) has also been considered to be Pliocene. However, recently the type section of the Caloosahatchee in the Caloosahatchee River has been studied carefully and in great detail by DuBar (1958), and he has come to the conclusion, based on vertebrate remains and paleoecological data (p. 145), that the type Caloosahatchee is late Pleistocene. In my opinion, the North St. Petersburg shell bed with only 34 per cent of the mollusks living to-day, must be pre-Pleistocene in age. It may well be Pliocene but could be late Miocene. And, as virtually all of the North St. Petersburg fossils occur in one member or another of the Caloosahatchee type section, it would seem to me that at least part of the type Caloosahatchee is contemporaneous with the North St. Petersburg deposit.

TROCHIDAE

Calliostoma caribbeanum, new species Pl. 4, figs. 8-10

Shell small, imperforate, the spire low conoidal, the angle of spire around 90 degrees.[4] Whorls a little over six in all, the smooth nucleus consisting of about 1-1/4 of them. Initial turn of nucleus small and indistinct, a little immersed, the last stage of the nucleus transitional into the conch. Post-nuclear whorls sloping above, more or less square-sided at the periphery; the upper slope, or ramp, is slightly concave on all but the first post-nuclear whorl, the sides of the peripheral belt nearly vertical on the last three whorls. On the second post-nuclear whorl the periphery is marked by a thin, finely beaded keel which later develops into the low broad spiral rib marking the top of the peripheral belt of the later whorls. Below the keel, the second whorl is slightly excavated, and above the keel, it is marked with strong axial threads which continue on the ramp to the suture. The axial threads are somewhat curved between the spiral threads, and, at the intersections of the axial and spiral threads, beads are formed. With growth of the shell the axial markings become finer and much more numerous, covering the whole of the surface. The spiral sculpture on the ramp consists first of beaded threads and then of beaded cords, with a minor thread appearing between the lower cords of the last whorl. On the penultimate whorl there are four beaded cords, the upper two a little closer and a little smaller than the lower two, the lowest one lying adjacent to the weakly crenate rib that marks the top of the peripheral belt. Peripheral belt sculptured by four low, finely crenate ribs, the uppermost the broadest, the lowest at the suture the smallest. Base slightly convex, sculptured by 11 flattish spiral riblets subequal in size, the innermost ones more or less beaded, the beading or crenation becoming obsolescent outward, the whole of the base traversed by numerous crescentic growth striae. Aperture rhomboidal, wider than high. Columella short and stout. Parietal wall with a thin sheath of callus, the callus extending along the side of the columella, then becoming detached and elevated at the base. Outer and lower

[4]The angle of spire as used in this work has been determined from photographs rather than the shell.

lips broken away. At the base and under side of the pillar there is a deep triangular fosset. Anterior outlet bent slightly toward the back.

Dimensions.—Holotype, altitude 8 mm.; max. width 9 mm.

Type locality.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. One specimen, the holotype.

Other localities.—Mare formation at W-25, south flank of Punta Gorda anticline. One fragment.

Comparisons.—The nearest relative is *C. decipiens laticarinatum* (Guppy) (see Maury, 1925a, p. 397, pl. 43, figs. 5, 10) from the Pliocene at Matura, Trinidad. The differences are that the Trinidad species has a spire angle of 80 degrees compared with 90 degrees on *C. caribbeanum,* n. sp., and the periphery of *C. laticarinatum* is subrounded instead of square-sided. Other species allied to, but distinct from *C. caribbeanum* are *C. basicum* Dall (1892, p. 392) (see Gardner, 1948, pl. 26, fig. 11); *C. mitchelli* (Conrad) (see Gardner, 1948, pl. 26, figs. 19, 23); and *C. willcoxianum* Dall (1892, p. 395, pl. 18, fig. 1). *C. basicum,* from the upper Miocene of Virginia and North Carolina has but six spiral cords on the base, and these are narrower than the 11 riblets on *C. caribbeanum. C. mitchelli,* also from the upper Miocene of Virginia and North Carolina, is more slenderly spired than *caribbeanum,* and there are eight spiral riblets on the base. *C. willcoxianum* from the upper Miocene of North Carolina and the Pliocene of Florida has a spire angle of about 68 degrees, and is more regularly pyramidal than the Venezuelan shell. The living *C. roseolum* Dall (1889b, p. 366, pl. 24, figs. 6, 6a) which ranges from North Carolina to Yucatan, in 15-200 fathoms, is readily distinguished from the fossil *C. caribbeanum* by its longer spire and subrounded periphery.

Calliostoma puntagordanum, new species Pl. 4, figs. 11, 12

Shell small, low conical, the angle of spire about 84 degrees. Nucleus decollate. Post-nuclear whorls slightly convex, estimated at three in number, separated by finely incised sutures. Body whorl angulate at the periphery, the base flattish. Whorls ornamented with four rows of beads, about 30 beads to the row on the penultimate, the upper row encircling the suture, the first three rows more

or less equal in size, the fourth smaller, situated just above the lower suture on the conch, but merging with, and annealed to the top of the peripheral rib of the ultima. Peripheral rib robust, unbeaded below. Base sculptured by seven plain subequal spiral cords crossed by microscopic growth lines. Normally, all but the outermost of these basal cords are covered by a neat circular sheath of enamel on the base, and this was observed on the holotype before it was peeled off inadvertently in handling. Adjacent to the columella there is an umbilical chink, and this too is covered by the basal enamel on perfect specimens. Aperture subquadrate, the lips broken back.

Dimensions.—Holotype, length 2.7 mm.; max. diameter 2.4 mm.

Type locality.—Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. One specimen, the holotype.

Comparisons.—*C. puntagordanum,* n. sp. is akin to *C. cheopsi* Gardner (1948, pp. 183-184, pl. 26, figs. 20, 21) from the Yorktown Miocene of North Carolina, but differs from that in its lower and more divergent spire. The living *C. sapidum* Dall (1889b, p. 364, pl. 21, figs. 2, 4), described from a single example obtained in 805 fathoms off Cuba, is taller and more heavily beaded than *C. puntagordanum,* and the whorls are flat-sided instead of gently rounded.

Calliostoma curucutianum, new species Pl. 4, figs. 13-17

Shell small, imperforate, conical, the angle of spire about 63 degrees. Whorls nearly five including the smooth nucleus which is defective but seems to consist of a half turn or so. Post-nuclear whorls flat-sided to hardly concave above the beaded carina near the base. Sculpture consisting of four rows of beads, the beads connected by spiral cords on each row and by somewhat slanted axial cords between the rows. The beads near the base of the whorl are the largest and form a peripheral carina; the two rows above are unequal in size but equal in spacing, the upper one the larger and forming a circlet at the summit; the fourth row of beads lies below the peripheral carina and is appressed against the suture. On the last whorl the periphery is bicarinate, and the two rows are beaded about equally. On all the whorls the oblique axial cords connecting the beads of the two lowest rows are the strongest, and on the

ultima there are about 32 beads per row. Sutures finely incised. Base flat, sculptured by seven subequal spiral threads crossed by numerous radiating microscopic growth striae. On perfectly preserved specimens the base is believed to be veneered in large part by a thin coating of enamel which covers all but the outer spiral threads. Aperture rhomboidal, lined with a thin sheath of enamel. Lips broken back at the edge, the basal lip sharply truncate. Columella nearly straight, short, and stout. Parietal wall with a thin coat of enamel which joins that of the aperture and undoubtedly extends, on well-preserved shells, over most of the base.

Dimensions.—Holotype (H113a), altitude 2.3 mm.; max. diameter 2.1 mm.; Paratype (S114a), altitude 1.3 mm.; max. diameter 1.2 mm. Aperture plugged with echinoid spine.

Type locality.—Mare formation at W-25, south flank of Punta Gorda anticline. Two specimens, one of them badly broken.

Other localities.—Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. One specimen.

Comparisons.—The new Venezuelan species is close to *C. rhombotum* Mansfield (1925, p. 59, pl. 8, figs. 4, 8) from the middle or lower Miocene of Trinidad. However, the base of *rhombotum* "shows five subequal crenulated spirals lying within a wider, undulated and spirally striated peripheral band," whereas on the base of the smaller *C. curucutianum,* n. sp. there are seven spiral threads. The species *C. puntagordanum,* n. sp., from the Maiquetía member of the Playa Grande formation has a much wider spire angle than *C. curucutianum,* and the Recent *C. sapidum* Dall (1889b, p. 364, pl. 21, figs. 2, 4) is more strongly nodulated. Another similar species is *C. indiana Dall* (1889b, p. 368, pl. 32, figs. 3, 5) dredged off the Island of Grenada in gray ooze, bottom temperature 53.5°F., but the spiral threads on the base of *C. indiana* are farther apart and finer than they are on the Venezuelan shell.

Livona pica (Linnaeus) Pl. 5, fig. 1

1758. *Turbo pica* Linnaeus, Syst. Nat., ed. 10, p. 763.
1781. *Turbo pica* Linnaeus, Chemnitz, Conchylien-Cabinet, vol. 5, p. 167, pl. 640, fig. 30.
1810. *Meleagris picus* (Linnaeus), Denys de Montfort, Conchyl. Syst., pp. 206-207.

1847. *Cittarium pica* (Linnaeus), Philippi, Zeitschr. f. Malakozool., p. 20.
1848. *Turbo pica* Linnaeus, Reeve, Conch. Icon., vol. 4, pl. 6, sp. 24.
1864. *Turbo pica* Linnaeus, Krebs, The West Indian Marine Shells, p. 80.
1878. *Trochus pica* (Linnaeus), Mörch, Catalogue of West-India Shells, p. 13.
1889. *Turbo pica* Linnaeus, Lorié, Samml. Geol. Reichs-Mus. Leiden, ser. 2, vol. 1, pp. 129-130.
1889. *Livona pica* (Linnaeus), Pilsbry, Man. Conch., vol. 11, p. 277, pl. 41, fig. 24.
1889. *Livona pica* (Linnaeus), Dall, U. S. Nat. Mus., Bull. 37, p. 160.
1901. *Livona pica* (Linnaeus), Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, pp. 443-444.
1902. *Livona pica* (Linnaeus), Verrill, Connecticut Acad. Arts and Sci., Trans., vol. 11, pt. 2, pp. 708-709.
1905. *Livona pica* (Linnaeus), Fluck, Nautilus, vol. 19, p. 78.
1922. *Livona pica* (Linnaeus), Maury, Bull. Amer. Paleont., vol. 9, No. 38, p. 153.
1922. *Livona pica* (Linnaeus), Remington, Nautilus, vol. 35, No. 4, pp. 119, 121.
1924. *Livona pica* (Linnaeus), Emery, Nautilus, vol. 38, No. 2, pp. 57, 61.
1926. *Livona pica* (Linnaeus), Peile, Malac. Soc. London, Proc., vol. 17, p. 73.
1935. *Livona pica* (Linnaeus), Richards, Jour. Paleont., vol. 9, No. 3, p. 257.
1937. *Livona pica* (Linnaeus), Smith, East Coast Marine Shells, p. 79, pl. 31, fig. 7.
1942. *Livona pica* (Linnaeus), Jaume and Pérez Farfante, Soc. Cubana Hist. Nat. "Felipe Poey" Mem., vol. 16, No. 1, p. 40.
1943. *Livona pica* (Linnaeus), Clench and Abbott, Johnsonia, vol. 1, No. 12, pp. 6-9, pls. 1 and 4.
1954. *Livona pica* (Linnaeus), Abbott, American Seashells, p. 117, fig. 34.
1958. *Livona pica* (Linnaeus), Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 10.
1958. *Livona pica* (Linnaeus), Abbott, Acad. Nat. Sci. Philadelphia, Mon. No. 11, p. 24.
1958. *Livona pica* (Linnaeus), Coomans, Caraibisch Marien-Biologisch Inst. Collected Papers 6, p. 55.
1959. *Livona pica* (Linnaeus), Rodriguez, Bull. Marine Sci. Gulf and Caribbean, vol. 9, No. 3, p. 276.
1959. *Livona pica* (Linnaeus), Nowell-Usticke, A Check List of the Marine Shells of St. Croix, p. 27.

A single, badly worn Recent specimen with only a portion of the body whorl intact is referred to this species. The ground is a pink-tinted white on which there are maculations and splashes of black, lead gray, and brown. On the base above the deep circular umbilicus there are brown maculations on white. The aperture is white, tinged faintly with green. On the periphery and base there are a few revolving ridges that are faintly nodulous.

Dimensions.—Figured specimen (body whorl only) diameter 19 mm.

Locality.—Recent, on beach southeast of Higuerote, State of Miranda. One poorly preserved and broken specimen.

Range and distribution.—Livona pica (Linnaeus) ranges from south Florida through the West Indies to northern South America. The living animal generally inhabits rocky shores, but it has been reported from dredgings as deep as 160 fathoms. The portion of the Higuerote beach on which the single imperfect specimen was collected is entirely sandy, but the shell had obviously been transported some distance from its natural habitat. As a fossil, *L. pica* is reported from sub-Recent dunes and aeolian limestones on the Bermuda Islands, and from the Pleistocene of Cuba, Aruba, Curaçao, and Barbados.

Tegula (Agathistoma) maculostriata (C. B. Adams) Pl. 5, figs. 17-19

1845. *Monodonta maculo-striata* C. B. Adams, Boston Soc. Nat. Hist., vol. 2, pp. 6-7.
1889. *Chlorostoma maculostriatum* (C. B. Adams), Pilsbry, Man. Conch., vol. 11, p. 184, pl. 24, figs. 88, 89.
1901. *Chlorostoma maculostriatum* (C. B. Adams), U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, p. 443.
1950. *Monodonta maculo-striata* C. B. Adams, Clench and Turner, Occas. Papers on Mollusks, vol. 1, No. 15, pp. 305-306, pl. 39, fig. 13.
1958. *Tegula maculostriata* (C. B. Adams), Coomans, Caraibisch Marien-Biologisch Inst. Collected Papers 6, p. 56.

The Venezuelan shell referred to this species is small, moderately sturdy, low conical. Whorls convex, the last flattish on the slope of the labrum below the suture, feebly angulate at the periphery, the base flat above the umbilicus, gently swollen behind the lower lip. Sutures tight. Surface sculptured by weak, low, distantly crenated spiral cords, the one at the periphery a little larger than any of the others, the one below that the second largest. There are about nine spiral cords on the ultima above the periphery, and between some of the cords there is a minute interstitial thread. Base with a dozen or more spiral threads and low riblets, the coarser spirals occurring around the umbilicus. The outer margin of the base proper is defined by the second largest spiral cord lying a short distance below the periphery, and this cord emerges from the commissure. Aperture subquadrate, iridescent, weakly lirate anteriorly, grooved feebly below the commissure. Outer lip the same thickness as the labrum proper, joined to the whorl directly over the umbilicus. Lower and basal lips thickened, provided with seven or more denticles the largest of which is the posteriormost one in front of the umbilical

cavity, the others decreasing in size more or less progressively toward the outer lip and merging with the lirae of the aperture. Columella deeply excavated, joined by the septum of callus from the parietal wall, the septum raised above the near margin of the deep, rounded perforation. Ground color tan or straw, splashed or flecked with greenish black, brown, and a little olive green, the base with short revolving stripes of brown, the tract around the umbilicus white, dotted and sporadically striped with brown. Aperture nacreous white.

Dimensions.—Figured specimen (three whorls), max. diameter 9.1 mm.; altitude 8 mm.

Locality.—Recent, on beach of Playa Grande Yachting Club, Distrito Federal. One specimen.

Remarks.—Allowing for some individual variation, the single specimen is close to C. B. Adams' species, and is identical with other specimens labeled *T. maculostriata* in the Museum of Comparative Zoology. Abbott (1958, p. 25) was of the opinion that *T. maculostriata* is a threaded form of the widespread *T. fasciata* (Born), and many authors, including Krebs (1864, p. 84), Abbott (1958, p. 25), and Coomans (1958, p. 56) believed that *T. maculostriata* is the same as *T. hotessieriana* (d'Orbigny).

Range and distribution.—*Tegula maculostriata, s.s.* is an Antillean and southern Caribbean species.

Tegula (Agathistoma) viridula (Gmelin) Pl. 5, figs. 2-7

1781. *Trochus viridulus* Chemnitz, Conchylien-Cabinet, vol. 5, p. 114, pl. 171, fig. 1679.
1791. *Trochus viridulus* Gmelin, Syst. Nat., ed. 13, p. 3574, No. 47.
1847. *Trochus viridulus* Gmelin, Philippi, Conchylien-Cabinet, p. 75, pl. 14, fig. 5.
1873. *Omphalius viridulus* (Gmelin), Gabb, Amer. Philos. Soc., Trans., new ser., vol. 15, p. 243.
1889. *Chlorostoma viridulum* (Gmelin), Pilsbry, Man. Conch., vol. 11, pp. 175-176, pl. 29, figs. 54-56.
1921. *Tegula viridula* (Gmelin), Pilsbry, Acad. Nat. Sci. Philadelphia, Proc., vol. 73, p. 396.
1924. *Tegula viridula* (Gmelin), Olsson, Nautilus, vol. 37, No. 4, p. 126.
1938. *Tegula viridula* (Gmelin), Bales, Nautilus, vol. 52, No. 2, p. 46.
1953. *Tegula* (*Chlorostoma*) *viridula viridula* (Gmelin), Haas, Fieldiana-Zoology, vol. 34, No. 20, p. 204.
1958. *Tegula viridula* (Gmelin), Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 11.

The shells referred to this species are sturdy, of medium size, low trochoidal, the spire gently rounded in outline, the apex obtuse. Whorls about five in all, 1-1/2 of them forming the smooth hyaline nucleus which is often greenish in color. Post-nuclear whorls slightly convex, the last often flat-sided above, rounded below, strongly but not sharply carinate at the base. Sculpture consisting of beaded spiral cords of which there are three to five on the conch and six or seven on the body whorl, the bottommost forming the peripheral carina. The spiral cords are separated by interspaces that are wider than, to as wide as the cords themselves, and bear microscopic spiral striations, the whole crossed by oblique lines of growth. Sutures narrowly channeled. Base convex behind the outer lip, flattish to slightly concave at the umbilicus, sculptured by five or six weakly crenated but broad spiral riblets with shallow interspaces which are also lineated with microscopic spirals and traversed by oblique growth striae. Aperture suborbicular, iridescent green. Outer lip moderately thin at the edge, thickening toward the labrum, joined to the whorl directly above the umbilicus, the inner margin gently fluted. Columella heavily callused, the callus extending to the lower portion of the parietal wall and partially encircling the umbilicus. Lower and basal lips denticulate, the first denticle below the umbilicus asymmetrically bifid, the lips proper bearing six or more single denticles which are tear-drop shaped or elongated into plicae and continue into the aperture where they become obsolescent. Umbilicus roundish and deep, half surrounded with a sickle-shaped callus which is often thickest at its termination above the umbilicus. The outer margin of the umbilicus is ridged, the ridge entering the umbilical cavity and, at the other end, merging with the bifid denticle. The surface is colored with slanting irregular bars of dark red or dark purplish red alternating with dull olive green. The umbilical callus is malachite green. Operculum dark amber, translucent, chitinous, gently convex outward like the lid of a pot, the apex appressed. Inner surface of operculum with equally spaced concentric rings.

Dimensions.—Recent specimen (A277a), max. diameter 17.2 mm.; altitude 15.8 mm. Recent operculum (A277b), max. diameter 5.5 mm.; altitude 1 mm. Fossil specimen (D277a), max. diameter 18.5 mm.; altitude 17.8 mm.

Localities.—Recent, on beach of Playa Grande Yachting Club, Distrito Federal. Nineteen specimens, including two operculi.

Abisinia formation at W-30, eastern edge of Playa Grande village. Two specimens, one of them with unfaded color markings. Station W-30 is about 62 meters above sea level.

Lower Mare formation, in small stream 100 meters west of Quebrada Mare Abajo. One badly corroded specimen, the identification of which is questionable.

Comparisons.—*Tegula semigranosa* (A. Adams) (1851, Zool. Soc. London Proc., pt. 19, p. 157, as *Phorcus*) is virtually identical save for the color of the umbilicus which, on all of the specimens I have seen in the Museum of Comparative Zoology, is whitish. The umbilicus of *T. viridula* is generally green, and there are usually five or six spiral riblets on the base as compared with about eight on *T. semigranosa.*

Range and distribution.—The known occurrences of the living *Tegula viridula* are few. In the Western Atlantic it is reported from the Caribbean coast of Panama, the West Indies, and Ilha Grande, Rio de Janeiro, Brazil. In the Eastern Pacific it is recorded by Bales from the west coast of Mexico, and by Olsson along the coast of Peru and Ecuador. As a fossil, *T. viridula* is listed as having been found in the Miocene of the Dominican Republic by Gabb and by Pilsbry. The present work establishes for the first time its occurrence in Venezuela as both a Recent and fossil shell.

Tegula (Agathistoma) puntagordana, new species Pl. 5, figs. 8-10

Shell of medium size, sturdy, trochoidal, perforate, the apex obtuse. Whorls about six in all, the nuclear two smooth, the first post-nuclear one moderately convex, the rest with a flat to concave slope above, straight-sided to slightly convex below, the shoulder subangulate to carinate. Sculpture consisting of low narrow crenated spiral cords crossed by numerous oblique microscopic striae and occasional oblique growth ridges. On the penultimate whorl there are six or seven subequal cords on the concave ramp above the shoulder, five subequal cords around the middle where the one at the periphery is the most pronounced, and two cords with an interstitial thread between them at the base. The pattern on the body whorl is repeated, with the shoulder sometimes acutely carinated.

Base with about eight spiral riblets of varying size. Sutures finely incised. Aperture suborbicular, lined with about eight revolving lirae which extend from within to near the inner margin of the outer lip where they may disperse or divaricate into disconnected folds or nodules. Outer lip heavy but thin at the extreme margin, joined to the whorl directly above the umbilicus, the under side faintly channeled at the commissure. Columella rather deeply excavated, the callus raised above and encroaching over the near side of the umbilicus, extending to the parietal wall where it terminates at the summit of the outer lip. Lower lip thickened except at the rim which is sharp, ornamented with four denticles, the posterior two occurring as a pair and somewhat larger than the others. Umbilicus circular, of medium diameter, deep, half surrounded on the apertural side by the columellar callus, the far margin of the perforation a little swollen, the swelling adjoining a moderately shallow sulcus which terminates abruptly against the lower lip. Color faded, but on the holotype there are narrow slanting axial bars of brown traversing the labrum at nearly right angles with the oblique microscopic growth lines.

Dimensions.—Holotype (S278a), max. diameter 16 mm.; altitude 15.8 mm.

Type locality.—Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. One specimen, the holotype.

Other localities.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. Two specimens.

Comparisons.—This is of the same general ilk as *T. excavata* (Lamarck) (1822, An. sans Vert., vol. 7, p. 29) but that Pleistocene to Recent species is concave at the base and lacks the prominent apertural lirae.

Tegula (Agathistoma) trilirata, new species Pl. 5, figs. 11-13

Shell of medium size, sturdy, low trochoidal, perforate, the spire broadly terraced. Whorls estimated at 5-1/2 in all, the nucleus decollate. Last three whorls angulate to carinate at the shoulder, the ultima with three moderately strong narrow carinae, one at the shoulder, one around the middle emerging from just above the

suture, and the third at the periphery emerging below the suture, the shoulder carina feebly nodulous in a spiral direction, the other two more or less crenate. Upper slope or ramp of the whorls is flattish to a little concave, the lower sides nearly vertical. Sutures finely incised to narrowly channeled. Sculpture consisting of minutely nodulated spiral threads crossed by numerous fine oblique growth striae. Body whorl with six spiral threads between the shoulder and suture, each of the threads with an interstitial threadlet, the threads becoming slightly wider progressively toward the shoulder; between the shoulder and middle carina are two subequal threadlets followed by two subequal threads, and then another threadlet above the carina; between the middle carina and the peripheral cord are first a threadlet and then two subequal threads; on the base there are seven or eight flattish riblets becoming progressively broader toward the umbilicus, each with a minor thread in the interspaces. In addition, the whole of the surface is covered with crowded microscopic lineations or filaments. Aperture suborbicular, lined with a number of irregular lirae which tend to develop into pustules and denticles at their termini near the margin of the outer lip. Outer lip the same thickness as the labrum but thin at the edge, joined to the whorl directly above the umbilicus, the under side of the lip grooved at the posterior outlet. Lower lip thickened, armed with as many as eight denticles, the posteriormost paired, the others single and more or less decreasing progressively in size around the basal margin of the aperture. Columellar lip rather heavily callused, the callus raised above and continuing arcuately over the side of the umbilicus to the parietal wall, and from there to the summit of the outer lip. Umbilical perforation deep, broadly oval, narrowing and shallowing against the side of the posteriormost denticle where it terminates; immediately anterior to the termination there is a prominent depression in the lower lip.

Dimensions.—Holotype (I279a), max. diameter 15.8 mm.; altitude 12.7 mm., No. 26033 (figured); paratype (I279b), max. diameter 12.9 mm.; altitude 9.9 mm., No. 26394 (unfigured) PRI.

Type locality.—Lower mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. Two specimens.

Comparisons.—This species resembles the preceding-described *T. puntagordana,* n. sp. particularly in the character of the aperture.

It is distinguished from *T. puntagordana*, however, by its tricarinate periphery, its more depressed spire, its more sharply terraced whorls, and in lacking the sulcus around the umbilicus.

Tegula phalera, new species Pl. 5, figs. 14-16

Shell small, depressed-turbinate, the nucleus decollate. Body whorl with a gently sloping ramp, a squarish periphery, and a convex base. Sculpture consisting of three subequal sharp spiral cords or carinae, the upper one at the shoulder, the lower two at the periphery, the interspaces wide, shallowly concave; the upper cord is weakly beaded, the middle faintly so, the lowest nearly plain to slightly crenulate. Ramp with a minor spiral cord between the suture and shoulder, and on either side of that a faint spiral thread, the spirals rendered crenulate by faint radial growth striae and wrinkles. Base with a thickened ridge at the margin of the umbilicus and two small sharp spiral cords adjacent; between these cords there is a minor thread, and there are still finer microscopic threads on the rest of the base as well as fine radial growth striae; also, on the outer half of the base, there are numerous but scarcely visible radial costae. Umbilicus round and deep, bordered by a well-excavated furrow emerging from the perforation and terminating against the lower lip, the inner margin of the furrow raised and a little thickened. Base of columella with a strong, warty, bifid tooth. Aperture subquadrate, a little oblique. Outer lip broken back, thin, and, under certain light, seemingly faintly fluted or lirate. Parietal wall callused. Basal lip subtruncate.

Dimensions.—Holotype (nucleus missing), altitude 1.8 mm.; max. diameter 2.6 mm.

Type locality.—Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. One specimen, the holotype.

Comparisons.—This miniature, and probably immature species is somewhat reminiscent of *T. mariana* (Dall) (see Pilsbry and Lowe, 1932, pp. 84-85, pl. 10, figs. 9-10), an Eastern Pacific Recent shell ranging from Baja California to Peru. The Venezuelan fossil, however, is more depressed and has a more strongly excavated umbilical furrow. The preceding species *T. trilirata*, n. sp., from the

Mare formation is also tricarinate like the present *T. phalera*, but *T. trilirata* is higher, the spiral cords on the base are coarser and flatter, and the umbilical furrow is not nearly so well developed as on *T. phalera*.

TURBINIDAE

Arene maiquetiana, new species Pl. 5, figs. 20-22

Shell small, rather sturdy, turbinate, the spire low, the apex obtuse. Whorls 3-1/2 in all, the nucleus consisting of about two of them. Nuclear whorls smooth, the initial loosely coiled and appressed, the last rapidly expanding and convex, the conch defined from the nucleus by the first appearance of faint spiral threads which become stronger as growth progresses. Body whorl gently sloping above, subsquarish at the peripheral region, moderately convex at the base, sculptured by three equidistant faintly crenulated spiral cords or carinae, the upper at the shoulder, the lower two at the periphery. On the ramp, about midway between the shoulder cord and the suture, there is a spiral thread, with another faint one starting to come in above it near the labrum. On the base there is a spiral cord bordering the umbilicus, and some distance above that another, with a minor, microscopic spiral thread appearing in the interspaces. The cord bordering the umbilicus forms a prominent angulation at the union of the lower and basal lips. Numerous microscopic axial or radial striae and wrinkles cover the surface of the shell, these visible only under magnification. Umbilical perforation suboval, the broad, convex funicle emerging therefrom terminating against the inner lip. The umbilical channel is broad and moderately deep. Aperture proper circular, holostomatous, the enamel of the peristome attached to the parietal wall. Outer lip fluted, basal lip subtruncate, the outer rim of the lips rendered angulate by the external cords.

Dimensions.—Holotype, altitude 2.0 mm.; max. diameter 2.2 mm.

Type locality.—Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. One specimen, the holotype.

Remarks.—Although, according to Pilsbry (1933, p. 380), the

limits of *Arene, senso strictu* are rather nebulous, the Venezuelan shell seems to fit the broad definition given by him. Typically, one or more of the major spiral cords of *Arene, s.s.* bear vaulted scales or tubercles, but there are transitions to species, such as *A. maiquetiana*, n. sp., in which the carinae are smooth. The Venezuelan shell superficially resembles the Pliocene to Recent *A. tricarinata* (Stearns) (1872, p. 23) but that species lacks a funicle and belongs to the subgenus *Marevalvata* erected by Olsson and Harbison (1953, p. 348).

Arene (Marevalvata) laguairana, new species Pl. 6, figs. 1-3

The spire of this small shell is broken away, but the indications are that it is low turbinate in shape. Body whorl with a squarish periphery, a gently sloping ramp above, and an equally gentle but broader slope at the base. The peripheral region is girded by three spiral cords or carinae separated by wide concave interspaces, the upper two cords subequal and finely beaded, the lowest at the edge of the base a little thicker than the others but not beaded. Another beaded spiral cord borders the upper suture, the beads bluntly pointed upward. Umbilicus round and deep, encircled by 12 or 13 separated, downward-pointing beads, the beads increasing progressively in size, the smallest one lying under the rim of callus of the parietal wall, the last one situated at the angle between the lower and basal lips. Within the umbilicus, the crenulate margin of the perforation proper is sharply angulated, and the area between the perforation and the umbilical beads is a little excavated. Surface crowded with fine axial striae, the upper slope or ramp with fairly numerous but nearly indistinguishable axial folds as well, such folds not appearing on the base. Neither the ramp nor the base bear spiral markings. Aperture holostomatous and subcircular, but the rim is rendered polygonal by the external carinae. Inner lip lamellar, rolled a little toward the umbilicus, the enamel extending to the parietal wall. Basal lip sharply truncate. Every third bead around the suture is flecked with brown and there are vague, light brown axial stripes on the ramp. Most of the colors are bleached away, and those remaining are faded.

Dimensions.—Holotype (body whorl only), max. diameter 3.3 mm.

Type locality.—Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. One broken specimen, the holotype.

Comparisons.—This species is close to the following:

A. gemma (Tuomey and Holmes) (1856, p. 118, pl. 26, fig. 4).

A. tricarinata (Stearns) (1872, p. 23).

A. pergemma Gardner (1948, pp. 190-191, pl. 28, figs. 31, 36, 37, 40, 41).

A. gemma, according to Abbott (1954b, p. 122, pl. 17q), has seven to nine beads around the umbilicus, whereas *A. laguairana,* which is smaller, has 12 or 13; another difference is that the basal lip of *A. gemma* is rounded, that of *A. laguairana* sharply truncate. According to Olsson and Harbison (1953, pp. 348-349) all three of the carinae of *A. tricarinata* are beaded, whereas on *A. laguairana* the lowest carina is at most slightly crenulated. Olsson and Harbison also state that *A. tricarinata* may be the same as *A. gemma,* as so considered by Dall (1892, p. 410), "but the original figure of Tuomey and Holmes is poor, and the description wholly inadequate for a certain identification, while the figure contributed by Gardner [1948, p. 190, pl. 28, figs. 38, 39] of a Duplin specimen, as *L. gemma,* if correctly identified differs from the Recent and St. Petersburg shells by its narrower, stouter form, sloping, non-tabulated spire, and narrower umbilicus". Dall (1892, p. 40) also placed *Margarita tricarinata* Gabb, from the Miocene of the Dominican Republic, in synonymy with *A. gemma,* but as shown in figure 33 of Pilsbry (1921, p. 397) that species differs markedly from both *A. tricarinata* (Stearns) and *A. laguairana,* n. sp. in lacking the square or tabulate peripheral region, and with the carina at the shoulder set inward rather than directly over the two lower ones. *A. pergemma* Gardner from the Yorktown (Miocene) and Waccamaw (Pliocene) formations of North Carolina is marked with spiral threads on the base, and these serve to distinguish that species from *A. laguairana* which lacks them.

Turbo caboblanquensis, new species Pl. 6, figs. 4, 5

Shell small, umbilicate, turbinate, the spire moderately elevated, the angle of spire 55-58 degrees. Whorls a little over 4 including 1-1/2 of the nucleus. Nucleus smooth, the initial whorl loosely coiled

and appressed to form an obtuse apex, the last asymmetrically convex and narrow, the junction with the conch marked by an obscure node and the first appearance of spiral lineations. Post-nuclear whorls sloping above to form a ramp, straight-sided below, the body whorl carinate at the shoulder. Sculpture predominantly spiral, the lower revolving threads of the first whorl of the conch typically with small, incipiently developed, widely spaced nodes. At first the spiral lineations of the ramp are faint, but become stronger later on, with two to five threads between the suture and the shoulder, the number increasing with growth. The lower half of the whorls is provided with three sharp, minutely beaded, revolving cords, the strongest one at the shoulder, another near the base, and one midway between. On the ultimate whorl there are about five finely beaded subequal spiral threads on the ramp above the strongly carinate shoulder, and three primary riblets, each with an intercalary thread, on the periphery below the shoulder keel. On the base there are as many as nine closely spaced, more or less equal cords, the last adjoining the anterior fasciole. Over the whole of the surface there are faint oblique growth markings. Sutures fine. Aperture broadly ovate, a little wider at the base which itself is obtusely truncate. Outer lip not thickened, smooth within, joined with the callus on the parietal wall at nearly a right angle. Callus of the parietal wall continuous with the columella. Columella moderately arcuate, somewhat rolled along the margin which is detached from, and rises above the umbilicus. Lower lip a little produced, generally slightly bent, and occasionally with a slight groove at the extremity. Basal lip faintly frilled on some specimens. The pillar of the holotype is feebly sulcate, but on other specimens from the type locality the pillar is smooth. On a single specimen from the Mare formation, the pillar is faintly denticulate. Umbilical chink generally deep and narrow, but on occasional examples the umbilicus is nearly entirely covered by columellar callus. Umbilicus margined by a broad, thickened crescentic ridge representing the anterior fasciole.

Dimensions.—Holotype, length 2.3 mm.; max. width 1.7 mm.

Type locality.—Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. Nine specimens.

Other localities.—Lower Mare formation in small stream 100 meters west of Quebrada Mare Abajo. One specimen.

Mare formation in stream 250 meters south-southwest of the mouth of Quebrada Las Pailas. One specimen.

Comparisons.—Among umbilicate Turbos, the new Venezuelan fossil species distantly resembles the living *Turbo mazatlanicus* Pilsbry and Lowe (1932, p. 87, pl. 9, fig. 6) from Mazatlan, Mexico. The differences are that the Mexican shell has a much broader columellar lip and a lower spire than the Venezuelan. In many ways *Turbo caboblanquensis,* n. sp. is like the Recent West Indian *Tricolia pulchella* (C. B. Adams) as shown in the illustration of *T. pulchella* by Clench and Turner (1950, p. 331, pl. 40, fig 9), but the prominent umbilicus with the strong fasciolar ridge around it serves to distinguish the fossil species from the living one. The *Tricolia pulchella* of Adams is now known as *Tricolia bella* M. Smith (see Robertson, 1958, pp. 274-276, pl. 139, fig. 5; pl. 142, figs. 4, 5; pl. 143, fig. 5; pl. 147, figs. 1, 2).

Turbo (Taeniaturbo ?) marensis, new species Pl. 6, figs. 6, 7

Shell moderately large, rather thin, turbinate, with rapidly enlarging whorls. Ultimate whorl inflated, sculptured by at least 17 spiral ribs of varying size, the ribs crossed by numerous low axial threads which crenulate the spiral ribs at the interceptions. The three largest ribs, all of them flattish, are around the upper-middle circumference of the last whorl. One of these ribs is at the shoulder, and bears low, narrow, widely spaced nodes, elongated in the spiral direction; the middle rib is at the periphery of the whorl, and is also noded, though more feebly so than the one at the shoulder; the third primary rib is below the periphery, and is followed anteriorward by at least nine spiral riblets of unequal to subequal size. Above the shoulder rib there are three subrounded riblets of unequal height which are successively broader toward the suture, and on either side of the peripheral rib there is a single rounded secondary cord. All interspaces are relatively shallow and more or less flat on bottom. The sutures are narrowly channeled. The aperture is obscured by a filling of medium-grained calcareous sandstone, and is broadly semilunate in outline. The distal area of the parietal wall is not callused, but the inner lip is probably heavily reinforced as evidenced by the callused edge which is just visible under the sandstone filling. The outer lip, which is broken far back, is believed to

be thin. It is not known with certainty whether the shell is umbilicate or nonumbilicate but it seems to be the latter.

Dimensions.—Holotype (base and most of spire missing), length 24.5 mm.; max. width 26 mm.

Type locality.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. A single imperfect specimen with but two whorls remaining; this is the holotype.

Comparisons.—In shape and external markings, this shell is reminiscent of the Recent imperforate *T. canaliculatus* Hermann (formerly *T. spenglerianus* Gmelin) and of the Recent perforate *T. filosus* Wood. As shown in the excellent photographs of these two species by Jaume and Sarasúa (1943, p. 56, pl. 9, figs. 1 and 4), however, it may be seen that the spiral ribs of the Venezuelan shell are much more unequal than they are on *T. canaliculatus*, and are broader than on *filosus* as well as being more nodular at the periphery. Also *T. filosus* is strongly umbilicate whereas *T. marensis* is inferred to be nonumbilicate. The closest Miocene analogues of *T. marensis* are *T.* (*Taeniaturbo*) species Woodring (1928, p. 411, pl. 32, fig. 14) from Bowden, Jamaica, and *T. dominicensis laloi* Maury (1917, p. 318, pl. 24, fig. 15) from the Dominican Republic, but both of those are more closely ribbed than the Cabo Blanco shell.

Turbo (Marmorostoma) crenulatus venezuelensis, new subspecies
Pl. 6, figs. 8, 9

Shell of medium size, turbinate, the spire sharply pointed, the angle of spire about 84 degrees. Nucleus decollate. Post-nuclear whorls about five. First post-nuclear whorl with a medial, saucer-like, scalloped keel slightly upturned at the margin. The ramp above the keel is a little concave, minutely beaded at the suture, marked with microscopic curved axial growth striae. Below the keel the sides are nearly vertically oriented, slightly concave, the numerous axial growth striae also vertical. On the second post-nuclear whorl the keel is thicker, slightly scalloped, and situated on the lower third. On the ramp of this whorl there is a lesser keel about midway between the lower one and the suture, and a circlet of beads at the suture. Between the two keels there is a single spiral thread, and between the upper keel and the sutural row of beads there are two spiral threads. Traversing the ramp are numerous raised axially

oblique threads, these more or less vertical below the ramp. On the lower third of the second post-nuclear whorl there is a single spiral thread between the lower keel and the suture. On the third and fourth post-nuclear whorls the beads around the suture have developed into nodulations. Below the circlet of nodes are two nearly equal crenulated spiral cords, and below these, just above the middle of the whorl and forming the shoulder, is a heavy squamous keel with U-shaped and V-shaped vaulted arches. Below the keel at the shoulder there is a wavy interstitial crenulated cord followed by another squamous keel just below the middle of the whorl. This keel forms the periphery of the whorl and is similar to, but a little smaller than the shoulder keel. Between the peripheral keel and the suture below there is first a spiral cord and then a spiral thread, both of them crenulated. The axial lineations on the third and fourth post-nuclear whorls are more pronounced than they are on the earlier ones, and are raised slightly above the surface as laminae. On the upper part of the body whorl the pattern of ornamentation is the same as on the penultimate whorl albeit with greater accent and with minor intercalated threads appearing. The body whorl is strongly tricarinate, the shoulder keel the largest and squamous, the peripheral keel a little smaller but still squamous, and the basal keel the smallest, no longer squamous but nodose. One the base of the body whorl below the anteriormost keel are nine spirals of varying size, all of them beaded or crenated. The succession of these is as follows: a cord, an immediately adjacent thread, and then a rib which is the fourth largest spiral of the body whorl; this is succeeded by a cord, a riblet, and a thread, each one touching the other, and finally three nearly equal ribs, the lowermost of these joined with the anterior fasciole. Fasciole large, convex, rather evenly segmented into nodes, terminated at the anterior end and on the oral surface by a fairly large shallow depression which leads into the narrow "umbilical" slit separating the fasciole from the slightly raised margin of the columellar lip. Columella thickened, weakly channeled, the lower lip projecting a little beyond the base where it flares out anteriorly into a spatulate process adjoining the basal depression on the fasciole. Aperture orbicular. Outer lip broadly fluted along the inner margin.

Dimensions.—Holotype, length 16.5 mm.; max. width 14 mm.

Type locality.—Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. One specimen, the holotype.

Comparisons.—*T. crenulatus* Gmelin (Syst. Nat., p. 3575, 1788) is believed by some authorities to be a synonym of *T. castaneus* Gmelin (Syst. Nat., p. 3595, 1791), by others a variation or a subspecies of *T. castaneus,* and by still others a valid species. According to Woodring (1957, p. 64), the "typical form of *T. castaneus,* as long accepted, is sculptured with nonlamellar noded spirals. Recent Caribbean shells that have noded spirals but also have thin lamellae forming vaulted scales on the primary spiral at the shoulder, or on that spiral and others, have been referred to *T. crenulatus,* also named by Gmelin". The fossil specimen from Venezuela, with its vaulted scales, is nearly a twin of *T. crenulatus,* although on close comparison with Recent examples of *T. crenulatus* from Florida certain differences are apparent. For one thing, the arrangement, size, and number of spirals on the base are not the same. For another, the three carinae around the convexity of the body whorl are progressively smaller from top to bottom on *T. c. venezuelensis* whereas on the Floridan *T. crenulatus* the shoulder and peripheral keels are nearly the same in size. There is no doubt about the kinship of the Venezuelan fossil with the *castaneus-crenulatus* clan, but it should, I think, be accorded subspecific rank. Rutsch (1934, p. 40, pl. 1, figs. 1, 2) records *T.* cf. *castaneus* from the late Miocene-Pliocene beds at Punta Gavilan, Venezuela, and although the Cabo Blanco form is close to that, the Punta Gavilan shell lacks the vaulted scales of *T. c. venezuelensis,* and the basal carina around the circumference of the body whorl is about as strong as the two above. Elsewhere in Venezuela the beaded variety of *castaneus-crenulatus* is common in the middle Miocene of north-central Falcon and *T. castaneus* has been listed by Guppy (1867a, p. 161) from the "Miocene" at Cumaná, State of Sucre.[5]

[5]This reference is especially interesting as in the collection of Cumaná fossils in the U. S. National Museum there are numerous mollusks from localities 18408-18410 which are so similar to those discussed in the present work from the Mare formation of the Cabo Blanco group that there is hardly a doubt of their age equivalence. I did not see *T. castaneus* in the Museum's Cumaná collection, but the species doubtless occurs as reported by Guppy, and it may well be, in view of the occurrence of identical species in both areas, that the *T. crenulatus venezuelensis* from Cabo Blanco is the same as Guppy's *castaneus*

Another fossil *Turbo* of the *castaneus-crenulatus* clan is *T. crenulatoides* Maury (1917, pp. 317-318, pl. 24, fig. 14) from the Miocene of the Dominican Republic and from the upper Miocene of Florida where it has been reported by Tucker and Wilson (1932, p. 52, pl. 5, fig. 3). Woodring (1957, p. 65) doubted that the Dominican *T. crenulatoides* can be differentiated from strongly lamellar Recent shells of *T. castaneus* which, in the collections of the U. S. National Museum, intergrade with the *T. crenulatus* variant. The precise limits of variability are difficult to determine even statistically since the "degree of confidence" is determined subjectively by the observer. In any event, I lean toward the consideration that *T. c. venezuelensis,* n. subsp. is different than Maury's Dominican *T. crenulatoides,* largely on the basis of ornamentation, especially on the base where the spirals on the Venezuelan shell are decidedly unequal, whereas they are rather regular and generally large on *T. crenulatoides.* The Venezuelan subspecies is even closer to the Floridan *T. crenulatoides* of Tucker and Wilson than it is to the original *T. crenulatoides* of Maury, but here again *T. c. venezuelensis* is distinguished by its more numerous and unequal spiral cords on the base.

Turbo species "a" Pl. 6, figs. 10, 11

Operculum calcareous, polished, generally suborbicular to subovate but sometimes elongate oval. Inner surface nearly flat to slightly convex, with three or four eccentric gyrations whose nucleus is well off center and whose sutures are finely incised. Exterior smooth, asymmetrically inflated, the maximum tumidity near the margin and along the short axis. On most specimens, especially those from the Mare formation, there is a sloping crescentric to ovate

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from Cumaná. The collections referred to above were made by P. Henry and J. A. Tong in September 1931, and are from the following localities:

18408-1. 2-1/2 kms. east of Cumaná, State of Sucre, Venezuela. N80°E from Cumaná Castle and S30°W from village of Caiguire Abajo. Yellowish brown marl, about 30 feet thick, dipping steeply northward.

18409-2. About 150 meters due south of locality no. 1. Hard, gray, sandy limestone dipping about 60° northward, about 60 ft. stratigraphically below locality no. 1.

18410-3. About 6 kms. east of Cumaná, at a small shrine on a footpath near north border of hills. Vertical, buff sandy limestone interbedded with dark-colored sandy siltstone and silty sandstone.

umbilical opening situated in the lee of the exterior swelling (and lying directly over the nucleus of the inner surface), but on a few of the operculi the umbilicus is blotted over with callus, and the site marked with a dimple or slight depression. The exterior of the operculum is half encircled by one or two channels; if two, the inner is the narrower and the deeper, the outer one being shallow and wide, its distal margin generally slightly thickened and a little upturned, and the broad channel itself shagreened and often marked with a couple of faint narrow subsidiary spiral ridges. Both channels become narrower and then wedge out below the "near" side of the umbilicus; oppositely, they shallow out completely in the area on the "far" side of the umbilicus. The divide or ridge between the two main channels is prominent. On the deeply umbilicate specimens a shallow groove issues from the umbilical depression and extends to the margin of the inner channel. On some of the deeply perforate specimens the inner channel is incipient, suppressed, or absent and on these the umbilical groove extends to the inner margin of the single channel.

Dimensions.—Figured specimen, length 16.5 mm.; max. width 14.5 mm.; max. altitude 5.5 mm. Largest specimen, length 20 mm.; max. width 17.5 mm.; max. altitude 7 mm.

Localities.—Lower Mare formation, in small stream 100 meters west of Quebrada Mare Abajo. Twelve specimens, including the one illustrated.

Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. Fourteen specimens.

Mare formation, in stream 250 meters south-southwest of the mouth of Quebrada Las Pailas. Five specimens.

Mare formation at W-25, south flank of Punta Gorda anticline. One specimen.

Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. Nineteen specimens.

Remarks.—Although there are numerous operculi of *Turbo* in the Mare and Playa Grande formations, I have only two specimens of the shell proper, neither of them with the operculum attached. One of the specimens is *T. crenulatus venezuelensis*, n. subsp., and the other *T. marensis*, n. sp. It cannot be said, of course, to which of these the present operculi belong, if indeed they are referable to

either. But because the operculi are not unlike those of the *castaneus-crenulatus* group, it is not entirely improbable that they pertain to *T. crenulatus venezuelensis*, n. subsp.

Turbo species "b" Pl. 6, figs. 12, 13

Operculum calcareous, subovate, imperforate. Inner surface nearly flat, or slightly convex to slightly concave, marked with three to four eccentrically expanding gyrations, the nucleus situated well off center, the sutures narrowly incised. Exterior asymmetrically swollen, the swelling subdued in general but a little higher near that margin where the operculum is broadest. From the area of maximum convexity, the surface slopes more or less regularly down the long axis toward the opposite margin, although on an occasional specimen there is a shallow depression between the margin and axis, this depression lying above the nucleus of the reverse side. A faint but moderately broad sulcus at the margin opposite the nuclear area half encircles the circumference of some specimens but is obsolescent or wanting on others. There is some evidence, on one of the less weathered examples, that both the inner and outer surfaces are normally shagreened, although the surface of virtually all of the present specimens is one of fine graininess and minute pitting due to corrosion.

Dimensions.—Figured specimen, length 14 mm.; max. width 12.5 mm.; max. altitude 5 mm.

Localities.—Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. Thirteen specimens, including the one illustrated.

Mare formation near W-14, on hillside above west bank of Quebrada Mare Abajo. Two small specimens, the larger measuring 2.5 x 2.2 x 0.75 mm.

Remarks.—Although the imperforate operculi of *Turbo* sp. "b" are generally readily distinguished from the umbilicate operculi of *Turbo* sp. "a" there are a few weathered specimens of "a" that are difficult to separate from "b". The one constant difference seems to be, that however obsolescent the umbilicus of "a" has become on some specimens, there always remains the suggestion of a dimple, whereas on "b" the outer surface is more or less uniform and at most broadly depressed in the region of the umbilicus.

Turbo species "c" Pl. 6, figs. 14, 15

Operculum calcareous, suborbicular. Inner surface a little convex subcentrally, flattish marginally, marked with about 4-1/2 gyrations, the sutures narrowly and sharply incised, the nucleus situated well off center. Exterior asymmetrically convex, the maximum swelling lying to one side and near that margin where the operculum is broadest. Away from this relatively high but appressed summit area the sides slope steeply to the margin, the surface in the long direction with a gentler slope and with a slight but fairly broad subcentral depression. Exterior sculptured by four concentric grooves, extending, at their positions, a little over halfway around the circumference, the distances between them widening progressively toward the broader portion of the operculum. The innermost of the grooves is the most deeply excavated and is in the form of a reversed or an inverted comma, A broad but low platform separates the innermost groove from the next one which is somewhat less deeply excavated than the former but more so than the two peripheral ones. The latter are subequal, narrowly and sharply incised, the last one the finest and situated a little above the margin. The three outer grooves terminate at the broad end of the operculum, and disappear at the opposite side under the sheath of callus of which the central portion of the operculum is composed. The inner and outer surfaces are grainy in texture and finely pitted from corrosion.

Dimensions.—Figured specimen, length 23.7 mm.; max. width 21 mm.; max. altitude 9 mm.

Localities.—Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. One specimen.

Mare formation near W-14, on hillside above west bank of Quebrada Mare Abajo. One specimen, 8 x 7.5 x 3.6 mm. This is well preserved and is smooth-surfaced and white.

Remarks.—On the basis of its general similarity to that of *Turbo floridensis* Olsson and Harbison (1954, pp. 342-343, pl. 61, figs. 1-1c) this operculum is assumed to belong to the genus *Turbo*. The species it represents is not known.

Astraea (Astralium) brevispina (Lamarck) Pl. 6, figs. 16-18

1822. *Trochus brevispina* Lamarck, An. sans Vert., vol. 7, p. 12.
1822. *Trochus aurispigmentum* "Jonas", Philippi, Zeitschr. f. Malakozool., p. 147.
1864. *Astralium brevispinum* (Lamarck), Krebs, The West Indian Marine Shells, p. 82.
1889. *Astralium brevispinum* (Lamarck), Dall, U. S. Nat. Mus., Bull. 37, p. 158.
1913. *Astralium brevispina* (Lamarck), Brown and Pilsbry, Acad. Nat. Sci. Philadelphia, Proc., vol. 65, p. 495.
1937. *Astraea brevispina* (Lamarck) ?, Smith, East Coast Marine Shells, p. 82, pl. 31, fig. 9; pl. 43, fig. 6.
1938. *Astraea brevispina* (Lamarck), Perry, Schwengel, and Dranga, Nautilus, vol. 52, No. 1, p. 27.
1940. *Astraea brevispina* (Lamarck), Smith, World-wide Sea Shells, p. 16, fig. 216.
1953. *Astraea* (*Astralium*) *brevispina* (Lamarck), Haas, Fieldiana-Zoology, vol. 34, No. 20, p. 204.
1954. *Astraea* (*Astralium*) *brevispina* (Lamarck), Abbott, American Seashells, pp. 123-124, pl. 3L.
1958. *Astraea* (*Astralium*) *brevispina* (Lamarck), Abbott, Acad. Nat. Sci. Philadelphia, Mon. No. 11, p. 31.
1958. *Astraea brevispina* (Lamarck), Coomans, Caraibisch Marien-Biologisch Inst. Collected Papers 6, p. 58.
1959. *Astraea brevispina* (Lamarck), Nowell-Usticke, A Check List of the Marine Shells of St. Croix, p. 30.

Shell of medium size, moderately high to high conical, the angle of spire of the latter around 70 degrees. Whorls about six, the nuclear two smooth, the apex obtuse. Post-nuclear whorls gently concave to flat-sided. Sculpture consisting of somewhat wriggly nodulous oblique spiral cords crossed by numerous fine wavy concentric laminae and about four spiral ridges, the nodulations occurring at the intercepts with the axial cords. Periphery of whorls somewhat keeled, with short flattened triangular spines of which there are 12 or so on the penultima. Sutures finely incised. Base flattened, marked with a fairly strong, raised spiral ridge originating opposite the summit of the outer lip; a feebler and smaller ridgelet lies a short distance outward from this, and inward from it there are two to four somewhat unequal ridgelets around the area of the umbilicus. The numerous wavy growth laminae are sharply defined on the base. Aperture broadly oval, the long axis normal to the long axis of the spire. Columellar lip sharply rounded. Columella medially sulcate, rather heavily callused, the callus covering the area of the umbilicus, the far margin of the callus raised a little above the base proper, the callus stained with bright red to orange. Ground color of surface dirty white to brown to dull gray.

Dimensions.—Figured specimen (B270a), altitude 36 mm.; max. width 41 mm.

Locality.—Recent, on beach southeast of Higuerote, State of Miranda. Five worn and faded specimens.

Remarks.—The spire of the specimens is more elevated than on most of the examples and illustrations I have seen, but the reddish stain on the umbilical callus is like that of the typical *A. brevispina.*

Range and distribution.—The Recent *A. brevispina* has been reported as far north as Florida to as far south as Rio de Janeiro, Brazil. As a fossil, it occurs in the Pleistocene of the Panamá Canal Zone in the black mud in Black Swamp near Mount Hope.

Liotiastralium, new subgenus

Type species, *Astraea* (*Liotiastralium*) *venezuelana,* new species.

Shell small, low conical, the apex appressed, the base perforate. Nucleus consisting of about 1-1/2 loosely coiled whorls. Post-nuclear whorls few in number, flattened at the periphery into a spinose keel. Umbilicus round and deep, with no funicle within, bounded by a strongly beaded anterior cord. Aperture more or less diamond-shaped. Lips thin, the inner one lamellar, incurved toward the umbilicus, merging anteriorly into a short V-shaped siphonal notch. Upper surface of body whorl sculptured by feeble oblique rugae, crossed by, or virgating with widely spaced oblique axial threads. Base marked with a few minor cords in the area between the beaded collar of the umbilicus and the outer rim.

The type species is an interesting shell, the like of which I have not seen before. The spire and aperture are like those of *Astralium* Link, the umbilicus, with its encircling beaded cord identical with that of *Liotia* Gray (see Pilsbry, 1933, p. 375, pl. 13, figs. 7, 7a, 7b). The subgeneric name *Liotiastralium,* combining the salient characteristics of *Liotia* and *Astralium,* is proposed.

Astraea (Liotiastralium) venezuelana, new subgenus, new species Pl. 47, figs. 16-18

Shell small, low and broadly conical, the spire appressed, the base perforate. Whorls 3-1/2 in all, the nucleus consisting of about 1-1/2 of them. Nucleus smooth, white, the initial whorl loosely coiled

and planispiral, depressed slightly below the summit of the first post-nuclear whorl, the last gradually transitional with the conch. Post-nuclear whorls moderately convex above. flattened into a keel at the periphery, the keel produced at intervals into short flat triangular spines of which there are 10 or so on the penultimate whorl. The penultimate whorl is a little canted and its periphery is tightly appressed on the summit of the ultimate whorl. Base with a deep circular umbilicus situated a little off center, the umbilicus encircled for about two-thirds its circumference with a collar composed of eight beads; the beads are roundish and increase progressively in size starting at the upper part of the inner lip and terminating at the lower part of the inner lip. A little less than halfway between the umbilical collar and the rim of the keel, the under side of the ultimate whorl is nearly plain but does have a slightly raised revolving thread or cord on which there are faint, rather widely spaced beads. Aperture roughly diamond-shaped. Outer lip thin. Inner lip lamellar, raised, joined posteriorly to the umbilical collar, merging anteriorly into a deep triangular notch representing the siphonal canal. Surface sculpture of body whorl worn but there are traces of oblique rugae, these crossed by, and virgating with relatively widely spaced oblique axial threads. The penultimate whorl is virtually smooth except for microscopic curved growth striae.

Dimensions.—Holotype, max. diameter including spines 2.7 mm.; altitude 1.1 mm.

Type locality.—Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. One specimen, the holotype; immature.

Comparisons.—This species recalls the short-spined variation of *A. phoebia* Röding (often referred to as *A. longispina* (Lamarck) by authors) and *A. brevispinia* (Lamarck). The Pliocene to Recent *A. phoebia,* which occurs with or without a perforation, has several more spiral cords on the base than *A. venezuelana,* n. sp. and the Pleistocene to Recent *A. brevispina* lacks the strong beads encircling the umbilicus. In some respects *A. venezuelana* recalls *A. sublongispina* Maury (1917, pp. 318-319, pl. 24, figs. 16, 17) from the Miocene of the Dominican Republic and *A. sublongispina acosmeta* Woodring (1928, pp. 412-413, figs. 1-3) from the Bowden Miocene of Jamaica, but on both of those also the beaded collar around the umbilicus is wanting.

Astraea (Lithopoma) tuber (Linnaeus) Pl. 7, figs. 1, 2

1758. *Trochus tuber* Linnaeus, Syst. Nat., ed. 10, p. 759.
1767. *Turbo tuber* Linnaeus, Syst. Nat., ed. 12, p. 1230, No. 596.
1864. *Calcar tuber* (Linnaeus), Krebs, The West Indian Marine Shells, p. 82.
1878. *Turbo tuber* Linnaeus, Mörch, Catalogue of West-India Shells, p. 13.
1888. *Astralium tuber* (Linnaeus), Pilsbry, Man. Conch., vol. 10, p. 223, pl. 56, figs. 79, 80.
1889. *Astralium tuber* (Linnaeus), Dall, U. S. Nat. Mus., Bull. 37, p. 158.
1901. *Astralium tuber* (Linnaeus), Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, p. 442.
1924. *Astraea tuber* (Linnaeus), Emery, Nautilus, vol. 38, No. 2, p. 60.
1937. *Astraea* (*Lithopoma*) *tuber* (Linnaeus), Smith, East Coast Marine Shells, p. 82, pl. 31, fig. 3.
1942. *Astraea tuber* (Linnaeus), Jaume and Pérez Farfante, Soc. Cubana Hist. Nat. "Felipe Poey" Mem., vol. 16, No. 1, p. 40.
1954. *Astraea* (*Lithopoma*) *tuber* (Linnaeus), Abbott, American Seashells, p. 124, pl. 3j.
1958. *Astraea tuber* (Linnaeus), Coomans, Caraibisch Marien-Biologisch Inst. Collected Papers 6, p. 57.
1959. *Astraea tuber* (Linnaeus), Nowell-Usticke, A Check List of the Marine Shells of St. Croix, p. 31.

Shell fairly solid, trochoid, the spire moderately elevated, the angle of divergence near 90 degrees. Whorls about six in all, the two or so of the nucleus smooth, the apex bluntly rounded. Post-nuclear whorls nearly flat-sided, bluntly ridged or nodulose at the shoulder. Sculpture consisting of knobby oblique axial folds, numerous coarse transverse nodular riblets and crowded oblique spiral striae, the latter crossing the axials more or less at right angles. Ultimate whorl with 9 to 12 axial folds at the shoulder, these generally becoming feebler around the middle but attaining a knobby character at the shoulder. Between and on the nodes are the obliquely radiating riblets, and, crossing the whole, are the concentric striae. This cross-hatched pattern produces a shagreen effect. Sutures narrowly incised, undulating. Base flattish-convex, with four to six faint unequal beaded spiral cords on which the one a short distance below the peripheral angulation is the largest. Aperture orbicular. Outer lip fluted above along the inner margin, the flutings occurring under the external axial folds. Columella wide, arcuately sulcate, bituberculate below. Middle layer of the exterior and surface of aperture nacreous. Ground color of outer surface dirty white with an overlay of green or brown, the base with some lineations of light brown.

Dimensions.—Figured specimen (A107a), altitude 23.7 mm.;

max. width 23.7 mm., No. 26045; largest specimen, altitude 31 mm.; max. width 28.1 mm., No. 26395 (unfigured) PRI.

Localities.—Recent, on beach at Playa Grande Yachting Club, Distrito Federal. Eleven specimens.

On hill above W-4 near south bank of Quebrada Las Pailas. The two specimens collected here are believed to be Recent and to have been transported by birds from the shore which is not far away.

Abisinia formation at W-30, eastern edge of Playa Grande village. The single worn specimen is a true fossil found in place.

Range and distribution.—The living *Astraea tuber* ranges from southeast Florida through the West Indies to northern South America. The only other fossil occurrence of *A. tuber* that I know of is the one reported by Jaume and Pérez Farfante from the Pleistocene at Gibara, Cuba.

Astraea (Lithopoma) ? diffidentia, new species Pl. 7, figs. 3, 4

Shell small, thick, imperforate, conical, the angle of spire 45 degrees. Post-nuclear whorls nearly flat-sided, each of the later ones irregularly overlapping the preceding. Periphery of last whorl subangular. Base short, flattened above the columella, a little convex behind the lower lip, marked with a single low rounded revolving ridge below the periphery, the ridge emerging from the commissure. Sculpture of surface worn down, but on the last two whorls there are broad axial folds and a thickening of the shell over the sutures. Aperture suboval, a little oblique. Lips thickened, the outer one broken back above, smooth within, the basal one rolled and rounded, the columellar lip obliquely twisted into a modified plait that continues into the aperture at the parietal wall. Behind the lips there is a faint continuous groove.

Dimensions.—Holotype (three whorls), length 4 mm.; max. width 3 mm.

Type locality.—Mare formation at W-14, on hillside above west bank of Quebrada Mare Abajo. One worn and incomplete specimen, the holotype.

Remarks.—The classification of this interesting shell is in doubt. It is referred diffidently to the subgenus *Lithopoma* on the

basis of its superficial resemblance to the middle Miocene *Astraea (Lithopoma) aora Woodring* (1928, p. 414, pl. 33, fig. 7) from Bowden, Jamaica.

LIOTIIDAE

Parviturbo venezuelensis, new species Pl. 7, figs. 5-7

Shell small, broadly turbinate, the spire moderately low. Nucleus missing. Post-nuclear whorls nearly three, rounded, rapidly expanding. Penultimate whorl subcarinate just below the middle, sculptured by three spiral ridgelets, a nodulose one near the summit, a sharp one at the periphery rendering the whorl subcarinate, and a fine one at the lower suture. Ultimate whorl with six strong subequal revolving ridges separated by well channeled interspaces. The topmost ridge is traversed by low, widely spaced axial cords, these originating at the suture, crossing the shelf and then the ridge which is nodulated at the interceptions, and continuing on the interspace between the topmost and succeeding ridge. These axial cords are more prominent over the outer lip, becoming more subdued therefrom around the whorl. The interspace of the topmost and next lower spiral ridge is a little wider than those of the other ridges. The third spiral ridge from the top forms a low keel around the periphery of the ultimate whorl. The lowest spiral is the broadest, and this borders the umbilical depression, passing under the fairly thick sheath of callus on the parietal wall. Within the umbilical depression there is a single umbilical cord, its upward course obscured from view by a filling of sand in the umbilicus proper. On the surface there are numerous fine raised axial threads which are sharper in the interspaces of the lower spiral ridges. Magnified 20 times, the surface is also seen to be ornamented with hardly discernible spiral threads on the shelf above the topmost spiral ridge and in the interspace below the ridge. The spiral ridges themselves are composed of about three closely spaced spiral threads. Aperture oval, stoppered with sand grains. Outer lip broken back but seemingly thin and joined to the whorl at a right angle, the exterior margin crenulated by the edges of the spiral ridges, the inner margin possibly a little fluted. Basal lip thin, evenly rounded.

Columellar margin gently curved, the callus of the columella reflected over the inner margin of the umbilical depression. Umbilical depression large, semilunate.

Dimensions.—Holotype, diameter 1.3 mm.; altitude 1.2 mm.

Type locality.—Mare formation at W-25, south flank of Punta Gorda anticline. One specimen, the holotype.

Comparisons.—This interesting little species is similar to several living forms in Florida waters: *P. rehderi* Pilsbry and McGinty (1945, pp. 54-55, pl. 6 fig. 8), from the east and west coasts, has a high, somewhat concave-sided penultimate whorl whereas that of *P. venezuelensis,* n. sp. is narrow and convex; *P. francesae* Pilsbry and McGinty (1945, p. 56, pl. 6, fig. 6) from off Palm Beach in 50 fathoms, and *P. calidimaris* Pilsbry and McGinty (1945, pp. 56-57, pl. 6, fig. 4) from both coasts are not so markedly concave on the shelf above the topmost spiral ridge as is *P. venezuelensis;* and *P. weberi* Pilsbry and McGinty (1945, pp. 55-56, pl. 6, fig. 1), also from the east and west coasts of Florida, has a higher spire than the Venezuelan fossil and is a sturdier shell. Another *Parviturbo* in Florida, this one from the Pliocene, is *P. milium* (Dall) (Dall, 1892, p. 409, pl. 18, fig. 4) which has "eight even, rounded, well elevated simple threads separated by equal, channeled interspaces" on the last whorl between the suture and the umbilicus. *P. venezuelensis,* n. sp. has six such spiral ridges and they are subequal.

Remarks.—The genus *Parviturbo* as presently classified ranges from Pliocene to Recent. Living species of the genus have been found under rocks in Lake Worth, Florida, along the shore of the east and west coasts of Florida, and in 11 to 50 fathoms off the east coast of Florida. The genus will undoubtedly be found to have a wide areal distribution in the Caribbean province when more attention is given to the micromollusks of that region.

Parviturbo is distinguished from the genus *Parviturboides* Pilsbry and McGinty (1950b, pp. 86-87) of the family Vitrinellidae primarily by the character of the radula and of the nucleus of the shell: *Parviturbo* has 1 to 1-1/2 nuclear whorls, *Parviturboides* has a little over 2; in *Parviturbo* the radula is rhipidoglossate, in *Parviturboides* the dentition is taenioglossate. On fossils, of course, the number of nuclear whorls is the key to identification, so that if the

new species *P. venezuelensis,* on which the nucleus is missing proves eventually to have a little over two nuclear whorls, it could, I presume, be referred to *Parviturboides.*

PHASIANELLIDAE

Tricolia affinis cruenta Robertson Pl. 7, figs. 8, 9

1958. *Tricolia affinis cruenta* Robertson, Johnsonia, vol. 3, No. 37, pp. 267-268, pl. 144, fig. 5; pl. 145, figs. 4, 6.

The form here described is probably not quite mature. Shell small, subglobose, thin and subtransparent above but moderately solid around the columellar area, the umbilical groove undeveloped. Angle of spire about 62 degrees. Whorls a little over four in all. Nucleus small, with two dull white whorls, the initial rather tightly coiled and appressed to form the blunt tip of the spire, the next one narrow but expanded and with convex sides, merging insensibly into the conch. First whorl of the conch moderately swollen, marked with about six microscopic revolving threads, these becoming fainter below and disappearing on the smooth subglobular body whorl. Sutures finely impressed. Aperture large, broadly oval. The outer lip is broken but it can be seen that there is a faint narrow groove on the under side along the commissure. Inner lip hyaline, asymmetrically thickened, with a feeble longitudinal narrow ridge along the middle, somewhat spatulate or flaring where it curves into the base. Inner edge of columella nearly straight for most of its length, but curved at the extremities. Color of last two whorls pink, with about 20 spiral rows of short stripes or bars of dark red on the body whorl, the stripes aligned one under the other in fairly regular columns. At the top of the last two whorls there is a row or two of dark red spots instead of stripes, and such spots also occur on the base where they are more widely spaced than on the convexity of the body whorl. The base is whitish as is the first post-nuclear whorl, the color becoming increasingly and progressively pinker below. On the ultimate and penultimate whorls there are irregular blotches of dull white around the shoulder, some of these margined with wavy axial lineations of dark brown. On these white blotches most of the stripes or bars are china-white. The markings on the surface are faintly visible within the aperture which itself is pink.

Dimensions.—Figured specimen, length 3.1 mm.; max. width 2.4 mm.

Locality.—Recent, on beach of Playa Grande Yachting Club, Distrito Federal. A single specimen.

Remarks.—Of the several subspecies of *T. affinis* (C. B. Adams) described by Robertson (Johnsonia, vol. 3, No. 37, 1958) this is closest to, and may well be the same as his *T. a. cruenta* although on the type of *T. cruenta* the angle of spire is somewhat greater, the ground color is light orange or white, tinged with red, and the markings are square or oblong red spots instead of mostly short stripes or bars as on our shell. *T. affinis affinis* (C. B. Adams), the type of the *affinis* tribe, is more elongate than the Playa Grande form, and its umbilical groove is rather pronounced and fairly wide. In the occurrence of the fine spiral threads on the early post-nuclear whorls, the Playa Grande shell accords well with C. B. Adams' original description of his *Phasianella brevis* [=*Tricolia adamsi* (Phillipi)], but the angle of spire of that species is said to be about 80 degrees. Furthermore the illustrations of *T. adamsi* show that the columella is more arcuate than that of the present shell. It might be mentioned here that Dall (1892, p. 381) considered *Phasianella brevis* C. B. Adams to be synonymous with the prior-named *Turbo* (?) *pulchellus* C. B. Adams [=*Tricolia bella* Smith (1937, p. 81, pl. 31, fig. 20)], but if these species are compared with the Adams' types as figured by Clench and Turner (1950) and by Turner (1956) they are seen to be different.

Range and distribution.—The habitat of *T. a. cruenta* is given by Robertson as follows: "Along the Caribbean coast of Central America and northern South America, ranging as far north as the Grenadines in the Lesser Antilles and south along the coast of Brazil to the State of Santa Catarina. Sporadic on the shores of the western Gulf of Mexico".

Tricolia rubrica, new species Pl. 7, figs. 12, 13

Shell small, moderately fragile, subtranslucent, ovate-naticoid. Angle of spire 61-66 degrees. Whorls about four in all, the nucleus made up of a little over one of them. Apex of spire obtuse, the initial whorl of the nucleus starting as a moderately tight coil. Post-

nuclear whorls convex, with fine but distinct sutures, the body whorl subglobose. Surface smooth except for transverse growth striae and an occasional rift at a former hiatus in development. Aperture oval. Outer lip broken at the rim but presumably not thickened, the under surface with a crease or groove at the commissure. Columella slightly arcuate, enameled, bordered by a semblance of an umbilical slit. Lower lip a little expanded. Basal lip thin, subtruncate. Ground color a creamy tan, marked with about a dozen short interrupted revolving stripes of light brown on the body whorl, the stripes or bars descending with slight obliquity to the base.

Dimensions.—Holotype, length 3.1 mm.; max. width 2.1 mm.

Type locality.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. Two specimens, one of them (I5a) the holotype.

Other localities.—Mare formation near W-14, on hillside above west bank of Quebrada Mare Abajo. Three specimens, the largest 3.1 mm. x 2.2 mm., its body whorl girdled with spiral rows of rectangular pits which seem to develop on or between the original stripes of color now bleached away. The two smaller specimens are broken and badly corroded, and one is thinner-shelled than the other. Their identity with *T. rubrica,* n. sp. is somewhat in doubt.

Remarks.—Due to the effect of shadow, this shell on Plate 7, figure 12, seems to have a wide umbilical area. In actuality the umbilical slit immediately adjacent to the columella is rudimentary.

Comparisons.—*Tricolia rubrica,* n. sp. is distinguished from such Recent West Indian forms as *T. affinis affinis* (C. B. Adams) (see Robertson, 1958, pp. 262-264, pl. 138, fig. 5; pl. 139, figs. 6-8; pl. 143, figs. 1, 2; pl. 145, fig. 1) by the wider angle of divergence; from *T. adamsi* (Philippi) (see Robertson, 1958, pp. 268-271, pl. 143, figs. 3, 4; pl. 145, fig. 2) by the narrower angle of divergence; from *T. affinis cruenta* Robertson (1958, pp. 267-268, pl. 144, fig. 5; pl. 145, figs. 4, 6) in having fewer rows of spots which are in the form of short stripes or bars rather than squares or oblongs; and from *T. thalassicola* Robertson (1958, pp. 271-274, pl. 142, fig. 2; pl. 144, figs. 1, 2; pl. 146) by its more delicate shell. The new species also resembles the Miocene *T. affinis gabbi* Woodring (1928, p. 420) from the Dominican Republic (as illustrated by Maury, 1917, p. 317, pl. 24, figs. 12, 13 under *Phasianella punctata*), but that is larger and,

according to Maury is characterized "by microscopic, opaque white spots on a quincunx plan upon a semi-translucent ground."

Tricolia mareana, new species Pl. 7, figs. 14, 15

Shell small, sturdy, ovate-naticoid. Angle of spire 55-58 degrees. Whorls a little over four in all. Nucleus smooth, subhyaline, consisting of about 1-1/4 whorls, the initial one of which is small, tightly coiled, and appressed to form an obtuse tip on the spire, the last one narrow, and grading insensibly into the conch. Post-nuclear whorls rapidly expanding and convex, the later ones with the sides somewhat more convergent above than below. Sutures fine and distinct but not channeled normally as they seem to be from weathering on the holotype. Aperture large, suboval, smooth within. Outer lip thin, grooved on the under side at the commissure, joined to the whorl at nearly a right angle. Basal lip broken at the rim, seemingly rounded. Columella nearly straight medially, covered with a thick sheath of enamel which extends well up on the parietal wall. Immediately adjacent to the columella there is a shallow, narrow, pseudo-umbilical slit. The ventral side of the body whorl is slightly subangulated at the convexity, the angulation continuing a short distance around the whorl and under the enamel of the parietal wall on which it is reflected as a feeble ridge, continuing therefrom into the aperture as a faint fold below the commissure. The surface of the shell is pitted and in places pustulated, these residual features occurring in rows and undoubtedly representing corrosion along the original color stripes.

Dimensions.—Holotype, length 3.8 mm.; max. width 2.1 mm.

Type locality.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. The holotype is the only specimen collected.

Comparisons.—*Tricolia mareana,* n. sp. differs from *T. affinis* (C. B. Adams) and its congeners by the acute rounding or subangulation on the ventral face of the body whorl and by the wider sheath of enamel on the parietal wall. It is distinguished from the Pliocene to Recent *Assiminea auberiana* (d'Orbigny) (see Clench and Turner, 1950, p. 266, pl. 36, fig. 4 under *Phasianella concolor* C. B. Adams) in its longer and straighter columella, that of "*concolor*" being pro-

foundly excavated. According to Dall (1892, pp. 347-348) and Robertson (1958, p. 280), *Phasianella concolor* is a synonym of *Assiminea auberiana*. In the pitted character of its corroded surface, *Tricolia mareana*, n. sp. is similar to *T. affinis gabbi* Woodring (1928, p. 420) from the Miocene of the Dominican Republic but is discriminated from that species by its suboval rather than broadly ovate aperture. *T. calypta* Woodring (1957, pp. 65-66, pl. 15, figs. 1, 2), a late Eocene or early Oligocene species from the now submerged Palenquilla Point in the Panamá Canal Zone, has much the same shape as *T. mareana*, but the Panamá shell is eroded on the surface into curved axial bands, and its aperture is ovate rather than suboval. It is difficult to separate this new species from the preceding species, *T. rubrica*, n. sp., but there are differences between them: one of them is that the body whorl of *T. mareana* is subangulate whereas that of *T. rubrica* is evenly convex; another distinction is that *T. mareana* has a faint narrow ridge well within the aperture below the commissure, and this is wanting in *T. rubrica;* a third distinction is that the outer lip of *T. mareana* is joined to the whorl at a right angle whereas on *T. rubrica* the angle is more acute; and lastly, the spire of *T. mareana* is a little less divergent than on *T. rubrica*.

Tricolia fasciata, new species Pl. 7, figs. 16, 17

Shell small, solid, ovate-naticoid, not umbilicate. Angle of spire about 60 degrees, the apex of the spire obtuse. Whorls about four in all, the initial coil of the nucleus decollate. Post-nuclear whorls gently convex, the body whorl moderately rounded although a little flattened at the middle. Sutures distinct. Aperture suboval, a little effuse at the curvature between the lower and basal lips. Outer lip broken away below, somewhat thickened at the junction with the whorl, the angle of junction acute. Underside of labrum grooved at the commissure. Basal lip truncate. Columella gently arcuate, sheathed with a heavy coating of enamel, the enamel extending to the parietal wall where it reaches the summit of the outer lip. Color faded, the ground a dull cream, the body whorl with about 14 rows of opaque white squarish spots and three or four rows of light brown spots that have not yet been corroded to opaque white as they have

been above. Surface marked with a finely impressed spiral groove between each row of spots, the grooves becoming obsolescent and finally disappearing at the base where the shell is less weathered.

Dimensions.—Holotype, length 3.7 mm.; max. width 2.5 mm.

Type locality.—Mare formation near W-14, on hillside above west bank of Quebrada Mare Abajo. One specimen, the holotype.

Comparisons.—Like *T. rubrica,* n. sp. the present shell is close to the *affinis* tribe of C. B. Adams and especially to *T. affinis cruenta* Robertson. Unlike *T. affinis* and its subspecies, however, *T. fasciata,* n. sp. has no semblance of an umbilical chink, and although *T. rubrica* is slightly umbilicate, *T. rubrica* is somewhat more rotund and much thinner than *T. fasciata.* Furthermore neither *T. rubrica* nor the *T. affinis* tribe are described as bearing a spiral groove between the rows of spots as does *T. fasciata,* but whether this characteristic is of specific validity cannot be determined indisputably until more specimens are available. *T. mareana,* n. sp. described previously, is more readily distinguished from *T. fasciata* in that the former not only has a more rounded basal lip but its outer lip is joined to the whorl at nearly a right angle.

Tricolia depressa, new species Pl. 47, figs. 19-21

Shell minute, fairly thin, globose, perforate, depressed naticoid, the spire very low, the apex broad and flattish. Whorls 2-1/2 to 3 including the nucleus. Nucleus one-whorled, porcelaneous, smooth, the initial turn loosely coiled and appressed, the last stage merging gradually into the conch from which it is differentiated by a change in texture of the shell material. Post-nuclear whorls swollen, rapidly expanding. Sutures shallowly and narrowly channeled on the apex, finely impressed below. Aperture large, broadly oval, the peristome rendered continuous by the coating of enamel on the parietal wall. Outer lip thin, joined obtusely and in an even arch with the enamel of the parietal wall. Basal lip thin, sharp, truncate, produced a little at the curve of the lower lip into a broadened and bluntly pointed process. Columella slightly arcuate, lamellar, raised, recurved somewhat toward the bordering umbilical groove. Umbilical groove narrow, more or less parallel with the columella, deeply perforate posteriorly, shallowing and becoming obsolescent anteriorly. Surface

smooth, marked with widely spaced, relatively large opaque white spots that undoubtedly were colored originally. On the body whorl there are about five rows of these spots, the spots more or less aligned vertically, becoming smaller on the base below the umbilical slit. Present ground color of shell off-white.

Dimensions.—Holotype, length 1.0 mm.; max. width 0.85 mm.

Type locality.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. One specimen, the holotype.

Comparisons.—The nearest species are the Recent West Indian *T. adamsi* (Phillipi) (Phillipi, 1853, Systematisches Conchylien-Cabinet, Nürnberg, vol. 2, p. 27), and the Recent *T. thalassicola* Robertson (1958, pp. 271-275, pl. 142, fig. 2; pl. 144, figs. 1,2; pl. 146) which ranges from North Carolina, through the West Indies to Cabo São Roque, Rio Grande do Norte, Brazil, and is often found on turtle grass, *Thallasia testudinum* Konig. The fossil *T. depressa,* n. sp. from Venezuela has a much lower spire and fewer spots than either of those.

Tricolia maiquetiana, new species Pl. 7, figs. 18-20

Shell small, solid, ovate, umbilicate, the spire low and appressed, the divergence about 95 degrees. Whorls a little over three in all, the nucleus smooth and moderately inflated, consisting of about 1-1/2 volutions of which the initial is flattened and rather loosely coiled, the last merging insensibly into the conch. Penultimate whorl inflated but narrow, the body whorl well rounded. Sutures fine, distinct. Aperture of holotype plugged with a grain of rock but appears to be rather broadly oval. Outer lip broken back, thickening slightly and evenly at the commissure. Columella gently arcuate, heavily enameled, the enamel covering part of the umbilicus and parietal wall. Umbilical groove crescentic, fairly prominent, shallowing anteriorly, the edge of the whorl bordering it rather sharply angulate. Original color faded, the present ground off-white, with small opaque white spots on the upper slope of the body whorl and a broad whitish band extending across the ventral surface just below the middle, the band merging with the ground toward the side.

Dimensions.—Holotype, length 1.9 mm.; width (across broken aperture) 1.2 mm.

Type locality.—Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. One imperfect specimen, the holotype.

Comparisons.—Although the holotype is broken and weathered, the narrowness of the penultimate whorl and the low and broad spire serve to distinguish *T. maiquetiana,* n. sp. from the relatively few fossil and living species of *Tricolia* described from the Caribbean area. The new species is close to, and may perhaps be the same as the preceding species *T. depressa,* n. sp., but the single example of *T. maiquetiana* is more robust than *T. depressa,* it is more heavily enameled labially, it has a broader and more crescentic umbilicus, and the opaque white spots are smaller and more closely spaced than on *T. depressa.* The new species is also reminiscent of *Tricolia ? syntoma* Woodring (1957a, p. 66, pl. 17, fig. 47) from the middle Miocene of the Panamá Canal Zone, although the Isthmian shell is discriminated by its furrowed columellar lip and nearly closed umbilicus. The living *T. thalassicola* Robertson (1958, pp. 271-274, pl. 142, fig. 2; pl. 144, figs. 1, 2; pl. 146) has several more whorls than *T. maiquetiana,* and *T. adamsi* (Phillippi) (see Robertson, 1958, pp. 268-271, pl. 143, figs. 3, 4; pl. 145, fig. 2), with the same number of whorls as *T. maiquetiana,* is thinner and higher than the Venezuelan fossil.

Tricolia tessellata (Potiez and Michaud) **Pl. 7, figs. 10, 11**

1838. *Phasianella tessellata* "Beck", Potiez and Michaud, Galerie des Mollusques, Paris, vol. 1, p. 312, pl. 29, figs. 7, 8.
1842. *Phasianella zebrina* d'Orbigny, [in] La Sagra, Hist. phys., polit., nat. l'Ile de Cuba, Mollusques, vol. 2, p. 78, pl. 19, figs. 35-37.
1850. *Phasianella tessellata* C. B. Adams, Contrib. to Conch., No. 4, pp. 67-68.
1864. *Phasianella tessellata* Potiez and Michaud, Krebs, The West Indian Marine Shells, p. 79.
1888. *Phasianella tessellata* Potiez and Michaud, Pilsbry, Man. Conch., vol. 10, pp. 170-171, pl. 39, figs. 99, 100.
1891. *Phasianella tessellata* Potiez and Michaud, Baker, Acad. Nat. Sci. Philadelphia, Proc., vol. 43, p. 54.
1901. *Phasianella tessellata* Potiez and Michaud, Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, p. 441.
1950. *Phasianella tessellata* C. B. Adams, Clench and Turner, Occas. Papers on Mollusks, vol. 1, No. 15, p. 351, pl. 36, fig. 12. "This name of Adams is both a synonym and homonym of *Phasianella tessellata* 'Beck', Potiez and Michaud".

1954. *Tricolia tessellata* (Potiez and Michaud), Abbott, American Seashells, p. 127.
1958. *Tricolia tessellata* (Potiez and Michaud), Robertson, Johnsonia, vol. 3, No. 37, pp. 277-278, pl. 142, fig. 3; pl. 143, fig. 6; pl. 147, fig. 3.
1958. *Tricolia tessellata* (Potiez and Michaud), Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 11.
1958. *Tricolia tessellata* (Potiez and Michaud), Abbott, Acad. Nat. Sci. Philadelphia, Mon. No. 11, p. 32.
1958. *Phasianella tessellata* Potiez and Michaud, Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, p. 59.
1959. *Tricolia tessellata* (Potiez and Michaud), Nowell-Usticke, A Check List of the Marine Shells of St. Croix, p. 32.

The Venezuelan fossil shell is small, smooth, naticoid, umbilicate. Angle of spire 72-75 degrees. Whorls a little over four including the nucleus. Nucleus consisting of about two whorls, the initial small and rather loosely coiled, the last convex, merging imperceptibly into the conch. Post-nuclear whorls tumid, rapidly expanding, the body whorl subglobose. Sutures fine but distinct. Aperture large, subovate, the base truncate. Outer lip thin, columellar lip thickened, lower lip somewhat expanded. Columella flattened along the distal margin, bordered by a narrow umbilical sulcus. Parietal wall thinly callused, the far margin of the callus extending downward from the top of the outer lip to merge with the edge of the columellar lip. Surface smooth except for microscopic transverse growth striae. Ground color cream, with revolving lines of brown descending obliquely. There are 15 of these brown lines on the body whorl, and on several specimens the lineations are blurred at intervals.

Dimensions.—Figured specimen, length 3 mm.; max. width 2.2 mm.

Locality.—Abisinia formation at W-30, eastern edge of Playa Grande village. Five specimens.

Range and distribution.—The living *T. tessellata* is known in Caribbean waters from Jamaica to northern South America, and as a fossil occurs in the Pleistocene of Barbados. The Venezuelan fossils have retained their color pattern, and in that and other respects they seem identical to the Recent form.

Gabrielona sphaera, new species Pl. 8, figs. 1-4

Shell small, fragile and subtranslucent to moderately sturdy, globose naticoid to broadly ovate, umbilicate. Spire low and obtuse.

Whorls a little over three including the nucleus which consists of a little over one of them. Nucleus smooth, subhyaline, the initial coil rather loose and appressed, the last volution narrow, moderately full, grading insensibly into the conch. Post-nuclear whorls rapidly expanding and swollen. Sutures finely impressed, distinct. Aperture broadly ovate to oval. Outer lip thin, joined to the whorl at nearly a right angle, the summit of the lip often extending a little beyond the line of the columella. Columellar lip lamellar, erect, slightly reflected, sometimes broadening anteriorly, its abutment with the parietal wall subangulate. Parietal wall with a wash or thin coating of enamel the edge of which is in line with the summit of the outer lip. Base gently rounded. Umbilicus prominent, deep, semilunate, scored with microscopic longitudinal lineations, the whorl margin bounding the umbilicus sharply angulate. Surface smooth but with numerous microscopic axial growth lines which are often a little more distinct under the umbilicus. The post-nuclear whorls are usually a more or less uniform tan in color but one of the specimens exhibits whitish zigzags on the labrum, these visible within the aperture.

Dimensions.—Holotype (G9a), length 1.2 mm.; max. width 1.05 mm. Paratype (I8a), length 2.3 mm.; max. width 1.9 mm. Average specimen, length 1.8 mm.; max. width 1.3 mm.

Type locality.—Mare formation near W-14, on hillside above west bank of Quebrada Mare Abajo. Three specimens, one of them the holotype.

Other localities.—Lower Mare formation, in small stream 100 meters west of Quebrada Mare Abajo. Two specimens.

Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. Seven specimens, one of them the paratype.

Comparisons.—*Gabrielona sphaera,* n. sp. at once recalls the Recent West Indian *G. brevis* (d'Orbigny) known variously under the generic names of *Phasianella, Eucosmia,* and *Tricolia* (see Robertson, 1958, pp. 258-260, pl. 138, fig. 2; pl. 139, figs. 3, 4; pl. 140, figs. 2, 3; pl. 141; pl. 142, fig. 1), but is distinguished from *G. brevis* in being a little less globose, in lacking the microscopic spiral striae on the early whorls, in having a more prominent umbilicus, and in its more erect and lamellar columella. Among fossil species,

the nearest analogue of *G. sphaera* is *Tricolia* (*Eulithidium*) *hadra* Woodring (1928, pp. 420,421, pl. 34, figs. 10, 11) from the Miocene of Jamaica. However, on the Jamaican shell the columella is decidedly arcuate, and there is a sharp ridge within the umbilical area. Robertson (1958, p. 257) provisionally refers *hadra* to the genus *Gabrielona*.

Gabrielona bruscasensis, new species Pl. 8, figs. 5-7

Shell small, moderately fragile, subtranslucent, globose-naticoid, umbilicate. Angle of spire about 98 degrees. Whorls a little over three including the nucleus which is flattened and scantly raised, if at all, above the level of the succeeding whorl. Post-nuclear whorls well rounded, the body whorl swollen. Sutures narrowly channeled. Aperture broadly ovate. Outer lip thin, joined to the whorl at nearly a right angle. Basal lip thin, rather evenly rounded. Columella slender, broken above the lower lip, the area at the insertion with the parietal wall missing. Most of the umbilical area is also broken away, but there is enough of the side adjacent to the whorl remaining to show that is moderately deep and crescentic. The surface of the shell is a uniform light tan in color, and under a 10- or 20-power lens in certain light, the penultimate whorl is seen to be engraved with extremely faint spiral lineations.

Dimensions.—Holotype, length 1.3 mm.; width 1.2 mm.

Type locality.—Playa Grande formation (Maiquetía member) at W-26, in Quebrada Las Bruscas about 120 meters upstream from its junction with Quebrada Las Pailas.

Comparisons.—With the columella gone it is difficult to place this species in its correct taxonomic position and to compare it satisfactorily with others of the same general appearance. The shell is close to the Recent *G. brevis* (d'Orbigny) (1842 [in] La Sagra, Hist. phys., polit. nat. l'Ile de Cuba, Mollusques, vol. 2, p. 79, pl. 20, figs. 19-21, as *Phasianella*) and to the previously described *G. sphaera,* n. sp., but the spire is less divergent than that of *G. brevis* and more so than that of *G. sphaera.*

NERITIDAE

Nerita tessellata Gmelin Pl. 8, figs. 8, 9

1791. *Nerita tessellata* Gmelin, Syst. Nat., vol. 1, pt. 6, p. 3685, No. 65.

1817. *Nerita tessellata* Gmelin, Dillwyn, Descriptive Catalogue of Recent Shells, vol. 2, p. 1006, sp. 65.
1822. *Nerita tessellata* Gmelin, Lamarck, An. sans Vert., vol. 6, p. 194.
1825. *Nerita tessellata* Gmelin, Wood, Index Testaceologicus, p. 182, pl. 36, fig. 68.
1855. *Nerita tessellata* Gmelin, Reeve, Conch. Icon., vol. 9, pl. 9, sp. 43, 43a.
1864. *Nerita varia* Meuschen, Krebs, The West Indian Marine Shells, p. 76.
1878. *Nerita varia* Meuschen, Mörch, Catalogue of West-India Shells, p. 13.
1886. *Nerita tessellata* Gmelin, Watson, Voyage H. M. S. Challenger, Zoology, vol. 15, pp. 133-134.
1888. *Nerita tessellata* Gmelin, Tryon, Man. Conch., vol. 10, p. 24, pl. 4, fig. 71.
1889. *Nerita tessellata* Gmelin, Dall, U. S. Nat. Mus., Bull. 37, p. 166.
1901. *Nerita tessellata* Gmelin, Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, p. 446.
1922. *Nerita tessellata* Gmelin, Maury, Bull. Amer. Paleont., vol. 9, No. 38, pp. 162-163.
1923. *Nerita tessellata* Gmelin, Remington, Nautilus, vol. 35, No. 4, p. 121.
1924. *Nerita tessellata* Gmelin, Emery, Nautilus, vol. 38, No. 2, p. 61.
1926. *Nerita tessellata* Gmelin, Weisbord, Nautilus, vol. 39, No. 3, p. 86.
1937. *Nerita* (*Theliostyla*) *tessellata* Gmelin, Smith, East Coast Marine Shells, p. 83, pl. 29, fig. 8.
1940. *Nerita tessellata Gmelin,* Andrews, Nautilus, vol. 54, No. 1, p. 22; No. 2, p. 67.
1941. *Nerita tessellata* Gmelin, Russell, Mus. Comp. Zool., Bull., vol. 88, pp. 365-366, pl. 1, figs. 7, 8; pl. 6, fig. 2.
1946. *Nerita tessellata* Gmelin, Jaume, Soc. Malac. "Carlos de La Torre" Rev., vol. 4, No. 3, p. 103.
1954. *Nerita tessellata* Gmelin, Abbott, American Seashells, p. 128, pl. 4f.
1958. *Nerita tessellata* Gmelin, Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 11.
1958. *Nerita tessellata* Gmelin, Abbott, Acad. Nat. Sci. Philadelphia, Mon. No. 11, p. 32.
1958. *Nerita tessellata* Gmelin, Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, pp. 59-60, pl. 6, 2 figs.
1959. *Nerita tessellata* Gmelin, Nowell-Usticke, A Check List of the Marine Shells of St. Croix, p. 33.

Shell of medium size, sturdy, the spire low, the apex obtuse. Whorls about three, the smooth hyaline nucleus composed of one of them, the suture between the nucleus and conch indistinct. Last whorl large, globose, flattened or slightly concave above, sculptured by as many as 17 coarse spiral ribs of varying size including a smaller intercalary or two near the base. The wide, white, columellar area is pustular, and the slightly excavated columellar margin bears two small teeth at the middle, these often worn down. Outer lip with 9 to 13 lirae some distance from the inner edge, with two large denticles above and a small one after the lowest lira. Color black and white, sometimes in alternating bars on the spiral ribs, the white often in zigzag or wavy stripes and columns running across the

grain. One specimen is nearly wholly black, with a few white maculations. Inner margin of lips bluish white on well-preserved specimens.

Dimensions.—Figured specimen, altitude 17 mm.; max. diameter 18.5 mm.

Locality.—Recent, on beach of Playa Grande Yachting Club, Distrito Federal, Twenty-eight specimens.

Range and distribution.—This common shell ranges from Florida to Brazil, and is often found in rocky intertidal areas. As a fossil it occurs in the Pleistocene of Barbados.

Nerita versicolor Gmelin Pl. 8, figs. 10. 11

1791. *Nerita versicolor* Gmelin, Syst. Nat., vol. 1, pt. 6, 3684.
1822. *Nerita versicolor* Gmelin, Lamarck, An. sans Vert., vol. 6, pt. 2, p. 193.
1855. *Nerita versicolor* Gmelin, Reeve, Conch. Icon., vol. 9, pl. 12, sp. 56, a-d.
1864. *Nerita variegata* Chemnitz, Krebs, The West Indian Marine Shells, p. 77.
1889. *Nerita versicolor* Gmelin, Dall, U. S. Nat. Mus., Bull. 37, p. 166.
1901. *Nerita versicolor* Gmelin, Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, p. 446.
1922. *Nerita versicolor* Gmelin, Maury, Bull. Amer. Paleont., vol. 9, No. 38, p. 163.
1922. *Nerita versicolor* Gmelin, Remington, Nautilus, vol. 35, No. 4, p. 121.
1924. *Nerita versicolor* Gmelin, Emery, Nautilus, vol. 38, No. 2, p. 61.
1935. *Nerita versicolor* Gmelin, Richards, Jour. Paleont., vol. 9, No. 3, p. 257.
1937. *Nerita versicolor* Gmelin, Smith, East Coast Marine Shells, p. 82, pl. 29, fig. 11.
1940. *Nerita versicolor* Gmelin, Andrews, Nautilus, vol. 54, No. 1, p. 22; No. 2, p. 67.
1941. *Nerita versicolor* Gmelin, Russell, Mus. Comp. Zool. Bull., vol. 88, pp. 361-363, pl. 1, figs. 3, 4; pl. 5, fig. 2.
1942. *Nerita versicolor* Gmelin, Jaume and Pérez Farfante, Soc. Cubana Hist. Nat. "Felipe Poey" Mem., vol. 16, No. 1, p. 40.
1946. *Nerita versicolor* Gmelin, Jaume, Soc. Malac. "Carlos de La Torre" Rev., vol. 4, No. 3, p. 103.
1954. *Nerita versicolor* Gmelin, Abbott, American Seashells, p. 128, pl. 4b.
1958. *Nerita versicolor* Gmelin, Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 11.
1958. *Nerita versicolor* Gmelin, Abbott, Acad. Nat. Sci. Philadelphia, Mon. No. 11, p. 32.
1958. *Nerita versicolor* Gmelin, Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, p. 60, pl. 6, 3 figs.
1959. *Nerita versicolor* Gmelin, Rodriguez, Bull. Marine Sci. Gulf and Caribbean, vol. 9, No. 3, p. 276.
1959. *Nerita versicolor* Gmelin, Nowell-Usticke, A Check List of the Marine Shells of St. Croix, p. 32.

Shell of medium size, sturdy, the spire low, the apex bluntly

pointed. Whorls about three in all, the single nuclear whorl smooth. Body whorl large, globose, flattish to slightly concave below the suture, sculptured by 15 to 17 strong subequal spiral ribs, most of them broad and flat. Aperture semilunate. Outer lip with a single denticle above and below, with eight lirae or so between them, the lirae some distance from the inner edge. Columella broad, the margin more or less straight, bearing four or five strong teeth, some of which may continue as feeble bipartite folds or plicae across the columellar area. Ground color of exterior off-white; aperture and columella milky white; ribs marked with alternating black and white lozenges or stripes aligned in zigzag columns. On several of the ribs, the black is replaced wholly or in part by violet.

Dimensions.—Figured specimen, altitude 17.3 mm.; max. diameter 17.1 mm.

Locality.—Recent, on beach of Playa Grande Yachting Club, Distrito Federal. Two specimens.

Range and distribution.—Living from southern Florida to Pará, Brazil, and often associated with *Nerita tessellata* Gmelin and *Nerita peloronta* Linnaeus. As a fossil, it has been reported by Richards (1935) from the Pleistocene on the west side of Matanzas Bay and at Mariel Bay, Cuba, and by Trechmann (1933, p. 40) from the Pleistocene of Barbados.

Nerita peloronta Linnaeus Pl. 8, figs. 12, 13

1758. *Nerita peloronta* Linnaeus, Syst. Nat., ed. 10, p. 778.
1855. *Nerita peloronta* Linnaeus, Reeve, Conch. Icon., vol. 9, pl. 2, sp. 8, 8b.
1864. *Nerita peloronta* Linnaeus, Krebs, The West Indian Marine Shells, p. 76.
1878. *Nerita peloronta* Linnaeus, Mörch, Catalogue of West-India Shells, p. 13.
1888. *Nerita peloronta* Linnaeus, Tryon, Man. Conch., vol. 10, p. 24, pl. 4, figs. 75-77.
1889. *Nerita peloronta* Linnaeus, Dall, U. S. Nat. Mus., Bull. 37, p. 166.
1901. *Nerita peloronta* Linnaeus, Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, p. 445.
1922. *Nerita peloronta* Linnaeus, Maury, Bull. Amer. Paleont., vol. 9, No. 38, p. 162.
1922. *Nerita peloronta* Linnaeus, Remington, Nautilus, vol. 35, No. 4, p. 121.
1924. *Nerita peloronta* Linnaeus, Emery, Nautilus, vol. 38, No. 2, p. 61.
1937. *Nerita peloronta* Linnaeus, Smith, East Coast Marine Shells, pp. 82-83, pl. 29, figs. 10, 21.
1940. *Nerita peloronta* Linnaeus, Andrews, Nautilus, vol. 54, No. 2, p. 67.
1941. *Nerita peloronta* Linnaeus, Russell, Mus. Comp. Zool. Bull., vol. 88, pp. 359-361, pl. 1, figs. 1, 2; pl. 5, fig. 1.
1946. *Nerita peloronta* Linnaeus, Jaume, Soc. Malac. "Carlos de La Torre" Rev., vol. 4, No. 3, p. 103.

1954. *Nerita peloronta* Linnaeus, Abbott, American Seashells, p. 128, pl. 4a.
1958. *Nerita peloronta* Linnaeus, Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 11.
1958. *Nerita peloronta* Linnaeus, Abbott, Acad. Nat. Sci. Philadelphia, Mon. No. 11, p. 32.
1958. *Nerita peloronta* Linnaeus, Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers, 6, p. 59, pl. 6, 2 figs.
1959. *Nerita peloronta* Linnaeus, Rodriguez, Bull. Marine Sci. Gulf and Caribbean, vol. 9, No. 3, p. 276.
1959. *Nerita peloronta* Linnaeus, Nowell-Usticke, A Check List of the Marine Shells of St. Croix, p. 32.

Shell moderately large, light in weight. Spire low, the apex bluntly pointed. Whorls about three in all, the single whorl of the nucleus smooth. Last whorl large, globose, slightly concave just below the narrowly channeled suture. Sculpture consisting of low broad spiral ribs (which are faint around the middle of the ultima) and numerous fine axial lineations. Aperture lunate. Outer lip with a long narrow ridge paralleling the edge a short distance inward from it, the ridge terminating sharply above at the lower of two sharp folds or denticles, and fading out below to merge with the upper of the three denticles at the base. Posterior outlet marked by a broad channel which continues as a groove under the commissure. Basal lip with three denticles, the largest near the curve with the columella, the others decreasing in size away from that, the farthest removed connected with the ridge on the inner margin of the outer lip. Lower lip with a broad oblique thickening across the front. Columellar margin raggedly concave, with a couple of irregular teeth at the middle, the margin merging above into a thickened area of the parietal wall which adjoins the posterior canal. Ground color yellowish, variously mottled and zigzagged with black and a little violet. The columellar area is stained orange at the middle, and the lips are whitish.

Dimensions.—Figured specimen, altitude 23 mm.; max. diameter 24.8 mm.

Locality.—Recent, on beach of Playa Grande Yachting Club, Distrito Federal. One specimen.

Range and distribution.—*N. peloronta* Linnaeus ranges from the east coast of Florida to the northern coast of South America. It is frequently found along rocky shores facing the open sea. Its occurrence as a Pleistocene fossil has been noted by Gregory (1895, p. 290) and Trechmann (1933, p. 40) in Barbados.

Smaragdia viridis venezuelensis, new subspecies Pl. 8, figs. 14, 15

Shell small, obliquely oval, subglobular. Whorls nearly three in all, the nucleus a hyaline pimple. Ultimate whorl greatly enlarged, tumid, spiralled eccentrically. Aperture simple, wide, semilunate. Outer lip thin. Free edge of columella slightly concave, finely and irregularly denticulate, the number of teeth about seven, the largest tooth being the posteriormost one, the anterior end of the columella thickened a little. Parietal area broad, flat below, slightly swollen above, the distal margin sharply defined posteriorly by a narrow impressed groove and anteriorly by the slightly projecting edge of the lower lip. Surface smooth except for microscopic arcuate growth lines. Paratype with opaque white spots haphazardly distributed within the outer layer of shell.

Dimensions.—Holotype, length 3.9 mm.; max. width 3 mm. Paratype, length 3.1 mm.; max. width 2.5 mm.

Type locality.—Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. Two specimens.

Comparisons.—This shell is another of the *viridis* clan, the prototype of which is *S. viridis viridis* (Linnaeus) (1758, Syst. Nat., ed. 10, p. 778) from the Mediterranean Sea. The Western Atlantic analogue of *S. v. viridis* is *S. v. weyssei* Russell (1940, pp. 257-259, pl. 46, figs. 5, 6). The European species has solid black axial lines on the whorls whereas Russell's shell "never possesses these solid black lines, but rather, when present, a brownish red 'trailing' edge to the white spots". Such coloration that the Venezuelan fossil may have had originally has been bleached out, and although otherwise it is close to *S. weyssei,* it is not identical in all respects, *S. wesseyi* having a more swollen columellar area and a slightly more elevated spire. Fossil representatives of the *S. viridis* clan in Florida (the type of *S. weyssei* is a Recent shell from Miami) are the Pliocene *S. v. merida* Dall (1903, p. 1633, pl. 60, fig. 3) from Shell Creek and North St. Petersburg, and *S. floridana* Smith (1937-38, pp. 66-67, pl. 6, fig. 8) from Loxahatchee. The free edge of the columella on *S. merida* is smooth, on *S. venezuelensis,* n. subsp. it is denticulate. The columellar margin of *S. floridana,* on the other hand, is more generously toothed than that of *S. venezuelensis,* the former having

one prominent denticle two-thirds of the way up from the anterior end, with six others below that and four above. The Caribbean Miocene member of the *viridis* clan is *S. v. viridemaris* Maury (1917, pp. 316-317, pl. 24, fig. 11) from the Dominican Republic, Costa Rica, and Jamica. The Dominican form of *S. viridemaris* is slightly shouldered whereas *S. venezuelensis* is full and evenly rounded; the Jamaican *S. viridemaris* (see Woodring, 1928, pp. 426-427, pl. 35, fig. 13) is rounder than *S. venezuelensis;* and the Costa Rican *S. viridemaris* (see Olsson, 1922, p. 331, pl. 15, fig. 22) has a slightly more elevated apex than our Venezuelan shell. Abbott (1958, p. 33) saw no fundamental difference between Maury's Miocene *S. viridemaris* and Russell's Recent *S. weyssei,* and relegated the latter to synonymy.

LITTORINIDAE

Littorina (Melarhaphe) nebulosa (Lamarck) Pl. 8, figs. 16, 17

1822. *Phasianella nebulosa* Lamarck, An. sans Vert., vol. 7, p. 54.
1840. *Littorina columellaris* d'Orbigny, Voy. Amér. Mérid., vol. 5, pt. 3, Mollusques, p. 392.
1841. *Phasianella nebulosa* Lamarck, Delessert, Recueil coquilles Lamarck, pl. 37, figs. 12a, b.
1842. *Littorina columellaris* d'Orbigny, [in] La Sagra, Hist. phys., polit. nat. l'Ile de Cuba, Mollusques, vol. 1, p. 213, pl. 15, figs. 18-20.
1842. *Littorina tigrina* d'Orbigny, [in] La Sagra, Hist. phys., polit. nat. l'Ile de Cuba, Mollusques, vol. 1, p. 211, pl. 15, figs. 9-11.
1846. *Littorina sayi* Philippi, Abbild. Beschr. Conchyl., vol. 3, p. 12, pl. 6, fig. 11.
1848. *Litorina exarata* Philippi, Abbild. Beschr. Conchyl., vol. 3, p. 63, pl. 7, fig. 8.
1857. *Littorina nebulosa* (Lamarck), Reeve, Conch. Icon., vol. 10, pl. 11, sp. 55a, 55b.
1864. *Littorina columellaris* d'Orbigny, Krebs, The West Indian Marine Shells, p. 59.
1878. *Littorina nebulosa* (Lamarck), Mörch, Catalogue of West-India Shells, p. 9.
1887. *Littorina lineata* (Gmelin) var. *nebulosa* (Lamarck), Tyron, Man. Conch., vol. 9, p. 244, pl. 43, fig. 38; pl. 42, fig. 14.
1891. *Littorina columellaris* d'Orbigny, Baker, Acad. Nat. Sci. Philadelphia, Proc., vol. 43, p. 53.
1935. *Littorina nebulosa* (Lamarck), Richards, Jour. Paleont., vol. 9, No. 3, p. 257.
1942. *Littorina nebulosa* (Lamarck), Jaume and Pérez Farfante, Soc. Cubana Hist. Nat. "Felipe Poey" Mem., vol. 16, No. 1, p. 41.
1943. *Littorina (Melarhaphe) nebulosa* (Lamarck), Bequaert, Johnsonia, vol. 1, No. 17, pp. 2, 11-13, pl. 4, figs. 1-4.

1952. *Littorina nebulosa* (Lamarck), Pulley, Texas Jour. Sci., vol. 4, No. 2, p. 171, pl. 1, figs. 6, 7.
1958. *Littorina nebulosa* (Lamarck), Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 11.
1958. *Littorina nebulosa* (Lamarck), Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, p. 62, pl. 8, 1 fig.

The Recent Venezuelan shells referred to this species are rather thin, and have a sharply pointed spire with a divergence of about 55 degrees. Whorls 6-1/2 in all, the white hyaline nucleus with 1-1/2 of them, the post-nuclear whorls well rounded, the last two appressed just below the suture. Surface engraved with numerous inequidistant spiral grooves separating low flat bands nearly always wider than the grooves themselves. Aperture oval. Outer lip thin, the inner margin finely fluted under the external ribbing, the external markings visible for some distance within the aperture but veneered with shell deposit which renders the aperture smooth except for the extreme labral edge. Spire amber-colored, always darker than the body which is cream-colored on the labrum but tinged purplish on the dorsum and in front. Aperture a uniform golden yellow, the inner margin of the outer and basal lips whitish. A number of specimens have rather large cream-colored blotches arranged unequally around the summit of the middle whorls, and a few specimens are marked on the body whorl by longitudinal bands of dull brown following along the slightly curved growth lineations. Operculum chitinous, pale mahogany brown, thin, flexible, translucent.

Dimensions.—Figured specimen (B73a), length 15.8 mm.; max. width 9 mm.; operculum (B73b), length 6 mm.; max. diameter 3.8 mm.; No. 26397 (unfigured) PRI.; largest specimen, length 16.5 mm.; max. width 10 mm.; smallest specimen, length 6 mm.; max. width 4 mm.

Locality.—Recent, on beach fronting open water southeast of Higuerote, State of Miranda. The 43 specimens were collected live about midday 22 February 1955 from the under side of a large water-worn log exposed during low tide.

Range and distribution.—The Recent *L. nebulosa* ranges from the Bahama Islands to northern South America. The fossil form is recorded from the Pleistocene on the west side of Matanzas Bay, Cuba.

RISSOIDAE

Rissoa trabeata, new species Pl. 10, figs. 5, 6

Shell small, moderately solid, ovate, low conical, the angle of spire about 40 degrees. Whorls a little over four in all, the smooth nucleus consisting of about 1-1/2 of them. Initial whorl of nucleus loosely coiled and appressed to form the blunt apex, the last narrow, convex, differentiated from the conch by the appearance on the latter of a faint peripheral carina or angulation. Post-nuclear whorls moderately convex, subangularly rounded below the middle. Sculpture consisting of narrow spiral ridges and broad axial folds, six of the former and 12 of the latter on the last whorl. The uppermost of the spirals is near the suture and is a little finer than the other five which are more or less equal in size and spacing and are a little less prominent on the crests of the axial folds than they are in the interspaces. The axial folds are strongest and broadest at the periphery, and are separated by concave interspaces which are wider than the folds themselves. Base convex, marked with closely spaced microscopic spiral threads every other one of which is slightly sharper than its alternate. Aperture subangulately ovate, holostomatous. Outer lip narrowly varicated behind by the last axial fold, thickened at its junction with the whorl. Basal and lower lips thickened, the aperture faintly patulous at the curvature between the two. Parietal wall enameled.

Dimensions.—Holotype, length 1.1 mm.; max. width 0.7 mm.

Type locality.—La Salina, west of Puerto Cabello, State of Carabobo. One specimen, the holotype.

Remarks.—The cavity adjoining the columella of the type specimen is an imperfection and not a natural umbilicus. *R. trabeata,* n. sp. is somewhat reminiscent of the Miocene *R. phagon* Gardner (1947, p. 606, pl. 57, fig. 10) from the Oak Grove sand of Florida, but that has twice as many axial costae as the Venezuelan shell.

Rissoina (Phosinella) puntagordana, new species Pl. 10, figs. 7, 8

Shell small, sturdy, elongate conical, the angle of spire 26 to 30 degrees. Whorls about 5-1/2 including the 1-1/2 of the nucleus. Nucleus smooth, the initial volution fairly tight and a little canted, the last rapidly expanding and inflated. Demarcation between nu-

cleus and conch defined by a fine straight axial ridge, on the forward side of which the reticulate sculpture of the conch begins. Post-nuclear whorls a little convex as a whole but rendered angulate by the coarse spiral ribs, the upper slope or ramp of the whorl concave, the sides tapering in profile, the base constricted to form an excavated sutural area. Sculpture consisting of strong spiral ribs and generally narrower axial ridges, the pattern reticulate, the intercepts slightly thickened. On the first post-nuclear whorl there are two spiral ribs of about equal size, and 18 small axial ridges, these extending from the summit to the suture although they are faint in the sutural area. On the penultimate whorl there are, in addition to the two primary spiral ribs, a thickened collar at the summit and a spiral cord at the anterior suture. Body whorl and base gently rounded, sculptured by six spiral ribs of somewhat varying size, and 18 to 20 axial cords about equal in size to the intermediate spiral ribs. Of the spirals, the one just below the summit is the smallest, the ones around the middle the largest, those on the base intermediate. The axial cords of the body whorl continue on the base in diminished strength. The spaces enclosed by the spiral ribs and axial ridges are squarish shallow pits. Anterior fasciole small, corded, bipartite. Aperture obliquely ovate, holostomatous, lined with a thin even coat of enamel. Lips thickened, the outer one swollen behind into a broad rounded varix on which the ribbing is dimmed, the basal lip evenly rounded, the inner lip and parietal wall neatly coated with the same white enamel lining the aperture.

Dimensions.—Holotype, length 2.5 mm., max. width 0.9 mm.

Type locality.—Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. One specimen, the holotype.

Comparisons.—Following are the species which *Rissoina puntagordana,* n. sp. resembles:

Rissoina oncera Woodring (1957, p. 77, pl. 23, fig. 3). Miocene, upper part of Gatun formation, Panamá Canal Zone. This is larger than *R. puntagordana,* has 1-1/2 more nuclear whorls, and possesses a rudimentary anterior canal not present on the Venezuelan species.

Rissoina guppyi Cossmann (see Woodring, 1928, pp. 366-367, pl. 28, fig 10), middle Miocene of Jamaica and of the Dominican

Republic (as *R. sagraiana* Maury; not of D'Orbigny). More strongly reticulate than *R. puntagordana,* with more numerous whorls, and with a short but pronounced anterior canal.

Rissoa pariana Guppy (Guppy and Dall, 1896, p. 321, pl. 27, fig. 10), from the Miocene *Cadulus* bed at Pointe-à-Pierre, Trinidad, is stubbier than *R. puntagordana,* and has fewer axial cords.

Rissoina fargoi Olsson and Harbison (1953, pp. 324-325, pl. 48, fig. 4). Pliocene, Shell Creek, Florida. This is larger than *R. puntagordana,* and has a broad siphonal canal.

Rissoina cancellata Philippi (1847, Zeitschr. f. Malakozool., p. 127). Pliocene of Florida, Pleistocene of Cuba, Recent from southeast Florida to the West Indies. This, and the synonymous *R. pulchra* of C. B. Adams (see Clench and Turner, 1950, p. 332, pl. 33, fig. 8), differs from *R. puntagordana* in having more numerous whorls and a well-developed basal notch.

Rissoina sagraiana d'Orbigny (1842, pp. 162-163, pl. 12, figs. 4, 5). Recent, Florida Strait to West Indies; Pleistocene, Barbados. More acuminate, and more delicately sculptured than *R. puntagordana.*

Rissoina (Eurissolina) bicrepida, new species Pl. 10, figs. 9, 10

Shell small, solid, porcelaneous, elongate conical. Nucleus decollate. Post-nuclear whorls five or six, moderately convex, contracted at the summit, sculptured by strong, widely spaced narrowish axial ribs which are in alignment from the apex to the base of the shell, the strength diminished on each whorl just below the suture. Of these ribs there are about nine on the first post-nuclear whorl, 15 or so on the body whorl. Intercostal areas smooth, at least as wide as, to wider than the ribs. Sutures finely impressed. Base rounded, short, axial ribs extending to the anterior fasciole. Fasciolar area swollen, consisting of two components; an inner nodulous cord adjacent to the lower lip, and a much wider, pronounced swelling encircling the anterior cord and extending across its upper end, the swollen area elongately and heavily beaded or ridged by the axial ribs. Aperture obliquely ovate, the peristome thick and rendered continuous by the heavy callus on the parietal wall. Outer lip varicated by the last axial rib which itself may be a composite of two or

three smaller riblets crowded and partially welded together. Posterior angle of aperture acute, slightly channeled at the commissure. Anteriorly, the aperture is broadly but faintly depressed at the curve of the lower and basal lips. Inner lip thick, appressed to the fasciole. Basal lip rounded.

Dimensions.—Holotype (two whorls, the penultima and ultima), length 3 mm.; max. width 2.2 mm., No. 26072; paratype (five post-nuclear whorls), length 2.2 mm.; width 1.1 mm., No. 26396 (unfigured) PRI.

Type locality.—Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. Three specimens, all of them broken.

Comparisons.—*Rissoina bicrepida,* n. sp. is close to *R. ditomus* Woodring (1928, p. 369, pl. 29, figs. 2-5) from the Jamaican Miocene, and is nearly identical with *R. floridana* Olsson and Harbison (1953, pp. 325-326, pl. 48, fig. 8) which ranges from Pliocene to Recent in Florida. On *R. ditomus* the axial ribs are much more strongly curved before reaching the fasciolar swelling than they are on *R. bicrepida,* and the inner beaded cord representing the anterior fasciole proper is more strongly pronounced on the Jamaican species. The differences between *R. bicrepida* and *R. floridana* seem to be that the Venezuelan shell is stouter and has a bipartite fasciolar area, the latter characteristic diagnostic of the subgenus *Eurissolina* Woodring (1928, p. 368). *R. floridana* is assigned to the subgenus *Schwartziella* by Olsson and Harbison.

Rissoina (Schwartziella ?) maiquetiana, new species Pl. 10, figs. 11,12

Shell small, porcelaneous, elongate conical, the angle of spire 28 to 31 degrees. Nucleus and upper spire whorls decollate, lower whorls somewhat convex, contracted at the summit, the body whorl gently rounded, the base moderately produced. Sculpture consisting of strong, fairly narrow axial ribs (about 13 on the penultimate whorl) separated by smooth interspaces which are about one and one-half times as wide as the ribs themselves. Above the ultimate whorl the axial ribs extend from suture to suture although in the

appressed area just below the suture the ribs are considerably subdued. Above the penultimate whorl some of the ribs are offset a little from those of the adjoining whorls but on the last two whorls most of them are in line. The ribs are slightly curved to straight, and generally subcoronate at their summits; on the body whorl the last two or three ribs on the labrum converge to form an emargination at the anterior extremity, the other ribs on the ultima playing out rather abruptly below the periphery. Aperture holostomatous, ovate, only slightly oblique, its long axis nearly parallel with the long axis of the spire. Outer lip broken back, the last axial rib situated immediately behind the margin, the posterior outlet represented by a shallow groove. Basal lip thick, its inner or apertural margin acutely rounded, the anterior extremity bluntly pointed. Columella evenly and gently arcuate.

Dimensions.—Holotype (last 3 whorls), length 3 mm.; max. width 1.5 mm.

Type locality.—Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. One broken specimen, the holotype.

Comparisons.—The subgenus *Schwartziella* Nevill is characterized by a pronounced swelling or tooth on the inner margin of the outer lip, and as this is broken away on our specimen the subgeneric classification is, of course, inferred. *Rissoina maiquetiana,* n. sp. is similar to the Pleistocene and Recent *R. chesnelii* (Michaud), but that species (see Abbott, 1954b, p. 137, pl. 22u) has a more oblique aperture.

Rissoina (Schwartziella) venezuelana, new species Pl. 10, figs. 13, 14

Shell small, porcelaneous, somewhat turrited, elongate conical, the angle of spire about 20 degrees. Nucleus decollate. Post-nuclear whorls remaining five, moderately convex, narrowly constricted at the suture. Sculpture consisting of axial costae only, these extending from suture to suture as elevated, moderately sharp ridges subcoronated at the summit, and usually slightly pinched at the upper suture. There are 14 costae on the body whorl including the double one behind the outer lip. The majority of the axials on the last two whorls are in columnar alignment, but higher on the conch, the

termini often alternate with those of the adjoining whorls. The intercostal areas are smooth, broadly and evenly concave, about twice as wide as the costae on the ultimate whorl but only a little wider on the earliest whorls. On the dorsum of the body whorl, the costae are sharply but gracefully curved anteriorly where they converge at the margin of the base. Sutures fine, distinct, undulating over the termini of the costae where the termini are staggered. Base of shell with a broad gentle swelling which is axially nodulated by the costae and bounded posteriorly by a feeble spiral depression. Aperture holostomatous, oblique, ovate-lenticular, narrowing sharply at the posterior outlet. Outer lip thickened somewhat along the back rim, the inner margin swollen just a little below the anal angulation. Basal and inner lips thickened, the enamel extending to the parietal wall and commissure, the outer margin of the enamel sharply defined from the whorl. Base obtusely truncate. Anterior outlet broad, represented by a faint shallow effusion at the curve of the lower and basal lips.

Dimensions.—Holotype (5 whorls), length 3.7 mm.; max. width 2.0 mm.

Type locality.—Mare formation at W-25, south flank of Punta Gorda anticline. Two specimens, both broken.

Comparisons.—*Rissoina venezuelana,* n. sp. is comparable to the Pliocene *R. harpa* Gardner (1948, p. 193, pl. 29, fig. 20) from the Waccamaw formation of North Carolina; to *R. floridana* Olsson and Harbison (1953, pp. 325-326, pl. 48, fig. 8), a Pliocene to Recent species in Florida; to *R. chesnelii* (Michaud) (see Abbott, 1954b, p. 137, pl. 22u) from the Pleistocene at Guantánamo, Cuba, (Jaume and Pérez Farfante, 1942, p. 40) and living from North Carolina to the West Indies; and to the living *R. fischeri* Desjardin from Cuba and Bocas Island, Panamá (see Olsson and McGinty, 1958, p. 12, pl. 1, fig. 10). *R. harpa,* which itself "is the possible antecedent of . . . *R. chesnelii* (Michaud)", is a little more broadly conic than *R. venezuelana,* its aperture is less oblique, and the lips are excurved rather than cylindrically thickened as on *R. venezuelana. R. floridana* is a little broader than *R. venezuelana,* and it has a more pronounced fasciolar or basal swelling, but otherwise the two species are nearly identical. *R. chesnelii* is not appressed at the suture as is *R. vene-*

zuelana nor are the ribs subcoronated at the summit as they are on the latter. *R. fischeri* is perceptibly stouter than *R. venezuelana,* but other than that the two shells are closely akin.

Rissoina (Cibdezebina) caribella, new species Pl. 10, figs. 15, 16

Shell small, smooth, porcelaneous, elongate subconical, the left side of the spire (as viewed with the aperture facing the observer and the base down) slightly curved in profile, the right side straight. Whorls about eight in all including the nucleus which is defective and corroded. All post-nuclear whorls save the ultima are more or less flat-sided and so tightly annealed that there is no sutural separation. The last whorl is misshapen or asymmetrical, being somewhat concave above on the left side and dorsum but flattish in front. Base of shell contracted gracefully above the smooth thickened fasciolar area. Aperture ovate-lenticular, acutely angled and simply grooved at the posterior outlet, feeble and broadly channeled anteriorly at the curve of the lower and basal lips. Outer lip narrowly thickened along the edge, broadly swollen behind, the inner margin provided with two obtuse denticles, one just below the middle, the other at the curvature with the basal lip, the area between the denticles shallowly excavated. Basal and lower lips thickened, the former subtruncate.

Dimensions.—Holotype, length 3.7 mm.; max. width 1.8 mm.

Type locality.—Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. One specimen, the holotype.

Comparisons.—This shell at once recalls the lower Miocene to Recent *R. browniana* d'Orbigny (in La Sagra, 1842, p. 164, pl. 12, figs. 33-35), and although it may be an extreme variant or defective example of that species, it differs from the typical Recent *R. browniana* in having a curved, instead of straightish spire, in having annealed, instead of finely impressed sutures, and in its rather markedly misshapen body whorl. According to Dall and Simpson (1901), Pilsbry (1921), Woodring (1928), Desjardin (1949), Clench and Turner (1950), and Olsson and Harbison (1953) one or the other of the following species are synonymous with *R. browniana* d'Orbigny: *R. sloaniana* d'Orbigny, *R. laevigata* and *R. laevissima* of C. B. Adams, and the Miocene *Iopsis fusiformis* and *Eulima crassilabris* of

Gabb (1873, p. 228; p. 227). There are two other species to which the Venezuelan *R. caribella* is related, and they are *R. johnsoni* Dall (1892, p. 342, pl. 20, fig. 1) from the upper Miocene and Pliocene of North Caroline and Florida, and *R. tersa* Mansfield (1930, pp. 113-114, pl. 16, fig. 9) from the upper Miocene Duplin marl of Florida and North Carolina. *R. johnsoni* is distinguished from *R. caribella* by its distinct sutures and bluntly angular periphery, *R. tersa* by its fewer whorls and shorter spire.

Alvania meridioamericana, new species Pl. 8, figs. 18, 19

Shell small, hyaline, ovate conical, rather sturdy. Tip of nucleus decollate, the last nuclear whorl smooth, shiny, well rounded, the junction with the conch marked by a vague nodulation. Post-nuclear whorls a little over four, the first two or so with concave sides, carinate or angulate at the summit and near the base, the sutures channeled and a little gaping. The pentultimate whorl is nearly straight-sided above, the lower fourth sloping into the sutural area, the anterior carination dying out as it approaches the ultimate whorl, the suture becoming narrowly channeled. The ultimate whorl is slightly convex, the base short but evenly rounded, the last suture finely impressed. Surface sculptured by spiral riblets and low rounded hardly flexuous axial folds separated by slightly wider interspaces. On the upper whorls of the conch the carinae at the summit and above the base are beaded or nodular at the intercepts of the ribs; the axial folds of these whorls extend from carina to carina and are thicker below than they are above, the spiral riblets between the carinae being absent. On the penultimate whorl there are five spiral riblets (including the beaded one at the summit) and 17 axial folds, the intersections with subdued nodulations. The spaces between the two sets of ribs are shallow rectangular pits, elongated in the spiral direction. On the body whorl there are six spiral riblets, the uppermost one at the suture being the strongest and most prominently beaded, the next four of equal size, separated by much narrower interspaces, and faintly nodular, the lowermost situated

at about the periphery of the whorl. This last riblet is faintly beaded, and the axial folds terminate against it. Below the peripheral riblet, the base is marked with about five faint, slightly raised spiral ridges. Aperture somewhat oblique, holostomatous, rather broadly ovate. Outer lip not thickened, the outer rim frilled at the termini of the surface riblets, the inner margin weakly fluted, the summit joined to the parietal wall at nearly a right angle. Inner lip and parietal wall gently curved, covered by a moderately thick coating of enamel, the distal edge of the enamel raised slightly above, and detached from the whorl. Basal lip gently rounded.

Dimensions.—Holotype (tip of nucleus missing), length 3 mm.; max. width 1.3 mm.

Type locality.—Mare formation at W-14, on hillside above west bank of Quebrada Mare Abajo. One specimen, the holotype.

Comparisons.—Among the American species of *Alvania,* the new Venezuelan fossil resembles most closely the Eastern Pacific *A. granti* Strong (1938, pp. 210-211, pl. 15, fig. 8), dredged at a depth of 10-25 fathoms off Maria Madre Island, Mexico. The Mexican shell is strikingly similar in general appearance but is differentiated from *A. meridioamericana* in having stronger and fewer axial costae, in having one more spiral riblet on the ultima and several more spiral ridges on the base, and in lacking the angulation at the summit and near the base of the early post-nuclear whorls. The nearest Western Atlantic species seems to be *A. epima* Dall and Simpson (1901, p. 433) from Mayaguez, Puerto Rico in 25 fathoms, and although I have not seen the type of *A. epima,* I gather from the original description that the Venezuelan shell is sturdier than that, and is girded with several more spiral riblets on the later whorls. The Recent West Indian *A. auberiana* (d'Orbigny) (in La Sagra, 1842, vol. 2, p. 22, pl. 11 *bis,* figs. 34-36) is less elevated than *A. meridioamericana,* and the sculpture is distinct (see Verrill and Bush, 1900, p. 539, pl. 65, fig. 17).

Alvania playagrandensis, new species — Pl. 9, figs. 1, 2; Pl. 10, figs. 1, 2

Shell small, ovate conical, the angle of spire about 37 degrees, the apex of the spire obtuse. Whorls a little over four including the

nucleus. Nucleus consisting of about 1-1/2 smooth whorls, the initial one obscure but seemingly rather tightly coiled and a little bulbous, the last well rounded, defined from the conch by an oblique axial rift. The first post-nuclear whorl is moderately convex, the penultimate slightly convex, the ultimate inflated. Surface sculptured by a few revolving riblets and numerous, somewhat smaller axial cords, the imprint of these markings just barely visible under the microscope because of the peeled-off outer layer of shell. On the early post-nuclear whorls there are two moderately elevated revolving riblets, one near the summit, the other near the base, these crossed by perhaps as many as 24 low narrow axial cords which impart a subreticulate pattern on the surface. On the body whorl the axial cords seem to become obsolete at the periphery. Base short, rounded, with a very vague suggestion of being spirally banded. Aperture a little oblique, oval, plugged with a granule of calcite. Peristome thin, continuous. Columella delicate, lamellar, gently arcuate, bordered by a deep, semilunar umbilicus.

Dimensions.—Holotype, length 1.4 mm.; max. width 0.7 mm.

Type locality.—Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. One specimen, the holotype.

Comparisons.—Despite the obliterated sculpture which precludes definitive comparison, the thin peristome and the relatively large umbilicus suggest that this is a new species. Were the details of sculpture more perfectly preserved, the shell probably would be seen to resemble *Rissoa lipeus* Dall (1892, p. 339, pl. 20, fig. 8b) which is reported from the Caloosahatchee deposits of Florida and as living in the Bahama Islands. The Venezuelan fossil, without the modifying relief of its sculpture, appears to be more slender than *A. lipeus,* but the significant difference is that *A. playagrandensis,* n. sp. has an umbilicus whereas *A. lipeus* and its subspecies *A. floridana* Mansfield (1930, pp. 114-115, pl. 19, fig. 8) from the upper Miocene in Leon County, Florida, do not. In superficial appearance our shell exhibits a startling resemblance to *Barleeia zeteki* Strong and Hertlein (1940, p. 228, pl. 21, fig. 1) dredged from 3-9 fathoms in Bahia Honda on the Pacific side of Panamá, but *B. zeteki* is obscurely angulate at the periphery rather than rounded, and the

whorls are smooth instead of sculptured by spiral and axial threads as is *Alvania playagrandensis*, n. sp. This species is referred to the genus *Alvania* rather than *Barleeia* on the basis of its surface sculpture, as the shell of *Barleeia*, according to Keen (1958, p. 287), is smooth and shining.

Alvania ? species — **Pl. 10, figs. 3, 4**

Shell small, weathered, elongate conical, the spire diverging at an angle of about 30 degrees. Before it was broken in handling it was seen to consist of six whorls in all, the smooth and glossy nucleus forming about two of them, the initial coil of the nucleus obtuse, the last asymmetrically bulbous and defined from the conch by an axial groove. Post-nuclear whorls nearly straight-sided to just perceptibly convex, the ultima moderately rounded, with the merest suggestion of an obtuse angulation at the periphery on the ventral side only. Sutures fine and distinct. Aperture oval, oriented obliquely to the long axis of the spire, the peristome continuous and a little thickened. Outer lip annealed to the whorl with a heavy deposit of callus. Columella evenly arcuate, sturdy, bordered by a long arcuate groove or slit paralleling the margin. Surface corroded, sculptured with obscure spiral bands or incisions which undoubtedly are more distinct on well-preserved specimens.

Dimensions.—Whole specimen, length 2.7 mm.; max. width 1.1 mm.

Figured specimen (same as above but with the upper whorls broken away), length 2.0 mm.; max. width 1.1 mm.

Locality.—Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. One specimen.

Remarks.—The generic classification of this form is in doubt. The oblique holostomatous aperture, the thickened peristome, and the crescentic slit adjoining the columella suggest that the species pertains to the *Rissoacea*, possibly to the genus *Alvania*.

Benthonella ? loriei, new species — **Pl. 46, figs. 7, 8; Pl. 47, figs. 6, 7**

Shell minute, thin, probably not fully mature, broadly conical,

the spire moderately short, the angle of divergence near 50 degrees. Whorls a little over four including the nucleus which consists of about 1-1/2 of them. Nucleus subhyaline, smooth, the initial whorl rather tightly coiled and obliquely appressed, the last well rounded and differentiated from the conch by the first appearance of axial ribbing. Post-nuclear whorls slightly to moderately convex, the convexity increasing with growth, the last two whorls subangularly rounded at the periphery and faintly concave above the periphery. Sculpture consisting of numerous closely spaced microscopic axial riblets of more or less equal size separated by interspaces about as wide as the riblets themselves. There are approximately 30 riblets on the last full volution, these continuing a short distance on to the base, the lower portion of the base smooth and subtranslucent. Under a magnification of 20X and in certain light the intercostal areas seem to be faintly striated spirally but it is not possible to be definite about this. Sutures very finely impressed. Aperture subangularly ovate, slightly oblique. Outer lip thin, joined to the whorl at nearly a right angle. Basal lip a little effuse and bluntly pointed anteriorly at the curve of the lower lip. Columella arcuate, raised a little above, and detached from the feeble narrow umbilical groove adjacent.

Dimensions.—Holotype, length 0.5 mm.; max. width 0.3 mm.

Type locality.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. One young specimen, the holotype.

Remarks.—The generic classification of this interesting shell is in doubt. It does not quite fit *Benthonella* as originally described by Dall (1889b, pp. 281-282; 1889a, p. 150, pl. 42, fig. 5) for the type *B. gaza,* but it would seem to fit the genus if the species *B. turbinata* Guppy (Guppy and Dall, 1897, p. 321 pl. 27, fig. 10) from the Miocene *Ditrupa* bed of Trinidad is rightly included in *Benthonella.* This does not imply that *B. loriei* is close to *B. turbinata* for the two species are distinct, *R. turbinata* being more globose and bearing fewer but stronger axial ribs than the Venezuelan shell.

The species is named in honor of Dr. J. Lorié, a pioneer paleontologist of the Caribbean region.

VITRINELLIDAE

Teinostoma (Pseudorotella) antilleanum, new species Pl. 12, figs. 7-9

Shell small, moderately sturdy, porcelaneous, depressed globose, with a blunt, hardly elevated spire. Whorls 3-1/2 to 4 including the nucleus which consists of about 1-1/2 of them. Initial whorl of the nucleus appressed, planispiral, loosely coiled, the last merging insensibly into the conch, the sutures separating the nuclear whorls distinct. Body whorl slightly overlapping and tightly appressed on the preceding, the sides well rounded, the summit faintly and narrowly concave at the area of overlap. Surface smooth except for fine, curved, axial growth lines. Umbilical area covered with a moderately thick subcircular callus that is somewhat concave into the umbilical depression and extends a short distance upward to the base of the parietal wall. The greater part of the parietal wall is thinly enameled, the enamel reaching the summit of the outer lip, and merging below with the extension of the umbilical callus. Umbilical callus longitudinally sulcate adjacent to the columella, the sulcus widening slightly and becoming shallower upward. The distal margin of the umbilical callus is well defined, rising forward as a ridge to join the lower lip. Columella moderately arcuate. Aperture roundish. Outer lip thin, the under side at the commissure grooved, the groove continuing within the aperture.

Dimensions.—Holotype, diameter 2.2 mm.; altitude 1.2 mm.

Type locality.—Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. Two specimens, the larger and more perfect the holotype.

Other localities.—Mare formation at W-25, south flank of Punta Gorda anticline. Two specimens. Mare formation near W-14, on hillside above west bank of Quebrada Mare Abajo. One specimen.

Comparisons.—This species resembles a number of forms of *Teinostoma* ranging from Miocene to Recent. Among the Recent ones are *T. megastoma* C. B. Adams (see Clench and Turner, 1950, pp. 306-307, pl. 35, fig. 2) from Jamaica, and *T. biscaynense* Pilsbry and McGinty (1945, p. 5, pl. 1, fig. 4) from southeast Florida. Both of those are more fragile than *T. antilleanum,* and both of them lack the sulcus adjacent to the columella. On *T. cryptospira* (Verrill)

(see Bush, 1897, p. 118, figs. 1, 2), a Pleistocene (North Creek, Florida) and Recent (North Carolina) shell, the last whorl conceals nearly all of the spire, whereas on *T. antilleanum* the last whorl only overlaps a little of the preceding one. The principal differences between the new Venezuelan species and *T. avunculus* Pilsbry (in Olsson and Harbison, 1953, pp. 413-414, pl. 49, figs. 3-3d) from the Pliocene at North St. Petersburg, Florida, are that the sulcus adjacent to the columella is wider and shallower in *antilleanum* than in *avunculus,* the umbilical pad is concave rather than convex as on the Floridan species, and the depression around the suture is less pronounced on *I. antilleanum* than on *T. avunculus.* Another Pliocene form which our Venezuelan species resembles is *T. ecuadorianum* Pilsbry and Olsson (1941, p. 47, pl. 9, fig. 1) from the Canoa formation of Ecuador; the main difference is that *T. ecuadorianum* lacks the faint subsutural depression around the summit of the ultimate whorl. In the Miocene there are five related species: *T. caroniense* Maury (1925b, p. 401, pl. 43, figs. 3, 4) from the Springvale deposits of Trinidad; *T. sandomingense* Maury (1917, p. 320, pl. 24, fig. 24) from Cercado de Mao in the Dominican Republic; *T. caronensis* Mansfield (1925, p. 60, pl. 8, figs. 9, 11) from Brasso, Trinidad; *T. pycnum* Woodring (1928, p. 446, pl. 38, figs. 10-12; 1957, p. 71, pl. 17, figs. 25-27) from Jamaica and the Panamá Canal Zone; and *T. nanum* (Lea) (see Pilsbry, in Olsson and Harbison, 1953, pp. 416-417, pl. 52, figs. 1-1b) from the St. Mary's formation of Maryland. The late Miocene *T. caroniense* Maury is not to be confused with the earlier Miocene *T. caronensis* Mansfield although both of them are from Trinidad and are sculptured with microscopic spiral striae. Maury's *T. caroniense* has five whorls, Mansfield's *T. caronensis* 3-1/2, and the base of the former at the lower lip is concave, whereas on the latter it is evenly convex. Neither of them possesses the sulcus adjacent to the columella as does *T. antilleanum,* n. sp., although both of them do have fine spiral markings which are wanting on the Venezuelan species. *T. sandomingense* Maury is slightly carinate at the periphery, *T. antilleanum* is rounded. On *T. pycnum* Woodring, the ultimate whorl does not partially overlap the penultima as on *T. antilleanum,* nor is there on *T. pycnum* the sulcus that adjoins the columella as on *T. antilleanum.* The

sulcus is also wanting on *T. nanum* (Lea), the Maryland species also differing from *T. antilleanum* by its larger, more circular, and more neatly defined umbilical pad.

Vitrinella mareana, new species Pl. 9, figs. 3-6; Pl. 12, figs. 10-13

Shell minute, thin, subtranslucent, perforate, appressed naticoid. Whorls 2-1/2 in all, the nucleus merging imperceptibly into the conch, the initial whorl of the nucleus loosely coiled and convex, the periphery of the last post-nuclear whorl rather acutely rounded. The umbilicus proper is bounded by a sharp angulation, the whorl adjacent depressed into a partially encircling sulcus. In this narrow circumumbilicate depression there is a filament or two, the filaments as well as the depression itself becoming obsolescent upward. Adjoining and sunken below the outer sulcus is a moderately deep channel which issues from the deep and round perforation. Aperture suborbicular, the peristome thin. Outer lip joined to the whorl at nearly a right angle, the summit a little angulated by the slight shouldering of the last whorl. Columella slightly arcuate. Inner lip lamellar, raised and detached, reflected in part over the perforation (of the paratype), its enamel continuing to, and thickening somewhat on the parietal wall where it lies flat. Surface devoid of markings except for microscopic axial growth lineations.

Dimensions.—Holotype, diameter 0.6 mm.; altitude 0.4 mm.; paratype, diameter 0.5 mm.; altitude 0.3 mm.

Type locality.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. Two specimens, the holotype and the paratype.

Remarks.—This new species is characterized by its minute size and paucity of whorls. The specimens are believed to be nearly full grown.

Comparisons.—This species resembles somewhat *V. blakei* Rehder (1944, p. 97, pl. 9, figs. 1, 2) from the Pleistocene Talbot formation at Wailes Bluff, Maryland, but that has one whorl more than the Venezuelan shell, and bears "well-defined, short, axial wrinkles of varying length, running down from the suture, and stronger, more crowded ones around the deep narrow umbilicus."

Vitrinella (Striovitrinella) venezuelana, new species Pl. 12, figs. 14-16

Shell small, thin, semitransparent, discoidal, the apex rising but slightly above the summit of the body whorl. Apical surface flattish but modified by a rather broad shallow concavity adjacent to the suture at the summit of the post-nuclear whorls. Base with a large round deep umbilicus within which the margin of the whorls is exposed. Whorls a little over three in all, the smooth hyaline appressed nucleus consisting of about 1-1/2 of them, the initial loosely coiled, the last defined from the conch at the line where the spiral lineations make their first appearance. Post-nuclear whorls tubular, convex, the ultima acutely rounded. Suture of the post-nuclear whorls bordered by a low narrow ridge or collar, and between this and the upper convexity of the whorl there is a concave area about twice as wide as the subsutural cingulum. Surface marked with fine low revolving lirae of which there are about 20 on the body whorl from the summit to the entrance of the umbilicus which itself is surrounded by an area in which the spiral lineations are very fine and close together. On the upper surface of the body whorl the lirae are separated by wider interspaces than they are below. All of the lirae are minutely crenated by numerous microscopic axial growth striae. Aperture round within, but the outline of the peristome is obtusely diamond-shaped. The labral rim joins the whorl forward of the labial rim so that the face of the aperture is slanted. Outer lip thin, slightly expanded at the peripheral curvature, the lirations on the surface visible within the margin and producing a very faint fluted effect which continues some distance within the aperture. The rim of the outer lip is straight from the medial curvature to the summit where it joins the enamel of the parietal wall at a right angle. On the paratype this upper rim is delicately rolled or reflected, and, at the commissure, there is a small notch at the egress of the anal gutter. The thin inner lip merges arcuately with the thickened enamel of the parietal wall. The posterior outlet is represented by a simple, shallow gutter.

Dimensions.—Holotype, max. diameter 2.0 mm.; min. diameter 1.5 mm., altitude 0.8 mm., No. 26091 (figured); paratype, max. diameter 1.9 mm.; min. diameter 1.45 mm.; altitude 0.75 mm., No. 26399 (unfigured) PRI.

Type locality.—Mare formation near W-14, on hillside above west bank of Quebrada Mare Abajo. Three specimens.

Comparisons.—This elegant little vitrinellid reminds one of *Circulus domingensis* Pilsbry and Johnson (1917, p. 184; new name for *Cyclostrema striata* Gabb) from the Miocene of the Dominican Republic, but as shown in the illustrations by Pilsbry (1921, p. 397, pl. 37, figs. 6-7) *C. domingensis* may be differentiated from the new species by its somewhat more elevated spire and by the broadly ovate rather than diamond-shaped outline of the peristome. There is also a superficial resemblance between *V. venezuelana* and the Recent *Cyclostremiscus liratus* (Verrill) which is found in considerable numbers off Cape Hatteras, North Carolina, in 8-43 fathoms, and ranges from Long Island to Florida (see Bush, 1897, p. 125, pl. 23, figs. 7, 12a, 12b; and Pilsbry, in Olsson and Harbison, 1953, p. 430). This species is distinguished from *V. liratus,* however, by the concentric lirations on the base which are entirely wanting on that species. *V. venezuelana,* n. sp. may also be compared with *Ethalia multistriata* Verrill, a Recent form obtained in 142 fathoms off Cape Hatteras (see Bush, 1897, pp. 124-125, pl. 22, fig. 7; pl. 23, figs. 4, 14), the distinction between them being that the columellar margin of *E. multistriata* is considerably thickened and flattened whereas the entire peristome of *V. venezuelana* is thin. *Cyclostremiscus millepunctatus* Pilsbry and Olsson (1945, p. 274, pl. 29, figs. 4, 4a), a Recent species from Isla de Gallo, Colombia, has much the same general appearance as *V. venezuelana* but is a solider shell, with the peristome thickened at the columella, and with the surface punctated by minute pits. The closest of all the shells I have seen, however, is the Recent *V. elegans* Olsson and McGinty (1958, p. 31, pl. 3, figs. 1-1d) from Bocas Island on the Caribbean coast of Panamá. *V. elegans* is the type species of the subgenus *Striovitrinella* erected by Olsson and McGinty and is distinguished from our Venezuelan fossil only by its more numerous spiral threads.

"Circulus" duracinus, new species Pl. 12, figs. 17-19

Shell small, moderately solid, porcelaneous, discoidal, the spire flat. Whorls about 3-1/2 including the nucleus, the characters of which are blurred. Sutures fine, indistinct. Ultimate whorl sub-

rectangular, the periphery flattened, the shoulder subangulately rounded, the base of the periphery obtusely carinated or keeled. Umbilicus circular, funnel-shaped, the edges of the whorls visible, these seemingly devoid of markings. The base of the shell is obtusely ridged or subangulately inflated around the umbilicus but flattens out peripherally at the carina. Aperture more or less circular. Outer lip broken. Inner lip somewhat thickened. Surface smooth except for vague radial riblets on the slope of the circumumbilicate swelling near the inner lip.

Dimensions.—Holotype, diameter 1.7 mm.; max. altitude 0.8 mm.

Type locality.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. One specimen, the holotype.

Remarks.—Although the only example of this species is broken and worn, what there is of it is so unlike any of the *Vitrinellidae* I have seen, that I think it just as well to apply a specific name to it. Distinguishing features are the broad, nearly perfectly flat apical area or spire, the circular, funnel-shaped umbilicus in which the inner rim of the earlier whorls projects slightly, and the absence of ornamentation, a lack that may be due to weathering. Generically the shell seems referable to *Circulus* of Jeffreys as redefined by Bush (1897, p. 111) although some authorities might place it in *Ponocyclus* a subgenus of *Cyclostremiscus* erected by Pilsbry in 1953 (in Olsson and Harbison, pp. 426-427).*Ponocyclus* was proposed by Pilsbry to find a place for those species that have been referred to the genera *Adeorbis, Skenea, Cyclostrema, Circulus,* and *Lydiphnis* but do not agree fully enough with any of them to lead to concensus of usage.

Comparisons.—*"Circulus" duracinus,* n. sp. is somewhat reminiscent of *Solariorbis* ? nov. sp. ind. Rutsch (1943, pp. 127-128, pl. 4, figs. 4, 5) from the Springvale Miocene of Trinidad, but among other differences that shell is characterized by a crescent-shaped umbilicus in contrast with the circular one of the Venezuelan shell.

Cyclostromella venezuelana, new species — Pl. 9, figs. 7, 8; Pl. 12, figs. 20-22

Shell minute, thin, subtranslucent, planorbiform, not quite

symmetrically coiled, the apical surface slightly concave, the base openly umbilicate. Whorls about two in all, the subhyaline nucleus with 1-1/2 of them. Initial whorl of nucleus loosely coiled, the last convex, defined from the conch by a vague axial varix. Sutures finely impressed. Ultimate whorl acutely rounded at its early stage, but behind the outer lip it is carinated by three angulations, one near the summit of the whorl, another near the base, and the third at the periphery midway between the other two. On the base proper there is also a narrow subangulate swelling between the basal carina and the umbilicus, this too becoming a little more pronounced on the later stage of the whorl. In addition to the angulations, the last whorl is marked with rather widely spaced microscopic radii, these visible on the upper circumference under 20X magnification. Aperture subquadrate, the peristome thin, somewhat flared, continuous, rendered angulate by the external carinae. Umbilical depression of medium size, shallow, the earlier whorls exposed within.

Dimensions.—Holotype, diameter 0.4 mm.; altitude 0.2 mm.

Type locality.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. The single specimen is probably a juvenile.

Remarks.—This new species is tentatively referred to the genus *Cyclostromella* Bush (1897, pp. 140-141, pl. 22, figs. 8-8b) because of its nautilicone coiling and shallow umbilical cavity in which the preceding whorls are visible. The type species *C. humilis* Bush, a rather rare living shell obtained off Cape Hatteras, North Carolinia in 16 fathoms, is not carinate as is the Venezuelan fossil but is crossed by "several raised, unequally separated, spiral threads". This is the first report of the genus as a fossil from the southern Caribbean region.

Cyclostremiscus (Ponocyclus) maiquetiensis, new species
Pl. 9, figs. 9, 10; Pl. 13, figs. 1-3

Shell small, subdiscoidal, perforate, the spire only moderately elevated but rising rather abruptly and a little obliquely above the summit of the ultima, the tip of the spire obtuse. Whorls three in all, the nucleus forming two of them. Nuclear whorls smooth, inflated, the initial loosely coiled, the last defined from the conch by the appearance, at the summit of the first post-nuclear whorl, of a faint

angulation which later develops into the carina at the shoulder of the body whorl. Body whorl with three carinae, one at the shoulder, one at the base of the convexity, and one at the periphery midway between the other two, the middle and lower of these becoming keel-like toward the labrum. Above the shoulder angulation the whorl is slightly convex for about two-thirds the distance to the suture, and then is concave around the suture itself. Sutures finely impressed but distinct. Base moderately tumid, the umbilical opening round, of medium diameter, the interior plugged with sand. Aperture polygonally orbicular, the outer angulations formed by the carinae on the surface. Lips thin, the outer one joined to the parietal wall at a right angle between the periphery and shoulder of the whorl. Columellar margin excavated into an obtuse V, the angle of the V not quite encroaching on the edge of the umbilicus. Parietal wall enameled. Last whorl with an occasional excrescence due to growth irregularity, but otherwise the surface is smoothish.

Dimensions.—Holotype, diameter 0.75 mm.; altitude 0.45 mm.

Type locality.—Playa Grande formation (Maiquetía member) at W-4, Quebrada Las Pailas. One specimen, the holotype.

Comparisons.—This species resembles certain forms of *C. pentagonus* (Gabb) which has been reported from the Miocene of the Dominican Republic, Jamaica, and the Panamá Canal Zone. *C. pentagonus* is a highly variable shell but all specimens have a considerably wider umbilicus than our *C. maiquetiensis.* In other respects the Venezuelan species is nearer the Canal Zone *C. pentagonus* (see Woodring, 1958, pp. 73-75, pl. 17, figs. 7-15) than it is to the Jamaican *C. pentagonus* (see Woodring, 1958, pp. 441-442, pl. 37, figs. 16-18) which bears prominent spiral cords within the umbilical orifice. The same characters by which *C. maiquetiensis* is differentiated from *C. pentagonus* serve to distinguish the Venezuelan species from the Miocene to Recent *C. trilix* (Bush) (see Bush, 1885, p. 464, pl. 45, figs. 7, 7a; and Bush, 1897, p. 127, pl. 22, figs. 6, 10, 10a, 12a-g; pl. 23, figs. 10, 15). On *Circulus occidentalis* Pilsbry and Olsson (1941, p. 48, pl. 9, fig. 3) from the Pliocene of Ecuador, the peripheral carina is situated at the upper third of the whorl and emerges from the commissure, whereas on *C. maiquetiensis* the peripheral carina is situated at about the middle of the whorl. *C. tricarinata* (C. B. Adams) (see Pilsbry and Olsson, 1945, p. 271, pl. 28,

figs. 3-3b; and Turner, 1956, p. 93, pl. 16, figs. 3-3b), a Recent species from Panamá, is depressed into a shallow, dish-shaped shelf above the shoulder carina whereas on *C. maiquetiensis* the whorl above the posterior carina is first a little convex and then gently concave around the suture.

Cyclostremiscus salinensis, new species Pl. 13, figs. 4-6

Shell small, sturdy, ornate, depressed subglobose, the spire low and gently rounded, the apex obtuse. Whorls a little over three in all, the nuclear 1-1/2 smooth, the initial of these not tightly coiled, the last differentiated from the conch by the abrupt appearance of ornamentation. Sutures of the nucleus narrowly channeled, those of the conch finely impressed and indistinct. Body whorl wide and nearly flat-sided around the middle, the base gently convex, the ramp subtrapezoidal in outline. Sculpture consisting of varying sized spiral ridges and more numerous radial cords. The largest spiral is the moderately broad, subrounded to flattish ridge at the shoulder of the body whorl, this ridge faintly crenated by axial threads and, on the holotype, becoming dichotomous toward the labrum. Bordering the shoulder ridge above is a broad and moderately deep revolving channel. The slope of the whorl above the channel is slightly concave and is sculptured by relatively broad, tightly packed radial ribs often thickened in the long direction, and extending to, but not beyond, the narrow convex welt at the suture. Below the shoulder ridge there is another revolving channel, a little narrower than the excavation above the shoulder, followed by three nodulous or beaded cords of which the posteriormost is larger than the next two which are subequal. A little farther below is a strong but weakly crenated spiral rib, this forming, as it were, the heel of the circumference. Under the heel is a broad shallow revolving excavation whose anterior rim forms the margin of the convexity of the base. The basal convexity is sculptured by radial ribs or cords converging toward the umbilicus, these varying in number and size, with at least 12 large ones on the paratype and at least 24 small ones on the holotype. Aperture suborbicular. Columella concave. Parietal wall heavily callused, the callus extending to the summit of the outer lip, and along the columella to the lower lip where it wedges out.

On the holotype and one other specimen the callus is longitudinally sulcate or grooved a short distance from the columellar margin. Outer lip not thickened, the margin within faintly fluted, the rim scalloped from the external ribbing, the junction with the whorl marked by a simple, narrowish and shallow gutter. On the holotype the umbilical area is completely covered by a secondary growth of callus extending over it from the margin of the columella, the site of the umbilicus itself indicated by a groove in the callus; on the paratype the umbilicus is only partially covered by callus and is seen to be deep and moderately long; on the third specimen the umbilicus is wholly uncovered, and, emerging from the anterior end, there is a rather sharply margined, parallel-sided depression.

Dimensions.—Holotype, diameter 1.75 mm.; altitude 1.05 mm. No. 26397 (unfigured); paratype, diameter 1.05 mm.; altitude 0.95 mm. No. 26093 (figured).

Type locality.—La Salina, west of Puerto Cabello, State of Carabobo. Three specimens.

Remarks.—This species is quite unlike any other I have seen.

Cyclostremiscus caraboboensis, new species Pl. 13, figs. 7-9

Shell small, moderately sturdy, ornate, low conical, umbilicate. Whorls about 3-1/2 in all. Nucleus smooth, moderately convex, consisting of 1-1/2 whorls, the initial loosely coiled, the last differentiated from the conch by the appearance on the latter of an angulation at the shoulder and the occurrence of the first axial thread. On the ultimate whorl the shoulder angulation develops into a prominent dish-shaped shelf with a scalloped or nodulated rim. Around the periphery of the last whorl there is another strong, nodulated keel, the interspace between this and the shoulder carina broad and shallowly concave. A short distance below the peripheral keel is another fairly strong carina, the interspace about as deep but only half as wide as the one above. The sutures of the nucleus are distinct, but on the conch they are not visible. Umbilical perforation more or less ovate, the umbilical area semilunate, bounded by a crescentic trough with strong somewhat elevated margins, the anterior margin of the trough emerging from the umbilical perforation proper, the posterior margin terminating at the edge of the

parietal callus, the trough itself ornamented with about 16 radial cords or threads becoming obsolescent toward both extremities. Surface sculptured by strong axial costae and spiral threads, the latter sharper in the interspaces than on the crests of the costae. There are 24 or 26 axial costae on the last full whorl, the costae between the periphery and shoulder more or less of uniform width, the interspaces wider than the ribs themselves. The costae between the periphery and shoulder are much stronger than those between the shoulder and suture, but all of them are dulled and weakened at the carinae which are, however, rendered somewhat nodulous by them. Between the periphery and shoulder there are four raised spiral threads of about equal size, and these too are stronger than the several microscopic spirals above the shoulder. The axial costae and spiral threads in the furrow between the peripheral and basal keels are finer than those between the peripheral and shoulder keels but a little more pronounced than the ones above the shoulder. On the base there are about 20 radial costae between the basal carina and the circumumbilicate trough, these connected by submicroscopic spiral threads. Aperture orbicular, the peristome made continuous by merging with the callus on the parietal wall. Columellar margin evenly concave. Outer lip not thickened, slightly guttered at the commissure.

Dimensions.—Holotype, diameter 1.2 mm.; altitude 0.9 mm.

Type locality.—La Salina, west of Puerto Cabello, State of Carabobo. One specimen, the holotype.

Comparisons.—The nearest analogue is the Recent *C. balboa* Pilsbry and Olsson (1945, pp. 267-268, pl. 30, fig. 5) from the Pacific side of Panamá at Búcaru, Los Santos Peninsula. The two species are much alike, the main difference lying in the character of the ramp above the shoulder carina; on the Venezuelan fossil the ramp is horizontally dish-shaped whereas on *C. balboa* the ramp slopes upward to the suture. Also, on the base of the penultimate whorl of *C. caraboboensis* there is an incipient carina, this becoming the peripheral keel of the final whorl; on *C. balboa* this incipient carina seems to be absent.

Cyclostremiscus puntagordensis, new species Pl. 13, figs. 10-12

Shell small, moderately solid, discoidal, the apical area flattish,

but with the nucleus rising slightly above the level of the last whorl. Whorls 3-1/2 including the nucleus which is smooth, convex, and consists of about 1-1/2 volutions. Transition from nucleus to conch gradual. Except on the labrum, the body whorl is strongly tricarinate with one carina around the shoulder, one around the periphery, and one at the base, the spaces between them equal, concave, and nearly smooth. The middle carina weakens considerably as it approaches the outer lip where, on the holotype, it is hardly discernible. Above the upper carina, the last whorl is first somewhat concave near the margin, then rather strongly convex centrally, and again concave at the summit in front of the ridge which adjoins the sutural area. Under the lowest carina, the base of the last whorl is narrowly concave near the margin but swollen around the umbilicus, the swelling becoming higher and more regularly convex toward the labium. Umbilical orifice large, roundish, tapering upward to the apex, the lower margin of the penultimate whorl visible within, the lower wall of the orifice sheathed with a covering of enamel or callus which extends to the labial edge of the aperture. Aperture subcircular. The outer lip is thickened only at the summit, but the inner lip is moderately thick throughout. Parietal wall sheathed with callus which, at the commissure of the outer lip, is creased into a simple gutter. Upper surface of shell with fine flexuous lines of growth; under surface of the basal carina marked with low radial cords, these continuing with more prominence up the basal swelling, and then in lesser size down the wall of the umbilicus, although where the umbilical wall is veneered with callus, the radials are of course hidden.

Dimensions.—Holotype, diameter 1.4 mm.; altitude 0.9 mm.

Type locality.—Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. One specimen, the holotype.

Comparisons.—This new species is somewhat comparable to the Recent *C. colombianus* Pilsbry and Olsson (1945, pp. 273-274, pl. 26, figs. 7, 7a) from Isla de Gallo on the Pacific coast of Colombia, but is readily distinguished from that in many respects, one of the differences being that the base of the Venezuelan shell is marked with radial cords.

OTIOMYLLON, new genus

Type species, *Otiomyllon venezuelanum,* new species. Playa Grande formation (Maiquetía member).

Shell minute, solid, imperforate, depressed-naticoid. Whorls few, the spire hardly elevated, the apical area flattish, the protoconch not well differentiated. Aperture relatively large, subovate, the lips thickened. Outer lip a little swollen and widened at the top, the swelling disappearing below. Umbilical area callused, the callus convex upward, the far margin of the umbilical area marked with a narrow shallow groove. Surface of shell smooth and sculptureless.

The genus *Otiomyllon* is proposed for small, unsculptured, subnaticoid shells with a thickened peristome and an earlike broadening at the top of the outer lip. Tentatively it is placed in the family Vitrinellidae.

Otiomyllon venezuelanum, new genus new species Pl. 9, figs. 11, 12; Pl. 13, figs. 13, 14

Shell minute, solid, imperforate, subglobose, depressed naticoid, the spire scarcely elevated, the apex obtuse. Whorls 2-1/2, the nucleus simple and transitional with the conch, the last whorl large and well inflated, rather acutely rounded at the periphery, and with a narrow flattish area at the suture. Sutures fine but distinct. Surface smooth, devoid of markings. Aperture broadly ovate, the peristome thickened more or less evenly except at the top of the outer lip where it is expanded more than elsewhere, the oral surface of the expansion a little dimpled. The aperture is plugged with sand so that it cannot be determined whether the inner margin of the lips is smooth or denticulate. Umbilical area covered with a thickened plug of callus, the distal margin of the area with a shallow groove bordering the callus; on the far side of this groove there is a feeble angulation or cord which joins the lower lip a little above the curve with the basal lip. The posterior outlet is also obscured by adherent sand but it seems to be a narrow gutter.

Dimensions.—Holotype, altitude 0.45 mm.; max. diameter 0.55 mm.

Type locality.—Playa Grande formation (Maiquetía member) at W-4, Quebrada Las Pailas. One specimen, the holotype.

Remarks.—Otiomyllon venezuelanum, n. sp. is somewhat reminiscent of *Didianema tytha* Woodring (1928, p. 448, pl. 38, figs. 16-18) from the Bowden Miocene of Jamaica; *Dillwynella errata* Guppy (Guppy and Dall, 1896, p. 323, pl. 27, fig. 2) from the Miocene *Ditrupa* bed at Point-à-Pierre, Trinidad; and *Vitrinella regularis* C. B. Adams (see Turner, 1956, p. 81, pl. 16, figs. 2, 2a, 2b), a rare Recent form from the Pacific coast of Panamá. *O. venezuelanum* is smaller than *D. tytha,* the upper part of the outer lip is more expanded, and it seems to lack the opercular shelf along the inner lip of the Bowden species. The Trinidad shell, *Dillwynella errata,* has a broader and thinner basal lip than *O. venezuelanum.* The Panamanian shell, *Vitrinella regularis,* has a somewhat more elevated spire than *O. venezuelanum* and at least one more whorl.

TURRITELLIDAE

Turritella variegata (Linnaeus) Pl. 10, figs. 17-20

1758. *Turbo variegatus* Linnaeus, Syst. Nat. ed. 10, p. 767.
1780. *Turbo marmoratus* Chemnitz, Conchylien-Cabinet, vol. 4, p. 259, pl. 152, fig. 1422.
1822. *Turritella imbricata* (Linnaeus), Lamarck, An. sans Vert., vol. 7, p. 57.
1849. *Turritella imbricata* (Linnaeus), Reeve, Conch. Icon., vol. 5, pl. 5, sp. 19.
1864. *Turritella imbricata* (Linnaeus), Krebs, The West Indian Marine Shells, p. 46.
1864. *Turritella variegata* (Linnaeus), Krebs, The West Indian Marine Shells, p. 47.
1873. *Turritella imbricata* (Linnaeus), Kiener, Icon. Coq. Viv., Turbinacées, p. 11, pl. 9, fig. 2.
1878. *Turritella variegata* (Linnaeus), Mörch, Catalogue of West-India Shells, p. 9.
1878. *Turritella imbricata* (Linnaeus), Mörch, Catalogue of West-India Shells, p. 9.
1886. *Turritella variegata* (Linnaeus), Tryon, Man. Conch., vol. 8, p. 198, pl. 61, fig. 58.
1889. *Turritella imbricata* (Linnaeus), Lorié, Samml. Geol. Reichs-Mus. Leiden, ser. 2, vol. 1, pp. 130, 141 (part).
1889. *Turritella variegata* (Linnaeus), Dall, U. S. Nat. Mus., Bull. 37, p. 144.
1889. *Turritella variegata* (Linnaeus), Dall, Mus. Comp. Zool., Bull., vol. 18, p. 265.
1901. *Turritella variegata* (Linnaeus), Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, p. 429.
1922. *Turritella* (*Haustator*) *variegata* (Linnaeus), Maury, Bull. Amer. Paleont., vol. 9, No. 38, p. 134.
1926. *Turritella variegata* (Linnaeus), Hodson, Bull. Amer. Paleont., vol. 11, No. 45, p. 201, pl. 22, fig. 7.
1940. *Turritella variegata* (Linnaeus), Smith, World-wide Sea Shells, p. 2, fig. 447.

1941. *Turritella variegata* (Linnaeus), Merriam, Univ. California Publ. Dept. Geol. Sci., Bull., vol. 26, p. 51, pl. 38, figs. 3, 4.
1943. *Turritella variegata* (Linnaeus), Richards, Jour. Paleont., vol. 17, No. 1, p. 121.
1946. *Turritella variegata* (Linnaeus), Richards, Soc. Venezolana Cienc. Nat., Bol., vol. 6, No. 46, p. 306.
1952. *Turritella variegata* (Iinnaeus), ? Pulley, Texas Jour. Sci., vol. 4, No. 2, p. 171.
1954. *Turritella variegata* (Linnaeus), Abbott, American Seashells, p. 141, pl. 21i.
1958. *Turritella imbricata* (Linnaeus), Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, p. 65.

Referred to *T. variegata* (Linnaeus) are two broken specimens, one with the middle upper portion of the spire remaining, the other with but a portion of the base. The latter (Pl. 10, figs. 17, 18) has a well-defined suture, a subquadrate aperture that is glossy and white, and a subtruncate basal lip. It is sculptured by eight or nine faintly beaded spiral cords of different size and unequal spacing, with closely spaced secondary and tertiary threads between them, the threads minutely and feebly crenulated. The growth ridges are prominent, somewhat sigmoidal, with a growth-line angle of about 28 degrees. The color is brown, with irregular longitudinal strigations of light tan or straw, and spiral bars and flecks of chocolate. The early whorls of the second specimen (Pl. 10, figs. 19, 20) are carinate submedially, and thickened a little above the sutures which are so tight as to be indistinguishable. On later whorls, the carina disappears but the thickening immediately above the sutures persists, the sculpture consisting of four subequal to unequal, small, faintly beaded spiral cords with closely spaced interstitial threads and threadlets between. The shell is suffused with mauve, light brown, and gray-white. The angle of spire is 18 degrees.

Dimensions.—Figured specimen (B207a), length (2 lower whorls) 21 mm.; max. width 20.6 mm.; figured specimen (B207b), length (9 whorls) 24.8 mm.; max. width 8.9 mm.

Locality.—Recent, on beach southeast of Higuerote, State of Miranda. Two broken specimens.

Remarks.—According to Dall (1889, p. 265), *T. imbricata* (Linnaeus) is generally regarded as merely a variant of *T. variegata* (Linnaeus).

Range and distribution.—T. variegata (Linnaeus) is a Recent, Pleistocene, and possibly late Tertiary species. The Recent form is reported from the southern Caribbean and the West Indies. In the Pleistocene, it has been recorded from Louisiana in wells in Terrebonne Parish by Maury, from the "Koralenkalk" of the Island of Aruba, by Lorié, and from Margarita Island, Venezuela, in soft calcareous clays west of the town of Juan Griego (Richards, 1946). Elsewhere in Venezuela, the fossil *T. variegata* (Linnaeus) has been reported by Karsten (1886) from the "Tertiary, or perhaps Quaternary, at least in part . . . in the hills of San Antonio near Cumaná", and by Schepman ([in] Martin, 1888) at Cabo Blanco in what is now known as the Mare formation. I have examined these fossil specimens from both Cumaná and Cabo Blanco, and they are indeed the same, although, as will be pointed out in the following pages, the Cumaná and Cabo Blanco *Turritella* is not the true *variegata* of Linnaeus but a new species for which the name *T. maiquetiana* is proposed.

Turritella maiquetiana, new species Pl. 11, figs. 1-16

1886. *Turritella variegata* Karsten, Géologie de l'ancienne Colombia bolivarienne, Vénézuela, Nouvelle-Grénade et Ecuador, p. 9. Not of Linnaeus, 1758.
1888. *Turritella variegata* Schepman and *Turritella imbricata* Schepman, [in] Martin, Bericht über eine Reise nach Nederlandisch West-Indien und darauf gegründete Studien, Leiden. Pt. 2. Geologische Studien, Appendix. Not of Linnaeus, 1758.
1889. *Turritella imbricata* Lorié, Samml. Geol. Reichs-Mus. Leiden, ser. 2, vol. 1, pp. 130, 141. The Cabo Blanco reference is not of Linnaeus, 1758.

Shell moderately large, the angle of spire 11 to 13 degrees, the apex tapering a little more rapidly than the spire proper. Whorls about 18 including the nucleus. Nucleus consisting of nearly two smooth inflated whorls, the last defined from the conch by the appearance of a medial thread on the first post-nuclear whorl. The first post-nuclear whorl is angularly convex, the next several with a strong keel around the middle. These early whorls are sculptured by three spiral cords, the strongest forming the medial keel. On the slopes between the cords there are extremely fine spiral striae and somewhat coarser axial threads, the latter forming a chevron pattern as they diverge away from the keel. On the posterior third of the spire, the upper slope of the whorls is moderately steep, the side

below the keel somewhat concave. Throughout, the shell is crowded with spiral threads of several sizes, and there is a thickening of the whorl immediately above the suture. On the lower two-thirds of the spire, the medial keel becomes progressively obsolescent until it is reduced, on the last two whorls to a spiral of about the same strength as several other primary cords that have made their appearance. Also on the anterior portion of the spire, the thickening or swelling above the suture becomes more and more pronounced and is itself marked with larger and smaller spiral threads. The sides of the lower whorls may be slightly concave above the basal bulge, and the sutures, which are finely incised on the upper part of the spire may now be somewhat gaping. On the base of the last whorl there are a number of flat subequal spiral ridges, on and between which are finer spiral threads, these basal spirals normally covered by a smooth heavy sheath of callus. Aperture subquadrate, the interior usually completely smooth, but sometimes lined with narrow lirae. Basal whorls often with strong, somewhat sigmoidal growth ridges, the growth-line angle on large specimens being about 30-32 degrees. The holotype has light brown bands running parallel with the growth ridges on the body whorl.

Dimensions.—Holotype (I206a), length (nucleus decollate) 101 mm.; max. width 23 mm.

Type locality.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. 22 specimens, including the holotype.

Other localities.—Lower Mare formation, in small stream 100 meters west of Quebrada Mare Abajo. Fourteen specimens; Mare formation at W-14, on hillside above west bank of Quebrada Mare Abajo. Twenty-eight specimens; Mare formation at W-25, south flank of Punta Gorda anticline. Thirteen specimens; Mare formation, in stream 250 meters south-southwest of mouth of Quebrada Las Pailas. Three specimens; Upper Mare formation, 120 meters south-southwest of intersection of Quebrada Mare Abajo and coast road. One specimen; Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. Seven specimens; Playa Grande formation (Maiquetía member), at, south of, and southwest of W-4, Quebrada Las Pailas. Eighty-eight specimens plus

fragments; Playa Grande formation (Maiquetía member) at W-26, in Quebrada Las Bruscas, about 120 meters upstream from junction with Quebrada Las Pailas. Four specimens.

Remarks.—This is one of the commoner shells of the Cabo Blanco group, and there are certain extremely fine silty layers exposed in small tributaries of Quebrada Las Pailas that are crowded with this shell and no other. It is an extraordinarily variable shell, but all specimens are characterized by the medial keel on the early whorls, by the nearly square aperture, and by the remarkable constancy of its spire angle which is close to 13 degrees. The spiral markings vary in strength, thickness, and arrangement from specimen to specimen in one or another of the formations, but about the only discriminating feature I can detect is that the spiral threads on most specimens from the Mare formation stand out more sharply than they do on specimens from the Playa Grande formation. However, the diagnostic characteristics seem to be identical, and I believe, therefore, that all of the Turritellas of this category should be referred to the present species. The same shell occurs near Cumaná in the State of Sucre, and is contained in collections 18408 and 18410 of the United State National Museum.

Comparisons.—Inasmuch as they were collected from the same formation and at the same locality as our shell, there is little doubt that the specimens referred to as *T. variegata* (Linnaeus) and *T. imbricata* (Linnaeus) by Schepman ([in] Martin, 1888) are the same as the one I am naming *T. maiquetiana,* n. sp. It is true that *T. maiquetiana* is close to the Recent and Pleistocene *T. variegata* of Linnaeus, but there is also no doubt that the angle of spire of *T. variegata* is generally greater than that of *T. maiquetiana,* and that *T. variegata* invariably has a number of spiral cords that are not only broader than those of *T. maiquetiana* but are slightly beaded as well. I have seen no true beading on *T. maiquetiana* although the spiral cords are often rendered finely crenulate by the longitudinal growth striae. Occasional variants of *T. maiquetiana,* n. sp. exhibit a startling similarity to *T. mimetes* Brown and Pilsbry (1911, p. 357, pl. 27, fig. 1) from the Gatun formation and Chagres (?) sandstone of the Panamá Canal Zone, but in general there are more numerous spiral threads on *T. maiquetiana,* and their ar-

rangement is more haphazard. In the Miocene of northern Colombia, *T. lloydsmithi* Pilsbry and Brown (1917, p. 35, pl. 5, fig. 11) resembles some examples of *T. maiquetiana* from the Playa Grande formation, and *T. cartagenensis* Pilsbry and Brown (1917, pp. 34-35, pl. 5, fig. 13) is like examples of *T. maiquetiana* from the Mare formation. Both *T. lloydsmithi* and *T. cartagenensis* were described from specimens lacking the early whorls, and without these definitive comparisons cannot be made. However, it does seem that on the lower whorls of about the same size, the basal swelling on *T. maiquetiana* is more pronounced, and the whorl itself more concave than on *T. lloydsmithi,* and that the taper of the spire of *T. maiquetiana* is more acute than in *T. cartagenensis. T. planigyrata* Guppy (1867a, pp. 169-170; 1874, p. 408, pl. 18, fig. 5) from the middle to upper Miocene of Trinidad, and from Delta de Amacuro, Venezuela, (Hodson, 1926, pp. 199-200, pl. 19, figs. 2, 9) is distinguished from *T. maiquetiana* by its more rapidly tapering spire, with the angle about 21 degrees as compared with 13 degrees on the Cabo Blanco shell. Other Venezuelan forms that are much like certain variants of *T. maiquetiana,* n. sp. are the Miocene *T. berjadinensis* Hodson (1926) and its several subspecies, and the Quaternary *T. variegata paraguanensis* Hodson (1926, p. 201, pl. 21, figs. 2, 7), but the angle of spire on all of these with the exception of *T. berjadinensis* Hodson (1926, pl. 20, fig. 11), is considerably greater than that of *T. maiquetiana.* The same is true of *T. varicosta* Spieker (see Olsson, 1932, p. 199, pl. 22, fig. 5) from the Miocene of Peru. Some of the specimens of *T. maiquetiana* from the Mare formation also look like *T. pasada* Pilsbry and Olsson (1914, p. 42, pl. 11, figs. 3, 4) from the Pliocene Jama formation of Ecuador, but the Cabo Blanco shell has many more fine spiral threads than the Ecuadorian species. Among late Tertiary turritellas of the southeastern United States, *T. maiquetiana* is reminiscent of *T. duplinensis* Gardner and Aldrich (1919, p. 41, pl. 2, fig. 4) from the late Miocene of North Carolina, South Carolina, and Florida, and *T. pontoni* Mansfield (1931, pp. 6-7, pl. 2, figs. 4, 5, 7) from the late Miocene and Pliocene of Florida. *T. maiquetiana* is slightly more slender than *T. duplinensis,* and has a squarer aperture than that; it is considerably more slender than *T. pontoni,* although the early post-nuclear whorls of *T.*

pontoni are keeled in much the same manner as the Cabo Blanco shell.

Turritella species Pl. 12, fig. 1

Illustrated is the internal mold of the only *Turritella* collected in the Catia member of the Playa Grande formation. The sutures are deeply channeled, the whorls tabulate, the last one faintly marked with three minor spiral riblets of equal size near the base, with two slightly larger riblets at and just above the middle, and with a pair of riblets of intermediate size near the summit. The rock is a soft, fine-grained, slightly micaceous, calcareous sandstone.

Dimensions.—Figured specimen (2-1/2 whorls), length 26 mm.; max. width 15 mm.

Locality.—Playa Grande formation (Catia member), about 220 meters west of W-15 on south side of Playa Grande road. One specimen.

Springvaleia leroyi secunda, new subspecies Pl. 12, figs. 2-6

Shell turritelloid, generally thick, moderately slender, the angle of spire between 12 and 18 degrees. Extrapolating from the basal two whorls of the largest example, it is estimated that the adult may attain a length of 90 mm., and bear perhaps as many as 19 whorls in all. Whorls full and rounded below, flat-sided to slightly concave above. Sutures narrowly channeled, usually a little irregular, the sutural areas moderately deep. Immediately atop the suture, there is a slight thickening of the whorl, this forming the peripheral ridgelet of the ultima. Aperture oval in the early stages of growth, subquadrate on adults, the aperture of the latter lined with unequal revolving lirae which continue far within. Outer lip joined obtusely to the whorl, the basal lip subtruncate. Base short, flat to concave above the columella, slightly convex behind the lower lip, normally veneered with callus which extends to the perimeter but through which the larger spiral cords on the base are reflected. Surface covered with pits, indentations, and impressions marking the sites of small shells and rock fragments agglutinated to the shell during life. On one specimen there are imprints of *Crassinella-* and *Leda*-like bivalves, and on another, fragments and grains of "greenstone" are still embedded in the ropy and uneven surface.

Sculpture between the pits and on the base consists of low spiral cords or ridgelets and numerous fine spiral threads and striae frosted by fine axial growth lines. In addition there are low arcuate growth ridges, the growth-line angle in the neighborhood of 27 degrees, the ridges sometimes nodulated. On the base under the sheath of callus there are generally five nearly equal low crenulated spiral cords or ridges separated by slightly wider interspaces, both the ridges and interspaces marked with finer but distinct spiral threads, the whole crossed by fine growth wrinkles.

Dimensions.—Holotype (2 basal whorls), length 31.8 mm.; max. width 22.3 mm.; paratype (3 intermediate whorls), length 26.8 mm.; max. width 12.7 mm.

Type locality.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. Six specimens, including holotype and paratype.

Other localities.—Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. One specimen.

Remarks.—The first species of the agglutinating genus *Springvaleia* Rutsch was originally named by Guppy (1867, p. 168) as *Epitonium leroyi.* It is now known as *Springvaleia leroyi* (Guppy), and it occurs in the late Miocene Springvale deposits of Trinidad. Further studies of the Trinidad species were made by Maury (1925b, pp. 393-394, pl. 41, figs. 8, 11), Rutsch (1942, pp. 133-134, pl. 7, figs. 1a, 1b), and Woodring (1958, pp. 163-171, pl. 17). The Venezuelan shell is close to the type *leroyi,* and although it may eventually prove to be the same, in none of the descriptions, nor in any of the illustrations, nor on any of the specimens I have examined is the aperture of *E. leroyi* lirate as it is on the Venezuelan shell. Whether the presence or absence of lirations within the aperture is significant species-wise in this case I cannot say, but because all of the adult Venezuelan specimens are lirate and none of the Trinidad specimens is, and as the whorls of *E. leroyi, s.s.* are generally more rounded and the sutural areas more deeply excavated, it may be permissible to consider the Cabo Blanco form distinct from the Springvale one even though there can be no doubt of their intimate relationship. Dr. Wendell P. Woodring was kind enough to examine the Cabo Blanco shells, and although no direct opinion was vouchsafed, I

gathered the impression that he might be inclined to consider the Venezuelan species identical with the Trinidad one.

ARCHITECTONICIDAE

Architectonica nobilis Röding Pl. 13, figs. 15, 16

1781. *Trochus perspectivus* Linnaeus, Chemnitz, Conchylien-Cabinet, vol. 5, pp. 121-127 (part), pl. 172, figs. 1695, 1696.
1798. *Architectonica nobilis* "Bolten" Röding, Mus. Boltenianum, pt. 2, p. 78.
1822. *Solarium granulatum* Lamarck, An. sans Vert., vol 7, p. 3. Encycl. Méthodique, pl. 446, figs. 5a, b, 1792.
1839. *Solarium granulatum* Lamarck, Kiener, Icon. Coq. Viv., *Solarium,* p. 4, pl. 2, fig. 2.
1849. *Solarium verrucosum* Philippi, Zeitschr, f. Malakozool., yr. 5, p. 172, No. 53.
1853. *Solarium verrucosum* Philippi, Conchylien-Cabinet, vol. 2, pt. 7, p. 10, pl. 2, figs. 5, 6.
1857. *Architectonica perspectiva* (Linnaeus), Tuomey and Holmes, Pleiocene Fossils of South Carolina, p. 120, pl. 26, fig. 6.
1863. *Solarium nobile* (Bolten), Hanley [in] Sowerby, Thes. Conchyl, vol. 3, p. 230, pl. 253, fig. 35.
1864. *Solarium granulatum* Lamarck, Reeve, Conch. Icon., vol. 15, *Solarium,* pl. 2, sp. 7.
1864. *Solarium granulatum* Lamarck, Krebs, The West Indian Marine Shells, p. 63.
1878. *Architectonica nobilis* (Bolten), Mörch, Catalogue of West-India Shells, p. 7.
1881. *Architectonica granulata* (Lamarck), Gabb, Acad. Nat. Sci. Philadelphia, Jour., ser. 2, vol. 8, p. 359.
1887. *Solarium granulatum* Lamarck, Tryon, Man. Conch., vol. 9, p. 11, pl. 5, figs. 53, 54.
1889. *Solarium granulatum* Lamarck, Dall, U.S. Nat. Mus., Bull. 37, p. 232.
1891. *Solarium granulatum* Lamarck, Baker, Acad. Nat. Sci. Philadelphia, Proc., vol. 43, p. 54.
1892. *Solarium granulatum* Lamarck, Dall, Wagner Free Inst. Sci. Trans., vol. 3, pt. 2, p. 329.
1901. *Solarium nobile* Hanley, Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, pp. 431-432.
1906. *Solarium Villarelloi* Böse, Inst. Geol. Mexico, Bol., vol. 22, p. 30, pl. 3, figs. 4, 5. 10, 11,
1909. *Solarium gatunense* Toula, K.-k. Geol. Reichsanstalt Jahrb., vol. 58, p. 692, pl. 25, fig. 3.
1917. *Solarium granulatum* Lamarck, Maury, Bull. Amer. Paleont., vol. 5, No. 29, p. 295, pl. 23, fig. 3.
1919. *Architectonica gatunensis* (Toula), Cooke, U. S. Nat. Mus., Bull. 103, p. 588.
1922. *Architectonica granulata* (Lamarck), Maury, Bull. Amer. Paleont., vol. 9, No. 38, p. 138.
1922. *Architectonica granulata* (Lamarck), Olsson, Bull. Amer. Paleont., vol. 9, No. 39, p. 326, pl. 13, figs. 10-12.
1925. *Architectonica granulata* (Lamarck), Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 388, pl. 40, fig. 1.
1927. *Architectonica gatunensis* (Toula), Anderson, California Acad. Sci., Proc., vol. 16, No. 3, p. 89.

1927. *Architectonica granulata* (Lamarck), Hodson, Hodson, and Harris, Bull. Amer. Paleont., vol. 13, No. 49, p. 66, pl. 36, fig. 7.
1928. *Architectonica nobilis quadriseriata* Woodring (*non* Sowerby ?), Carnegie Inst. Washington, Pub. No. 385, pp. 354-355, pl. 27, figs. 5-7.
1929. *Architectonica granulata* (Lamarck), Clench, Nautilus, vol. 43, No. 1, p. 35.
1929. *Architectonica granulatum* (Lamarck), Weisbord, Bull. Amer. Paleont., vol. 14, No. 54, pp. 259-260, pl. 9, fig. 15.
1929. *Architectonica granulata* (Lamarck), Anderson, California Acad. Sci., Proc., 4th ser., vol. 18, p. 122.
1930. *Architectonica granulata* (Lamarck), Mansfield, Florida State Geol., Sur., Bull. No. 3, pp. 110-111, pl. 18, figs. 1, 2.
1931. *Architectonica nobilis* Röding, Grant and Gale, San Diego Soc. Nat. Hist., Mem., vol. 1, p. 785.
1934. *Architectonica nobilis* (Bolten) [Roeding], Rutsch, Schweiz. Palaeont. Gesell. Abh., vols. 54-55, pp. 42-44, pl. 1, figs. 5-7.
1935. *Solarium granulatum* Lamarck, Richards, Jour. Paleont., vol. 9, No. 3, p. 257.
1937. *Architectonica granulata* (Lamarck), Smith, East Coast Marine Shells, pp. 98-99, pl. 36, fig. 10; pl. 37, fig. 4.
1938. *Architectonica granulata* (Lamarck), Smith, Nautilus, vol. 51, No. 3, p. 91.
1939. *Architectonica granulata* (Lamarck), Oinomikado, Geol. Soc. Japan Jour., vol. 46, p. 620, pl. 29, (15), fig. 11.
1940. *Solarium nobilis* (Röding), Bayer, Zool. Mededeel., vol. 22, pp. 229-232.
1940. *Architectonica granulata* (Lamarck), Stenzel, Nautilus, vol. 54, no. 1, p. 20.
1941. *Architectonica granulata* (Lamarck), Pilsbry and Olsson, Acad. Nat. Sci. Philadelphia, Proc., vol. 93, p. 44.
1944. *Architectonica granulata* (Lamarck), Smith, Panamic Marine Shells, p. 15, fig. 166.
1947. *Architectonica nobilis* "Bolten" Roeding, Gardner, U. S. Geol. Surv. Prof. Paper 142-HH, p. 587.
1948. *Architectonica nobilis* "Bolten" Roeding, Gardner, U. S. Geol. Surv. Prof. Paper 199-B, pp. 199-200, pl. 24, figs. 9, 13.
1950. *Architectonica nobilis* (Bolten), Durham, Geol. Soc. Amer. Mem. 43, Pt. 2, pl. 124, pl. 34, figs. 5, 7
1951. *Architectonica nobilis* Röding, Marks, Bull. Amer. Paleont., vol. 33, No. 139, pp. 361-362.
1952. *Architectonica granulata* (Lamarck), Pulley, Texas Jour. Sci., vol. 4, No. 2, p. 172, pl. 1, figs. 12, 13.
1954. *Architectonica nobilis* Röding, Abbott, American Seashells, pp. 142-143, pl. 4m.
1955. *Architectonica nobilis* (Bolten), Hertlein and Strong, Am. Mus. Nat. Hist., Bull., vol. 107, art. 2, pp. 275-277.
1958. *Architectonica nobilis* Röding, Keen, Sea Shells of Tropical West America, pp. 292-293, fig. 191. The following species are placed in synonymy by Keen: *Solarium granulatum* Lamarck; *S. granosum* Valenciennes, 1832; *S. quadriceps* Hinds, 1844; *S. verrucosum* Philippi, 1849; *Architectonica valenciennesi* Mörch, 1860.
1958. *Architectonica nobilis* Röding, Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 12.
1958. *Architectonica nobile* Röding, Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, p. 65.
1959. *Architectonica nobilis* Röding, Nowell-Usticke, A check list of the Marine Shells of St. Croix, p. 36.

This sundial shell is well represented in the Cabo Blanco group and seems to vary no more from the living form than do the living ones among themselves. Many of the Cabo Blanco specimens still retain faintly the coloration of the shell which is an off-white or cream with lozenges of orange on the spiral rib just below the suture, and smaller paler ones aligned in a slanting column on succeeding spirals. The shell is circular, low conical, with a sharply rounded periphery and a flat to slightly convex base. The nucleus consists of one smooth, white, loosely coiled whorl, the tip of which is a little immersed. Post-nuclear whorls as many as eight, gently rounded, the early ones beaded from suture to suture, the later ones beaded above, crenate below, the body whorl finely crenate only, rendered so by numerous growth striae which traverse the whole of the conch. Whorls sculptured by four beaded spiral ribs, the two subequal middle ones closer together than the others, the uppermost one near the suture, the lowermost a short distance from the suture with a furrow below it. Sutures finely channeled, bordered immediately above by a narrow rib and then a narrow cord. The beads are elongated in the spiral direction, and in the intercostal areas there are closely spaced axial threads. Body whorl with four broad spiral ribs and a sharply rounded keel above which is a somewhat sunken interstitial spiral cord. Microscopic spiral threads are often present on the ribs and in the interspaces of the body whorl. Umbilicus round, deep, the edges of the preceding whorls visible within, the umbilicus fringed by a wide, heavily denticulate band bearing as many as 13 elevated plaits. Outward from the umbilical band there are flat, beaded, spiral ribs of equal size, the innermost of these separated from the umbilical band by a deep groove, the interspace between the first and second rib wider than that between the second and third. Adjoining the third rib is a plain flat band, broader than any on the whole shell, this succeeded by a raised beaded cord, then a narrow plain sunken interstitial cord which disappears within the aperture, and finally the rounded keel. Axial growth striae and laminae are numerous and prominent on the base, particularly in the intercostal areas. Aperture subrectangular. Siphonal canal a deep groove at the base of inner lip, the termination of the groove expanded into a chamber which is notched into the extremity of the umbilical band, the

chamber bordered by the deep channel encircling the umbilical band. Inner lip above canal fluted as is the inner margin of the basal lip below the canal. Commissure shallowly grooved.

Dimensions.—Figured specimen, diameter 29.2 mm.; altitude 17.4 mm. Largest specimen, diameter 41.9 mm.; altitude 23.9 mm.

Localities.—Playa Grande formation (Maiquetía member) at W-4, Quebrada Las Pailas. four specimens; Playa Grande formation (Maiquetía member) at W-26, in Quebrada Las Bruscas about 125 meters upstream from mouth of Quebrada Las Pailas. One specimen; Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. One specimen; Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. Sixteen specimens; Lower Mare formation, in small stream 100 meters west of Quebrada Mare Abajo. thirteen specimens; Mare formation at W-25, south flank of Punta Gorda anticline. Two specimens,; Mare formation at W-14, on hillside above west bank of Quebrada Mare Abajo. Nine specimens; Mare formation, in stream 250 meters south-southwest of mouth of Quebrada Las Pailas. Six specimens.

Range and distribution.—*A. nobilis* Röding ranges from lower Miocene to Recent. The living shell is found in the Western Atlantic from North Carolina to northern South America, and in the Eastern Pacific from Baja California to Peru. In the Western Atlantic it is moderately common in sand below low-water line, and is recorded to depths of 54 fathoms. In the Eastern Pacific it occurs on tide flats and to depths of 20 fathoms. The species has been reported as a fossil from the following localities:

Pleistocene—California; Louisiana; South Carolina; Cuba.

Pliocene—Costa Rica; Ecuador.

Pliocene or Upper Miocene—Venezuela.

Upper Miocene—Texas (Galveston well at 2158-2871 feet); North Carolina; South Carolina; Florida; Venezuela; Trinidad.

Middle Miocene—Mexico; Costa Rica; Panamá; Colombia; Ecuador; Venezeula; Dominican Republic; Jamaica.

Lower Miocene; Ecuador; Venezeula.

VERMETIDAE

Serpulorbis catella, new species Pl. 13, figs. 17, 18

Shell small, tubular, loosely looped, sometimes a little twisted, the tube subcircular to subelliptical in cross section. The tube is adherent throughout its length, the attached or inferior surface flattened to slightly concave. Interior of tube smooth, the exterior sculptured by longitudinal riblets between which are short, horizontal, closely spaced slots or pits so arrayed as to impart a reticulate and chainlike appearance. There are about nine longitudinal riblets, one of them along the middle of the upper surface of the tube being somewhat larger than the others. The smaller riblets are disposed more or less equally around the circumfrence, are rather sharp, and may have a low secondary thread between them.

Dimensions.—Holotype, length of fragment 2.9 mm.; diameter of larger end of tube 0.6 mm.

Type locality.—Abisinia formation at W-30, eastern edge of Playa Grande village. The holotype was removed from a pelecypod to which it was adherent.

Other localities.—Mare formation W-14, on hillside above west bank of Quebrada Mare Abajo. Six fragments.

Recent, on beach of Playa Grande Yachting Club, Distrito Federal. Examples are fairly common, and have been found attached to the following gastropods among others: *Nitidella nitida* (Lamarck); *Nitidella laevigata* (Linnaeus); *Cheilea equestris* (Linnaeus); *Capulus intortus* (Lamarck); *Hipponix antiquatus* (Linnaeus);*Ancilla tankervillei* (Swainson); *Pisania pusio* (Linnaeus); *Conus mus* Hwass; *Thais rustica* (Lamarck).

Remarks.—As indicated above, this vermetid occurs in both the fossil and Recent faunal assemblages of the Cabo Blanco area. Since it is not uncommon in the Recent fauna one would presume that the species is known, although I have been unable to track it down. There is a remote possibility that the shell is one of the numerous variations of *Petaloconchus varians* (d'Orbigny) described by Mörch (1861, Zool. Soc. London Proc., pp. 339-341), but these are not illustrated and there is nothing in the brief descriptions to suggest similarity. The present shell does not seem the same as the

S. varians illustrated by D'Orbigny (1841, Voy. Amer. Mérid., pp. 456-457, pl. 54, figs. 7-10) as that lacks the true slots or pits that characterize *S. catella,* n. sp., and, according to Tryon (1886, Man. Conch., vol. 8, p. 70), Mörch's varietal forms (*carpenteri, occlusa, monile, electrina, badia, candidissima, perlata,* and *costata*), are "scarcely of sufficient proportions to justify separate headings and descriptions." In ornamentation *S. catella* is somewhat like the Pliocene to Recent *Petaloconchus irregularis* (d'Orbigny) (1842, p. 235, pl. 17, figs. 16, 18) and the Miocene to Recent *P. floridana* Olsson and Harbison (1953, p. 304, pl. 46, figs. 2, 2a), but those, though reticulate are not slotted, and are tightly coiled rather than loosely looped.

Serpulorbis birugosus, new species Pl. 14, figs. 8, 9

Shell a long, narrow, gradually enlarging tube randomly looped and coiled, but not twisted, the annulus subcircular, the walls smooth within, the under side of the tube flattened by attachment to other objects, the lateral and upper surfaces modified a little if in contact with other loops. The margins of the flat inferior side are sharply edged or carinate, the edges themselves adherent and often extending out a short distance as a flat rim on the attached surface. Superior side with two coarse, unequal longitudinal rugae or ridges so situated that one of them is a little nearer the side of the tube than the other. Between, and crossing the longitudinal rugae on the superior surface there are numerous transverse threads, these imparting to the rugae a ropy structure at the crest. The early stage of the tube is whitish, the later stage darker in shade.

Dimensions.—Holotype, diameter of larger end of tube 0.75 mm.; length of specimen figured 6.5 mm.

Type locality.—Recent, on beach of Playa Grande Yachting Club, Distrito Federal. The holotype is attached to the interior of *Crucibulum auricula* Gmelin.

Remarks.—This often occurs together with the preceding species, *S. catella,* n. sp., the tubes not infrequently lying side by side and sometimes intertwined. Like *S. catella,* the new *S. birugosus* is found adherent on different species of Mollusca.

Comparisons.—Although I have not seen the earliest growth

stage of the tube, I believe it is not turritelloid as in the genus *Vermicularia*. The later section of the tube is not to be confused with the upper Miocene to Recent *Vermicularia spirata* Philippi (1836, Archiv für Naturgeschichte, p. 224, pl. 7, figs. 1-1c) which, in addition to being coiled and looped, is twisted, has smaller longitudinal threads parallel with the major cords, and does not have the flat inferior surface of attachment. These same differences apply to the Recent *V. knorri* Deshayes and *V. fargoi* Olsson (see Abbott, 1954b, p. 145, pls. 21a, 21b).

Serpulorbis cf. papulosus (Guppy) Pl. 13, figs. 19, 20

1866. *Vermetus papulosus* Guppy, Geol. Soc. London Quart. Jour., vol. 22, p. 292, pl. 17, fig. 3.
1867. *Vermetus papulosus* Guppy, Sci. Assoc. Trinidad Proc., pt. 3, p. 156.
1873. *Petaloconchus sculpturatus* Lea, Gabb, Am. Philos. Soc., Trans., vol. 15, pp. 240-241. Not of Lea 1846.
1876. *Vermetus papulosus* Guppy, Geol. Soc. London Quart. Jour., vol. 32, p. 519.
1903. *Serpulorbis papulosus* (Guppy), Dall, Wagner Free Inst. Sci., Trans., vol. 3, pt. 6, p. 1585.
1917. *Serpulorbis papulosa* (Guppy), Maury, Bull. Amer. Paleont., vol. 5, No. 29, pp. 291-292, pl. 22, fig. 10.
1921. *Serpulorbis papulosus* (Guppy), Pilsbry, Acad. Nat. Sci. Philadelphia, Proc., vol. 73, p. 376.
1922. *Serpulorbis papulosa* (Guppy), Olsson, Bull. Amer. Paleont., vol. 9, No. 39, pp. 317-318, pl. 12, fig. 1.
1925. *Serpulorbis papulosa* (Guppy), Maury, Bull. Amer. Paleont., vol. 10, No. 42, pp. 377-378.
1927. *Serpulorbis papulosa* (Guppy), Anderson, California Acad. Sci., Proc., ser. 4, vol. 16, No. 3, p. 89.
1928. *Lemintina papulosa* (Guppy), Woodring, Carnegie Inst. Washington, Publ. No. 385, pp. 346-347, pl. 26, fig. 6.
1929. *Serpulorbis papulosa* (Guppy) ?, Weisbord, Bull. Amer. Paleont., vol. 14, No. 54, pp. 267-268, pl. 8, fig. 13.
1929. *Serpulorbis papulosa* (Guppy), Anderson, California Acad. Sci., Proc., ser. 4, vol. 18, No. 4, p. 144.
1934. *Vermetus* (*Lemintina*) *papulosus* Guppy, Rutsch, Schweizer Palaeont. Gesell. Abh., vols. 54-55, pp. 46-47, pl. 1, fig. 14; pl. 2, fig. 1; text fig. 6.
1947. *Lemintina papulosa* (Guppy), Gardner, U. S. Geol. Sur., Prof. Paper 142-H, p. 585, pl. 55, fig. 20.
1948. *Lemintina papulosa* (Guppy), Aguayo, Soc. Mala. "Carlos de La Torre" Rev., vol. 6, No. 2, p. 62.
1959. *Serpulorbis papulosus* (Guppy), Woodring, U. S. Geol. Sur., Prof. Paper 306-B, p. 161, pl. 29, fig. 13.

Shell a slightly curved tube, constricted in places, subcircular in cross section, the walls relatively thick, smooth within. Surface sculptured by longitudinal, crenulated to nodular cords and threads, and numerous irregular concentric growth ridges. The primary cords

are subequally to unequally spaced and bear the largest nodules. In the interspaces of the primary cords there is generally a smaller secondary cord, and on either side of the secondary there is a still smaller tertiary thread also crenulated. Where the tube is constricted, the primary cords are closer together and sometimes contiguous, one or more of the intermediaries playing out before reaching the constricted area. The normal pattern, however, is for every fourth cord to be the largest. Locally, the tube is coarsely shagreened by closely spaced pustulations, and on one side there are irregular swollen concentric undulations.

Dimensions.—Length of tube 13 mm.; diameter of larger end 4.7 mm.

Locality.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. One specimen.

Comparisons.—The Cabo Blanco shell is more closely and less regularly tuberculate than the typical *S. papulosus* from Jamaica (see Woodring, 1928), but there is enough similarity to suggest a close relationship. Of the variety of shells referred to *S. papulosus* the present one is nearest that of Rutsch (1934) from the upper Miocene-Pliocene beds at Punta Gavilan, Venezuela, and that of Gardner (1947) from the Miocene Shoal River formation of Florida. Certain forms of *S. papulosus* resemble *S. granifera* (Say) (1824, p. 154, pl. 8, fig. 4) and *S. decussata* (Gmelin) (1791, Syst. Nat., ed. 13, p. 3745). *S. granifera* is widely distributed in the Miocene along the east coast of the United States from New Jersey to Florida, and is reported by Maury (1917, p. 291, pl. 22, fig. 9) from the Dominican Republic. It is characterized by alternating larger and smaller granulose cords, and by "numerous little pouches, concave anteriorly, set into the tube at right angles to the axis" (Gardner, 1948, p. 201). The interior of the tube of *S. papulosus* is smooth, and the external cords, unlike those of *S. granifera,* are usually pustulose or tuberculate. The Miocene to Recent *S. decussata* also lacks the swellings or tubercles.

Range and distribution.—Serpulorbis papulosus (Guppy) has been reported from lower-middle Miocene to Pliocene, and from the following countries:

Lower-middle Miocene (Brasso formation) of Trinidad.

Middle Miocene in Colombia, the Panamá Canal Zone, the Dominican Republic, Cuba, Jamaica, and the State of Florida, U.S.A.

Upper Miocene of Trinidad.

Upper Miocene-Pliocene of Venezuela.

Serpulorbis incomptus, new species Pl. 14, figs. 1-4

Shell an irregularly looped or coiled tube, sometimes twisted, roughly subcircular in cross section. Walls moderately thin to moderately thick, the attached surface flattened or concave. Interior smooth, exterior marked with numerous, occasionally scabrous concentric lamellae and a few concentric growth ridges, some of the tubes also bearing low longitudinal cords which are relatively widely spaced. A number of specimens, especially from the type locality, have a greater or lesser amount of sand adhering to them, and this, together with some irregular pits and depressions on the surface indicate that in life the form possessed an agglutinating property.

Dimensions.—Holotype (I79a), diameter of tube 0.7 mm.; distance across ends of loop 2.9 mm.; paratype (I79b), diameter of tube 0.95 mm.; distance across loop from short end 2.3 mm.

Type locality.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. Seven specimens.

Other localities.—Lower Mare formation, in small stream 100 meters west of Quebrada Mare Abajo. Two specimens; Mare formation at W-14, on hillside above west bank of Quebrada Mare Abajo. Two specimens; Mare formation at W-25, south flank of Punta Gorda anticline. Three specimens, one of them referred to this species with doubt; Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. One specimen.

Remarks.—The agglutination of sand to the shell is reminiscent of the coating of certain arenaceous Foraminifera. The superior surface of the holotype of *S. incomptus* is embedded with numerous grains of sand whereas most of the other specimens have but few of them.

Serpulorbis aff. conicus (Dillwyn) Pl. 14, figs. 5, 6

1815. *Serpula conica* Dillwyn, Descriptive Catalogue of Recent Shells, vol. 2, p. 1078.
1861. *Vermetus conicus* (Dillwyn), Mörch, Zool. Soc. London Proc., pp. 341-343.

1878. *Vermetus conicus* (Dillwyn), Mörch, Catalogue of West-India Shells, p. 10.
1886. *Vermetus conicus* (Dillwyn), Tryon, Man. Conch., vol. 8, p. 170, pl. 49, fig. 24.

Shell tubular, erratically looped and coiled, subcircular to suboval in cross section, the inferior side flattened from attachment. Interior of tube smooth, the exterior marked with closely spaced scabrous concentric lamellae or with numerous to relatively few low annulations and rugae, some specimens also with broad low longitudinal swellings or ridges.

Dimensions.—Figured specimen, with sharp concentric lamellae, max. diameter of tube 1.5 mm.; distance across the ends of the tube 4.8 mm.

Localities.—Playa Grande formation (Catia member), on dip slope at W-22, about 100 meters west of Costa fault. Four fragments; Playa Grande formation (Catia member), south side of Playa Grande road, 40 meters southeast of its intersection with the Playa Grande Yachting Club road. Four fragments; Playa Grande formation (Catia member), in stream flowing along the strike of the north flank of the Litoral anticline. One specimen, the identification doubtful; Playa Grande formation (Catia member), south side of coast road at east end of village of Catia La Mar. Nineteen fragments.

Remarks.—Our figured specimen with the sharp concentric lamellae is virtually identical to specimen No. 87976 in the Academy of Natural Sciences of Philadelphia labeled *Vermetus conicus* Dillwyn, H. A. Pilsbry '04, from the east side of Matanzas Bay, Cuba. Typically, if it can be said that any of the Vermetidae have a "typical" surface ornamentation, *V. conicus, s.s.* is sculptured by prominent longitudinal ridglets which are lacking on Pilsbry's *conicus* and on most of our Venezuelan specimens. Our form may be the one described by Mörch (1861, pp. 341-342) as *Vermetus conicus* Dillwyn var. *personatus* as that is characterized by strong concentric lamellae and obsolete longitudinal lirae, but not having seen an illustration of *S. personatus*, perhaps it is just as well to call attention to the affinity of our Venezuelan fossil with the *S. conicus* clan and leave it at that.

Range and distribution.—The Recent *S. conicus* is West Indian in habitat.

Serpulorbis pallidus, new species Pl. 14, fig. 7

Shell a coiled, slightly twisted, narrowish tube, rudely subcircular in cross section, the interior smooth, the outer surface a little gnarled or constricted here and there, marked with numerous but exceedingly faint concentric striations and occasional fine concentric growth rifts.

Dimensions.—Holotype, diameter of tube 0.35 mm.; length of specimen 2.6 mm.

Type locality.—Playa Grande formation (Catia member), south side of Playa Grande road, 40 meters southeast of its intersection with the Playa Grande Yachting Club road. One specimen, the holotype, on which the outer coating of the shell is partially peeled away in places.

Other localities.—Mare formation near W-14, on hillside above west bank of Quebrada Mare Abajo. A single thick-walled tube of small diameter is dobutfully identified as this species.

Comparisons.—It is difficult to differentiate this shell from *Petaloconchus ? collazoensis* Hubbard (1920, p. 140, pl. 21, fig. 16) which occurs in the Oligocene San Sebastian formation of Puerto Rico. However, judging from Hubbard's illustration of *S. collazoensis,* it would seem that the Puerto Rican tube is nearly circular in cross section whereas the Venezuelan shell is subcircular. The Miocene *S. virginicus* (Conrad) (see Gardner, 1948, p. 202, pl. 24, fig. 12), from Virginia and Maryland, is more readily distinguished from *S. pallidus* by its rather prominent concentric wrinkles.

CAECIDAE

Caecum (Caecum) regulare Carpenter Pl. 14, figs. 10, 11

1858. *Caecum regulare* Carpenter, Zool. Soc. London Proc., vol. 26, p. 428, sp. 22.
1886. *Caecum regulare* Carpenter, de Folin, Voyage H.M.S. Challenger-Zoology, vol. 15, Appendix B, p. 687.
1892. *Caecum regulare* Carpenter, Dall, Wagner Free Inst. Sci., Trans., vol. 3, pt. 2, p. 299.
1904. *Caecum regulare* Carpenter, Clessin, Conchylien-Cabinet, vol. 6, pt. 6, p. 24.
1930. *Caecum regulare* Carpenter, Mansfield, Florida Geol. Sur., Bull. No. 3, p. 102, pl. 14, fig. 5.
1948. *Caecum regulare* Carpenter, Gardner, U.S. Geol. Sur., Prof. Paper 199-B, pt. 2, p. 203, pl. 28, fig. 18.
1953. *Caecum (Caecum) regulare* Carpenter, Olsson and Harbison, Acad. Nat. Sci. Philadelphia, Mon. No. 8, p. 317, pl. 45, figs. 2a-2c.

Venezuelan shell a small, moderately slender, gently curved tube

expanding slightly toward the anterior extremity. Posterior extremity closed with a blunt-tipped emergent plug or a septum partially depressed into the tube. Protruding somewhat obliquely from the septum beyond the edge of the posterior lip is a short, pointed triangular mucro situated near the margin of the convex side of the whorl. Tube annulated with 22 to 28 moderately strong, smooth, rounded concentric ribs, the smooth interspaces generally about as wide as the ribs themselves. The ribs are about the same in width except near the aperture where they may be slightly larger. Aperture circular, the outer margin generally somewhat beveled, the sides of the beveled area sloping forward. A little posterior to the aperture, mature tubes may be constricted by a strong circular depression, the ribs near this groove often somewhat irregular.

Dimensions.—Average adult, length of chord between shortest extremities of tube 1.8 mm.; diameter at aperture 0.6 mm.

Locality.—La Salina, west of Puerto Cabello, State of Carabobo. Twelve specimens.

Comparison.—I am unable to detect any significant difference between these specimens and *C. regulare* as described and illustrated by Olsson and Harbison, although certain forms of *C. regulare* are a trifle stouter than the Venezuelan shell. *C. pulchellum* Stimpson (1851, Shells of New England, p. 36, pl. 2, fig. 3), which is living from Cape Cod to the West Indies in 1 to 52 fathoms, and has been reported from the Pleistocene of Louisiana by Maury (1922, p. 131) and from the Pliocene at Matura Bay, Trinidad by Guppy (1864a, p. 35), is also close to *C. regulare*. *C. pulchellum* is distinguished from *C. regulare* by its somewhat grubbier shape and by the slightly broader and more closely spaced annulations. *C. patuxentium* Martin (1904, p. 231, pl. 55, figs. 11, 12) from the Miocene Choptank formation of Maryland has narrower and more numerous annulations than *C. regulare* although otherwise the general appearance is the same. *C. properegulare* Mansfield (1925, p. 50, pl. 8, fig. 6) from the lower-middle Miocene of Trinidad, is still another species akin to *C. regulare* but is differentiated from *C. regulare* by its lower and broader annulations.

Range and distribution.—*Caecum regulare* Carpenter has been reported from the following localities:

Upper Miocene—Yorktown formation, North Carolina. Choctawhatchee formation, Florida.

Pliocene—Waccamaw formation, North Carolina. Caloosahatchee marl, Florida.

Recent—Florida to Brazil (off Pernambuco in red mud at 350 fathoms).

Caecum (Caecum) marense, new species Pl. 14, fig. 12

Shell a small, shiny, gently tapering tube which expands gradually toward the anterior extremity. The anterior end of the single specimen is missing so that the curve of the extant portion of the tube is gentle and perhaps less than it is on the complete shell. The tube is annulated with smooth, narrow, strongly elevated concentric ribs which are about the same width as the deep interspaces on the concave side, but are considerably narrower than the interspaces on the convex side. There are 14 such ribs on the holotype, but there must be several more on a whole individual. The interspaces are smooth, although under certain light and high magnification there seem to be some transverse striae in some of them. Posterior extremity closed with a somewhat convex septum from which protrudes obliquely a short, pointed mucro extending slightly beyond the margin of the posterior lip on the convex side. Aperture circular, entire.

Dimensions.—Holotype, length of chord between shortest extremities of tube (not complete) 1.3 mm.; max. diameter 0.4 mm.

Type locality.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. One incomplete specimen, the holotype.

Comparisons.—This species is like the preceding *C. regulare* Carpenter but may be distinguished from that by its fewer, narrower, and more strongly elevated ribs. *C. marense* is nearly identical with the Recent *C. tornatum* Verrill and Bush (1900, p. 537, pl. 65, fig. 1) from Bermuda, but as stated by Verrill and Bush, and confirmed by comparison with *C. tornatum* in the collection at the Museum of Comparative Zoology, the ribs of their species are subacute, whereas those of *C. marense,* though narrow, are rounded at the crest. Furthermore, the curvature of the tube of *C. tornatum* appears to be greater per unit of length than that of the Venezuelan fossil. *C. marense,* n. sp. is also closely related to an unnamed species of *Caecum,* No. 83180, in the Aldrich Collection at the United States National Museum, obtained in 16 fathoms of Cárdenas, Cuba. There

are 10 specimens of the U.S.N.M. form mounted on a card, the six larger ones of which are virtually identical to *C. marense* except for their slightly more acute annulations.

Caecum (Caecum) puntagordanum, new species Pl. 14, figs. 13, 14

Shell a small, gently arcuate, moderately slender tube expanding slightly and gradually toward the anterior extremity. Circumference annulated with low broad ribs which are traversed by longitudinal threads. Most of the ribs, probably numbering in the twenties on complete specimens, are of about the same width, but the terminal one forming the posterior lip is wider than the others and slopes toward the opening. All of the ribs are wider than the interspaces, the interspaces on the concave or ventral side of the tube being reduced to narrow grooves. The longitudinal threads are much finer but more numerous than the annulations, and cross both the interspaces and ribs, in places forming narrow nodulations on the ribs. The threads are subequal in size and there are 40 or more of them on the holotype; on the paratype smaller interstitial threadlets or striae occur in places between the primary ones. Posterior extremity closed with a septum depressed within the tube. Projecting from the septum is a sharp, flattened, nearly erect mucro extending well above the margin on the convex side of the tube. Aperture missing, but the tube itself is circular in cross section.

Dimensions.—Holotype (aperture missing), length of chord between shortest extremities of tube 1.7 mm.; max. diameter 0.7 mm.; paratype (extremities broken away), length of chord between shortest extremities of tube 1.9 mm.; max. diameter 0.8 mm.

Type locality.—Mare formation at W-25, south flank of Punta Gorda anticline. One specimen, the holotype.

Other localities.—Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. One specimen, the paratype.

Comparisons.—*C. puntagordanum,* n. sp. is close to the Miocene to Recent *C. floridanum* Stimpson (1851, p. 112), the main difference being that the longitudinal threads are more strongly pronounced on the Venezuelan species. The longitudinal striations on *C. floridanum* are faint and more or less fortuitous (See Gardner, 1948, p. 203, pl. 28, fig. 27; Olsson and Harbison, 1953, pp. 317-318, pl. 45,

figs. 1-1c) whereas on *C. puntagordanum* they are developed to the extent that the subgenus *Elephantellum* is distantly approached. The late Miocene to Recent *C. imbricatum* Carpenter as described and illustrated by Olsson and Harbison (1953, pp. 318-319, pl. 45, figs. 4-4b) is differentiated from *C. puntagordanum* by its fewer (12-14) and much stronger longitudinal ribs which impart a polygonal cross section to the tube. In some respects the new species is similar to *C. crassicostum* Gabb (1881, p. 363, pl. 46, fig. 58) from the Pliocene of Costa Rica, but on *C. crassicostum* the longitudinal threads or striae are confined to the interspaces of the annular ribs and do not rise above them. The Pliocene *C. crassicostum* was thought by Dall (1892, p. 297) to be the adult form of Gabb's *annulatum* from the Miocene of the Dominican Republic, and had this to say about it: "*C. annulatum* Emmons (*non* Brown) from the Newer Miocene of North Carolina, is *C. floridanum* Stimpson; *C. annulatum* Gabb (Geol. St. Domingo, 1873, p. 241; Jour. Acad. Nat. Sci., 2d Series, VIII, p. 363, pl. 46, fig. 59, 1874), *non* Brown *nec* Emmons, appears to be a good species, but the figured type seems to be the second stage of what in the adult condition Gabb has named and figured (*op. cit.* f. 58) as *C. crassicostum,* which name, as *annulatum* is preoccupied, may be kept for the species. The original form came from the Miocene of Santo Dominga and the adult from the Pliocene of Costa Rica". The new species, *C. puntagordanum,* is nearer Gabb's *C. crassicostum* than it is to his *C. annulatum* but is not identical with either. Gabb's *C. annulatum* was re-named *C. anellifer* by Pilsbry and Brown (1917, p. 172; Pilsbry, 1921, p. 378, fig. 18), and this is quite distinct from our *C. puntagordanum.*

Caecum (Defolinia) tomaculum, new subgenus, new species Pl. 14, fig. 15

Shell a small, completely smooth, porcelaneous, slightly curved, moderately thick, sausage-shaped tube, circular in cross section. Posterior extremity closed by a somewhat bulbous septum from which protrudes a short blunt mucro extending slightly above the margin of the convex side. Aperture oblique to the long axis, the margin moderately thickened into a fused collar, the sides of the collar beveled.

Dimensions.—Holotype, length of chord between shortest extremities of tube 1.3 mm., diameter at aperture 0.4 mm.

Type locality.—Mare formation at W-25, south flank of Punta Gorda anticline. One specimen, the holotype.

Remarks.—The holotype is somewhat corroded, but it is believed that the smoothness of the tube and lack of sculpture are natural and not due to weathering. Such small, completely smooth, porcelaneous tubes with a fused, beveled collar around the aperture do not seem to have been classified subgenerically, and therefore the name *Defolinia,* after the Marquis Léopold de Folin, author of several excellent papers on the Caecidae is proposed. The type species is *Caecum tomaculum,* n. sp.

Comparisons.—The following smooth species of *Caecum* are somewhat similar to the new *C. tomaculum* from Venezuela:

C. virginianum Meyer (1888, p. 139, unnumbered plate, fig. 3). Yorktown formation (Miocene) of Virginia and North Carolina.

C. flemingi Gardner and Aldrich (1919, pp. 40-41, pl. 4, fig. 5). Waccamaw formation (Pliocene) of North Carolina; Duplin marl (Upper Miocene) of South Carolina.

C. putnamensis Mansfield (1924, pp. 46-47, pl. 1, figs. 1, 2). Upper Pliocene or lower Pleistocene of Putnam County, Florida.

C. chipolanum Gardner (1947, p. 583, pl. 55, fig. 13). Chipola formation (Miocene), Chipola River, Calhoun County, Florida.

Of the above-listed species, *C. tomaculum* is closest to *C. chipolanum* and to *C. putnamensis.* The Venezuelan shell does not gradually enlarge anteriorly as does *C. chipolanum* and it lacks the wide beveled margin that the Florida shell has around the aperture; also the apertural collar of *C. tomaculum* is more in the nature of a swelling than a clearly defined ring as it is on *C. chipolanum.* From *C. putnamensis,* the Venezuelan form is differentiated by its thicker shell, and by the absence, even under magnification, of the "faint, irregular annulations and growth lines" that appear on the Florida species.

Caecum (Fartulum) venezuelanum, new species Pl. 14, fig. 16

1888. *Caecum glabrum* Montagu var. ?, Meyer, Amer. Philos. Soc. Proc., vol. 25, No. 127, p. 140, unnumbered pl., fig. 5.

Shell a small, thin, subhyaline, moderately curved tube, expanding rather rapidly and regularly toward the anterior extremity. Tube circular in cross section, the surface completely smooth. Aperture a

little oblique to the long axis, the simple margin neither constricted nor thickened. Protruding from the posterior extremity is a short, obliquely truncated plug, the dorsal side of the plug higher than on the ventral side, produced slightly to form a blunt mucro, the top sealed with a flattish septum.

Dimensions.—Holotype, length of chord between shortest extremities of tube 2.2 mm.

Type locality.—Mare formation, in stream 250 meters south-southwest of mouth of Quebrada Las Pailas. One specimen, the holotype.

Comparisons.—This differs from the preceding *C. tomaculum,* n. sp. in having a thin subhyaline tube instead of a moderately thick porcelaneous one. *C. flemingi* Gardner and Aldrich (1919, pp. 40-41, pl. 4, fig. 5), a smooth shell occurring in the upper Miocene of South Carolina and in the Pliocene of North Carolina, is broader than *C. venezuelanum,* n. sp. and its apertural margin is "faintly but perceptibly, contracted at the obscure apertural ring" (Gardner, 1948, p. 203, pl. 25, fig. 26). *C. virginianum* Meyer (1888, p. 139, unnumbered plate, fig. 3) from the Miocene Yorktown formation is distinguished from *C. venezuelanum* by its thicker shell, but it is much more difficult to separate *C. venezuelanum* from what Meyer referred to as *C. glabrum* Montagu var. The latter is described as follows: "6. *Caecum glabrum* Mont. var., Yorktown, Va., smooth, small, thin, curved with flattened septum". Our shell is virtually identical with the one illustrated by Meyer except that *C. glabrum* var. appears to be less attenuated. Both the fossil and living forms of the true *glabrum* from England are characterized by, as Meyer put it, "a septum as regularly curved as a watch glass" (see Gardner, 1948, pl. 28, fig. 19), but on the varietal form described by Meyer and on the Venezuelan shell, the septum sealing the top of the oblique plug is flattish. Compared with the Recent *C. glabrum, s.s.* in the United States National Museum (No. 83419, de Folin collection), the Venezuelan fossil is a little wider and not so delicate.

PLANAXIDAE

Planaxis (Supplanaxis) nucleus ? (Bruguière) **Pl. 14, figs. 17, 18**

1780. *Buccinum nucleus* Chemnitz, Conchylien-Cabinet, vol. 4, pl. 125, fig. 1183.
1789. *Buccinum nucleus* Bruguière, Encyc. Méth., pp. 254-255.

1822. *Purpura nucleus* Lamarck, An. sans. Vert., vol. 7, pp. 249-250.
1824. *Planaxis semisulcatus* Sowerby, Genera of Recent and Fossil Shells, No. 1, *Planaxis,* fig. 3.
1825. *Buccinum nucleus* Wood, Index Testaceologicus, p. 110, No. 91, pl. 23, fig. 91.
1864. *Planaxis nucleus* (Lamarck), Krebs, The West Indian Marine Shells, p. 52.
1878. *Planaxis nucleus* (Lamarck), Reeve, Conch. Icon., vol. 20, *Planaxis,* pl. 1, sp. 7.
1878. *Planaxis semisulcata* Sowerby, Mörch, Catalogue of West-India Shells, p. 9.
1884. *Planaxis nucleus* (Brugière), Sowerby, Thes. Conchyl., p. 13, pl. 1, fig. 20.
1887. *Planaxis nucleus* (Lamarck), Tryon, Man. Conch., vol. 9, p. 277, pl. 52, fig. 36.
1889. *Planaxis nucleus* (Wood), Dall, U. S. Nat. Mus., Bull. 37, p. 140.
1891. *Planaxis nucleus* (Wood), Baker, Acad. Nat. Sci. Philadelphia, Proc. vol. 43, p. 53.
1901. *Planaxis nucleus* (Wood), Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, p. 428.
1922. *Planaxis nucleus* (Wood), Remington, Nautilus, vol. 35, No. 4, p. 121.
1924. *Planaxis nucleus* (Wood), Emery, Nautilus, vol. 38, No. 2, p. 61.
1937. *Planaxis nucleus* (Lamarck), Smith, East Coast Marine Shells, p. 104, pl. 37, fig. 7.
1954. *Planaxis* (*Supplanaxis*) *nucleus* (Bruguière), Abbott, American Seashells, pp. 150-151.
1958. *Planaxis nucleus* (Brugière), Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 13.
1958. *Planaxis nucleus* (Lamarck), Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, p. 67, pl. 10, 1. fig.
1958. *Planaxis nucleus* (Bruguière), Nowell-Usticke, A Check List of the Marine Shells of St. Croix, p. 37.

The Cabo Blanco fossils referred to this species are worn, rather small, moderately stout, with a conical spire. Post-nuclear whorls slightly convex, the body whorl moderately ventricose. Sutures distinct, finely channeled. Surface abraded, but under a lens it is seen to be marked with rather widely spaced, faint spiral grooves below the suture of the body whorl. Aperture large, broadly ovate, a little oblique. Outer lip below broken far back, the inner surface thickened or swollen a little a short distance from the edge, the inner margin bearing 10 faint denticles. Columella arcuate, stout, flattened-concave, with a shallow, longitudinal furrow generally parallel with the columellar margin, the base bent forward and emarginate, the emargination extending upward for a short distance along the far side. Parietal wall with a thick sheath of callus which is heavily ridged adjacent to the sharply triangular anal notch. Siphonal canal short, deep, slanted to the left, the terminal notch narrow, fairly long, U-shaped, the margin thickened somewhat, the emargination

kinked into and joining that on the far side of the base of the columella.

Dimensions.—Length 9.5 mm.; max. width 6.1 mm.

Locality.—Abisinia formation at W-30, eastern edge of Playa Grande village. Three specimens.

Remarks.—Because of shell wear and incompletness of our specimens it is not known with certainty that they bear the deep spiral grooves behind the outer lip as do the typical forms of *P. nucleus*. In other respects they are identical.

Range and distribution.—The Recent *P. nucleus* ranges from southeast Florida to the southern Caribbean. To my knowledge this is the first report of its occurrence as a fossil, although the Venezuelan shell is nearly identical with *P. ame* Woodring (1928, p. 342, pl. 25, fig. 16) from the Bowden Miocene of Jamaica. *P. ame,* however, is more slender.

CERITHIIDAE

Cerithium litteratum playagrandensis, new subspecies Pl. 15, figs. 1, 2

Shell of medium size, cerithoid, the spire moderately long, the left profile slightly curved, the labral side straight, the approximate divergence of the spire 33 degrees. Whorls nearly 10 in all, the nucleus consisting of about 2-1/2 of them. Nuclear whorls smooth, the initial loosely coiled and a little canted, the last defined from the conch by a faint axial swelling. Post-nuclear whorls trapezoidal, the sutures finely incised except the last which is narrowly channeled and undulatory. Early whorls flat-sided, sculptured by feeble narrow axial folds for two-thirds the distance down from the upper suture, and by faintly beaded spiral threads alternating in size. On the last three whorls the axial folds are on the upper third, and each of the 12 folds is nodulated or beaded a short distance below the suture. On the body whorl there are three plain spiral threads or cords above the row of nodules, the middle thread a little larger than the other two which are about the same in size. On the periphery of the body whorl there is a small beaded carina, the area between the carina and the upper row of nodules being somewhat concave. In this area there are several orders of beaded or crenulated spiral cords between which are fine unbeaded threads;

the largest of these cords is the one a little below the middle of the area. On the body whorl also, there is a faint varix opposite the outer lip. Base with beaded and crenulated cords and threads, the cord a short distance below the peripheral carina being the largest. Aperture lenticular, the canals deeply excavated. Outer lip varicose behind, the inner margin grooved, the grooves or channels lying under the larger spiral cords of the exterior. Labium with a heavy coat of enamel, the distal margin of the enamel sharply defined and raised a little above the whorl surface. Upper part of parietal wall with a strong ridge which enters the interior and forms the margin of the deep posterior siphonal groove. Posterior outlet excavated, narrowing into a small triangular fosset above. Anterior canal short, deep, the labial margin a little thickened, the extremity excavated into a subcircular notch, the entrance to the canal somewhat restricted. In places a little color remains, and this is in the form of short interrupted spiral stripes of orange, more or less aligned in columns.

Dimensions.—Holotype, length 19 mm.; max. width 8 mm.

Type locality.—Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. One specimen, the holotype.

Comparisons.—The Pleistocene to Recent *C. litteratum* (Born) (1778, Index Rerum Naturalium Musei Caesarei Vindobonensis, p. 327) is a variable shell but constant in certain particulars: the last whorl or two is flattened or slightly concave; there are 9 to 12 prominent nodules just below the suture; and there is a weak varix opposite the outer lip. The Venezuelan fossil partakes of all these features in subdued fashion, and is unequivocally of *litteratum* stock. Generally, however, *C. litteratum, senso strictu* is more angulate than the Venezuelan form, and for this reason the subspecific name *playagrandensis* is proposed. *C. l. playagrandensis*, n. subsp. is also reminiscent of the following fossil species:

C. russelli Maury (1917, pp. 287-288, pl. 22, figs. 2, 3) from the Miocene of the Dominican Republic. The outer lip of *C. russelli* is smooth within, that of *C. playagrandensis* grooved.

C. dominicense Gabb (1873, p. 328) (see Pilsbry, 1921, p. 370, pl. 33, figs. 3, 4) from the Miocene of the Dominican Republic. This has fewer subsutural tubercles than *C. playagrandensis* and a more

turreted spire. On the earlier whorls of *C. dominicense* "every third axial fold is somewhat larger, then every fourth; but on the last three whorls such variceal folds do not appear". On *C. l. playagrandensis* none of the upper whorls is varicose.

C. costaricensis Olsson (1922, pp. 315-316, pl. 10, fig. 28) from the Miocene in Red Cliff Creek, Costa Rica, is more slender than *C. playagrandensis*, and its spire is more acuminate.

C. coccodes Dall(1892, p. 284, pl. 22, fig. 6) from the Pliocene of Florida has about 22 tubercles on the cord below the suture as compared with 12 on *C. playagrandensis*. An excellent illustration of *C. coccodes* may be seen in Olsson and Harbison (1953, pl. 42, fig. 10).

Cerithium cf. **eburneum** Bruguière **Pl. 15, figs. 3, 4**

1792. *Cerithium eburneum* Bruguière, Encyc. Méth., pl. 442, figs. 1a, b.
1850. *Cerithium versicolor* C. B. Adams, Contrib. to Conch., No. 7, p. 119.
1864. *Cerithium eburneum* Bruguière, Krebs, The West Indian Marine Shells, p. 48.
1878. *Cerithium eburneum* Bruguière, Mörch, Catalogue of West-India Shells, p. 9.
1887. *Cerithium eburneum* Bruguière, Tryon, Man. Conch., vol. 9, p. 129, pl. 61, figs. 71, 72
1889. *Cerithium eburneum* Bruguière, Dall, U. S. Nat. Mus., Bull. 37, p. 140.
1901. *Cerithium eburneum* Bruguière, Baker, Acad. Nat. Sci. Philadelphia, Proc., vol. 43, p. 53.
1922. *Cerithium eburneum* Bruguière, Maury, Bull. Amer. Paleont., vol. 9, No. 38, pp. 125-126.
1934. *Cerithium eburneum* Bruguière, Emery, Nautilus, vol. 38, No. 2, p. 60.
1937. *Cerithium eburneum* Bruguière, Smith, East Coast Marine Shells, p. 166, pl. 38, fig. 13.
1950. *Cerithium versicolor* C. B. Adams, Clench and Turner, Occas. Papers on Mollusks, vol. 1, No. 15, p. 355, pl. 37, fig. 1.
1952. *Cerithium eburneum* Bruguière, ?, Pulley, Texas Jour. Sci., vol. 4, No. 2, p. 172.
1954. *Cerithium eburneum* Bruguière, Abbott, American Seashells, p. 154, pl. 19q.
1958. *Cerithium eburneum* Bruguière, Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 13.
1958. *Cerithium eburneum* Bruguière, Abbott, Acad. Nat. Sci. Philadelphia, Mon. No. 11, p. 40.
1958. *Cerithium eburneum* Bruguière, Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, p. 69, pl. 11, 1 fig.
1959. *Cerithium eburneum* Bruguière, Rodriguez, Bull. Marine Sci. Gulf and Caribbean, vol. 9, No. 3, p. 276.
1959. *Cerithium eburneum* Bruguière, Nowell-Usticke, A Check List of the Marine Shells of St. Croix, pp. 38, 39-40.

Shell small, moderately slender, ornate, the angle of spire about 30 degrees. Nucleus decollate. Post-nuclear whorls at least seven,

separated by fine sutures, the upper ones tightly compressed, the lower ones narrowly incised. Early whorls of the conch subcancellate, sculptured by about 12 axial folds extending from suture to suture, and three primary revolving threads. Each axial fold is beaded at the intersection with the spiral thread, and between each primary thread there is a single fine intercalary. On later whorls there are the three nodulous spiral cords, a smaller, unbeaded secondary cord between each of those, and one or two simple tertiary threads on either side of the secondaries. On the last two whorls there is also a beaded cord immediately above the suture, and, on the penultimate whorl, the secondary spiral cord below the anterior primary is also beaded although more feebly so than the row at the suture. The three nodular primary spirals of the later whorls are equidistant, the uppermost just below the suture the smallest, the lower two, situated above and below the middle of the whorls of about the same size. Starting on the fourth from last whorl and continuing to the body, every fifth axial fold is, or tends to be varicose, and on the body whorl there are 15 axial folds in all. Ultima with about 11 primary spiral ribs, the three upper ones nodulose to subnodular, the ones below slightly crenulated to smooth, each with secondary and tertiary threads in the interspaces. Anterior fasciole small, slightly swollen, and nearly barren except for residual spiral markings. Aperture obliquely sublenticular, the canals short and deep. Outer lip a little thickened, subvaricose behind, the inner margin lined with paired and single lirae, the rim of the lip arched over the posterior outlet to connect with the callus of the parietal wall. Posterior outlet deep, a little inclined, bordered below by a strong sharp ridge which continues into the interior. Columella arcuate, smoothly callused, the distal edge of the callus slightly detached. Anterior canal short and deep, the extremity excavated into a semicircular notch. The residual ground color of the shell is whitish, the nodules are light tan, and the ribs of the base are marked with spiral bars of orange.

Dimensions.—Figured specimen, length (tip of spire missing) 10.5 mm.; max. width 4.5 mm.

Locality.—La Salina, west of Puerto Cabello, State of Carabobo. Two specimens.

Remarks.—The distinguishing characteristics of this species are the three rows of nodules and the three varicose folds on each of the lower whorls. Aside from being a little more slender than the average *C. eburneum,* the Venezuelan shell is otherwise so similar as to suggest that the two are identical. The La Salina fossil is also reminiscent of *C. costaricensis* Olsson (1922, pp. 315-316, pl. 10, fig. 28) from the Miocene at Red Cliff Creek, Costa Rica, but that is a nonvaricate shell and is less prominently beaded than the present one. *C. harrisii* Maury (1912, pp. 90-91, pl. 12. fig. 18) and *C. isabellae* Maury (1912, p. 91, pl. 12, fig. 19) from the Miocene at Brighton, Trinidad, have three rows of beads like the Venezuelan form but the Brighton shells are shorter and stouter.

Range and distribution.—The living *Cerithium eburneum* Bruguière ranges from southern Florida, to northern South America. The fossil *C. eburneum* has been reported from the Pleistocene of Barbados by Gregory (1895, Geol. Soc. London, Quart. Jour., vol. 51, p. 289). The age of the La Salina clays is not yet known, but it is tentatively considered to be Pliocene.

Portoricia salinensis, new species **Pl. 16, figs. 15-17**

Shell small, the upper portion of the spire subcyclindrical, the early post-nuclear whorls tubular and subcircular in cross section. Nucleus large, smooth, less than a full turn, the tip tongue-like, slightly twisted, and partially immersed in the succeeding whorl, the top or apex of the tongue swollen, the last stage subglobular. The transition from the nucleus to the conch is gradual, but on each side of the nuclear tip there is a prominent indentation or depression. There are only the first two post-nuclear whorls left on the specimen and these are of about the same diameter with little difference in height, and are separated by narrow, deeply impressed sutures. Sculpture consisting of a few faint spiral riblets or fillets and a shallow, noncontinuous spiral trench or furrow situated at about the middle of the first post-nuclear whorl, and a little below the middle of the succeeding whorl. There are three spiral fillets below the furrow on the first post-nuclear whorl and a few vague ones above it. Although the whorls are well rounded, a faint angulation or carination is present at the shoulder, and this is presumed to become more pronounced later. Here and there the whorls are

crossed by a curved axial cicatrix or varix at places of growth stoppage.

Dimensions.—Holotype (uppermost three whorls), length 2.0 mm.; max. width 1.4 mm.

Type locality.—La Salina, west of Puerto Cabello, State of Carabobo. One broken and worn specimen.

Remarks.—This unusual shell seems referable to the subgenus *Portoricia,* the type species of which is *Campanile* (*Portoricia*) *laricum* Maury (1920a, pp. 54-55, pl. 8, figs. 1, 2) from the Lares limestone (middle to late Oligocene) of Puerto Rico. The external characters of *Portoricia* are not yet wholly known, as the type species was erected from internal molds. If the Venezuelan shell is correctly classified, we now know more about the nucleus which is indeed cerithid in nature as surmised by Maury, but until more is known about the aperture and details of sculpture, *Portoricia* might be given generic rank. The question is, however, whether the Venezuelan shell is *Portoricia,* and I think it may be by virtue of the tubular whorls and the peculiar interrupted spiral furrow with which the whorls are encircled. On the other hand, I doubt that the Venezuelan species is *P. laricum* Maury as that attains a large size with the whorls subtabulate at their summit.

BRACHYBITTIUM, new subgenus

Type species, *Bittium* (*Brachybittium*) *caraboboense,* new species.

Shell small, low conical. Nucleus smooth, inflated, consisting of 1-1/2 to 2-1/2 whorls, the initial of which is rather loosely coiled and slightly immersed. First post-nuclear whorl with no axial ribs but with two strong spiral threads which later develop into carinae, one of the carinae situated at about the middle of the whorl, the other near the base. Subsequent whorls sculptured, in addition to the carinae, by a few more spiral threads or riblets and low axial folds that are a little broader but more subdued than the sharp primary spirals. The intercepts of the axial folds and spiral cords are thickened or nodulated. There are no true axial varices. Base short, evenly convex at the labrum, margined above by two spiral ribs, the outer and larger one emerging from the suture or commissure, the inner one lying a short distance below, and emerging from the aperture

just under the commissure. The rest of the base is covered with enamel which is generally smooth but sometimes faintly lineated spirally. Aperture slightly oblique, subquadrate to ovate, produced a little anteriorly into a spatulate or effuse lip. Outer lip thin, slightly frilled. Columella short, gently curved.

The new subgenus *Brachybittium* is proposed to include small, moderately sturdy, nonvaricate shells with a relatively short conical spire and a generally smooth, heavily enameled base. The Venezuelan species referred to the new subgenus do not adequately fit into any of the subgenera erected by Bartsch (1911c), as all of his West American forms are multiwhorled, elongate, and spirally lirate on the base.

Bittium (Brachybittium) caraboboense, new subgenus, new species
Pl. 15, figs. 5, 6

Shell small, broadly conical, the base relatively short, the spire rapidly tapering, the angle of divergence 42 degrees. Whorls 6-1/2 including the nucleus. Nuclear whorls about 2-1/2, smooth, well rounded, the initial rather loosely coiled and a little inflated, the last merging into but differentiated from the conch by the first appearance of spiral threads. All of the post-nuclear whorls save the first are carinated well below the middle, the long sloping sides above the carina flattish, the short ones below constricted to form channeled sutural areas although the sutures themselves are finely impressed. First post-nuclear whorl slightly convex, ornamented with three spiral threads, one around the middle, another of equal size near the base, and the third, a faint one, between the periphery and posterior suture. Succeeding whorls are sculptured by both spiral and axial ribs which are nodulated at their intersections, the second post-nuclear whorl with three spirals, the later ones with four. On the second post-nuclear whorl the upper spiral rib is at the suture, the other two below the middle, the lowest forming a keel which is accentuated by slightly larger nodulations. On the penultimate whorl the keel is still stronger and scalloped as well, the three subequal spiral ribs above it a little more subdued. On the last full whorl there are 18 to 20 subregular axial ribs of moderate elevation, these somewhat larger than the spirals, separated by shallow concave interspaces a little wider than the ribs themselves. On the whorls of the spire the axial ribs extend from suture to suture; on

the ultima they terminate at the nodulated peripheral carina. Base relatively short and somewhat convex, with a single simple spiral cord near the outer edge under the peripheral carina; the remainder of the base is smooth except for exceedingly faint axial growth lines. Aperture subquadrate, a little effuse at the angulation of the lower and basal lips. Outer lip thin, the edge finely scalloped, the inner margin slightly fluted from the external spirals. Columella short, straight, and sturdy, the parietal wall well within the aperture sheathed on some specimens with a thin coating of enamel.

Dimensions.—Holotype, length 1.75 mm.; max. width 1.0 mm.

Type locality.—La Salina, west of Puerto Cabello, State of Carabobo. Seven specimens.

Remarks.—This shell is characterized by its broadly conical, rapidly tapering spire, and smooth base. I have seen no forms that are closely analogous.

Bittium (Brachybittium) venezuelanum, new species Pl. 15, figs. 7, 8

Shell small, conical, the spire moderately low and rapidly tapering, the divergence 49 to 52 degrees. Whorls about 6-1/2 including the nucleus, all of them convex, but the later ones rendered angulate or carinate by the spiral ribbing. Nucleus smooth, composed of a little over two volutions, the initial one a little swollen and rather loosely coiled, the last one well rounded, and defined from the conch by the appearance of two spiral cords of about equal size, one situated at about the middle of the first post-nuclear whorl, the other near the base, both of them forming carinae. The remaining whorls are vertical-sided below, sloping above, and are sculptured by sharp spiral cords and low axial ribs, the latter broader and less elevated than the spiral cords but gaining in prominence with growth. The whorls are constricted at the base causing the sutural areas to appear channeled although the sutures themselves are hidden by the summit of the succeeding whorl. The second post-nuclear whorl is carinated by a peripheral and a basal cord, these thickened spirally at the intersections with the low axial folds. There is also a smaller revolving thread a short distance above the peripheral cord as well as a fine narrow ridglet on the summit of the whorl at the suture. This sculpture is repeated more strongly on the subsequent whorls, the nodulation likewise becoming more pro-

nounced. On the last full volution there are about 18 subangular axial ribs separated by interspaces a little wider than the ribs themselves, the spaces enclosed by the axial and spiral ribs forming shallow squarish pits. On the spire the axial ribs extend across the whorls from the summit to the sutural area below (where they are reduced in size); on the body whorl they extend in strength to the periphery, continuing weakly therefrom a short distance below where they terminate at the spiral cord emerging from the commissure. Base short, moderately convex at the labrum, rather sharply indrawn on the ventral face, sheathed nearly completely by an extension of the shiny enamel of which the columella is composed. Under this enamel the base is smoothish. Aperture broadly ovate or suborbicular. Outer lip thin, joined at an obtuse angle with the whorl where it is a little thickened. Basal lip thin, expanded at the angle with the lower lip. Columella short, sturdy, moderately curved.

Dimensions.—Holotype, length 1.5 mm.; max. width 0.85 mm.

Type locality.—La Salina, west of Puerto Cabello, State of Carabobo. Seven specimens.

Remarks.—This species occurs together with the preceding *Bittium caraboboense,* n. sp. from which it is distinguished by its more divergent spire, by its more turbinate whorls, by its suborbicular rather than subquadrate aperture, and in having one less primary spiral cord. Subgenerically it would be included under the newly proposed *Brachybittium.*

Bittium (Brachybittium) salinae, new species Pl. 15, figs. 9, 10

Shell minute, sturdy, turbinate, the spire rather broadly conical, the angle of divergence about 45 degrees, the apex obtuse. Whorls inflated, about four in all. Nucleus large, smooth, consisting of about 1-1/4 whorls, the initial bulbous and fused at the tip, the last well rounded, merging normally into the conch from which it is differentiated by the first appearance of two spiral cords on the lower half of the first post-nuclear whorl. These two spiral cords develop rapidly into sharp narrow carinae, the ramp above the peripheral carina at first being smooth although farther along low axial folds appear, these extending from suture to suture. On the last full volution there are approximately 16 broad axial folds separated by slightly wider interspaces, and, at the intercepts with the spiral

carinae, spirally elongate nodulations are formed. The two spiral carinae are sharper but narrower than the axial folds, and on the upper slope of the ultimate whorl there are two finer spiral threads, one adjoining the suture and the other not quite halfway between the suture and the peripheral carina. The upper slope or ramp of the penultimate whorl is a little concave but on the ultimate whorl it is a little convex. Sutures narrowly channeled below, narrowly impressed above. Base short, convex at the labrum, marked above with two spiral riblets, one emerging from the suture, and a smaller one under this emerging from the aperture just below the commissure; farther down, the base is smoothish although on the holotype there are several vague spiral lineations barely visible under the microscope. Aperture broadly ovate, produced anteriorly, on the holotype, into a short, spoutlike anterior canal which is slightly twisted to the left and channeled. Outer lip joined to the whorl at an obtuse angle. Columella short, slightly curved, that of the paratype, which is a more mature shell than the holotype, much the stouter.

Dimensions.—Holotype (C51a), length 0.75 mm.; max. width 0.4 mm., No. 26393 (unfigured); paratype (C51b) (broken at base), length 0.8 mm.; max. width 0.5 mm., No. 26116 paratype (figured) PRI.

Type locality.—La Salina, west of Puerto Cabello, State of Carabobo. Two specimens, the one illustrated, the paratype.

Remarks.—This species is also assigned to the newly proposed subgenus *Brachybittium.* It occurs together with *B. caraboboense,* n. sp. and *B. venezuelanum,* n. sp. but differs from both in having fewer whorls, and in details of ornamentation. All three species, however, are characterized by the presence of two spiral carinae on the lower half of the first post-nuclear whorl.

Bittium (Brachybittium) palitoense, new species Pl. 15, figs. 11-14

Shell small, somewhat variable in shape and sculpture, moderately elongate, generally rather slender. Whorls seven in all, the smooth nucleus consisting of about 1-1/2 of them. Nuclear whorls convex, the initial small, rather loosely coiled and a little immersed, the last differentiated from the conch by the first appearance of two spiral cords on the first post-nuclear whorl. On all post-nuclear

whorls and generally on the body whorl as well, these two spiral cords develop into carinae, the upper one situated near the middle and forming the periphery, the lower one bordering the sutural excavation, the peripheral carina being the larger of the two on the anterior half of the spire. A minor spiral cord is present on the ramp of the later whorls, and on an occasional specimen there is a faint intercalary thread between the primary cords. The body whorl of the paratype and of several other specimens is not carinate but is sculptured by as many as seven subequal spiral riblets which are a little more pronounced anteriorward. Post-nuclear whorls more or less polygonal. the upper slope or ramp generally a little concave, the base of the whorls sloping sharply inward to form an excavated sutural area, although the sutures themselves are finely impressed. Immediately above or below the suture, and often on both sides of it, the whorl is thickened a little into a sort of collar. Axial sculpture consisting of slightly curved costae or folds separated by interspaces that are as wide as the ribs on the early whorls but wider than the ribs on the later whorls. Except at the beginning of the conch proper where they do not appear, the axial costae extend from suture to suture, and, where they cross the spiral cords, the intercepts are thickened to nodulated. On the holotype there are about 22 axial folds but on one specimen there are only 14, the number varying more or less between these limits. The axial folds terminate at the periphery of the body whorl but may continue weakly on the base itself. Where the spiral and axial ribs are strong, the areas enclosed by the decussation are developed into shallow quadrangular pits. Base short, convex, the upper margin rimmed by a spiral rib emerging from near the suture; a short distance below this there is another slightly smaller rib emerging from the aperture just below the commissure. The rest of the base is lightly enameled and smooth, but where the enamel is thin, it is occasionally spirally lineated with a few faint bands. Aperture slightly oblique, ovately diamond-shaped. Lips thin, the outer one joined obtusely to the whorl and frilled a little at the edge, the basal one slightly produced and spatulate at the canal. Columella thin, gently arcuate.

Dimensions.—Holotype (tip of nucleus missing), length 2.25 mm.; max. width 1.0 mm.; paratype (complete), length 2.1 mm.; max. width 0.95 mm.

Type locality.—La Salina, west of Puerto Cabello, State of Carabobo. Twelve specimens.

Remarks.—There is considerable superficial variation among the 12 specimens referred to this new species, but inasmuch as there seems to be an easy gradation between the forms represented by the holotype (C52a) and those represented by the paratype (C52b), all of them are considered the same.

Comparisons.—The general configuration of the holotype of this species is somewhat like that of the Miocene *B. asperoides* Gabb (1873, p. 239) from the Dominican Republic as illustrated by Pilsbry (1921, p. 375, pl. 35, fig. 4). The Dominican shell, however, has four more whorls, bears two varices on the penultima, and has six equal spiral threads on the base.

Bittiolum caribense, new species Pl. 15, figs. 15, 16

Shell small, moderately elongate, ovate conical, the angle of spire around 28 degrees. Nucleus decollate. Post-nuclear whorls about five, the first two straight-sided, the next two a little convex, the body whorl gently rounded, a little narrower than the penultima, all of the whorls separated by excavated sutural areas in which the sutures themselves are narrowly incised. Early post-nuclear whorls sculptured by three spiral cords crossed by regularly spaced axial costae of which there are 18 on the whorl preceding the penultima. The spiral cords are equidistant, the uppermost flattened and forming a collar at the suture, the next one rounded and situated a little above the middle of the whorl, the lowest one also rounded, situated at the sutural excavation over which it projects out slightly. At the intercepts of the axial riblets and spiral cords there are strong nodulations or beads, the ones on the lowest cord being slightly larger than on the cord above, and much larger than on the collar. The spaces enclosed by the spiral and axial ribs are shallow squarish pits. The axial riblets extend from suture to suture, although within the sutural area they are diminished in size. On the penultimate whorl there are five spiral cords (two of them interstitial) and 20 axials, and on the last whorl there are seven spirals from the suture to the periphery, and about 22 axial riblets, the latter more or less terminating at the periphery. The last whorl also bears a single broad, swollen varix about one-third of a turn behind the outer lip.

Base moderately long, sculptured by five subequally spaced, flattish spiral ribs, these a little crenulated by faint axial growth lines. Aperture oval, fluted gently at the labrum. Outer lip broken away in part, thin, joined obtusely to the whorl. Basal lip thin, rounded, scalloped at the rim and lightly fluted within from the external ribbing, broadly patulous at the anterior canal. Columella moderately long, curved slightly to the left anteriorly. Inner lip and parietal wall uniformly enameled, the distal margin of the enamel raised above, and sharply defined from the whorl.

Dimensions.—Holotype (nucleus decollate), length 3.0 mm.; max. width (across penultimate whorl) 1.1 mm.

Type locality.—La Salina, west of Puerto Cabello, State of Carabobo. One specimen, the holotype.

Comparisons.—This shell is patterned after such species as *B. nugatorium* (Brown and Pilsbry) (1911, p. 357, fig. 1) from the Gatun Miocene of the Panamá Canal Zone, *B. annettae* (Dall) (1892, pp. 273-274, pl. 20, fig. 3) from the upper Miocene of the Cape Fear River, North Carolina, and *B. podagrinum* (Dall) (1892, p. 274, pl. 21, fig. 12) from the Caloosahatchee River, Shell Creek, and St. Petersburg, Florida. On *B. nugatorium* the uppermost spiral cord is on the shoulder of the whorl instead of at the suture or summit as it is on the new Venezuelan species; on *B. annettae* the transverse ribs stop short of the sutures whereas on *B. caribense* they continue into the sutural area; on *B. podagrinum* the aperture is more oblique than on *B. caribense,* and the sutures are narrowly channeled rather than broadly excavated.

Cerithiopsis maiquetiensis, new species Pl. 15, figs. 17, 18

Shell small, the spire acuminate, the divergence about 35 degrees. Nuclear whorls about three, smooth, the tip of the initial one rather loosely coiled and a little immersed, the last convex, merging transitionally into the conch but defined from it by the first appearance of spiral threadlets. The first post-nuclear whorl or two is sculptured by three spiral threads, the largest forming a carina near the base, the other two decreasing in size upward, the smallest forming a narrow cingulum just below the suture. All whorls are excavated at the base, and, on the later ones, there is a fine spiral thread atop the suture in the excavated area. On the third post-

nuclear whorl faint axial ribs make their appearance. On the fourth and fifth post-nuclear whorls there are four spiral cords and 13 axial riblets separated by shallow interspaces, the intercepts of the cords and riblets rendered nodulous. Base of shell missing, but judging from the whorls of the spire it seems likely that the aperture is subquadrate, that the columella and parietal wall are heavily enameled, and that the anterior canal is short and curved sharply to the left.

Dimensions.—Holotype (8 whorls, including nucleus), length 1.8 mm.; max, width 0.75 mm.

Type locality.—Playa Grande formation (Maiquetía member) at W-4, Quebrada Las Pailas. One incomplete specimen, the holotype.

Comparisons.—There is a distant resemblance between the new species and *C. bermudensis* Verrill and Bush (1900, pp. 536-537, pl. 65, fig. 20), a Recent shell dredged from white sand at three to seven fathoms in the Bermudas. However, the Bermudan shell is not so widely excavated at the sutural area as is the Venezuelan fossil, and the whorls are angularly convex rather than with straight slopes as on *C. maiquetiensis,* n. sp.

Cerithiopsis tela, new species Pl. 15, figs. 19, 20

Shell small, elongate-pupoid, the angle of spire about 15 degrees, the tip of the spire decollate. Post-nuclear whorls at least seven, flat-sided, the early sutures annealed and not visible, the sutural area of the last whorls shallowly excavated. Sculpture consisting of strong spiral cords, two on the upper whorls, three on the later ones, and four on the ultima. The holotype and only specimen is considerably worn, but there is evidence that the spiral cords are beaded and that the beads are connected in the narrow interspaces by axial threads. Of the spiral cords on the later whorls, the one just below the suture is slightly more pronounced than the others. The base is short, convex, and seemingly smooth. Aperture small, subquadrate. Outer lip broken away below, not thickened, the posterior angle acute. Columella short, the curve with the parietal wall rather sharp, the base of the columella emarginate, the inner lip callused, the callus extending on the parietal wall to the junction of the outer lip. Anterior canal short, fairly broad, curved sharply to the left, the extremity shallowly notched.

Dimensions.—Holotype, length (tip of spire missing) 4.5 mm., max. width 1.8 mm.

Type locality.—Mare formation at W-14, on hillside above west bank of Quebrada Mare Abajo. One specimen, the holotype.

Comparisons.—Although an accurate comparison cannot be made because of the wearing down of the beads, this species, with its slenderly pupoid shape, is believed to be new, and is given the name *tela* to indicate its projectile-like appearance. Among the numerous Recent cerithiopsids from Jamaica described by C. B. Adams under *Cerithium,* the Venezuelan shell is closest perhaps to *C. iota* (C. B. Adams) (see Clench and Turner, 1950, p. pp. 295-296, pl. 37, fig. 16), differing from that, however, in being more elongate. Of the several Pliocene species of *Cerithiopsis* from Florida, *C. tela,* n. sp. is nearest *C. vinca* Olsson and Harbison (1953, pp. 297-298, pl. 48, fig. 2) from which it may be distinguished by its more acute angle at the union of the outer lip with the whorl.

Cerithiopsis (Laskeya) emersonii ? (C. B. Adams) Pl. 15, figs. 21, 22

1766. ? *Trochus punctatus* Linnaeus, Syst. Nat., ed. 12, p. 1231, No. 603.
1808. *Murex subulatus* Montagu, Testacea British Shells, Suppl., p. 115, pl. 30, fig. 6.
1839. *Cerithium emersonii* C. B. Adams, Boston Jour. Nat. Hist., vol. 2, pp. 284-285, pl. 4, fig. 10.
1841. *Cerithium Emersonii* C. B. Adams, Gould, Invert. Massachusetts, fig. 180.
1848. *Cerithium punctatum* (Linnaeus), Philippi, Zeitschr. f. Malakozool., yr. 5, p. 23. Not of Bruguière, Encycl. Méth., p. 463.
1849. *Cerithium punctatum* (Linnaeus), Philippi, Abbild. u. Beschr. Conchyl., vol. 3, p. 99, pl. 20, figs. 16, 18.
1858. *Cerithiopsis Emersonii* (C. B. Adams), H. and A. Adams, The Genera of Recent Mollusca, vol. 1, p. 240.
1858. *Cerithium bicostata* Emmons, Geol. Rept. North Carolina, p. 270, fig. 162.
1864. *Cerithiopsis subulatum* (Montagu), Guppy, Sci. Assoc. Trinidad Trans., p. 35.
1864. *Cerithium punctatum* (Linnaeus), Krebs, The West Indian Marine Shells, p. 50.
1873. *Cerithiopsis Emersonii* (C. B. Adams), Verrill, Invertebrate Animals of Vineyard Sound, p. 648, pl. 24, fig. 151.
1885. *Cerithiopsis Emersonii* (C. B. Adams), Bush, Connecticut Acad. Arts and Sci., Trans., vol. 6, p. 463.
1887. *Cerithiopsis punctatum* (Montagu), Tryon, Man. Conch., vol. 9, p. 170, pl. 35, fig. 34.
1889. *Cerithiopsis* (*Eumeta* ?) *subulata* (Montagu), Dall, Mus. Comp. Zool., Bull., vol. 18, pp. 252-253, pl. 20, fig. 4.
1891. *Cerithiopsis subulata* (Montagu), Baker, Acad. Nat. Sci. Philadelphia, Proc., vol. 43, p. 53.
1892. *Cerithiopsis* (*Eumeta*) *subulata* (Montagu), Dall, Wagner Free Inst. Sci., Trans., vol. 3, pt. 2, pp. 268-269.

1901. *Cerithiopsis* (*Eumeta*) *subulata* (Montagu), Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, p. 424.
1904. *Cerithiopsis subulata* (Montagu), Martin, Maryland Geol. Sur., Miocene, p. 230, pl. 55, fig. 8.
1922. *Cerithiopsis* (*Eumeta*) *subulata* (Montagu), Maury, Bull. Amer. Paleont., vol. 9, No. 38, p. 124.
1934. *Cerithiopsis subulata* (Montagu), Johnson, Boston Soc. Nat. Hist., Proc., vol 40, No. 1, p. 108.
1937. *Cerithiopsis subulata* (Montagu), Smith, East Coast Marine Shells, p. 105, pl. 38, fig. 2; pl. 71, fig. 1.
1944. *Cerithiopsis subulata* (Montagu), Hackney, Nautilus, vol. 58, No. 2, p. 61.
1946. *Cerithiopsis* (*Laskeya*) *subulata* (Montagu), Jaume, Soc. Malac. "Carlos de La Torre" Rev., vol. 4, No. 3, p. 104.
1950. *Cerithium emersonii* C. B. Adams, Clench and Turner, Occas. Papers on Mollusks, vol. 1, No. 15, pp. 277-278, pl. 37, figs. 12-14.
1953. *Cerithiopsis* (*Laskeya*) *emersonii* (C. B. Adams), Olsson and Harbison, Acad. Nat. Sci. Philadelphia, Mon. No. 8, pp. 301-302, pl. 48, fig. 1.
1954. *Cerithiopsis* (*Laskeya*) *subulata* (Montagu), Abbott, American Seashells, p. 157, pl. 19w.
1955. *Cerithiopsis emersonii* (C. B. Adams), Perry and Schwengel), Marine Shells of the Western Coast of Florida, p. 140, pl. 27, fig. 19.
1958. *Cerithiopsis* (*Laskeya*) *emersonii* (C. B. Adams), DuBar, Florida Geol. Sur., Geol. Bull. No. 40, p. 214.
1958. *Cerithiopsis emersonii ?* (C. B. Adams), Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 13.
1958. *Cerithiopsis subulata* (Montagu), Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, p. 70.
1959. *Cerithiopsis subulata ?* (Montagu), Nowell-Usticke, A Check List of the Marine Shells of St. Croix, pp. 42, 43.

The Venezuelan fossil referred to this species is represented by a single specimen with but four middle whorls remaining. The shell is small, fairly solid, slender, the angle of spire about 20 degrees. Whorls flat-sided, separated by a narrow, deeply channeled groove in which the suture is not visible. Sculpture consisting of two rows of large beads, the space between the rows a trifle wider but shallower than the sutural groove. On the lowest whorl of the shell there are 15 equal beads to the row, the beads of the anterior row slightly larger than the posterior. The beads are connected around the whorl by a spiral cord, and are joined axially by tapered prolongations which meet in the interspace. Immediately below the anterior row of beads, and forming the perimeter of the base, there is another much smaller spiral thread. Inward, the base of the spire whorl is marked with fairly prominent curved growth filaments.

Dimensions.—Length (four whorls) 2 mm.; max. width 1.2 mm.

Locality.—Mare formation at W-25, south flank of Punta Gorda anticline. One specimen.

Remarks.—It is not unlikely that the lowest whorls of the complete Venezuelan shell bear an interstitial thread between the two rows of beads as they do on *C. emersonii*. Unfortunately the lowest whorls of our specimen are missing, but the ones that are present are so similar to those of *C. emersonii* that the Venezuelan shell is believed to be closely related, if not identical. *C. emersonii* ranges from late Miocene to Recent, and is living, generally in 1 to 15 fathoms, from Cape Cod, Massachusetts, to the West Indies. It is also known under the name of *C. subulata* (Montagu) concerning which Olsson and Harbison (1953, p. 301) state the following: "*Murex subulata* Montagu was described from a shell sorted from beach sand collected at Scalasdale on the coast of Scotland. Jeffreys did not accept this shell as a British species and it is possible, as believed by Dall, that the specimens represented drift shells or ones derived from a mixed collection. As this question cannot be settled here, we have preferred to use the American name of *emersonii* of which there is no doubt".

Range and distribution.—*C. emersonii* is fairly common in the Pliocene of Florida, and has been reported by Guppy (1864, p. 35) from the Pliocene at Matura Bay, Trinidad. The Miocene to Recent analogues of *C. emersonii* occurring on the east coast of the United States are named *C. emersonii persubulata* by Gardner (1948, pp. 204–205, pl. 27, fig. 4) who stated that they are consistently more slender than the living *C. emersonii* from South Atlantic waters.

Alabina cereola, new species Pl. 16, figs. 7, 8, 11, 12

Shell small, delicate, elongate conical, imperforate, the angle of spire around 22 degrees. The surface is light creamy tan in tone and has a waxy lustre. The whorls are eight in all including the three nuclear ones. The initial whorl of the nucleus is bulbous and a little immersed, the next narrow but convex, the last well rounded and defined from the conch by the appearance of a moderately prominent submedial to medial angulation which is present on all post-nuclear whorls except the last where it is obsolescent. On the earliest post-nuclear whorls there is a faint spiral thread below the angulation or carina, but above the carina the whorl is smoothish. The sculpture of the later whorls consists of weak narrow axial riblets angulately bowed at the periphery, and

faint equally spaced spiral threads in the intercostal spaces, the threads being more obvious below the carina or periphery than they are above where they are scarcely visible even under 20X magnification. On the penultimate whorl there are about three spiral threads below the periphery, and on the ultima there are about 34 axial riblets. The intercostal spaces are shallow and are about twice as wide as the costae themselves. The ultimate whorl is flattened a little around the middle, and the axial riblets play out at the anterior margin of the flattened area. Sutures finely impressed and distinct. The base is short and well rounded, and is scored with very faint, minutely incised, equally spaced spiral grooves, the narrow flattened fillets between the grooves microscopically crenulated. Aperture of holotype plugged with sand, more or less ovate. Outer lip simple and thin. Basal lip broken, also thin, somewhat spatulate at the curve with the delicate lower lip.

Dimensions.—Holotype, length 2.1 mm.; max. width 0.75 mm.; Paratype, length (6 whorls) 1.1 mm.; max. width 0.65 mm.

Type locality.—Playa Grande formation (Maiquetía member) at W-4, Quebrada Las Pailas. Six specimens, only the holotype complete.

Remarks.—There are no true varices on the shell.

Comparisons.—*Alabina cereola,* n. sp. is closely related to the *A. cerithidioides* (Dall) described and illustrated by Olsson and Harbison (1953, pp. 292-293, pl. 48, fig. 9) from the Caloosahatchee shell deposit at North St. Petersburg, Florida, but is quite unlike Dall's type (see Dall, 1892, p. 276, pl. 16, fig. 8) which is somewhat umbilicate, possesses low broad rounded axial costae separated by very narrow interspaces, and is carinate below the middle on the first three post-nuclear whorls. The earlier whorls of Olsson and Harbison's *A. cerithidioides* is also carinate well below the middle, and in this respect differs from the Venezuelan shell which is carinate medially to submedially. The Floridan *A. cerithidioides* also has coarser axial ribs, and coarser spirals on the base. *A. cerithidioides* is said to range from Pliocene to Recent. The Pliocene to Recent *A. adamsi* (Dall) as described by Olsson and Harbison (1953, pp. 293-294, pl. 48, fig. 7) is a more slender shell than *A. cereola,* n. sp, and is sculptured by heavier axial and spiral ribs. The Venezuelan shell also recalls *A. canaliculata* (Gabb) (see Maury, 1917, p. 290,

pl. 21, fig. 18); Pilsbry, 1921, p. 375, pl. 35, fig. 2; and Woodring, 1959, pp. 180-182, pl. 38, figs. 3-5) from the Miocene of the Dominican Republic and the Panamá Canal Zone, but *A. canaliculata* always seems to bear varices on the body whorl whereas on *A. cereola,* n. sp. they are absent. Woodring (1959, p. 181), who had access to several thousand specimens of *A. canaliculata* from the Dominican Republic, noted that *A. canaliculata* is an extremely variable shell, and he assigned it to a subspecific rank under the species *A. asperoides* Gabb. He placed in synonymy with *A. asperoides canaliculata* Pilsbry's *A. angustior* from the Dominican Republic and Woodring's *A. curta* from the Bowden Miocene of Jamaica. Superficially *A. cereola,* n. sp. resembles *Bittium palitoense,* n. sp., but *B. palitoense* is sturdier and stouter, and the base is heavily enameled.

Alabina venezuelana, new species Pl. 16, figs. 9, 10

Shell small, delicate, elongate-turbiform, the angle of spire about 41 degrees. Whorls six including the nucleus. Nucleus smooth, porcelaneous, consisting of about 1-1/2 convex whorls, the area of union with the conch corroded and marked by a cicatrix. The first post-nuclear whorl is subcarinate at the shoulder, the sides above the shoulder flattish and sloping inward, the sides below nearly vertical. A short distance below the carina there is a spiral cord nearly as strong as the carina itself. On the second post-nuclear whorl the sculpture is repeated, the carina becoming a sharp thin keel, the cord under it also sharp and lying a little above the suture. The interval between the two spirals is moderately deep, smooth, and concave, and the sutural area below the anterior cord is rather deeply excavated. On the following whorls the keels become less pronounced, a fine interstitial thread appears between the primary cords as well as on the posterior slope or ramp, and immediately below the suture a narrow collar has developed. Additionally, chevron-shaped low axial riblets have come in, these diverging slightly away from the peripheral spiral cord to the subsutural collar above, and to the anterior spiral cord below. The posterior riblets are a little stronger than the anterior ones, and the interspaces are slightly wider than the riblets themselves. At the intersections between the spiral cords and axial riblets small nodules or beads are formed. On the body whorl a secondary spiral cord emerges from the com-

missure, and a short distance below that there is a still smaller spiral cord or thread around the outer zone of the base. The rest of the base is smooth except for faint, widely spaced, microscopic axial threads. Aperture subquadrate, the spiral sculpture of the exterior showing through faintly. Outer lip thin, the inner margin seemingly slightly fluted, the lip joined to the whorl at nearly a right angle. Columella short, very slightly excavated, fairly sturdy as compared with the rest of the shell, the lower lip reinforced with a little enamel. Basal lip broken away as is most of the outer lip.

Dimensions.—Holotype, length 1.0 mm.; width 0.7 mm.

Type locality.—Mare formation at W-14, on hillside above west bank of Quebrada Mare Abajo. One immature specimen, the holotype.

Remarks.—The wide angle of spire is the distinguishing characteristic. In general the new species is not unlike *A. diomedae* Bartsch (1911e, p. 413, pl. 62, fig. 1), a Recent Pacific shell found along the beach on both coasts of Baja California, Mexico. That, however, is more slender than *A. venezuelana,* n. sp. and differs also in details of sculpture. Superficially, also, *Alabina venezuelana,* n. sp. rather closely resembles *Bittium venezuelanum,* n. sp. (see Pl. 15 figs. 7, 8), but *B. venezuelanum* is a sturdier shell, with a smooth, heavily enameled base.

Alaba incerta ? (d'Orbigny) Pl. 16, figs. 3-6

1842. *Eulima incerta* d'Orbigny [in] La Sagra, Hist. phys., polit. nat. l'Ile de Cuba (8 vo.), vol. 1, p. 218, Atlas, pl. 16, figs. 7, 9.
1845. *Rissoa tervaricosa* C. B. Adams, Boston Soc. Nat. Hist. Proc., vol. 2, p. 6.
1850. *Rissoa ? melanura* C. B. Adams, Contrib. to Conch., No. 7, p. 116.
1864. *Rissoa ? melanura* Adams, Krebs, The West Indian Marine Shells, pp. 54-55.
1864. *Rissoa ? trivaricosa* [*sic*] Adams, Krebs, The West Indian Marine Shells, p. 56.
1864. *Eulima incerta* d'Orbigny, Krebs, The West Indian Marine Shells, p. 74.
1876. *Alaba tervaricosa* (Adams), Mörch, Malakozool. Blätter, vol. 23, p. 57.
1878. *Alaba tervaricosa* (Adams), Mörch, Catalogue of West-India Shells, p. 8.
1889. *Alaba tervaricosa* (C. B. Adams), Dall, U. S. Nat. Mus., Bull. 7, p. 146.
1901. *Alaba tervaricosa* (C. B. Adams), Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, p. 431, pl. 58, fig. 8.
1928. *Alaba tervaricosa* (C. B. Adams), Woodring, Carnegie Inst. Washington, Publ. No. 385, pp. 340, 341.
1937. *Alaba tervaricosa* (C. B. Adams), Smith, East Coast Marine Shells, p. 98, pl. 37, figs. 11a, 11b.

1950. *Rissoa ? melanura* C. B. Adams, Clench and Turner, Occas. Papers on Mollusks, vol. 1, No. 15, pp. 307-308, pl. 33, fig. 2.
1950. *Rissoa tervaricosa* C. B. Adams, Clench and Turner, Occas. Papers on Mollusks, vol. 1, No. 15, pp. 350-351, pl. 34, fig. 3.
1953. *Alaba tervaricosa* (C. B. Adams), Haas, Fieldiana-Zoology, vol. 34 No. 20, p. 204.
1958. *Alaba incerta* (d'Orbigny), Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 13.
1958. *Alaba incerta* (Orbigny), Abbott, Acad. Nat. Sci. Philadelphia, Mon. No. 11, pp. 40-41.
1959. *Alaba incerta* (Orbigny), Nowell-Usticke, A Check List of the Marine Shells of St. Croix, p. 42.

Two small, badly corroded shells, one from the Playa Grande formation and the other from the Abisinia formation, are tentatively referred to this species. The shell from the Playa Grande formation (Pl. 16, figs. 3, 4) has but 3-1/2 whorls remaining. These are hardly convex, and are separated by deeply impressed sutures, the last whorl being evenly rounded. Each of the whorls bears three low, equidistant varices which are aligned on the conch in a slightly diagonal column. All of the varices, except the one behind the outer lip, are eroded in varying degree down the middle. Aperture broadly subovate. Outer lip gently swollen behind. Basal lip slightly undercutting the base of the columella, the columella nearly straight. Surface of specimen worn but there is the suggestion that well-preserved shells are marked with spiral grooves. The angle of spire is about 15 degrees.

The shell from the Abisinia formation (Pl. 16, figs. 5, 6) is elongate conical, the angle of spire about 26 degrees. Nucleus decollate, post-nuclear whorls remaining 4-1/2, these slightly convex, the body whorl gently rounded but a trifle subangular at the periphery. Sutures finely but deeply impressed. Sculpture consisting of vague and hardly distinguishable low broad varices, the spacing of which seems variable, and relatively widely spaced fine spiral grooves barely visible on the anterior third of the penultimate whorl and on the periphery and base of the ultimate whorl. Aperture subovate. Outer lip broken back. Basal lip a little spatulate next to the lower lip, the lower lip itself at the anterior extremity very slightly curved away from the aperture. Columella nearly straight. Parietal wall lightly enameled.

Dimensions.—Figured specimen (S1a), length (3 whorls) 3.7 mm.; max. width 1.7 mm.; figured specimen (D2a), length (4-1/2 whorls) 2.6 mm.; max. width 1.1 mm.

Localities.—Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. One specimen. Abisinia formation at W-30, eastern edge of Playa Grande village. One specimen.

Remarks.—Making allowance for its poor preservation and for the relatively small divergence of the spire, specimen S1a seems near, if not identical with *S. incerta* (d'Orbigny). *A. incerta* exhibits considerable variation and, according to Abbott, the angle of spire varies from 15 to 30 degrees. The angle of spire of S1a is about 15 degrees and thus would appear to fall within the normal range of deviation.

The preservation of specimen D2a from the Abisinia formation is not good enough for definitive identification, but there is nothing to preclude the consideration that it is a fossil analogue of *A. incerta* (d'Orbigny). However, it is also similar to the Miocene *A. turrita* Guppy from Jamaica as illustrated by Woodring (1928, pl. 25, fig. 15) and to the Miocene *A. dodona* Gardner (1947, pp. 580-581, pl. 54, figs. 14, 15) from the Oak Grove sand of Florida. It is apparent that more material is needed for a convincing appraisal.

Range and distribution.—The Recent *A. incerta* (d'Orbigny) ranges from southeast Florida to Rio de Janeiro, Brazil. The fossil *A. incerta* has been recorded from the Pleistocene of Barbados by Gregory (1895, Geol. Soc. London, Quart. Jour., vol. 51, p. 289).

Alaba insculpta, new species Pl. 16, figs. 1, 2

Shell small, relatively slender, the angle of spire about 28 degrees. Whorls about 10 including those of the nucleus. Nuclear whorls about two, smooth, the first decollate. Post-nuclear whorls convex, the earliest two bearing obscure axial riblets observable in certain light under magnification. The body whorl is subangularly rounded at the periphery, and the base is rather sharply but evenly drawn in. Last five whorls varicated, each of them except the ultima with two varices, the ultima with three. All of the varices are eroded down the middle, and are offset on each succeeding whorl. Sutures finely impressed above, narrowly channeled below. Sculpture consisting of more or less equally spaced spiral grooves on the anterior half of the penultimate whorl and on the periphery and base of the ultimate whorl where eight or nine of them may be counted. Above the peri-

phery of the ultimate whorl the spiral grooves are obsolescent as they are on the penultima. Aperture ovate. Outer lip broken in part but it can be seen that the labrum itself is varicated. Basal lip broken away. Columellar lip and parietal wall thinly sheathed with enamel. Columella straight, its anterior extremity seemingly slightly twisted.

Dimensions.—Holotype, length 4 mm.; max. width 1.5 mm.

Type locality.—Mare formation near W-14, on hillside above west bank of Quebrada Mare Abajo. One specimen, the holotype.

Comparisons.—This species is close to *A. turrita* Guppy (in Guppy and Dall, 1896, p. 321, pl. 28, fig. 7) from the middle Miocene of Jamaica, the Dominican Republic, and Costa Rica, although certain differences can be recognized. For example, the whorls of *A. turrita* are a little more convex than they are on *A. insculpta,* and the last whorl of *A. turrita* is well rounded whereas on the Venezuelan shell it is subangularly rounded. The two species can also be discriminated by the aperture, as that of *A. turrita* is broadly lunate, that of *A. insculpta* ovate. Nevertheless, the general similarity of the two species is striking.

Seila adamsii ? (H. C. Lea) **Pl. 15, figs. 23, 24**

1840. *Cerithium terebrale* C. B. Adams, Boston Jour. Nat. Hist., vol. 3, p. 320, pl. 3, fig. 7. Not Lamarck 1804.
1845. *Cerithium adamsii* H. C. Lea, Am. Philos. Soc. Trans., ser. 2, vol. 9, p. 42 (new name for *C. terebrale* C. B. Adams).
1847. *Cerithium terebellum* C. B. Adams, Catalogue of the Genera and Species in the Collection of C. B. Adams, Middlebury, Vermont, p. 45.
1851. *Cerithiopsis terebellum* (C. B. Adams), Stimpson, New England Shells, p. 45.
1855. *Cerithium terebellum* C. B. Adams, Sowerby, Thes. Conchyl., vol. 2, p. 880, pl. 184, fig. 241.
1864. *Cerithium terebellum* Adams, Krebs, The West Indian Marine Shells, p. 50.
1878. *Bittium terebellum* (Adams), Mörch, Catalogue of West-India Shells, p. 8.
1889. *Seila terebralis* (C. B. Adams), Dall, Mus. Comp. Zool., vol. 18, p. 250.
1889. *Seila terebralis* (C. B. Adams), Dall, U. S. Nat. Mus., Bull. 37, p. 138, pl. 52, fig. 5.
1891. *Seila terebralis* (C. B. Adams), Baker, Acad. Nat. Sci. Philadelphia, Proc., vol. 43, p. 53.
1892. *Seila Adamsii* (H. C. Lea), Dall, Wagner Free Inst. Sci., Trans., vol. 3, pt. 2, pp. 267-268.
1901. *Seila terebralis* (C. B. Adams), Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, p. 424.
1903. *Seila adamsii* (H. C. Lea), Vanatta, Acad. Nat. Sci. Philadelphia, Proc., vol. 55, p. 758.

1915. *Seila adamsi* (H. C. Lea), Johnson, Boston Soc. Nat. Hist. Occas. Papers, vol. 7, p. 127.
1922. *Seila adamsi* (H. C. Lea), Maury, Bull. Amer. Paleont., vol. 9, No. 38, p. 124.
1937. *Seila admasii* (H. C. Lea), Smith, East Coast Marine Shells, p. 105, pl. 38, fig. 22; pl. 71, fig. 5.
1938. *Seila adamsi* (Lea), Richards, Geol. Soc. Amer. Bull., vol. 49, p. 1292.
1940. *Seila adamsi* (H. C. Lea), Perry, Bull. Amer. Paleont., vol. 26, No. 95, p. 130, pl. 27, fig. 192.
1943. *Seila terebralis* (C. B. Adams), De Kay, New York Mollusca, p. 130, pl. 8, fig. 172.
1943. *Seila admasii* (H. C. Lea), Jacobs, Nautilus, vol. 58, No. 2, p. 61.
1944. *Cerithium terebellum and C. terebrale* C. B. Adams, Clench and Turner, Occas. Papers on Mollusks, vol. 1, No. 15, p. 345, pl. 37, figs. 5-7.
1952. *Seila adamsi* (H. C. Lea), Pulley, Texas Jour. Sci., vol. 4, No. 2, p. 172.
1953. *Seila adamsii* (H. C. Lea), Olsson and Harbison, Acad. Nat. Sci. Philadelphia, Mon. No. 8, p. 302.
1954. *Seila adamsi* (H. C. Lea), Abbott, American Seashells, p. 158, pl. 22t.
1955. *Seila adamsii* (H. C. Lea), Perry and Schwengel, Marine Shells of the Western Coast of Florida, pp. 140-141, pl. 27, fig. 192.
1958. *Seila adamsii* (H. C. Lea), Du Bar, Florida Geol. Sur. Geol., Bull., No. 40, p. 214.
1958. *Seila adamsi* (H. C. Lea), Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 13.
1958. *Seila adamsi* (H. C. Lea), Abbott, Acad. Nat. Sci. Philadelphia, Mon. No. 11, pp. 41-42.
1958. *Seila adamsi* (Lea), Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, p. 70.

Shell small, the spire elongate, the divergence 19-20 degrees. Whorls estimated at 12 including the nucleus which is decollate. Post-nuclear whorls flat-sided, sculptured by three elevated subequal spiral cords, separated by deep, square-cut interspaces about as wide as the cords themselves, the interspaces bear numerous axial threads which do not cross the top of the cords. On the base of the last whorl there is a fourth spiral cord, smaller than the others, bipartite, the lower strand of the cord being the narrower and forming the peripheral thread of the base proper. Outer area of base concave, the inner convex, the base smooth except for fine axial growth wrinkles. Aperture small, subquadrate. Outer lip and columella broken away.

Dimensions.—Figured specimen (nucleus decollate, anterior end missing), length 4.1 mm.; max. width 1.3 mm. Measurement includes the two halves of the specimen which was broken while being mounted for photographing.

Locality.—Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. One specimen.

Remarks.—The spiral cords of the Venezuelan specimen are slightly thicker and a little closer than on many Recent specimens of *S. adamsii* I have examined but otherwise there is no significant difference. A closely related species is *S. clavulus* (H. C. Lea) (1845, p. 268, pl. 37, fig. 89), but that is slightly narrower than the Venezuelan shell, and the longitudinal threads between the spiral cords are fewer and stronger. *S. clavulus* and *S. adamsii* have been considered synonymous by some authorities, but Mansfield (1930, pp. 96-97, pl. 13, fig. 7) was of the opinion that "the two forms do not appear to be identical and cannot be united under one specific name". *S. clavulus,* according to Mansfield, occurs in the upper Miocene of Virginia, North Carolina, South Carolina, and Florida, and in the Pliocene of South Carolina and Florida.

Range and distribution.—Species referred to *S. clavulus* and *S. adamsii* have been reported from the middle Miocene of Florida; the upper Miocene of Maryland, Virginia, North Carolina, South Carolina, and Florida; the Pliocene of North Carolina, South Carolina, and Florida; the Pleistocene of the Gulf coast and Florida; and in the Recent Western Atlantic fauna from Massachusetts to the West Indies.

TRIPHORIDAE

Triphora (Cosmotriphora) decorata (C. B. Adams) Pl. 16, figs. 18, 19

1850. *Cerithium decoratum* C. B. Adams, Contrib. to Conch., No. 7, p. 117.
1864. *Triforis decoratus* (Adams), Krebs, The West Indian Marine Shells, p. 51.
1878. *Triforis decoratus* (Adams), Mörch. Catalogue of West-India Shells, p. 9.
1891. *Triforis decoratus* (C. B. Adams), Baker, Acad. Nat. Sci. Philadelphia, Proc., vol. 43, p. 53.
1892. *Triforis decorata* (C. B. Adams), Dall, Wagner Free Inst. Sci., Trans., vol. 3, pt. 2, p. 265.
1922. *Triphora decorata* (C. B. Adams), Maury, Bull. Amer. Paleont., vol. 9, No. 38, p. 121.
1937. *Triphora decorata* (C. B. Adams), Smith, East Coast Marine Shells, p. 104.
1950. *Cerithium decoratum* C. B. Adams, Clench and Turner, Occas. Papers on Mollusks, vol. 1, No. 15, p. 272, pl. 38, fig. 1.
1954. *Triphora decorata* (C. B. Aadms), Abbott, American Seashells, p. 159, pl. 19zz.
1958. *Triphora decorata* (C. B. Adams), Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 13.
1958. *Triphora decorata* (C. B. Adams), Abbott, Acad. Nat. Sci. Philadelphia, Mon. No. 11, p. 43.

1958. *Triphora decorata* (C. B. Adams), Coomans, Caraibisch Marien- Biologisch Inst., Collected Papers 6, p. 71.
1959. *Triphora decorata* (C. B. Adams), Nowell-Usticke, A Check List of the Marine Shells of St. Croix.

Shell small, sinistral, elongate conical, the angle of spire 23-24 degrees. Whorls planulate, the early ones with two, the later ones with three rows of beads, each bead connected with the other by a spiral cord on the same row and by an axial cord between rows. Where there are two rows, the beads are large and equal in size; where there are three rows, the middle one is notably smaller at first but enlarges progressively with growth, becoming finally nearly the same in size as the other two. The large beads are bulbous, more or less oval, their long axes aligned with the long axis of the shell; the small beads of the middle row are subrounded. Sutural areas narrowly and rather deeply channeled, the sutures themselves not visible. Base gently concave, the acute periphery sculptured by 21 short prongs or lirae bent over the peripheral angulation and connected with the beads by short axial cords; the rest of the base is smooth except for fairly strong, curved growth wrinkles converging toward the pillar. Aperture nearly circular, holostomatous. Columella with a thin sheath of enamel, the far margin of which is detached, the enamel extending to the parietal wall. Pillar short, the extremity swirled to form a narrow channel or slitted opening which is closed off against the lower side of the aperture. Posterior sinus a small, hardly discernible notch. Basal lip sharply truncate. Edge of outer lip broken away.

Dimensions.—Figured specimen (five whorls, upper end of spire missing), length 2.9 mm.; max. width 1.6 mm.

Locality.—Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. One specimen.

Remarks.—Of the several Recent species of *Triphora* described by C. B. Adams under *Cerithium,* the Venezuelan fossil, except for slightly narrower sutural channels, is identical with *T. decorata.* It also seems to be identical with the lectotype of Adams' *T. intermedia* (see Clench and Turner, 1950, pl. 38, fig. 9) which itself appears to be the same as *T. decorata* except for the color pattern. The heautotype of *T. intermedia,* however, is considerably more slender than *T. decorata,* the spire is slightly curved in outline rather than rectilinear as in *T. decorata,* and the aperture is obcordate rather

than suborbicular. On *T. dealbata* the beads are less developed than on *T. decorata* and there are more rows of them. *T. calypsonis* Maury (1917, pp. 286-287, pl. 21, fig. 13) from the Miocene of the Dominican Republic is more slender than the Venezuelan *T. decorata,* and *T. apania* Woodring (1928, p. 329, pl. 25, fig. 2) from the Bowden Miocene of Jamaica, is girdled with two spiral cords at the base of the ultimate whorl whereas our *T. decorata* has but one. Although the nucleus of our shell is missing, the character of the ornamentation on the spire whorls suggests that it belongs to the subgenus *Cosmotriphora* established by Olsson and Harbison (Acad. Nat. Sci. Philadelphia, Mon. No. 8, p. 295) in 1953.

Range and distribution.—*T. decorata* (C. B. Adams) ranges from southeast Florida to the Lesser Antilles. The only fossil occurrence, other than the present record of it in Venezuela, is in the Chipola Miocene of Florida (Dall, 1892, p. 265).

Triphora (Cosmotriphora) caribbeana, new species Pl. 16, figs. 20, 21

Shell small, sturdy, sinistral, slenderly elongate, the angle of spire 9-1/2 degrees. Whorls planulate, separated by finely incised sutures. Third from last whorl ornamented with two equal rows of 17 large beads, the top of the beads of the lower row connected by a spiral thread, the space between the rows moderately deep. At the lower suture of this whorl there is another spiral thread. Second from last whorl sculptured the same but with an additional fairly strong spiral thread having come in between the two rows of beads. As on the preceding whorl, the tops of the beads of the anterior row are connected by a sharp spiral thread, the thread passing over the surface of the beads as well as between them. On the penultimate whorl there are still about 17 beads per row; the thread between the rows has developed into a finely beaded cord, and the sutural thread at the base of the whorl is weakly noded. All of the larger beads on the spire are aligned in a slightly oblique column. Body whorl ornamented with five rows of beads, the four upper rows subequal in size and separated by narrower interspaces, the last row slightly smaller than the others and more widely separated, the beading relatively faint. Base short. Aperture small, more or less suborbicular. Columella with a heavy blob of callus. Outer lip broken far back. Anterior canal thickened, very short, narrow, bent back a little at its extremity.

Dimensions.—Holotype (four whorls), length 3 mm.; max. width 1.7 mm.

Type locality.—Mare formation at W-25, south flank of Punta Gorda anticline. One specimen.

Comparisons.—The main feature of this shell is the spiral thread connecting the tops of the lower row of beads. In general appearance it is of the same general ilk as the *T. decorata-melanura-modesta* complex of C. B. Adams (see Clench and Turner, 1950) but in addition to minor differences in ornamentation it is more slender than those. The Venezuelan shell is also reminiscent of *T. oreodoxa* Olsson and Harbison (1953, p. 296, pl. 43, figs. 3-3b) and *T. bolax* Olsson and Harbison (1953, pp. 295-296, pl. 43, figs. 4-4c) from the Pliocene shell bed at North St. Petersburg, Florida, but at the equivalent position of the whorls *T. oreodoxa* has three more or less equal rows of beads, and *T. bolax,* although sculptured like *T. caribbeana* with two rows of beads has a more divergent, and a curvilinear, rather than rectilinear spire.

EPITONIIDAE

Epitonium (Asperiscala) venezuelense, new species Pl. 16, figs. 22, 23

Shell small, sturdily constructed, the apex decollate, the angle of spire around 32 degrees. Whorls remaining four, these wider than high, strongly convex, ornamented with lamellar to cordlike axial costae (11 on the body whorl) and faint subequally spaced spiral threads in the intercostal areas. The crests of the axial lamellae are generally recurved a little to the right as viewed with the spire away from the observer, but occasional lamellae are strongly recurved and broadened. All of the axial costae are connected across the sutural areas, and at the summit there is generally an acute angulation, this often developing into a fine, sharp-pointed hook, the tip of the hook curved inward toward the suture and bent slightly to the right. The spiral threads in the interspaces of the axial costae become obsolescent near the posterior suture, and on the penultimate whorl there are about 10 of them. The base of the shell is marked with numerous microscopic spiral threads and, with a 20-power lens, there can be seen closely spaced axial filaments of equal size between the spiral threads of the intercostal areas. Sutural areas deeply impressed. Aperture subcircular, holostomatous. Columella gently arcuate, the

distal margin raised above and recurved over a part of the shallow umbilical depression. Immediately behind the thickened rim of the outer lip is the last axial lamella and this is the most prominent of all. On the short well rounded base of the shell the axial costae seem, on our single specimen, to diminish in strength, and converge toward the umbilicus.

Dimensions.—Holotype (four whorls), length 2.9 mm.; max. width 1.8 mm.

Type locality.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. One specimen, the holotype. The shell seems to be that of an adult.

Comparisons.—*E. venezuelense,* n. sp. is similar to, but not, so far as I can perceive, identical with any of the following living species as described and illustrated by Clench and Turner (Johnsonia, vol. 2, Nos. 30 and 31, 1951-1952):

E. novangliae (Couthouy). The Venezuelan fossil is close to this but is smaller and sturdier, the sutural areas are more profound, the axial costae are higher, and the umbilical depression is more pronounced.

E. venosum (Sowerby). This species, recorded from Puerto Cabello, Venezuela, among other Caribbean localities, is imperforate, and has smooth intercostal spaces.

E. candeanum (d'Orbigny). The angles or hooks on the costae are wanting or are small and inconspicuous. On *E. venezuelense* they are prominent.

E. denticulatum (Sowerby). Our Venezuelan fossil is closely related, differing in its more exposed umbilicus. Also, on specimens of comparable size, the spire of *E. denticulatum* is more rapidly tapering, and there are nine axial lamellae as compared with 11 on *E. venezuelense.*

Fossil species which *E. venezuelense* resembles are these:

E. dupliniana (Olsson) (1916a, p. 135, pl. 1, fig. 14) from the upper Miocene Duplin formation at Natural Well, North Carolina. This is characterized by low flat axials as contrasted with the blade-like costae of *E. venezuelense.*

E. virginiae (Maury) (1910, p. 147, pl. 7, fig. 8) from the Chipola Miocene of Florida. *E. venezuelense* is differentiated solely by its somewhat lesser angle of divergence.

E. gabbi (de Boury), re-named from *E. minutissima* (Gabb) by Woodring (1928, p. 397, pl. 31, figs. 11, 12), from the Miocene of Jamaica and the Dominican Republic. The whorls of *E. gabbi* are less tumid and the sutural areas less profound than on the Venezuelan shell. Also, two of the ribs on the last whorl of *E. gabbi* are thicker and higher than the others.

E. cf. *gabbi* (de Boury) Woodring (1959, p. 182, pl. 38, fig. 17) from the Gatun Miocene of the Panamá Canal Zone, has sharper and more numerous spiral threads on the last whorl.

E. amosbrowni Pilsbry (1921, pp. 388-389, pl. 34, fig. 7), from the Miocene of the Dominican Republic has 16 axial costae on the last whorl compared with 11 on *E. venezuelense.*

E. etolium Woodring (1928, p. 398, pl. 31, figs. 13, 14) from the Bowden Miocene of Jamaica, is stubbier than *E. venezuelense,* and imperforate as well; *E. anlanum* Woodring (1928, p. 399, pl. 31, figs. 16, 17) bears heavier intercostal spiral threads than does *E. venezuelense;* and on *E. callipticum* Woodring (1928, pp. 399-400, pl. 31, fig. 18), also from the Jamaican Miocene, the umbilical opening is "masked by the lamellae, which extend down and virtually touch" the peristome.

E. eleutherium Pilsbry and Olsson (1941, p. 38, pl. 2, fig. 7) from the Pliocene of Ecuador, is an imperforate shell whereas *E. venezuelense* has a narrow umbilicus.

Epitonium (Asperiscala) laguairense, new species Pl. 18, figs. 1, 2

1959. *Epitonium (Asperiscala) cf. E. rushii* (Dall), Woodring, U. S. Geol. Sur., Prof. Paper 306, B, p. 153, pl. 34, fig. 22.

Shell small, subtranslucent, elongate conical, the angle of spire around 34 degrees. Nuclear whorls estimated at three, the earliest ones decollate, the last china-white, smooth, defined from the conch by the appearance of the first axial rib. Post-nuclear whorls five or six, well rounded, the sutural areas rather deeply and widely impressed. Axial sculpture consisting of low, bladelike and occasionally reflected axial costae of which there are 18 on the last full volution. These lamellae are continuous from one whorl to the other and are usually kinked in the sutural areas where they are joined. Rarely the blade columns are offset in the sutural area, and occasionally the lamellae develop small angles at the shoulder of the whorl.

In the intercostal areas there are faint subequal spiral ridges crossed by numerous microscopic axial striae. The spiral ridges (about ten on the penultimate whorl) are obsolescent around the summit of the whorls but are numerous and fine on the base of the shell. Aperture ovate, widest below, smooth within, but with the external sculpture showing through the translucency. Outer lip reinforced immediately behind by the last axial rib which is recumbently recurved. Basal lip truncate, with a slight incurve medially. Columella scarcely curved, stout. Parietal wall with a thin sheath of enamel appressed against the whorl.

Dimensions.—Holotype (earliest nuclear whorls decollate), length 4.5 mm.; max. width 2.1 mm.

Type locality.—Mare formation at W-25, south flank of Punta Gorda anticline. One specimen, the holotype.

Comparisons.—The distinguishing characteristics of this species are the undeveloped parietal shield and truncated basal lip. Otherwise it is not unlike the living *E. candeanum* (d'Orbigny) (see Clench and Turner, 1952, pp. 301-303, pls. 140-141) which ranges from Florida to the Barbados in 1 to 400 fathoms. In the character of its costae, including their kinks in the sutural area, *E. laguairense,* n. sp. recalls the present-day *E. rushii* (Dall) as described and illustrated by Clench and Turner (Johnsonia, 1952, pp. 296-298, pl. 136). But *E. rushii,* which ranges from North Carolina through the Florida Keys in 38-100 fathoms, is rounded instead of squared-off on the base, its aperture is subcircular instead of ovate, and it has more numerous whorls, with 25-27 costae on the ultima compared with the smaller *E. laguairense* which has 18. Notwithstanding, the Venezuelan shell is so similar to the form referred to as *E.* cf. *rushii* (Dall) by Woodring that *E. laguairense* may well be the same as Woodring's species which occurs in the upper part of the Gatun formation (late Miocene) in the Panamá Canal Zone. The Miocene *E. gabbi* (de Boury) (see Woodring, 1928, pp. 397-398, pl. 31, figs. 11, 12) from the Dominican Republic and Jamaica has several varicose costae on the last whorl or two, and at the union of the basal and lower lips there is a slight channel.

Epitonium (Asperiscala ?) marenum, new species Pl. 17, figs. 3, 4; Pl. 18, figs. 3, 4

This tiny mollusk is barely beyond the nuclear stage. The shell

is thin, ovate, broadly conical, and consists of 4 whorls, 3-1/2 of them forming the smooth subhyaline nucleus. The initial nuclear whorl is appressed, rendering the tip of the spire obtuse; the succeeding nuclear whorls are moderately convex, the last rapidly expanding, long, and sharply defined from the conch. The conch is ornamented with narrow, elevated, somewhat recurved axial costae which converge on the base toward the umbilical area, and at the summit of the whorl encroach a little on the protoconch. The intercostal areas are wider than the costae, and are faintly sculptured by more or less regularly spaced spiral threads. Sutures sharply incised. Aperture oval, holostomatous, the outer lip with the last axial rib immediately behind the rim, the basal lip rounded, the lower lip widened a little but thin. Columella gently arcuate, the parietal shield thinly enameled. Umbilical chink rudimentary, obscured by the distal margin of the lower lip and columella.

Dimensions.—Holotype, length 0.5 mm.; max. width 0.3 mm.

Type locality.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. One immature specimen, the holotype.

Remarks.—Although this might be the same as any one of a number of living or fossil species of *Epitonium*, the protoconch, with its long final whorl, is unlike that on any other adult I have compared it with. It is to be hoped that the validity of the new name proposed for this juvenile shell will be confirmed or negated when more specimens become available.

Epitonium species Pl. 18, fig. 5

Illustrated is a portion of the whorl of an unknown species. The shell, which is represented only by the fragment shown, is thin, polished within, subtranslucent, and probably attains a relatively large size. The whorl is evenly rounded and sculptured with low thin axial costae between which are faint spiral riblets and threads. The costae are somewhat unequal in size and spacing and are slightly thickened at their crests. One of the costa is bifurcated and somewhat flexous, but the rest are fairly straight with a tendency to be recurved toward the midline of the whorl. From the number of costae remaining, it is estimated that there are at least 25 on the last full volution. The spiral markings in the intercostal areas consist of low

subequal dichotomous riblets between each of which there are two or three finer threads.

Dimensions.—Height of whorl 4.2 mm.

Locality.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. One fragment.

Remarks.—The character of the sculpture suggests that this shell is like *E. multistriatum* (Say) (1826, p. 280) which is living along the east coast of the United States from "Buzzards Bay, Massachusetts, south to Cape Canaveral, Florida and probably along the north coast of the Gulf of Mexico from Florida to Texas" (Clench and Turner, 1952, p. 294). *E. multistriatum* has also been reported in the upper Miocene at Simmons, South Carolina, by Holmes (1860, Post-Pleiocene Fossils of South Carolina, p. 90, pl. 14, fig. 4).

HIPPONICIDAE

Cheilea equestris (Linnaeus) **Pl. 18, figs. 8-12**

1758. *Patella equestris* Linnaeus, Syat. Nat., ed. 10, p. 780.
1864. *Mitrularia esqvestris* (Linnaeus), Krebs, The West-Indian Marine Shells, p. 69.
1878. *Calyptraea equestris* (Linnaeus), Mörch, Catalogue of West-India Shells, p. 10.
1886. *Mitrularia equestris* (Linnaeus), Tryon, Man. Conch., vol. 8, p. 137, pl. 41, figs. 25, 26.
1889. *Mitrularia equestris* (Linnaeus), Dall, U. S. Nat. Mus., Bull. 37, p. 152.
1889. *Mitrularia equestris* (Linnaeus), Dall, Mus. Comp. Zool., Bull., vol. 18, p. 283.
1892. *Mitrularia equestris* (Linnaeus), Dall, Wagner Free Inst. Sci., Trans. vol. 3, pt. 2, p. 348.
1901. *Cheilea equestris* (Linnaeus), Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, p. 436.
1909. *Cheilea equestris* (Linnaeus), Dall, U. S. Nat. Mus., Proc., vol. 37, No. 1704, pp. 232, 281, 286.
1922. *Cheilea equestris* (Linnaeus), Maury, Bull. Amer. Paleont., vol. 9, No. 38, p. 143.
1924. *Cheilea equestris* (Linnaeus), Olsson, Nautilus, vol. 37, No. 4, p. 125.
1928. *Cheilea "equestris* (Linné)", Woodring, Carnegie Inst. Washington, Publ. No. 385, p. 375, pl. 30, figs. 1, 2.
1937. *Cheilea equestris* (Linnaeus), Smith, East Coast Marine Shells, pp. 94-95, pl. 36, fig. 7.
1946. *Cheilea equestris* (Linnaeus) McLean and Hebert, Nautilus, vol. 60, No. 2, p. 55.
1952. *Cheilea equestris* (Linnaeus), Pulley, Texas Jour. Sci., vol. 4, No. 2, p. 174.
1954. *Cheilea equestris* (Linnaeus), Abbott, American Seashells, pp. 165-166, pl. 21p.

1958. *Cheilea equestris* (Linnaeus), Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 14.
1958. *Cheilea equestris* (Linnaeus), Abbott, Acad. Nat. Sci. Philadelphia, Mon. No. 11, p. 45.
1958. *Cheilea equestris* (Linnaeus), Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, p. 74.
1959. *Cheilea equestris* (Linnaeus), Nowell-Usticke, A Check List of the Marine Shells of St. Croix, p. 47.

The Recent Venezuelan shells referred to this species are thin and translucent to moderately thick, low conical to high conical, white to straw-colored, frayed to minutely serrate at the somewhat undulatory margin. The septum is a deep delicate half-funnel, the base of which is attached on the inside of the shell under the beak. Beak situated a little off center toward the posterior margin. Apex twisted, the beak formed by a single hyaline nuclear whorl. The initial turn of the nucleus is rather tightly and planispirally coiled, but the final stage expands rapidly to form the umbo of the conch. Exterior sculptured by numerous, small wavy radial cords of more or less equal size. Often there are minor threads between the radial cords, the most delicate specimen having three such threads between the primary cords. In addition to the radial markings there are a few irregular concentric growth corrugations which are particularly prominent on the translucent specimens. Interior of shell smooth to glossy, the sides a little wavy in conformity with the external corrugations. Base roughly orbicular in outline.

Dimensions.—Figured specimen (A294a), max. diameter 11.5 mm.; altitude 6.5 mm.; figured specimen (A294b), max. diameter 10.6 mm.; altitude 6.3 mm.

Locality.—Recent, on beach of Playa Grande Yachting Club, Distrito Federal. Three specimens.

Range and distribution.—To judge from even the few Venezuelan examples, *Cheilea equestris* must be an exceedingly variable form. In the Western Atlantic it is known from Cape Hatteras, North Carolina, to northern South America. In the Gulf of Mexico it lives in deep water (up to 189 fathoms), but elsewhere it may occur off shore. In the Eastern Pacific it has been reported by Dall (1909) and Olsson (1924) from Mazatlan, Mexico to Arica, Chile, and the Galapagos Islands. In the Central Pacific it is listed by McLean and Hebert (1946) from the Admiralty Islands. Many Recent forms have been synonymized with *C. equestris* by Tryon

and Dall, but Woodring (1928) felt that several species are represented in the mixture. A case in point is *C. cepacea* (Broderip) which is described by Keen (1958, p. 312) as the Eastern Pacific analogue of *C. equestris,* although she, too, stated that some authors regard *C. cepacea* the same as the prior-named *C. equestris.* As a fossil, *C. equestris* is recorded from the Pliocene of Florida by Dall (1892) and from the Bowden Miocene deposits in Jamaica by Woodring.

Hipponix antiquatus (Linnaeus) Pl. 18, figs. 13-15

1767. *Patella antiquata* Linnaeus, Syst. Nat., ed. 12, p. 1259.
1847. *Hipponix antiquata* (Linnaeus), Sowerby, Thes. Conchyl., vol 1, p. 369, pl. 73, figs. 18-20.
1864. *Capulus* (*Hipponyx*) *antiquatus* (Linnaeus), Krebs, The West Indian Marine Shells, p. 70.
1870. *Hipponyx antiquatus* (Linnaeus), Cooper, Am. Jour. Conch., vol. 6, pt. 1, No. 8, p. 64.
1878. *Hipponyx antiquatus* (Linnaeus), Mörch, Catalogue of West-India Shells, p. 10.
1886. *Hipponyx antiquatus* (Linnaeus), Tryon, Man. Conch., vol. 8, p. 134, pl. 40, figs. 93-97.
1890. *Hipponyx antiquatus* (Linnaeus), Smith, Linnaean Soc. Jour., Zoology, vol. 20, p. 492.
1901. *Amalthea antiquata* (Linnaeus), Dall and Simpson, U. S. Fish. Com., Bull., vol. 20 for 1900, pt. 1, p. 437.
1909. *Hipponix antiquata* (Linnaeus), Dall, U. S. Nat. Mus., Proc., vol. 37, No. 1704, p. 234.
1923. *Hipponix antiquatus* (Linnaeus), Strong, Nautilus, vol. 37, No. 2, p. 43.
1931. *Hipponix antiquatus* (Linnaeus), Oldroyd, Nautilus, vol. 44, No. 3, p. 93.
1935. *Hipponix antiquata* (Linnaeus), Richards, Jour. Paleont., vol. 9, No. 3, p. 257.
1936. *Hipponix antiquatus* (Linnaeus), Vokes, Nautilus, vol. 50, No. 2, p. 48.
1937. *Hipponix antiquatus* (Linnaeus), Smith, East Coast Marine Shells, p. 94, pl. 36, figs. 3a-3c.
1940. *Hipponix antiquatus* (Linnaeus), Smith, World-wide Sea Shells, pp. 28-29, fig. 399.
1942. *Hipponix antiquatus* (Linnaeus), Jaume and Pérez Farfante, Soc. Cubana Hist. Nat. "Felipe Poey" Mem., vol. 16, No. 1. p. 40.
1946. *Amalthea antiquatus* (Linnaeus), McLean and Hebert, Nautilus, vol. 60, p. 55.
1954. *Hipponix antiquatus* (Linnaeus), Abbott, American Seashells, p. 166, pl. 21t.
1958. *Hipponix antiquatus* (Linnaeus), Keen, Sea Shells of Tropical West America, p. 308, fig. 225.
1958. *Hipponix antiquatus* (Linnaeus), Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 14.
1958. *Hipponix antiquatus* (Linnaeus), Abbott, Acad. Nat. Sci. Philadelphia, Proc., Mon. 11, p. 45.
1958. *Hipponix antiquatus* (Linnaeus), Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, p. 73, pl. 12, 2 figs.
1959. *Hipponix antiquatus* (Linnaeus), Nowell-Usticke, A Check List of the Marine Shells of St. Croix, p. 47.

The Recent shell referred to this species is of medium size, robust, subtrigonal in outline. The aperture is large, suborbicular, with a broadly undulating margin. Apex high, situated posteriorly, a little twisted. Nucleus small, hyaline, obscure. Dorsum corrugated by four broad unequal undulations crossed by coarse overlapping foliaceous concentric lamellae, the undersides of the edges sculptured by fine spiral threads often reticulated by fine axial grooves, these markings quite prominent near the base. The upper surface of the lamellae is smoothish except immediately below the apex where there are feeble, wavy, radial threads and cords. Muscular impression distinct, horseshoe-shaped, the ends slightly and evenly expanded. Color whitish and straw-stained on the surface, the aperture cream-colored.

Dimensions.—Length 16.5 mm.; max. width 13.3 mm.; distance between ends of muscle scar 5.3 mm.

Locality.—Recent, on beach at Playa Grande Yachting Club, Distrito Federal. One specimen.

Remarks.—As it often clings to rocks and other shells, this species exhibits considerable variation. According to Abbott (1954), *H. antiquatus* may be differentiated from the similar *H. subrufus* (Lamarck) by the latter's orange-brown stain and the "numerous small spiral cords crossing the concentric ridges of about the same size".

Range and distribution.—In the Western Atlantic, *H. antiquatus* ranges from southeast Florida, to Brazil. As a fossil, it has been reported on the Atlantic side of the Americas from the Pleistocene of Cuba and Barbados. Along the Eastern Pacific it is said to extend from California to Peru, although some authors feel that the West Coast form is not the true *H. antiquatus* but the analogous *H. panamensis* (C. B. Adams), better known as *H. serratus* (Carpenter) which, according to Durham (1950, p. 125, pl. 30, figs. 9, 10), ranges from late Pliocene to Recent.

VANIKORIDAE

Vanikoro antillensis, new species — Pl. 17, figs. 5, 6; Pl. 18, figs. 16, 17

Shell small, solid, naticoid in outline, narrowly umbilicate, the top of the umbilicus partially roofed over by the membrane of enamel extending thereto from the thin wash of the parietal wall.

Whorls about 3-1/2 in all, the nucleus made up of a little over one of them. Nucleus smooth, porcelaneous, inflated, and somewhat lopsided, the first turn hardly coiled, swollen, and tilted, the last narrowish but tumid. Nucleus differentiated from the conch by the first axial thread. Penultimate whorl convex, the ultimate globose, and marked by a low, faint, narrow carina which crosses the ventral surface from the suture and descends around the dorsum as a weak angulation or acute rounding. Above this peripheral angulation there are two thread-sized carinae, one at the shoulder and the other a short distance below the suture, these appearing on the penultimate whorl as angulations. Crossing the penultimate whorl from suture to suture are fine raised axial threads separated by much wider interspaces, the interspaces becoming even broader toward the anterior suture. These threads also occur at the summit of the ultimate whorl but cannot be seen much below the shoulder either because of normal obsolescence or because of weathering of the surface, more probably the latter. Under a 20-power lens there can also be seen several spiral threads behind the outer lip at the base, and it is not unlikely that these are present over the whole of the dorsal surface on well-preserved specimens. Aperture broadly ovate, smooth within. Outer lip broken back, the angle of junction with the whorl acute. The outer lip is not varicated, but the shell substance is thick, the thickness diminishing at the base. Basal lip broken along the margin, but the shell seems to be thinner than on the labrum. Columella, so far as can be determined, is straight and presumably rather delicate. Umbilical depression shallow, its crescentic outer margin moderately sharp, the side with a few filaments which may represent the termini of the axial threads now worn off the surface of the whorl.

Dimensions.—Holotype, length 1.5 mm.; max. width 1.2 mm.

Type locality.—Mare formation at W-25, south flank of Punta Gorda anticline. One specimen, the holotype.

Remarks.—So far as I know, this is the first fossil representative of the genus *Vanikoro* recorded from the Caribbean area. It differs from the Recent West Indian *V. oxychone* Mörch (see Verrill and Bush, 1900, p. 540, pl. 65, fig. 6; and Abbott, 1954b, p. 167) in having a porcelaneous apex rather than a glassy one, and in its relatively small and shallow umbilicus.

CAPULIDAE

Capulus (Krebsia) incurvatus (Gmelin) Pl. 18, figs. 18-20; Pl. 19, figs. 1, 2

1791. *Patella incurva* Gmelin, Syst. Nat., ed. 13, vol. 1, p. 3715.
1822. *Pileopsis intorta* Lamarck, An. sans Vert., vol. 6, pt. 2, p. 18.
1842. *Capulus intortus* d'Orbigny [in] La Sagra, Hist. phys., polit. nat. l'Ile de Cuba (8 vo.), vol. 1, p. 186, Atlas, pl. 24, figs. 22, 23.
1864. *Capulus incurvus* (Gmelin), Krebs, The West Indian Marine Shells, p. 70. *P. militaris* L., Dw., and P. *intorta* Lmk. are listed as synonyms.
1878. *Capulus intortus* (d'Orbigny), Mörch, Catalogue of West-India Shells, p. 10.
1886. *Capulus intortus* (Lamarck), Tryon, Man. Conch., vol. 8, p. 131, pl. 39, fig. 75.
1889. *Capulus intortus* (Lamarck), Dall, U. S. Nat. Mus., Bull. 37, p. 154.
1889. *Capulus intortus* (Lamarck), Dall, Mus. Comp. Zool., Bull., vol. 18, p. 288.
1895. *Pileopsis (Capulus) intortus* Meusch., Gregory, Geol. Soc. London, Quart. Jour., vol. 51, p. 290.
1922. *Capulus intortus* (Lamarck), Maury, Bull. Amer. Paleont., vol. 9, No. 38, p. 143.
1933. *Hipponyx intortus (Lamarck),* Trechmann, Geol. Mag., vol. 70, No. 823, p. 40.
1937. *Capulus intortus* (Lamarck), Smith, East Coast Marine Shells, p. 94, pl. 36, fig. 4.
1954. *Capulus* (*Krebsia*) *incurvatus* (Gmelin), Abbott, American Seashells, p. 168.
1958. *Capulus incurvatus* (Gmelin), Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, p. 74, pl. 12, 3 figs.

Shell of medium size, strongly inflated, moderately solid. Apex elevated, twisted, high, situated far to the rear but not projecting beyond the posterior margin of the aperture. Nucleus smooth, one-whorled, the initial turn rather tight, dextrally coiled, highly inclined, the later stage expanding rapidly into the conch. Aperture large, more or less orbicular, polished. Muscular scar faint, horse-shoe-shaped, open toward the front, the ends a little expanded. Sculpture consisting of numerous low flexous radial cords, generally with an intercalary thread between, crossed by irregular concentric growth lamellae and ridges. The periostracum that adheres to one of the Recent specimens is tan in color, moderately thick, consisting of vertical tufts arranged in rows. The color of the Recent shell is cream or straw on the outside, white within.

Dimensions.—Recent specimen (A267a), length 15.2 mm.; max. width 10 mm.; length of aperture 10 mm.; max. width of aperture 9.1 mm.; fossil specimen (D267a), length 6.6 mm.; max. width 6 mm.; length of aperture 6.1 mm.

Localities.—Recent, on beach of Playa Grande Yachting Club, Distrito Federal. Two specimens. Abisinia formation at W-30, east-

ern edge of Playa Grande village. One well-preserved specimen with the intercepts of the radial cords and concentric threads finely beaded. It is not entirely certain that this is the same as the Recent species, but if it is not identical it must be closely related.

Remarks.—The present shell is named *C. intortus* by many authorities but *C. incurvatus* would seem to have priority.

Range and distribution.—*C. incurvatus-intortus* is an uncommon shell living among rocks in shallow water. It ranges from Cape Hatteras, North Carolina, to the northern coast of South America. As a fossil, the species occurs in the Pleistocene of Barbados.

CALYPTRAEIDAE

Crepidula phalaena, new species Pl. 19, figs. 3-5; 16-18

Shell generally fragile, although one specimen, the largest among 12 examples, is solid and robust. Outline elongate ovate, occasionally suborbicular. Beak raised somewhat above the margin, twisted to the left (as viewed dorsally with the spire upright). Dorsum humped and compressed longitudinally to form a swelling which is most pronounced on the posterior half. Surface with sinuous, fine to coarse concentric growth lines but with no axial markings except for occasional vague rugae. Internally, the diaphragm or deck is moderately depressed below the margins, nearly flat away from the margins, but with a nearly imperceptible central rise near the free edge which itself is bowed slightly beakward. The diaphragm on all but the largest shell is thin, white, and subtranslucent, reaching to the middle of the aperture; on the largest specimen it extends as far as the anterior fourth of the aperture. There is no definite muscle scar although the slightly more polished sheen below the right side of the deck on a few specimens suggests there may have been attachment in that area. Margin thin except under the beak where it is somewhat thicker. On the largest specimen the lateral and anterior margins are thick, the posterior margin considerably more so.

Dimensions.—Holotype, length 17.2 mm.; max. width 11.5 mm.; average adult, length 27 mm.; max. width 15 mm.; largest specimen, length 36.5 mm.; max. width 20 mm.

Type locality.—Lower Mare formation, in small stream 100 meters west of Quebrada Mare Abajo. Five specimens.

Other localities.—Lower Mare formation at W-13 on hillside above west bank of Quebrada Mare Abajo. Three specimens; Mare

formation near W-14 on hillside above west bank of Quebrada Mare Abajo. Two specimens; Upper Mare formation, 80 meters southeast of W-12 and 120 meters south-southwest of the crossing of Quebrada Mare Abajo and coast road. Two specimens.

Remarks.—None of the shells retains any distinctive color markings, and they may have been whitish to light tan originally as they are now. At a distance, the dorsum of *C. phalaena* looks like a moth in repose, hence the name given to the species.

Comparisons.—The Cabo Blanco species at once recalls, of course, the well-known *C. fornicata* (Linnaeus) and *C. maculosa* Conrad, the latter differing from *C. phalaena* by its strong oval muscle scar just below and in front of the right anterior edge of the diaphragm (see Stingley, 1952, pp. 83-85, pl. 2, figs. 7-10). *C. fornicata* is such a variable shell that certain individuals could resemble any number of other species which themselves are diverse in form. One apparent difference, however, between the new species and *C. fornicata* is that its diaphragm is nearly flat whereas that of *C. fornicata* is nearly always flexed or creased upward in greater or lesser degree along the middle. So far as appearance goes, *C. phalaena* is a good deal like the Pleistocene and Recent *C. onyx* Sowerby of the west Coast of the Americas but here again a differentiation can be made by the character of the dorsum which is more decidely humped or pinched down the middle than is *C. onyx*. The largest example of *C. phalaena* (Pl. 19, figs. 16-18) is not unlike the *C.* cf. *maculosa* of Woodring (1957, p. 79, pl. 19, figs. 4, 5) from the Gatun formation (Miocene) of the Panamá Canal Zone but differs from that in its more elevated and compressed umbonal area. The Gatun species furthermore is more regularly convex on the dorsum behind the beak. *C. gatunensis* Toula (1911, p. 498, pl. 31, figs. 12a, b), also from the Gatun formation of the Panamá Canal Zone, does have the pinched back of *C. phalaena,* but the diaphragm or deck of *C. gatunensis* is considerably more undulatory.

C. fornicata ranges chronologically from Miocene to Recent, *C. maculosa* from Pliocene ? (see Olsson and Harbison, 1953, p. 278, pl. 47, fig. 7) to Recent.

Crepidula avirostra, new species Pl. 19, figs. 6, 7

Shell fragile, elongate ovate, oblique. Margin thin except under

the beak where it is somewhat thicker. Beak high, narrow, sharply pointed, elevated above the margin, and, as viewed dorsally with the spire upright, curved slightly to the left. Dorsum high, compressed, swollen longitudinally. Diaphragm thin, extending about halfway down the aperture, deeply recessed into the middle or lower third of the interior, it surface flattish to slightly concave or undulating with a tendency to rise at the free margin, the free margin somewhat bowed toward the beak. Surface with concentric growth striae, sometimes with and sometimes without irregular axial rugae. No muscle scar is visible.

Dimensions.—Holotype, length 18 mm.; max. width 10 mm.; max. altitude 10 mm.

Type locality.—Lower Mare formation, in small stream 100 meters west of Quebrada Mare Abajo. Two specimens.

Other localities.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. Four specimens.

Comparisons.—This species answers closely to the original description of *C. cymbaeformis* Conrad (1844, p. 173) which is as follows:

"Crepidula *cymbaeformis*. Elliptical, very profound or ventricose; thick about the region of the beak; apex inclined towards the left margin; acute, separated from the margin of the aperture; umbo compressed, prominent; aperture dilated above the middle and rapidly narrowed towards the end opposite the beak; diaphragm concave and remote from the margin. Length 1-1/2 inch.

Locality.—Petersburg, Virginia.

The boat-shaped outline of this shell serves to distinguish it from its congeners. It is the deepest or most ventricose of all the smooth species of the Union."

C. cymbaeformis is considered synonymous with *C. fornicata* (Linnaeus) by some authors and as a variation of *C. fornicata* by others. The one consistent difference of possible significance that I think I can detect between *C. fornicata-cymbaeformis* and the Venezuelan *C. avirostra* is that the diaphragm is flexed or creased along the middle on the former and nearly flat on the latter. I also believe, although the two occur together in the lower Mare formation at the same localities, that *C. avirostra* is distinct from the preceding *Crepidula phalaena,* n. sp. by the much deeper attachment of the diaphragm of *C. avirostra,* by the more elevated position of its beak above the posterior margin, and by its narrower but more convex dorsum.

Along the Pacific Coast of the Americas, a living species which *C. avirostra* resembles is *C. cerithicola* C. B. Adams (see Turner, 1956, p. 37, pl. 11, figs. 14, 15) originally described from the Panamanian island of Taboga situated about 21 kilometers south of the city of Panamá. *C. cerithicola,* however, is smaller, and is characterized by an angulation of the diaphragm whereas the diaphragm of *C. avirostra* is only faintly undulatory. According to Dall (1909c, p. 283) and Keen (1958, p. 314, fig. 245), *C. cerithicola* is the same as *C. onyx* Sowerby (1824, The Genera of Recent and Fossil Shells, *Crepidula,* fig. 2).

Crepidula corcovada, new species Pl. 19, figs. 8-10

Shell small, rather solid, obliquely and eccentrically ovate. Dorsum pinched and highly convex along the middle, the right side, as viewed dorsally with the spire upright, nearly vertical. Beak smooth, narrow, elevated high above the posterior margin, inclined slightly to the right. Diaphragm attached at about the center of the interior, extending from the excavation under the beak to the middle of the aperture. The attachment area of the diaphragm with the sides of the interior is completely smooth. The deck or surface of the diaphragm is nearly flat in its central area but rises slightly toward the free margin. The free margin is irregularly arcuate and shallowly excavated toward the beak. Surface with strong unequal axial rugae, these traversed by sinuous, irregular, concentric growth markings. No muscle scar is visible.

Dimensions.—Holotype, length 13 mm.; max. width 8.5 mm.; max. altitude 10.5 mm.

Type locality.—Lower Mare formation in small stream 100 meters west of Quebrada Mare Abajo. A single specimen, partially broken along the basal margin.

Comparisons.—The nearest analogue of this humpbacked species is the Recent *C. rostrata* C. B. Adams (see Turner, 1956, p. 82, pl. 11, figs. 9, 10) from Panamá. However, there are these differences: the free margin of the deck of the Panamanian shell is straight, that of the Venezuelan fossil arcuate; and, with the spire upright and the dorsum facing the observer, the beak of *C. rostrata* is inclined to the left, in contrast with that of *C. corcovada* which leans to the right.

Crepidula plana triangula, new subspecies Pl. 19, figs. 11-13

Shell of medium size, flattened, fairly solid, subtrigonal in outline, the dorsum slightly convex. Anterior margin subangular; lateral margins nearly straight, converging toward the beak like the sides of a triangle; posterior margin bluntly pointed, extending a little beyond the beak, bent inward over the head of the deck; a similar arrowhead-shaped inbend occurs on the left margin (with the deck facing the observer and the beak upright) just below the attachment of the diaphragm; the right margin is simple. Beak small, warty, appressed, directed somewhat to the left as viewed dorsally with the spire upright. Diaphragm undulating, higher anteriorly toward the center of the free edge, extending across the aperture from just above the middle of the right margin of the shell to just below the middle on the left margin. Interior shallow, no muscle scar visible. Dorsal surface with sinuous concentric growth lamellae and ridges, these prominent at the sides and base but becoming obsolescent toward the beak.

Dimensions.—Holotype, length 20 mm.; max. width 14.5 mm.; max. altitude 6 mm.

Type locality.—Lower Mare formation, in small stream 100 meters west of Quebrada Mare Abajo. One specimen, the holotype.

Other localities.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. One immature specimen with a length of 3.8 mm. and a maximum width of 3.2 mm. is tentatively referred to the new species. It is broadly ovate, and the deck is inflected gently upward along the length and at the middle of the diaphragm. The deck is concave to the left of the inflexion, flatly slanted at the right.

Comparison.—Because it is a flattish shell, the new Venezuelan species is at once reminiscent of the widespread Miocene to Recent *C. plana* Say (1822, p. 226). However, it differs from *C. plana, s.s.* in the slight but rather regular convexity of the dorsum, the overhang of its pointed anterior margin, and in its more undulating diaphragm. Another species which seems to be distantly related is *C. rhyssema* Olsson and Harbison (1953, p. 278, pl. 47, figs. 4-4c) from the Pliocene at North St. Petersburg, Florida. The adult Florida shell, however, can be discriminated from the holotype of *C. triangula*

by its much broader apical area, by the more ovate outline of the shell, and by the sharp convex crease running the length of the diaphragm. The young specimen of *C. triangula* from locality W-13 referred to above resembles the adult *C. rhyssema* more than the holotype of *C. triangula* does, but here again the deck is more gently arched and much less curved than on *C. rhyssema.*

For citations on *C. plana,* the reader is referred to Gardner (1947, p. 565) and Woodring (1957, p. 79).

Crepidula juliella, new species Pl. 19, figs. 14, 15

Shell small, thin, conical, the base subcircular. Apex high, large, bulbous, subhyaline, situated off center somewhat nearer the posterior margin, the beak proper twisted to the left as viewed from above with the apex upright. Surface sculptured by numerous microscopic concentric striations. Within, and attached to the sides a little more than halfway up from the base, is a narrow, undulatory diaphragm, rather deeply concave, its free edge somewhat sinuous. Internal cavity deep, the margin of the base thin and slightly irregular. There is no muscle scar visible.

Dimensions.—Holotype, diameter 2.5 mm.; altitude 1.5 mm.

Type locality.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. One specimen, the holotype.

Other localities.—Mare formation near W-14, on hillside above west bank of Quebrada Mare Abajo. One specimen.

Comparisons.—The holotype is probably an immature example. The shell is cap-shaped like the Miocene to Recent *C. convexa* Say (1822, p. 227), but that species has a flattish to somewhat convex deck, and there is a muscle scar on the right side just under the outer corner of the deck.

Crepidula (Bostrycapulus) aculeata venezuelana, new subspecies Pl. 20, figs. 1-4

Shell of medium size, semilunate to ovate, generally moderately convex, although an occasional specimen is flatter than average or more tumid than average. Whorls two in all, the last one rapidly expanding to form the entire body. Apex a one-whorled coil twisted to the left (as viewed dorsally with the beak upright), ap-

pressed close to the margin. Sculpture consisting of fine or scabrous or subspinose wavy longitudinal ribs with or without intermediate threads traversed by fine concentric striae or coarser imbrications as well as occasional concentric growth constrictions. Diaphragm covering a little less than half the aperture, attached at about the mid-line of the interior, undulating, gently vaulted to the right of center, the free edge sinuous, evenly excavated near the left margin, sometimes turned up sharply near the right margin. Muscle attachment marked by a transversely oval depression situated just below the right edge of the diaphragm. Base with irregular edges. Interior glossy on unweathered specimens.

Dimensions.—Holotype, length 23 mm.; max. width 17.5 mm.; max. altitude 5 mm.; paratype, length 18 mm.; max. width 14.2 mm.; altitude 7.5 mm.

Type locality.—Lower Mare formation, in small stream 100 meters west of Quebrada Mare Abajo. Three specimens including holotype.

Other localities.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. Fifteen specimens including paratype.

Mare formation at W-25, south flank of Punta Gorda anticline. Fourteen specimens. Mare formation in stream 250 meters south-southwest of the mouth of Quebrada Las Pailas. One specimen. Upper Mare formation, 120 meters south-southwest of the crossing of Quebrada Mare Abajo and coast road. One specimen. Playa Grande formation (Maiquetía member) at W-26 in Quebrada Las Bruscas, approximately 120 meters upstream from junction with Quebrada Las Pailas. One specimen. Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. Seven specimens.

Remarks.—The subgenus *Bostrycapulus* is based on the designation of Olsson and Harbison (1953, pp. 279-280).

Comparisons.—The main distinction between this subspecies and the typical *C. aculeata* Gmelin is that on *C. aculeata* the diaphragm is usually sharply pleated along its length, the pleat forming an arcuate ridge which traverses the deck to the right of center. None of the specimens of the subspecies *C. a. venezuelana* exhibits such a well-defined crease, and although *C. aculeata* is a variable

shell with respect to its surface sculpture as is the Venezuelan subspecies, most of the specimens and illustrations of *C. aculeata* I have seen show the distinctive pinching of the diaphragm. None of the 42 specimens of *C. a. venezuelana* in this collection displays this character.

As a fossil *Crepidula aculeata, s. s.* is reported from the following localities:

Middle or upper Miocene—In well at 35 ft., Surry County, Virginia (Richards, 1947, p. 28).

Pliocene—"Left bank of the Caloosahachee River about three-fourths of a mile above Fort Denaud", Florida, from the upper part of bed No. 2 (Mansfield, 1939, p. 18). Also at De Leon Springs, Shell Creek, Alligator Creek, and St. Petersburg, Florida. Matura, Trinidad (Guppy, 1864, p. 35; Maury, 1925, pp. 395-396).

Pleistocene—Barbados (Gregory, 1895, Geol. Soc. London Quart. Jour., vol. 51, p. 290).

The living *Crepidula aculeata, s. s.* is a cosmopolitan species. It is generally found near shore to depths of less than 25 fathoms although it is recorded by Dall (1889b, p. 286) from a depth of 539 fathoms in the Gulf of Mexico near the Tortugas, bottom temperature 39.5° F. In the Western Atlantic *C. aculeata* ranges from North Carolina to South America. Krebs (1864, pp. 69-70) listed it as far south as Patagonia. Some authors (Maury, 1922, p. 144 and Oldroyd, 1927, p. 722) report it in the Eastern Pacific from California to Chile, and Dall (1909c, p. 233) records it from Africa and Japan as well.

Crucibulum (Crucibulum) auricula (Gmelin) Pl. 20, figs. 5-9

1780. *Patella auricula* Gmelin, Syst. Nat., ed. 10, p. 3694.
1817. *Crucibulum auricula* (Gmelin), Dillwyn, Descriptive Catalogue of Recent Shells, vol. 2, p. 1017.
1864. *Crucibulum auriculatum* (Chemnitz), Krebs, The West Indian Marine Shells, p. 69.
1878. *Crucibulum auriculatum* (Chemnitz), Mörch, Catalogue of West-India Shells, p. 10.
1886. *Crucibulum scutellatum* var. *auriculatum* (Chemnitz), Tryon, Man. Conch., vol. 8, p. 118, pl. 32, figs. 34, 35.
1889. *Crucibulum auricula* (Gmelin), Dall, U. S. Nat. Mus., Bull. 37, p. 152.
1889. *Crucibulum auricula* (Gmelin), Dall, Mus. Comp. Zool. Bull., vol. 18, p. 284.
1892. *Crucibulum auricula* (Gmelin), Dall, Wagner Free Inst. Sci., Trans., vol. 3, pt. 2, p. 349.
1921. *Crucibulum auricula* (Gmelin), Pilsbry, Acad. Nat. Sci. Philadelphia, Proc., vol. 73, p. 385.

1922. *Crucibulum auricula* (Gmelin), Maury, Bull. Amer. Paleont., vol. 9, No. 38, p. 145.
1937. *Crucibulum auricula* (Gmelin), Smith, East Coast Marine Shells, p. 95, pl. 59, fig. 7.
1939. *Crucibulum auriculum* (Gmelin), Mansfield, Florida State Geol. Sur., Bull. No. 3, pp. 118-119.
1940. *Crucibulum auricula* (Gmelin), Stubbs, Jour. Paleont., vol. 14, No. 5, p. 512.
1952. *Crucibulum auricula* (Gmelin), Pulley, Texas Jour. Sci., vol. 4, No. 2, p. 174.
1954. *Crucibulum auricula* (Gmelin), Abbott, American Seashells, p. 169, pl. 21s.
1958. *Crucibulum auricula* (Gmelin), DuBar, Florida Geol. Sur., Bull. No. 40, p. 200.
1958. *Crucibulum auricula* (Gmelin), Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, p. 74.
1959. *Crucibulum auricula costatum* Say, Nowell-Usticke, A Check List of the Marine Shells of St. Croix, p. 48.

Shell thin, suborbicular, dome-shaped, moderately low. Apex small, smooth, beaklike, situated a little off center. Nucleus consisting of about one volution, the tip tightly coiled and highly inclined, this expanding to form the cap at the summit. Sculpture consisting of irregular radiating subtriangular costae and numerous fine concentric lamellae which may form a scabrous surface and are not infrequently vaulted at the intersections with the radiating rugae near the base. Basal margin thin and scalloped, the edge more or less sawtoothed. Internal cup oblong ovate, rather deeply funneled, the margin entirely free, pinched at the right extremity where the underside is attached to the interior of the shell by a septum.

Dimensions.—Figured specimen (fossil), length 25.8 mm.; width 22 mm.; altitude 8 mm.; length of cup 12 mm.; max. width of cup 7.5 mm. Figured specimen (Recent), length 11 mm.; width 10.5 mm.; altitude 6.1 mm.

Localities.—Recent, on beach of Playa Grande Yachting Club, Distrito Federal. Two specimens.; Mare formation, in stream 250 meters south-southwest of mouth of Quebrada Las Pailas. Three specimens; lower Mare formation, in small stream 100 meters west of Quebrada Mare Abajo. Six specimens.

Remarks.—The foregoing description applies to the fossil specimens of *C. auricula* from the Mare formation, but these seem to be identical with the two Recent specimens collected on the beach about four kilometers west of Quebrada Mare Abajo. One of the Recent specimens is elevated, the other appressed. Both are strongly costate and cream-colored exteriorly, and one is glossy and pinkish white within.

Comparisons.—The Venezuelan shells referred to *C. auricula* (Gmelin) are close to what Martin (1904, p. 245, pl. 58, figs. 8-10) identified as *C. costatum* (Conrad) var. *pileolum* (H. C. Lea). The latter occurs in the upper Miocene of Virginia and Maryland, and differs but slightly from *C. auricula* in having rounded rather than subtriangular costae, and in its thicker shell. According to Dall, the typical form of *C. auricula* is rather depressed, with fine, radiating, frequently dichotomous lines on the upper surface; the variation with strong radiating ribs was referred to by Dall as *C. auricula* var. *costata* Say. However, the strongly ribbed form is *C. costatum* (Conrad) (Fossils of the Medial Teriary, No. 3, p. 79, pl. 45, fig. 2) and not the *C. costatum* of Say. The West Coast analogue of *C. auricula* is *C. imbricatum* Sowerby [not Fischer, 1807] and this, according to Durham (1950, p. 126, pl. 30, figs. 12, 13) ranges from late Pliocene to Recent. Olsson and Harbison (1953, pp. 275-276, pl. 47, figs. 8, 8a) also recorded *C. imbricatum* from the Pliocene at North St. Petersburg, Florida, but *C. auricula* is closer to the West Coast *C. imbricatum* than to the Florida shell which has much stronger concentric lamellae than either the western *C. imbricatum* or the Venezuelan *C. auricula.* Keen (1958, p. 316, fig. 252) placed *C. imbricatum* in synonymy with *C. scutellatum* Wood. In the Pliocene of Trinidad, *S. piliferum* Guppy (1867a, p. 160) and *C. subsutum* Guppy (167a, p. 172) seem to be near *C. auricula* although the descriptions are so condensed it is difficult to compare them with assurance. Dall (1892, p. 351) suggested that *C. piliferum* is "perhaps a variety of *C. auricula spinosum,* while the second [*C. subsutum* Guppy] appears to be a *Dispotaea* not unlike Conrad's *multilineatum*". *C. spinosum* Sowerby is a prickly or spiny form occurring along the west coast of the Americas; *C. multilineatum* (Conrad) (1841a, p. 346, pl. 2, fig. 8) from the upper Miocene of Maryland and North Carolina has finer and more numerous radiating ribs than *C. auricula.* Finally there is *C. striatum* Say (1826, p. 216), a Quaternary species from eastern North America, and that differs from *C. auricula* in having a cup that is only two-thirds free from attachment to the shell. In *C. auricula* the margin of the cup is entirely free.

Range and distribution.—The living *C. auricula* is found in the Gulf of Mexico, the Caribbean Sea, and the Western Atlantic as far south as Brazil. As a fossil, it is reported from the middle Miocene

of the Dominican Republic, from the upper Miocene of Florida, and from the Pliocene of South Carolina and Florida.

Crucibulum (Dispotaea) marense, new species Pl. 20, figs. 10, 11

Shell moderately large, fragile, suborbicular around the base, conical and cap-shaped above, the beaked apex situated toward the rear. Nucleus waxy smooth, one-whorled, the tip planispirally and not tightly coiled, the later stage enlarging rather rapidly to form the short umbo. Forward slope convex, the rearward slope concave below the beak, flattening toward the margin. Area immediately below the apex marked with numerous fine concentric lamellae and striae over faint irregular radial lineations. Below, the radials develop into closely spaced wriggly riblets, some of them dichotomous, all of them traversed by concentric growth lamellae, the whole surface having a shagreen effect. Rim of base irregularly scalloped, the inner margin feebly denticulated here and there. Internal cup sitituated obliquely under the apex, funneled, ovate in outline but coming to a point near the right margin where it is pinched and creased, the crease continuing within the funnel to the apex. Margin of cup attached to the shell, the attachment extending from the crease for a distance of about one-fifth the circumference of the cup, the free edge immediately aft of the crease excavated or nicked a little inward, the edge gently sinuous thereafter.

Dimensions.—Holotype, length (reconstructed) 24 mm.; max. width (reconstructed) 22 mm.; altitude 10 mm.; length of cup 10.5 mm.; max. width of cup 8 mm.

Type locality.—Mare formation at W-14, on hillside above west bank of Quebrada Mare Abajo. One specimen, the holotype.

Comparisons.—*C. marense,* n. sp. is similar to the Pleistocene and Recent *C. striatum* Say (1826, p. 216) and to the late Miocene *C. multilineatum* (Conrad) (1841a, p. 346, pl. 2, fig 8). However, the cup of *C. striatum* is not nicked near the crease as is the Cabo Blanco shell, and the cup of *C. multilineatum* has a much greater length of attachment than *C. marense.* The external sculpture and general configuration of *C. marense* is like that of *C. chipolanum* Dall (see Gardner, 1947, p. 567, figs. 10, 11; and Woodring, 1957, p. 82, pl. 19, figs. 6, 7) from the middle Miocene of Florida, and the Panamá Canal Zone, but the rim of the cup is entirely free in *C. chipolanum,* attached for a short stretch in *C. marense.*

Crucibulum (Dispotaea) venezuelanum, new species Pl. 20, figs. 12-14

Shell small, cap-shaped, moderately elevated, the apex situated toward the rear, the base subcircular, its edge weakly and broadly scalloped and finely denticulate. Nucleus smoothish, one-whorled, the tip loosely coiled, beaklike, strongly inclined, merging into a swollen umbo which forms the apex. External sculpture consisting of irregular concentric incrementals, and, starting halfway down the slope, there are broad feeble radial undulations or ridges extending to the base. Interior with an irregularly concave deck, the free edge thin, undulatory, extending across the rear third of the aperture, the sides of the deck attached. Looking down on the deck with the free edge toward the observer, the line of attachment seems higher and farther to the rear on the left side than it does on the right.

Dimensions.—Holotype, max. diameter 2.6 mm.; altitude 1.4 mm.

Type locality.—Lower Mare formation, in small stream 100 meters west of Quebrada Mare Abajo. One specimen, the holotype.

Comparisons.—This species has much in common with those forms of *C. constrictum* (Conrad) that are sculptured with weak radial costae except in the area of attachment of the cup which is greater in the Venezuelan shell. As pointed out by Gardner (1947, pp. 568-569), *C. constrictum* and its relatives (*C. c. conjuge* Gardner and *C. waltonense* Gardner) exhibit a strong tendency toward an obsolete sculpture, but on none of those Miocene shells from Virginia and Florida are the sculptural details quite like those of *C. venezuelanum,* n. sp., and on none of them is the area of attachment of the cup so extensive. The new species also recalls *C. inerme* Nelson (see Olsson, 1932, pp. 212-213, pl. 24, figs. 4, 7; and Pilsbry and Olsson, 1941, p. 44, pl. 7, fig. 2) from the Miocene of Peru and the Pliocene of Ecuador, but that shell is oval rather than suborbicular, and the apex is subcentral rather than at the rear as on *C. venezuelanum.* The Miocene *C. gatunense* (Toula) from the Panamá Canal Zone and Colombia as described and illustrated by Anderson (1929, pp. 121-122, pl. 13, figs. 4-6) is also subelliptical, and the surface is roughened, granular, and radially costate, the numerous radial markings starting a short distance below the

apex and strengthening toward the base which has a faintly crenulate margin. Toula's *Capulus gatunensis* and Anderson's *Crucibulum gatunense* (Toula) have been referred by Woodring (1957, pp. 83-84, pl. 19, figs. 8-10) to *Crucibulum springvaleense* Rutsch (1942, pp. 138-139, pl. 4, fig. 8), a form described from the upper Miocene of Trinidad. The radial ribs of *C. springvaleense* are strong, numerous, and coarse, and that species is also quite unlike the present *C. venezuelanum*, n. sp.

STROMBIDAE

Strombus pugilis pugilis Linnaeus Pl. 21, figs. 1-4

1758. *Strombus pugilis* Linnaeus, Syst. Nat., ed. 10, p. 744, No. 430.
1773. *Strombus pugilis* Linnaeus, Martini, Conchylien-Cabinet, vol. 3, p. 122, pl. 81, figs. 830, 831.
1817. *Strombus pugilis* Linnaeus, Dillwyn, A Descriptive Catalogue of Recent Shells, vol. 2, p. 664, sp. 17 (excl. var.).
1822. *Strombus pugilis* Linnaeus, Lamarck, An. sans Vert., vol. 7, No. 204.
1825. *Strombus pugilis* Linnaeus, Wood, Index Testaceologicus, p. 123, pl. 25, fig. 17.
1832. *Strombus pugilis* Linnaeus, Deshayes, Encycl. Méth., p. 996, pl. 408, fig. 4.
1851. *Strombus pugilis* Linnaeus, Reeve, Conch. Icon., vol. 6, pl. 16, sp. 39-41.
1857. *Strombus pugilis* Linnaeus, Fischer, Revue coloniale, p. 7, sp. 6.
1860. *Strombus pugilis* Linnaeus, Holmes, Post-Pleiocene Fossils of South Carolina, p. 61, pl. 10, figs. 1, 1a.
1861. *Strombus pugilis* Linnaeus, Tristram, Zool. Soc. London Proc., p. 404.
1864. *Strombus pugilis* Linnaeus, Krebs, The West Indian Marine Shells, p. 2.
1867. *Strombus pugilis* Linnaeus, Guppy, Sci. Assoc. Trinidad Proc., p. 157 (part).
1878. *Strombus pugilis* Linnaeus, Mörch, Catalogue of West-India Shells, p. 9.
1881. *Strombus pugilis* Linnaeus, Gabb, Acad. Nat. Sci. Philadelphia, Jour., ser. 2, vol. 8, p. 360.
1885. *Strombus pugilis* Linnaeus, Tryon, Man. Conch., vol. 7, p. 109, pl. 2, figs. 13-15.
1886. *Strombus pugilis* Linnaeus, Watson, Voyage of H.M.S. Challenger, Zoology, vol. 15, p. 416.
1889. *Strombus pugilis* Linnaeus, Dall, U. S. Nat. Mus., Bull. 37, p. 699.
1889. *Strombus pugilis* Linnaeus, Lorié, Samml. Geol. Reichs-Mus. Leiden, ser. 2, vol. 1, p. 132.
1890. *Strombus pugilis* Linnaeus, Dall, Wagner Free Inst. Sci., Trans., vol. 3, pt. 1, pp. 177-178.
1891. *Strombus pugilis* Linnaeus, Baker, Acad. Nat. Sci., Philadelphia Proc., vol. 43, p. 52.
1892. *Strombus pugilis* Linnaeus, Dall and Harris, U. S. Geol. Sur., Bull., vol. 84, p. 147.
1901. *Strombus pugilis* Linnaeus, Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, p. 422.
1903. *Strombus pugilis* Linnaeus, Vanatta, Acad. Nat. Sci. Philadelphia, Proc., vol. 55, p. 758.
1906. *Strombus pugilis* Linnaeus ?, Böse, Inst. Geol. Mexico, Bol. No. 22, pp. 35-36, 86, pl. 4, figs. 1-6.

1910. *Strombus pugilis* Linnaeus, Vaughan, Carnegie Inst. Washington, Publ. No. 133, p. 171.
1913. *Strombus pugilis* Linnaeus, Brown and Pilsbry, Acad. Nat. Sci. Philadelphia, Proc., vol. 65, p. 495.
1920. *Strombus pugilis* Linnaeus, Hinkley, Nautilus, vol. 34, p. 41.
1922. *Strombus pugilis* Linnaeus, Maury, Bull. Amer. Paleont., vol. 9, No. 38, pp. 119-120.
1923. *Strombus pugilis* Linnaeus, Clench, Nautilus, vol. 37, No. 2, pp. 53, 55.
1926. *Strombus pugilis* Linnaeus, Weisbord, Nautilus, vol. 39, No. 3, pp. 82, 86.
1935. *Strombus pugilis* Linnaeus, Richards, Jour. Paleont., vol. 9, No. 3, p. 257.
1937. *Strombus pugilis* Linnaeus, Smith, East Coast Marine Shells, pp. 108-109, pl. 39, fig. 7.
1938. *Strombus pugilis* Linnaeus, Mansfield, State of Florida Dept. Conserv., Geol. Bull. No. 18, pp. 22, 25.
1941. *Strombus pugilis pugilis* Linnaeus, Clench and Abbott, Johnsonia, vol. 1, No. 1, pp. 5-7, pls. 1, 4.
1942. *Strombus pugilis pugilis* Linnaeus, Jaume and Pérez Farfante, Soc. Cubana Hist. Nat. "Felipe Poey" Mem., vol. 16, No. 1, p. 41.
1954. *Strombus pugilis* Linnaeus, Abbott, American Seashells, pp. 173-174, pl. 5g.
1958. *Strombus pugilis* Linnaeus, Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 14.
1958. *Strombus pugilis pugilis* Linnaeus, Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, p. 76.
1959. *Strombus pugilis* Linnaeus, Nowell-Usticke, A Check List of the Marine Shells of St. Crox, pp. 50, 51.

Two young and three adult specimens from the Mare formation are referred to this species. Immature shell with about 12 whorls in all, the smooth, elongate nucleus consisting of two or three of them, the demarcation between the nucleus and conch sharply defined by the occurrence, on the latter, of the first fine axial riblet. The first two or three post-nuclear whorls are convex, relatively long and slender, and are sculptured by rather closely spaced and slightly curved axial riblets extending from suture to suture, and fine revolving threads. Succeeding whorls are shouldered, the shoulder strongly rounded and situated above the middle on the earlier whorls, becoming more and more angular below where it is situated first at the middle of the whorl and then later below the middle, developing into a spiny keel. On the lower whorls, the axial ribs are strongest at the shoulder, become more and more nodose with growth, and on the last two whorls develop into flattened spines normal to the long axis of the shell, the spines increasing progressively in length, being longest on the back and labral side of the body whorl. Spiral sculpture above the body whorl consisting of subequal riblets a little more pronounced on the ramp than below the shoulder, the interspaces on the ramp about as wide as the riblets, narrower than the riblets

below the ramp. On both of the young specimens the surface is covered with many transverse striae and lamellae. The shell is moderately thin, and the spire is acuminate. Below the spines, the body whorl is sculptured by low spiral fillets, these increasing in elevation and decreasing in width toward the base, the ones immediately below the spines faint and becoming obsolescent toward the labrum.

The adults of *S. pugilis* from Cabo Blanco are robust and thick-shelled. There are nine whorls excluding the nucleus which is decollate. Inner lip smoothly and heavily glazed with callus, the base of the columella bent to the right. The last three or four whorls bear spines, the shortest of these on the upper whorl, the longest on the penultimate. Sculpture of higher whorls like that of young individuals. On the body whorl, however, there are only a few widely spaced spiral cords near the base, the upper portion of the whorl smooth except for fine, closely spaced spiral threads at the suture. Surface with numerous sinuous axial growth striae. Siphonal fasciole large, swollen, the base contracted above it. Side of body whorl somewhat humped below the middle. Outer lip broken away.

Dimensions.—Immature specimen (G263a), length 59 mm.; max. width (including spines) 41 mm.

Adult specimen (E263a), length (tip missing) 76 mm., max. width (including spines) 43 mm.

Localities.—Mare formation at W-14, on hillside above west bank of Quebrada Mare Abajo. Three specimens, two of them young, the third a portion of the base of an adult; upper Mare formation, 115 meters south-southwest of crossing of Quebrada Mare Abajo and coast road. Two adult specimens.

Remarks.—I am unable to detect any significant difference between the fossils and the Recent *S. pugilis pugilis* Linnaeus. The spines are longest on the penultimate whorl of mature shells, and this characteristic serves to distinguish the typical *S. pugilis* from *S. p. alatus* Gmelin (1791, Syst. Nat., vol. 1, p. 3513, No. 14) and *S. p. nicaraguensis* Fluck (1905, Nautilus, vol. 19, p. 32).

Range and distribution.—The living *S. pugilis pugilis* is a Western Atlantic species extending from southeastern Florida through the Antilles and the West Indies to southern Brazil. It dwells in shallow waters of the intertidal zone to a depth of 10 fathoms but has been dredged in 350-400 fathoms in red mud off Pernambuco,

Brazil. Chronologically, *S. pugilis pugilis* ranges from Pliocene (and possibly Miocene) to Recent. In the Pleistocene the species is widespread in Cuba (Jaume and Pérez Farfante, 1942, p. 41), has been reported from the reef limestone at Spanish Lagoon, Aruba, by Lorié (1889, p. 132), is found in Barbados, is listed by Brown and Pilsbry from the Black Swamp in the Panamá Canal Zone, and occurs, according to Maury (1922, p. 89-90), at Grand Chenier and New Orleans in Louisiana, and at North Creek and LaBelle in western Florida. In the Pliocene, *S. pugilis* is recorded by Dall and Harris (1892, p. 147) at Alligator Creek; by Mansfield (1939, p. 25) one mile north of Bermont; and by Dall (1890, p. 177) at Myakka River and Shell Creek, all of these localities in Florida. It is also stated by Dall that the species occurs in the Pliocene of Costa Rica (Gabb, 1881), as well as in the Miocene of Haiti, Jamaica, and Anguilla. However, the occurrence of the true *S. pugilis* in the Caribbean Miocene is questioned by Olsson (1922, p. 314) who wrote that it "does not appear to descend below the Pliocene", and certain it is that the "*pugilis*" of Gabb and of Guppy (1867, p. 157) from the Miocene of the Dominican Republic and Jamaica is not the *S. pugilis* of Linnaeus but the *S. pugiloides* of Guppy by whom it was described on page 82 in the Proceedings of the Scientific Association of Trinidad, volume 2,1873. Böse (1906) described *S. pugilis* from the Pliocene and Miocene of Mexico, but there may be some question as to the validity of the identification.

Strombus ? species indeterminate Brown and Pilsbry Pl. 20, figs. 15, 16

1911. *Strombus* (?) sp. undet. Brown and Pilsbry, Acad. Nat. Sci. Philadelphia, Proc.,, vol. 63, p. 355, pl. 26, fig. 7.

Illustrated is the filling of a form which is surprisingly similar to the internal cast described by Brown and Pilsbry from the Gatun formation (middle Miocene) of the Panamá Canal Zone. The specimen is made up of compact, fine-grained, highly calcareous sand containing small flakes of muscovite and, like the Canal Zone example, there is an angulation at the shoulder of the body whorl. The shape is more or less olivid, and the outer lip, though broken back, is seen to be thick especially toward the base. The sutures are narrowly channeled, but that of the body whorl is gaping.

Dimensions.—Length (three whorls) 51 mm.; max. width 21.8 mm.

Locality.—Playa Grande formation (Catia member) at W-15, south side of Playa Grande road, 40 meters southeast of its intersection with the Playa Grande Yachting Club road. One specimen.

Remarks.—I have compared the Venezuelan cast with Brown and Pilsbry's type at the Academy of Natural Sciences of Philadelphia. The Venezuelan form is larger and the labial side more rapidly attenuating anteriorly, but it is so similar otherwise to the Canal Zone specimen that it must be considered the same species, whatever that may be. Most of the fossils at the Venezuelan W-15 locality, including a number of large pelecypods, have had the original shell dissolved away and are present as internal fillings.

ERATOIDAE

Erato venezuelana, new species Pl. 18, figs. 6, 7

Shell small, subpyriform, the spire short, obtuse at the apex. Whorls four, including the two of the nucleus. Nucleus somewhat papilliform, glassy, and smooth, the initial whorl rather loosely coiled, hardly immersed, the last rounded, grading insensibly into the conch. First post-nuclear whorl slightly convex, the body whorl a trifle concave above the shoulder, the shoulder rounded, the base a little constricted. Sutures fine, visible on the nucleus, covered with a thin glaze on the conch. Aperture more or less oblong, moderately wide. Outer lip somewhat thickened, ascending slightly on the whorl, shallowly notched at the posterior outlet, the inner margin vaguely denticulate above. Columella and parietal wall smooth, the latter with a small pimple of callus below and away from the summit of the outer lip. Columellar lip thickened a little along the margin. Anterior edge of pillar emarginated by a thickened twisted plait which continues around the extremity of the siphonal notch. Anterior canal short, broad, excavated behind into a shallow notch. Surface of shell smooth.

Dimensions.—Holotype, length 4.9 mm.; max. width 3.2 mm.

Type locality.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. One specimen, the holotype.

Remarks.—It is not unlikely that in a larger suite of examples, the outer lip will be seen to be thicker and more strongly denticulate than it is on the holotype.

Comparisons.—The species of *Erato* recorded from the Atlantic side of the Americas are the following:

E. maugeriae Gray (in Sowerby, 1832, Conch. Illustr., *Cypraeidae,* p. 17, pl. 7, fig. 47). Miocene ? to Recent. The living form ranges from Cape Hatteras, North Carolina, to the Caribbean Sea, where it is found in shallow water to 63 fathoms. In the Pleistocene the species is recorded at a depth of 118 feet in a well at Delray, Florida, by Richards (1938, pp. 1289, 1293). In the Pliocene, *E. maugeriae* is found at Shell Creek (Dall, 1890, p. 168) and in the Caloosahatchee beds (Olsson and Harbison, 1953, p. 286, pl. 60, fig. 7) of Florida. Dall (1890, p. 168) also reported *E. maugeriae* from the Miocene marls of Cape Fear River, North Carolina, under the synonym of *E. laevis* Emmons, but Martin (1904, pp. 227-228, pl. 55, fig. 5) suggested that Emmons' *laevis* might be *E. perexigua* (Conrad) (1841, Acad. Nat. Sci. Philadelphia, Proc., vol. 1, p. 32).

E. perexigua (Conrad). Miocene of New Jersey and Maryland. Martin (1904, p. 227) placed *E. emmonsi* Whitfield in synonymy with *E. perexigua.*

E. chipolana Maury (1910, p. 145, pl. 6, fig. 9). Chipola Miocene at Baileys Ferry, Florida.

E. maugeriae domingensis Maury (1917, p. 118, pl. 21, fig. 8). Miocene, Cercado de Mao, Dominican Republic.

E. domingensis trochala Woodring (1928, p. 321, pl. 22, fig. 12). Miocene, Bowden, Jamaica.

E. vaughani (Maury) (1912, p. 87, pl. 11, figs. 14, 15). Soldado formation, Bed. No. 2, Solado Rock, Gulf of Paria, Trinidad. The Soldado formation is now thought to be Paleocene in age by Kugler (Lexique Stratigraphique International, Amérique Latine, vol. 5, fascicule 2b, Antilles, pp. 95-97).

E. venezuelana, n. sp. differs from *E. maugeriae* in its subangularly rounded, rather than subtabulate shoulder on the outer lip; *E. perexigua* has a wider anterior canal than *E. venezuelana,* and the inner lip bears widely spaced denticles or plaits not present on the Venezuelan shell; *E. m. domingensis* is square-shouldered on the outer lip, and its anterior canal is narrower than that of the new species; the aperture of *E. d. trochala* is narrower and more arcuate than that of *E. venezuelana,* and the same is true of *E. chipolana;* the Paleocene *E. vaughani* (see Van Winkle, 1919, p. 23, pl. 3, figs.

8, 9) has a much thicker outer lip than *E. venezuelana,* the lip extending far up the concave, acuminate spire.

Trivia pediculus (Linnaeus) Pl. 21, figs. 5-10

1758. *Cypraea pediculus* Linnaeus, Syst. Nat., ed. 10, p. 724.
1846. *Trivia pediculus* (Linnaeus), Reeve, Conch. Icon., vol. 3, pl. 23, sp. 131.
1857. *Cypraea pediculus* Linnaeus, Tuomey and Holmes, Pleiocene Fossils of South Carolina, p. 127, pl. 27, figs. 3, 4.
1864. *Cypraea pediculus* Linnaeus, Krebs, The West Indian Marine Shells, p. 41.
1878. *Trivia pediculus* (Linnaeus), Mörch, Catalogue of West-India Shells, p. 10.
1881. *Trivia pediculus* (Linnaeus), Gabb, Acad. Nat. Sci. Philadelphia, Jour., ser. 2, vol. 8, p. 360.
1885. *Trivia pediculus* (Linnaeus), Tryon, Man. Conch., vol. 7, p. 201, pl. 21, figs. 94-97.
1889. *Trivia pediculus* (Linnaeus), Dall, U. S. Nat. Mus., Bull. 37, p. 136.
1890. *Trivia pediculus* (Linnaeus), Dall, Wagner Free Inst. Sci., Trans., vol. 3, pt. 1, p. 168.
1890. *Cypraea* (*Trivia*) *pediculus* Linnaeus, Smith, Linnaean Soc. Jour., Zoology, vol. 20, p. 490.
1891. *Trivia pediculus* (Linnaeus), Baker, Acad. Nat. Sci., Philadelphia, Proc., vol. 43, p. 52.
1901. *Trivia pediculus* (Linnaeus), Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, p. 421.
1907. *Cypraea pediculus* (Linnaeus), Hidalgo, Mon. *Cypraea,* pp. 463-465.
1922. *Trivia pediculus* (Linnaeus), Maury, Bull. Amer. Paleont., vol. 9, No. 38, p. 113.
1928. *Trivia pediculus* (Linnaeus), Woodring, Carnegie Inst. Washington, Publ. No. 385, pp. 320-321, pl. 22, figs. 6-11.
1937. *Trivia pediculus* (Linnaeus), Smith, East Coast Marine Shells, p. 110, pl. 40, figs. 7a-7c.
1946. *Trivia pediculus* (Linnaeus), Jaume, Soc. Malac. "Carlos de La Torre" Rev., vol. 4, No. 3, p. 105.
1948. *Trivia pediculus* (Linnaeus), Gardner, U. S. Geol. Sur., Prof. Paper 199-B, pp. 214-215, pl. 29, figs. 8, 9.
1952. *Trivia pediculus* (Linnaeus), Pulley, Texas Jour. Sci., vol. 4, No. 2, p. 174.
1953. *Trivia pediculus* (Linnaeus), Olsson and Harbison, Acad. Nat. Sci. Philadelphia, Mon. No. 8, p. 265, pl. 60, figs. 1, 1a.
1954. *Trivia pediculus* (Linnaeus), Abbott, American Seashells, p. 177, pl. 21bb.
1955. *Trivia pediculus* (Linnaeus), Perry and Schwengel, Marine Shells of the Western Coast of Florida, p. 148, pl. 28, fig. 206.
1956. *Pusula* (*Niveria*) *pediculus* (Linnaeus), Allan, Cowry Shells of World Seas, p. 155, pl. 13, fig. 1. Numerous synonyms are cited.
1958. *Trivia pediculus* (Linnaeus), DuBar, Florida Geol. Sur., Bull. No. 40, pp. 198-199, pl. 12, fig. 6.
1958. *Trivia pediculus* (Linnaeus), Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 15.
1958. *Trivia pediculus* (Linnaeus), Abbott, Acad. Nat. Sci. Philadelphia, Mon. No. 11, p. 47.
1958. *Trivia pediculus* (Linnaeus), Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, p. 80, pl. 13, 2 figs.
1959. *Trivia pediculus* (Linnaeus), Nowell-Usticke, A Check List of the Marine Shells of St. Croix, p. 52.

This species is represented by 10 Recent examples and one fossil specimen from the Abisinia formation. The Recent shells are tan, pink, or ashy gray, and there are three pairs of large irregular brown spots on the back, the spots of each pair situated on either side of, and close to the dorsal furrow. Dorsal furrow clearly defined but not persistent to the anterior and posterior extremities. Spire entirely concealed. Sculpture consisting of 16 to 19 revolving riblets, with additional intercalaries appearing on the sides and back. The ribs are pustular to subnodulous, the nodules most pronounced at the margins of the dorsal furrow. Both lips are somewhat swollen, and the aperture is emarginate at the extremities. Well-preserved shells show numerous axial growth striae between the spiral riblets.

Dimensions.—Specimen A199a, length 12 mm.; max. width 8 mm.; max. altitude 6.8 mm.

Localities.—Recent, on beach at Playa Grande Yachting Club, Distrito Federal. Ten specimens. Abisinia formation at W-30, eastern edge of Playa Grande village. One specimen.

Range and distribution.—*Trivia pediculus* ranges chronologically from Miocene to Recent, and geographically from South Carolina to Brazil.

The living shell is found in shallow water to depths of less than 50 fathoms, and is recorded from east and west Florida to as far south as Brazil. In the Pliocene, *T. pediculus* has been found in the Waccamaw formation of North Carolina, in the Caloosahatchee and St. Petersburg shell beds of Florida, and in the clays of the Limon peninsula, Costa Rica. As a Miocene fossil it occurs in the Bowden beds of Jamaica.

Remarks.—Among the specimens of *T. pediculus* collected on the beach at Playa Grande is the one illustrated on Plate 21, figures 7,8. This single example has the same shape and general characters of *T. pediculus* but differs from normal specimens of *T. pediculus* in the following particulars: a) the spire is uncovered (revealing that there are four whorls in all with the nucleus consisting of three smooth ones); b) it lacks the dorsal groove; c) it has a lighter and thinner shell; d) there is only a single column of three spots on the dorsum just to the right of middle; and e) only the right side of the dorsum (as viewed with the spire up) is ribbed, the left half being smooth. I believe that the lack of symmetry in sculpture and the

uncovered spire denotes an arrested development of the epidermal layer, and that the form is a pathological example of the true *T. pediculus*. The specimen in question has a startling similarity to *T. incerta* Tucker and Wilson (1932, pp. 50-51, pl. 2, figs. 9, 10) from the Pliocene of Moore Haven, Florida. Tucker and Wilson stated that "this species [*T. incerta*] is apparently quite distinct from any thus far collected from the Caloosahatchie Pliocene. However, it may prove to be a pathologic specimen, or the young of some undescribed species". I would be inclined to agree with the authors that their specimen is indeed pathologic but it would not be surprising if *T. incerta* turns out to be *T. pediculus*, normal specimens of which are found in the Pliocene along the Caloosahatchee River west of Moore Haven and at North St. Petersburg, Florida.

CYPRAEIDAE

Cypraea (Luria) cinerea Gmelin — Pl. 21, figs. 11, 12; Pl. 22, figs. 1, 2

1769. *Porcellana cinerea* Martini, Conchylien-Cabinet, vol. 1, p. 346, pl. 25, figs. 254, 255.
1791. *Cypraea cinerea* Gmelin, Syst. Nat., p. 3402, No. 16.
1817. *Cypraea cinerea* Gmelin, Dillwyn, A Descriptive Catalogue of Recent Shells, vol. 1, p. 451, sp. 27.
1822. *Cypraea cinerea* Gmelin, Lamarck, An. sans Vert., vol. 7, p. 386.
1822. *Cypraea sordida* Lamarck, An. sans Vert., vol. 7, p. 387.
1825. *Cypraea cinerea* Gmelin, Wood, Index Testaceologicus, p. 88, pl. 17, fig. 27.
1845. *Cypraea cinerea* Gmelin, Reeve, Conch. Icon., vol. 3, pl. 22, sp. 124.
1853. *Cypraea cinerea* Gmelin, d'Orbigny, Hist. phys., polit. nat. l'Ile de Cuba, Mollusques, vol. 2, p. 91, No. 267.
1857. *Cypraea cinerea* Gmelin, Fischer, Revue coloniale, p. 7, sp. 4.
1864. *Cypraea cinerea* Gmelin, Krebs, The West Indian Marine Shells, p. 42.
1878. *Cypraea cinerea* Gmelin, Mörch, Catalogue of West-India Shells, p. 10.
1881. *Cypraea cinerea* Gmelin, Gabb, Acad. Nat. Sci. Philadelphia, Jour., ser. 2, vol. 8, p. 360.
1885. *Cypraea cinerea* Gmelin, Tryon, Man. Conch., vol. 7, p. 166, pl. 2, figs. 15, 16.
1886. *Cypraea cinerea* Gmelin, Watson, Voyage of H.M.S. Challenger, Zoology, vol. 15, p. 422.
1889. *Cypraea cf. sordida* Lamarck, Lorié, Samml. Geol. Reichs-Mus. Leiden, ser. 2, vol. 1, pp. 134, 142.
1889. *Cypraea cinerea* Gmelin, Dall, U. S. Nat. Mus., Bull. 37, p. 136.
1891. *Cypraea cinerea* Gmelin, Baker, Acad. Nat. Sci. Philadelphia, Proc., vol. 43, p. 52.
1901. *Cyparea cinerea* Gmelin, Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, p. 420.
1921. *Cypraea cinerea* Gmelin, Pilsbry, Acad. Nat. Sci. Philadelphia, Proc, vol. 73, p. 364.

1922. *Cypraea cinerea* Gmelin, Maury, Bull. Amer. Paleont., vol. 9, No. 38, p. 113.
1932. *Luria* (*Luria*) *cinerea cinerea* Gmelin, Schilder, Fossilium Catalogus, vol. 1, Animalia, pt. 55, p. 148.
1937. *Cypraea cinerea* Gmelin, Smith, East Coast Marine Shells, p. 110, pl. 40, fig. 4.
1939. *Cypraea cinerea* Gmelin, McGinty, Nautilus, vol. 53, No. 2, p. 38.
1939. *Luria (Luria) cinerea cinerea* (Gmelin), Schilder, Schweiz. Palaeont. Proc., vol. 23, No. 4, p. 175.
1939. *Luria* (*Luria*) *cinerea cinerea* (Gmelin), Schilder, Schweiz. Palaeont. Gesell. Abh., vol. 62, pp.
1942. *Cypraea cinerea* Gmelin, Ingram, Bull. Amer. Paleont., vol. 27, No. 104, p. 99.
1942. *Cypraea cinerea* Gmelin, Jaume and Pérez Farfante, Soc. Cubana Hist. Nat. "Felipe Poey" Mem., vol. 16, No. 1, p. 41.
1944. *Cypraea cinerea* Gmelin, Patterson, Nautilus, vol. 58, No. 2, p. 38.
1946. *Cypraea cinerea* Gmelin, Jaume, Soc. Malac. "Carlos de La Torre" Rev., vol. 4, No. 3, p. 105.
1947. *Cypraea cinerea* Gmelin, Ingram, Bull. Amer. Paleont., vol. 31, No. 120, p. 91.
1951. *Cypraea cinerea* Gmelin, Ingram, Bull. Amer. Paleont., vol. 33, No. 136, pp. 147-149, pl. 1, (21), figs. 1, 2.
1952. *Cypraea cinerea* Gmelin, Pulley, Texas Jour. Sci., vol. 4, No. 2, p. 174.
1954. *Cypraea (Luria) cinerea* Gmelin, Abbott, American Seashells, p. 180, pl. 6c.
1956. *Luria cinerea* (Gmelin), Allan, Cowry Shells of World Seas, p. 38, pl. 4, figs. 21, 22.
1958. *Cypraea cinerea* Gmelin, Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 15.
1958. *Luria cinerea* (Gmelin), Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, pp. 78-79.
1958. *Cypraea* (*Luria*) *cinerea* Gmelin, Abbott, Acad. Nat. Sci. Philadelphia, Mon. No. 11, p. 48.
1959. *Cypraea cinerea* Gmelin, Nowell-Usticke, A Check List of the Marine Shells of St. Croix, p. 53.

The Recent Venezuelan shells here referred to *C. cinerea* are of medium size, subcylindrical to ovate, and rather swollen. The coloration of the dorsum is variable, some of the specimens being orange whereas others are light brown, chocolate, dull brown, ashy brown, or olive-brown. All of the specimens are traversed by two faint spiral bands of a hue lighter than the ground, one of these bands lying above the middle, the other below the middle. Three specimens are sprinkled with dark flecks, these occurring on the olive-brown shells. The ventral surface and teeth are cream-colored, the interstices of the teeth tinged with violet or light brown, the number of teeth on the outer lip varying from 17 to 28. The fossula is well developed, bearing five to eight unequal denticles, the an-

teriormost of which is the most widely separated. These denticles and their interspaces are whitish.

Dimensions.—Specimen A194a, length 21.5 mm.; max. width 14.6 mm.; max. height 12.3 mm.; smallest adult specimen, length 15.3 mm.; max. width 9.5 mm.; max. height 8 mm.; largest specimen, length 28.6 mm.; max. width 18.8 mm.; max. height 15.5 mm.

Locality.—Recent, on beach at Playa Grande Yachting Club, Distrito Federal. Twenty-nine specimens.

Range and distribution.—The Recent *C. cinerea* is circum-Caribbean, ranging from southeast Florida and the Gulf of Mexico to northern South America. The animal is a near-shore denizen, usually dwelling on reefs and under rocks, and the beach at Playa Grande Yachting Club where these specimens were collected is just such an environment, with stretches of sand alternating with beachrock. As a fossil, *C. cinerea* occurs in the Miocene of the Dominican Republic and of Costa Rica, in the Pliocene of Costa Rica and Colombia, and in the Pleistocene of Barbados, Bermuda, Cuba, and probably Aruba where it has been described as *Cypraea* cf. *sordida* Lamarck by Lorié. *C. sordida,* according to Krebs, Watson, and Allan is the same as *C. cinerea* Gmelin.

Cypraea (Luria) cinerea catiana, new subspecies Pl. 21, figs. 13, 14

Shell moderately large, subovate, inflated and bulbous dorsally, slightly swollen ventrally. Columellar profile in the form of a narrow reversed "S", with the anterior curvature the more pronounced causing the aperture to be slightly wider below than above. Fossula deep, well developed, protruding into the aperture, extending upward from the top of the basal notch one-third the distance of the length of the columella, bearing eight broad low ridges separated by narrower, shallow interspaces, the ridges progressively larger anteriorward and at the apertural edge of the fossula. Inner lip with 22 denticles which are slightly oblique above and horizontal or nearly so below, as wide as, but not quite as elevated as the denticles of the outer lip, and arranged in a narrow column from the top of the anterior notch to the base of the posterior notch. Outer lip subangularly curved along the apertural margin, ornamented with 29 strong denticles confined to the inner border, the denticles somewhat

larger below than above. Outer lip somewhat swollen, widest medially, where it is about one fourth the diameter of the ventral face of the shell, thickened at the extremities with callus which emarginates the terminal canals. Terminal notches rather deep and broad, both indented obliquely, the anterior into an angularly "U" shaped recess, the posterior into a "V" shaped one.

The original color of the holotype is faded away although there is a lemon-yellow stain in the aperture and around the outer margins of the lips. This staining is believed to be secondary and derived from the enveloped sediments which themselves have a somewhat yellowish cast.

Dimensions.—Holotype, length 32 mm.; max. width 21 mm.; max. altitude 17.5 mm.

Type locality.—Playa Grande formation (Catia member), in bluff 125 meters west of the intersection of the Playa Grande Yachting Club road and coast road and about 95 meters due south of the shoreline. One specimen, the holotype.

Remarks.—There is only one specimen of this form in the Cabo Blanco collection but fortunately its preservation is good. Aside from being somewhat larger, more generously toothed, and more curvaceous of lip, this shell is closely related, if not identical, to Recent examples of *C. cinerea* Gmelin collected by me a scant hundred meters away. However, since the minor differences may be of stratigraphic significance, the subspecific name of *C. catiana* is proposed pending its validation from a larger suite of the fossil forms.

Comparisons.—Among the fossil Cypraeidae, *C. cinerea catiana* seems to be kindred to the following:

Cypraea spurcoides Gabb (1873, p. 235; Maury, 1917, p. 279, pl. 19, figs. 7-9) from the Miocene of the Dominican Republic and Trinidad. The aperture is less sinuous, and there are fewer teeth than on *C. catiana.*

Cypraea parisimina Olsson (1922, pp. 311-312, pl. 12, fig. 10) from the Miocene of Costa Rica. The aperture is less sinuous, and the extremities of the lips are more "pouting" than on *C. catiana.*

Cypraea fossula Ingram (1947b, pp. 128-129, pl. 1, fig. 3) from the upper Miocene of the Paraguaná Peninsula, Venezuela. The

aperture is wider anteriorly, and the basal notch is broader than on *C. catiana.*

Cypraea cinerea morinis Ingram (1947a, p. 91, pl. 3, figs. 5, 6) from the Pliocene of Costa Rica. The Costa Rican shell is less tumid than *C. catiana.*

Luria cinerea rutschi Schilder (1939, pp. 28-29, fig. 31) from the Jacmel Pliocene of Haiti (Miocene according to Ingram, 1947c, p. 145). The aperture is straighter than that of *C. catiana.*

Cypraea (Erosaria) spurca acicularis Gmelin Pl. 21, figs. 15, 16

1766. *Cypraea spurca* Linnaeus, Syst. Nat., ed. 12, p. 1179, No. 395, According to some authorities, the true *spurca* is from the Mediterranean.
1791. *Cypraea acicularis* Gmelin, Syst. Nat., ed. 13, p. 3421. This is considered the Caribbean race of *C. spurca* Linnaeus.
1845. *Cypraea spurca* Linneaus, Reeve, Conch. Icon., vol. 3, pl. 14, sp. 68.
1853. *Cypraea spurca* Linnaeus, d'Orbigny, Hist. phys., nat. polit. l'Ilde de Cuba, Mollsuques, vol. 2, p. 90, No. 266.
1857. *Cypraea spurca* Linnaeus, Fischer, Revue coloniale, p. 7, sp. 2, Guadeloupe.
1864. *Cypraea spurca* Linnaeus, Krebs, The West Indian Marine Shells, p. 42.
1873. *Cypraea spurca* Linnaeus, Gabb, Amer. Philos. Soc., Trans., new ser., vol. 15, p. 235.
1878. *Cypraea spurca* Linneaus, Mörch, Catalogue of West-India Shells, p. 10.
1885. *Cypraea spurca* Linnaeus, Tryon, Man. Conch., vol. 7, p. 195, pl. 19, fig. 16.
1886. *Cypraea spurca* Linnaeus, Watson, Voyage of H.M.S. Challenger, Zoology, vol. 15, pp. 425-426.
1889. *Cypraea spurca* Linnaeus, Dall, U. S. Nat. Mus., Bull. 37, p. 136.
1891. *Cypraea spurca* Linnaeus, Baker, Acad. Nat. Sci. Philadelphia, Proc., vol. 43, p. 52.
1901. *Cypraea spurca* Linnaeus, Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, p. 420.
1917. *Cypraea spurca* Linnaeus, Maury, Bull. Amer. Paleont., vol. 5, No. 29, p. 279, pl. 19, fig. 6.
1921. *Cypraea spurca* Linnaeus, Vaughan and Woodring, Geol. Reconn. Dominican Republic, p. 141.
1921. *Cypraea spurca* Linnaeus, Pilsbry, Acad. Nat. Sci. Philadelphia, Proc., vol. 73, p. 365.
1922. *Cypraea spurca* Linnaeus, Maury, Bull. Amer. Paleont., vol. 9, No. 38, p. 113.
1928. *Cypraea spurca* Linnaeus, Woodring, Carnegie Inst. Washington, Publ. No. 385, p. 104.
1937. *Cypraea spurca* Linnaeus, Smith, East Coast Marine Shells, p. 110, pl. 40, fig. 6.
1939. *Cypraea spurca* Linnaeus, McGinty, Nautilus, vol. 53, No. 2, p. 38.
1939. *Erosaria spurca acicularis* Gmelin, Schilder and Schilder, Malac. Soc. London Proc., vol. 23, No. 4, p. 133.
1944. *Cypraea spurca* Linnaeus, Patterson, Nautilus, vol. 58, No. 2, p. 38.
1946. *Cypraea spurca flaveola* Lamarck, Jaume, Soc. Malac. "Carlos de La Torre" Rev., vol. 4, No. 3, p. 105.

1947. *Cypraea spurca* Linnaeus, Ingram, Bull. Amer. Paleont., vol. 31, No. 120, pp. 80-81, pl. 3, fig. 8.
1947. *Cypraea spurca* Linnaeus, Ingram, Bull. Amer. Paleont., vol. 31, No. 127, p. 149.
1951. *Cypraea spurca* Linnaeus, Ingram, Amer. Paleont., vol. 33, No. 136, pp. 140, 159-161, pl. 1, figs. 3, 4.
1954. *Cypraea* (*Erosaria*) *spurca acicularis* Gmelin, Abbott, American Seashells, p. 180, pl. 6a.
1956. *Ravitrona spurca acicularis* (Gmelin), Allan, Cowry Shells of World Seas, p. 95.
1958. *Cypraea spurca acicularis* Gmelin, Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 15.
1958. *Cypraea* (*Erosaria*) *spurca acicularis* Gmelin, Abbott, Acad. Nat. Sci. Philadelphia, Mon. No. 11, p. 48.
1958. *Erosaria spurca acicularis* Gmelin, Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, p. 78.
1959. *Cypraea spurca acicularis* Gmelin, Nowell-Usticke, A Check List of the Marine Shells of St. Croix, p. 53.

The Recent Venezuelan shells are of medium size, obovate, and well inflated. The aperture is slightly curved, a little wider anteriorly. The fossula is poorly developed, the short denticles thereon being more or less a continuation of the teeth of the columellar lip. Lips broad and somewhat swollen, the inner with 13 to 16 teeth, the outer with 16 to 19 teeth. On the back of the outer lip is a single column of pits or indentations, these extending across the margin of the terminal notches and a short distance up and down the distal margin of the columella. The dorsum is clouded and mottled with orange-brown, the sides marked with relatively widely spaced dark brown circular spots, and in the pits there is a rusty brown tinge. The ventral surface and the strong teeth are whitish.

Dimensions.—Figured specimen, length 21 mm.; max. width 14 mm.; max. height 11.5 mm.

Locality.—Recent, on beach of Playa Grande Yachting Club, Distrito Federal. Nine specimens.

Range and distribution.—In the Americas, the living *C. spurca* completely circles the Caribbean Sea, the Caribbean race of the species being referred to by the Schilders, Abbott, Allan, and others as *C. spurca acicularis*. These same authors consider the true *C. spurca* to be of Mediterranean (Eurafrican) habitat exclusively, but Ingram (1951, p. 159) stated that *C. spurca* "is the only Afro-European cowry to enter the fauna of the Western Hemisphere". Allan (1956, p. 95) recognized four races of *C. spurca*: *C. spurca spurca* Linnaeus of the Eurafrican province, *C. spurca acicularis*

Gmelin of the Caribbean-West Indian province, *C. spurca santaehelenae* Schilder of the South Atlantic region, and *C. spurca atlantica* Monterosato from West Africa.

The Caribbean *C. spurca,* as a fossil, is recorded from the Miocene of the Dominican Republic and from the Pleistocene of Barbados.

Cypraea (Trona) zebra (Linnaeus) Pl. 22, figs. 3, 4

1758. *Cypraea zebra* Linnaeus, Syst. Nat., ed. 10, p. 724.
1767. *Cypraea exanthema* Linnaeus, Syst. Nat., ed. 12, p. 1172.
1822. *Cypraea exanthema* Linnaeus, Lamarck, Syst. Nat., vol. 7, p. 375.
1832. *Cypraea exanthema* Linnaeus, Deshayes, Encycl. Méth., p. 813, sp. 349.
1845. *Cypraea exanthema* Linnaeus, Reeve, Conch. Icon., vol., 3, pl. 5, sp. 16.
1859. *Cypraea exanthema* Linnaeus, Sowerby, Thes. Conchyl., *Cypraea,* p. 5, pl. 22, fig. 181.
1864. *Cypraea exanthema* Linnaeus, Krebs, The West Indian Marine Shells, p. 41.
1878. *Cypraea exanthema* Linnaeus, Mörch, Catalogue of West-India Shells, p. 10.
1885. *Cypraea exanthema* Linnaeus, Tryon, Man. Conch., vol. 7, p. 164, pl. 1, figs. 4, 5.
1889. *Cypraea exanthema* Linnaeus, Dall, U. S. Nat. Mus., Bull. 37, p. 136.
1889. *Cypraea cf. exanthema* Linnaeus, Lorié, Samml. Geol. Reichs-Mus. Leiden, ser. 2, vol. 1, pp. 133-134, 142, pl. 2, fig. 40.
1891. *Cypraea exanthema* Linnaeus, Baker, Acad. Nat. Sci. Philadelphia, Proc., vol. 43, p. 52.
1901. *Cypraea exanthema* Linnaeus, Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, p. 420.
1905. *Cypraea exanthema* Linnaeus, Verrill, Connecticut Acad. Arts and Sci., Trans., vol. 12, p. 348, pl. 36, fig. 19.
1910. *Cypraea exanthema* Linnaeus, Dall, U. S. Nat. Mus., Proc., vol. 37, No. 1704, p. 227.
1913. *Cypraea exanthema* Linnaeus, Presbry, Nautilus, vol. 27, No. 1, p. 8.
1922. *Cypraea exanthema* Linnaeus, Maury, Bull. Amer. Paleont., vol. 9, No. 38, p. 113.
1924. *Cypraea exanthema* Linnaeus, Olsson, Nautilus, vol. 37, No. 4, p. 125.
1924. *Cypraea exanthema* Linnaeus, Emery, Nautilus, vol. 38, No. 2, p. 61.
1932. *Trona* (*Macrocypraea*) *zebra* (Linnaeus), Schilder, Fossilium Catalogus, vol. 1, Animalia, pt. 55, p. 134.
1937. *Cypraea exanthema* Linnaeus, Smith, East Coast Marine Shells, p. 110, pl. 40, fig. 5.
1939. *Trona zebra zebra* (Linnaeus), Schilder and Schilder, Malac. Soc. London, Proc., vol. 23, No. 4, p. 179.
1941. *Cypraea exanthema* Linnaeus, Bayer, Nautilus, vol. 55, No. 2, p. 44.
1942. *Cypraea exanthema* Linnaeus, Jaume and Pérez Farfante, Soc. Cubana Hist. Nat. "Felipe Poey" Mem., vol. 16, No. 1, p. 41.
1946. *Cypraea* (*Trona*) *zebra* Linnaeus, Jaume, Soc. Malac. "Carlos de La Torre" Rev., vol. 4, No. 3, p. 105.
1946. *Cypraea* (*Trona*) *zebra* Linnaeus, var. *vallei* Jaume and Borro. Soc. Cubana Hist. Nat. "Felipe Poey" Rev., vol. 4, No. 1, pp. 21-22.
1947. *Cypraea zebra* Linnaeus, Ingram, Bull. Amer. Paleont., vol. 31, No. 120, pp. 82-83.

1947. *Cypraea zebra* Linnaeus, Ingram, Bull. Amer. Paleont., vol. 31, No. 122, p. 150.
1947. *Cypraea zebra* Linnaeus, Ingram, Am. Mus. Novitates, No. 1366, p. 1.
1951. *Cypraea zebra* Linnaeus, Ingram, Bull. Amer. Paleont., vol. 33, No. 136, pp. 162-163, pl. 1, figs. 9, 10.
1951. *Cypraea exanthema* Linnaeus, Rogers, The Shell Book, p. 129. Modern name given as *C. zebra* by Rehder, p. 491.
1954. *Cypraea* (*Trona*) *zebra* Linnaeus, Abbott, American Seashells, p. 180, pl. 6d.
1956. *Macrocypraea zebra zebra* (Linnaeus), Allan, Cowry Shells of World Seas, p. 40, pl. 5, figs. 5, 6.
1958. *Cypraea zebra* Linnaeus, Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 15.
1958. *Cypraea* (*Trona*) *zebra* Linnaeus, Abbott, Acad. Nat. Sci. Philadelphia, Mon. No. 11, p. 48.
1958. *Trona zebra* (Linnaeus), Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, p. 78.
1959. *Cypraea zebra* Linnaeus, Nowell-Usticke, A Check List of the Marine Shells of St. Croix, p. 53.

Illustrated is a thin shell which is believed to be the young of *Cypraea zebra* Linnaeus. It has an *Oliva*-like spire and an *Ancilla*-like columella. The ground is pale tan, and there are four spiral bands of brown, the lowest band, at the base, the widest but most obscure. The brown of the bands is more intense near the margin of the outer lip. The whitish spots, characteristic of the mature shell of *C. zebra* and the related *C. cervus* Linnaeus, are not present. The columella is twisted, plicate longitudinally, and rather sharply truncate at the anterior end.

Dimensions.—Figured specimen, length 23 mm.; max. width (outer lip broken) 12 mm.

Locality.—Recent, on beach of Playa Grande Yachting Club, Distrito Federal. Two specimens. In addition to the specimen described, our collection contains the tip end of one other example of what is presumed to be *C. zebra.* This is also a young shell but is somewhat more developed than the preceding as shown by the callus which has started to encroach on the spire.

Remarks.—Although the adult *C. zebra* is said to be readily distinguished from *C. cervus* Linnaeus by its smaller and more numerous white spots, and by its less inflated, narrower shell, I cannot be certain, in the absence of spots, of the correct identity of the Venezuelan specimens. Tentatively, however, the shell in question is referred to *C. zebra* for the reason that *C. zebra* is known to occur in South American waters, whereas the farthest south that *C. cervus* has been reported definitely is Cuba.

Range and distribution.—The living *C. zebra* Linnaeus is found in the Western Atlantic from southeast Florida to northern South America. A red-brown variety with no, or obsolescent, lateral spots, named *Trona zebra dissimilis* by the Schilders (1939, p. 179), occurs in Brazil. As a Pleistocene fossil, *C. zebra* is recorded from Bermuda, Barbados, Cuba, and probably from Curaçao and Aruba where it has been described as *C.* cf. *exanthema* by Lorié. *C. zebra* has also been reported from the Pliocene of Haiti by Schilder. Formerly known as *C. exanthema,* the present shell has also been reported in the Eastern Pacific from the Gulf of California to Peru, and the Galapagos Islands, by Sowerby (1859), Dall (1910), and Olsson (1924)) but the West Coast species, although close to the Western Atlantic *C. zebra,* is given the name *C. cervinetta* Kiener by many authors including Keen (1958, p. 328, sp. 283) in her "Sea Shells of Tropical West America".

Cypraea (Muracypraea) henekeni Sowerby Pl. 22, figs. 5, 6

1849. *Cypraea henikeri* Sowerby, Geol. Soc. London Quart. Jour., vol. 6, p. 45, pl. 9, fig. 3.
1873. *Cypraea henekeni* Sowerby, Gabb, Amer. Philos. Soc., Trans., new ser., vol. 15, p. 235.
1911. *Cypraea henikeni* Sowerby var., Brown and Pilsbry, Acad. Nat. Sci. Philadelphia, Proc., vol. 63, p. 356, pl. 26, fig. 8.
1917. *Cypraea henekeni* Sowerby, Maury, Bull. Amer. Paleont., vol. 5, No. 29, p. 278, pl. 19, fig. 4.
1921. *Cypraea henekeni* Sowerby, Pilsbry, Acad. Nat. Sci. Philadelphia, Proc., vol. 73, p. 365.
1922. *Cypraea Henekini* Sowerby var., Olsson, Bull. Amer. Paleont., vol. 9, No. 39, p. 186.
1925. *Cypraea henekeni* Sowerby, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 371, pl. 37, fig. 1.
1925. *Cypraea henekeni* var. *lacrimula* Maury, Bull. Amer. Paleont. vol. 10, No. 42, p. 372, pl. 37, fig. 2.
1925. *Cypraea caroniensis* Maury, Bull. Amer. Paleont., vol. 10. No. 42, p. 373, pl. 37, figs. 3, 5, 6.
1927. *Siphocypraea isthmica* Schilder, Arch. Naturgesch., 91st yr., pt. A, No. 10, pp. 99, 144.
1929. *Cypraea henekeni* Sowerby, Anderson, California Acad. Sci. Proc., ser. 4, vol. 18, No. 4, p. 139.
1939. *Cypraea henekeni* var. *potreronis* Ingram, Bull. Amer. Paleont., vol. 24, No. 85, pp. 331-332, pl. 1, figs. 8, 9.
1939. *Cypraea henekeni* Sowerby, Ingram, Bull. Amer. Paleont., vol. 24, No. 85, pp. 334-335, pl. 1, fig. 3.
1939. *Siphocypraea henikeri* (Sowerby), Schilder, Schweiz. Palaeont. Gesell. Abh., vol. 62, p. 24.
1939. *Siphocypraea caroniensis* (Maury), Schilder, Schweiz. Palaeont. Gesell. Abh., vol. 62, p. 24, figs. 26, 27.

1939. *Siphocypraea quagga* Schilder, Schweiz. Palaeont. Gesell. Abh, vol. 62, p. 25, fig. 28.
1947. *Cypraea andersoni* Ingram, Bull. Amer. Paleont., vol. 31, No. 120, pp. 84-85, pl. 2, fig. 2.
1947. *Cypraea tuberae* Ingram, Bull. Amer. Paleotn., vol. 31, No. 120, p. 103, pl. 2, fig. 1.
1947. *Cypraea projecta* Ingram, Bull. Amer. Paleont., vol. 31, No. 121, pp. 129-130, pl. 1, figs. 4, 5.
1947. *Cypraea grahami* Ingram, Bull. Amer. Paleont., vol. 31, No. 121, pp. 130-131, pl. 2, figs. 6, 7.
1947. *Cypraea rugosa* Ingram, Bull. Amer. Paleont., vol. 31, No. 121, pp. 131-132, pl. 2, figs. 8, 9.
1948. *Cypraea andersoni* Ingram, California Acad. Sci., Proc., ser. 4, vol. 26, No. 6, p. 125, pl. 2, figs. 5, 7.
1948. *Cypraea tuberae* Ingram, California Acad. Sci., Proc., ser. 4, vol. 26, No. 6, p. 129, pl. 2, figs. 9, 12.
1951. *Cypraea cf. C. henekeni* Sowerby, Marks, Bull. Amer. Paleont., vol. 33, No. 139, p. 376.
1959. *Cypraea* (*Muracypraea*) *henekeni* Sowerby, Woodring, U. S. Geol. Sur., Prof. Paper 306-B, pp. 194-196, pl. 31, figs. 6-10; pl. 32, figs. 1, 4, 6, 9.

Shell moderately large and heavy, the ventral side heart-shaped, the dorsum asymmetrically swollen, with the maximum convexity near the posterior margin. Viewed at arm's length with the dorsum up, the shell looks like a foreshortened whale. On the dorsum there is a horseshoe-shaped swirl of callus, both ends of the swirl elevated into low irregular nodes. The tuberculation is not constant, however, as on another specimen the dorsum seems relatively smooth. Aperture wide, more so anteriorly than posteriorly. Outer lip nearly straight except at the ends where it curves toward the aperture, the posterior end longer and more angularly curved than the anterior, and extending a little higher than the posterior extremity of the columellar lip. The widest part of the outer lip is well above the middle where it is a little over one-third the greatest breadth of the ventral surface. On the outer lip there are 17 to 22 strong teeth along the inner margin. To the left of the aperture the shell is decidedly pyriform, the upper half of the columellar lip extending far into the aperture. Columellar lip with 11 to 16 teeth. Anterior end of shell pinched and flattened into two lobes or ears, the back side of the labial lobe being dimpled. When viewed with the spire upright, the lobes are bent toward the observer. Anterior canal deep, moderately wide, excavated dorsally into a partially recumbent U-shaped notch, the margin of the notch thickened. The posterior outlet is broader and deeper than the anterior canal, and is notched shallowly behind into a nearly parallel-sided "U".

Dimensions.—Figured specimen (tuberculate), length 67 mm.; max. width 45 mm.; max. height (excluding tubercule) 38 mm.

Localities.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. One specimen, the dorsum nodulated. Between the nodes, there are three brown dots in a column, a horizontal bar to the right of the uppermost dot, and a dash below the bar.

Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. One specimen, the dorsum relatively smooth.

Remarks.—I had originally intended to give the Cabo Blanco shell a subspecific name, but as shown by Woodring (1959, pp. 194-196) *C. henekeni* is such an inconstant species that this shell easily fits within its range of variability. This can be seen in Woodring's synonymy (of which mine is a near duplicate), where a goodly number of variously named forms are included under *C. henekeni, s.s.* Other related species are the lower Miocene *C. amandusi* Hertlein and Jordan (1927, pp. 628-629, pl. 18, fig. 1; pl. 19, figs. 1, 4, 5) from California; the upper Miocene *C. carolinensis floridana* Mansfield (1931, p. 6, pl. 1, figs. 2, 6, 7), a nontuberculate shell from Florida; and the Pliocene *C. cayapa* Pilsbry and Olsson (1941, pp. 41-42, pl. 7, fig. 4) from the Pliocene of Ecuador.

Range and distribution.—Lower Miocene of Trinidad; middle Miocene of Costa Rica, Panamá Canal Zone, Dominican Republic, Jamaica, Ecuador, Colombia, Venezuela, and Trinidad; upper Miocene of the Panamá Canal Zone, Colombia, Venezuela, and Trinidad; Pliocene (this report) of Venezuela.

NATICIDAE

Polinices lacteus (Guilding) Pl. 22, figs. 7, 8

1834. *Naticina lactea* Guilding, Linnaean Soc. London Trans., vol. 7, No. 1, p. 31.
1864. *Natica lactea* Philippi, Krebs, The West Indian Marine Shells, p. 67.
1878. *Natica lactea* (Guilding) Mörch, Catalogue of West-India Shells, p. 10.
1886. *Natica lactea* (Guilding), Tryon, Man. Conch., vol. 8, p. 49, pl. 16, figs. 54-57.
1889. *Polynices lactea* (Guilding), Dall, U. S. Nat. Mus., Bull. 37, p. 156.
1891. *Natica lactea* (Guilding), Baker, Acad. Nat. Sci. Philadelphia, Proc., vol. 43, p. 54.
1901. *Polinices (Mammilla) lactea* (Guilding), Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, p. 439.

1922. *Polinices (Mammilla) lactea* (Guilding), Maury, Bull. Amer. Paleont., vol. 9, No. 38, p. 149.
1930. *Polinices lactea* (Guilding), Baker, Nautilus, vol. 43, No. 4, p. 132.
1935. *Polinices lactea* (Guilding), Richards, Jour. Paleont., vol. 9, No. 3, p. 257.
1937. *Polinices lactea* (Guilding), Smith, East Coast Marine Shells, p. 92, pl. 35, fig. 13.
1942. *Polinices lactea* (Guilding), Jaume and Pérez Farfante, Soc. Cubana Hist. Nat. "Felipe Poey" Mem., vol. 16, No. 1, p. 40.
1946. *Polinices lactea* (Guilding), Jaume, Soc. Malac. "Carlos de La Torre" Rev., vol. 4, No. 3, p. 40.
1952. *Polinices lactea* (Guilding), Pulley, Texas Jour. Sci., vol. 4, No. 2, p. 174.
1953. *Polinices* (*Naticina*) *lacteus* Guilding, Haas, Fieldiana-Zoology, vol. 34, No. 20, p. 204.
1954. *Polinices lacteus* (Guilding), Abbott, American Seashells, pp. 185-186, pl. 221.
1955. *Polinices lactea* (Guilding), Perry and Schwengel, Marine Shells of the Western Coast of Florida, p. 124, pl. 46, fig. 324.
1958. *Polinices lacteus* (Guilding), Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 15.
1958. *Polinices lacteus* (Guilding), Abbott, Acad. Nat. Sci. Philadelphia, Mon. No. 11, p. 48.
1958. *Polinices lacteus* (Guilding), Coomans, Caraibisch Marien-Biologisch Inst. Collected Papers 6, p. 77.
1959. *Polinices lacteus* (Guilding), Nowell-Usticke, A Check List of the Marine Shells of St. Croix, pp. 54, 55, 56.

Shell of medium size, subglobose, milk-white, moderately glossy, the surface marked only with fine longitudinal growth lines. Umbilicus deep, the channel bearing eight or nine faint small slightly crenulated threads running parallel with it. The upper part of the umbilicus is bridged over by the heavy enamel of the parietal wall. This enamel neatly fills the triangular space between the summit of the outer lip and the whorl, thickens a little as it arches gently over the posterior end of the aperture, and is indented into a short, nearly horizontal groove or sulcus just above the umbilical opening. Aperture semilunar. Outer and basal lips thin, the lower lip evenly thickened and slightly reflexed.

Dimensions.—Figured specimen, length 18.3 mm.; max. width 15.2 mm.

Locality.—Recent, on beach at Playa Grande Yachting Club, Distrito Federal. One specimen.

Remarks.—Although the threads in the umbilical channel are more numerous than in "typical" forms of *P. lacteus,* there is little doubt that the Venezuelan shell is the same species.

Range and distribution.—The living *P. lacteus* is a shallow-water species ranging from North Carolina to Brazil. The species

has also been recorded from the Pleistocene of Cuba by Richards and by Jaume and Pérez Farfante.

Polinices hepaticus (Röding) Pl. 22, figs. 9, 10

1798. *Albula hepatica* Röding, Museum Boltenianum, p. 21, No. 249; refers to Chemnitz, Conchylien-Cabinet, vol. 5, figs. 1932, 1933.
1807. *Natica brunnea* Link, Beschreibung der Naturalien-Sammlung der Universität zu Rostock, p. 40; refers to Chemnitz, Conchylien-Cabinet, vol. 5, figs. 1932, 1933.
1822. *Natica mamillaris* Lamarck, An. sans Vert., vol. 6, pt. 2, p. 197; refers to Chemnitz, Conchylien-Cabinet, vol. 5, figs. 1932, 1933.
1864. *Natica fuscata* Chemnitz, Krebs, The West Indian Marine Shells, p. 66.
1878. *Natica fuscata* Humph., = *N. mamillaris* Lamarck, Mörch, Catalogue of West-India Shells, p. 10.
1881. *Mamilla mamillaris* (Lamarck), Gabb, Acad. Nat. Sci. Philadelphia, Jour., ser. 2, vol. 8, p. 357.
1886. *Natica mamillaris* Lamarck, Tryon, Man. Conch., vol. 8, p. 43, pl. 18, fig. 74.
1889. *Polynices brunnea* (Link), Dall, U.S. Nat. Mus., Bull. 37, p. 156.
1891. *Natica mamillaris* Lamarck = *brunnea* Link, Baker, Acad. Nat. Sci. Philadelphia, Proc., vol. 43, p. 54.
1901. *Polinices mamillaris* (Lamarck), Dall and Simpson, U.S. Fish Com., Bull., vol. 20 for 1901, pt. 1, p. 439.
1922. *Polinices* (*Mammilla*) *brunnea* (Link), Maury, Bull. Amer. Paleont., vol. 9, No. 38, p. 150.
1937. *Polinices brunnea* (Link), Smith, East Coast Marine Shells, p. 92, pl. 35, fig. 2.
1942. *Polinices brunnea* (Link), Jaume and Pérez Farfante, Soc. Cubana Hist. Nat. "Felipe Poey" Mem., vol. 16, No. 1, p. 40.
1946. *Polinices brunnea* (Link), Jaume, Soc. Malac. "Carlos de La Torre" Rev., vol. 46, No. 3, p. 103.
1954. *Polinices brunneus* (Link), Abbott, American Seashells, p. 186, pl. 5j.
1958. *Polinices hepaticus* (Röding), Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 15.
1958. *Polinices hepaticus* (Röding), Abbott, Acad. Nat. Sci. Philadelphia, Mon. No. 11, p. 49.
1958. *Polinices brunneus* (Link), Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, p. 77.
1959. *Polinices hepaticus* (Röding), Nowell-Usticke, A Check List of the Marine Shells of St. Croix, pp. 54, 55, 56.

The young Venezuelan shell referred to this species is rather small, subglobose, with 4-1/2 whorls in all, the tip of the nucleus loosely coiled and appressed. Surface smooth but with numerous fine longitudinal growth lines and a few fine spiral lines below the suture, the latter barely visible with a 10-power lens. Umbilicus arcuate, the channel deep and fairly broad and with sharp margins, the growth striae lining the channel pronounced. The heavy callus of the parietal wall is bowed into, and bridges part of the umbilicus;

it bears a short broad sulcus just above the umbilicus, and it forms a connective ridge from the wall to the outer lip at the posterior end of the aperture. Columella straightish. Aperture broadly semilunar. Outer and basal lips thin, the inner lip a little thickened. Color a slaty tan with faint whitish narrow streaks paralleling the longitudinal growth lines. The callus is white, with a fleck of brown in the sulcus of the parietal wall, and a larger stain of brown above the connective ridge at the outer lip. On the distal side, the umbilicus is bordered by a band of white which broadens at the base.

Dimensions.—Figured specimen, length 11.1 mm.; max. width 10.1 mm.

Locality.—Recent, on beach at Playa Grande Yachting Club, Distrito Federal. One specimen.

Remarks.—This was formerly known as *P. mamillaris* (Lamarck) and *P. brunnea* (Link).

Range and distribution.—*P. hepaticus* is found from southeast Florida through the West Indies to northern South America. As a fossil it has been reported from the Pleistocene of Cuba, by Jaume and Pérez Farfante, and from the Pliocene clays between Limon and Moen, Costa Rica, by Gabb.

Polinices subclausus (Sowerby) Pl. 22, figs. 11-16

1849. *Natica subclausa* Sowerby, Geol. Soc. London Quart. Jour., vol. 6, p. 51.
1866. *Natica subclausa* Sowerby, Guppy, Geol. Soc. London Quart. Jour., vol. 22, p. 290, pl. 18, fig. 8.
1866. *Natica mammillaris* Lamarck, Guppy, Geol. Soc. London Quart. Jour., vol. 22, p. 291. Not of Lamarck.
1873. *Mammilla mamillaris* (Lamarck), Gabb, Amer. Philos. Soc., Trans., new ser., vol. 15, p. 223. Not of Lamarck.
1874. *Natica subclausa* Sowerby, Guppy, Geol. Mag., decade 2, vol. 1, p. 437.
1876. *Natica mammillaris* Lamarck, Guppy, Geol. Soc. London Quart. Jour., vol. 32, p. 519. Not of Lamarck.
1903. *Polynices subclausa* (Sowerby), Dall, Wagner Free Inst. Sci., Trans., vol. 3, pt. 6, p. 1585.
1911. *Polinices subclausa* (Sowerby), Brown and Pilsbry, Acad. Nat. Sci. Philadelphia, Proc., vol. 63, p. 360.
1917. *Polinices subclausa* (Sowerby), Maury, Bull. Amer. Paleont., vol. 5, No. 29, p. 300, pl. 23, fig. 14.
1917. *Polinices mammillaris* (Lamarck), Pilsbry and Brown, Acad. Nat. Sci. Philadlphia, Proc., vol. 69, p. 34. Not of Lamarck.
1921. *Polinices mamillaris* (Lamarck), Pilsbry, Acad. Nat. Sci. Philadelphia, Proc., vol. 73, p. 386. Not of Lamarck.
1922. *Polinices subclausa* (Sowerby), Olsson, Bull. Amer. Paleont., vol. 9, No. 39, p. 329, pl. 13, figs. 16, 17.

1927. *Polinices subclausa* (Sowerby), Hodson, Hodson, and Harris, Bull. Amer. Paleont., vol. 13, No. 49, p. 69, pl. 36, fig. 5.
1928. *Polinices brunnea subclausa* (Sowerby), Woodring, Carnegie Inst. Washington, Publ. No. 385, pp. 385-386, pl. 30, fig. 13.
1929. *Polinices* (*Mammilla*) cf. *brunnea* (Link), Weisbord, Bull. Amer. Paleont., vol. 14, No. 54, p. 261, pl. 9, fig. 12.
1929. *Polinices subclausa* (Sowerby), Anderson, California Acad. Sci., Proc., ser. 4, vol. 18.
1933. *Polinices subclausa* (Sowerby) ?, Tucker and Wilson, Bull. Amer. Paleont., vol. 18, No. 66, p. 69, pl. 2, fig. 7.
1957. *Polinices brunneus subclausa* (Sowerby), Woodring, U.S. Geol. Surv., Prof. Paper 306-A, pp. 88-90, pl. 20, fig. 9.

The Cabo Blanco shells are subglobose, ovate, the spire low to moderately high. Whorls 4-1/2 to 5-1/2 in all, the nucleus small, the post-nuclear whorls rapidly expanding. Sutures tight, finely impressed. Surface smooth but with numerous longitudinal growth lines. The middle layer of shell is also finely lineated longitudinally, these lineations crossed by microscopic spiral striae. Body whorl flattened in the labral area below the suture. Umbilicus arcuate, the furrow deeply excavated, the far margin of the furrow often sharp, the furrow terminating at the inner lip. Many of the specimens have a strong, broad, rounded funicle joined to the columellar callus, but on some specimens the funicle is hardly developed, if at all; where the columellar callus is button-shaped at the umbilicus, the funicle is generally well developed, whereas if the callus enters the umbilical area but slightly, the funicle is rudimentary or absent. Aperture large, semilunar. Outer lip semicircular, thin. Inner lip heavily callused, the callus neatly filling the triangular area of the parietal wall above the aperture, bowed in varying degree into the umbilicus, and continuing therefrom to the lower lip; immediately above the umbilicus, the callus is grooved transversely, the groove or depression varying somewhat in depth. Lower lip thickly emarginated with callus, slightly reflexed. Columellar margin a little convex toward the aperture, somewhat oblique, the angle with the vertical near 25 degrees. The callus of the parietal wall is thickened into a gentle arch over the posterior end of the aperture.

Dimensions.—Specimen I225a, length 28.5 mm.; max. width 23 mm.; specimen I225b, length 41 mm.; max. width 31.6 mm. Without funicle; specimen 1225c, length 18 mm.; max. width 15 mm.

Localities.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. Seven specimens; lower Mare

formation, in small stream 100 meters west of Quebrada Mare Abajo. One specimen; Mare formation at W-14, on hillside above west bank of Quebrada Mare Abajo. Two specimens; Mare formation at W-25, south flank of Punta Gorda anticline. Two specimens; Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. Two specimens.

Comparisons.—There are a number of related species, the closest one perhaps being *P. hepaticus* (Röding) (formerly *P. brunneus* Link and *P. mamillaris* Lamarck). Most of these related fossils are more strongly funicled, and all of them lack the microscopic spiral striae that often appear on the surface of *hepaticus*. One of the specimens on which the funicle is not developed is nearly identical with *P. lacteus* (Guilding); however, that particular specimen of the Cabo Blanco *P. subclausus* is much heavier than *P. lacteus*, and more of the umbilicus is uncovered. Another close relative is *P. carolinianus* (Conrad) (1841a, p. 347, pl. 2, fig. 18) from the upper Miocene of North Carolina and Florida, and from the Pliocene at North St. Petersburg, Florida. The only consistent difference I have been able to detect between the Cabo Blanco *P. subclausus* and *P. carolinianus* is that the former has a somewhat narrower aperture. Other tropical late Tertiary species resembling *P. subclausus* are the following:

P. subclausus lavelanus F. Hodson (1927, p. 69, pl. 37, figs. 12, 14), from the Miocene of the State of Falcon, Venezuela, is more elongate and has a much more irregular parietal callus than does *P. subclausus, s.s.*

P. stanislas-meunieri Maury (1917, pp. 300-301, pl. 23, figs. 15, 16), middle or late Miocene of the Dominican Republic, Costa Rica, Panamá Canal Zone, Colombia, Venezuela, and Trinidad is finely lineate spirally on the surface, and the inner lip is more oblique than on *P. subclausus*.

P. springvalensis Maury (1925b, 393, pl. 40, fig. 6), from the upper Miocene of Trinidad, has conspicuously shouldered whorls. Woodring (1957, p. 91) suggested that this is a variant of Maury's *P. stanislas-meunieri.*

P. caparona Maury (1925b, pp. 392-393, pl. 40, fig. 5), from the Manzanilla Miocene of Trinidad, is concave below the suture, and its large callus all but envelops the umbilicus.

P. boutakoffi Rutsch (1942, p. 139, pl. 6, figs. 7a, 7b), from the upper Miocene Springvale deposits of Trinidad, is more rotund than *P. subclausus*.

P. canalizonalis (Brown and Pilsbry) (1912b, p. 508, pl. 22, fig. 10), from the Gatun Miocene of the Panamá Canal Zone, has a much wider umbilicus than *P. subclausus*.

P. prolacteus Anderson (1929, p. 124–125, pl. 14, figs. 8, 9), occurring in Los Peridices group, Colombia, is much like the largest specimen of the Cabo Blanco *P. subclausus*, but the surface of *P. prolacteus* is marked near the base by faint spiral striations that are not present on the Cabo Blanco shell.

P. nelsoni Olsson (1932, pp. 208-209, pl. 24, figs. 8, 10), Miocene of Peru. This lacks the sharp umbilical furrow of *P. subclausus* and is a more elongated shell.

Range and distribution.—Middle Miocene of the Dominican Republic, Jamaica, Costa Rica, the Panamá Canal Zone, and Colombia; upper Miocene at Acline, Florida, *fide* Tucker and Wilson; Pliocene (this report) of Venezuela. In the United States National Museum, Collection No. 18408, from 2.5 kilometers east of Cumaná, State of Sucre, Venezuela, there is a form that is close to, if not identical with *P. subclausus* (Sowerby), and that may also be Pliocene in age.

Natica (Naticarius) canrena (Linnaeus) Pl. 23, figs. 1, 2

1758. *Nerita canrena* Linnaeus, Syst. Nat., ed. 10, p. 776, No. 623.
1855. *Natica canrena* (Linnaeus), Reeve, Conch. Icon., vol. 9, pl. 4, sp. 14.
1857. *Natica canrena* (Linnaeus), Tuomey and Holmes, Pleiocene Fossils of South Carolina, p. 115, pl. 25, fig. 17.
1858. *Natica canrena* (Linnaeus), Emmons, Rept. North Carolina Geol. Survey, p. 267, fig. 152.
1864. *Natica canrena* (Linnaeus), Krebs, The West Indian Marine Shells, p. 66.
1867. *Natica canrena* (Linnaeus), Guppy, Sci. Assoc. Trinidad Proc., pt. 3, pp. 5, 11.
1873. *Natica canrena* (Linnaeus), Gabb, Amer. Philos, Soc., Trans., vol. 15, p. 223.
1867. *Natica canrena* (Linnaeus), Guppy, Geol. Soc. London Quart. Jour., vol. 32, p. 518.
1878. *Natica canrena* (Linnaeus), Mörch, Catalogue of West-India Shells,
1881. *Natica canrena* (Linnaeus), Gabb, Acad. Nat. Sci. Philadelphia, Jour., 2d ser., vol. 8, p. 357.
1889. *Natica canrena* (Linnaeus), Dall, U. S. Nat. Mus., Bull. 37, p. 154.
1891. *Natica canrena* (Linnaeus), Baker, Acad. Nat. Sci., Philadelphia, Proc., vol. 43, p. 54.

1892. *Natica canrena* (Linnaeus), Dall, Wagner Free Inst. Sci., Trans., vol. 3, pt. 2, pp. 364-365.
1895. *Natica canrena* (Linnaeus), Harris, Bull. Amer. Paleont., vol. 1, No. 3, p. 106.
1901. *Natica canrena* (Linnaeus), Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, p. 438.
1910. *Natica canrena* (Linnaeus), Guppy, Agric. Soc. Trinidad and Tobago Soc. Paper No. 440, p. 10; No. 454, p. 5.
1913. *Natica canrena* (Linnaeus), Brown and Pilsbry, Acad. Nat. Sci. Philadelphia, Proc., vol. 64, pp. 501, 508.
1917. *Natica canrena* (Linnaeus), Maury, Bull. Amer. Paleont., vol. 5, No. 29, pp. 298-299, pl. 23, fig. 10.
1919. *Natica canrena* (Linnaeus), Gardner and Aldrich, Acad. Nat. Sci. Philadelphia, Proc., vol. 71, p. 18.
1920. *Natica cf. canrena* (Linnaeus), Maury, Sci. Survey of Porto Rico and the Virgin Islands, New York Acad. Sci., vol. 3, pt. 1, pp. 48-49.
1920. *Natica canrena* ? (Linnaeus), Hubbard, Sci. Survey of Porto Rico and the Virgin Islands, New York Acad. Sci., vol. 3, pt. 2, pp. 134-135.
1921. *Natica canrena* (Linnaeus), Pilsbry, Acad. Nat. Sci. Philadelphia, Proc., vol. 73, p. 386.
1922. *Natica canrena* (Linnaeus), Maury, Bull. Amer. Paleont., vol. 9, No. 38, p. 147.
1922. *Natica canrena* (Linnaeus), Olsson, Bull. Amer. Paleont., vol. 9, No. 39, p. 327, pl. 13, fig. 9.
1923. *Natica canrena* (Linnaeus), Clench, Nautilus, vol. 37, No. 2, p. 56.
1925. *Natica canrena* (Linnaeus), Maury, Bull. Amer. Paleont., vol. 10, No. 42, pp. 390-391. pl. 40, fig. 8.
1925. *Natica canrena,* (Linnaeus), Mansfield, U. S. Nat. Mus., Proc., vol. 66, art. 22, pp. 57-58.
1926. *Natica canrena* (Linnaeus), Weisbord, Nautilus, vol. 39, No. 3, p. 86.
1927. *Natica canrena* (Linnaeus), F. Hodson, H. K. Hodson, and Harris, Bull. Amer. Paleont., vol. 13, No. 49, p. 68.
1929. *Natica canrena* (Linnaeus), Weisbord, Bull. Amer. Paleont., vol. 14, No. 54, p. 260, pl. 9, fig. 12.
1930. *Natica canrena* (Linnaeus), Mansfield, Florida State Geol. Sur., Bull. No. 13, pp. 122-123, pl. 19, fig. 2.
1932. *Natica canrena* (Linnaeus), Marshall, Nautilus, vol. 46, No. 2, p. 45.
1934. *Natica* (*Naticarius*) cf. *canrena* (Linnaeus), Rutsch, Schweiz, Palaeont. Ges. Abh., vols. 54-55, p. 53.
1935. *Natica canrena* (Linnaeus), Richards, Jour. Paleont., vol. 9, No. 3, p. 257.
1937. *Natica canrena* (Linnaeus), Smith, East Coast Marine Shells, p. 91, pl. 35, fig. 7.
1938. *Natica canrena* (Linnaeus), Richards, Geol. Soc. Amer. Bull., vol. 49, p. 1292.
1938. *Natica canrena* (Linnaeus), Vokes, Amer. Mus. Novitates No. 988, p. 5.
1940. *Natica canrena* (Linnaeus), Smith, World-wide Sea Shells, p. 24, fig. 337.
1942. *Natica canrena* (Linnaeus), Jaume and Pérez Farfante, Soc. Cubana Hist. Nat. "Felipe Poey" Mem., vol. 16, No. 1, p. 40.
1946. *Natica canrena* (Linnaeus), Jaume, Soc. Malac. "Carlos de La Torre Rev., vol. 4, No. 3, p. 103.
1953. *Natica* (*Naticarius*) *canrena* (Linnaeus), Olsson and Harbison, Acad. Nat. Sci. Philadelphia, Mon. No. 8, p. 267, pl. 57, figs. 2, 2a.
1953. *Natica* (*Natica*) *canrena* (Linnaeus), Haas, Fieldiana-Zoology, vol. 34, No. 20, p. 204.
1954. *Natica* (*Naticarius*) *canrena* (Linnaeus), Abbott, American Seashells, p. 191, pl. 5L.

1955. *Natica canrena* (Linnaeus), Perry and Schwengel, Marine Shells of the Western Coast of Florida, pp. 123-124, pl. 24, figs. 165a, b.
1958. *Natica canrena* (Linnaeus), Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 15.
1958. *Natica* (*Naticarius*) *canrena* (Linnaeus), Abbott, Acad. Nat. Sci. Philadelphia, Mon. No. 11, p. 50, pls. 2a, b.
1958. *Natica canrena* (Linnaeus), Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, p. 76.
1959. *Natica canrena* (Linnaeus), Nowell-Usticke, A Check List of the Marine Shells of St. Croix, pp. 54, 55, 56.

The single Recent specimen is worn and solid. Last whorl is inflated and flattened above where there are slightly curved tangential wrinkles leading off from the suture. Aperture large, semioval. Umbilicus arcuate, rather narrow and deep. Upper callus short, separated from the lower callus by a squarish notch, the lower callus button-shaped and forming the top of the broad entering funicle. Colors faded, the ground whitish. Last whorl with a row of short tangential stripes or bars of brown at the suture, and below with four rows of oblong brown spots or flecks, the spots around the shoulder slanted. There appear to have been three bands of lighter brown between the rows of spots.

Dimensions.—Figured specimen, altitude 17 mm.; max. width 18 mm.

Locality.—Recent, on beach at Playa Grande Yachting Club, Distrito Federal. One specimen.

Range and distribution.—*Natica canrena* ranges from lower Miocene to Recent, and has been reported from the following localities, arranged in descending chronologic order:

Recent—In the Western Atlantic from Cape Hatteras, North Carolina, to Rio de Janeiro, Brazil.

Pleistocene—Cuba and Florida.

Pliocene—Venezuela (Cumaná, Collection No. 18409, United States National Museum), Trinidad, Costa Rica, Florida, South Carolina, North Carolina.

Upper Miocene to Pliocene—Venezuela.

Upper Miocene—Trinidad, Texas (Galveston deep well, 2158-2920 ft.), Florida, South Carolina, North Carolina.

Middle to upper Miocene—Trinidad, Venezuela, Colombia, Panamá Canal Zone, Costa Rica, Dominican Republic, Florida.

Lower to middle Miocene—Trinidad, Puerto Rico, Alabama (Bascom No. 2 well, Mobile, at 1241 ft.).

Remarks.—Whether all of the fossil species referred to *N. canrena* are the true *N. canrena* of Linnaeus is a moot question, and as Woodring stated (1928, p. 381), "it would take an exhaustive study to attempt to find out just what these fossils represent".

Stigmaulax guppiana ? (Toula) Pl. 23, figs. 3, 4

1908. *Natica* (*Stigmaulax*) *Guppiana* Toula, K. k. Geol. Reichsanstalt Jahr., vol. 58, p. 696, pl. 25, fig. 6.
1910. *Natica guppyana* Toula, Engerrand and Urbina, Soc. Geol. Mexicana Bol., vol. 6, p. 130, pl. 60, figs. 53, 54, 55 (reproduction of Toula's illustration).
1911. *Natica guppyana* Toula, Brown and Pilsbry, Acad. Nat. Sci. Philadelphia, Proc., vol. 63, p. 360.
1922. *Natica guppyana* Toula, Olsson, Bull. Amer. Paleont., vol. 9, No. 39, pp. 328-329, pl. 13, figs. 13-15.
1927. *Natica guppiana* Toula, Hodson, Hodson, and Harris, Bull. Amer. Paleont., vol. 13, No. 49, p. 67, pl. 36, figs. 1, 4.
1929. *Natica guppyana* Toula, Anderson, California Acad. Sci., Proc., 4th ser., vol. 18, No. 4, p. 123.
1930. Not *Natica guppyana* Li, Geol. Soc. China Bull., vol. 3, p. 266, pl. 6, fig. 45 (= *Natica* (*Stigmaulax*) *elenae* Récluz according to Pilsbry, Acad. Nat. Sci. Philadelphia, Proc., vol. 83, 1931, p. 432).
1932. *Natica guppyana* Toula, Tucker and Wilson, Bull. Amer. Paleont., vol. 18, No. 65, p. 13, pl. 2, figs. 3, 4.
1934. *Natica* (*Stigmaulax*) *sulcata guppiana* Toula, Rutsch, Schweiz. Palaeont. Ges. Abh., vols. 54-55, p. 51, pl. 1, fig. 15 (figure of Toula's holotype).
1935. *Natica guppyana* Toula, Mansfield, Florida Dept. Conserv., Geol. Bull., No. 12, pp. 10, 13.
1939. *Natica guppyana* Toula, Mansfield, Florida Dept. Conserv., Geol. Bull. No. 18, p. 15.
1939. *Natica* (*Naticarius*) *guppyana* Toula, Oinomikado, Geol. Soc. Japan, Jour., vol. 46, p. 621, pl. 29, fig. 18.
1947. *Natica* (*Stigmaulax*) *guppiana* Toula, Gardner, U. S. Geol. Sur., Prof. Paper 142-H, p. 546, pl. 59, fig. 9 (reproduction of Toula's illustration).
1947. *Natica* (*Stigmaulax*) *guppiana toulana* Gardner, U. S. Geol. Sur., Prof. Paper 142-H, p. 547, pl. 59, figs. 7, 8.
1951. *Natica* (*Stigmaulax*) *guppyana* Toula, Marks, Bull. Amer. Paleont., vol. 33, No. 139, p. 98.
1957. *Stigmaulax guppiana* Toula, Woodring, U. S. Geol. Sur., Prof. Paper 306-A, pp. 86-88, pl. 20, figs. 11-16.

The Cabo Blanco shell tentatively referred *S. guppiana* (Toula) is small, thin, broken, and worn. It has 4-1/2 whorls in all, the smooth subhyaline nucleus consisting of a little over two of them. The initial whorl of the nucleus is not tightly coiled, and the last is sharply differentiated from the conch by an oblique axial groove, on the forward side of which the shell is porcelaneous. Sculpture consisting of retractive axial grooves and numerous growth lines, the grooves on the last whorl emerging from the suture and becoming obsolescent at the shoulder whence they continue as, or merge with

other growth lines. The growth lines are numerous, and occur in axial bands, the intervals between the bands are relatively smooth. The middle layer of shell is made up of longitudinal threadlets crossed by spiral striae, some of the latter being hardly visible through the outer layer where the surface is worn. The umbilical button is broken away as are the outer and basal lips.

Dimensions.—Figured specimen (base missing), length 11 mm.; estimated max. diameter 11 mm.

Cabo Blanco localities.—Mare formation at W-14, on hillside above west bank of Quebrada Mare Abajo. One specimen; Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. A single small, badly worn and broken specimen, the identification of which is in doubt.

Remarks.—The true identity of this Cabo Blanco fossil can only be determined with better and more complete specimens. If it is not the same as *S. guppiana,* it is reasonably certain to be of the same clan. The latest, and by far the most informative account of *S. guppiana* (Toula), is given by Woodring (1957).

Range and distribution.—*Stigmaulax guppiana* ranges from middle Miocene to early Pliocene and has been reported from the following localities:

Lower Pliocene—Panamá Canal Zone (Chagres sandstone).

Upper Miocene or Pliocene—Venezuela.

Upper Miocene—Florida (at Acline).

Middle to upper Miocene—Venezuela, Colombia, Panamá Canal Zone, Costa Rica, Mexico.

Middle Miocene—Ecuador, Florida (Shoal River formation).

Tectonatica venezuelana, new species Pl. 23, figs. 5, 6

Shell small, rather thin, rotund, with a low, obtuse spire. Whorls 3-1/2 in all, the initial turn of the nucleus not tightly coiled, appressed, the last turn merging insensibly into the conch. Post nuclear whorls slightly convex, the body whorl globose. Sutures finely channeled. Surface smooth, originally polished, with numerous microscopic axial growth striae and a few fine grooves extending from the suture part way down the body whorl. Aperture semilunar, the outer and basal lips thin, the base rounded. Columellar margin

straightish, a little oblique to the vertical axis of the shell. Umbilical pad moderately thick, slightly raised at the margin, feebly depressed in the center, covering nearly the whole of the umbilicus, generally separated from the whorl by a narrow groove, the callus spreading thinly to the parietal wall and to the posterior outlet which it fills. Lower lip a little thickened.

Dimensions.—Holotype (I99a), altitude 1.9 mm.; max. width 2.0 mm.

Type locality.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. Two specimens, including the holotype.

Other localities.—Mare formation at W-14, on hillside above west bank of Quebrada Mare Abajo. One fragment of a specimen much larger than the holotype. Playa Grande formation (Maiquetía member) at W-4, Quebrada Las Pailas. Two specimens, including the paratype (Q99b), altitude 1.4 mm.; max. width 1.3 mm.

Comparisons.—This species resembles the Miocene to Recent *T. pusilla* (Say) (1822, p. 257) but is more rotund and somewhat more fragile than that. It is also like the Chipola Miocene *T. floridana* (Dall) (1892, p. 366, pl. 17, fig. 5) but is smaller and has a thicker umbilical pad than the Florida shell. *T. agna* Woodring (1957, pp. 88-89, pl. 17, fig. 46) from the middle and upper Gatun formation of the Panama Canal Zone has a horizontal depression across the umbilical pad, a feature not exhibited on *T. venezuelana*, n. sp. The Recent *T. micra* Haas (1953, pp. 206-207, fig. 41) from Ilha Grande, Rio de Janeiro, Brazil, has a somewhat more swollen and much larger penultimate whorl than *T. venezuelana.*

Tectonatica antilleana, new species Pl. 43, figs. 22, 23

Shell small, rather fragile, porcelaneous, with a low spire and flattened apex. Whorls a little over three in all. Nucleus smooth, consisting of about one turn, this grading insensibly into the conch. Post-nuclear whorls convex, the body globose. Sutures finely incised. Surface smooth, sculptureless. Aperture semioval, the base seemingly subtruncate. Outer lip thin, broken back, joined to the whorl at an obtuse angle. Columella gently arcuate. Umbilical area covered with callus which is partially encircled by a groove. Anterior and pos-

terior margins of the umbilical callus broadly thickened or swollen, the lateral margin slightly thickened, the center of the callus depressed. Columella feebly and narrowly ridged longitudinally, the ridge becoming obsolescent on the callus of the parietal wall. There is another small, threadlike horizontal ridge across the upper part of the parietal wall. Lower and basal lips broken away.

Dimensions.—Holotype (broken at base), altitude 0.9 mm.; max. diameter 1.1 mm.

Type locality.—Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. One specimen, the holotype.

Comparisons.—This shell is distinguished from the preceding species *T. venezuelana,* n. sp. by the horseshoe-shaped thickening of the margin of the umbilical callus, and by the longitudinal ridglet along the columella. *T. antilleana,* n. sp. also resembles the middle-upper Miocene *T. agna Woodring* (1957, pp. 88-89, pl. 17, fig. 46) from the Panamá Canal Zone, but that species, although having a distinct depression on the umbilical pad, is not so rotund as *T. antilleana* and lacks the faint longitudinal ridglet along the columella.

Sinum ? peculiaris, new species — Pl. 17, figs. 7, 8; Pl. 23, figs. 7, 8

Shell minute, immature, depressed- naticoid, the apical area flattened. Post-nuclear whorls about two, the nucleus indistinct and sunken a little below the apex. Last whorl slightly eccentric, expanded, the dorsum evenly convex, the ventral face of the whorl subangularly rounded for a short distance away from the top of the outer lip, the labial or left side of the whorl a little flattened above. Surface smooth and polished. Under a magnification of 20X, however, very faint axial lines and a few spiral ones may be observed, as well as relatively widely spaced tiny grooves leading away from the impressed suture. Aperture large, suboval, smooth within. Outer lip broken along the edge but seemingly of about the same thickness as the rest of the shell. The inner lip, however, is thin, raised a little above, and reflected slightly over the narrow umbilical groove. Parietal wall lightly glazed, swollen into a ridge which enters the aperture obliquely.

Dimensions.—Holotype, altitude 1.2 mm., max. diameter 1.1 mm.

Type locality.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. One specimen, the holotype.

Remarks.—This immature shell with its flattened apex, and polished, virtually sculptureless surface is unlike any other I have seen, though the shape of the body whorl is somewhat the same as that of the much larger *S. naticoidalis* Vokes (1938, p. 27, figs. 25, 26) from the upper Miocene at Springvale, Trinidad. That species, however, has a slightly elevated spire and is marked with numerous wavy spiral threads.

CASSIDIDAE

Cassis aff. madagascariensis Lamarck **Pl. 23, figs. 9, 10**

1822. *Cassis madagascariensis* Lamarck, An. sans Vert., vol. 7, p. 219.
1844. *Cassis madagascariensis* Lamarck [Deshayes edition], An. sans Vert., vol. 10, p. 20 [refers to Kiener 1835, Coq. Viv., vol. 8, p. 7, pl. 2, fig. 2].
1860. *Cassis cameo* Stimpson, Amer. Jour. Sci. and Arts, ser. 2, vol. 9, p. 443.
1864. *Cassis madagascariensis* Lamarck, Krebs, The West Indian Marine Shells, p. 67.
1878. *Cassis madagascariensis* Lamarck, Mörch, Catalogue of West-India Shells, p. 10.
1885. *Cassis cameo* Stimpson, Tryon, Man. Conch., vol. 7, p. 271, pl. 2, fig. 50.
1889. *Cassis cameo* Stimpson, Dall, U. S. Nat. Mus., Bull. 37, p. 134.
1922. *Cassis cameo* Stimpson, Maury, Bull. Amer. Paleont., vol. 9, No. 38, p. 118.
1936. *Cassis madagascariensis* Lamarck, Richards, Nautilus, vol. 49, No. 4, p. 133.
1937. *Cassis madagascariensis* Lamarck, Smith, East Coast Marine Shells, p. 111, pl. 1, fig. 1.
1937. *Cassis madagascariensis* Lamarck, Lyman, Nautilus, vol. 51, No. 1, p. 34.
1939. *Cassis madagascariensis* Lamarck, McGinty, Naultilus, vol. 53, No. 2, p. 38.
1944. *Cassis madagascariensis* Lamarck, Clench, Johnsonia, vol. 1, No. 16, pp. 14-15, pl. 7.
1944. *Cassis madagascariensis* Lamarck, Patterson, Nautilus, vol. 58, No. 2, p. 37.
1944. *Cassis madagascariensis* Lamarck, Hackney, Nautilus, vol. 58, No. 2, p. 61.
1946. *Cassis madagascariensis* Lamarck, Jaume, Soc. Malac. "Carlos de La Torre" Rev., vol. 4, No. 3, p. 106.
1951. *Cassis cameo* Stimpson, Rogers, The Shell Book, p. 137, pl. 35, fig. 2.
1954. *Cassis madagascariensis* Lamarck, Abbott, American Seashells, pp. 193-194, pl. 23v.
1959. *Cassis madagascariensis* Lamarck, Nowell-Usticke, A Check List of the Marine Shells of St. Croix, p. 57.

A single large fossil fragment resembles the Recent *C. madagascariensis* Lamarck. The shell is thick, and highly polished on the

inner surface. On the exterior there are two rows of large blunt nodes around the mid-section the body whorl, and some distance under the lower row there is an irregular low spiral cord. The surface is sculptured by feeble spiral bands and axial growth wrinkles. The former are slightly more pronounced around the circumference at the nodes, and the latter converge and become puckered toward the base.

Dimensions.—Length of fragment 95 mm.; thickness of shell 5 mm.

Locality.—Mare formation, in stream 250 meters south-southwest of the mouth of Quebrada Las Pailas. One fragment.

Remarks.—Of the four living species of *Cassis* recognized by Clench (1944, Johnsonia, pp. 10-16, pls. 5-8) in the Western Atlantic, the Venezuelan fossil is closest to *C. madagascariensis* Lamarck insofar as a comparison can be made with but a single fragment. *C. tuberosa* (Linnaeus), the most widespread of the Western Atlantic species of *Cassis* differs from *C. madagascariensis* and the Cabo Blanco form in having a more finely reticulate surface. *C. flammea* (Linnaeus) has a smoother surface than *C. madagascariensis* because of the lack of spiral ridges. *C. madagascariensis spinella* Clench is known only from the lower Florida Keys. It is distinguished from the typical *C. madagascariensis* by its smaller, more regular, and far more numerous tubercles.

Range and distribution.—*C. madagascariensis* ranges from southeast Florida to the Greater Antilles. In the Bahamas it is moderately common from 5 to 10 fathoms. So far as I know, it has not been reported hitherto as a fossil.

Cypraecassis testiculus (Linnaeus) Pl. 23, figs. 11-14

1758. *Buccinum testiculus* Linnaeus, Syst. Nat., ed. 10, p. 736.
1848. *Cassis testiculus* (Linnaeus), Reeve, Conch. Icon., vol. 5, pl. 4, sp. 10.
1864. *Cypraecassis testiculus* (Linnaeus), Krebs, The West Indian Marine Shells, p. 35.
1873. *Cypraecassis testiculus* (Linnaeus), Gabb, Amer. Philos. Soc. Trans., new ser., vol. 15, p. 222.
1885. *Cassis testiculus* (Linnaeus), Tryon, Man. Conch., vol. 7, p. 273, pl. 2, fig. 64; pl. 4, fig. 63.
1878. *Cassis testiculus* (Linnaeus), Mörch, Catalogue of West-India Shells, p. 10.
1891. *Cassis testiculus* (Linnaeus), Baker, Acad. Nat. Sci. Philadelphia, Proc., vol. 43, p. 52.
1901. *Cassis testiculus* (Linnaeus), Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, p. 418.

1915. *Buccinum testiculus* Linnaeus, Bartsch, U. S. Nat. Mus., Bull. 91, p. 231.
1917. *Cassis* (*Cypraecassis*) *testiculus* (Linnaeus), Maury, Bull. Amer. Paleont., vol. 5, No. 29, p. 275.
1921. *Cassis* (*Cypraecassis*) *testiculus* (Linnaeus), Pilsbry, Acad. Nat. Sci. Philadelphia, Proc., vol. 73, p. 361.
1922. *Cassis* (*Cypraecassis*) *testiculus* (Linnaeus), Maury, Bull. Amer. Paleont., vol. 9, No. 38, p. 118.
1937. *Cassis testiculus* (Linnaeus), Smith, East Coast Marine Shells, p. 111, pl. 41, fig. 3.
1937. *Cassis testiculus* (Linnaeus), Lyman, Nautilus, vol. 51, No. 1, p. 34.
1939. *Cassis testiculus* (Linnaeus), Richards, Jour. Paleont., vol. 9, No. 3, p. 257.
1939. *Cassis testiculus* (Linnaeus), McGinty, Nautilus, vol. 53, No. 2, p. 38.
1940. *Cypraecassis testiculus* (Linnaeus), Smith, World-wide Sea Shells, p. 46, fig. 629.
1942. *Cassis testiculus* (Linnaeus), Jaume and Pérez Farfante, Soc. Cubana Hist. Nat. "Felipe Poey" Mem., vol. 16, No. 1, p. 41.
1943. *Cypraecassis testiculus* (Linnaeus), Clench and Abbott, Johnsonia, vol. 1, No. 9, pp. 1-3, pl. 1 and pl. 3, figs. 1-3.
1946. *Cypraecassis testiculus* (Linnaeus), Jaume, Soc. Malac. "Carlos de La Torre" Rev., vol. 4, No. 3, p. 106.
1952. *Cypraecassis testiculus* (Linnaeus), Pulley, Texas Jour. Sci., vol. 4, No. 2, p. 175.
1954. *Cypraecassis testiculus* (Linnaeus), Abbott, American Seashells, p. 194, pl. 9c.
1958. *Cypraecassis testiculus* (Linnaeus), Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 15.
1958. *Cypraecassis testiculus* (Linnaeus), Abbott, Acad. Nat. Sci. Philadelphia, Mon. No. 11, p. 51.
1958. *Cypraecassis testiculus* (Linnaeus), Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, p. 81.
1959. *Cypraecassis testiculus* (Linnaeus), Nowell-Usticke, A Check List of the Marine Shells of St. Croix, p. 58.

Shell broadly subcylindrical, with a low spire and rounded shoulder. Whorls about 7 in all, the smooth pale amber nucleus made up of 2-1/2 of them. Sculpture consisting of equally spaced narrow longitudinal riblets more or less broken by distant shallow revolving furrows of which there are 14 or so on the body whorl; the whole of the surface is also covered with closely set microscopic revolving threads, and the whorls are traversed by several faint varices. Outer lip thick, reflexed, the inner margin bearing about 22 teeth, a few of the teeth shorter than the rest. Parietal wall sheathed with a fairly heavy callus extending to the base. Inner margin of columellar lip bearing about 22 plicae. Terminal notch emarginate, recumbent, comma-shaped. Posterior outlet a simple shallow groove. Color orange-brown with squarish brown patches unevenly disposed. Parietal shield off-white with a pale orange band across the base. Outer lip with alternating bands of pale orange and white, the

orange bands terminated at the back margin of the lip by blackish brown spots occurring in pairs.

Dimensions.—Length 30.5 mm.; max. width 20.2 mm.

Locality.—Recent, on beach at Playa Grande Yachting Club, Distrito Federal. Three specimens. One young example, presumed to be male, has a thin outer lip without teeth, and a noncallused inner lip, also without folds or plications.

Range and distribution.—In the Western Atlantic, the living *C. testiculus* ranges from southern Florida to Brazil. In the Eastern Atlantic it is reported by Bartsch (1915) from South Africa, and by Clench and Abbott (1943) from Spanish Guinea, Africa. In the fossil state, *C. testiculus* occurs in the Pleistocene of Barbados and Cuba, and, according to Gabb, Maury, and Pilsbry, in the Miocene of the Dominican Republic.

Semicassis (Tylocassis) granulata (Born) Pl. 23, figs. 15-18

1780. *Buccinum granulatum* Born, Testacea Musei Caesarei Vindobenensis, p. 248.
1791. *Buccinum gibbus* Gmelin, Syst. Nat. ed. 13, p. 3476 (refers to Lister, pl. 999, fig. 64).
1798. *Cassis malum* Röding, Mus. Boltenianum, p. 31 (refers to Lister, pl. 1056, fig. 9).
1798. *Cassis globulus* Röding, Mus. Boltenianum, p. 31 (refers to Lister, pl. 999, fig. 64).
1811. *Buccinum inflatum* Shaw, Naturalists Miscellany, vol. 22, pl. 959.
1822. *Cassis abbreviata Lamarck,* An. sans Vert., vol. 7, p. 224; not *abbreviatum* Gmelin 1791.
1822. *Cassis granulosa* Lamarck, An. sans Vert., vol. 7, p. 227.
1830. *Cassis laevigata* Menke, Synopsis Methodica Molluscorum, p. 144.
1848. *Buccinum inflatum* Reeve, Conch. Icon., vol. 5, *Cassis,* pl. 9, sp. 22 c.; not *B. inflatum* Lamarck 1822.
1864. *Cassis* (*Semicassis*) *gibba* (Gmelin), Krebs, The West Indian Marine Shells, p. 34.
1878. *Cassis granulata* (Born), Mörch, Catalogue of West-India Shells, p. 10.
1885. *Cassis* (*Semicassis*) *inflata* (Shaw), Tryon, Man. Conch., vol. 7, p. 274, pl. 4, fig. 65.
1889. *Cassis inflata* (Shaw), Dall. U. S. Nat. Mus., Bull. 37, p. 134.
1901. *Cassis* (*Semicassis*) *inflata* (Shaw), Dall and Simpson, U. S. Fish Com., Bull., vol. 20, pt. 1, p. 418.
1903. *Cassis inflata* (Shaw), Vanatta, Acad. Nat. Sci. Philadelphia, Proc., vol. 55, p. 758.
1922. *Cassis* (*Semicassis*) *inflata* (Shaw), Maury, Bull. Amer. Paleont., vol. 9, No. 38, p. 118.
1938. *Cassis inflata* (Shaw), Richards, Geol. Soc. Amer. Bull., vol. 49, p. 1293.
1944. *Phalium* (*Semicassis*) *granulatum* (Born), Clench, Johnsonia, vol. 1, No. 16, pp. 6-8, pl. 1, figs. 3-7; pl. 3, figs. 1-4.
1946. *Phalium* (*Tylocassis*) *granulatum* (Born), Jaume, Soc. Malac. "Carlos de La Torre" Rev., vol. 4, No. 3, p. 106.

1952. *Phalium granulatum* (Born), Pulley, Texas Jour. Sci., vol. 4, No. 2, p. 175, pl. 2, figs. 4, 6.
1954. *Phalium* (*Semicassis*) *granulatum* (Born), Abbott, American Seashells, pp. 192-193, pl. 9e.
1955. *Phalium* (*Semicassis*) *granulatum* (Born), Perry and Schwengel, Marine Shells of the Western Coast of Florida, p. 149, pl. 29, fig. 208.
1958. *Phalium granulatum* (Born), Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 15.
1958. *Phalium granulatum* (Born), Coomans, Caraibisch Marien-Biologisch Inst. Collected Papers 6, p. 82.

A portion of the body whorl of two individuals, and the parietal shield of a third, are all that I have of this species. The body whorl is evenly globose and is sculptured by low flat spiral bands separated by narrow, shallow, flat-bottomed interspaces. On the larger specimen there are 16 of these bands from the suture to near the base, the upper four of unequal size, the ones from the shoulder down nearly equal. The surface is traversed by long axial growth lines and ridges of varying width, the latter forming low, axially elongate beads or nodulations on the spiral bands; the nodulations are more pronounced higher on the whorl than below. The outer lip of two specimens is thickened and reflected, that of the larger specimen smooth, that of the smaller grooved by longitudinal furrows. The spiral bands continue to the underside of the reflected area, and the depression between the lip and whorl surface is deep. The inner margin of the outer lip is lirate, the lirae of the smaller specimen rather uniformly thin and sharp, those of the larger shell thicker posteriorly than anteriorly. On both specimens the lirae become indented a little near the edge of the lip. The outer lip merges into the broadly emarginate base with an acute swirl, the area of union marked by a shallow furrow which branches above into the depression behind the outer lip and into the deep narrow channel separating the basal lip from the base of the whorl. Terminal notch excavated semicircularly. Parietal shield papillose, the pustules extending to near the distal margin, the margin itself smooth. There are seven denticulate pustules at the base of the shield, and along the inner side of the shield there are narrow ridges or plicae continuing well within the aperture.

Dimensions.—Smaller fragment (G216a), length 22.5 mm.; larger fragment (I216a), length 28 mm.; parietal shield fragment (G216b), length 22.5 mm.

Cabo Blanco localities.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. One fragment; upper Mare formation at W-14, on hillside above west bank of Quebrada Mare Abajo. Two fragments.

Remarks.—A more complete example of this species from the same locality as above, and labelled *Semicassis* (*Tylocassis*) *granulata* (Born), is contained in the Cabo Blanco collection of the U. S. National Museum under lot No. 18253—CB5, collected by Wendell P. Woodring 17 September 1951.

Comparisons.—Allied fossil species are *Phalium* (*Tylocassis*) *sulcosum senni* Rutsch (1934, pp. 55-57, pl. 3, figs. 1, 2) from the upper Miocene-Pliocene at Punta Gavilan, State of Falcon, Venezuela; *Semicassis* (*Tylocassis*) *reclusa* (Guppy) (1866a, p. 287, pl. 17, fig. 8) from the middle Miocene of Jamaica, the Dominican Republic, Colombia, the Panamá Canal Zone, and Costa Rica; *Semicassis* (*Tylocassis*) *maleaformis* Vokes (1938, p. 24, figs. 22, 23) from the late Miocene Springvale deposits of Trinidad; and *Semicassis* (*Tylocassis*) *inflata waltonensis* Mansfield (1935, pp. 40-41, pl. 4, figs. 5, 9) from the middle Miocene at Vaughan Creek, Walton County, Florida. Rutsch's *P. senni* seems to be more slender and more weakly sculptured axially than *S. granulata,* but as Rutsch inferred, and Woodring (1959, p. 200) supported, *P. senni* might as well be considered a subspecies of *S. granulata* as of *P. sulcosum* which is Mediterranean in habitat. *Semicassis reclusa* is relatively more globose than *S. granulata,* and *S. maleaformis* is considerably more so. "*Semicassis inflata waltonensis* . . . is closely related to and probably is an ancestral form of *Semicassis inflata* Shaw, a living east coast species, differing from the latter in having a relatively shorter and more inflated shell and showing a tendency to a more persistent interpolation of secondary spiral threads or narrow bands" (Mansfield, 1935, p. 41). *S. inflata* is one of the many synonyms of *S. granulata* which is a variable form. The Pliocene to Recent *S. centiquadrata* (Valenciennes) is the West American analogue.

Range and distribution.—Pliocene to Recent. The living *S. granulata* ranges from North Carolina to Brazil. In the Pleistocene it is recorded from Louisiana, Florida, and Barbados. Woodring (1959, p. 200) stated that it occurs in deposits of Pliocene age at Limón, Costa Rica.

CYMATIIDAE

Cymatium (Septa) pileare martinianum (d'Orbigny) Pl. 24, figs. 9-12

1758. *Murex pileare* Linnaeus, Syst. Nat., ed. 10, p. 749 [refers to Gualtieri 1742, pl. 49, fig. G].
1816. *Triton pileare* (Linnaeus), Lamarck, Encycl. Méth., vol. 3, pl. 415, figs. 4a, b; Liste, p. 4.
1822. *Triton pileare* (Linnaeus), Lamarck, An. sans Vert., vol. 7, p. 182.
1845. *Triton martinianum* d'Orbigny [in] La Sagra, Hist. Fís., Polít., y Nat. de la Isla de Cuba, vol. 5, p. 249 [refers to Lister, pl. 924, fig. 29 and Chemnitz, Conchylien-Cabinet, vol. 4, figs. 1248, 1249].
1846. *Tritonium martinianum* (d'Orbigny), *piliare* (L. & Lmk.), Krebs, The West Indian Marine Shells, P. 24.
1850. *Litiopa effusa* C. B. Adams, Contrib. to Conch., No. 5, p. 7; Turner, 1956, Occas. Papers on Mollusks, vol. 2, p. 136, pl. 21, fig. 3 [is the veliger stage of *C. pileare* (Linnaeus)].
1873. *Tritonium* (*Lampusia*) *lineatum* Broderip ?, Gabb, Amer. Philos. Soc. Trans., vol. 15, p. 211.
1878. *Triton velei* Calkins, Davenport Acad. Nat. Sci. Rec. and Proc., vol. 2, p. 235, pl. 8, figs. 1, 2.
1878. *Triton martinianum* d'Orbigny, Mörch, Catalogue of West-India Shells, p. 10.
1878. *Triton pilearis* (Linnaeus), Küster, Conchylien-Cabinet, 2d ed., *Triton*, p. 196, pl. 42, figs. 3, 4; pl. 56, fig. 4.
1881. *Tritonium* (*Lampusia*) *lineatum* Broderip ?, Gabb, Acad. Nat. Sci. Philadelphia, Jour., ser. 2, vol. 8, p. 352.
1890. *Triton pilearis* Lamarck, Smith, Linnaean Soc. Jour., Zoology, vol. 20, p. 490.
1890. *Tritonium* (*Lampusia*) *pileare* (Linnaeus), Dall, Wagner Free Inst. Sci., Trans., vol. 3, pt. 1, p. 161.
1891. *Triton pileare* Lamarck, Baker, Acad. Nat. Sci. Philadelphia, Proc., vol. 43, p. 52.
1901. *Lampusia pilearis* (Lamarck), Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, p. 417.
1910. *Cymatium pileare* (Linnaeus), Dall, U. S. Nat. Mus., Proc., vol. 37, No. 1704, p. 226.
1917. *Simpulum pileare* (Lamarck), Maury, Bull. Amer. Paleont., vol. 5, No. 29, pt. 1, p. 269.
1921. *Cymatium pileare* (Lamarck), Pilsbry, Acad. Nat. Sci. Philadelphia, Proc., vol. 73, p. 356.
1928. *Cymatium* (*Lampusia*) *pileare* (Linnaeus), Woodring, Carnegie Inst. Washington, Publ. No. 385, p. 297.
1937. *Cymatium aquatile* (Reeve), Smith, East Coast Marine Shells, p. 112, pl. 42, fig. 4. Not Reeve, 1844.
1945. *Dissentoma prima* Pilsbry, Nautilus, vol. 59, No. 2, p. 59, text fig. 1.
1949. *Dissentoma prima* Pilsbry, Nautilus, vol. 62, No. 4, p. 142.
1946. *Cymatium* (*Lampusia*) *aquitilis* (Reeve), Jaume, Soc. Malac. "Carlos de La Torre" Rev., vol. 4, No. 3, p. 106. Not Reeve, 1844.
1954. *Cymatium martinianum* (d'Orbigny), Abbott, American Seashells, p. 195, pl. 91.
1957. *Murex pileare* Linneaus, Dodge, Amer. Mus. Nat. Hist. Bull., vol. 113, pt. 2, pp. 116-120 (part).
1957. *Cymatium* (*Septa*) *pileare* (Linnaeus), Clench and Turner, Johnsonia, vol. 3, No. 36, pp. 216-220, pl. 112, figs. 1, 2; pl. 113, fig. 7; pl. 122, figs. 1-3; pl. 123.

1958. *Cymatium martinianum* (Linnaeus), Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 15.
1958. *Cymatium* (*Lampusia*) *pileare martinianum* (d'Orbigny), Abbott, Acad. Nat. Sci. Philadelphia, Mon. No. 11, pp. 52-53.
1958. *Cymatium martinianum* (d'Orbigny), Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, p. 82.
1959. *Cymatium pileare* (Linnaeus), Nowell-Usticke, A Check List of the Marine Shells of St. Croix, p. 60.
1959. *Cymatium* (*Septa*) *pileare* (Linnaeus), Woodring, U. S. Geol. Sur. Prof. Paper 306-B, pp. 204-205 (part).

An immature Recent shell and an adult fossil specimen are tentatively referred to *C. martinianum* (d'Orbigny). The Recent shell has but 3-1/2 whorls remaining, with the tip of the spire being decollate. The earlier post-nuclear whorls are regularly convex, subcancellated by broadish spiral ribs crossed by numerous, regularly spaced axial threads of low relief. The third whorl from the last has a flattened varix, but the succeeding one is nonvaricose and much larger; both of them are creamy white with a narrow band of light brown around the summit. Penultimate whorl slightly shouldered well below the summit, the ultima more prominently so. Both of the latter are light creamy brown below the shoulder, a darker brown above. Body whorl with a creamy white band descending gently from opposite the commissure to about the middle of the outer lip. Ultimate whorl with two varices, one before the aperture, the other behind the outer lip, both of them rather knobby, the knob at the shoulder pure white. Sculpture consisting of spiral ribs which are crenated, beaded, or knobby, depending on their position, and low axial threads and folds. On the body whorl there is a strong double spiral rib adjoining the suture, three equally spaced primary ribs around the periphery, each of them faintly grooved along the middle, and about 14 subequal to unequal ribs on the base, these becoming smaller and more closely spaced as they approach the anterior fasciole. An interstitial spiral cord occurs between the primary ribs of the periphery, and several spiral threads are present on the ramp below the double spiral at the suture. Excluding the varices, there are about 13 axial folds, these becoming obsolescent below the convexity, with low, closely spaced axial cords between them. The intersections of the larger spiral and axial ribs are produced into low knobs, the rest of the surface everywhere crenulated. Anterior fasciole convex, merging with the base, vaguely corded.

Aperture elliptical, the colors of the surface reflected through in lighter tone. Outer lip varicated behind, the inner margin armed with seven pairs of denticles which continue some distance within the aperture as lirae. Between each pair of denticles the margin is smoothly concave, the excavations deeper posteriorly, the anal outlet, lying between the uppermost pair of denticles and the parietal wall, the deepest. Inner lip with seven single lirae from the top of the columella to the posterior entrance of the siphonal canal. Parietal wall gently concave below, slightly convex above, the spiral ribbing of the whorl showing plainly through the very thin whitish wash on the wall. Anterior canal moderately long and narrow, bent backward a little, excavated slightly at the tip into a shallow notch.

The single fossil specimen is cleaved on a bias through the body whorl. The shell is large, robust, moderately slender, strongly sculptured, the last whorl bearing two large, elevated, evenly rounded varices, one of them behind the outer lip. Sculpture consisting of spiral ribs, all of them beaded longitudinally by low, short axial cords which are prominent on the ribs but very faint or evanescent in the intercostal areas. Body whorl with seven bilirate primary ribs separated by broad and fairly deep interspaces, the summit rib at the suture a double one, the other six below more or less equal in size and rendered bilirate by a narrow shallow groove along the middle. All of the grooves widen, however, as they cross the varices, and in the groove or interspace of the summit rib there is an interstitial riblet. In the interspace between the summit rib and the succeeding one there is a secondary riblet, with two tertiary riblets above the secondary and one below the secondary. In the interspaces of the other five primary ribs there is one secondary riblet and a tertiary on either side of that, the posterior tertiary just below the primary, the anterior tertiary about halfway between the secondary and primary. Base with strong but low spiral ribs of several sizes, some of them with an intercalary cord in the interspace, the anteriormost ones close together and becoming somewhat smaller progressively toward the anterior fasciole. Aperture oval, lirate on the labral side, the lirae merging with the denticles on the outer lip. Outer lip strongly but evenly varicose behind, the rim thickened with lamellar incrementals, the inner margin provided with seven pairs of denticles. Anterior canal long, deep, narrow, and slightly

twisted. Inner lip with a thick coat of enamel which is plaited with somewhat irregular narrow folds.

Dimensions.—Recent specimen (3-1/2 whorls), length 19 mm.; max. width 11.4 mm.; fossil specimen (one whorl and a portion of the canal), length 52 mm.; max. width 30 mm.

Localities.—Recent, on beach at Playa Grande Yachting Club, Distrito Federal. One young specimen; La Salina, west of Puerto Cabello, State of Carabobo. One broken specimen.

Range and distribution.—The fossil *C. pileare* has been reported from the middle Miocene of the Dominican Republic and, with question, of Jamaica; from the Pliocene of Costa Rica by Gabb (1881, as *Tritonium lineatum*) and of Florida by Dall ,1890); and from the Pleistocene of Barbados and the Panamá Canal Zone. In the Western Atlantic the living *C. pileare* ranges from North Carolina to Bahia, Brazil, and it is found over an extensive area of the Pacific. The Western Atlantic shell was given the name *C. martinianum* by d'Orbigny (1845), but Clench and Turner (1957) stated that they are unable to separate Atlantic or Pacific specimens on any shell characters. "Individual specimens from one locality may show a great deal of variation, but there does not appear to be any geographic significance to these variations". Dodge (1957) was of the same opinion. Abbott (1958) stated that he also finds "no important or consistent differences between the adult shells of *C. martinianum* of the West Indies and *C. pileare* of the Indo-Pacific". But, in his dissections, Abbott noted minor radulae differences, and these may justify the consideration that the Western Atlantic form is subspecifically distinct. Following Bayer (1933, p. 47), Abbott treated *C. martinianum* as the Western Atlantic subspecies of *C. pileare,* and as I find the shell in both the Recent and fossil state, I also name it thus.

Cymatium (Septa) krebsii (Mörch) Pl. 25, figs. 1-4

1877. *Triton krebsii* Mörch, Malakozool. Blätter, vol. 24, p. 30.
1878. *Triton Krebsii* Mörch, Catalogue of West-India Shells, p. 10.
1878. *Triton krebsii* Mörch, Kobelt, Conchylien-Cabinet, ed. 2, vol. 3, pt. 2, p. 265, pl. 70, figs. 3, 4.
1889. *Lampusia ? pharcida* Dall, Mus. Comp. Zool. Bull., vol. 18, p. 227, pl. 36, fig. 2.
1951. *Cymatium* (*Lampusia*) *krebsii* (Mörch), Rehder and Abbott, Soc. Malac. "Carlos de La Torre" Rev., vol. 8, No. 2, p. 58, pl. 8, fig. 6.

1957. *Cymatium* (*Septa*) *krebsii* (Mörch), Clench and Turner, Johnsonia, vol. 3, No. 36, pp. 220-222, pl. 112, figs. 3, 4; pl. 124, figs. 1-4.

The fossil referred to this species is of medium size, biconical, sturdy, moderately slender. Nucleus decollate in part, post-nuclear whorls 4-1/2, the conch sharply defined from the smooth nucleus by the abrupt appearance of cancellate sculpture. First two whorls cancellated by spiral and axial ribbing, the spirals consisting of two riblets, one around the middle, the other below, and a cord (which later becomes bipartite) at the summit adjoining the suture; in each of the interspaces there is a single intercalary thread. Crossing the spirals there are about 25 narrow axial cords, and the intercepts are finely beaded. On the lower whorls the cancellate pattern is no longer evident: the spirals on the periphery become bipartite, the summit cord becomes a doublet, the axials are fewer (about nine on the ultima) and develop into broad low folds which become obsolescent on the base, the shoulder becomes angulate, and strong rounded varices make their appearance. On the varices the spiral ribs are more pronounced than on the whorl proper, the primary ones separating widely on the crest of the varix but coming together again off the crest; the secondary or interstitial threads become rounded cords. On the labial side of each varix there are a number of strong incremental axial laminae, but these are not present on the back, or labral side of the varix. Between the varices the axial folds are knobby at the shoulder. Body whorl with as many as 18 spiral ridges, about 13 of them crowded on the canal, the upper six or so bipartite and each with a secondary thread or cord between them. Anterior fasciole convex, feebly corded. Aperture elliptical, grooved, the grooves connecting with the spaces between the denticles or lirae of the outer lip. Outer lip with a strong varix behind, the rim thickened by several lamellate layers of callus, the inner margin of the lip armed with seven recumbent, V-shaped denticles the apex of which points toward the aperture. Aperture ward the denticles develop into knobs or folds and sometimes into papillate projections, separated, because of incomplete absorption of the lip material, from the denticles proper by a deep narrow channel. Parietal wall thinly enameled, the enamel continuing to near the tip of the anterior canal where it is reflexed toward the fasciole, from which it is

separated by an elongate groove. Columella with about 9 or 10 horizontal lirae, decreasing in size anteriorly starting with the third lira from the top. Anterior canal fairly narrow, moderately long and deep, faintly denticulate along the margins, bent backwards a little, widening slightly at the tip which is shallowly notched. Posterior outlet a nearly vertical notch arched over by the rim of the outer lip.

Dimensions.—Specimen I244a, length (nucleus decollate) 30.5 mm.; max. width (including varix of outer lip) 16 mm.; specimen I244b, length (tip of nucleus missing) 39 mm.; max. width (including varix of outer lip) 21.5 mm.

Locality—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. Five specimens, two of them fragments.

Remarks.—The Cabo Blanco fossils are so close to a number of Recent specimens in the Museum of Comparative Zoology labeled *C. krebsii* (Mörch) that they must be considered the same species. This is the first report of *C. krebsii* as a fossil. The Recent form ranges from Florida to the Island of Cubagua, Venezuela.

Cymatium (Monoplex) parthenopeum (von Salis) Pl. 25, figs. 5, 6

1778. *Murex costatus* Born, Index Rerum Naturalium Musei Caesarei Vindobonensis, vol. 1, p. 295.
1780. *Murex costatus* Born, Testacea Musei Caesarei Vindobonensis, p. 297 [refers to Seba 1758, Thesauri, vol. 3, pl. 57, fig. 31]. Not *Murex costatus* Pennant 1777.
1793. *Murex parthenopeus* von Salis, Reisen in versch. Prov. Königreich Neapel, vol. 1, p. 370, pl. 7, fig. 4. English translation by Anthony Aufrere 1795, "Travels through various Provinces of the Kingdom of Naples in 1789," London, 527 pp., 9 pls.
1811. *Monoplex australasia* Perry, Conchology, London, pl. 3, fig. 3.
1816. *Triton succinctum* Lamarck, Encycl. Méth., vol. 3, Liste, p. 5, pl. 416, fig. 2.
1817. *Murex parthenopus* von Salis, Dillwyn, A Descriptive Catalogue of Recent Shells, vol. 2, p. 696, sp. 29.
1822. *Triton succinctum* Lamarck, An. sans Vert., vol. 7, p. 181.
1825. *Murex parthenopoeus* von Salis, Wood, Index Testaceologicus, p. 127, pl. 25, fig. 30.
1842. *Triton americanum* d'Orbigny [in] La Sagra, Hist. phys., polit. nat. l'Ile de Cuba, Mollusques, vol. 2, p. 163, pl. 23, fig. 22.
1849. *Triton brasilianum* Gould, Boston Soc. Nat. Hist. Proc., vol. 3, p. 142.
1857. *Tritonium costatum* (Born), Fischer, Revue coloniale, p. 8, No. 9.
1864. *Tritonium costatum* (Born), Krebs, The West Indian Marine Shells, p. 23.

1864. *Tritonium americanus* (d'Orbigny), Krebs, The West Indian Marine Shells, p. 22.
1873. *Triton* (*Simpulum*) *acclivis* Hutton, Catalogue of the Marine Mollusca of New Zealand, Wellington, pl. 13, fig. 8.
1878. *Triton costatum* (Born), Mörch, Catalogue of West-India Shells, p. 9.
1886. *Triton* (*Simpulum*) *costatus* (Born), Watson, Voyage of H.M.S. Challenger, Zoology, vol. 15, pp. 390-391.
1910. *Cymatium costatum* (Born), *parthenopeus* (von Salis), *succinctum* (Lamarck), Dall, U. S. Nat. Mus., Proc., vol. 37, No. 1704, pp. 226, 287, 291.
1922. *Cymatium olearium* Maury, Bull. Amer. Paleont., vol. 9, No. 38, p. 116. Not *Murex olearium* Linnaeus, 1758 and 1767 which is an earlier name for *Ranella gigantea* Lamarck.
1937. *Cymatium* (*Monoplex*) *costatum* (Born), Smith, East Coast Marine Shells, p. 113, pl. 42, figs. 1, 2.
1953. *Cabestana* (*Monoplex*) *costata* (Born), Haas, Fieldiana—Zoology, vol. 34, No. 20, p. 204.
1955. *Cymatium costatum* (Born), Perry and Schwengel, Marine Shells of the Western Coast of Florida, pp. 150-151, pl. 29, fig. 210.
1957. *Cymatium* (*Monoplex*) *parthenopeum* (von Salis), Clench and Turner, Johnsonia, vol. 3, pp. 228-230, pl. 110, fig. 4; pl. 112, figs. 7, 8; pl. 113, figs. 9, 10; pl. 128, figs. 1-3.
1958. *Cymatium* (*Monoplex*) *parthenopeum* (von Salis), Keen, Sea Shells of Tropical West America, p. 346, fig. 322.
1958. *Cymatium parthenopeum* (von Salis), Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 15.

Shell of medium size, fairly solid, biconical, the moderately elevated spire produced at an angle of 65-68 degrees. Nucleus smooth, decollate, the tip a little tilted, defined abruptly from the conch by a flattened bipartite axial fold on the forward side of which the sculpture of the shell begins. Post-nuclear whorls 4-1/2, the first two evenly convex, the later ones slightly shouldered. Sculpture consisting of spiral ribs and axial folds and, in the interspaces of the latter, low axial cords or threads which form longitudinal crenations on the entire surface of the shell. The spiral markings consist of two larger ribs, one above the middle of the whorl, the other below; above the former is a secondary riblet, and above that, adjoining the suture is a double cord; between the two primary spiral ribs there is an interstitial riblet, and below the lower of the primaries another secondary riblet; on the later stages of the conch a third primary rib occurs on the base of the whorl adjoining the suture. There are 9 or 10 widely spaced narrow axial folds, these extending from suture to suture on the spire but becoming obsolescent on the body whorl below the shoulder which itself is rendered nodulous as are the other primary ribs on the conch. Body whorl with two varices, a strong, narrow, elevated one behind the

outer lip, and a low lamellar one on the side opposite the lip. In all there are 14 major spiral ribs on the body whorl: a low doublet just below the suture, five single ribs on the convexity, each with a secondary cord in the interspace, and the remainder on the base. The six posterior primaries bifurcate on the varix of the outer lip. Anterior fasciole subangularly convex, with a vague cord or two. Upper sutures narrowly channeled, the last impressed. Aperture broadly ovate, rendered holostomatous by the rather thick coat of shiny, taffy-colored callus, the interior with four faint grooves which merge into the deepened interspaces of the palatal denticles. Outer lip varicated behind, the rim scalloped, thickened a little by lamellar incrementals, the inner margin armed with 12 denticles, the two anterior denticles single but converging inward, the other 10 arranged in 5 bifid pairs, each pair under an interspace of the external primary ribs, and converging to join at the entry to the aperture. Parietal wall and columella callused, the margin of the callus raised slightly, the anterior end joining the margin of the siphonal canal where it is also rolled somewhat over the fasciole producing there a narrow slit. The spiral ribs of the whorl are reflected through the callus of the parietal wall, and under the anal notch there is a single large, dog-legged ridge on the upper portion of the wall. Inner lip with six more or less horizontal folds, the first but one from the top the largest, the anterior ones progressively smaller. Anterior canal moderately long, deep, flaring somewhat at the tip where it is bent slightly backward and is shallowly notched. Anal canal marked by a high recess between the posterior pair of denticles and the ridge on the upper portion of the parietal wall.

Dimensions.—Figured specimen (tip of nucleus missing), length 41 mm.; max. width 25.5 mm.

Localities.—Upper Mare formation near headwaters of small stream east of Quebrada Mare Abajo, about 90 meters southeast of W-12. One specimen, well preserved; lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. One specimen, broken.

Range and distribution.—This is the first record of *C. parthenopeum* as a Caribbean fossil, although in Europe it is reported from the upper Miocene of Calabria onwards (Watson, 1886, p. 391). The living species is cosmopolitan, occuring in the Western Mediter-

ranean, and from the Azores south to South Africa; from Florida south to Brazil in the Western Atlantic; and in Japan, eastern Australia, northern New Zealand, and Portuguese East Africa in the Indo-Pacific region. According to Clench and Turner (1957, p. 230) the species occurs from just below low water to depths of at least 35 fathoms.

Remarks.—The Venezuelan fossil shell may be a variation of the true *C. parthenopeum,* but I am unable to detect a significant difference between it and the Recent shell which itself is somewhat variable.

Cymatium ? species Pl. 25, figs. 7, 8

Shell small, barely out of the embryonic stage, the spire rather broadly conoidal, the base spindly. Whorls about 4, the 3-1/2 earliest ones forming the nucleus. Nuclear whorls smooth, the initial appressed and indistinct, the remaining convex, regularly and evenly expanding. About a third of a turn back of the outer lip the last smooth nuclear whorl terminates abruptly at a flat, narrow axial rib, on the forward side of which the spiral fillets of the conch originate. Ultimate whorl (and in this specimen the only post-nuclear whorl) globose above, tapering abruptly below the convexity into a moderately short canal. Sutures finely impressed. Sculpture of last whorl consisting of strong, subequal, flat spiral ribs or fillets of which there are seven between the suture and top of the canal. The spiral ribs are separated by narrow grooves, and traversing them are exceedingly faint narrow axial wrinkles forming small crenations on the bands and in the grooves. Canal rugose. Aperture proper ovate, plugged with what seems to be a scaphopod tube. Outer lip thin, merging with the side of the siphonal canal at nearly a right angle, the inner margin gently fluted, the rim scalloped by the projecting ends of the surface ribs. Columella and parietal wall rather heavily enameled, the enamel a little detached along the distal side of the canal. Canal a little twisted, bent slightly back at the anterior end. Terminal notch shallow, unemarginated.

Dimensions.—Figured specimen, length 2 mm.; max. width 1 mm.

Locality.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. One specimen.

Remarks.—Although the protoconch of this immature shell suggests that it belongs to the family Cymatiidae, there is little that can be said about its specific identity until more examples are available.

Charonia species Pl. 25, figs. 9-11

Illustrated are two fragments which are presumed to belong to the same species of the genus *Charonia* Gistel. One of the fragments consists of the parietal wall and part of the inner lip. Near the top of the parietal wall there is a strong, nearly horizontal plait. The inner lip is rather heavily enameled, the enamel reflecting weakly the spiral banding of the whorl. The whorl is varicated away from the parietal wall, and the varix is bounded by a longitudinal cicatrix. The other fragment is a portion of the labrum and outer lip. The exterior of the labrum is sculptured by low, broad, spiral bands or ribs, the upper ones near the margin of the outer lip knobby, the medial ones bearing a faint spiral cord or two. Intercostal areas very shallow. Inner margin of outer lip raised and denticulate, each of the teeth lying under the interspace of the exterior ribs. The apertural linning reflects in reverse the sculpture of the exterior.

Dimensions.—Columellar fragment, length 60 mm., width 38 mm.; labral fragment, length 60 mm., width 28 mm.

Locality.—Mare formation near W-14, on hillside above west bank of Quebrada Mare Abajo. Two fragments.

Remarks.—This fossil, estimated to attain a length of some 200 mm., is moderately thin-shelled for its large size. The nearest analogue is the living "trumpet Triton" *Charonia variegata* (Lamarck) (see Clench and Turner, 1957, pp. 193-197, pl. 111, figs. 1, 2; pl. 113, fig. 1; pl. 114, figs. 1, 2) which ranges from Florida to Brazil in the Western Atlantic, and from the Mediterranean Sea to St. Helena in the Eastern Atlantic. The columella of the Venezuelan fossil is relatively smooth whereas that of the typical *C. variegata* is closely lirate. Whether this difference is individual or specific cannot be determined without more and complete specimens.

Distorsio (Rhysema) clathrata (Lamarck) Pl. 25, figs. 12-16

1816. *Triton clathratum* Lamarck, Encycl. Méth., Liste, p. 4, Atlas, vol. 3, pl. 413, figs. 4a, b.
1822. *Triton clathratum* Lamarck, An. sans Vert., vol. 7, p. 186 (reference to Lamarck 1816 only).
1842. *Triton clathratum* Lamarck, Kiener, Spécies général, *Triton,* p. 21, pl. 14, fig. 1.
1866. *Persona simillima* (Sowerby), Guppy, Geol. Soc. London Quart. Jour., vol. 22, p. 288, pl. 17, fig. 13.
1867. *Persona similima* (Sowerby), Guppy, Sci. Assoc. Trinidad Proc., pt. 3, p. 158.
1874. *Persona simillima* (Sowerby), Guppy, Geol. Mag., decade 2, vol. 1, p. 439.
1878. *Distortio clathrata* (Lamarck), Mörch, Catalogue of West India Shells, p. 10.
1889. *Distortrix reticulata* 'Link', Dall, Mus. Comp. Zool. Bull., vol. 18, p. 221 (part). Not *D. reticulata* Link 1807 [= D. reticulata Röding 1798].
1901. *Distortrix reticulata* var. *clathrata* (Lamarck), Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, p. 46.
1903. *Distortrix simillima* (Sowerby), Dall, Wagner Free Inst. Sci., Trans., vol. 3, pt. 6, p. 1584.
1921. *Distortio reticulatus* var. *clathratus* (Lamarck), Maury, Bull. Amer. Paleont., vol. 9, No. 38, p. 115.
1921. *Distorsio clathratus* Pilsbry, Acad. Nat. Sci. Philadelphia, Proc., vol. 73, pp. 357, 359.
1928. *Distorsio clathratus gatunensis* 'Toula', Woodring, Carnegie Inst. Washington, Publ. No. 385, pt. 2, p. 300, pl. 19, figs. 2, 3.
1929. *Distorsio aff. gatunensis* Toula, Weisbord, Bull. Amer. Paleont., vol. 14, No. 54, p. 273, pl. 8, fig. 3.
1930. *Distorsio clathratus* (Lamarck), Rutsch, Eclogae Geol. Helvetiae, vol. 23, pt. 3, pp. 607-610, pl. 17, figs. 4, 5.
1934. *Distorsio clathratus* (Lamarck), Rutsch, Schweiz. Palaeont. Gesell, Abh., vols. 54-55, p. 58.
1937. *Distorsio clathratus* (Lamarck), Rutsch, Bol. Geol. y Min. (Venezuela), vol. 1, No. 1, pp. 43-47, unnumbered pl., figs. 4, 5. Reprint in Spanish of Rutsch 1930, Eclogae Geol. Helvetiae, vol. 23, pt. 3, pp. 607-610, pl. 17, figs. 4, 5.
1937. *Distorsio clathrata* (Lamarck), Smith, East Coast Marine Shells, p. 113, pl. 42, fig. 8.
1940. *Distorsio clathrata* (Lamarck), Smith, World-wide Sea Shells, p. 48, figs. 655a, b.
1952. *Distorsio clathrata* Pulley, Texas Jour. Sci., vol. 4, No. 2, p. 175, pl. 2, fig. 10.
1953. *Distorsio* (*Personella*) *clathratum* (Lamarck), Emerson and Puffer, Biol. Soc. Washington, Proc., vol. 66, p. 97.
1954. *Distorsio clathrata* (Lamarck), Abbott, American Seashells, pp. 196-197, pl. 25aa.
1957. *Distorsio* (*Rhysema*) *clathrata* (Lamarck), Clench and Turner, Johnsonia, vol. 3, No. 36, pp. 236-240, pl. 131; pl. 132, figs. 2-8; pl. 133.
1958. *Distorsio clathrata* (Lamarck), Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 15.
1958. *Distorsio clathrata* (Lamarck), Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, p. 83.

Shell of medium size, biconical, the spire moderately produced,

the angle of spire around 57 degrees, the anterior canal somewhat twisted and bent backward. Whorls 10 in all, the smooth nucleus consisting of four of them, the axis of the nucleus slightly inclined to the axis of the conch. Initial whorl of nucleus appressed, the second narrow and gently convex, the third enlarged and well rounded, the last rapidly expanding and convex, the sutures separating the nuclear whorls finely impressed at the outset, narrowly channeled later. The demarcation betwen the nucleus and the conch is distinct, and is defined by the abrupt appearance of reticulate markings. The early post-nuclear whorls are rather regularly convex, shouldered at the summit and excavated at the base, and are sculptured into a reticulate design by 3 primary spiral ribs and about 22 axial cords. The axial cords are slightly oblique, a little smaller than the primary spiral ribs, and, at their intersections with the spirals, they are beaded. The spiral ribs are more or less equal in size and equally spaced, the uppermost one situated at the summit of the whorl, the next a little above the middle of the whorl, and the lowest one a little below the middle. Additionally, there is a low secondary spiral riblet at the base of the whorl adjoining the suture, and this too is beaded although feebly so. The narrow shelf or ramp between the summit rib and the suture is slightly concave and bears a small spiral riblet or thread.

Starting with the third or fourth post-nuclear one, the whorls are globularly distorted and humped, the distension on each succeeding whorl offset with relation to the one above. The spiral ribs, instead of being unilirate and more or less equally spaced as they are on the upper whorls, are now bilirate or shallowly grooved along the middle, the bilirate character persisting, on the body whorl, to below the convexity whence they become single again on the base proper. The distance between the upper two spiral ribs increases considerably, and all of the intercostal spaces are farther apart on the humped portion of the whorl than they are distally. On our largest specimen the secondary spiral riblet adjoining the lower suture of the early whorls becomes a primary rib above the suture on the penultimate whorl. On the body whorl of this specimen there are 11 primary spirals between the suture and the anterior fasciole, the upper six bilirate, the lower ones more or less single, unequal in size, with an interstitial riblet between the third and fourth

rib above the fasciole; the two primary ribs adjoining the fasciole are the largest of all. Like the spiral ribs, the axial cords are more widely spaced on the swollen areas but are closer together and often weaker toward the labrum; all of the axials diminish in strength below the convexity of the body whorl and play out on the base. Generally there is one axial growth rift or sinus on each of the later whorls, and on either side of the rift the axial rib is a modified varix. Surface of shell covered with regular, closely spaced axial lineations crossed by more widely spaced fine spiral threads or filaments. Anterior fasciole long, fairly broad and low, made up of feeble horizontal folds and a vague longitudinal cord or two.

Aperture auriculate, excavated more or less squarely above the columella, narrowly produced anteriorly, prominently notched at the anal outlet. Outer lip ascending, thin along the rim, the oral surface broad, shallowly furrowed medially; on the inner thickened margin of the lip there are 10 denticles or folds, the third from the top is the largest, the 3 or 4 at the base generally small and decreasing in size anteriorly; on the far margin of the lip there are 7 or 8 denticles or folds, the uppermost of which usually occurs in a pair as may some of the others, these denticles opposite the inner ones; the rim of the outer lip is somewhat scalloped, and behind the rim is a deep longitudinal rift with a varicated axial rib on either side. Labial area also flattened, narrowing anteriorly, with a smooth triangular shallow depression down the middle, the depression also pointed anteriorly; the inner, or columellar lip to the right of the depression is girded with about seven plicae or folds, the uppermost at the head of the columella the largest, the others decreasing in size downward; to the left of the triangular depression there are also about seven folds or lirae, and these are a little narrower and more irregular than their opposites. Siphonal canal fairly long, deep, bent perceptibly backward, denticulate along the margins, the denticles decreasing in size anteriorward, the extremity or the canal with no perceptible notch. Posterior canal exhibited as a notch between the uppermost denticle of the outer lip and the two parietal plicae. Parietal wall quadrately excavated at the top of the columella, the reticulate sculpture of the whorl projecting clearly through the thin glaze or veneer of the parietal shield. At the top of the parietal wall adjacent to the anal notch are two strong ridges of callus resembling

a pair of converging commas, the left one of which is reversed and longer than the right. Parietal shield thin, outlined by a raised lamellar margin along the rim of the outer lip and along the far side of the parietal wall, these margins uniting below the suture on the far side. There, near the summit of the whorl, the lamellar edge of the shield is sharply elevated, crosses the suture, then turns, flattens, and adheres to the top of the preceding whorl. The adherent glaze continues across about a fourth of the whorl and unites with a slightly upturned lamellar varix, this in turn ascending and flattening against the whorl above, the process repeating itself upward. This is seen on each of the four latest whorls of the mature shell.

Dimensions.—Largest specimen (J248a), the tip of the nucleus decollate, length 57 mm.; max. width 29 mm.

Average adult (T248a), the tip of the nucleus decollate, length 42 mm.; max. width 25 mm.

Smallest specimen, the nucleus entire, length 8.5 mm.; max. width 6.2 mm.

Venezuelan localities.—Cabo Blanco area, Distrito Federal (fossil specimens):

Playa Grande formation (Maiquetía member) at W-26, in Quebrada Las Bruscas, approximately 120 meters upstream from junction with Quebrada Las Pailas. One specimen, nucleus and anterior canal missing; lower Mare formation in small stream 100 meters west of Quebrada Mare Abajo. Two specimens, one a nearly perfect adult, the other a broken, immature shell; Mare formation in stream 250 meters south-southwest of mouth of Quebrada Las Pailas. One specimen, nucleus and part of anterior canal missing; Abisinia formation at W-30, eastern edge of Playa Grande village. One immature specimen, broken, but with the entire nucleus intact; "Cabo Blanco, near La Guaira, Distrito Federal (Coll. Drs. Kugler and Vonderschmitt). Age: Probably Quaternary". (Rutsch, 1930, p. 610, pl. 17, fig. 4).

State of Falcon (fossil specimens)

"Coast at Punta Gavilan (SE), 3 kilometers west of Punta Zamuro in northeastern Falcon. (Collection Drs. Kugler and Leuzinger). Age: Upper Tertiary, probably Pliocene." (Rutsch, 1930, p. 610). Five specimens (Rutsch, 1934, p. 58); "Valley of Rio

Cumarebo, about 1 kilometer southeast of Puerto Cumarebo, Falcon (Collection Dr. Meesman). Age: Upper Tertiary, probably Pliocene". (Rutsch, 1930, p. 610). One specimen (Rutsch, 1934, p. 58); "Coast at Sabanas Altas, Falcon (Collection Drs. Wiedenmayer, Vonderschmitt and Meesmann). Age: Upper Tertiary, probably Pliocene". (Rutsch, 1930, p. 610). Three specimens (Rutsch, 1934, p. 58).

Recent specimens

On coast between Chichiriviche and Curamichate, State of Falcon (Rutsch, 1930, p. 609); Guanta, State of Anzoategui (Clench and Turner, 1957, p. 240).

Range and distribution.—Distorsio clathrata (Lamarck) ranges from middle Miocene to Recent. It occurs, or is reported to occur under the erroneous names of *simillima, reticulata* or *gatunensis,* in the Miocene of Venezuela (Guppy, 1867), Jamaica (Woodring, 1928), Colombia (Weisbord, 1929), and Mexico (Schuchert, 1935); in the Mio-Pliocene or Pliocene of Venezuela (Rutsch, 1930, 1934); in the Pleistocene at New Orleans pumping station No. 7 (Maury, 1921); and is living from Cape Hatteras, North Carolina, to the northern coast of South America, as well as off the coast of West Africa (Emerson and Puffer, 1953, p. 97). The living shell is generally found from just below low water to depths of about 30 fathoms.

Remarks.—The fossil form of *D. clathrata* (Lamarck) has been confused with *D. gatunensis* Toula (1909, p. 700, pl. 25, fig. 10), a Miocene species from the Panamá Canal Zone, Costa Rica, and the Paraguaná Peninsula of Venezuela (see Emerson and Puffer, 1953, p. 100). The two species are indeed close, but according to Rutsch (1930, pp. 610-611, 614, pl. 17, fig. 6), who has examined and figured the type, *D. gatunensis* has a subangulate rather than rounded body whorl, and around the periphery there are two closely spaced spiral ribs. On the body whorl of the Venezuelan fossils from Cabo Blanco referred to *D. clathrata,* the peripheral ribs are widely separated on Rutsch's adult specimens and on mine.

It may be noted that Emerson and Puffer (1953) placed *D. clathrata* in the subgenus *Personella* Conrad, whereas Clench and Turner (1957, p. 236) erected the new subgenus *Rhysema.*

TONNIDAE

Malea ringens mareana, new subspecies Pl. 24, figs. 1, 2

Shell moderately large, globose, the spire relatively short and subconical, the body rotund. Whorls remaining five, the nucleus decollate. Early post-nuclear whorls with the outer layer of shell stripped off but evenly convex, the later whorls becoming increasingly shouldered, the shoulder of the ultima subtabulate. Ultimate whorl regularly rounded below the shoulder, rather sharply contracted above the anterior fasciole. Surface sculptured by low, flattened spiral bands crossed by crowded longitudinal striae or laminae which stand out more clearly in the spaces between the bands. On the penultimate whorl there are two primary spiral bands, one at the shoulder, the other about halfway between the shoulder and the anterior suture, these with a single rounded secondary cord in the interspaces; on the very shallowly concave ramp above the shoulder there are two secondary cords, with an intercalary thread between the lower one and the shoulder. On the body whorl there are 18 primary spiral bands from the shoulder to the anterior fasciole, the upper 4 the most prominent and subrounded at their crest, the one below the shoulder the largest; in the interspace between the shoulder band and the one anterior to it, there is a flattish secondary band with a minor spiral cord below, and between each of the other larger spiral bands there is a single minor cord. The remaining 14 bands are nearly equal and flat-topped, the interspaces slightly narrower than the bands above but about as wide as the bands themselves below. Anterior fasciole highly convex, built up of about four strong cords crossed by numerous fine sinuous lamellae. Aperture semilunar. Outer lip of holotype broken away but is probably characteristic of the genus with a varicose and frilled outer edge and heavily ridged inner margin. Parietal wall with an expensive sheath of callus, the callus extending to the base and covering much of the fasciole, the far edge of the callus neatly defined and rising above the level of the whorl surface. Between the parietal wall and pillar, there is a deep, square-cut excavation on the columella. The parietal wall above the excavation is swollen longitudinally, the swelling bearing 11 folds

or plicae, the upper seven of these relatively feeble and continuing into the aperture as normal spiral bands which are there not covered by callus as on the wall. The four lower folds are strong and elevated, and of these the last but one is the largest, all of them slightly askew. Just below the excavation, and at the top of the twisted pillar, there is a prominent protruding fold; the callused pillar itself is wrinkled into folds reflecting the cords of the fasciole underneath. Anterior canal short and broad, the labial margin thickened somewhat by a fold which ascends to join the apertural end of the large plica immedately below the columellar excavation; between this emarginating fold and the inner side of the pillar there is a smooth, wedge-shaped, slightly depressed, flattened area or fosset. Character of posterior outlet not known as the shell is broken in that area.

Dimensions.—Holotype, length 47 mm.; max. width 36 mm.

Type locality.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. One broken specimen, the holotype.

Comparisons.—The Cabo Blanco shell is closely related to the lower Pliocene to Recent *M. ringens* (Swainson) (1822, Appendix, p. 4) from the west coast of the Americas but is not so globose and is girdled by a few more spiral bands. *Malea ringens* is also reported from the middle-upper Miocene of Colombia by Anderson (1929, pp. 140-141, pl. 12. figs. 3-6), and the same differences are noted between the Cabo Blanco shell and that. It is more difficult, however, to separate the Cabo Blanco form from *M. ringens densecostata Rutsch* (1934, pp. 60-62, pl. 3, figs. 6, 7) an upper Miocene-Pliocene species from Punta Gavilan and Sabanas Altas, in the State of Falcon, Venezuela. *M. r. mareana* is sheathed with an even expanse of callus on the parietal wall, whereas on *M. r. densecostata* the callus is lacking. *M. r. mareana* has a deep, square-cut excavation on the columella; on *M. densecostata* the excavation is wider, shallower, and more irregular. On the body whorl of *M. mareana* there are secondary cords between the primary spiral bands on and above the periphery; on *M. densecostata* the secondaries are present just below the periphery, and the primary spiral bands above the periphery are nearly equal instead of unequal in size as they are on the Cabo Blanco shell. Whether the

characters mentioned are constant on *M. mareana* is indeterminable as I have but a single imperfect specimen, and this particular specimen seems to be as subspecifically distinct from *M. r. densecostata* as it does from *M. ringens ringens*. The widespread Caribbean Miocene species, *Malea camura* Guppy (see Woodring, 1959, pp. 208-209, pl. 33, figs. 1-4) is differentiated from *M. ringens* by its shallower and more irregular columellar excavation. *M. elliptica* Pilsbry and Johnson (1917, p. 169; Pilsbry, 1921, p. 363, pl. 29, fig. 3) from the Miocene of the Dominican Republic is more elliptical than *M. r. mareana,* n. sp., and *M. goliath* Pilsbry and Johnson 1917, p 170; Pilsbry, 1921, pp. 363-364, pl. 29, figs. 1, 9), also from the Miocene of the Dominican Republic, is broader than *M. mareana,* and has wider spiral bands, and, for its size, has a weaker columellar armature than the Cabo Blanco shell.

Tonna galea ? (Linnaeus) Pl. 24, figs. 3, 4

1758. *Buccinum galea* Linnaeus, Syst. Nat., ed. 10, p. 734.
1864. *Dolium galea* (Linnaeus) ?, Krebs, The West Indian Marine Shells, p. 35.
1877. *Dolium antillarum* Mörch, Malakozoologische Blätter, vol. 24, p. 41.
1878. *Dolium antillarum* Mörch, Mörch, Catalogue of West-India Shells, p. 10.
1885. *Dolium galea* (Linnaeus), Tryon, Man. Conch., vol. 7, p. 261, pl. 1, fig. 3.
1889. *Dolium galea* (Linnaeus), Dall, U. S. Nat. Mus. Bull. 37, p. 134.
1889. *Dolium galea* (Linnaeus), Dall, Mus. Comp. Zool., Bull., vol. 18, p. 232.
1901. *Dolium galea* (Linnaeus), Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, p. 419.
1906. *Dolium cf. galea* (Linnaeus), Böse, Inst. Geol. Mexico, vol. 22, p. 87.
1922. *Tonna galea* (Linnaeus), Maury, Bull. Amer. Paleont., vol. 9, No. 38, p. 119.
1937. *Tonna galea* (Linnaeus), Smith, East Coast Marine Shells, p. 112, pl. 41, fig. 6.
1938. *Dolium galea* (Linnaeus), Clench, Nautilus, vol. 38, No. 3, p. 95.
1938. *Tonna galea* (Linnaeus), Richards, Geol. Soc. Amer., Bull., vol. 49, pt. 2, p. 1293.
1942. *Tonna galea* (Linnaeus), Jaume and Pérez Farfante, Soc. Cubana Hist. Nat. "Felipe Poey", Mem., vol. 16, No. 1, p. 41.
1944. *Tonna galea* (Linnaeus), Hackney, Nautilus, vol. 58, No. 2, p. 61.
1948. *Tonna galea* (Linnaeus), Turner, Johnsonia, vol. 2, No. 26, pp. 173-176, pl. 75, fig. 4; pl. 78, figs. 1, 2.
1952. *Tonna galea* (Linnaeus), Pulley, Texas Jour. Sci., vol. 4, No. 2, p. 175.
1954. *Tonna galea* (Linnaeus), Abbott, American Seashells, p. 199, pl. 23f.
1955. *Tonna galea* (Linnaeus), Perry and Schwengel, Marine Shells of the Western Coast of Florida, p. 150.
1958. *Dolium galea antillarum* Mörch, Coomans, Caraibisch Marien-Biological Inst., Collected Papers 6, p. 84.
1959. *Tonna galea* (Linnaeus), Woodring, U. S. Geol. Sur., Prof. Paper 306-B, p. 210.

Tentatively referred to this species are several fragments, the

largest of which takes in part of the aperture and most of the outer lip. Body whorl sculptured by at least 19 broad spiral ridges, the one at the suture being a doublet. That and the following three ridges are slightly arched, as are the ones at the base. The ridges on the convexity of the body whorl are flattish and are separated by moderately deep square interspaces somewhat narrower than the ridges themselves. In each of the interspaces between the first five ridges below the suture there is a secondary spiral riblet or cord, the uppermost of these intersitials the largest, the others decreasing progressively in size anteriorward, the lowest a mere thread. The axial markings consist of numerous lineations and occasional scalloped grooves representing hiatuses in growth. Aperture highly polished and spirally ribbed, the low ribs being the underside of the external interspaces. Outer lip rather thin, the edge scalloped and fluted, with a longitudinal swelling some distance in from the margin. Similar swellings occur well within the aperture under, and a little to the side of the external scalloped grooves which themselves represent earlier lips. The shell is thin but strong.

Dimensions.—Length of largest fragment (T255a) 67 mm.

Cabo Blanco localities.—Upper Mare formation, in stream 250 meters south-southwest of the mouth of Quebrada Las Pailas. Two fragments; lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. Two fragments.

Range and distribution.—The living *T. galea* is widely distributed. It is recorded in the Western Atlantic from North Carolina to to northern South America, in the Eastern Atlantic from the Mediterranean Sea southward along the African coast, and in the Indo-Pacific from the Hawaiian Islands to Japan and south through Indonesia and the Indian Ocean. The fossil *T. galea* is reported from the Pleistocene of Cuba and Florida, and Böse (1906, p. 87) recorded it from deposits in Mexico to which he assigned a Pliocene age.

Tonna (Cadus) maculosa (Dillwyn) **Pl. 24, figs. 5, 6**

1786. *Buccinum maculosum* Solander, A Catalogue of the Portland Museum, p. 137, No. 3050 [nude name].

1817. *Buccinum maculosum* 'Solander', Dillwyn, Descriptive catalogue of Recent Shells, vol. 2, p. 583.
1852. *Dolium pennatum* Mörch, Catalogus Conchyliorum. . . Comes de Yoldi, pt. 1, p. 110.
1853. *Dolium perdix* (Linnaeus), d'Orbigny, Hist. phys., polit. nat. l'Ile de Cuba, Mollusques, vol. 2, p. 182, No. 388. Not Linneaus 1758.
1854. *Dolium album* Conrad, Acad. Nat. Sci. Philadelphia, Proc. vol. 7, p. 31.
1864. *Dolium pennatum* Mart., Krebs, The West Indian Marine Shells, pp. 35-36.
1878. *Dolium perdix occidentalis* Mörch, Mörch, Catalogue of West-India Shells, p. 10.
1889. *Dolium perdix* (Linnaeus), Dall, U. S. Nat. Mus., Bull. 37, p. 134. Not *Buccinum perdix* Linnaeus 1758, Syst. Nat. ed. 10, p. 734.
1891. *Dolium perdix* (Linnaeus), Baker, Acad. Nat. Sci. Philadelphia, Proc., vol. 43, p. 52. Not Linnaeus 1758.
1901. *Dolium perdix* (Linnaeus), Dall and Simpson, U.S. Fish Com., Bull., vol. 20, for 1900, pt. 1, p. 119. Not Linnaeus, 1758.
1922. *Tonna perdix* (Linnaeus), Maury, Bull. Amer. Paleont., vol. 9, No. 38, p. 119 (part). Not Linnaeus, 1758.
1935. *Dolium perdix* (Linnaeus), Richards, Jour. Paleont., vol. 9, No. 3, p. 257. Not Linnaeus, 1758.
1937. *Tonna perdix* (Linnaeus), Smith, East Coast Marine Shells, p. 112, pl. 41, fig. 7. Not Linnaeus, 1758.
1942. *Tonna perdix* (Linnaeus), Jaume and Pérez Farfante, Soc. Cubana Hist. Nat. "Felipe Poey" Mem., vol. 16, No. 1, p. 41. Not Linnaeus, 1758.
1946. *Tonna perdix* (Linnaeus), Jaume, Soc. Malac. "Carlos de La Torre" Rev., vol. 4, No. 3, p. 106. Not Linnaeus, 1758.
1948. *Tonna maculosa* (Dillwyn), Turner, Johnsonia, vol. 2, No. 26, pp. 169-172, pl. 75, fig. 2; pl. 76, figs. 1, 2.
1954. *Tonna maculosa* (Dillwyn), Abbott, American Seashells, p. 199, pl. 9d.
1958. *Tonna maculosa* (Dillwyn), Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 15.
1958. *Tonna* (*Cadus*) *maculosa* (Dillwyn), Abbott, Acad. Nat. Sci. Philadelphia, Mon. No. 11, p. 52.
1958. *Dolium perdix* (Linnaeus), Coomans, Caraibisch Marien-Biologisch Instituut, Curaçao, Collected Papers 6, p. 84. Not Linnaeus, 1758.
1959. *Tonna maculosa* (Dillwyn), Nowell-Usticke, A Check List of the Marine Shells of St. Croix, p. 62.

Two fragments, one of them half a shell, are referred to this spices. There are 22 subequal flattened spiral ribs on the body whorl, and eight subequal subrounded spiral ribs on the penultimate whorl; the rib at the suture of the penultima is a doublet. The color is dull brown, interrupted on the ribs by long and short bars of white. The interior is highly polished and also brownish except for a longitudinal swath of white a short distance in from the rim of the outer lip; the rim itself is dark brown with intervals of white.

Dimensions.—Length (apex missing) 44.5 mm.; max. width 31.5 mm.

Cabo Blanco locality.—Recent, on beach at Playa Grande Yachting Club, Distrito Federal. Two broken specimens.

Range and distribution.—*T. maculosa* ranges from south Florida through the West Indies to Brazil, and is reported from the Pleistocene of Barbados and Cuba. *T. perdix* (Linn.) is the Indo-Pacific analogue. That has a more pointed spire than the Western Atlantic *T. maculosa,* a less pronounced curve between the columella and parietal wall, and is marked with relatively narrow longitudinal scallops of white rather than with spiral bars of white, as on *T. maculosa.*

Tonna (Cadus) maculosa catiana, new subspecies Pl. 24, figs. 7, 8

Shell large, moderately thin but strong, subtranslucent, ovately subglobose. Apex decollate, the total number of whorls estimated at six to seven including about three nuclear ones. Post-nuclear whorls convex, the body well rounded, the sutures narrowly incised. Sculpture consisting of 21 rather broad subequal ribs on the body whorl and seven subequal narrower riblets on the penultimate and antepenultimate whorls, the rib just below the suture followed by an interspace which is a little deeper than all of the other interspaces. On the convexity of the body whorl the ribs are low, moderately broad, and flattened, the interspaces narrow and shallow. The ribs above and below the convexity are a little rounded and are slightly more prominent than those around the middle. Axial markings consisting of numerous lineations or very fine ridglets and occasional faintly scalloped rifts or grooves marking the site of earlier lip margins. Aperture large, subovate, the ribs of the surface reflected through as feeble corrugations. Outer lip rather thin, the margin faintly fluted and beveled a little so that it seems to be slightly recurved toward the labrum. Parietal wall somewhat bulging, the curve between it and the columella rather acute, both wall and columella covered with a sheath of callus, the callus folded over the upper part of the unbilicus. Umbilicus moderately large, the groove lying between the pillar and fasciole. Pillar broad above, narrowing sharply and merging with the emargination at the side of the anterior canal. Anterior fasciole large, strongly convex, more or less smooth but with faint growth increments arched upward, forming a bulge under the callus on the columella and imparting a flexured

profile to the inner lip. Siphonal canal very short and wide, the termination excavated into a broad, shallow semilunar notch, the basal margin of the notch thin. Posterior outlet broken away. The little of the color pattern that still remains is bleached, and consists of pale orange or faded brown short interrupted bars on the spiral ribs.

Dimensions.—Holotype (apex decollate), length 73.5 mm.; max. width 50 mm.

Type locality.—Playa Grande formation (Catia member), in bluff 125 meters west of the intersection of the Playa Grande Yachting Club road and coast road. Two specimens, the larger the holotype.

Comparisons.—This is close to *T. maculosa* (Dillwyn) and may be its progenitor. It differs from *T. maculosa, s.s.* in having a more bulging parietal wall, a heavier parietal callus, a larger umbilicus, and a much broader pillar area formed by the arcuate spreading of the lower lip.

MURICIDAE

Murex (Murex) recurvirostris recurvirostris Broderip Pl. 26, figs. 3, 4; Pl. 47, figs. 8, 9

1833. *Murex recurvirostris* Broderip, Zool. Soc. London Proc., p. 174.
1834. *Murex messorius* Sowerby, The Conchological Illustrations, *Murex,* fig. 93.
1840. *Murex messorius* Sowerby, Zool. Soc. London, Proc., pp. 137-138.
1845. *Murex recurvirostris* Broderip, Reeve, Conch. Icon., vol. 3, *Murex,* sp. 75.
1845. *Murex messorius* Sowerby, Reeve, Conch. Icon., vol. 3, *Murex,* sp. 90.
1866. *Murex domingensis* Guppy, (not Sowerby), Geol. Soc. London Quart. Jour., vol. 22, p. 288.
1873. *Murex recurvirostris* Broderip, Gabb, Amer. Philos. Soc., Trans., new ser., vol. 15, p. 201.
1874. *Murex domingensis* Guppy, (part, not Sowerby), Geol. Mag., decade 2, vol. 1, p. 438.
1879. *Murex recurvirostris* Broderip, Sowerby, Thes. Conchyl., *Murex,* pl. 11, fig. 15.
1879. *Murex messorius* Sowerby, Thes. Conchyl., *Murex,* pl. 11, fig. 20.
1880. *Murex recurvirostris* Broderip, Tryon, Man. Conch., vol. 2, pp. 80-82, pl. 11, fig. 193; pl. 12, figs. 124, 125.
1881. *Murex recurvirostris* Broderip, Gabb, Acad. Nat. Sci. Philadelphia, Jour., ser. 2, vol. 8, pp. 349-350.
1889. *Murex messorius* Sowerby, Dall, Mus. Comp. Zool. Bull., vol. 18, p. 196.
1890. *Murex messorius* Sowerby, Dall, Wagner Free Inst. Sci., Trans., vol. 3, pt. 1, p. 139.
1901. *Murex messorius* Sowerby, Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, p. 407.

1903. *Murex domingensis* Guppy, Dall, Wagner Free Inst. Sci., Trans., vol. 3, pt. 6, p. 1584.
1911. *Murex messorius* Sowerby, Brown and Pilsbry, Acad. Nat. Sci. Philadelphia, Proc., vol. 63, p. 353.
1917. *Murex messorius* Sowerby, Maury, Bull. Amer. Paleont., vol. 5, No. 29, p. 265, pl. 42, figs. 1, 2.
1920. *Murex messorius* Sowerby, Maury, New York Acad. Sci. Scientific Survey of Porto Rico and the Virgin Islands, vol. 3, pt. 1, pp. 63-64.
1921. *Murex recurvirostris* Broderip, Pilsbry, Acad. Nat. Sci. Philadelphia, vol. 73, p. 353.
1922. *Murex messorius* Sowerby, Olsson, Bull. Amer. Paleont., vol. 9, No. 39, p. 303.
1925. *Murex messorius* Sowerby, Maury, Serv. Geol. Mineral. Brasil, Mon. 4, pp. 136-139, pl. 6, fig. 5.
1928. *Murex* (*Murex*) *recurvirostris* Broderip, Woodring, Carnegie Inst. Washington, Publ. No. 385, pp. 288-289, pl. 17, figs. 7, 8.
1933. *Murex (Haustellum) messorius* Sowerby, Trechmann, Geol. Mag., vol. 70, No. 823, p. 38, pl. 4, fig. 14.
1934. *Murex recurvirostris* Broderip, Rutsch, Schweiz. Palaeont. Gesell. Abh., vols. 54 and 55, p. 64, pl. 4, fig. 1.
1945. *Murex* (*Murex*) *woodringi* Clench and Pérez Farfante, Johnsonia, vol. 1, No. 17, pp. 9-10, pl. 4, figs. 1-3.
1948. *Murex woodringi* Clench and Pérez Farfante, Aguayo, Soc. Malac. "Carlos de La Torre", Rev., vol. 6, No. 2, p. 63.
1954. *Murex* (*Murex*) *recurvirostris* Broderip, Abbott, American Seashells, p. 202.
1955. *Murex* (*Murex*) *recurvirostris* Broderip, Hertlein and Strong, Amer. Mus. Nat. Hist., Bull., vol. 107, pp. 252-254.
1958. *Murex recurvirostris* Broderip, Keen, Sea Shells of Tropical West America, p. 352, fig. 336.
1959. *Murex* (*Murex*) *recurvirostris recurvirostris* Broderip, Woodring, U. S. Geol. Sur., Prof. Paper 306-B, pp. 214-215, pl. 35, figs. 5, 8; pl. 36, figs. 11, 12.

Cabo Blanco shell moderately large and with some spines, the spire relatively short, the body whorl globose, the stem or siphonal canal long and nearly perpendicular. Whorls six to seven in all, the nucleus made up of about 1-1/2 of them. The initial whorl of the nucleus is tumid, the tip loosely coiled and slightly immersed; with growth a smooth spiral carina develops, and, at the union with the conch, this is situated near the base. Junction of nucleus and conch marked by a raised axial rib. Post-nuclear whorls convex, subangular at the periphery. Early sutures narrowly channeled, the later ones finely incised and undulating. The first whorl or two is sculptured by axial folds of equal size separated by slightly wider interspaces, these crossed by three equal spiral cords with a finer thread above the topmost on the first whorl. The intercepts of the axial folds and main spiral cords are beaded. Starting with the second or third whorl of the conch, three of the axial folds develop into varices, each varix located at an interval of about 120 degrees; between the varices

there are two to three axial folds on the early whorls, generally three, but occasionally four on the later whorls, one of the folds always considerably weaker than the others. The spiral sculpture of the penultimate and ultimate whorls consists of subequal to alternating coarser and finer riblets, these crossing the varices and folds, and thickening, on the folds, into low spirally elongate nodes. On the stem of the body whorl, the spiral cords are narrow and subequal, and on the stem there are two oblique rows of thin, hollow spines, one row a little below the convexity, the anterior row some distance farther down the canal; on each row there are three spines, the spines emerging from the prolongation of each varix. On the antepenultimate and penultimate whorls there is a single short tubular spine, and on the convexity of the body whorl there are two to six spines on each varix, those of the upper row the longest, all of them open in a slit to the left, and each of them situated just to the left, or on the crest of the varix. On the forward side of each varix there is a serrately fringed narrow lamella which represents the edge of the former outer lip. At the suture, the back of each varix is joined to the front side of the varix underneath thus forming a staggered column on the spire. The varix behind the outer lip is generally the largest, and on this the uppermost spine is the thickest and longest. Aperture oval, encircled on the labium by the parietal shield, the membrane of the shield adherent on the upper part of the parietal wall, but detached and erect below where it forms a sharply triangular re-entrant at the head of the siphonal canal, the membrane merging with the side of the canal a little below the head. On the labium of the shield there are as many as 10 irregular plicae, some of them anastomosing, the stronger ones on the lower portion of the shield. Outer lip relatively thin, the rim with scalloped arches, the inner margin with 15 to 18 short denticles, the denticles usually paired from the anal notch to about the middle of the lip. Somewhat removed from the edge of the lip, and extending for a short distance within the aperture, are eight or nine widely separated plicae, the lowest situated at the entrance to the siphonal canal. The siphonal canal is broken on the anterior end of all specimens, but the canal is known to be long, moderately broad above, regularly tapering below, nearly vertical, and marked on each side of the dorsum by a well-defined axial furrow which is a prolongation from

the fringed lamella adjoining the forward side of the varix. The canal is fairly deep, and is open throughout except at the head where the membrane of the shield restricts it to a slit. Posterior canal simply notched at the outlet where it is arched over by welded growth incrementals, bordered on the left by a blob of callus, and margined below by a short ridge of callus. Surface of shell with longitudinal growth striae and lamellae.

Dimensions.—Specimen T240a, length (anterior end of canal broken away) 51 mm.; max. width (excluding spines) 31 mm.; specimen J240a, length (anterior end of canal broken away) 30 mm.; max. width (excluding spines) 18 mm.

Cabo Blanco localities.—Mare formation, in stream 250 meters south-southwest of the mouth of Quebrada Las Pailas. Two specimens; lower Mare formation, in small stream 100 meters west of Quebrada Mare Abajo. Three specimens; Mare formation at W-14, on hillside above west bank of Quebrada Mare Abajo. Two specimens and two fragments.

Comparisons.—The Recent *M. recurvirostris recurvirostris* Broderip is an Eastern Pacific shell, and is another example of a species that appeared in the Miocene and survived on both sides of the Americas. The Recent Western Atlantic form was named *M. woodringi* by Clench and Pérez Farfante. The siphonal canal on most Recent forms of *M. recurvirostris* is closed to a mere slit by the extension of the membrane from the parietal shield, but I have also seen Recent specimens with the slit more open as on our Cabo Blanco fossils. Other Recent Western Atlantic analogues of *M. recurvirostris recurvirostris* are *M. recurvirostris rubidus* Baker and the Mexican *M. recurvirostris sallasi* Rehder and Abbott, the latter with four or five intervarical folds as compared with three, or rarely four, on the Cabo Blanco shells. According to Woodring, (1959, p. 215), the number of axial ribs between the varices of *M. recurvirostris s.s.* occurring on both sides of Central America, vary from two to five.

Range and distribution.—*Murex recurvirostris recurvirostris* Broderip ranges from lower Miocene to Recent. In the lower Miocene it is reported from Puerto Rico and Brazil; in the middle Miocene it occurs in Costa Rica, the Panamá Canal Zone, the Dominican Republic, and Cuba; in the upper Miocene and Pliocene it is found

in Costa Rica and Venezuela; and in the Pleistocene it is recorded from Barbados and Costa Rica. The living shell ranges from Jamaica to northern South America in the Western Atlantic, and from Baja California to southern Ecuador in the Eastern Pacific.

Remarks.—Following is the description of the shell illustrated on Plate 47, figures 8, 9. This is so similar to the nucleus of the adult *Murex* (*Murex*) *recurvirostris recurvirostris* Broderip, that it is believed to be the embryonic form of the species.

Shell small, porcelaneous, broadly pear-shaped, the apex hardly elevated, the number of whorls about 1-1/2. Apical whorl large, bulbous, loosely coiled, the tip full, smooth, and slightly canted. Aft of the tip proper, a faint angulation appears at the finely incised suture, the angulation, as it engirdles the whorls, developing gradually into a strong, smooth, rounded keel. Above the keel there are four or five barely discernible microscopic spiral lines, the surface of this portion of the whorl appearing to be vaguely shagreened under certain light conditions. Below the keel there are half a dozen or so microscopic lines, and over the whole of the last whorl there are extremely feeble axial folds interrupted only by the keel. Across the ventral face, and in line with the suture, there is a subdued angulation which becomes evanescent on the dorsum. Aperture large, more or less ovate, plugged with a cemented sand filling, apparently widest at the middle. Outer lip broken away, but seemingly joined to the whorl at nearly a right angle. Columella callused, the callus heavy and the margin detached at the base but thinning out to a mere wash on the parietal wall. Terminal notch rather large, semicircular, undercutting the base of the columella. The length is 1.5 mm., and the maximum width 1.2 mm. The shell was collected in the Mare formation at W-14, on the hillside above the west bank of Quebrada Mare Abajo, from which locality four adult specimens were also obtained.

Murex (Murex) chrysostomus Sowerby **Pl. 25, figs. 17, 18**

1834. *Murex chrysostoma* 'Gray', Sowerby, The Conchological Illustrations, pl. 58, fig. 1, with name in the catalogue of species, p. 1, No. 8.
1845. *Murex bellus* Reeve, Conch. Icon., vol. 3, *Murex,* pl. 21, sp. 84.
1864. *Murex chrysostoma* Gray, Krebs, The West Indian Marine Shells, p. 19.
1878. *Murex chrysostomus* Gray, Mörch, Catalogue of West-India Shells, p. 11.
1880. *Murex chrysostoma* Gray, Tryon, Man. Conch., vol. 2, pp. 82-83, pl. 13, figs. 135, 136.

1937. *Murex chrysostomus* Sowerby, Smith, East Coast Marine Shells, p. 115, pl. 43, fig. 4.
1945. *Murex* (*Murex*) *chrysostoma* Sowerby, Clench and Pérez Farfante, Johnsonia, vol. 1, No. 17, pp. 10-12, pl. 5, figs. 1, 2.
1953. *Hexaplex* (*Phyllonotus*) *chrysostomus* (Sowerby), Haas, Fieldiana-Zoology, vol. 34, No. 20, p. 204.
1958. *Murex chrysostoma* Gray, Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, p. 84.

Venezuelan shell moderately large, broadly diamond-shaped except for the attenuate canal, the spire fairly low, the angle of divergence near 85 degrees. Sutures fine, the later ones undulating. Whorls eight including the nucleus, the 1-1/2 volutions of the nucleus smooth, subhyaline and swollen, the initial obtuse at the apex, the last sharply defined from the conch by the first axial rib. The earliest post-nuclear whorls are convex, the later ones shouldered submedially, the slope of the ramp moderately steep and widening with growth, the sides below the shoulder or periphery short and inclined a little inward. Sculpture of the first 1-1/2 whorls or so consisting of broad subequal axial folds crossed by three raised spiral cords; later, three of the folds develop into strong elevated rounded varices, the back of each varix, at the suture, joined to the front of the varix underneath, thus forming a staggered column on the spire. On the forward side, each varix develops a lamellar fringe raised slightly above the surface and serrate at the margin, this margin forming the edge of the outer lip. Between the varices there are usually two, but occasionally three axial folds or costae which are knobby to subspinose. On all specimens the most protuberant of the knobs is the one at the shoulder of the body whorl on the axial fold lying between the labral and dorsal varices, but closer to the latter. There is usually one, but sometimes two axial folds to the left of the aforementioned, and these weaken toward the outer lip as well as toward the base. On the uppermost post-nuclear whorls the axial folds and varices are of about the same size, and are crossed by three or four nearly equal spiral cords. Lower, the spiral sculpture consists of raised riblets and threads, the riblets often thickened in the spiral direction into projecting keels on both the varices and axial folds. Aperture large, suboval. Parietal shield adherent above, but below, the distal margin is detached and membranous, the strong membrane curving sharply inward at the head of the siphonal

canal which it nearly closes, leaving a narrow slit as it continues down the stem. Parietal lip with about nine short, irregular, subparallel plicae, the anteriormost of which is near the head of the canal at the curve of the shield. Outer lip thin, scalloped to serrate along the edge, the inner margin with as many as 16 lirae or denticles, the lirae continuing a short distance into the aperture, the posterior ones often paired. The last varix lies behind the rim of the lip. One specimen—the one illustrated—has a rather wide and deep channel beneath the labral varix, the channel extending from the anal notch to the siphonal canal. The inner margin of this channel is thickened a little and edged with about 11 blunt denticles. The channel is incipient on another specimen but is absent on the remaining ones. The siphonal canal is broken away on all specimens and is therefore longer than that shown in the illustration. The canal of the body whorl under the convexity is marked with two furrows or creases, one on the ventral side leading from the fringe of the varix and terminating against the membrane about halfway down the stem of the canal, the other on the dorsal side leading from the fringe of the dorsal varix and continuing farther down the stem than the ventral furrow. On the prolongation of the labial varix, opposite the incurve of the parietal shield, there is a slender, pointed, hollow spine with its slit on the left. There is also a spine at the side of the siphonal canal on the prolongation of the labral varix a little below the head of the canal, and this spine points away from the side and is open on the ventral face. Whether there are additional spurlike spines farther down the canal is not determinable. Anal or posterior notch short, subtriangular, bordered to the left and below by a thickened irregular ridge of callus. The little color that remains is a light brownish orange in blobs below the suture and in interrupted lineations on the spiral cords of the dorsum.

Dimensions.—Figured specimen (siphonal canal incomplete), length 51 mm.; max. width 35.5 mm.; length of aperture 19 mm.; max. width of aperture 12.5 mm.

Localities.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. Four specimens; lower Mare formation, in small stream 100 meters west of Quebrada Mare Abajo. One specimen.

Remarks.—The Cabo Blanco fossils referred to *M. chrysostomus* seem identical with the Recent shell which has been reported from Tobago, Trinidad, Venezuela (Cumaná and the Island of Margarita), and Brazil.

Murex (Phyllonotus) pomum Gmelin Pl. 26, figs. 1, 2

1791. *Murex pomum* Gmelin, Syst. Nat., ed. 13, vol. 1, pt. 6, p. 3527.
1822. *Murex asperrimus* Lamarck, An. sans Vert., vol. 7, p. 164.
1841. *Murex asperrimus* Lamarck, d'Orbigny, Voyage dans l'Amérique Méridionale, vol. 5, pt. 3, Mollusca, p. 452.
1845. *Murex asperrimus* Lamarck, Deshayes, An. sans Vert., vol. 9, p. 576.
1845. *Murex pomum* Gmelin, Reeve, Conch. Icon., vol. 3, *Murex,* pl. 9, sp. 35.
1845. *Murex oculatus* Reeve, Conch. Icon., vol. 3, *Murex,* pl 9, fig. 36.
1852. *Murex mexicanus* Petit de la Saussaye, Jour. Conchyl., vol. 3, p. 51, pl. 2, fig. 9.
1852. *Murex pomiformis* 'Martini', Mörch, Cat. Conchyl. Comes de Yoldi, p. 96.
1852. *Murex globosa* Emmons, North Carolina Geol. Sur., Rept., p. 247, fig. 105a.
1863. *Murex globosa* Emmons, Conrad, Acad. Nat. Sci. Philadelphia, Proc. for 1862, p. 60.
1864. *Murex pomiformis* Martini and *Murex oculatus* Reeve, Krebs, The West Indian Marine Shells, pp. 21, 22.
1878. *Murex pomiformis* Martini, Mörch, Catalogue of West India Shells, p. 11.
1880. *Murex pomum* Gmelin, Tryon, Man. Conch., vol. 2, p. 97, pl. 20, fig. 182.
1889. *Murex pomum* Gmelin, Dall, U. S. Nat. Mus., Bull. 37, p. 120, pl. 16, fig. 2.
1890. *Murex pomum* Gmelin, Dall, Wagner Free Inst. Sci., Trans., vol. 3, pt. 1, p. 142.
1901. *Murex* (*Phyllonotus*) *pomum* Gmelin, Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, p. 408.
1913. *Murex pomum* Gmelin, Brown and Pilsbry, Acad. Nat. Sci. Philadelphia, Proc., vol. 65, p. 495.
1917. *Murex pomum* Gmelin, Pilsbry and Brown, Acad. Nat. Sci. Philadelphia, Proc., vol. 69, p. 34.
1922. *Murex* (*Phyllonotus*) *pomum* Gmelin, Maury, Bull. Amer. Paleont., vol. 9, No. 38, p. 96.
1923. *Murex pomum* Gmelin, Clench, Nautilus, vol. 37, No. 2, p. 55.
1924. *Murex pomum* Gmelin, Emery, Nautilus, vol. 38, No. 2, p. 61.
1926. *Murex pomum* Gmelin, Weisbord, Nautilus, vol. 39, No. 3, p. 85.
1928. *Murex* (*Phyllonotus*) *pomum* Gmelin, Woodring, Carnegie Inst. Washington, Publ. No. 385, p. 290, pl. 17, fig. 9.
1930. *Murex pomum* Gmelin, Mansfield, Florida Geol. Sur., Bull. No. 3, p. 83, pl. 11, fig. 9.
1935. *Murex pomum* Gmelin, Richards, Jour. Paleont., vol. 9, No. 3, p. 257.
1937. *Murex* (*Phyllonotus*) *pomum* Gmelin, Smith, East Coast Marine Shells, p. 115, pl. 43, fig. 3.
1938. *Murex pomum* Gmelin, Richards, Geol. Soc. Amer., Bull., vol. 49, p. 1293.
1940. *Murex pomum* Gmelin, Stubbs, Jour. Paleont., vol. 14, No. 5, p. 512.
1942. *Murex pomum* Gmelin, Jaume and Pérez Farfante, Soc. Cubana Hist. Nat. "Felipe Poey" Mem., vol. 16, No. 1, p. 41.
1944. *Murex pomum* Gmelin, Patterson, Nautilus, vol. 58, No. 2, p. 59.
1944. *Murex pomum* Gmelin, Hackney, Nautilus, vol. 58, No. 2, p. 61.

1945. *Murex* (*Phyllonotus*) *pomum* Gmelin, Clench and Pérez Farfante, Johnsonia, vol. 1, No. 17, pp. 26-28, pl. 14, figs. 1-3.
1948. *Murex* (*Phyllonotus*) *pomum* Gmelin, Gardner, U. S. Geol. Sur., Prof. Paper 199-B, p. 219, pl. 29, figs. 22, 24.
1951. *Murex pomum* Gmelin, Rogers, The Shell Book, pp. 31-32, pl. 3, fig. 1.
1952. *Murex pomum* Gmelin, Pulley, Texas Jour. Sci., vol. 4, No. 2, p. 175, pl. 3, fig. 1.
1953. *Murex* (*Phyllonotus*) *pomum* Gmelin, Olsson and Harbison, Acad. Nat. Sci. Philadelphia, Mon. No. 8, p. 243, pl. 34, fig. 1.
1954. *Murex* (*Phyllonotus*) *pomum* Gmelin, Abbott, American Seashells, pp. 202-203, pl. 10L.
1955. *Murex* (*Phyllonotus*) *pomum* Gmelin, Perry and Schwengel, Marine Shells of the Western Coast of Florida, p. 153, pl. 30, fig. 214.
1958. *Murex* (*Phyllonotus*) *pomum* Gmelin, DuBar, Florida Geol. Sur. Geol., Bull. No. 40, p. 196.
1958. *Murex pomum* Gmelin, Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 15.
1958. *Murex* (*Phyllonotus*) *pomum* Gmelin, Abbott, Acad. Nat. Sci. Philadelphia, Mon. No. 11, p. 61.
1958. *Murex pomum* Gmelin, Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, p. 85.
1959. *Murex pomum* Gmelin, Nowell-Usticke, A Check List of the Marine Shells of St. Croix, p. 63.

Shell moderately large and sturdy. Whorls estimated at eight in all, the apex decollate, the earliest post-nuclear whorls convex, the later ones subangulate at the shoulder, the body whorl inflated, the ramp above the shoulder on the last two whorls rather wide and a little concave. Sutures finely incised, undulatory. Axial sculpture of later whorls consisting of three strong, elevated, subangular, equidistant varices, the varices staggered from whorl to whorl, the back side of each varix joined, at the suture, with a weld of callus to the forward side of the varix on the whorl below. The early post-nuclear whorls are sculptured by subequal axial riblets extending from suture to suture, the riblets reticulated by spiral threads. Later, three of the axial riblets develop into varices, and between the varices are two knobby ridges, one of them generally the larger. On the body whorl there may be but one intervarical ridge, not reaching the suture or base, the ridge often as high and sometimes higher than the varices. The forward side of each varix is built up of scalloped and fluted incremental lamellae representing the former outer lip. Toward the base and on the labral side of the siphonal canal the flutings of the lamellae are produced into vaulted arches or short spines open toward the aperture. Spiral sculpture consisting, on the body whorl, of six elevated, subrounded primary cords on

the convexity, and two such cords on the base, the anterior one of the latter adjoining the former siphonal canal. On the varices and intervarical ridges the cords thicken in the spiral direction into elongated nodes. Between the spiral cords are spiral threads of three ranks, and the cords themselves are traversed by minor threads. Surface also marked with fine axial laminae producing minute scales or crenulations on all of the spiral threads. Aperture large, oval. Outer lip with about 14 denticles or lirae along the inner margin, some of the lirae tending to occur in pairs, the spaces between the lirae developing into flutings toward the base, the rim of the lip scalloped. Parietal lip reflected over and adherent to the body whorl, except along the distal edge which is erect. On the lower half of the parietal lip, some distance from the edge, there are six to nine short, somewhat irregular plicae, and on the upper part of the parietal wall two or three of the external cords of the body are reflected through the callus as low swellings or welts. Anterior canal fairly short, slightly curved to the right, bent back a little at the end, flattened on the columellar side into a finely rugose plastron, the labral side of the canal with two or three flutings along the edge, the extremity of the canal formed into a deep unemarginate recumbent notch narrowing somewhat toward the canal proper. Bordering the plastron is an elevated tubular ridge of the former siphonal canal, the base of the tube open and curved upward over the edge of the plastron. Posterior outlet a simple broad shallow channel arched over by the edge of the parietal callus where it joins the outer lip. Bordering the outlet on the upper part of the parietal wall is a welt or ridge of callus which may enter the aperture for a short distance.

Dimensions.—Figured specimen, length (apex decollate) 76 mm.; max. width 49 mm.

Localities.—Lower Mare formation, in small stream 100 meters west of Quebrada Mare Abajo. One specimen; lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo; Mare formation at W-14, on hillside above west bank of Quebrada Mare Abajo. One specimen; Mare formation, in stream 250 meters south-southwest of the mouth of Quebrada Las Pailas. One specimen.

Range and distribution.—The chronologic range of *M. pomum* is from mid-Miocene to Recent. The geographic range of the living species, which inhabits shallow water, is from North Carolina to Brazil. As a fossil, *M. pomum* is reported from the following localities:

Pleistocene—Louisiana: New Orleans pumping station No. 7. Florida: Lock No. 3, Caloosahatchee Canal; Gandy bridge fill between Tampa and St. Petersburg. Cuba: Mariel Bay and Guantánamo Bay, Panama Canal Zone: Black Swamp near Mount Hope.

Pliocene—North Carolina: Waccamaw formation. Florida: Sanford (in well at 85-95 feet); De Leon Springs; North St. Petersburg; Alligator Creek.

Upper Miocene—Florida: Choctawhatchee formation (*Cancellaria* zone), north-central part of State.

Middle Miocene: Jamaica (Bowden beds). Colombia: near Cartagena.

The Cabo Blanco forms described in this paper are believed to be Pliocene in age.

Murex (Chicoreus) brevifrons Lamarck **Pl. 48, figs. 1, 2**

1810. *Murex ramosus* Denys de Montfort, Conchyliologie Systématique, vol. 2, p. 611 and plate. Not *Murex ramosus* Linnaeus, 1758.
1822. *Murex brevifrons* Lamarck, An. sans Vert., vol. 7, p. 161. Figure refers to Martini, 1777, Conchylien-Cabinet, vol. 3, pl. 103, fig. 983.
1822. *Murex calcitrapa* Lamarck, An. sans Vert., vol. 7, p. 162.
1845. *Murex calcitrapa* Lamarck, Reeve, Conch. Icon., vol. 3, *Murex,* pl. 3, sp. 13.
1845. *Murex crassivaricosa* Reeve, Conch. Icon., vol. 3, *Murex,* pl. 9, sp. 33.
1845. *Murex pudoricolor* Reeve, Conch. Icon., vol. 3, *Murex,* pl. 33, sp. 171.
1846. *Murex purpuratus* Reeve, Conch. Icon., vol. 3, *Murex,* pl. 35, sp. 183.
1864. *Murex brevifrons* Lamarck, Krebs, The West Indian Marine Shells, p. 18.
1878. *Murex brevifrons* Lamarck, Mörch, Catalogue of West-India Shells, p. 11.
1876. *Murex cornurectus* Guppy, Geol. Soc. London Quart. Jour., vol. 32, p. 521, pl. 28, fig. 4.
1879. *Murex approximatus* Sowerby, Thes. Conchyl., vol. 4, *Murex,* p. 13, pl. 7, fig. 62.
1881. *Murex calcitrapa* Lamarck, Gabb, Acad. Nat. Sci. Phila. Jour., ser. 2, vol. 8, p. 350.
1887. *Murex brevifrons* var. *calcitrapa* Lamarck, Heilprin, Wagner Free Inst. Sci., Trans., vol. 1, p. 68.
1889. *Murex brevifrons* Lamarck, Lorié, Samml. Geol. Reichs-Mus. Leiden, ser. 2, vol. 1, pp. 136, 142.
1889. *Murex* (*Chicoreus*) *brevifrons* Lamarck, Dall, U. S. Nat. Mus., Bull. 37, p. 118.
1901. *Murex* (*Chicoreus*) *brevifrons* Lamarck, Dall and Simpson, U. S. Fish Com., Bull., vol. 20, for 1900, pt. 1, p. 407.

1917. *Murex* (*Phyllonotus*) *cornurectus* Guppy, Maury, Bull. Amer. Paleont., vol. 5, No. 29, p. 267, pl. 16, figs. 9, 10.
1920. *Murex* (*Phyllonotus*) *cornurectus* Guppy, Hubbard, New York Acad. Sci. Scientific Survey of Porto Rico and the Virgin Islands, vol. 3, pt. 2, p. 150.
1921. *Murex* (*Chicoreus*) *brevifrons* Lamarck, Pilsbry, Acad. Nat. Sci. Philadelphia, Proc., vol. 73, p. 352.
1922. *Murex* (*Chicoreus*) *brevifrons* Lamarck, Maury, Bull. Amer. Paleont., vol. 9, No. 38, p. 96.
1922. *Murex cornurectus* Guppy, Olsson, Bull. Amer. Paleont., vol. 9, No. 39, pp. 303-304.
1925. *Murex brevifrons* Lamarck, Maury, Serv. Geol. Mineral. Brazil, Mon. 4, p. 130, pl. 6, fig. 9.
1925. *Murex* (*Phyllonotus*) *cornurectus* Guppy, Maury, Bull. Amer. Paleont., vol. 10, No. 42, pp. 365-366.
1937. *Murex* (*Chicoreus*) *brevifrons* Lamarck, Smith, East Coast Marine Shells, p. 114, pl. 44, fig. 2.
1945. *Murex* (*Chicoreus*) *brevifrons* Lamarck, Clench and Pérez Farfante, Johnsonia, vol. 1, No. 17, pp. 28-31, pl. 15, figs. 1, 2; pl. 16, figs. 1, 2.
1953. *Murex* (*Chicoreus*) *brevifrons* Lamarck, Olsson and Harbison, Acad. Nat. Sci. Philadelphia, Mon. No. 8, p. 244, pl. 36, fig. 2.
1954. *Murex* (*Chicoreus*) *brevifrons* Lamarck, Abbott, American Seashells, p. 203, pl. 10a.
1958. *Murex (Chicoreus) brevifrons* Lamarck, DuBar, Florida Geol. Sur. Geol., Bull., No. 40, pp. 196-197, pl. 12, fig. 1.
1958. *Murex brevifrons* Lamarck, Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, p. 85.
1959. *Murex brevifrons* Lamarck, Rodriguez, Bull. Marine Sci. of the Gulf and Caribbean, vol. 9, No. 3, p. 276.
1959. *Murex brevifrons* Lamarck, Nowell-Usticke, A Check List of the Marine Shells of St. Croix, p. 62.
1959. *Murex* (*Chicoreus*) *brevifrons* Lamarck, Woodring, U. S. Geol. Sur., Prof. Paper 306-B, pp. 216-217, pl. 35, figs. 11-13.

Shell large, thick, sturdy, broadly biconical. The five remaining whorls of the single specimen are subangulate at the shoulder, and the ramp slope above the shoulder is a little concave. Sutures finely incised, undulatory. Whorls with three large, elevated, subangular, equidistant varices, the back of each varix joined at the suture with the forward side of the varix of the succeeding whorl. Between each varix, on the ultimate and penultimate whorls, there is a single knobby axial fold at the shoulder, the fold not so high as the varix, and not reaching the suture but becoming obsolescent at the edge of the ramp; on earlier whorls there are one or two intervarical ridges, and one of these, if there are two, is larger than the other. The forward side of each varix is built up of scalloped, fluted, and openly spinose lamellae representing the former outer lip. The lamellae of these former lips and of the present true lip form vaulted

arches many of which are produced into spines (most of the latter broken down to their base), the spines always open toward the aperture, the lamellae encroaching on the varix to the crest. Spiral sculpture consisting of triangular, sharp-crested ridges of which there are six on the convexity of the body whorl as well as two primary ridges on the base, the anterior of those two much the larger and convex, and representing the former siphonal canal. Between the major ridges are numerous spiral threads of three ranks, and the ridges themselves are traversed by minor threads. All of the spiral threads are crenulated or beaded, the beads narrow and elongated axially. Aperture broadly oval. Outer lip with seven paired denticles along the inner margin, the spaces between the pairs fluted, the rim scalloped, the area between the rim and the varix composed of incremental lamellae produced into vaulted arches and open spines. Parietal lip thickly callused, the callus smooth and adherent throughout except over the posterior part of the basal plastron where it forms a roof. Siphonal canal rather long, wide, and deep, curved to the right and bent slightly backward near the end, bordered on the left by a long and moderately wide flattened area termed here the plastron. The distal edge of the plastron is bordered by the elevated former canal, that being open at the basal end. Posterior outlet a simple broad channel, bordered on the parietal side by a rather sharp narrow ridge which enters rather far into the aperture.

Dimensions.—Length (apex missing) 129 mm.; max. width 84 mm.

Locality.—Upper Mare formation, 115 meters south-southwest of crossing of Quebrada Mare Abajo with coast road. One specimen.

Remarks.—Woodring (1959, p. 216) mentions the occurrence of *M. brevifrons* at Cabo Blanco, Venezuela. Specimen, E242a, also from Cabo Blanco, is identical with Woodring's (U. S. National Museum No. 18253-CB5) which was collected by him 17 Sept. 1951, at the same locality as was this specimen. The Cabo Blanco shell seems broader and heavier than most Recent examples of *M. brevifrons* I have seen, but it undoubtedly falls within the normal range of variation of the species. The spines of *M. brevifrons* are typically frondose but the character of the spines of the Cabo Blanco specimens cannot be determined as they are broken.

Range and distribution.—Murex (*Chicoreus*) *brevifrons* ranges from lower Miocene to Recent. It has been reported from the lower Miocene of Puerto Rico and Brazil; the middle Miocene of Costa Rica, the Panamá Canal Zone, Venezuela, and the Dominican Republic; the upper Miocene of Trinidad; and the Pliocene of Venezuela Costa Rica, and Florida. The living shell ranges from Florida to Brazil.

Murex (Chicoreus ?) brevifrons ? Lamarck Pl. 26, figs. 5, 6

Shell fairly young, of medium size, worn, moderately thin, spinose. Spire nearly one-third the length of the shell, the angle of divergence, measured between varices, about 60 degrees. Whorls a little over seven in all, including the nucleus. Nucleus smooth, mammiliform, composed of two whorls, the initial one full and scarcely coiled, the last highly convex and rapidly expanding, the intermediate turn much swollen and with a few vague humps. First post-nuclear whorl rounded, sculptured by 13 axial folds more or less equal in size, crossed by three equal spiral threads which are a little thickened on the crest of the axial folds. Later whorls are subangulate at the shoulder, and the ramp above the shoulder is slightly concave. Each whorl bears three sharp, elevated, subspinose to spiney varices. Between each varix there are two axial folds, both of them of equal size at first, but one of them becomes much the larger as growth progresses. Crossing the axials are three low beaded spiral cords (one each at the shoulder, periphery and near the base) and closely spaced beaded spiral threads. On the penultimate whorl one of the two intervarical folds becomes obsolescent, but there appear more numerous spiral threads of several sizes, these occurring in the interspaces and on the flanks of the primary cords. Throughout there are many subequally spaced fine axial growth laminae. These produce crenations or beads on all of the spiral cords and threads, the beads narrow, and elongated axially. Each varix bears, or tends to bear short vaulted arches or spines, the spines often frondose. On the body whorl there are six primary spiral cords on the convexity and several on the stem. The spines are formed at the intersection of each primary spiral cord with the varix, and thus each varix of the earlier whorls has three spines or

scabrous arches. On the body whorl, the last varix behind the outer lip has 9 or 10 spiny projections, the one just below the anal notch is the longest, this one hollowed, like all of the others, along the side facing the aperture. Sutures very fine and undulatory. Aperture oval. Outer lip varicated behind, frilled and scalloped at the rim, lirated and fluted along the inner margin, the lirae 12 in number and occurring in pairs, the largest fluting occurring at the posterior canal and under the posteriormost spine, the flutings V-shaped. Parietal lip relatively narrow, the distal margin adherent except at the head of the siphonal canal where it forms a roof, the membrane of the roof continuing along the columellar side of the canal as a narrow plastron. The canal itself is fairly long, narrow, open, and curved to the right. Posterior outlet a V-shaped notch arched over by the edge of the parietal callus and the rim of the outer lip, the notch bordered on the upper part of the parietal wall by a ridge which enters the aperture for some distance. Former siphonal canal convex, made up of spiral threads, elevated above and adjacent to the distal margin of the plastron.

Dimensions.—Figured specimen, length 32 mm.; max. width 15.2 mm.; length of spire 12 mm.; length of aperture 9 mm. No. 26201 PRI.

Locality.—La Salina, west of Puerto Cabello, State of Carabobo. Four specimens, all of them worn or broken.

Remarks.—The numerous finely crenated spiral threads, and the frondose character of such of the longer spines that have not been completely worn down, suggest that the species in question may be *M. brevifrons* Lamarck. The description of the shell is a composite from four mutilated specimens in the youthful stage of development.

Murex (Favartia) puntagordanum, new species Pl. 26, figs. 7, 8

Shell small, with a little over five whorls including the nucleus. Nucleus smooth, consisting of about 1-1/4 whorls, the tip loosely coiled and somewhat immersed, the last turn narrow and rounded. Post-nuclear whorls shouldered, the sculpture consisting of axial folds which later develop into varices, and spiral riblets of which there are three to five on the whorls of the spire. On the body whorl there are six high narrow varices and seven or eight strong, elevated, flat-topped primary spiral ribs separated by deep interspaces in

either side of which there is a spiral thread close to the primary rib. On the whorls of the spire, the spiral riblets are narrow and tend to bifurcate on the crest of the axial folds and varices. On the ramp above the shoulder, spiral lineations are wanting or obsolescent throughout although the varices continue across the ramp to the suture. All of the six axials on the body whorl are true varices, and these are built up by incremental growth laminae into short spines whose tips are bent backward, the spines being channeled below the tip with the hollows open toward the aperture. These spines or pointed arches are produced on the narrow crest of the varices at the crossing or intercept of the spiral primary rib, and thus there are as many spines as there are spiral ribs on each varix. Surface of shell traversed with growth lamellae and it is these which, by incrementation at the varix, produce the "cellular" structure or spines. Aperture asymmetrically oval, the entrance to the siphonal canal wide, the posterior outlet covered over by the callus of the parietal shield. Outer lip with about seven denticles along the inner margin, the varix rising from the rim. Previous siphonal canal prominent, convex, bordered by an unbilicate depression. Present siphonal canal broken at the anterior end, but is probably relatively short.

Dimensions.—Holotype (anterior end of canal severed off), length 13 mm.; max. width (including varices), 8 mm.

Type locality.—Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. The single specimen on which the species is founded is worn and broken.

Comparisons.—*M. puntagordanum*, n. sp. is like the Pliocene to Recent *M. cellulosus* Conrad and particularly the subspecies *leviculus* Dall (see Clench and Pérez Farfante 1945, pp. 53-56, pl. 27, figs. 5-8; pl. 28, figs. 1-3). Although more specimens of the Venezuelan fossil are needed for a comparative study, *M. puntagordanum* seems to differ from *M. cellulosus* and its variants in having fewer whorls (5-1/2 as compared with 7 to 8) and in its much wider entrance to the siphonal canal.

Drupa (Morula) nodulosa (C. B. Adams) Pl. 26, fig. 9-11

1845. *Purpura nodulosa* C. B. Adams, Boston Soc. Nat. Hist. Proc., vol. 2, pp. 2-3.
1864. *Recinula nodulosa* (Adams) Krebs, The West Indian Marine Shells, p. 27.

1880. *Ricinula nodulosa* (C. B. Adams), Tryon, Man. Conch., vol. 2, p. 190, pl. 59, fig. 275.
1891. *Ricinula nodulosa* (C. B. Adams), Baker, Acad. Nat. Sci. Philadelphia, Proc., vol. 43, p. 51.
1895. *Ricinula (Sistrum) nodulosa* (C. B. Adams), Gregory, Geol. Soc. London Quart. Jour., vol. 51, p. 288.
1901. *Sistrum nodulosum* (C. B. Adams), Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, p. 411.
1922. *Sistrum nodulosum* (C. B. Adams), Olsson, Bull. Amer., Paleont.,, vol. 9, No. 39, p. 305, pl. 10, fig. 23.
1922. *Sistrum nodulosum* (C. B. Adams), Remington, Nautilus, vol. 35, No. 4, p. 121.
1922. *Sistrum nodulosum* (C. B. Adams), Maury, Bull. Amer. Paleont., vol. 9, No. 38, p. 101.
1924. *Sistrum nodulosum* (C. B. Adams), Emery, Nautilus, vol. 38, No. 2, p. 61.
1939. *Sistrum nodulosum* (C. B. Adams), Smith, An Illustrated Catalog of the Recent Species of Rock Shells, p. 31, No. 467, pl. 19, fig. 13.
1937. *Sistrum nodulosum* (Adams), Smith, East Coast Marine Shells, p. 118, pl. 45, fig. 4
1946. *Drupa nodulosa* (C. B. Adams), Jaume, Soc. Malac. "Carlos de La Torre" Rev., vol. 4, No. 3, p. 107.
1947. *Sistrum nodulosum* (C. B. Adams), Clench, Johnsonia, vol. 2, No. 23, p. 91.
1950. *Purpura nodulosa* C. B. Adams, Clench and Turner, Occas. Papers on Mollusks, vol. 1, No. 15, p. 318, pl. 32, fig. 10.
1954. *Drupa nodulosa* (C. B. Adams), Abbott, American Seashells, p. 211, pl. 25v.
1958. *Drupa nodulosa* (C. B. Adams), Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 16.
1958. *Drupa nodulosa* (C. B. Adams), Abbott, Acad. Nat. Sci. Philadelphia, Mon. No. 11, pp. 63-64.
1958. *Drupa nodulosa* (C. B. Adams), Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, p. 87.
1959. *Drupa nodulosa* (C. B. Adams), Nowell-Usticke, A Check List of the Marine Shells of St. Croix, p. 63.

Three weathered specimens, one Recent, the other two fossil, are believed referable to this species. Typically, *D. nodulosa* has black nodules with occasional white spots between the tubercles. My Recent specimen has brown nodules and a varicated and denticulate outer lip.

Dimensions.—Recent specimen (A115a), length 11 mm.; max. width 6 mm.; fossil specimen (D115b), length 11 mm.; max. width 6 mm.

Localities.—Recent, on beach at Playa Grande Yachting Club, Distrito Federal. One worn specimen; Abisinia formation at W-30, eastern edge of Playa Grande village. Two poorly preserved specimens.

Range and distribution.—Middle Miocene at Red Creek Cliff,

Costa Rica (Olsson), Pleistocene of Barbados (Gregory), and Recent. The living shell is commonly found under rocks in shallow water and ranges from Biscayne Bay, Florida, south to Brazil.

Remarks.—Recent specimens of *D. nodulosa* from the Florida Keys fall into two categories: denticulate and nondenticulate. The denticulate variation has a varicated outer lip, the inner margin of which is armed with four prominent beads below the posterior canal, and an inner lip with three irregular folds. The outer lip of the nondenticulate variation is thin, scalloped along the edge, and fluted along the inner margin, with the inner lip smooth. These differences are probably related to the sex of the animal.

Drupa (Morula) gilbertharrisi, new species Pl. 26, figs. 12-14

Shell of medium size, slenderly biconical, the spire acuminate, a little shorter than the body. Whorls 8½ in all, the smooth nucleus composed of 1-1/2 of them. Initial turn of the nucleus somewhat globose and a little inclined, the last spirally carinate, the carina starting at the top of the whorl and descending obliquely to the conch where it is then at the middle of the whorl. The nucleus is defined from the conch by a narrow axial groove on the forward side of which the sculpture of the shell begins. First three post-nuclear whorls slightly convex, bearing strong nodulose evenly spaced axial costae and three plain spiral cords separated by equal interspaces, the cords connecting the nodules and passing across them in diminished strength. Remaining whorls moderately convex, with 12 equal tuberculate axial folds, each fold with three tubercles, the tubercles becoming progressively more elongate spirally on the lower portion of the shell, the right half of each tubercle a little more attenuated than the left, the drawn and somewhat sunken ends tending to join those of the adjacent tubercles. Between each row of tubercles there are two or three raised spiral threads or cords, the threads crenulated, beaded, or rendered scabrous by the numerous fine axial lamellae which traverse the surface, Body whorl with two to four raised spirals between each row of tubercles, the top and bottom ones in the interspace lying immediately adjacent to the row of tubercles; where the spiral thread is present, and this is generally the case, it lies about midway between the other two, and is slightly larger; where

four spiral cords are present the middle two are about equal and are larger than the ones above and below. Sutures fine. Anterior fasciole prominent, convex, marked with 8 to 10 strong cords crossed by 6 vaulted growth incrementals. Between the fasciole and the inner lip there is an umbilicus-like depression. Aperture lenticular Outer lip thickened behind by an axial fold larger than the ones on the dorsum, the forward side of the fold built up with vaulted axial lamellae. Rim of outer lip frilled or closely scalloped. Interior of outer lip armed with five rounded denticles, the uppermost bordering the posterior canal; the topmost of the four remaining denticles is the largest of all and is situated a little above the middle of the lip; the three denticles below are subequal in size, the lowest one lying near the entrance to the siphonal canal. Inner lip with a white callus, adherent on the partietal wall but the distal edge detached and sheath-like below. Columella with three raised welts, the uppermost roundish, the next, close by, larger and horizontally elongate, the lowest a faint fold or plica. Anterior canal relatively long and deep, excavated into a small U-shaped terminal notch. Posterior canal shallow and fairly broad, bordered below on the parietal side by a thickening of callus which partially covers the last tubercle on the spiral cord extending across the upper portion of the parietal wall. The ground color of the surface and of the aperture is pure white. The tubercles of the ultimate and penultimate whorls are light brown. On the 2 whorls above the penultima, the upper and lower rows of tubercles are brown, the middle one glassy white. On the next whorl above, the tubercles are brown only on the topmost row, and above that the whorls are wholly of an off-white shade.

Dimensions.—Holotype, length 21 mm.; max. width 9.8 mm.

Type locality.—Lower Mare formation, in stream 100 meters west of Quebrada Mare Abajo. One specimen, the holotype.

Remarks.—This is a handsome shell, especially as seen under the lens which reveals the fine spiral threads and axial lamellae. There is only one specimen in the collection, but this is excellently preserved. The species is named in honor of Gilbert D. Harris, Professor of stratigraphy and paleontology for many years at Cornell University, and founder of the Paleontological Research Institution.

I am somewhat in doubt about the generic classification of this interesting shell, although except for its slenderness and smaller no-

dules it seems to fit the genus *Drupa* of Röding as exemplified by *D. nodulosa* (C. B. Adams) (see Clench and Turner, 1950, p. 318, pl. 32, fig. 10). What is now referred to as *Drupa nodulosa* (see Abbott, 1945, p. 211, pl. 25v) was formerly known under the genus *Sistrum* (see, among others, Smith, 1939, pl. 19, fig. 13, and Dall and Simpson, 1901, p. 311), and still earlier as *Ricinula* (*e.g.* Tryon 1880, p. 190, pl. 59, fig. 275). Fischer (1887, p. 646) was of the opinion that both *Sistrum* Montfort, 1810 and *Ricinula* Lamarck, 1812 were synonymous with *Pentadactylus* Klein, 1753, but the latter name has not gained acceptance. The armature of *D. gilbertharrisi* is similar to that of *D. nodulosa* and the two are comparable generically. Specifically, however, *D. nodulosa* and *D. gilbertharrisi* are entirely distinct as *D. nodulosa* is stubbier and more coarsely tuberculate. I have seen no species closely related to *D. gilberharrisi* although the recent *Phos lannumi* Schwengel (1951a, pp. 80-81, pl. 5, fig. 3) from the Island of Guam in the Pacific has much the same shape and general ornamentation. It differs from *D. gilbertharrisi*, however, in details of sculpture and has seven heavy ridges on the inner side of the outer lip. *Drupa didyma* Schwengel (1943a, pp. 76-77, pl. 7, fig. 7), dredged in 200 feet off Palm Beach, Florida, has larger and fewer nodules than the Venezuelan fossil, and sharper lirae along the inner margin of the outer lip.

Purpura patula (Linnaeus) Pl. 26, figs. 15, 16

1758. *Buccinum patulum* Linnaeus, Syst. Nat., ed. 10, p. 739.
1846. *Purpura patula* (Linnaeus), Reeve, Conch. Icon., vol. 3, pl. 1, sp. 3.
1864. *Purpura patula* (Linnaeus), Krebs, The West Indian Marine Shells, p. 26.
1878. *Purpura patula* (Linnaeus), Mörch, Catalogue of West-India Shells, p. 11.
1880. *Thais patula* (Linnaeus), Tryon, Man. Conch., vol. 2, p. 159, pl. 43, figs. 19-22.
1891. *Purpura patula* (Linnaeus), Baker, Acad. Nat. Sci. Philadelphia, Proc., vol. 43, p. 51.
1901. *Purpura patula* (Linnaeus), Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, p. 410.
1922. *Thais patula* (Linnaeus), Maury, Bull. Amer. Paleont., vol. 9, No. 38, pp. 99-100.
1924. *Thais patula* (Linnaeus), Emery, Nautilus, vol. 38, No. 2, p. 62.
1935. *Thais patula* (Linnaeus), Remington, Nautilus, vol. 35, No. 4, p. 121.
1937. *Thais patula* (Linnaeus), Smith, East Coast Marine Shells, p. 117, pl. 45, fig. 8.
1947. *Purpura patula* (Linnaeus), Clench, Johnsonia, vol. 2, No. 23, pp. 64-67 pl. 33, figs. 3, 4.
1954. *Purpura patula* (Linnaeus), Abbott, American Seashells, p. 213, pl. 25L.

1958. *Purpura patula* (Linnaeus),Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 16.
1958. *Purpura patula* (Linnaeus), Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, p. 63.
1959. *Purpura patula* (Linnaeus), Nowell-Usticke, A Check List of the Marine Shells of St. Croix, p. 63.
1959. *Purpura patula* (Linnaeus), Rodriguez, Bull. Marine Sci. Gulf and Caribean, vol. 9, No. 3, p. 276.

Venezuelan shell ovate, with a short, strongly terraced, protuberant spire and a blunt, rounded apex. Whorls about four in all, rapidly increasing in size, the body whorl large, constituting a little over four-fifths the length of the shell. Nucleus smooth, consisting of about 1-1/2 volutions, the initial appressed, the last much larger and rounded. Post-nuclear whorls nodulose, with two rows of eight short nodules each on the penultimate whorl and perhaps six rows on the ultima; of the latter, the uppermost row is at the shoulder, the lowermost adjacent to the narrow, corded, anterior fasciole, and the ones between about equidistant. In addition there are flat spiral fillets of which there are four or five between each row of nodules, the fillets separated by weakly incised narrow grooves. The penultimate and ultimate whorls are prominently shouldered, the ramp above the shoulder slightly concave and also sculptured by a few spiral bands. Surface with numerous transverse growth striae which are strongly curved on the ramp. Upper sutures tight, the last suture channeled or narrowly gaping. Aperture exceedingly capacious, broadly ovate. Outer lip scalloped along the rim, the inner margin faintly denticulate. Inner lip scythelike, widening upward, the inner edge sharp and angularly sinuous, the face with a slightly transverse depression along the middle. Distal margin of labium strongly angulate, the base of the margin denticulate. Anterior canal short, moderately broad, rather shallow, the extremity gently excavated into an obtuse, V-shaped notch. Color in bands of dull brown or gray alternating with off-white, the nodules brownish, the columella light salmon, the inner margin of the outer lip brown, the interior of the aperture with a broad band of white below the middle reflected through from the exterior.

Dimensions.—Figured specimen, length 50 mm.; max. width 33 mm.; length af aperture 37 mm.; width of aperture 20 mm.

Localities.—Found loose on surface of upper Mare formation

115 meters south-southwest of crossing of Quebrada Mare Abajo and coast road. One specimen; found loose on surface of Upper Mare formation, in stream 250 meters south-southwest of mouth of Quebrada Las Pailas. One specimen.

Remarks.—The two examples of this species look like worn beach specimens, and I suspect that they may be Recent shells that were transported by birds or some other carrier from the shore. I seem to recollect having seen this shell elsewhere inland, and although I did not find any Recent shells of *D. patula* on the beach, the species is recorded by Clench (1943, p. 67) from La Guaira which is a short distance east of the Cabo Blanco area. There is no record of *Purpura patula* having been found in pre-Quaternary deposits, and its presence in the Cabo Blanco group is probably fortuitous and alien, depending on where the shell happened to be dropped by its carrier.

Range and distribution.—*Purpura patula,* the wide-mouthed rock shell, is intertidal in habitat, and is found living from southeast Florida to northern South America. The Eastern Pacific analogue is *P. patula pansa* Gould (1853, Boston Jour. Nat. Hist., vol. 6, pl. 406) and is characterized by the white inner margin of the parietal area, whereas that of the Western Atlantic *P. patula, s.s.* is salmon-colored.

Thais (Stramonita) rustica (Lamarck) Pl. 27, figs. 1, 2

1822. *Purpura rustica* Lamarck, An. sans Vert., vol. 7, p. 246.
1827. *Purpura bicostalis* 'Lamarck' de St. Vincent, Encycl. Méth., vol. 3, pl. 398, figs. 5a, b.
1836. *Purpura undata* Kiener, Icon. Coq. Viv., vol. 8, pl. 34, fig. 81c.
1836. *Purpura bitubercularis* Kiener, (not Lamarck), Icon. Coq. Viv., vol. 8, pl. 11, fig. 32.
1844. *Purpura kienerii* Deshayes, An. sans Vert., vol. 10. pp. 64, 101.
1846. *Purpura fasciata* Reeve, Conch. Incon., vol. 3, *Purpura,* pl. 9, sp. 45. Not *P. fasciata* Dunker, 1857.
1864. *Purpura rustica* Lamarck, Krebs, The West Indian Marine Shells, p. 27.
1878. *Purpura rustica* Lamarck, Mörch, Catalogue of West-India Shells, p. 11.
1895. *Purpura (Stramonita) fasciata* Reeve, Gregory, Geol. Soc. London Quart. Jour., vol. 51, p. 288. Not of Dunker, 1857.
1947. *Thais* (*Stramonita*) *rustica* (Lamarck), Clench, Johnsonia, vol. 2, No. 23, pp. 80-82, pl. 39, figs. 4-6, 8, 10.
1954. *Thais* (*Stramonita*) *rustica* (Lamarck), Abbott, American Seashells, p. 214, pl. 25f.
1958. *Thais rustica* (Lamarck), Olsson and McGinty, Bull. Am. Paleont., vol. 39, No. 177, p. 16.
1958. *Thais* (*Stramonita*) *rustica* (Lamarck), Abbott, Acad. Nat. Sci. Philadelphia, Mon., No. 11, p. 64.

1958. *Thais rustica* (Lamarck), Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, p. 86.
1959. *Thais rustica* (Lamarck), Nowell-Usticke, A Check List of the Marine Shells of St. Croix, p. 64.
1959. *Thais* (*Stramonita*) *rustica* (Lamarck), Woodring, U. S. Geol. Survey, Prof. Paper 306-B, p. 222.

The figured shell is one of two Recent fragments tentatively referred to *T. rustica* (Lamarck). The shell is sturdy, with an ovate aperture; the outer lip is denticulate along the inner margin, the more or less paired denticles continuing as lirae for a short distance within the aperture; the body whorl is shouldered and nodulous, and there is a smaller row of feeble nodules at the periphery and below the convexity, the nodules whitish with brown between them. The ramp above the shoulder is slightly concave. Surface sculptured by spiral ribs and cords of chocolate brown. Interior of aperture white, margined with brown along the outer lip.

Dimensions.—Figured specimen (body whorl), length 23 mm.; max. width 23 mm.

Locality.—Recent, on beach of Playa Grande Yachting Club, Distrito Federal. Two broken specimens.

Range and distribution.—This rock dweller is intertidal, and ranges from southern Florida, to Brazil. It is stated by Woodring (1959) that his *T. aff. haemastoma* (Linnaeus) from the middle Miocene of the Panamá Canal Zone is closely related to *T. rustica* (Lamarck), and the species occurs in the Pleistocene of Barbados.

Thais (Stramonita) haemastoma (Linnaeus) Pl. 27, figs. 3, 4

1767. *Buccinum haemastoma* Linnaeus, Syst. Nat., ed. 12, p. 1202. Refers to Gualtieri 1742, pl. 51, fig. A.
1832. *Purpura biserialis* Blainville, Mus. Hist. Nat. Paris Nouv. An., ser. 3, vol. 1, p. 238, pl. 11, fig. 11
1846. *Purpura haemastoma* (Linnaeus), Reeve, Conch. Icon., vol. 3, *Murex*, sp. 21.
1864. *Purpura haemastoma* 'Lamarck' Krebs, The West Indian Marine Shells, p. 26.
1878. *Purpura patula* (Linnaeus), Mörch, Catalogue of West-India Shells, p. 11.
1909. *Thais biserialis* (Blainville), Dall, U. S. Nat. Mus., Proc., vol. 37 (1910), No. 1704, p. 220.
1939. *Thais biserialis* (Blainville), Smith, An Illustrated Catalog of the Recent Species of Rock Shells, p. 26, No. 390, pl. 17, fig. 13.
1947. *Thais (Stramonita) haemastoma haemostoma* (Linnaeus), Clench, Johnsonia, vol. 2, No. 23, pl. 36, fig. 4.
1953. *Thais* (*Stramonita*) *haemastoma* (Linnaeus), Haas, Fieldiana-Zoolgy, vol. 34, No. 20, p. 204.

1954. *Thais* (*Stramonita*) *haemastoma* (Linnaeus), Abbott, American Seashells, p. 213, pl. 25d.
1959. *Thais haemastoma* (Linnaeus), Nowell-Usticke, A Check List of the Marine Shells of St. Croix, p. 63.
1959. *Thais* (*Stramonita*) *aff. T. haemastoma* (Linnaeus), Woodring, U. S. Geol. Survey, Prof. Paper 306-B, p. 222, pl. 28, figs. 13, 14.

Shell rather large, solid, nodulous, with a moderately produced and turrited spire. Whorls seven in all, the smooth nucleus consisting of two of them. Initial nuclear whorl somewhat canted, the last convex and sharply defined from the conch by a narrow axial varix or cord. Early post-nuclear whorls with a medial keel upturned at the rim which is beaded. On later whorls the keel becomes a knobby or tuberculate shoulder, the tubercles or nodules also tending to curve upward. The first two post-nuclear whorls are sculptured by two spiral cords above and below the keel and fairly numerous but rather feeble axial riblets, the spaces between the riblets about as wide as the riblets themselves. The intercepts of the spiral cords and axial riblets are strongly beaded, and the spaces between them are decussated into squarish pits. On succeeding whorls, the beads of the keel develop into nodes (of which there are eight on the penultima), and the spiral cords become flat fillets separated by fine spiral grooves, there being about six of these fillets above and below the submedial shoulder. Body whorl with two rows of tubercles, one around the shoulder, the other around the periphery a short distance below, the nine or so shoulder nodes being much the larger and subtriangular, the ones at the periphery being smaller and tending to become more and more elongate in the spiral direction as well as more subdued toward the labrum. Body sculptured by low spiral bands or fillets, every fourth or fifth band slightly larger and thickened at intervals around the circumference. Surface traversed axially by closely spaced growth striae and lamellae. The ramp above the shoulder on the last three or four whorls widens rapidly and is slightly concave. Sutures indistinct and wavy. Aperture large, ovate, lined with 16 lirae. All of the lirae, except the ones near the base of the outer lip, continue far within the aperture, and all of them reach the fluted and scalloped margin of the outer lip where they underlie every alternate groove of the exterior. Just below the commissure there is a rounded ridge which continues within the aperture and extends across the heavily enameled

parietal wall, forming the margin of the shallow anal outlet. The columella, like the parietal wall, is heavily enameled, the outer margin of the enamel gently arcuate and adherent, the enamel smooth, except below where it bears four short oblique folds. Siphonal canal short and narrow but deep, the extremity with an obliquely directed, nearly recumbent U-shaped notch. Anterior fasciole large, swollen, more or less wedge-shaped.

Dimensions.—Figured specimen (apex missing), length 53.5 mm.; width across periphery including nodes 35 mm.; young specimen (broken away at anterior end but with spire and nucleus intact), length 26.5 mm.; max. width including nodules 17.6 mm.

Localities.—Lower Mare formation, in small stream 100 meters west of Quebrada Mare Abajo. One specimen; lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. One specimen; Abisinia formation at W-30, eastern edge of Playa Grande village. A single small and broken juvenile with only a portion of the body whorl intact.

Remarks.—The Cabo Blanco fossils undoubtedly belong to the ubiquitous and extremely variable tribe of *T. haemastoma* (Linnaeus). They are particularly close to the Recent Eastern Pacific *T. haemastoma haemastoma* illustrated by Clench (1947, pl. 36, fig. 4) from Taboga Island, and to the Recent Eastern Pacific *T. biserialis* (Blainville) illustrated by Smith (1939) from Panamá. The Venezuelan forms may yet prove to be identical with the knobby variation of *T. biserialis* although they seem dissimilar to the relatively smooth form of *T. biserialis* as illustrated by Keen (1958, p. 372, fig. 398). Clench, in his authoritative treatise on "The genera *Purpura* and *Thais* in the Western Atlantic" (Johnsonia, 1947, vol. 2, No. 23, pp. 73-76, pl. 36, figs. 1-6) considers *T. biserialis* and many other forms to be synonymous with *T. haemastoma haemastoma,* and finds that the species may be completely nontuberculate to strongly nodulose, with gradations between the extremes. The typical *T. haemastoma* occurs in the Mediterranean Sea and along the west coast of Africa, and is generally nodulose. In the Eastern Pacific, nodular forms of the tribe occur from Mexico to Chile, and in the Western Atlantic from northern South America to Uruguay.

Range and distribution.—Recent tuberculate forms of *T. haemastoma* are found in the Eastern Atlantic, Western Atlantic, and Eastern Pacific oceans. The Venezuelan fossils are probably Pliocene and Pleistocene in age, and Woodring's *T.* aff. *haemastoma* is from the middle Miocene of the Panamá Canal Zone.

Thais (Stramonita) chocolata (Duclos) **Pl. 27, figs. 5, 6**

1832. *Purpura chocolatum* Duclos, An. Sci. Nat. Paris, vol. 26, p. 108, pl. 2, fig. 7.
1841. *Purpura chocolata* Duclos, d'Orbigny, Voyage l'Amerique Méridionale, vol. 5, pt. 3, Mollusques, p. 436, pl. 61, figs. 1-3.
1909. *Thais chocolata* (Duclos), Dall, U. S. Nat. Mus., Proc., vol. 37 (1910), pp. 169, 221, pl. 22, fig. 2.
1924. *Thais chocolata* (Duclos), Olsson, Nautilus, vol. 37, No. 4, pp. 121, 124.
1936. *Thais* (*Stramonita*) *chocolatum* (Duclos), Rogers, The Shell Book, pp. 43, 488.
1947. *Thais* (*Mancinella*) *consul* 'Gmelin', Clench, Johnsonia, vol. 2, No. 23, p. 90.
1958. *Thais* (*Stramonita*) *chocolata* (Duclos), Keen, Sea Shells of Tropical West America, p. 372.

Shell ovate, moderately large, rather thin, the spire a little produced. Whorls remaining five, these slightly convex at first, then somewhat rounded and inflated at the shoulder, the shoulder later becoming angulate on the body whorl, the ramp on the labrum of the body whorl broad and concave. Ventrally, the body whorl is inflated above, but at the labrum it is flat-sided from the shoulder carina to the periphery, convex below the periphery, the carina thickened with low, spirally elongate nodes which become obsolescent on the dorsum. Surface sculptured by numerous low flat subequal spiral ribs, the interspaces narrower than, to as wide as the ribs themselves, the whole traversed by crowded axial growth striae and fine lamellar imbrications visible on the better preserved areas of the shell. Vague axial swellings are present on the front of the last whorl, and there is the suggestion that there may be feeble axial folds on antecedent whorls. On the body whorl also there are at intervals long narrow axial growth rifts. Aperture large, ovate. Outer lip scalloped or frilled at the termini of the external ribs, angulate, fluted under the angulation, the inner margin of the lip with 30 or so rounded narrow ridges extending from the rim into the aperture for a short distance. Columella and parietal wall callused, the distal edge of the callus adherent, the columellar lip subcrescentic, the lower lip with four feeble oblique folds, the rest of the inner

lip smooth. Below the commissure there is a low rounded ridge emerging from the aperture and extending part way across the parietal wall where it borders the shallow triangular depression of the anal outlet. Siphonal canal rather short, broad, and deep, the extremity of the canal excavated into an obliquely directed, nearly recumbent, U-shaped notch. Lower lip flattened. Anterior fasciole large, swollen, built up of arched incrementals. The overall color of the body is now a faded mahogany, and there is a whitish spiral stripe on the rib at the shoulder and at the periphery.

Dimensions.—Figured specimen, length 43.5 mm.; max. width 32 mm.

Locality.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. Two specimens.

Remarks.—The Cabo Blanco fossil is similar to the Recent Eastern Pacific *T. chocolata* (Duclos) and is believed to be the same despite the somewhat more produced spire. The longer spire of the fossil is probably more apparent than real as the surface layer of the spire is peeled away. The Western Atlantic analogue of *T. chocolata* is *T. haemastoma floridana* (Conrad) (1837, p. 265, pl. 20, fig. 21) which is recorded from the Pleistocene of Cuba and is found living from North Carolina to the northern coast of South America. The Western Atlantic and Eastern Pacific species are themselves much alike, although *T. chocolata* is more inflated and less contracted at the base than *T. floridana.* If the identification of the Cabo Blanco fossil is correct, *T. chocolata* is yet another example of survival after migrating to the west coast of the Americas from the Caribbean through the Central American seaway.

Range and distribution.—The living *T. chocolata* ranges from Ecuador to Chile. So far as I know, this is the first record of its occurrence as a fossil, the Venezuelan shell probably of Pliocene age.

MAGILIDAE

Coralliophila caribaea Abbott Pl. 27, figs. 7-9

Coralliophila plicata of authors, not Wood, Index Testaceologicus, p. 124, pl. 36, fig. 56 (refers to Chemnitz, Conchylien-Cabinet, vol. 3, figs. 954, 955 which is *erosa* Röding from the Indo-Pacific).
Coralliophila brevis of authors, not Blainville 1832, Mus. Hist. Nat. Paris Nouv. An., vol. 1, p. 233 (Mediterranean).

1864. *Purpura plicata* Martini, Krebs, The West Indian Marine Shells, p. 26.
1878. *Purpura plicata* Martini, Mörch, Catalogue of West-India Shells, p. 11.
1891. *Coralliophila plicata* (Wood), Baker, Acad. Nat. Sci. Philadelphia, Proc., vol. 43, p. 60.
1958. *Coralliophila plicata* (Wood), Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 17.
1958. *Coralliophila caribaea* Abbott, Acad. Nat. Sci. Philadelphia, Mon. No. 11, pp. 66-67, text fig. 3; pl. 1, figs. g, h.
1959. *Coralliophila caribaea* Abbott, Nowell-Usticke, A Check List of the Marine Shells of St. Croix, p. 64.

The weathered Venezuelan shell referred to this species is small, solid, and biconical. Angle of spire about 63 degrees, the apex worn. Post-nuclear whorls four, keeled or shouldered at the lower third, the slopes above the keel becoming progressively less steep with growth, the sides below the keel nearly vertical. Surface sculptured by broad axial folds and fimbriated spiral cords developing into flat ribs on the ultima, the axial folds stronger than the spirals on the whorls of the conch, the spirals stronger than the axials on the anterior half of the body whorl. On the penultimate whorl there are 10 axial folds, increasing in width away from the suture, and six spiral cords, four of them on the ramp above the strong revolving rib at the keel, and two below the keel. On the spire whorls the cords are more pronounced in the interspaces of the axial folds than they are on the crests, but this may be due to wear. On the body whorl the axial folds play out below the periphery and become obsolescent toward the labrum, and in all there are 22 spirals. Above the flat heavy revolving rib of the periphery there are six flat-topped spiral riblets separated by narrower, deeply channeled interspaces, the riblets more or less equal save the one nearest the periphery which is lightly larger. Below the periphery there are five large but unequal spiral ribs, some with a secondary cord in the interspaces, the first two major ribs below the periphery with a secondary cord in the intercostal area and a tertiary thread on either side of that. Traversing the body are numerous strong growth lamellae forming curved rasplike fimbriations where they cross the spiral ribs. Umbilicus moderately shallow, triangular, bordered by a prominent, convex to flattened fasciole built up of vaulted scales and incrementals which are arched upward. Aperture elongate-triangular, gradually narrowing to the canal. Outer lip broken back, but there is the suggestion that the rim is faintly scalloped and the inner edge slightly denticulate. Columella straight and completely

smooth, with a slight bulge at the pillar. Inner lip callused, the callus forming an erect laminar wall alongside the umbilical depression. Anterior canal short, bent back a little, the extremity with a U-shaped notch. Color cinereous, the aperture white.

Dimensions.—Length 11.5 mm.; max. width 6.5 mm.

Locality.—Recent, on beach of Playa Grande Yachting Club, Distrito Federal. One specimen.

Remarks.—The "*Purpura plicata* Mart." listed by Krebs (1864) may be this species as, like *C. caribaea,* it is commensal with certain coelenterates.

Comparisons.—*C. caribaea* is more angular than *C. abbreviata* (Lamarck), also known as *C. galea* (Chemnitz), and lacks the lirations within the aperture. *C. mansfieldi* McGinty (1940, p. 83, pl. 10) is sharply keeled at the periphery, and both sexes of that species bear lirae within the aperture.

Range and distribution.—*C. caribaea* is a shallow-water form living on and under the branches of certain species of coral. It ranges from southeast Florida, to northern South America. It also may occur in the Pleistocene of Barbados (see Trechmann, 1933, pp. 38-39).

COLUMBELLIDAE

Columbella mercatoria (Linnaeus) Pl. 27, figs. 10-13

1758. *Voluta mercatoria* Linnaeus, Syst. Nat., ed. 10, p. 730.
1817. *Voluta mercatoria* Linnaeus, Dillwyn, Descriptive Catalogue of Recent Shells, vol. 1, p. 532, sp. 74.
1822. *Columbella mercatoria* (Linnaeus), Lamarck, An. sans Vert., vol. 7, p. 294.
1825. *Voluta mercatoria* Linnaeus, Wood, Index Testaceologicus, p. 102, pl. 20, fig. 73.
1841. *Columbella mercatoria* (Linnaeus), Kiener, Coq. Viv., *Columbella,* p. 23, pl. 5, fig. 1.
1861. *Columbella mercatoria* (Linnaeus), Tristram, Zool. Soc. London, Proc., p. 404.
1864. *Columbella mercatoria* (Linnaeus), Krebs, The West Indian Marine Shells, p. 29.
1878. *Columbella mercatoria* (Linnaeus), Mörch, Catalogue of West-India Shells, p. 12.
1886. *Columbella mercatoria* (Linnaeus), Watson, Voyage H. M. S. Challenger, Zoology, vol. 15, p. 233.
1887. *Columbella mercatoria* (Linnaeus), Fischer, Man. Conch. et Paléont. Conch., p. 637, pl. 6, fig. 10.
1889. *Columbella mercatoria* (Linnaeus), Dall, U. S. Nat. Mus., Bull. 57, p. 116.
1890. *Columbella mercatoria* (Linnaeus), Smith, Linnaean Soc. Jour., Zoology, vol. 20, p. 486.

1890. *Columbella mercatoria* (Linnaeus), Dall, Wagner Free Inst. Sci., Trans., vol. 3, pt. 1, p. 135.
1891. *Columbella mercatoria* (Linnaeus), Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, pp. 403-404.
1922. *Columbella mercatoria* (Linnaeus), Maury, Bull. Amer. Paleont., vol. 9, No. 38, p. 93.
1924. *Columbella mercatoria* (Linnaeus), Emery, Nautilus, vol. 38, No. 2, p. 61.
1926. *Columbella mercatoria* (Linnaeus), Weisbord, Nautilus, vol. 39, No. 3, p. 85.
1935. *Columbella mercatoria* (Linnaeus), Richards, Jour. Paleont., vol. 9, No. 3, p. 257.
1937. *Pyrene* (*Columbella*) *mercatoria* (Linnaeus), Smith, East Coast Marine Shells, p. 119, pl. 46, figs. 8a, 8b.
1938. *Columbella mercatoria* (Linnaeus), Richards, Geol. Soc. Amer. Bull., vol. 49, p. 1293.
1939. *Pyrene mercatoria* (Linnaeus), McGinty, Nautilus, vol. 53, No. 2, p. 38.
1940. *Pyrene* (*Columbella*) *mercatoria* (Linnaeus), Smith, World-wide Sea Shells, p. 55, fig. 739.
1941. *Pyrene mercatoria* (Linnaeus), T. Bayer, Nautilus, vol. 55, No. 2, p. 44.
1942. *Columbella mercatoria* (Linnaeus), Jaume and Pérez Farfante, Soc. Cubana Hist. Nat. "Felipe Poey", Mem., vol. 16, No. 1, p. 41.
1944. *Columbella mercatoria* (Linnaeus), Hackney, Nautilus, vol. 58, No. 2, p. 61.
1946. *Columbella mercatoria* (Linnaeus), Jaume, Soc. Malac. "Carlos de La Torre" Rev., vol. 4, No. 3, p. 107.
1954. *Columbella mercatoria* (Linnaeus), Abbott, American Seashells, p. 220, pl. 25bb.
1958. *Columbella mercatoria* (Linnaeus), Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 16.
1958. *Columbella mercatoria* (Linnaeus), Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, p. 88, pl. 14, 1 fig.
1958. *Columbella mercatoria* (Linnaeus), Abbott, Acad. Nat. Sci. Philadelphia, Mon. No. 11, p. 68.
1959 *Columbella mercatoria* (Linnaeus), Nowell-Usticke, A Check List of the Marine Shells of St Croix, p. 65.

Illustrated are Recent and fossil examples of this species from the Cabo Blanco area, Venezuela. The color pattern of the Recent specimens is in the form of interrupted brown stripes on a whitish ground, the stripes arranged in irregular columns. The brown is orangey to deep chocolate, the color being more intense generally around the periphery of the body whorl. Aperture suffused faintly with light purple. The teeth and interdental spaces of the lips are white.

Dimensions.—Recent shell (A280a), length 14.6 mm.; max. width 9 mm.; fossil shell (last whorl), length 10.8 mm.; max. width 9.8 mm.

Localities.—Recent, on beach at Playa Grande Yachting Club, Distrito Federal. Fourteen specimens. Abisinia formation at W-30,

eastern edge of Playa Grande village. Two worn and broken specimens.

Range and distribution.—Columbella mercatoria (Linnaeus) is a common shallow-water species extending from Brazil and northern South America through the West Indies to southeast Florida. As a fossil *C. mercatoria* has been reported from the post-Pliocene of Costa Rica and the Dominican Republic by Dall, and has been found in Pleistocene deposits of Barbados, Cuba, and Florida. The Abisinia formation of Venezuela is the highest unit of the Cabo Blanco group and is tentatively believed to be Pleistocene in age.

Columbella williamgabbi, new species Pl. 27, figs. 14, 15

Shell of medium size, more or less ovate, sturdy, the spire low, the divergence about 70 degrees. Whorls six including the nucleus. Nuclear whorls smooth, 1-1/2, the initial rather tightly coiled and appressed to form the blunt apex, the last relatively high, hardly convex. The first post-nuclear whorl is slightly convex, the succeeding ones subangularly shouldered, straight-sided below. Summit of whorls a little swollen at the suture, the narrow ramp between the suture and shoulder moderately concave. Surface sculptured by low spiral ribs, fine, closely spaced longitudinal growth striae, and very feeble but fairly numerous narrow axial folds which, on the body whorl, are obsolescent except on the labrum and near the columella. The shoulder of each whorl bears two subequal spiral riblets with, on the penultima, three weak, unequal spiral riblets below. On the ultimate whorl there are in all about 17 low, broad, subequal spiral ribs separated by narrower interspaces, with a smaller interstitial riblet between the first and secondary rib below the shoulder, the ribs slightly higher and a little more rounded anteriorly than posteriorly. Anterior fasciole a little swollen, not prominent, made up of a few faint spiral cords. Sutures narrowly channeled. Aperture narrowly S-shaped, somewhat wider just above the base. Outer lip thick, traversed immediately behind the edge by a longitudinal rift extending from the summit to the base, subangulate at the shoulder, the inner margin bulging toward the columella at the middle, bearing 17 heavy, moderately wide denticles of which the ones along the middle are the strongest. Posterior part of parietal wall with a heavy and axially swollen

deposit of callus along the posterior channel, the lower part of the wall merely glazed with enamel. Inner lip broad and flattened posteriorly, narrowed anteriorly, the broad area with two strong teeth and a basal node along the apertural margin, the distal margin of the lip armed with eight denticles. Anterior canal short, slightly oblique to the left, the extremity excavated into a recumbent U-shaped notch.

Dimensions.—Holotype, length 21.4 mm.; max. width 12.7 mm.

Type locality.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. One specimen, the holotype.

Other localities.—Lower Mare formation, in small stream 100 meters west of Quebrada Mare Abajo. One broken specimen.

Comparisons.—The new species, named in honor of William M. Gabb for his early noteworthy contributions to the geology and paleontology of Hispaniola, is decidedly less pyriform than the Pliocene to Recent *C. mercatoria* (Linnaeus) and has a lower spire than the Miocene *C. submercatoria* Olsson (1922, p. 297-298, pl. 10, figs. 33-34) from Costa Rica and Jamaica. *C. platynema* Woodring (1928, p. 271, pl. 16, fig. 10), from the Bowden Miocene of Jamaica, is another related form but differs from *C. williamgabbi,* n. sp. in its coarser spiral ribs and by the single instead of the dual revolving rib on the shoulder.

Columbella mareana, new species Pl. 27, figs. 16, 17

Shell ovate, sturdy, with a short, conical, bluntly tipped spire, the divergence of which is about 60 degrees. Whorls five including the nucleus. Nucleus smooth, one-whorled, the tip loosely coiled, somewhat swollen, depressed a little below the flattened summit of the later turn. Post-nuclear whorls gently convex, the sutures narrowly channeled. Sculpture consisting of flat spiral ribs and low axial folds, the latter becoming obsolescent below the periphery on the dorsum of the body whorl but continuing weakly toward the base in front and on the labrum. On the penultimate whorl there are four spiral ribs and 15 or 16 axial folds, the intercepts, as they are elsewhere, nodulated or beaded. On the ultimate whorl there are 13 spiral ribs from the summit to the anterior fasciole, the flat-

bottomed interspaces about as wide as the ribs themselves. Traversing the surface are numerous longitudinal striae and lamellae, often crinkly. Siphonal fasciole swollen, made up of about eight spiral cords of which the posteriormost is the broadest, the fasciole separated from the whorl proper by a rather pronounced sulcus or depression. Aperture S-shaped. Outer lip ascending at the summit, feebly but broadly varicose behind, the inner margin bearing six or seven narrow denticles, the lip widely notched above the posteriormost tooth. Posterior outlet a simple groove. Columella and parietal wall enameled, the enamel of the columella nearly smooth but with a few faint lirae reflected from the spiral ribs underneath the enamel. Anterior canal short, deep, twisted, the extremity deeply and narrowly excavated into a nearly recumbent U-shaped notch.

Dimensions.—Holotype, length 14 mm.; max. width 10.3 mm.

Type locality.—Mare formation at W-14, on hillside above west bank of Quebrada Mare Abajo. One specimen, the holotype.

Comparisons.—Although this shell has a weak armature on the columellar lip, and lacks the medial bulge of the outer lip toward the aperture, the strong spiral sculpture may justify the generic designation of *Columbella* rather than *Pyrene* or one of the other of the Columbellidae. Specifically, the shell is reminiscent of *Pyrene cricamola* (Olsson) (1922, pp. 299-300, pl. 10, fig. 18) from the middle Miocene of Costa Rica and the upper Miocene-Pliocene at Punta Gavilan, Venezuela, (Rutsch, 1934, pp. 66-67, pl. 4, figs. 5, 6) and *Pyrene duddeleyi* Rutsch (1943, pp. 145-147, pl. 7, figs. 2, 3) from the late Miocene deposits at Springvale, Trinidad. The spire of *Columbella mareana,* n. sp. is shorter than on either of those, but the external sculpture of all three is much alike.

Anachis (Costoanachis) obesa (C. B. Adams) Pl. 27, figs. 18-23

1845. *Buccinum obesum* C. B. Adams, Boston Soc. Nat. Hist. Proc., vol. 2, p. 2.
1850. *Columbella obesa* C. B. Adams, Contrib. to Conch., No. 4, p. 55.
1864. *Columbella obesa* C. E. Adams, Krebs, The West Indian Marine Shells, p. 29.
1878. *Columbella obesa* C. B. Adams, Mörch, Catalogue of the West-India Shells, p. 12.
1883. *Columbella obesa* C. B. Adams, Tryon, Man. Conch., vol. 5, p. 169, pl. 57, figs. 7-9, 20.
1889. *Anachis obesa* (C. B. Adams), Dall, U. S. Nat. Mus., Bull. 37, p. 118.
1889. *Anachis obesa* (C. B. Adams), Dall, Mus. Comp. Zool. Bull., vol. 18, p. 188.

1891. *Columbella obesa* C. B. Adams, Baker, Acad. Nat. Sci. Philadelphia, Proc., vol. 43, p. 51.
1901. *Columbella* (*Anachis*) *obesa* C. B. Adams, Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, p. 404.
1903. *Columbella obesa* C. B. Adams, Vanatta, Acad. Nat. Sci. Philadelphia, Proc., vol. 55, p. 758.
1905. *Columbella* (*Anachis*) *obesa* C. B. Adams, Harris, Bull. Amer. Paleont., vol. 1, No 3, p 102.
1922. *Anachis obesa* (C. B. Adams), Maury, Bull. Amer. Paleont., vol. 9, No. 38, p. 92.
1938. *Columbella obesa* C. B. Adams, Richards, Geol. Soc. Amer. Bull., vol. 49, p. 1293.
1939. *Anachis obesa* C. B. Adams, Mansfield, State of Florida Dept. Conserv., Geol. Bull. No. 18, p. 38.
1944. *Anachis obesa* (C. B. Adams), Hackney, Nautilus, vol. 58, No. 2, p. 61.
1948. *Anachis* (*Costoanachis*) *obesa* (C. B. Adams), Gardner, U. S. Geol. Sur., Prof. Paper 199-B, pt. 2, p. 229, pl. 30, fig. 26.
1950. *Buccinum obesum* C. B. Adams, Clench and Turner, Occas. Papers on Mollusks, vol. 1, No. 15, p. 319, pl. 32, fig. 11.
1952. *Anachis obesa* (C. B. Adams), Pulley, Texas Jour. Sci., vol. 4, No. 2, p. 176, pl. 5, fig. 9.
1953. *Anachis* (*Costoanachis*) *obesa* (C. B. Adams), Olsson and Harbison, Acad. Nat. Sci. Philadelphia, Mon. No. 8, pp. 222-223, pl. 38, fig. 11.
1953. *Anachis* (*Zafra*) *obesa* (C. B. Adams), Haas, Fieldiana-Zoology, vol. 34, No. 20, p. 204.
1954. *Anachis obesa* (C. B. Adams), Abbott, American Seashells, p. 221.
1955. *Anachis obesa* (C. B. Adams), Perry and Schwengel, Marine Shells of the Western Coast of Florida, p. 160, pl. 32, fig. 226.
1958. *Anachis obesa* (C. B. Adams), Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 16.
1958. *Anachis obesa* (C. B. Adams), Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, p. 90.
1959. *Anachis obesa* (C. B. Adams), Nowell-Usticke, A Check List of the Marine Shells of St. Croix, p. 67.

The Cabo Blanco fossils referred to this species are small, rather stubby, low conical, the spire slightly convex in profile, the angle of spire near 45 degrees. Whorls about 5-1/2 including the nucleus. Nucleus smooth, consisting of about 1-1/2 whorls, the initial appressed to form an obtuse apex, the last moderately convex, defined from the conch by the first axial rib that makes its appearance. Post-nuclear whorls hardly convex, inset slightly one into the other, the sutures narrowly channeled. Axial sculpture dominant, consisting of 12 to 17 strong, low, broadly rounded axial costae, separated by somewhat wider to somewhat narrower interspaces. The costae extend from suture to suture, are slightly curved, and are a little nodulous at the summit where there is a narrow feeble cingulum. On the moderately convex body whorl, the axials terminate a short distance below the middle, and are succeeded by about four

flat spiral bands or fillets with shallow, finely incised grooves between them. These spiral bands are followed by the rather broad anterior fasciole which itself is made up of about five narrow spiral cords. The intercostal areas are sculptured by spiral grooves which do not ascend on the axial ribs, the grooves more or less uniform in spacing and tending to become obsolescent toward the cingulum. Aperture moderately wide, sinuate by virtue of the well excavated posterior notch and broad, slightly twisted anterior canal, the sides of the aperture subparallel. Outer lip broadly varicose behind, the inner margin bearing five or six denticles of which the posterior one bordering the anal notch is the largest, the others progressively decreasing in size anteriorward. Columella with a fairly heavy sheath of callus whose distal edge is sharply defined and slightly raised below, but adherent on the parietal wall above. Outer margin of columellar callus faintly lirate, the lirae reflected from, and lying above the spiral bands of the base which continue under the callus. Anterior canal wide, short, deep, undercut below the pillar, excavated into a shallow notch.

Dimensions.—Length 5 mm.; max. width 2.8 mm.

Cabo Blanco localities.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. One specimen; lower Mare formation, in small stream 100 meters west of Quebrada Mare Abajo. One specimen; upper mare formation at W-14, on hillside above west bank of Quebrada Mare Abajo. One specimen; upper Mare formation, in stream 250 meters south-southwest of mouth of Quebrada Las Pailas. One specimen; Abisinia formation at W-30, eastern edge of Playa Grande village. One broken specimen.

Remarks.—Making allowances for the variability in the number and prominence of the axial costae and in the strength of the spiral grooves, the Venezuelan fossils are believed to be referable to *A. obesa* (C. B. Adams), originally described as a Recent species from Jamaica. *A. costulata* (C. B. Adams) (see Clench and Turner, 1950, pp. 268-269, pl. 41, fig. 3) may be a stubbier, paucicostate form of *A. obesa,* and *A. albella* (C. B. Adams) (see Clench and Turner, 1950, p. 251, pl. 29, fig. 2), also from the Recent fauna of Jamaica, is believed by Abbott (1958, pp. 68-69) to be synonymous with *A. hotessieriana* (d'Orbigny). The last-named differs from *A. obesa* in having flat-sided, rather than slightly convex spire whorls.

Range and distribution.—*A. obesa* (C. B. Adams) ranges from Miocene to Recent. The Miocene form is reported from Virginia and North Carolina; the Pliocene from North Carolina, Florida, and Louisiana (Gymnasium Club well at New Orleans, 1,200 feet, by Maury); the Pleistocene from Florida, Louisiana, and Texas; and the Recent from Cape Hatteras, North Carolina, to Brazil in the Western Atlantic.

Anachis (Costoanachis) plicatulum ? (Dunker) Pl. 28, figs. 1-4

1853. *Buccinum* (*Columbella*) *plicatulum* Dunker, Zeitschr. f. Malakozool., vol. 10, No. 4, pp. 58-59.

Shell of medium size, polished, slender, the spire acuminate, the angle of spire about 33 degrees. Whorls eight including the smooth nucleus which consists of 1-1/2 of them. Nuclear whorls light amber, the tip of the initial one decollate, the last slightly convex. Union of nucleus and conch marked by the first axial fold; these folds continue around the first 2-1/2 post-nuclear whorls, are absent on the next two, and re-appear again on the last ones. The earliest folds are somewhat oblique and a little curved, the later ones straight, all of them extending from suture to suture, the interspaces generally wider than the folds themselves. On the last whorl there are 15 axial folds or ribs, the ribs on the dorsum extending from the suture to the periphery, those on the sides continuing a little below the periphery but becoming obsolescent on the base. Base with about 14 flat, closely spaced spiral fillets or slightly raised bands increasing in prominence anteriorly, these starting just below the convexity and continuing to the anterior lip. Under a 10-power lens the surface of the last two whorls is seen to be covered with very numerous spiral lineations which appear a little sharper in the intercostal areas, crossed by even finer axial lineations. Under higher magnification it is seen that the non-costate middle whorls are also spirally lineate though the markings are fainter than they are on the last costate whorls. Post-nuclear whorls flat-sided, the sutures fine, impressed. Aperture elongate rectangular, constricted and somewhat produced at the posterior notch. Outer lip a little varicose behind, thin along the edge, the inner margin armed with 10 denticles aligned in rather wide pairs. Columella and parietal wall callused, the outer edge of the callus tidily trimmed and raised slightly above

the surface of the whorl, bearing about 10 feeble plicae from the base of the parietal wall to near the anterior end of the columella. Inner margin of pillar projecting a little into the aperture, faintly grooved. Anterior canal very short, broad, excavated behind into a deep, oblique, U-shaped notch. Spire tessellated with a mosaic of light brown and dark brown arrowheads enclosing rhomboid areas of tan, the summit of all whorls encircled with a narrow band of white under which are blotches of dark brown. Axial costae of last two whorls whitish along the crest, the last whorl with a broad band of brown to dull gray below the white band of the summit; under that, at the suture, is a narrow band of cream tessellated with arrowheads of light brown, the band widening considerably on the dorsum. Emerging from the aperture below the commissure is another band with dark brown splashes and links, the splashes occurring on the white of the parietal callus, the links enclosing areas of light tan of the ground. Base light tan with flecks of light brown. The interior of the highly polished aperture is tinged above and below with a pale bluish gray, and on the back of the outer lip is a column of light brown triangles on the light tan of the ground. Flecks of light brown occur sparsely on the distal margin of the inner lip.

Dimensions.—Length 10.9 mm.; max. width 4.2 mm.

Localities.—Recent, on beach at Playa Grande Yachting Club, Distrito Federal. One specimen, No. 26218 PRI (figured); Abisinia formation at W-30, eastern edge of Playa Grande village. Two specimens doubtfully identified as this species, No. 26219 (figured) and 26390 (unfigured) PRI.

Remarks.—Although I have seen no specimens of *A. plicatulum* (Dunker) nor any illustrations of it, the fact that our Playa Grande shell meets Dunker's description and is found on the beach about 115 kilometers east of the type locality of Puerto Cabello, suggests that the Playa Grande species may be *A. plicatulum*. Dunker's original description is as follows:

B. testa parvula ovato-acuta, apice acuminata, nitidissima, subdiaphana, albida seu fulvescente plerumque fasciis duabus pallide fuscis interruptis cincta; anfractibus convexiusculis 7-8, supremis longitudine distincte plicatis, ceteris, praesertim ultimo semiplicato spira perparum majore, basin versus transversim sulcato, sulcis 16-18 regulariter et concinne incisis; apertura ovata, labro dextro crassiusculo subvaricoso, intus striato; faucibus plerumque fuscis. —Long. 3-2/3 lin., latit. 1-2/3 lin.

Plura specimena exstant prope Puerto Cabello lecta unde misit Clar. G. Tams, Med. Dr.

Haec species sub microscopio spectata elegantissimarum una est sui generis.

Ad eas Buccinarum formas pertinet, quae ab auctoribus nonnullis eodem forsan jure Columbellis adjungtur ut *Buccinum cereale* Mke., *mitrula* Dkr., *punctatum* Kien., *lacteum* Kien. et cetera, quae sectionem propriam aut familiam constituunt. At vero ubi sunt limites arcti inter Buccina quaedam et Columbellas? et ex altera parte inter Purpuras, Fusos atque Buccina ? Sola testarum consideratio eos, nostra opinione, nunquam inveniet nisi forte et animalium ipsorum naturam perscrutare possumus.

Comparisons—This beautiful shell is related to the *Anachis avara* clan, particularly to *A. semiplicata* Stearns (1873, pp. 344-345, Fig. 1) from Florida. That, however, is "light sienna-yellow, closely covered with white rounded spots", and the axial costae are fewer, broader, and less elevated than they are on our Playa Grande shell. The only difference that I can detect between our Recent specimen and *A. floridana* Rehder (1939, pp. 29-21, pl. 6, fig. 6) from both coasts of peninsular Florida is that the Floridan shell seems consistently somewhat stouter. Nevertheless if the Playa Grande species proves not to be the same as *A. plicatulum* (Dunker), one would not go far astray in relating it to *A. floridana* Rehder.

Anachis ? implumis, new species **Pl. 28, figs. 5, 6**

Shell small, broadly ovate, the spire moderately short, the apex obtuse. Whorls a little over four including the nucleus. Nuclear whorls about three, shiny, thin, smooth, the first tightly coiled, appressed, the next narrow and convex, the last merging insensibly into the conch. Post-nuclear whorls rounded, the ultima constricted near the base. Sutures finely impressed. All whorls smooth except the last which is sculptured by about six microscopic spiral threads on the base and pillar, and faint, widely spaced, arcuate axial folds extending from the suture part way down the convexity, the folds waning progressively from the labrum and dorsum to the ventral face where they disappear. Aperture broadly lenticular. Outer lip broken far back, thickened along the commissure. Columella rather deeply excavated above the pillar. Pillar slightly twisted, thickened along the inner margin. Area of siphonal canal broken away in part, the canal fairly short and moderately deep.

Dimensions.—Holotype, length 1.4 mm.; max. width 0.8 mm.

Type locality.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. A single specimen, the holotype.

Remarks.—The shell is a juvenile and unlike any other I have seen.

Anachis ? indistincta, new species Pl. 28, figs. 7, 8

Shell small, thin, ovate, the spire moderately produced, the apex obtuse. Whorls nearly five in all, the smooth shiny nucleus consisting of about 2-1/2 of them. Initial whorl of nucleus appressed and indistinct, the succeeding ones well rounded, the last defined vaguely from the conch by a slight difference in shell texture. Penultimate whorl full, body whorl slightly convex above, rounded medially, contracted somewhat at the base. Sutures distinct, the early ones finely impressed, the later ones finely channeled. Because of corrosion, the holotype seems devoid of markings except at the base, but the paratype, which was broken while handling, is sculptured on the body whorl by fairly numerous, microscopic axial threads or riblets extending from the suture toward the base where they become obsolescent. Base with six or seven subequal spiral threads which are rendered slightly crenulate by microscopic axial growth striae, the threads extending on the pillar. Pillar moderately long, a little twisted, the inner margin thickened. Aperture lenticular, moderately wide. Outer lip broken away, thickened a little at the commissure. Columella straight, the curve with the parietal wall gentle. Anterior canal broken at the extremity.

Dimensions.—Holotype, length 1.8 mm.; max. width 0.8 mm., No. 26221 PRI; paratype (measured before breakage), length 2.0 mm.; max. width 0.95 mm., No. 26,388 PRI.

Type locality.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. Two specimens.

Remarks.—The two immature specimens of this species were found together with *Anachis ? implumis,* n. sp.; also a juvenile. Although similar, the present shell, *A. ? indistincta,* n. sp., is distinguished from *A. ? implumis* by one more whorl, in being a little longer, and in having much less curvature between the columella and parietal wall.

Anachis (Litotrema) exuta, new subgenus, new species Pl. 28, figs. 9, 10

Shell small, broadly biconical, the spire moderatly short, the angle of spire about 50 degrees. Whorls six in all, the smooth nucleus consisting of about three of them, the initial nuclear whorl small, the last moderately convex. Post-nuclear whorls a little rounded, the ultima somewhat swollen at the periphery and constricted at the base, the summit of each whorl with a narrow feeble cingulum at the narrowly incised sutures. Sculpture consisting of strong, nearly straight axial costae and spiral riblets, the latter pronounced at the base but often evanescent above the periphery. On the spire whorls the axial costae extend from suture to suture, are slightly narrower at the upper suture than the lower, and are separated by interspaces about equally as wide. On the body whorl there are 15 costae, those on the labrum extending well below the convexity, the others reaching only to the periphery. On the whorls of the spire, the spiral riblets are faint and are confined to the intercostal areas. On the peripheral area of the last whorl the spiral riblets in the intercostal areas are accentuated, and the grooves between the subequal riblets may appear as rectangular pits or slots. Below the convexity of the ultima, the spiral riblets are continuous to the base where there are also fine longitudinal growth threads. Aperture more or less lenticular, smooth. Outer lip thin at the edge, the last axial rib immediately behind, the inner margin not denticulate, although the basal edge of the lip is gently frilled by the termini of the spiral riblets. Columella deeply excavated below the parietal wall, virtually devoid of wash or glaze, the base of the columella emarginated by a fold which continues a short distance along the labial margin of the anterior canal. Above the basal fold of the columella there is a sulcus or groove. Anterior canal moderately long, deep and broad, the labial margin bent to the left, the termination of the canal excavated into a deep semicircular notch. Posterior outlet small, arched over acutely by the rim of the outer lip.

Dimensions.—Holotype (D129a), length 3.7 mm.; max. width 2.1 mm., No. 26222 PRI; paratype (I129a), length 3.5 mm.; max. width 1.9 mm., No. 26389 PRI.

Type locality.—Abisinia formation at W-30, eastern edge of Playa Grande village. One specimen, the holotype.

Other localities.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. One specimen, the paratype.

Mare formation near W-14, on hillside above west bank of Quebrada Mare Abajo. Three specimens.

Comparisons.—The new species is akin to *Columbella asphaltoda* Maury (1912, p. 81, pl. 12, fig. 2; 1925b, p. 363) from the Matura Pliocene of Trinidad, but *C. asphaltoda* has three or four lirae within the outer lip, its axial costae are not so strong as those on the Venezuelan shell, and the base of *C. asphaltoda* is less contracted than that of *Anachis exuta,* n. sp. In shape and external sculpture *A. exuta* is reminiscent of the Recent Eastern Pacific *Anachis diminuta* (C. B. Adams) (see Turner, 1956, p. 45, pl. 7, fig. 2) from Panama, but *C. diminuta* is a typical *Anachis* whose outer lip is lirate along the inner margin; also, *C. diminuta* has fewer and larger axial costae than the Venezeulan fossil. The possibility is not excluded that *A. extua,* n. sp. is the adult of the previously described *Anachis* ? *implumis,* n. sp. which is a juvenile shell. This, however, can only be determined definitively with a suite of specimens in various growth stages.

Remarks.—There seems to be the need for the establishment of a new subgenus to include such forms as *A. extua* that are small, axially costate, *Anachis*-like shells with a smooth outer lip within, and with an uncallused columellar lip. The name proposed is *Litotrema,* and the type species is the new species *Anachis* (*Litotrema*) *extua* from the Pleistocene Abisinia formation of Venezuela.

Nitidella laevigata (Linnaeus) Pl. 28, figs. 11-18

1758. *Buccinum laevigatum* Linnaeus, Syst. Nat., ed. 10, p. 274.
1864. *Columbella laevigata* Lamarck, Krebs, The West Indian Marine Shells, p. 29 .
1878. *Columbella laevigata* Lamarck, Mörch, Catalogue of West-India Shells, p. 12.
1883. *Columbella laevigata* (Linnaeus), Tryon, Man. Conch., vol. 5, p. 113, pl. 46, figs. 16-21.
1889. *Columbella* (*Nitidella*) *laevigata* (Linnaeus), Dall, U. S. Nat. Mus., Bull. 37, p. 118.
1889. *Columbella* (*Nitidella*) *laevigata,* (Linnaeus), Dall, Mus. Comp. Zool., Bull., vol. 18, p. 189.
1891. *Columbella laevigata* (Linnaeus), Baker, Acad. Nat. Sci. Phhiladelphia, Proc., vol. 43, p. 51.

1901. *Nitidella laevigata* (Linnaeus), Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. I, p. 406.
1937. *Nitidella laevigata* (Linnaeus), Smith, East Coast Marine Shells, p. 120, pl. 46, fig. 5.
1946. *Nitidella laevigata* (Linnaeus), Jaume, Soc. Malac. "Carlos de La Torre" Rev., vol. 4, No. 3, p. 107.
1958. *Nitidella laevigata* (Linnaeus), Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 16.
1958. *Nitidella laevigata* (Linnaeus), Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, p. 89, pl. 14, 2 figs.
1959. *Nitidella laevigata* (Linnaeus), Nowell-Usticke, A Check List of the Marine Shells of St. Croix, p. 66.

Shell of medium size, moderately thin to moderately solid, ovate conical, the spire produced at an angle of 45 to 49 degrees, the apex obtuse. Whorls about six in all, the nucleus made up of 1-1/2 of them. Nucleus dark amber on dark brown shells, light amber on light brown shells, the initial whorl not tightly coiled but appressed, the last merging insensibly into the conch. Post-nuclear whorls gently and roundly shouldered, the body whorl sculptured by 10 to 14 spiral grooves on the base. Aperture lenticularly ovate, widest at the base. Outer lip moderately thick to moderately thin, not swollen behind, the inner margin smooth or denticulate, the latter with 8 to 14 teeth. Columella arcuately excavated above, grooved near its base to form two oblique folds. Siphonal canal short, fairly deep, the anterior notch deeply indented, recumbent, U-shaped, non-emarginate. Ground color straw, with light brown to deep reddish brown zigzags. Color pattern exceedingly variable although always there are alternating brown and white longitudinal bars or blotches around the summit and base of the whorls, the browns more intense at the base. Around the middle of the body whorl there is often a narrow band of brown and white markings, the brown ones sometimes shaped like arrowheads. On some specimens there is another such band below the middle one, and rarely there are no bands at all on the ultima except for the alternations around the summit. Aperture white except on the darkest specimens where it is slightly purplish.

Dimensions.—Average Recent specimen, length 13 mm.; max. width 7.5 mm.; length of aperture 7.5 mm.; average fossil specimen, length 10 mm.; max. width 6 mm.; length of aperture 6 mm.

Localities.—Recent, on beach at Playa Grande Yachting Club, Distrito Federal. One hundred thirty-six specimens; Abisinia forma-

tion at W-30, eastern edge of Playa Grande village. One hundred seven specimens.

Remarks.—All of the specimens from the Abisinia formation are abraded and, therefore, somewhat thinner than their Recent counterparts. A few of them have retained their color markings, and there is no doubt that the fossil specimens represent the same species as the dead shells found on the beach 800 meters northwest of, and 62 meters lower than, the Abisinia formation at W-30.

Range and distribution.—The living *N. laevigata* (Linnaeus) extends from southeast Florida through the West Indies to northern South America and Trinidad. So far as I know, Venezuela is the only country where it has been reported as a fossil.

Nitidella nitida (Lamarck) Pl. 28, figs. 19-22

1822. *Columbella nitida* Lamarck, An. sans. Vert., vol. 7, p. 295.
1822. *Columbella nitidula* Sowerby, The Genera of Recent and Fossil Shells, pt. 9, pl. 248, fig. 7.
1823. *Voluta gracilis* Dillwyn, [in] Index to Martin Lister, Barbados. Refers to Lister, pl. 827, fig. 49b.
1864. *Columbella nitida* Lamarck, Krebs, The West Indian Marine Shells, p. 29.
1878. *Columbella nitida* Lamarck, Mörch, Catalogue of West-India Shells, p. 12.
1889. *Columbella* (*Nitidella*) *nitidula* Sowerby, Dall, U. S. Nat. Mus., Bull. 37, p. 118.
1889. *Columbella* (*Nitidella*) *nitidula* Sowerby, Dall, Mus. Comp. Zool. Bull., vol. 18, p. 189.
1891. *Columbella nitida* Lamarck, Baker, Acad. Nat. Sci. Philadelphia, Proc., vol. 43, p. 51.
1901. *Nitidella nitidula* (Sowerby), Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, p. 405.
1937. *Nitidella nitidula* (Sowerby), Smith, East Coast Marine Shells, p. 120, pl. 46, fig. 15 .
1939. *Columbella* (*Nitidella*) *nitidula* Sowerby, McGinty, Nautilus, vol. 53, No. 2, p. 38.
1946. *Nitidella nitidula* (Sowerby), Jaume, Soc. Malac. "Carlos de La Torre" Rev., vol. 4, No. 3, p. 107.
1954. *Nitidella nitidula* (Sowerby), Abbott, American Seashells, p. 222, pl. 25 dd.
1955. *Nitidella nitidula* (Sowerby), Perry and Schwengel, Marine Shells of the Western Coast of Florida, p. 160, pl. 51, fig. 346.
1958. *Nitidella nitidula* (Sowerby), Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 16.
1958. *Nitidella nitida* (Lamarck), Abbott, Acad. Nat. Sci. Philadelphia, Mon. No. 11, pp. 69-70.
1958. *Nitidella nitidula* (Sowerby), Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, p. 89, pl. 14, 1 fig.
1959. *Nitidella nitida* (Lamarck), Nowell-Usticke, A Check List of the Marine Shells of St. Croix, p. 66.

Shell of medium size, shiny, oblong-ovate, with a short, acute spire, a papilliform apex, and a divergence of 55 to 59 degrees. Whorls seven in all, 1-1/2 or two of them forming the nucleus, the tip of which is rather tightly coiled and appressed. Early post-nuclear whorls flat-sided, the remainder slightly convex. Sutures distinct, finely incised. Aperture elongate, subtriangular, widest at the base, the length about three-fourths that of the shell, the posterior outlet relatively wide and deeply channeled, the anterior canal short, rather broad, the extremity excavated into a wide, oblique, U-shaped, nonemarginate notch. Outer lip thickened a little behind and at the middle where it bulges somewhat toward the columella; summit of lip sharply upcurved, the inner margin bearing 8 to 12 white teeth which are strongest at the middle, the spaces between the teeth on well preserved specimens stained light brown or dark brown. Columella slightly concave above, callused and protruding at the curve with the lower lip where there is a nearly horizontal groove with a fold or plait on either side, the lower or anterior fold the sronger. Surface smooth and glossy, unsculptured save for a number of fine, scarcely visible spiral grooves at the base. The specimens are fairly evenly divided into two main color groups, one a chocolate to reddish brown, the other a light tan, both blotched and spotted with white, the light markings concentrated around the summit and a little below the middle of the body whorl. The first post-nuclear whorl of the dark brown specimens is black, that of the light tan specimens a dark brown. On specimens with the nucleus worn down - and these are in the majority - the blunted apex is tipped with black or dark brown depending on the intensity of the tone of the rest of the shell. Aperture of the dark variety purplish, of the light variety faintly roseate.

Dimensions.—Specimen A231a, length 13 mm.; max. width 6.2 mm.; length of aperture 8.1 mm.; specimen A231b, length 13.4 mm.; max. width 6.8 mm.; length of aperture 9 mm.

Locality.—Recent, on beach at Playa Grande Yachting Club, Distrito Federal. Fifty-one specimens.

Remarks.—Although *N. nitida* is fairly abundant on the beach, not a single fossil specimen was observed in the Abisinia formation. On the other hand nearly as many fossil specimens of *N. laevigata*

were collected from the Abisinia formation as were Recent ones from the beach.

Range and distribution.—*N. nitida* (Lamarck) dwells in shallow water and is found in seaweed and under rocks and detritus. It is common in the West Indies, and its range is from southeast Florida to northern South America.

Nitidella cf. ocellata (Gmelin) Pl. 28, figs. 23, 24

1791. *Buccinum ocellatum* Gmelin, Syst. Nat., ed. 13, vol. 1, p. 3488.
1822. *Buccinum cribrarium* Lamarck, An. sans Vert., vol. 7. p. 274.
1832. *Buccinum cribrarium* Lamarck, Quoy and Gaimard, Voy. Astrolobe, Zoology, vol. 2, p. 421, pl. 30, figs. 21, 22.
1858. *Columbella cribraria* (Lamarck), Reeve, Conch. Icon., vol. 11, pl. 13, sp. 62.
1864. *Columbella ocellata* (Gmelin), Krebs, The West Indian Marine Shells, p. 30.
1878. *Columbella ocellata* (Gmelin), Mörch, Catalogue of West-India Shells, p. 12.
1883. *Mitrella cribraria* (Lamarck), Tryon, Man. Conch., vol. 5, p. 122, pl. 48, figs. 73-75.
1889. *Columbella* (*Nitidella*) *cribraria* (Lamarck), Dall, U. S. Nat. Mus. Bull. 37, p. 118.
1891. *Columbella cribraria* (Lamarck), Baker, Acad. Nat. Sci. Philadelphia, Proc., vol. 43, p. 51.
1901. *Nitidella cribraria* (Lamarck), Dall and Simpson, U. S. Fish Com. Bull., vol. 20 for 1900, pt. 1, p. 406.
1909. *Nitidella ocellata* (Gmelin), Dall, U. S. Nat. Mus., Proc., vol. 37 (1910), No. 1704, pp. 217, 281, 282, 288.
1928. *Mitrella* (*Mitrella*) *ocellata* Woodring, Carnegie Inst. Washington, Publ. No. 385, p. 274.
1937. *Nitidella cribraria* (Lamarck), Smith, East Coast Marine Shells, p. 120, pl. 46, fig. 5.
1938. *Mitrella ocellata* (Gmelin), Bales, Nautilus, vol. 52, No. 2, p. 45.
1938. *Mitrella ocellata* (Gmelin), Baker, Hanna, and Strong, California Acad. Sci. Proc., ser. 4, vol. 23, No. 16, p. 248, pl. 24, fig. 3.
1946. *Nitidella cribraria* (Lamarck), Jaume, Soc. Malac. "Carlos de La Torre" Rev., vol. 4, No. 3, p. 107.
1954. *Nitidella ocellata* (Gmelin), Abbott, American Seashells, p. 222, pl. 25hh.
1958. *Mitrella ocellata* (Gmelin), Keen, Sea Shells of Tropical West America, p. 390, fig. 484.
1958. *Nitidella ocellata* (Gmelin), Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 16.
1959. *Nitidella ocellata* (Gmelin), Nowell-Usticke, A Check List of the Marine Shells of St. Crox, p. 66.

Fossil shell with only the last two whorls remaining, slender, moderately solid, elongate ovate, the surface smooth except for about six flat spiral fillets separated by narrow incisions at the base. Lower whorls very slightly convex, the body whorl weakly and obtusely angulate at the periphery, the angulation in line with the last

suture, becoming obsolescent on the dorsum. Penultimate whorl nested slightly in the ultima. Sutures well defined. Aperture lenticular, narrowing into a simple groove or channel at the posterior outlet, the anterior canal relatively short, broad, and deep, the extremity notched, the notch broken. Outer lip also broken back medially, thickened at the summit and, inferentially, along the margin, the inner margin showing evidence of being denticulate on whole specimens. Parietal wall arcuately excavated. Columella rather long and fairly straight, the anterior end bent to the left, the lip callused, the callus extending to the parietal wall where it is thinner and adherent; below, the distal margin of the callus is raised slightly above the surface, and bears weak lirae reflected through from the spiral fillets underneath. The surface retains a faded color pattern of rather small white oval to roundish spots on a pale brownish yellow ground.

Dimensions.—Length (2 whorls) 4.5 mm.; max. width 2.5 mm.

Locality.—Mare formation at W-14, on hillside above west bank of Quebrada Mare Abajo. One specimen. When collected, the specimen was encrusted with a bryozoan mat. This was removed to reveal the characters of the shell.

Remarks.—The ocellate color pattern of the Venezuelan fossil immediately recalls *N. ocellata* (Gmelin) which is reported (see synonymy) from both Atlantic and Pacific waters. Our shell is more like the Atlantic variety, the Recent Pacific *N. ocellata* often being flatened on the left side of the body whorl whereas the Cabo Blanco shell is gently rounded. There seems to be considerable variation in shape, and in the character of the spots of the living *N. ocellata,* and until more specimens of the fossil are available, the true identity of the fossil will remain in doubt.

Range and distribution.—There is no previous record of *N. ocellata s.s.* occurring as a fossil. The Recent shell is reported from the Florida Keys to the West Indies and at the Island of Ascension in the Atlantic, and from Cape St. Lucas southward to Guayaquil, Ecuador, and the Galapagos Islands in the Pacific.

Strombina caboblanquensis, new species Pl. 28, figs. 25-30; Pl. 29, figs. 1-4

1888. *Columbella recurva* Sowerby, Schepman, [in] Martin, Bericht über eine Reise nach Nederlandisch West-Indien und darauf gegründete Studien, Leiden: II-Geologische Studien, Appendix. Not Sowerby, 1832, Zool. Soc. London, Proc., vol. 19, p. 115.

1889. *Columbella recurva* Sowerby, Lorié, Samml. Geol., Reichs-Mus. Leiden, ser. 2, vol. 1, p. 137. Not Sowerby, 1832, Zool. Soc London, Proc., vol. 19, p. 115.

The Cabo Blanco fossil is of medium size, sturdy, the spire turreted, acuminate, the divergence averaging 40 degrees but varying from 35 to 47 degrees. Whorls nearly nine in all, the smooth hyaline nucleus consisting of 1-1/2 of them. Nucleus papilliform, the tip appressed, the succeeding turn decidedly bulbous, the last stage only a little convex as it merges insensibly into the conch. The nucleus is a little off center, and the last whorl is differentiated from the conch by the procelaneous surface of the latter as compared with the hyaline surface of the nucleus proper. Post-nuclear whorls somewhat telescoped one into the other, the first two hardly convex, relatively long and smooth except for fine longitudinal growth lineations, the lower ones more or less tabulate and straight-sided but rounded at the rather distinct shoulder, the ultimate whorl generally a little swollen below the summit. The last four whorls are sculptured by subequal, slightly elevated spiral fillets or riblets and thin arcuate axial costae, the costae tending to become obsolescent toward the base of the penultimate whorl, and confined to the shoulder of the ultimate whorl. The penultimate whorl may bear as few as 8 or as many as 14 fillets, the fillets becoming faint and often disappearing toward the anterior suture, and 13 to 18 axial costae. On the mid-section of the body whorl the spiral fillets are always faint whereas on the base they are strong, the posterior two of the latter close together, the anterior ones broader, higher, and farther apart. The axial costae of the body whorl are confined to the slightly swollen shoulder area, are generally narrow and a little flexuous but occasionally thickened, the costae usually absent or obsolescent in the area of the labrum back of the labral varix. Below the shoulder, the body whorl is often slightly depressed on the dorsum. Sutures distinct, very narrowly channeled, the suture of the ultima curving over the varix of the outer lip. Anterior fasciole relatively large, convex, made up of closely spaced crenated spiral cords. The surface of the shell is crowded with axial lineations, and, on specimens which retain their polish, the epidermal layer of shell is stamped, as it were, with a crisscross of feebly impressed grooves which impart a diamond or polygon pattern. Aperture moderately wide, S-shaped,

the posterior outlet a relatively long but narrow and shallow groove, the outlet bordered below by a prominent notch in the outer lip. Outer lip rather strongly and broadly varicose behind, the edge moderately thin to lamellate and sometimes recurved slightly toward the varix, the inner margin slightly swollen next to the posterior outlet, thickened below the labral notch with a denticulate callus, the callus thickest immediately below the notch, the number of teeth 6 to 10, the posterior tooth sometimes bifid. Columella and parietal wall callused, the callus smooth and adherent on the wall proper, detached and raised, often vertically, on the base where it forms a shield against which the spiral fillets terminate. Anterior canal short and deep, the terminal notch U-shaped, nearly recumbent, its sides subparallel, the edge of the notch not emarginate.

The description above refers to the heavy, denticulate variation of the species as shown on Plate 29, figures 3 and 4. Associated with the denticulate shells are a number of specimens that are sculptured exactly the same on the exterior, but have an uncallused columella and a thin, nonvaricose outer lip which is smooth within except for faint flutings near the base. This form is illustrated on Plate 28, figures 26 and 27, and is believed, despite the unlike morphology of the oral area, to be the same species as the denticulate variation but to be either less developed or of the opposite sex.

Dimensions.—Holotype (J213a), length 23.1 mm.; max. width 10.2 mm.; paratype (I213a), length 19.2 mm.; max. width 9.5 mm.; paratype (I213b), length 21.7 mm.; max. width 10 mm.; paratype (I213c), length 13.1 mm.; max. width 5.3 mm.

Type locality.—Lower Mare formation, in small stream 100 meters west of Quebrada Mare Abajo. Thirty specimens.

Other localities.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. Fifty-two specimens; Mare formation near W-14, on hillside above west bank of Quebrada Mare Abajo. Six specimens; Mare formation, in stream 250 meters south-southwest of mouth of Quebrada Las Pailas. Six specimens; Playa Grande formation (Maiquetía member) at W-4, Quebrada Las Pailas. Four specimens; Playa Grande formation (Maiquetía member) at W-26 in Quebrada Las Bruscas, approximately 120 meters upstream from junction with Quebrada Las Pailas. One specimen; Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. One specimen.

Comparisons.—This is one of the more abundant fossils in the Cabo Blanco group and undoubtedly represents the species that was referred to as *Columbella recurva* Sowerby by Schepman and Lorié. The shell does resemble the Eastern Pacific *C. recurva* (Baja California to Lobitos, Peru) but the whorls of Sowerby's *C. recurva* are angulate at the shoulder, and the body whorl is tuberculate at the shoulder rather than ribbed as on *Strombina caboblanquensis,* n. sp. Actually, the Cabo Blanco fossil is just as close to the only known survivor of *Strombina* in the Western Atlantic, *S. pumilio*[6] (Reeve) (Conch. Icon., vol. 11, pl. 24, sp. 147, 1859), but *S. pumilio* is also irregularly noded at the angulate shoulder of the body whorl, and the body whorl is usually a trifle shorter and more triangular in outline than that of the Cabo Blanco shell *Strombina recurva* and *Strombina pumilia* are themselves similar, and as *S. caboblanquensis* is also found as a fossil near Cumaná, Venezuela, (U. S. National Museum collection No. 18408) not far from the type locality of the living *S. pumilio,* the fossil may be the precursor or progenitor of the Recent species. Among fossil species, *S. caboblanquensis* is exceedingly close to the upper-middle Miocene *S. colinensis* H. K. Hodson (1931, p. 29, pl. 11, fig. 8) from the State of Falcon, Venezuela, the differences being that the spire of *S. caboblanquensis* is shorter, the labral notch is nearer the posterior outlet, and the distal edge of the columellar callus is detached and often erect whereas on *S. colinensis* it tends to lie flat. *Pyrene* (*Strombina*) *gradata humboldti* Rutsch (1934, pp. 67-68, pl. 4, figs. 7, 8) from the upper Miocene-Pliocene deposits at Punta Gavilan, State of Falcon, Venezuela, is also related but that has a longer, more turreted spire, the whorls are a little concave, and the base is more attenuate. Superficially there is considerable resemblance between the Cabo Blanco shell and *S. gradata* (Guppy) from the Bowden Miocene of Jamaica as figured and described by Woodring (1928, pp. 283-284, pl. 17, figs. 3, 4). The outer lip of *S. gradata,* however, "is not thickened below the notch, or only slightly thickened", and its inner lip is obscurely denticulate whereas on *S. caboblanquensis*

[6]I am indebeted to Dr. R. Tucker Abbott, Pilsbry Chair of Malacology, Department of Mollusks, Academy of Natural Sciences of Philadelphia, for calling my attention to *S. pumilio* and for his donation of several specimens (ANSP No. 240053) dredged off Punta Piedras, Isla Margarita, Venezuela, by Wesley M. Heilman on 5 Feb. 1959.

the inner lip, if callused, as it is on the majority of adults, is always smooth.

Remarks.—The West Indian, Central American, and northern South American fossil species of *Strombina* that have come to my attention during this study are listed below. Some of them may eventually prove to be synonymous.

ambigua Guppy, 1866, Geol. Soc. London Quart. Jour., vol. 22, p. 288, pl. 18, fig. 8 [= *Strombina guppyi* Woodring]. Miocene—Jamaica, Costa Rica.
bassi Maury, 1917, Bull. Amer. Paleont., vol. 5, No. 29, p. 260, pl. 15, fig. 17. Miocene—Dominican Republic.
caribaea Gabb, 1873, Amer. Philos. Soc., Trans., vol. 15, p. 221. Miocene—Dominican Republic.
caribaea micra Pilsbry, 1921, Acad. Nat. Sci. Philadelphia, Proc., vol. 73, p. 351, pl. 18, figs. 10, 11. Miocene—Dominican Republic.
cartagenensis Pilsbry and Brown, 1917, Acad. Nat. Sci. Philadelphia, Proc., vol. 69, p. 33, pl. 5, fig. 3. Miocene—Colombia.
chiriquiensis Olsson, Bull. Amer. Paleont., vol. 9, No. 39, pp. 302-303, pl. 10, figs. 14, 24. Miocene—Panamá, Costa Rica, Colombia.
cimarroma Marks, 1951, Bull. Amer. Paleont., vol. 33, No. 139, pp. 379-380, pl. 7, fig. 4. Miocene—Ecuador.
colinensis H. K. Hodson, 1931, Bull. Amer. Paleont., vol. 16, No. 59, p. 29, pl. 11, fig. 8. Miocene—Venezuela.
colombiana Weisbord, 1929, Bull. Amer. Paleont., vol. 14, No. 54, p. 275, pl. 7, figs. 11, 12. Miocene—Colombia.
costaricensis Olsson, 1922, Bull. Amer. Paleont., vol. 9, No. 39, pp. 300-301, pl. 10, figs. 8, 17. Miocene—Costa Rica.
costaricensis var. *musanica* Olsson, 1922, Bull. Amer. Paleont., vol. 9, No. 39, p. 301, pl. 10, figs. 26, 27. Miocene—Costa Rica.
cricamola Olsson, 1922, Bull. Amer. Paleont., vol. 9, No. 39, pp. 299-300, pl. 10, fig. 18. Miocene—Costa Rica, Venezuela.
cunningham-craigi Rutsch, 1943, Naturforsch. Gesell. Basel Verh., vol. 54, p. 148, pl. 3, figs. 12a, 12b. Upper Miocene—Trinidad.
cyphonotus Pilsbry and Johnson, 1911, Acad. Nat. Sci. Philadelphia, Proc., vol. 63, p. 353, pl. 25, figs. 6, 7. Miocene-Panamá, Colombia, Dominican Republic.
daulechica Marks, 1951, Bull. Amer. Paleont., vol. 33, No. 139, p. 382, pl. 7, fig. 5. Miocene—Ecuador.
divilitus Harris and Maury, 1917, Bull. Amer. Paleont., vol. 5, No. 29, p. 262, pl. 21, fig. 12. Pliocene—Costa Rica.
duddeleyi Rutsch, 1943, Naturforsch., Gesell. Basel Verh., vol. 54, pp. 145-147, pl. 7, figs. 2, 3. Miocene—Trinidad.
ecuadoriana Olsson, 1941, Acad. Nat. Sci. Philadelphia, Proc., vol. 93, p. 35, pl. 5, figs. 7, 8. Pliocene—Ecuador.
falconensis H. K. Hodson, 1931, Bull. Amer. Paleont., vol. 16, No. 59, pp. 28-29, pl. 10, figs. 10, 11. Miocene—Venezuela.
gatunensis Toula, 1911, K.—k. geol. Reichsanstalt Jahr., Part 2, vol. 61, p. 501, pl. 30, fig. 8. Miocene—Panamá.
gibberula Sowerby, 1832, Zool. Soc. London, Proc., p. 115. Pliocene—Ecuador. Also Recent—Baja California to Peru.
gradata Guppy, 1866, Geol. Soc. London Quart. Jour., vol. 22, pp. 288-289, pl. 16, fig. 10. Miocene—Jamaica.

gradata humboldti Rutsch, 1934, Schweiz. Palaeont. Gesell. Abh., vol. 54-55, pp. 67-68, pl. 4, figs. 7, 8. Miocene—Pliocene, Venezuela; Miocene—Trinidad.
guppyi Woodring, 1928, Carnegie Inst. Washington, Pub. No. 385, pp. 282-283, pl. 17, fig. 2. Miocene—Jamaica, Costa Rica.
guaica Maury, 1925, Bull. Amer. Paleont., vol. 10, No. 42, p. 364, pl. 36, figs. 10, 11. Miocene—Trinidad.
haitensis Sowerby, 1849, Geol. Soc. London Quart. Jour., vol. 6, p. 46. Miocene—Dominican Republic.
lanceolata Sowerby, 1832, Zool. Soc. London, Proc., p. 116. Pliocene—Ecuador. Also Recent—Perú, Ecuador, Galapagos Islands.
lessepsiana Brown and Pilsbry, 1911, Acad. Nat. Sci. Philadelphia, Proc., vol. 63, pp. 352-353, pl. 25, figs. 11, 12. Miocene—Panamá, Costa Rica.
lloydsmithi Pilsbry and Brown, 1917, Acad. Nat. Sci. Philadelphia, Proc., vol. 69, pp. 33-34, pl. 5, fig. 4. Miocene—Colombia.
matima Olsson, 1922, Bull. Amer. Paleont., vol. 9, No. 39, p. 299, pl. 10, fig. 7. Miocene—Costa Rica.
mira Dall, 1897, U. S. Nat. Mus., Proc., vol. 19, No. 1110, pp. 312-313, pl. 29, fig. 7. Miocene—Panamá.
nanniebellae Maury, 1917, Bull. Amer. Paleont., vol. 5, No. 29, pp. 260-261, pl. 15, figs. 15, 16. Miocene—Dominican Republic.
nuestrasenorae Maury, 1917, Bull. Amer. Paleont., vol. 5, No. 29, p. 262, pl. 15, fig. 11. Miocene—Dominican Republic [= *Strombina caribaea* Gabb].
ohomachii Oinomikado, 1939, Geol. Soc. Japan Jour., vol. 46, p. 621, pl. 29 (15), figs. 4a, b. Miocene—Colombia.
politissima Pilsbry and Johnson, 1917, Acad. Nat. Sci. Philadelphia, Proc., vol. 69, p. 168.
portoricana Hubbard, 1920, Scientific Survey of Porto Rico and the Virgin Islands, New York Acad. Sci., vol. 3, pt. 2, p. 149, pl. 23, fig. 4. Lower Miocene—Puerto Rico.
prisma Pilsbry and Johnson, 1911, Acad. Nat. Sci. Philadelphia, Proc., vol. 63, pp. 352-353, pl. 25, figs. 9, 10. Miocene—Panamá, Dominican Republic.
pseudohaitensis Maury, 1917, Bull. Amer. Paleont., vol. 5, No. 29, p. 259, pl. 15, figs. 12, 13. Miocene—Dominican Republic.
pseudohaitensis var. *gurabensis* Maury, 1917, Bull. Amer. Paleont., vol. 5, No. 29, pp. 259-260, pl. 15, fig. 14.
pumilio Reeve, 1859, Conch. Icon., vol. 11, pl. 24, sp. 147.
pequenita Marks, 1951, Bull. Amer. Paleont., vol. 33, No. 139, pp. 381-382, pl. 7, fig. 1. Miocene—Ecuador.
quirosana H. K. Hodson, 1931, Bull. Amer. Paleont., vol. 16, No. 59, pp. 27-28, pl. 10, figs. 12, 13.
recurva Sowerby, 1832, Zool. Soc. London, Proc., p. 115. Pliocene—Ecuador. Also Recent—Baja California to Perú.
sincola Olsson, 1922, Bull. Amer. Paleont., vol. 9, No. 39, pp. 301-302, pl. 10, figs. 19, 21. Miocene—Costa Rica.
striatocostata Marks, 1951, Bull. Amer. Paleont., vol. 33, No. 139, pp. 380-381, pl. 7, fig. 7. Miocene—Ecuador.
tumbezia Olsson, 1932, Bull. Amer. Paleont., vol. 19, No. 68, pp. 190-191, pl. 18, fig. 7. Miocene—Perú.
tumbezia olssoni Oinomikado, 1939, Geol. Soc. Japan, Jour., vol. 46, p. 621, pl. 29 (15), figs. 5a, b. Miocene—Colombia.
walli Mansfield, 1925, U. S. Nat. Mus., Proc., vol. 66, No. 2559, pp. 47-48, pl. 8, figs. 5, 7. Miocene—Trinidad.
lanceolata zorritosensis Olsson, 1932, Bull. Amer. Paleont., vol. 19, No. 68, p. 191, pl. 18, figs. 8, 13. Miocene—Perú.

Strombina ? galba, new species Pl. 29, figs. 5, 6

Shell small, thin, elongate ovate, the spire fairly long, the angle of divergence near 29 degrees, the apex obtuse. Whorls nearly six in all, the glossy, subtranslucent nucleus made up of about three of them. Initial whorl of nucleus coiled rather tightly and appressed, the second convex, the last a little bulbous. Demarcation between nucleus and conch defined by a slight difference in shell texture, and by the occurrence, on the first post-nuclear whorl, of microscopic, curved axial threads extending from suture to suture, the threads visible under a magnification of 20X and in certain light, but not visible on the penultimate and ultimate whorls. The first post-nuclear whorl is less convex than the last nuclear whorl, the penultimate whorl is slightly convex, and the last is inflated at the middle, rather acutely constricted anteriorly. Surface of last two whorls devoid of sculpture except at base of ultima where there are half a dozen or so faint spiral threads. Sutures distinct, finely incised. Aperture lenticularly S-shaped. Outer lip broken back but probably thin as well as smooth along the inner margin. Pillar traversed obliquely by the threads of the base, the inner margin of the pillar not thickened. Anterior canal short and wide. Terminal notch moderately deep, nearly semicircular.

Dimensions.—Holotype, length 2.9 mm.; max. width 1.3 mm.

Type locality.—Mare formation, in stream 250 meters south-southwest of mouth of Quebrada Las Pailas. One specimen, the holotype.

Other localities.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. The single specimen found here is even thinner and more fragile than the holotype.

Comparisons.—The slight eccentricity in shape suggests that the Venezuelan shell is referable to *Strombina* rather than *Mitrella.* The two examples of the new species are immature and distantly resemble the juvenile of *S. lissa* Gardner (1947, pp. 514-515, pl. 52, fig. 14) from the Miocene Shoal River formation in Walton County, Florida. *S. lissa,* however, is subangulate at the periphery, the anterior canal is narrower, and the labium is more deeply excavated above the columella.

Alcira ? tropicana, new species Pl. 29, figs. 7, 8

Shell small, thin, subtransparent, more or less oval in outline, the spire broad, the apex obtuse. Whorls four in all, the initial appressed, the next moderately convex, the penultimate well rounded, the last inflated above, acutely constricted at the base. Sutures finely channeled. Surface hyaline and smooth except for a few spiral riblets on the base and canal, the riblets visible within the aperture, their terminations minutely frilling the lower edge of the outer lip and the extremity of the siphonal notch. Aperture pyriform-lenticular, widest at the middle. Outer lip thin, smooth along the inner margin; basal lip also very thin, truncated. Internal axis of columella hazily visible through the whorls, the inner margin of the columella curving sharply into the parietal wall, the middle section of the columellar lip flattened, the anterior end of the columellar lip emarginate, the emargination continuing along the labial side of the canal. Anterior canal short, broad, shallowly notched, the extremity thin and bent slightly backward.

Dimensions.—Holotype, length 1.1 mm.; max. width 0.85 mm.

Type locality.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. One specimen, the holotype.

Remarks.—As this tiny, delicate shell is barely beyond the embryonic stage of growth, the generic determination is suspect. The genus *Alcira* was erected by H. Adams in 1860 (Zool. Soc. London Proc., vol. 28, pp. 450-451), and was based on a single specimen, *A. elegans,* collected from the Cape of Good Hope, South Africa. Fischer (1887, p. 638) placed *Alcira* in *Astyris,* a name that many authorities are replacing with the genus *Mitrella* Risso, 1826. The Venezuelan shell is shorter and more delicate than the type species of *Alcira* but seems to fit somewhere in the mitrellids.

Mazatlania aciculata (Lamarck) Pl. 29, figs. 9-18

1844. *Buccinum aciculatum* Lamarck, An. sans Vert., vol. 10, p. 175.
1853. *Terebra nodosoplicata* Dunker ?, Zeitschr. f. Malakozool., yr. 10, No. 4, p. 110.
1864. *Bullia aciculata* (Lamarck), Krebs, The West Indian Marine Shells, p. 33.
1878. *Bullia* (*Euryta*) *aciculata* (Lamarck), Mörch, Catalogue of West-India Shells, p. 12.
1885. *Terebra aciculata* (Lamarck), Tryon, Man. Conch., vol. 7, pp. 37-38, pl. 11, figs. 15-17.
1887. *Terebra* (*Euryta*) *aciculata* (Lamarck), Fischer, Man. Conchyl., p. 587.

1929. *Mazatlania aciculata* (Lamarck), Thiele, Handb. Syst. Weichtierkunde, p. 303.
1932. *Mazatlania aciculata* (Lamarck), Pilsbry and Lowe, Acad. Nat. Sci. Philadelphia, Proc., vol. 84, p. 74.
1958. *Mazatlania aciculata* (Lamarck), Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 16.
1958. *Eurita aciculata* (Lamarck), Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, p. 102, pl. 9, 1 fig.

Shell small, moderately slender, the spire elongate, the tip of the spire acuminate, the angle of spire below the tip 27 to 32 degrees. Largest adult with 11 whorls in all, the nucleus composed of about 2-1/2 of them. Nuclear whorls smooth, the initial appressed, the last moderately bulbous, its diameter somewhat greater than that of the first post-nuclear whorl. The first post-nuclear whorl is flat-sided, somewhat narrower than the nuclear volution above, sculptured by closely spaced axial riblets extending from suture to suture. The next two or three whorls are nearly smooth but often with the merest suggestion of axial ribbing. The remaining whorls are sculptured by strong, rather widely spaced axial costae, varying in number from 10 to 16 but generally with 12 or 13 of them. The axial costae tend to fade out toward the base of the later whorls, and on the ultima they usually do so below the periphery, although occasionally several of them may continue to the base. On the last three or four whorls there is a shallow spiral sulcus a little above the middle, and immediately below the sulcus the costae are slightly to strongly nodulous, the nodulations elongated in the axial direction. The character of the ribbing is variable, the costae on some specimens being nearly plain folds, on others forming a strongly nodulose shoulder especially on the ultimate and penultimate whorls. The sutures are impressed, and, where the ribs are well developed, undulatory. Spiral sculpture appears only on the body whorl and this is near the base where there are four or five barely raised, sometimes strigitate, spiral fillets crossed by numerous axial threadlets. At the base of the fillets is the strong ridge characteristic of the genus, the ridge emarginating the back side of the basal lip. Below the ridge is the anterior fasciole which is composed of three to five spiral cords crossed by axial threads and growth increments. Aperture subtriangular, *Olivella*-like, widest at the base. Outer lip thin, nondenticulate along the inner margin, sometimes with the last

axial rib extending the full length of the margin behind. Columella arcuate, bordered anteriorly by a strong descending fold. Siphonal notch large, semicircular, reinforced on the dorsal side by a continuation of the suprafasciolar ridge. Parietal wall with a smooth fused sheath of enamel against which the spiral fillets of the base terminate. Posterior outlet a narrow simple groove.

Dimensions.—A233a (Recent shell, with six whorls remaining), length 14 mm.; max. width 5.8 mm.; D233a (Abisinia formation), length 14 mm.; max. width 5.1 mm.; D233b (Abisinia formation), length 12 mm.; max. width 5.1 mm.; D143a (Abisinia formation, young), length 7.5 mm.; max. width 3.1 mm.; J233a (lower Mare formation, nodulose variety, tip decollate), length 17.3 mm.; max. width 7.2 mm.

Cabo Blanco localities.—Recent, on beach at Playa Grande Yachting Club, Distrito Federal. Two specimens; Abisinia formation at W-30, eastern edge of Playa Grande village. Two hundred thirty-six specimens; Lower Mare formation, in small stream 100 meters west of Quebrada Mare Abajo. Three specimens; Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. Three specimens.

Remarks.—The intergrading of the many examples of this species from the Abisinia formation suggests that the highly nodulous form, *M. nodosoplicata* (Dunker), may be a variant of *M. aciculata* (Lamarck).

Range and distribution.—So far as I know, this is the first report of *M. aciculata* as a fossil, occurring abundantly in the Abisinia formation (Pleistocene?) and sparsely in the Mare formation (Pliocene?). The living *M. aciculata* has been reported from several localities in the southern Caribbean other than the present one in the Cabo Blanco area. My Recent specimens are whitish, with a pale orange band in the sulcus above the middle of the spire whorls, and with two even fainter bands of orange on the ultima, one above the suprafasciolar ridge, the other on the lower side of the ridge itself.

Pyrene (Eurypyrene) venezuelanum, new species Pl. 29, figs. 19, 20

Shell of medium size, more or less biconical, the body somewhat

pyriform, the spire relatively short, the angle of spire around 75 degrees. Whorls about six in all, the nucleus badly corroded but seeming to consist of about 1-1/2 smooth volutions. Post-nuclear whorls a little rounded, subangulate to carinate at the shoulder, the narrow ramp between the shoulder and suture sloping moderately upward and a little concave. Surface worn and smooth, but under a 10-power lens it can be seen that it is marked with very faint spiral fillets (of which there are about five on the penultimate whorl below the shoulder angulation), numerous axial growth threads which are a little curved on the ramp, and vague axial folds. The spiral markings are much stronger on the base, and here there are about 10 subregular, rounded cords with generally wider interspaces. The base merges insensibly into the anterior fasciole which itself is made up of eight or nine crowded riblets. Sutures finely channeled. Aperture lenticular, the wide and rather deeply excavated posterior notch roofed over by the outer lip; adjoining the notch on the parietal wall is a short ridge of callus. Outer lip thin along the edge, broadly but feebly varicose behind, the inner margin bearing 11 or 12 relatively long lirae extending some distance into the aperture. Columella gently excavated above, straight below, sheathed with a moderately thick coating of enamel, the enamel raised above, and detached from the whorl along its distal margin. Inner lip with seven or eight short denticles a little bit in from the edge of the enamel. Anterior canal short, deep, slightly twisted, the extremity excavated into an oblique, U-shaped notch which is faintly emarginate.

Dimensions.—Holotype, length 18.7 mm.; max. width 11.3 mm.

Type locality.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. One specimen, the holotype.

Comparisons.—*P. venezuelanum,* n. sp. has the same general appearance as *P. eurynotum* Woodring (1928, pp. 272-273, pl. 16, figs. 11, 12) from the Bowden Miocene of Jamaica, but has a shorter spire than that. The short, wide-angled spire also serves to distinguish *P. venezuelanum* from *P. inflata* (Gabb) which is a Miocene species from the Dominican Republic. *P. inflata* was originally described by Gabb (1873, p. 221) under the genus *Strombina,* but this designation was changed to *Columbella* in 1921 by Pilsbry (p.

350, pl. 18, fig. 14). In 1928, Woodring (p. 272) erected the subgenus *Eurypyrene* for *inflata* and *eurynotum*, and this classification applies to *E. venezuelanum*. Maury's *Meta perplexabilis* (Maury, 1917, p. 258, pl. 15, figs. 4, 5), a probable *Eurypyrene* from the Miocene of the Dominican Republic, is not unlike *E. venezuelanum*, although the Dominican shell may be discrimminated from it by its narrower aperture and lack of a varix behind the outer lip. In Trinidad there are two species of *Eurypyrene*, one from the middle Miocene in Brasso district, the other from the upper Miocene Springvale formation on the Brechin Castle estate. The former is *Columbella inflata brassica* Maury (1925b, p. 363, pl. 36, fig. 8), the latter *Pyrene* (*Eurypyrene*?) *schideri* Rutsch (1943, pp. 148-149, pl. 5, figs. 5a, 5b). The subspecies *brassica* is more globose than *E. venezuelanum*, and *E. schideri* lacks the denticulate lips and the varicose labrum possessed by *E. venezuelanum*. The possibility is not ruled out, however, in view of the close superficial resemblance, that *E. venezuelanum* is a sex variant of *E. schideri*, although many more examples of both are needed to verify this. On present evidence they must be considered distinct species.

Although *Eurypyrene* is represented in the Caribbean area by at least five species mentioned above, the number of individuals is exceedingly rare. *P.* (*Eurypyrene*) *eurynotum* is represented by only two examples, and *inflata*, *brassica*, *schideri*, and *venezuelanum* by but one.

Pyrene (Eurypyrene ?) occidentalis, new species Pl. 29, figs. 21, 22

Shell of medium size, biconical, rather thin but strong, the spire moderately produced, the divergence 56 to 61 degrees, the apex obtuse. Whorls six in all. Nucleus smooth, hyaline, consisting of about 1-1/2 whorls, the initial a little swollen, loosely coiled, appressed. Post-nuclear whorls gently convex, vaguely shouldered a short distance below the summit, the sutures narrowly channeled. Surface smooth except at base where there are eight or nine spiral cords, and on the anterior fasciole which is made up of eight closely spaced revolving riblets. The cords on the base are faintly beaded or crenated and are less widely separated as they approach the fasciole which itself merges insensibly with the base. At the summit

of the whorls there are a few faint spiral fillets, and, under magnification, the surface is seen to be marked with rather widely spaced, extremely faint spiral lineations. Microscopic longitudinal growth striae are also present as well as a few very vague axial swellings extending a little way down from the summit. Aperture long, rather wide, subcylindrical. Outer lip thin throughout, smooth within, ascending slightly at its junction with the whorl. Columella gently excavated, lightly callused, a little thickened or swollen at the curve with the lower lip. Parietal wall with a small swollen area below the commissure. Siphonal canal short and broad, excavated behind into a wide, oblique nonemarginate notch. Ground color light brown and straw, the latter occurring as small round spots, maculations, and large blobs. The blobs are irregular in shape but are arranged in two bands, one below the suture, the other of larger size around the middle. The small spots are a little whiter than the blobs and are dispersed throughout.

Dimensions.—Holotype, length 22.1 mm.; max. width 12.2 mm.

Type locality.—Lower Mare formation, in small stream 100 meters west of Quebrada Mare Abajo. One specimen, the holotype.

Remarks.—Like *Pyrene* (*Eurypyrene* ?) *schideri* Rutsch(1943, pp. 148-149, pl. 5, figs. 5a, 5b) which the new species resembles, the subgeneric classification of *occidentalis* is in doubt. The Venezuelan shell is not so prominently shouldered as *P. schideri* (which occurs in the upper Miocene Springvale deposits of Trinidad) but both species are similar in having a thin, nonlirate outer lip. The type of *Eurypyrene* is *E. eurynotum* Woodring (1928, pp. 272-273, pl. 16, figs. 11, 12) from the Bowden Miocene of Jamaica, and the outer lip of that species is thick, and lirate within. If the morphologic character of the labrum varies with the sex of the animal, as I think it does in certain genera, it may be that examples of *P. eurynotum* will be found with a smooth, simple lip, and examples of *P. schideri* and *P. occidentalis* with a lirate, thickened lip.

BRACHYSTYLOMA, new genus

Type species, *Brachystyloma caribbeana,* new species.

Shell rather small, slender, porcelaneous, moderately sturdy, mitrelloid in general outline. Nucleus subhayline, consisting of about

1-1/2 whorls. Post-nuclear whorls nearly flat-sided, the last gently convex, sculptured by feeble axial costae which extend slightly above the suture on the last two whorls. Spiral sculpture absent except for two or three spiral grooves at the base. Sutures fine, undulating over the top of the costae. Aperture shaped like a broad inverted comma, the anterior end deeply and broadly undercutting the base of the columella. Outer lip broken far back, thickened at the junction with the whorl. Columella short, arcuate, the base thickened or emarginate, the emargination continuing along the edge of the lower and basal lips, the base of the columella extending down into the aperture as a small projection considerably distant from the basal lip. Columella and parietal wall callused, the callus spreading upward from the base of the columella, the margin of the callus slightly detached.

The new genus is characterized by the short subtruncate columella and the broad and deep excavation of the aperture underneath. The taxonomic relationship can only be inferred, but the similarity of the spire with *Aesopus eurytoides* (Carpenter) (see Palmer, 1958, pp. 213-214, pl. 23, figs. 14-17; and Keen, 1958, p. 379, fig. 415) suggests that the Venezuelan shell may be in the family Columbellidae.

Brachystyloma caribbeana, new genus, new species Pl. 29, figs. 23, 24

Shell small, moderately sturdy, the spire elongate conical, the angle of spire about 26 degrees. Whorls about 6-1/2 including the subhyaline nucleus which is worn but seems to consist of 1-1/2 of them, the apical one obtuse. Post-nuclear whorls flat-sided to hardly convex, the ultima elongate and gently convex. Sculpture consisting of low feeble axial folds, of which there are 11 on the body whorl, the folds extending from a little above the suture to the base on the lower spire whorls, becoming obsolescent below the convexity of the ultimate whorl. Spiral markings absent except at the very base where there are two or three narrow fillets or bands separated by fine, weakly incised grooves. Sutures finely impressed, undulating over the tops of the projecting costae or folds. Aperture, lips, and columella as described under the genus.

Dimensions.—Holotype, length 8.4 mm.; max. width 4.9 mm.; length of aperture 4.2 mm.

Type locality.—Abisinia formation at W-30, eastern edge of Playa Grande village. Three specimens.

Remarks.—The deep excavation under the base of the columella is the outstanding characteristic of the new species. Most of the gastropods occurring in the Abisinia formation (Pleistocene ?) are known to be living to-day, and *Brachystyloma caribbeana,* n. sp. may also be found eventually as a Recent shell in Caribbean waters.

STREPTORYGMA, new genus

Type species, *Streptorygma erugata,* new species.

Shell small, moderately solid, few-whorled, completely smooth, the spire moderately elevated. Nucleus large, pupoid or papilliform, bluntly rounded at the apex, consisting of about two whorls. Body whorl swollen but drawn in sharply near the base. Aperture rather large, subquadrate or broadly oval. Outer lip thick at the summit, the underside with a shelf of callus which continues into the aperture. The thickness of the outer lip diminishes medially but increases again at the base. Columella short, fairly straight, but twisted at the base where there are several threads, the lowest of them emarginating the side of the canal. Anterior canal obliquely twisted to the left, moderately long, tapering toward the extremity which is bent a little backward.

The name *Streptorygma* is proposed for small sculptureless shells, with a few whorls, a large pupoid nucleus, a thick but not varicated outer lip, a twisted anterior canal, and a relatively short columella on the base of which are several small descending plicae. The form is placed with doubt in the family Columbellidae.

Streptorygma erugata, new genus, new species Pl. 47, figs. 14, 15

Shell small, moderately solid, more or less ovate in general outline, the spire broadly subcylindrical. Whorls four in all. Nucleus relatively large, smooth, papilliform, consisting of two whorls, the initial bluntly rounded and fused at the apex, the last much expanded and subglobose, the junction with the conch defined by a faint narrow axial welt. Post-nuclear whorls smooth and sculp-

tureless, the first moderately convex, the ultima tumid at the middle rather severely drawn in at the base. Sutures distinct, the summit of the post-nuclear whorls projecting slightly beyond the base of the preceding. Aperture subquadrilateral, smooth within. Outer lip thick, especially on top where it is joined to the whorl; on the under side of the outer lip along the commissure, is a prominent platelike weld of callus which continues into the aperture. The outer lip is somewhat thinner along the middle but thickens again at the side of the canal. Columella with virtually no wash, short and nearly straight below the parietal wall, the lower part twisted and bearing three threads with faint grooves between them, the basal thread forming the labial margin of the anterior canal. Anterior canal obliquely twisted to the left, of medium length, narrowish and tapering, the extremity broken away but bent a little backward.

Dimensions.—Holotype, length 2.7 mm.; max. width 1.5 mm.

Type locality.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. One specimen, the holotype.

Comparisons.—Superficially *Streptorygma erugata,* n. sp. resembles *Anachis implumis,* n. sp., but that is axially ribbed on the last whorl, whereas this is not. *Anachis* ? *indistincta,* n. sp. is a more slender form, and although smaller than *S. erugata* has nearly five whorls instead of four. *A.* ? *indistincta* also has six or seven spiral fillets on the base, whereas the base of *S. erugata* is smooth. *Strombina galba,* n. sp. is also a more slender shell than *S. erugata,* and though smaller has six whorls, with a few spiral bands at the base.

BUCCINIDAE

Engina ? species Pl. 29, figs. 25, 26

There is so little left of this small sturdy shell, and it is so scored and worn that even its generic classification is uncertain. Only a portion of the body whorl remains, and the present faded color is dull tan with a bluish gray band around the labrum at the periphery. Extrapolating from the two axial folds on the labral portion of the body whorl, it is conjectured there are about eight of

these folds and that they are nodulose at the shoulder. The aperture is relatively narrow, and the parietal wall deeply but evenly excavated. The outer lip is thickened behind by the last axial fold, and the inner margin projects somewhat into the aperture opposite the excavation of the parietal wall. Above this projection of the lip is a deep notch, and below the projection are four thick denticles. The pillar and parietal wall bear vestiges of plicae, and the top of the columella is thickened. Anterior canal gently arcuate, deep, the labral side of the entrance marked by a strong, narrow ridge which curves toward the labium within the aperture. Anal notch deep and high, bordered by a ridge separating it from the parietal wall. The surface of a well-preserved specimen is presumed to be sculptured by spiral threads as well as with the nodulous axial folds.

Dimensions.—Figured specimen, length 6 mm.; max. width 5.2 mm.

Locality.—Recent, on beach at Playa Grande Yachting Club, Distrito Federal. One broken specimen.

Remarks.—The identity of this species awaits the finding of better examples.

Pisania pusio (Linnaeus) Pl. 30, figs. 1, 2

1758. *Murex pusio* Linnaeus, Syst. Nat., ed. 10, p. 754, No. 490.
1778. *Murex accintus* Born, Index Rerum Nat. Mus. Caesarei Vind., p. 317 (refers to Martini, Conchylien-Cabinet, vol. 4, fig. 1219).
1791. *Buccinum plumatum* Gmelin, Syst. Nat., ed. 13, p. 3494, No. 108 (refers to Lister, pl. 822, fig. 41; Martini, Conchylien-Cabinet, vol. 4, figs. 1218-1220; and Knorr, vol. 4, pl. 21, fig. 6).
1798. *Tritonium accinctum* Röding, Museum Boltenianum, p. 125, No. 1617 (refers to Martini, Conchylien-Cabinet, vol. 4, figs. 1218, 1219).
1807. *Buccinum fasciatum* Fischer, Mus. Demidoff Moscow, p. 177 (refers to Martini, Conchylien-Cabinet, vol. 4, figs. 1218-1220). Not Müller 1774.
1822. *Fusus articulatus* Lamarck, An. sans Vert., vol. 7, p. 132, No. 33 (refers to Lamarck, Encycl. Méth., pl. 426, figs. 1a, b).
1840. *Fusus pusio* (Linnaeus), Kiener, Coq. Viv., *Fusus,* pl. 26, fig. 2.
1846. *Buccinum pusio* (Linnaeus), Reeve, Conch. Icon., vol. 3, pl. 6, sp. 43.
1864. *Pisania pennata* Brown, Krebs, The West Indian Marine Shells, p. 31.
1878. *Buccinum pennatum* Chemnitz, Mörch, Catalogue of West-India Shells, p. 11.
1891. *Pisania pusio* (Linnaeus), Baker, Acad. Nat. Sci. Philadelphia, Proc., vol. 43, p. 50.
1901. *Pisania pusio* (Linnaeus), Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, p. 399.
1937. *Pisania pusio* (Linnaeus), Smith, East Coast Marine Shells, p. 122, pl. 47, fig. 9.

1939. *Pisania pusio* (Linnaeus), McGinty, Nautilus, vol. 38, No. 2, p. 38.
1946. *Pisania pusio* (Linnaeus), Jaume, Soc. Malac. "Carlos de La Torre" Rev., vol. 4, No. 2, p. 107.
1954. *Pisania pusio* (Linnaeus), Abbott, American Seashells, p. 233, pl. 13-o.
1958. *Pisania pusio* (Linnaeus), Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 16.
1958. *Pisania pusio* (Linnaeus), Abbott, Acad. Nat. Sci. Philadelphia, Mon. No. 11, pp. 73-74.
1958. *Pisania pusio* (Linnaeus), Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, p. 90, pl. 14, 1 fig.
1959. *Pisania pusio* (Linnaeus), Nowell-Usticke, A Check List of the Marine Shells of St. Croix, p. 69.

A single worn and broken shell is referable to this species. The outer lip is denticulate along the inner margin, and the aperture is finely lirate within, every alternate lira connecting with a denticle of the lip. Each denticle merges with a lira lining the aperture but every alternate lira within the aperture does not reach the labrum. The anal notch is bordered by a pair of thick denticles on the labrum, and by a prominent spiral ridge on the parietal wall, the ridge continuing into the interior below the commissure; on the parietal wall there is a short fold above the ridge and a still smaller one below, neither of these entering into the aperture. The four whorls remaining on the specimen are sculptured by faint spiral cords or threads and axial growth lines, the latter almost riblike on the upper whorls. Color of shell light brown, chestnut-brown, and cream, the cream disposed in a fairly wide band at the summit of the whorls, in a narrow band around the periphery of the body, and as irregular axial bars. Immediately below the suture there is a row of short, longitudinal, chestnut-brown bars on the cream-colored ground. On the field of light brown there are flecks and lozenges of chestnut-brown disposed in spiral bands, with some of the lozenges aligned in the axial direction. An occasional chestnut-brown marking on the peripheral band is chevron-shaped.

Dimensions.—Figured specimen (4 whorls) 26.5 mm.; max. width 12.5 mm.

Locality.—Recent, on beach at Playa Grande Yachting Club, Distrito Federal. One specimen.

Range and distribution.—The living *P. pusio* is a shallow-water species extending from southeast Florida through the West Indies and the Yucatan Peninsula to the northern coast of South America. As a fossil it occurs in the Pleistocene of Barbados.

Remarks.—In examining a suite of examples of *P. pusio* from the Florida Keys I have noticed that some have a well-developed posterior notch and a heavy, denticulate outer lip, whereas others have no notch whatsoever at the posterior outlet. These, and other differences in shell morphology, may be attributable to the sex of the animal.

Cantharus (Pollia) auritulus (Link) Pl. 30, figs. 3-6

1807. *Nassaria auritula* Link, Beschreibung der Naturalien-Sammlung der Universität zu Rostock, p. 124 (refers to Martini, Conchylien-Cabinet, vol. 4, figs. 1148, 1149).
1822. *Buccinum coromandelianum* Lamarck, An. sans Vert., vol. 7, p. 270 (refers to Martini, Conchylien-Cabinet, vol. 4, figs. 1148-1149).
1846. *Buccinum coromandelianum* Lamarck, Reeve, Conch. Icon., vol. 3, pl. 9, sp. 62.
1864. *Buccinum auriculatum* Lamarck, Krebs, The West Indian Marine Shells, p. 32.
1878. *Buccinum auritula* (Link), Mörch, Catalogue of West-India Shells, p. 11.
1890. *Pisania* (*Tritonidea*) *auritula* (Link), Dall, Wagner Free Inst., Sci., Trans., vol. 3, pt. 1, p. 130 (part).
1901. *Tritonidea auritula* (Link), Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, p. 400.
1936. *Pisania* (*Tritonidea*) *auritulus* (Link), Smith, Nautilus, vol. 49, No. 4, p. 139, pl. 9, fig. 17; vol. 50, No. 1, p. 20.
1937. *Cantharus auritula* (Link), Smith, East Coast Marine Shells, p. 122, pl. 47, fig. 11.
1958. *Cantharus auritulus* (Link), Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 16.
1958. *Cantharus auritula* (Link), Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, p. 90, pl. 8, 1 fig.
1958. *Cantharus* (*Pollia*) *auritulus* (Link), Abbott, Acad. Nat. Sci. Philadelphia, Mon. No. 11, pp. 74-75, pl. 2p.
1959. *Cantharus auritulus* ? (Link) Voss [in] Rodriguez, Bull. Marine Sci. Gulf and Caribbean, vol. 9, No. 3, p. 277.

The Recent Venezuelan shell is of medium size, solid, more or less biconical, the spire conoidal, the apex obtuse. Whorls six including the hyaline nucleus which consists of 1-1/2 of them, the initial loosely coiled and appressed, the last moderately convex, defined from the conch by the first axial rib. The earliest post-nuclear whorls are moderately convex, subreticulate, sculptured by approximately 25 subequal axial costae which are crossed by spiral cords and threads. There are three spiral cords, one at the upper suture, and two below the middle of the whorl; of the spiral threads there are five in all, three of them between the first and second cord, one

between the second and third cord, and sometimes one between the third cord and the lower suture. Later whorls shouldered, the last prominently so. With growth, the axial costae diminish in number and become rounded folds of which, including the varix on the outer lip, there are generally 10 or 11 on the body whorl, the folds on some specimens reaching the base, on others becoming obsolescent below the convexity. Body whorl with 9 to 10 low spiral ridges, with sharp spiral threads between them, the surface crenated by numerous axial growth striae. The three spiral ridges on the shoulder area are the largest and bear, at the crest of the folds, low, spirally oriented nodes, the nodulation of the spiral ridges below the shoulder much less conspicuous. The ramp above the shoulder is concave, and sculptured by spiral cords and threads, these being of several sizes on some specimens, subequal on others. Excepting the canals, the aperture is oval and lined with faint narrow spiral lirae. Outer lip thickened behind by the last axial fold, the inner margin denticulate, the number of teeth ranging from 12 to 16 and occurring as pairs, the pair below the anal notch the largest and most protuberant. Anal notch prominent, with an upswept callus, the notch bordered below by a strong ridge which extends from the parietal wall into the interior below the commissure. Columella arcuate, the distal margin with as many as 10 nodules and folds, the folds occurring near the base. Anterior canal short, moderately deep and wide, a little twisted, the extremity emarginate, the siphonal notch U-shaped, obliquely directed, and a little recumbent. Color of shell chestnut-brown, dark brown, or gray-black, clouded and maculated with white; columella and aperture milk-white.

Dimensions.—Specimen A284a, length 23.5 mm.; max. width 14.9mm.; Specimen A658a, length 16.4 mm.; max. width 10.4 mm.

Locality.—Recent, on beach at Playa Grande Yachting Club, Distrito Federal. Fifteen specimens. Specimen A658a, with the inner margin of the labrum smooth, is identical with specimens labelled *C. auritulus* from Barbados, B.W.I., lot No. 212947 in the Museum of Comparative Zoology.

Remarks.—Though normally quite different from *C. tinctus* (Conrad), "the two forms approach each other until it is difficult to separate them, and each has been taken for the other" (Dall and

Simpson). Abbott (1958) distinguished *C.auritulus* from *C. tinctus* by its prominent upsweep at the top of the aperture, in being shorter, and in having 10 to 11 axial ribs instead of the 12 to 14 on *C. tinctus*. Because this shell meets these criteria it is referred to *C. auritulus*.

Range and distribution.—The living *C. auritulus* is intertidal and reef-dwelling, and ranges from southeast Florida, to the northern coast of Brazil. Gregory (1895) and Trechmann (1933) noted its occurrence in the Pleistocene of Barbados. Dall (1890) reported it from the Pliocene of Black River, South Carolina, and from the Caloosahatchee beds of Florida. Maxwell Smith (1936) recorded it from the Pliocene? at Clewiston, Florida.

Cantharus (Pollia) tinctus ? Conrad Pl. 30, figs. 7-10

1846. *Pollia tincta* Conrad, Acad. Nat. Sci. Philadelphia, Proc., vol. 3, p. 25, pl. 1, fig. 9.
1878. *Buccinum tinctum* (Conrad), Mörch, Catalogue of West-India Shells, p. 11.
1889. *Tritonidea tincta* (Conrad), Dall, U. S. Nat. Mus., Bull. 37, p. 116.
1891. *Pisania tincta* (Conrad), Baker, Acad. Nat. Sci. Philadelphia, Proc., vol. 43, p. 50.
1901. *Tritonidea tincta* (Conrad), Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, pp. 399-400.
1922. *Cantharus tinctus* (Conrad), Maury, Bull. Amer. Paleont., vol. 9, No. 38, p. 87.
1923. *Cantharus tinctus* (Conrad), Clench, Nautilus, vol. 37, No. 2, p. 55.
1925. *Cantharus tinctus* (Conrad), Clench, Nautilus, vol. 38, No. 3, p. 94.
1926. *Cantharus tinctus* (Conrad), Weisbord, Nautilus, vol. 39, No. 3, p. 85.
1937. *Cantharus tinctus* (Conrad), Smith, East Coast Marine Shells, p. 122, pl. 47, fig. 4.
1938. *Cantharus tinctus* (Conrad), Richards, Geol. Soc. Amer., Bull., vol. 49, p. 1293.
1946. *Cantharus tinctus* (Conrad), Jaume, Soc. Malac. "Carlos de La Torre" Rev., vol. 4, No. 3, p. 107.
1954. *Cantharus* (*Pollia*) *tinctus* Conrad, Abbott, American Seashells, p. 233, pl. 25y.
1955. *Cantharus tinctus* (Conrad), Perry and Schwengel, Marine Shells of the Western Coast of Florida, p. 162, pl. 32, figs. 232a, b.
1958. *Cantharus tinctus* (Conrad), Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 16.
1958. *Cantharus tinctus* (Conrad), Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, p. 90.

The small, worn fossils referred to this species have a conical spire somewhat shorter than the body, and an angle of spire of about 61 degrees. Whorls about six, the post-nuclear ones with beaded spiral cords and low weak axial ribs. The lower whorls are subcarinate at the periphery, and there is a beaded collar immedi-

ately below the suture, the area between the collar and carina shallowly concave. There are about 20 feeble axial ribs, all of them more or less equal on the spire but subequal on the body where they become obsolescent below the convexity. Spiral sculpture consists of three beaded primary spiral cords; one forms the collar below the suture, one is at the periphery, and a slightly smaller one is at the base adjoining the suture. In the sinus between the collar and carina there are at first one and later two secondary threads as there are between the peripheral and basal spiral cords. On the body whorl there are 12 or 13 primary spiral cords from the shoulder to the top of the anterior fasciole, and on one specimen (D140a) there is an interstitial thread between each of the primary cords. Crenulating the surface are numerous fine longitudinal growth threadlets. Anterior fasciole moderately convex, sculptured by four or five crenulated threads on most of the specimens, but smoothish on one of them. Aperture sigmoidal. Outer lip broken back, the inner margin lirate on one specimen with the base preserved. Columella moderately excavated below the parietal wall, the base of the columella with a thickened plait which continues along the left margin of the anterior canal. Anterior canal rather short and deep, the terminal notch shallowly to rather deeply excavated. Columella callused, the callus with a longitudinal furrow on one specimen, the far edge of the callus vaguely denticulate on another.

Dimensions.—Specimen D140a, length 11 mm.; max. width 6.3 mm.; length of aperture 6.2 mm.; Specimen D141a, length 9 mm.; max. width 5.8 mm.; length of aperture 5.8 mm.

Locality.—Abisinia formation at W-30, eastern edge of Playa Grande village. Four specimens, all of them broken and corroded. The specimens vary in details of sculpture, but all of them are believed to represent the same species. The best preserved of the lot is D140a, and that is close to *Cantharus tinctus* (Conrad), although smaller.

Range and distribution.—*Cantharus tinctus* (Conrad) ranges from Pleistocene to Recent, the Pleistocene occurrences recorded in Florida by Maury and Richards. The living shell is found from North Carolina to the West Indies.

MELONGENIDAE

Melongena melongena (Linnaeus) Pl. 30, figs. 11, 12

1758. *Murex melongena* Linnaeus, Syst. Nat., ed. 10, p. 751.
1798. *Galeodes melongena* (Linnaeus), Röding, Mus. Boltenianum, p. 53.
1816. *Pyrula melongena* (Linnaeus), Lamarck, Encycl. Méth., pl. 435, figs. 3a-e.
1817. *Melongena fasciata* Schumacher, Essai d'un nouveau système des habitations des Vers Testacés, Copenhagen, p. 212.
1822. *Pyrula melongena* (Linnaeus), Lamarck, An. sans Vert., vol. 7, p. 140.
1847. *Pyrula melongena* (Linnaeus), Reeve, Conch. Icon., vol. 4, pl. 6, sp. 18.
1864. *Pyrula melongena* (Linnaeus), Krebs, The West Indian Marine Shells, p. 18.
1867. *Pyrula melongena* (Linnaeus), Guppy, Sci. Assoc. Trinidad Proc., pt. 3, p. 157.
1881. *Melongena melongena* (Linnaeus), Gabb, Acad. Nat. Sci. Philadelphia, Jour., ser. 2, vol. 8, p. 350.
1881. *Melongena melongena* (Linnaeus), Tryon, Man. Conch., vol. 3, p. 107, pl. 41, figs. 197, 198.
1887. *Melongena melongena denudata* Dollfus, Soc. d'études sci. Angers Bull., new ser., vol. 17, p. 56, pl. 2, fig. 3.
1887. *Melongena melongena multispinosa* Dollfus, Soc. d'études sci. Angers Bull., new ser., vol. 17, p. 56, pl. 2, fig. 4.
1887. *Melongena melongena semispinosa* Dollfus, Soc. d'études sci. Angers Bull., new ser., vol. 17, p. 56, pl. 2, fig. 5.
1889. *Pyrula melongena* (Linnaeus), Lorié, Samml. Geol. Reichs-Mus. Leiden ser. 2, vol. 1, pp. 135-136.
1889. *Melongena melongena* (Linnaeus), Dall, U. S. Nat. Mus., Bull. 37, p. 112.
1891. *Melongena melongena* (Linnaeus), Baker, Acad. Nat. Sci. Philadelphia, Proc., vol. 43, p. 51.
1895. *Melongena melongena* (Linnaeus), Harris, Bull. Amer. Paleont., vol. 1, No. 3, p. 101.
1922. *Melongena melongena* (Linnaeus), Maury, Bull. Amer. Paleont., vol. 9, No. 38, p. 87.
1934. *Melongena melongena* (Linnaeus), Pilsbry and Vanatta, Nautilus, vol. 47, No. 4, p. 118.
1940. *Melongena melongena* (Linnaeus), Richards, Soc. Venezolana Cienc. Nat., Bol., No. 46, p. 306.
1940. *Melongena margaritana* Richards, Soc. Venezolana Cienc. Nat., Bol., No. 46, p. 306.
1942. *Melongena melongena* (Linnaeus), Jaume and Pérez Farfante, Soc. Cubana Hist. Nat. "Felipe Poey", Mem., vol. 16, No. 1, p. 41.
1943. *Melongena melongena* (Linnaeus), Richards, Jour. Paleont., vol. 17, p. 120.
1943. *Melongena margaritana* Richards, Jour. Paleont., vol. 17, pp. 120-123, figs. 1, 2.
1952. *Melongena melongena* (Linnaeus), Pulley, Texas Jour. Sci., vol. 4, No. 2, p. 176.
1954. *Melongena melongena* (Linnaeus), Abbott, American Seashells, p. 235, pl. 23h.
1956. *Melongena melongena* (Linnaeus), Clench and Turner, Johnsonia, vol. 3, No. 35, pp. 165-168, pls. 96, 98.

1958. *Melongena melongena* (Linnaeus), Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 16.
1958. *Melongena melongena* (Linnaeus), Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, p. 91.

The Venezuelan fossils referred to this species are poorly preserved, broadly triangular in outline, with a large body whorl and a relatively short and narrow spire. Post-nuclear whorls about five, each of the later ones swirling over its predecessor. Sutures narrowly channeled or excavated, undulatory. Body whorl rounded at the shoulder, slightly concave anteriorly, ornamented with two rows of spines (on some specimens there is a third imperfectly developed row) on the shoulder, and a single row of spines below the periphery descending to near the base of the shell. The spines protrude normal to the surface, and are usually solid and more or less pinched. The largest spines of each row are on the labrum whence they become progressively smaller around the dorsum to the distal margin of the columella where they terminate. Most of the spines are curved a little at the tip, and occasional ones are slitted lengthwise, the slits facing left with the spire upright. Above the ultimate, the whorls are nodulose, the knobs developing from still earlier axial folds. The spiral sculpture consists of low flattish ribs which are most pronounced below the anterior row of spines on the body whorl. Additionally, the surface of the shell is marked with numerous transverse growth striae and lamellae. Anterior fasciole large, elevated, flattened along the middle, built up of incrementals which are convex upward. Aperture oblong-elliptical, with a well-developed recessed anal notch, and a broad and short siphonal canal. Columellar lip gently arcuate, the columella and parietal wall covered with a moderately thick sheath of smooth callus, the callus extending to the anterior tip where it may be rolled a little along the margin of the canal. Pillar flattened on the oral surface.

Dimensions.—Figured specimen (C262a), length 51 mm.; max. width (excluding spines) 38 mm.

Locality.—La Salina, west of Puerto Cabello, State of Carabobo. Three specimens.

Comparisons.—Among Recent species, *M. melongena* is similar to certain variations of *M. corona* Gmelin and *M. patula* Broderip and Sowerby, the latter an eastern Pacific shell ranging from Guay-

mas, Mexico, south to Bahía de Caráques, Ecuador. It is distinguished from the Western Atlantic *M. corona* by its rounded rather than tabulate shoulders, and from *M. patula* by the basal row of spines which is lacking on the Pacific species. "*M. melongena* may lack spines or have as many as four rows of spines, while *M. patula*, which also may be without spines, never has more than one row, and this is composed of relatively few spines" (Clench and Turner, 1956, p. 167).

The nearest fossil species to the fossil *M. melongena* is *M. consors* (Sowerby) described by Sowerby in 1849 (Quart. Jour. Geol. Soc. London, vol. 6, p. 49) and figured for the first time by Maury in 1917 (Bull. Amer. Paleont., vol. 5, No. 29, p. 249, pl. 14, fig. 5). Sowerby's original description of *consors* is translated as follows:

> Shell obovate, ventricose, smooth, lineated transversely; whorls five, the early ones with one row of tubercles, the ultima adorned with two to three rows posteriorly, a single row anteriorly; aperture rather long, broad; canal wide and short; columella subangulate and flattened anteriorly.

The specimens from La Salina are so close to both *M. melongena* and *M. consors* that one is hard put to differentiate them. Sowerby (1849, p. 49) distinguished *M. consors* from *M. melongena* by "its shorter figure, by being more ventricose, by the pointed tubercles on the spire, and its shorter and wider canal". Gabb (1873, p. 205), who examined over a hundred specimens of *M. consors* from the Dominican Republic, believed it to be synonymous with both *M. melongena* and *M. patula*. After a re-examination of *M. consors*, Guppy (1876, pp. 523-524) thought there was "some difference in the surface characters of the Miocene and Recent shells" but nevertheless relegated *M. consors* to synonymy under the prior-named *M. melongena*. He did, however, question Gabb's opinion that *M. melongena* was conspecific with *M. patula* and doubted that they should be so regarded. Dall (1890, pp. 121-122) considered Gabb's consolidation of Sowerby's species with the others to be ill-advised, and, following Dall's pronouncement, "it has been customary to use Sowerby's name *consors* for the Miocene form of *melongena*" (Olsson, 1932, pp. 176-177, pl. 19, fig. 4). Maury differentiated *M. consors* from *M. melongena* by its higher spire, and Pilsbry (1921, pp. 347-248) noted that *M.*

consors is more ponderous than *M. melongena*, and has strong spiral striation in the adult stage. Olsson's criterion for separating the Recent *M. melongena melongena* from the fossil *M. m. consors* is that "the recent shell has usually a channelled suture while in *consors* the sutures are generally close and appressed although a slightly excavated suture is occasionally seen in the fossil as well". Because the Venezuelan fossil specimens are channeled at the sutures they are referred to as *M. melongena* even though they are somewhat broader than most of the Recent forms I have seen.

Range and distribution.—The living *Melongena melongena* (Linnaeus) ranges from the Florida Keys to the northern coast of South America. In the Pleistocene it is recorded by Jaume and Pérez Farfante from Guantánamo, Cuba, by Lorié from the reef limestone in Spanish Lagoon, Island of Aruba, and by Gregory and Trechmann from Barbados. In the Miocene it is recorded by Guppy at Cumaná, Venezuela, and by Harris from the deep well at Galveston, Texas at 2,448 - 2,465 feet.

Melongena consors (Sowerby) is a widespread Caribbean Miocene species extending across northern South America. In Perú it has been found in the lower Miocene Zorritos formation by Olsson (1932, pp. 176-177, pl. 19, fig. 4). In northern Colombia it is recorded at several localities in the Department of Atlántico by Weisbord (1929, pp. 276-277, pl. 7, fig. 5). In Venezuela it is present in middle to late Miocene deposits in the State of Falcon, and in Trinidad it occurs in the Brasso, Springvale, and Manzanilla formations (Maury, 1925b, pp. 360-361, pl. 35, figs. 1, 2). Farther north it occurs in the middle Miocene of Costa Rica (Olsson, 1921, pp. 284-285, pl. 9, fig. 1) and, of course, it is abundant in the Dominican Republic where it was first found. The reported occurrence of *M. consors* in the Bowden Miocene of Jamaica is not confirmed by Woodring (1928, p. 261) who stated that the records probably are erroneous. Still farther north, *M. consors* is recorded by Tucker and Wilson (1932, p. 48, pl. 2, fig. 1) from the "Pliocene" at Okeechobee City, Florida, but here again, as in other instances, we are faced with the problem of separating *M. consors* from *M. melongena*.

NASSARIIDAE

Nassarius (Phrontis) vibex (Say) Pl. 30, figs. 13, 14

1822. *Nassa vibex* Say, Acad. Nat. Sci. Philadelphia, Jour., 1st ser., vol. 2, p. 231.
1864. *Nassa vibex* Say, Krebs, The West Indian Marine Shells, p. 32.
1869. *Nassa fretensis* Perkins, Boston Soc. Nat. Hist., Proc., vol. 13, p. 117.
1873. *Nassa vibex* Say, Tryon, Am. Marine Conch., p. 34, pl. 7, figs. 52, 53.
1878. *Nassa vibex* Say, Mörch, Catalogue of West-India Shells, p. 12.
1882. *Nassa vibex* Say, Tryon, Man. Conch., vol. 4, pp. 42-43, pl. 13, fig. 198.
1889. *Nassa vibex* Say, Dall, U.S. Nat. Mus., Bull. 37, p. 116, pl. 50, fig. 8; Mus. Comp. Zool. Bull., vol. 18, p. 183.
1890. *Nassa vibex* Say, Dall, Wagner Free Inst. Sci., Trans., vol. 3, pt. 1, p. 132.
1891. *Nassa vibex* Say, Baker, Acad. Nat. Sci. Philadelphia, Proc., vol. 43, p. 51.
1892. *Nassa vibex* Say, Dall, Wagner Free Inst. Sci., Trans., vol. 3, pt. 2, p. 215.
1892. *Nassa vibex* Say, Singley, 4th An. Rept. Texas Geol. Sur., p. 335.
1901. Nassa vibex Say, Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, p. 403.
1913. *Nassa vibex* Say, Brown and Pilsbry, Acad. Nat. Aci. Philadelphia, Proc., vol. 65, p. 495.
1915. *Nassa vibex* Say, Johnson, Boston Soc. Nat. Hist. Occas. Papers, vol. 7, p. 134.
1922. *Alectrion vibex* (Say), Maury, Bull. Amer. Paleont., vol. 9, No. 38, p. 89.
1925. *Nassa vibex* Say, Richards, Jour. Paleont., vol. 9, No. 3, p. 257.
1937. *Nassarius vibex* (Say), Smith, East Coast Marine Shells, p. 121, pl. 46, fig. 13; pl. 69, fig. 8.
1938. *Nassa vibex* Say, Richards, Geol. Soc. Amer. Bull., vol. 49, p. 1293.
1938. *Nassa vibex* Say, Wheeler, Nautilus, vol. 51, No. 3, p. 93.
1940. *Nassarius vibex* (Say), Stubbs, Jour. Paleont., vol. 14, No. 5, p. 512.
1940. *Nassarius vibex* (Say), Richards, Soc. Venezolana Cienc. Nat. Bol., No. 46, p. 306.
1942. *Nassarius vivex* (Say), Jaume and Pérez Farfante, Soc. Cubana Hist. Nat. "Felipe Poey," Mem., vol. 16, No. 1, p. 41.
1943. *Nassarius vibex* (Say), Jacobson, Nautilus, vol. 56, No. 4, p. 141.
1943. *Nassarius vibex* (Say), Richards, Jour. Paleont., vol.. 17, No. 1, p. 121.
1944. *Nassarius vibex* (Say), Hackney, Nautilus, vol. 58, No. 2, p. 62.
1946. *Uzita vibex* (Say), Jaume, Soc. Malac. "Carlos de La Torre" Rev., vol. 4. No. 3, p. 107.
1947. *Nassarius vibex* (Say), Freire and Alayo, Soc. Malac. "Carlos de La Torre" Rev., vol. 5, No. 1, p. 22.
1948. *Uzita vibex* (Say), Gardner, U. S. Geol. Sur., Prof. Paper 199-B, p. 253, pl. 30, fig. 23.
1952. *Nassarius vibex* (Say), Pulley, Texas Jour, Sci., vol. 4, No. 2, p. 176, pl. 4, fig. 6.
1953. *Nassarius (Phrontis) vibex* (Say), Olsson and Harbison, Acad. Nat. Sci. Philadelphia, Mon. No. 8, pp. 220-221, pl. 33, figs. 1, 1a.
1954. *Nassarius vibex* (Say), Abbott, American Seashells, p. 237, pl. 23q.
1955. *Nassarius vibex* (Say), Perry and Schwengel, Marine Shells of the Western Coast of Florida, p. 162, pl. 32, fig. 231,

1958. *Nassarius* (*Phrontis*) *vibex* (Say), Dubar, Florida Geol. Sur., Geol. Bull. No. 40 p. 194.
1958. *Nassarius vibex* (Say), Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 16.
1958. *Nassarius vibex* (Say), Coomans, Caraibisch Marien-Biologisch Inst., collected papers 6, p. 91, pl. 10, 2 figs.
1959. *Nassarius vibex* (Say), Nowell-Usticke, A Check List of the Marine Shells of St. Croix, pp. 69, 70.

Shell rather small, the angle of spire about 60 degrees. Nucleus decollate, remaining whorls six, the later ones subangulate at the shoulder, each with a narrow collar below the suture, the body whorl ventricose, sharply constricted above the anterior fasciole. Axial sculpture consisting of 11 somewhat flexuous axial costae separated by wider concave interspaces. The costae are somewhat retractive and subdued in the subsutural area, stronger and horizontally nodulous from the shoulder down. Spiral sculpture consisting of narrow cords, of which there are seven on the body whorl, and minor threads, of which there is one between the collar and shoulder, one between each of last four spiral cords above the anterior fasciole, and three, decreasing in size toward the fasciole, in the constricted area. Additionally, the surface is traversed by sinuous longitudinal growth lineations. Aperture broadly ovate. Outer lip recurved toward the labrum along the edge, prominently varicose behind, the inner margin with nine short lirae, the uppermost bordering the anal notch. Columella concave, with a sharp fold at the base, the fold margining the labial side of the canal. Parietal shield heavily callused, expansive, ascending to about the middle of the whorl above the suture, extending beyond the midline of the body and downward to the base of the fasciole, the distal margin detached and raised above the surface of the whorl. Inner lip with erratically disposed lirae, denticles, and pustules, the largest of these at the top of the parietal wall adjoining the posterior notch. Anterior fasciole large, wedge-shaped, built up of six or seven crenulate cords, the uppermost the stoutest and forming a ridge, the others diminishing progressively in size basalward. The inner margin of the fasciole is truncated by a gutter of callus produced from the under side of the parietal shield. Posterior canal short, broad, and moderately deep. Anterior canal short and deep, moderately broad, strongly excavated into a long U-shaped notch with subparallel sides.

Dimensions.—Length (nucleus decollate), 14 mm.; max. width 8.2 mm.

Locality.—La Salina, west of Puerto Cabello, State of Carabobo. Two specimens.

Range and distribution.—*N. vibex* (Say) is widely distributed. The Recent form is found from Cape Cod, Massachusetts, through the West Indies to Brazil. In the Pleistocene it is recorded from Louisiana, Florida, South Carolina (Mansfield, 1939, 1939, p. 38), Cuba, the Island of Margarita, Venezuela, and Barbados. As a Pliocene fossil it is common in Florida, and in the upper Miocene it has been found in the Duplin marl of North Carolina and South Carolina. The living *N. vibex* inhabits muddy beaches.

FASCIOLARIIDAE

Fasciolaria hollisteri, new species Pl. 31, figs. 1, 2

Shell large, generally ovate in outline, the angle of spire around 61 degrees, the apex obtuse. Whorls about eight including the nucleus. Nucleus hyaline, consisting of 1-1/2 whorls, the initial small and appressed, the last rapidly expanding, merging insensibly into the conch which is procelaneous. Post-nuclear whorls convex, the body whorl well rounded. Sutures canaliculate, somewhat gaping. Around the summit of the whorls there is a slight thickening or collar at the suture, the collar rendered rugose or crenate by fine axial grooves and numerous growth striae. Below the sutural collar is another strong spiral fillet, this about half as wide as the collar and separated from it by a deep groove, the fillet in turn separated from the shoulder area by another prominent groove. Remaining area of body marked with faint spiral bands between fine shallow grooves, these markings much closer together on the base than they are on the shoulder and on the convexity. Surface covered with longitudinal sinuous growth striae, the striae building up into incrementals on the back of the anterior canal. Aperture proper ovate, lined with about 82 closely spaced subequal lirae, the lirae terminating irregularly but abruptly some distance from the edge of the outer lip. Between the termini of the lirae and the rim of the outer lip the apertural margin is mooth. Outer lip thin, the inner margin along the rim bearing about 29 denticles which project into points above the rim,

the denticles extending from the posterior outlet to the entrance of the siphonal canal. The denticles of the lip and the lirae of the aperture are brownish, the interspaces more or less whitish. Columella arcuate, the base with three low oblique folds, the middle one of which is the most elevated, the lowest one the broadest and forming the margin of the pillar, the uppermost one the feeblest. Siphonal canal of moderate length, wide, curved a little upward anteriorly, the extremity shallowly notched. Labium with a glaze of tan enamel extending from the pillar to above the parietal wall, the margin of the glaze neatly and clearly defined from the egg-white surface of the whorl, the glaze encircling the base of each preceding whorl, becoming less and less wide above the suture until, near the tip of the spire, the glaze is entirely concealed by the suture. Posterior outlet marked by a subtriangular arch, the groove of the posterior siphon margined below by a broad low ridge of callus which does not extend across the parietal wall. It is this ridge across the parietal wall which distinguishes the subgenus *Cinctura* Hollister (1956, pp. 76-84, pl. 6) from the subgenus *Fasciolaria* on which the ridge is wanting.

Dimensions.—Holotype, length 158 mm.; max. width 74 mm.; length of aperture and canal 104.5 mm.; width of siphonal canal at anterior end 9 mm.

Type locality.—Lower Mare formation, in small stream 100 meters west of Quebrada Mare Abajo. The holotype is the only example of this species, but fortunately it is nearly whole and rather well preserved for its size.

Comparisons.—*F. hollisteri* closely resembles the well-known Miocene to Recent *F. tulipa* (Linnaeus) but differs from that in being stouter and in having canaliculate rather than tight sutures. The Recent and Pleistocene *F.* (*Cinctura*) *hunteria* G. Perry, formerly known as *F. distans* Lamarck, differs from *F. hollisteri* in having a spiral ridge across the parietal wall to the margin of the glaze, and in having the whorls entirely smooth near the suture as does the Recent *F. hunteria branhamae* Rehder and Abbott (1951, pp. 59-60, pl. 8, figs. 4, 5) dredged off Puerto Alvaro Obregon, Tabasco, Mexico, in 1951. *F. okeechobensis* Tucker and Wilson (1932, p.

48, pl. 1, fig. 6) from the Pliocene? at Port Myakka, Florida, differs from *F. hollisteri,* n. sp. in bearing strong elevated spiral threads on the post-nuclear whorls and in having the early apical whorls both spirally and longitudinally grooved. *F. semistriata* Sowerby (1849, p. 49) as figured by Maury (1917, pp. 244-245, pl. 13, fig. 1) from the Dominican Republic has a shorter and rounder body whorl than does *F. hollisteri,* and the same is true of *F. semistriata leura* Woodring (1928, pp. 255-256, pl. 15, fig. 7) from the Bowden Miocene of Jamaica. Also, both *F. semistriata, s.s.* and *F. semistriata leura* are ornamented with raised spiral threads on the base of the shell, whereas on the Cabo Blanco fossil the basal lineation is faint.

Remarks.—The new species is named for Solomon C. Hollister, Research Associate, Paleontological Research Institution, in recognition of his scholarly treatises on the Busyconidae and Fasciolariidae.

Fasciolaria semistriata mareana, new subspecies Pl. 30, figs. 15, 16

Shell young, small, ovate in outline, the angle of spire about 55 degrees, the apex obtuse. Whorls about 5-1/2 including the nucleus which is indistinct. Post-nuclear whorls moderately convex, the body whorl gracefully contracted below. Sutures finely incised and distinct. The last two whorls are girdled with the merest suggestion of a narrow sulcus below the suture, and the two whorls above the ultima are marked with alternating axial swellings that in certain light are seen to be worn, scarcely developed, broad folds. At the base of these two whorls immediately adjoining the suture are 10 more or less equally spaced maculations of tan which are the faded residue of the original color. Upper part of body whorl devoid of sculpture, the base with six or seven spiral lineations and threads, the two posterior ones being fine incisions or microgrooves. The hardly differentiated anterior fasciole is also made up of spiral cords, the five or six of them larger than those above, and rendered crenulate by transverse growth striae. Outer lip and part of the aperture broken away, the summit of the labrum thickened considerably at the commissure, the interior of what is left of the labrum completely smooth. Columella arcuate, washed with callus, the base with a feeble biplicate fold, the lower portion of the fold continuing down

to the head of the canal as a rather sharp ridge. Anterior canal of moderate length and breadth, skewed a little to the left, the terminal notch semicircular and fairly deep. Parietal wall callused, the callus a little swollen directly below the posterior outlet, the swelling not extending across the wall.

Dimensions.—Holotype, length 9.4 mm.; max. width 4.9 mm.

Type locality.—Lower Mare formation, in small stream 100 meters west of Quebrada Mare Abajo. One specimen, the holotype.

Comparisons.—Although this immature shell occurs at the same locality and horizon as the preceding described *F. hollisteri,* n. sp. and resembles it, I doubt that it is the young of that species, as *F. hollisteri* lacks the broad axial folds on the early post-nuclear whorls and is engraved with fine spiral grooves on the whole of the body whorl. Such grooves are present even on the young of the *F. tulipa* clan as shown by Dall (1890, pp. 101-102, pl. 7, fig. 11). *F. semistriata mareana,* n. subsp. is more akin to the Miocene *F. semistriata* Sowerby (1849, p. 49) from the Dominican Republic which is also "free from spiral striae", but it differs from *F. semistriata, s. s.,* as shown in Maury's illustration (Maury, 1917, pl. 13, fig. 1), in the lesser convexity of the whorls. Compared with the Miocene *F. semistriata leura* Woodring (1928, pp. 255-256, pl. 15, fig. 7) from Bowden, Jamaica, the Venezuelan shell does not have the subtabulate shoulder, or lirae within the aperture, or the spiral threads at the suture.

Fasciolaria (Pleuroploca ?) crassinoda, new species Pl. 31, figs. 3, 4

Shell large, heavy, subfusiform, with a relatively short, wide-angled spire and blunt apex. Whorls about eight in all, the papilliform nucleus consisting of nearly two of them, the initial whorl of the nucleus indistinct, welded, and appressed, the last large and tumid, a little wider than the first post-nuclear whorl, the latter slightly convex, with fairly numerous but obscure axial ribs. Second post-nuclear whorl with an incipient shoulder below the middle, the shoulder with broad axial folds, the folds reaching the suture below but extending only a little on the concave ramp above the shoulder. Succeeding whorls strongly shouldered at or a little below the middle, the ramp concave, the sides below the shoulder sloping

slightly inward, the shoulder with eight large subrounded nodes. Sculpture consisting of faint spiral cords and bands covered with numerous crinkly microscopic spiral striae, and longitudinal growth lineations. Around the middle of the body whorl the spiral bands are faint but become a little more pronounced farther down, finally giving way, on the stem, to narrow, wriggly cords with wide shallow interspaces. Sutures narrowly channeled, irregularly saw-toothed. The aperture suboval, lined with narrow lirae which fade out before reaching the center, and terminate before reaching the edge of the outer lip. Outer lip thin, the inner margin armed with relatively widely spaced denticles the ends of which project slightly as points above the rim. Farther in there is a smooth area between the denticles and the termini of the apertural lirae. Anterior canal relatively long, broad, and deep, the extremity with a shallow, semicircular notch. Posterior siphon bordered below by a sharp ridge which extends into the interior but not across the parietal wall, the outlet of the siphonal groove arched over sharply by growth incrementals at the summit of the outer lip. Columella and parietal wall sheathed with a coat of adherent white enamel which is sharply defined from the straw-colored exterior surface of the shell. Columella arcuately excavated, provided at the base with three oblique plaits, the one bordering the canal stronger than the ones above. Anterior fasciole long, convex at the side, flattened on the ventral face, the umbilical slit completely covered by an extension of the columellar enamel.

Dimensions.—Holotype (I235a), length 138 mm.; width (obliquely across body, including nodes) 76 mm.; height of spire from lowest suture 48 mm.; length of spihonal canal 42 mm.; paratype (I235b), length 104 mm.; width (obliquely across body, including nodes 52.5 mm.; height of spire from lowest suture 39 mm.; length of siphonal canal 29.9 mm.

Type locality.—Lower Mare formation near W-13, on hillside above west bank of Quebrada Mare Abajo. Two specimens.

Comparisons.—This species recalls the late Miocene to Recent *F. gigantea* Kiener (1840, Coq. Viv., *Fasciolaria,* p. 5, pls. 10, 11) but is distinguished from that in having fewer whorls, a shorter spire, a more oval aperture, and smoother nodes. Olsson and Harbi-

son (1953, pp. 216-217) proposed, on the character of the radula in the living animal, that *F. gigantea* be placed in their new subgenus *Triplofusus*. Abbott (1954b, p. 242), on the other hand, would assign *F. gigantea* to the genus *Pleuroploca* established by P. Fischer in 1884.

Fasciolaria (Pleuroploca ?) species Pl. 32, figs. 1, 2

The preservation of this single example is so poor that even the generic determination is doubtful. Half of the incomplete specimen is an internal mold and the remaining portion is covered with a chalky shell on which the details of sculpture have been obliterated. The shell when whole probably attains a length of a little over 100 mm. as the three lower whorls of the specimen in question are 60 mm. long, with the canal and much of the spire missing. The whorls are shouldered, the shoulder of the ultima bearing six weak nodes.

Dimensions.—Length of incomplete specimen 60 mm.; max. width 45 mm.

Locality.—Playa Grande formation (Maiquetía member) at W-4, Quebrada Las Pailas. One specimen.

Remarks.—However worn and ill preserved, it can be said that this species not the same as the preceding *F. crassinoda,* n. sp. from the Mare formation as the latter is more prominently shouldered and bears eight strong nodes instead of six weak ones. There is some resemblance to *Triton* sp. indet. Toula (1908, pl. 28, figs. 5a, b) from the Gatun formation of the Panamá Canal Zone, but that is distinguished from the Venezuelan shell in having a more rotund body whorl and a shorter penultimate whorl. *Fasciolaria crowleyensis* Gardner (1948, p. 254, pl. 36, figs. 1-3, 6) from the Waccamaw formation (Pliocene) of North Carolina, is more generously noded and more distinctly shouldered than the Cabo Blanco specimen.

Latirus (Polygona) recticanalis, new species Pl. 30, figs. 17, 18

Shell small, sturdy, short-fusiform, the angle of spire 62 degrees. Nucleus decollate. Post-nuclear whorls at least five, those of the spire strongly shouldered, the ultima convex, rather sharply con-

stricted at the base. Sculpture on body consisting of seven swollen axial folds, about 11 strong spiral cords which thicken into elongate nodes as they cross the crest of the folds, and numerous axial growth lamellae. On the spire whorls, the axial folds are dominant from the shoulder to the suture but are feeble on the ramp above the shoulder; on the body, the folds continue to the base where they are narrower and lower, the labral side of each fold accompanied by a varical rift bordered by incremental growth lamellae. Whorls of the conch with four nodulous spiral cords, the two largest occurring on the shoulder, another not as large at the suture below, and a fourth one in the ramp between the shoulder and upper suture. The spiral cords of the body are elevated and narrow between the axial folds, but are thickened into prominent, spirally elongate nodes on the folds, the cords separated generally by wider interspaces, the interspaces on the convexity of the whorl with a secondary thread or two, the interspace at the constriction of the whorl near the base with a broad secondary cord lower than the primary ones. Anterior fasciole long, convex, built up of broad growth incrementals bowed upward. Adjacent to the fasciole is an elongated umbilical slit. Aperture pear-shaped, lined with six or seven lirae which strengthen as they approach the outer lip but do not reach the edge proper. Outer lip with an axial swelling behind the edge, the edge thin and lamellar, the rim scalloped, the inner margin fluted, the base of the margin with a thick, paired denticle which does not extend inward. Labium with a fairly heavy sheath of callus whose outer margin is detached, extending from the parietal wall to the side of anterior canal, the callus arched over the posterior outlet and joining the rim of the outer lip. Columella with five plaits diminishing in length anteriorward, the bottommost nodulous and situated at the entrance to the canal. Upper part of parietal shield with a ridge of callus below the posterior outlet, the broad outlet bordered by this ridge and the upermost apertural lira. Anterior canal deep, of medium length, moderately narrow, nearly straight, the extremity excavated into an obliquely directed, nonemarginate, U-shaped notch.

Dimensions.—Holotype (R264a), length (5 whorls) 15 mm.; max. width 8.7 mm.; length of canal 2.8 mm., No. 26254 (figured); paratype (I264a), length (5 whorls) 16.9 mm.; max. width 9.7 mm.; length of canal 3.5 mm., No. 26392 (unfigured) PRI.

Type locality.—Playa Grande formation (Maiquetía member) at W-26, in Quebrada Las Bruscas about 125 meters upstream from junction with Quebrada Las Pailas. One specimen, the holotype.

Other localities.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. One specimen, the paratype.

Comparisons.—This species recalls the Recent *L. brevicaudatus* (Reeve) (1847, Conch. Icon., vol. 4, pl. 10, sp. 50) and *L. trochlearis* (Kobelt) (see Abbott, 1958, p. 76, pl. 2-Q). It is smaller and broader than *L. brevicaudatus,* has seven instead of eight to nine axial folds, and its canal is straighter and a little shorter. The new species differs from *L. trochlearis* in being more prominently shouldered, in having fewer axial folds, and in its shorter canal. Among fossil species, *L. recticanalis,* n. sp. is distinguished from the middle and late Miocene *L. infundibulum polius* Woodring (1928, pp. 253-254, pl. 15, figs. 4, 5) of Jamaica, and Trinidad (see Vokes, 1938, p. 23, fig. 24) in being smaller and less attenuate. *L. jucundus* McGinty (1940a, p. 83, pl. 10, fig. 3) from the Pliocene? at Belle Glade, Florida, has four rather than five columellar folds, and the canal is not so straight and sharp as it is on the Venezuelan shell.

Leucozonia ocellata (Gmelin) Pl. 32, figs. 3, 4

1791. *Buccinum ocellatum* Gmelin, Syst. Nat., p. 3488.
1847. *Turbinella ocellata* (Gmelin), Reeve, Conch. Icon., vol. 4, pl. 8, sp. 38.
1881. *Leucozonia ocellata* (Gmelin), Tryon, Man. Conch., vol. 3, p. 95, pl. 70, figs. 178, 179.
1889. *Latirus* (*Leucozonia*) *ocellata* (Gmelin), Dall, U. S. Nat. Mus., Bull. 37, p. 112.
1890. *Leucozonia ocellata* (Gmelin), Smith, Linnaean Soc. Jour., Zoology, vol. 20, p. 488.
1891. *Latirus ocellatus* (Gmelin), Baker, Acad. Nat. Sci. Philadelphia, Proc., vol. 43, p. 50.
1901. *Latirus* (*Leucozonia*) *ocellatus* (Gmelin), Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, p. 398.
1922. *Leucozonia ocellata* (Gmelin), Maury, Bull. Amer. Paleont., vol. 9, No. 38, p. 85.
1924. *Leucozonia ocellata* (Gmelin), Emery, Nautilus, vol. 38, No. 2, p. 60.
1937. *Leucozonia ocellata* (Gmelin), Smith, East Coast Marine Shells, p. 127, pl. 44, fig. 8.
1946. *Leucozonia ocellata* (Gmelin), Jaume, Soc. Malac. "Carlos de La Torre", Rev., vol. 4, No. 3, p. 108.
1954. *Leucozonia ocellata* (Gmelin), Abbott, American Seashells, p. 241, pl. 11e.
1958. *Leucozonia ocellata* (Gmelin), Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 16.

1958. *Leucozonia ocellata* (Gmelin), Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, p. 92.
1959. *Leucozonia ocellata* (Gmelin), Nowell-Usticke, A Check List of the Marine Shells of St. Croix, p. 71.

The single, weathered shell referred to this species is of medium size, fusiform, nodulous, the last two whorls prominently shouldered. On the shoulder of the ultimate whorl and around the lower half of the penultimate whorl there are 11 broad white nodes, and in the concave ramp above the shoulder there is a small, secondary row of nodes, these lying above the interspaces of the primary nodes. Below the convexity of the body whorl there are four more rows of feeble nodules, the last two rows close together and adjoining the smooth, white, convex fasciole. The nodes on the body are in axial alignment, and are more or less connected by white along this alignment. Surface of shell covered with small revolving ridges (on which the nodes occur), and between these there are smaller alternating cords and threads. Ground color of surface blackish brown, the columella milky white, the aperture a pale bluish white. Aperture ovate-lenticular, lined with about 14 lirae of which 11 reach the margin of the outer lip. Posterior notch triangular, underlain by a low revolving ridge which extends from the parietal wall into the interior, the ridge merging on the labial side into the first row of nodes below the shoulder. Anterior canal short, a little twisted, the emarginate extremity excavated into a recumbent, U-shaped notch. Columella arcuate, the base with four folds, the lowest of which is the largest and forms the pillar, the highest being the smallest. Above these folds there are about five feeble plicae confined to the inner margin of the columella and extending upward to the parietal wall. Between the siphonal fasciole and the pillar there is a curved depression.

Dimensions.—Length (3 last whorls) 17.2 mm.; max. width 12 mm.

Locality.—Recent, on beach at Playa Grande Yachting Club, Distrito Federal. One specimen.

Range and distribution.—*L. ocellata* is an intertidal shell found under rocks and extends from the Florida Keys to northern South America.

Leucozonia nassa (Gmelin) Pl. 32, figs. 5-8

1791. *Murex nassa* Gmelin, Syst. Nat., ed. 13, p. 3551, No. 93. Refers to Lister, pl. 828, fig. 50; Martini, Conchylien-Cabinet, vol. 4, figs. 1131-1134.
1822. *Turbinella cingulifera* Lamarck, An. sans Vert., vol. 7, p. 107.
1847. *Turbinella cingulifera* Lamarck, Reeve, Conch. Icon., vol. 4, pl. 3, sp. 17.
1864. *Turbinella cingulifera* Lamarck, Krebs, The West Indian Marine Shells, p. 16.
1864. *Turbinella nassa* (Gmelin), Krebs, The West Indian Marine Shells, p. 17.
1878. *Turbinella nassa* (Gmelin), Mörch, Catalogue of West-India Shells, p. 11.
1881. *Leucozonia cingulifera* (Lamarck), Tryon, Man. Conch., vol. 3, pp. 94-95, pl. 70, fig. 165.
1889. *Latirus* (*Leucozonia*) *cingulifera* (Lamarck), Dall, U. S. Nat. Mus., Bull. 37, p. 112.
1890. *Leucozonia cingulifera* (Lamarck), Smith, Linnaean Soc. Jour., Zoology, vol. 20, p. 487.
1891. *Latirus cinguliferus* (Lamarck), Baker, Acad. Nat. Sci. Philadelphia, Proc., vol. 43, p. 50.
1901. *Latirus* (*Leucozonia*) *cinguliferus* (Lamarck), Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, p. 398.
1913. *Latirus cingulifera* (Lamarck), Brown and Pilsbry, Acad. Nat. Sci. Philadelphia, Proc., vol. 65, p. 495.
1922. *Leucozonia cingulifera* (Lamarck), Maury, Bull. Amer. Paleont., vol. 9, No. 38, p. 85.
1922. *Leucozonia cingulifera* (Lamarck), Remington, Nautilus, vol. 35, No. 4, p. 121.
1924. *Leucozonia cingulifera* (Lamarck), Emery, Nautilus, vol. 38, No. 2, p. 60.
1926. *Leucozonia cingulifera* (Lamarck), Weisbord, Nautilus, vol. 39, No. 3, p. 85.
1937. *Leucozonia cingulifera* (Lamarck), Smith, East Coast Marine Shells, pp. 126-127, pl. 45, fig. 17; pl. 47, fig. 12.
1938. *Leucozonia cingulifera* (Lamarck), Perry, Schwengel, and Dranga, Nautilus, vol. 52, No. 1, p. 28.
1938. *Leucozonia cingulifera* (Lamarck), Richards, Geol. Soc. Amer., Bull., vol. 49, pt. 2, p. 1293.
1942. *Leucozonia cingulifera* (Lamarck), Jaume and Pérez Farfante, Soc. Cubana Hist. Nat. "Felipe Poey", Mem., vol. 16, No. 1, p. 41.
1953. *Leucozonia* (*Leucozonia*) *cingulifera* (Lamarck), Haas, Fieldiana- Zoology, vol. 34, No. 20, p. 204.
1954. *Leucozonia nassa* (Gmelin), Abbott, American Seashells, pp. 240-241, pl. 11d.
1955. *Leucozonia cingulifera* (Lamarck), Perry and Schwengel, Marine Shells of the Western Coast of Florida, p. 170, pl. 35, fig. 239.
1958. *Leucozonia nassa* (Gmelin), Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 16.
1958. *Leucozonia nassa nassa* (Gmelin), Abbott, Acad. Nat. Sci. Philadelphia, Mon. No. 11, pp. 78-79, pl. 2m.
1958. *Leucozonia nassa* (Gmelin), Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, p. 92.
1959. *Leucozonia nassa* (Gmelin), Nowell-Usticke, A Check List of the Marine Shells of St. Croix, p. 71.

Recent and fossil examples of this species have been collected

in the Cabo Blanco area. The Recent shell is dark brown, the columella is white, and the aperture yellowish tan within. Generally there are nine large nodules around the shoulder and three strong folds at the base of the columella; sometimes there is a small auxiliary plica below the basal fold or one or two feeble plicae above the upper fold. Below the commissure there is a strong spiral ridge emerging from far within the aperture to join the spiral cord below the shoulder of the body whorl. The fossil specimens are small and badly worn but are also referred to *L. nassa* on the basis of their similarity to small Recent specimens.

Dimensions.—Recent specimen, length 27.7 mm.; max. width 15.5 mm.; fossil specimen, length 9 mm.; max. width 4.7 mm.

Localities.—Recent, on beach of Playa Grande Yachting Club, Distrito Federal. Five specimens; Abisinia formation at W-30, eastern edge of Playa Grande village. Three specimens.

Range and distribution.—The living *L. nassa* is often found among rocks in shallow water and ranges from Florida, to northern South America. Fossil representatives are reported from the Pleistocene of Black Swamp in the Panamá Canal Zone, at Gibara, Cuba, in Barbados, and in dredgings from Fort Pierce harbor, Florida.

Leucozonia caribbeana, new species Pl. 32, figs. 9, 10

Shell moderately large, broadly fusiform. Tip of spire decollate. Post-nuclear whorls at least five, strongly shouldered, the shoulder with seven large nodes, the ramp above the shoulder concave. Surface sculptured by numerous, slightly raised spiral threads and cords and fine closely spaced axial growth striae. Sutures narrowly channeled, somewhat undulatory. A short distance below the suture there is a spiral cord which is a little larger than the subequal threads above and below; a somewhat similar cord is present on the body whorl below the shoulder, this peripheral cord joining the ridge of callus beneath the anal outlet, and standing out a little more prominently than the other many and vari-sized spiral threads on the surface. Aperture proper broadly oval in outline, vaguely lirate in places. Outer lip thin, shallowly and broadly fluted under the peripheral cord. Siphonal canal fairly long, rather wide and deep, angled sharply to the left, a little flaring and slightly twisted an-

teriorly, the extremity excavated into a broad, somewhat oblique, U-shaped notch. Columella semicircular, forming a sharp angle at the union with the side of the canal. On this angle there is a strong, oblique fold entering into the interior, with a short non-entering fold immediately below, and a feeble parallel fold a short distance above. Parietal wall with a thin adherent sheath of callus, the callus becoming thicker on the pillar where it rises above the depression which adjoins the siphonal fasciole. Siphonal fasciole thick, convex, built up of broad growth incrementals. Upper part of parietal wall has a horizontal ridge of callus along the extension of the peripheral cord; the ridge extends only a short distance within. Outlet of posterior siphon simple, shallow, triangular.

Dimensions.—Holotype, length (5 whorls) 36.3 mm.; width (diagonally across shoulder, including nodes) 22.2 mm.

Type locality.—Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. One specimen, the holotype.

Remarks.—*L. caribbeana,* n. sp. is much like the preceding species, *L. nassa* (Gmelin), but has a more oblique and somewhat wider anterior canal than that, has seven instead of nine shoulder knobs, and has fewer folds at the base of the columella.

Fusinus marensis, new species Pl. 32, figs. 11, 12

Shell slender, moderately solid, fusiform, the canal long and tapering, the spire conoidal, the angle of divergence 41 degrees. Whorls 10, including 1-1/2 of the nucleus. Nucleus pupoid, smooth except at the final stage, the tip full and immersed, the middle turn large and swollen, the last convex, marked with three or four axial threads immediately before the conch. The first post-nuclear whorl is moderately convex, sculptured by 10 broad axial folds which are crossed by three spiral cords thickened into beads or nodules at the intercepts with the axial folds, the lower two cords the stronger, the upper one faint and lying just under the narrow subsutural cingulum. The next three whorls are subcarinate a little below the middle, and are also sculptured by 10 axial folds and 3 primary spiral cords which are nodulose in the spiral direction at the intercepts with the axials. Again the lower two spiral cords are the stronger and, on

the third and fourth post-nuclear whorls, fine intercalary spiral threads occur between the primaries. On the second and third post-nuclear whorls the subsutural cingulum or collar is strongly crenate by the axial growth threads that cover the surface of the shell, but on the fourth post-nuclear whorl the cingulum begins to lose its identity as such. The last three whorls are devoid of axial folds, and spiral markings predominate. Around the middle of the whorls there are three smooth primary and spiral cords, the upper one smaller than the lower two, and between the primaries and on the rest of the whorl there are secondary and tertiary spiral threads. The entire surface of the conch is covered with minute but distinct axial threads which, however, do not cross the crest of the larger spiral cords. Body whorl symmetrically rounded at the convexity, sculptured by smooth-crested primary and secondary spiral cords with interstitial threads between them. Sutures narrowly incised. Aperture proper rather small, ovate, lined with about 18 strong, subequal but sometimes paired lirae. Inner edge of outer lip with paired or bifid denticles, each pair with a short smooth groove or fluting between them, the rim of the lip scalloped by the slightly projecting denticles. Anterior canal long, gently sinuous, the margins parallel except near the anterior end where the canal widens a little, the terminus bent back somewhat, the extremity with a shallow semicircular notch, the labral margin with obliquely directed narrow flutings or grooves, the termini of the grooves lying under the primary spiral cords on the surface of the canal. Labium with a well-defined sheath of enamel extending from the parietal wall to the anterior end of the canal, the distal margin of the enamel adherent to but elevated a little above the surface on the parietal wall, slightly detached along the canal for most of its length but forming a slight thickening at the margin a short distance above the end of the canal. Columella gently concave, the spiral cords of the whorl reflected through the enamel, with additional folds appearing on the columella toward the base.

Dimensions.—Holotype (J237a), length (anterior end of canal broken away) 50 mm.; max. width 17 mm.; length of spire from last suture 22 mm., No. 26263 (figured); paratype (J237b), length (nucleus decollate, the canal wholly intact) 79.3 mm., No. 26401 (unfigured) PRI.

Type locality.—Lower Mare formation, in small stream 100 meters west of Quebrada Mare Abajo. Two specimens.

Other localities.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. One broken specimen.

Comparisons.—Among fossil species, *F. marensis,* n. sp. is somewhat akin to *F. henekeni veatchi* (Maury) (1917, pp. 243-244, pl. 12, fig. 3) from the Miocene of the Dominican Republic, but is distinguished from that by its more sinuous canal. The Venezuelan shell is also related to *F. springvalensis* (Maury) (see Vokes, 1938, pp. 23-24, figs. 27, 28) from the upper Miocene of Trinidad, but *F. springvalensis* has relics of the axial folds on the later whorls whereas *F. marensis* is completely devoid of folds on the last three whorls. *F. magdalenensis* Anderson (1929, p. 133, pl. 15, figs. 1-3) from the Miocene P horizon of Tuberá Mountain, Colombia, is yet another relative of *F. marensis* but has fewer and larger primary spiral ribs on the body and canal. Among Recent shells, the analogue is *F. helenae* Bartsch (1939, pp. 2-3, pl. 1, figs. 4, 5) from Tarpon Springs, Florida, but the whorls of *F. helenae* are more rotund, and there are inconspicuous axial riblets on the last whorl. *F. couei* (Petit) (1853, Jour. Conchyl., vol. 4, pp. 249-250, pl. 8, fig. 1), another Recent Caribbean species, is also similar to the fossil *F. marensis,* but the Venezuelan shell is readily differentiated from *F. couei* (see Rehder and Abbott, 1951b, pp. 60-61, pl. 8, fig. 7) by its shorter spire. The photograph of *F. marensis* looks as though it has a considerably shorter canal than *F. couei,* but this is because the anterior end of the canal is broken off.

Fusinus closter caboblanquensis, new subspecies Pl. 32, figs. 13, 14; Pl. 33, figs. 1, 2

Shell large, fusiform, long-stemmed, the aperture and canal about two-thirds the length of the shell, the spire pointed, its angle of divergence about 49 degrees. Whorls 12 in all, the nucleus consisting of two of them. Nucleus pupoid, the tip loosely coiled and a little canted, the following turn swollen, the last whorl convex, sculptured by about 10 axial threads before the conch. The demarcation between the nucleus and conch is sharply defined by a strong axial rib, on the forward side of which the sculpture of the conch

proper begins. Early post-nuclear whorls moderately convex, marked with nine strong axial costae extending from suture to suture and separated by narrower interspaces, the costae crossed by narrow spiral cords which are prominently beaded or nodulose on the crest of the axial costae. Immediately below the suture of the early post-nuclear whorls there is a subsutural thickening or cingulum which becomes less pronounced with the growth of the shell. On the first post-nuclear whorl there are three equal and equally spaced spiral cords, these devloping into the primary spirals around the middle of the later whorls. On the second and third post-nuclear whorls a single intercalary thread appears between each of the spiral cords, and later there is a progressive increase in the number and size of the interstitial threads. The lower whorls develop a slope above the middle and are a little convex below the middle. With maturity, the upper slope, or ramp becomes progressively wider, occupying perhaps one-fourth of the fourth post-nuclear whorl and as much as two-thirds of the penultimate whorl. Surface of shell minutely but sharply decussated by numerous axial growth threads. Sutures narrowly channeled, undulatory. The axial costae are best developed and are the most regular on the upper part of the spire where they extend from suture to suture; farther down they broaden into low folds and play out toward the sutures; on the body whorl, where there are 11 to 13 of them, they become obsolescent below the convexity. On large specimens the periphery of the last two or three whorls is angulate or keeled, the keel characterized by spirally elongate nodes on the crest of each axial fold; on smaller specimens the keel is less pronounced, and the nodulation is no more than a slight thickening of the spiral cord on the sides and top of the axial fold. All of the primary spiral cords on all of the whorls, however, are thickened on the axial folds, the thickening more pronounced on the early whorls and on the keel of the last two whorls. In addition to the larger primary spirals there are secondary spiral cords, with tertiary threads between those, and with still finer striae between the tertiaries. Body whorl with coarse spiral cords, these intercalated by smaller ones, and bearing a number of finer threads in the shallow interspaces. Aperture more or less ovate, lined with about 20 or so sharply-crested lirae, the lirae becoming subdued

near the edge of the outer lip. In addition, the aperture is marked with a row of shallow pits or depressions, each depression lying under a node of the surface keel. Outer lip thin, the rim somewhat scalloped, the inner margin weakly denticulate and fluted, the flutings merging with the interspaces of the apertural lirae. The shell surface between the apertural lirae is scored by numerous microscopic spiral lineations. Siphonal canal long, narrow, a little sinuous, the margins subparallel, the anterior end slightly wider, the extremity with a shallow, broadly U-shaped, nonemarginate notch. Labral side of canal grooved with upward slanting narrow flutings, the outer end of the flutings occurring under the coarser spiral cords of the stem. Parietal wall with a mere wash or glaze, the wash developing into a narrow sheath of enamel which continues along the side of the canal and forms an erect laminar wall near the anterior end of the canal. Anterior fasciole long and narrow, convex at the side, flattened to concave adjacent to the canal, covered with numerous fine threads. Canal generally swollen somewhat along the middle.

Dimensions.—Holotype (J238a), length (nucleus decollate) 102.5 mm.; width (diagonally across keel of body whorl, including nodes) 43 mm.; length of aperture and canal from commisure 64 mm.; paratype (T238a), length 142 mm.; width diagonally across keel of body whorl, including nodes 59 mm.; length of spire from lowest suture 53 mm.; length of aperture and canal from commissure 90 mm.; largest specimen, estimated length 230 mm.; width diagonally across keel of body whorl, including nodes 73 mm.; length of spire from lowest suture (nucleus decollate) 85 mm.; estimated length of aperture and canal from commissure 145 mm.

Type locality.—Lower Mare formation, in small stream 100 meters west of Quebrada Mare Abajo. Eleven specimens including fragmentary ones.

Other localities.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. Thirty-three specimens, including fragmentary ones. Mare formation at W-14, on hillside above west bank of Quebrada Mare Abajo. Two fragmentary specimens; Mare formation, in stream 250 meters south-southwest of mouth of Quebrada Las Pailas. Two specimens, including the paratype; Mare formation at W-25, south flank of Punta Gorda anticline.

One poorly preserved specimen; Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. One fragmentary specimen.

Comparisons.—The Cabo Blanco shell is close to the Recent *F. closter* (Philippi) (1851, Abbild. u. Beschreib. Conchyl., vol. 3, *Fusus,* pp. 115-116, pl. 5, fig. 1) the type of which is from Margarita Island, Venezuela, some 300 kilometers east of Cabo Blanco. However, in comparing a Recent specimen of *F. closter* from the type locality (No. 54474, U. S. National Museum) with a fossil of the same size from Cabo Blanco, I have observed that the stem, or canal of the Margarita *F. closter* is straight whereas that of the fossil is sinuous. As Philippi's original figure also shows the canal of *F. closter* to be straight, and as on all of the Cabo Blanco fossils the canal is always more or less sinuous and a little twisted, I think that the Cabo Blanco fossil is a subspecies for which I propose the name *F. closter caboblanquensis.* Young specimens of *F. c. caboblanquensis,* n. subsp. resemble adults of the Recent *F. eucosmius* Dall (1889b, p. 167, pl. 35, fig. 5) from the Gulf of Mexico. *F. eucosmius,* however, has a more circular aperture, a more conspicuously fusiform and higher spire, and fewer axial costae. Small specimens of *F. c. caboblanquensis* also resemble *F. helenae* Bartsch (1939, pp. 2-3, pl. 1, figs. 4, 5) collected near Tarpon Springs, Florida, but *F. helenae* is distinguished from the Venezuelan fossil in being a little more slender, in having more regularly rounded whorls, and in having four, rather than three spiral threads on the first post-nuclear whorl. Two somewhat similar species occurring in the eastern coastal plain of the United States are *F. exilis* (Conrad) (see Gardner, 1948, p. 255, pl. 32, fig. 10) from the upper Miocene in Virginia, and *F. caloosaensis florida* Olsson and Harbison (1953, p. 219, pl. 35, figs. 6-6c) from the Pliocene at North St. Petersburg, Florida. The Venezuelan *F. caboblanquensis* has a much longer canal than *F. exilis,* and is discriminated from *F. florida* in the better development of the axial costae, in having three, rather than four primary spiral cords on the upper whorls of the spire, and in having fewer axial threads on the nucleus. Species in the Caribbean area that are similar to, but not identical with *F. c. caboblanquensis,* n. subsp. are the following:

F. engonius Woodring (1928, pp. 258-259, pl. 15, fig. 9) from the Bowden Miocene of Jamaica. That has a shorter canal than *F. caboblanquensis*.

F. henekeni (Sowerby) (see Pilsbry, 1921, p. 347, pl. 26, figs. 6, 7) from the Miocene of the Dominican Republic. The Dominican form is close to young examples of *F. caboblanquensis*, differing, however, in bearing somewhat fewer primary spiral cords, in lacking the tendency to develop nodes on the periphery of the last few whorls, and in possessing a thicker labial callus which is detached along the distal margin for most of its length.

F. henekeni haitensis (Sowerby) (see Maury, 1917, p. 243, pl. 12, fig. 2) from the Miocene of the Dominican Republic is nearly identical with the young of *F. c. caboblanquensis*, but the main point of difference is the longer and more slender spire of *F. haitensis*.

F. miocosmius Olsson (1922, pp. 103-104, pl. 8, fig. 5) from the Gatun stage (Miocene) of Bocas del Toro, Panamá, has a more swollen body whorl, fewer axial folds, and a more acuminate spire than does F. *caboblanquensis*.

OLIVIDAE

Oliva (Ispidula) reticularis Lamarck — Pl. 33, figs. 3, 4

1811. *Oliva reticularis* Lamarck, Mus. Hist. Nat. nat. Paris An., vol. 16, p. 314.
1864. *Oliva reticularis* Lamarck, Krebs, The West Indian Marine Shells, p. 40.
1867. *Oliva reticularis* Lamarck, Guppy, Sci. Assoc. Trinidad Proc., pt. 3, p. 158 (part).
1873. *Oliva reticularis* Lamarck, Guppy, Sci. Assoc. Trinidad, Proc., vol. 2, p. 91.
1878. *Oliva reticularis* Lamarck, Mörch, Catalogue of West-India Shells, p. 12.
1881. *Oliva reticularis* Lamarck, Gabb, Acad. Nat. Sci. Philadelphia, Jour., ser. 2, vol. 8, p. 354.
1883. *Oliva reticularis* Lamarck, Tryon, Man. Conch., vol. 5, p. 85, pl. 30, figs. 90-95.
1889. *Oliva reticularis* Lamarck, Dall, U. S. Nat.. Mus., Bull. 37, p. 106.
1890. *Oliva reticularis* Lamarck, Dall, Wagner Free Inst. Sci., Trans., vol. 3, pt. 1, pp. 44, 45 (part).
1895. *Oliva reticularis* Lamarck, Harris, Bull. Amer. Paleont., vol. 1, No. 3, p. 100, pl. 3, fig. 12.
1901. *Oliva reticularis* Lamarck, Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, p. 391.
1921. *Oliva reticularis* Lamarch, Pilsbry, Acad. Nat. Sci. Philadelphia, Proc., vol. 73, p. 334.
1928. *Oliva reticularis* Lamarck, Woodring, Carnegie Inst. Wanshington Publ. No. 385, p. 227.

1937. *Oliva reticularis* Lamarck, Smith, East Coast Marine Shells, p. 131, pl. 50, fig. 23; pl. 51, fig. 18.
1938. *Oliva reticularis* Lamarck, Clench, Nautilus, vol. 51, No. 4, p. 112.
1938. *Oliva reticularis* Lamarck, Richards, Geol. Soc. Amer. Bull., vol. 49, p. 1293.
1942. *Oliva reticularis* Lamarck, Jaume and Pérez. Farfante, Soc. Cubana Hist. Nat. "Felipe Poey," Mem., vol. 16, No. 1, p. 42.
1944. *Oliva reticularis* Lamarck, Patterson, Nautilus, vol. 58, No. 2, p. 37.
1946. *Oliva reticularis* Lamarck, Jaume, Soc. Malac. "Carlos de La Torre", Rev., vol. 4, No. 3, p. 109.
1953. *Oliva* (*Ispidula*) *reticularis* Lamarck, Olsson and Harbison, Acad. Nat. Sci. Philadelphia, Mon. No. 8, p. 184, pl. 29, figs. 2, 3a-3c.
1954. *Oliva reticularis* Lamarck, Abbott, American Seashells, pp. 245-246, pl. 12c.
1958. *Oliva reticularis* Lamarck, Coomans, Caraibisch Marien-Biologisch Inst. Collected Papers 6, p. 93.
1958. *Oliva reticularis* Lamarck, Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 17.
1958. *Oliva* (*Ispidula*) *reticularis* Lamarck, Abbott, Acad. Nat. Sci. Philadelphia, Mon. No. 11, p. 81.
1959. *Oliva reticularis* Lamarck, Nowell-Usticke, A Check List of the Marine Shells of St. Croix, p. 72.

A worn and broken Recent specimen is believed to be referable to the typical *O. reticularis*. The whorls of the spire are slightly convex, and there is a shallow posterior canal at the channeled suture. Ground color a dull cream overlaid by irregular spiral stripes and maculations of brown, with longitudinal chestnut-brown bars on the labral area. Under the suture there are short, somewhat curved axial stripes of brown. There are two vague bands of lighter tone, one around the shoulder, the other around the middle. The columella and aperture are white.

Dimensions.—Figured specimen (anterior third and tip of spire missing), length 21.3 mm.; max. width 13.3 mm.

Locality.—Recent, on beach at Playa Grande Yachting Club, Distrito Federal. One specimen.

Range and distribution.—The living *O. reticularis* ranges from southeast Florida, to Brazil. In the Pleistocene it is recorded at Matanzas Bay, Cuba, by Jaume and Pérez Farfante, and from a well at Delray, Florida, at a depth of 118 feet, by Richards. Pliocene forms believed to be close, if not identical with *O. reticularis*, are reported by Olsson and Harbison from St. Petersburg, Florida, and by Gabb from Limon, Costa Rica. Rutsch (1934, pp. 79-82, pl. 5, figs. 8-11) described *O.* cf. *reticularis* from Punta Gavilan and Sabanas Altas in the State of Falcon, Venezuela, in upper Miocene-

Pliocene deposits but the Falcon specimens seem a little more contracted at the anterior end than *O. reticularis, s.s.* A rather stubby form of *O. reticularis* was described by Harris from the upper Miocene in the "deep well at Galveston", Texas, between 2158 and 2920 feet, and Pilsbry referred certain specimens from the middle Miocene of the Dominican Republic to the typical *O. reticularis*, stating that they were readily separated from *O. cylindrica* Sowerby, in the large series at hand.

Oliva (Ispidula) schepmani, new species Pl. 33, figs. 5-13

1888. *Oliva reticularis* Lamarck and *Oliva fusiformis* Lamarck, Schepman, [in] Martin, Bericht über eine Reise nach Nederlandisch West-Indien und darauf gegründete Studien, Leiden: II-Geologische Studien, Appendix. Not of Lamarck, 1811.
1889. *Oliva venulata* Lamarck, Lorie, Samml., Geol. Reichs-Mus. Leiden, ser. 2, vol. 1, pp. 138, 142 (part). Not of Lamarck.
1934. *Oliva* cf. *reticularis* Lamarck, Rutsch, Schweiz. Palaeont. Ges. Abh., vol. 54-55, pp. 79-82, pl. 5, figs. 8-11.

Shell relatively large, solid, subcylindrical to ovate-subcylindrical, the spire moderately short and conical, the tip subulate and mammilliform or pupoid. Whorls about 6-1/2 including a little over 2 of the nucleus. Nuclear whorls smooth, subhyaline to subporcelaneous, the initial small and appressed, the next greatly expanded, tumid, and a little eccentric, the last stage defined from the conch by a feeble axial rift coinciding with a change in shell texture. The first post-nuclear whorl is narrower and shorter than the last nuclear whorl and the sides are nearly vertical compared with the much gentler slope of the succeeding whorls. Except for the first, the spire whorls are flat-sided and later nearly always slightly concave. The penultimate whorl is much wider than the preceding ones, and the last turn of the penultima is thinly coated with callus. This callus thickens and occupies the lower half of or two-thirds of the ultimate whorl where it joins the callus of the parietal wall. Sutures channeled, the upper margin of the channel sharp, the summit of the following whorl lying level with about the middle of the channel. Body whorl of adult specimens somewhat swollen or distended around the shoulder, the top of the labral area flattish compared with the gentle curve of the opposite side. Below the

shoulder, the body whorl is gently and evenly convex, and the anterior extremity of the labium is pinched in along the side of the terminal notch. Aperture moderately wide, the sides subparallel, flared a little below. Outer lip generally thin at the rim but thickened behind the same as the rest of the labrum, the outer margin often somewhat flattened. Columellar margin callused, bearing on the average 17 plaits extending from just below the suture to the anterior tip. The upper plaits are short, parallel, and not quite horizontal. On the lower third of the columella there are four or five longer plaits which descend obliquely and merge with the callus emarginating the anterior notch. The longest of these lower plaits is the posterior one, and this, as it descends, forms the border of the siphonal fasciole. Siphonal fasciole broad and wedge-shaped, convex and wider below, flat above, the fasciolar area sharply defined from the whorl proper by a bounding groove or slightly elevated ledge. Terminal notch broad, deep, obtusely V-shaped, bordered by a wide band of callus which merges with that of the columella on one side and with the back surface of the outer lip on the other. The posterior canal at the suture is narrow, short, and moderately deep. The original color pattern is faded out but several specimens are flecked with brown at the summit of the whorls adjoining the sutures. An occasional shell reveals a faint "crackly" or arrowhead pattern defined in brown, and on some examples there is the suggestion of spiral banding as well.

Dimensions.—Holotype (I212a), length 46. 5 mm.; max. width 24.5 mm.;paratype (I212b), young, length 22.8 mm.; max. width 10.1 mm.; paratype (G212a), length 37 mm.; max. width 13.8 mm.; paratype (J212a), length 51.4 mm.; max. width 24.7 mm.; largest specimen, length 62.5 mm.; max. width 30.5 mm.

Type locality.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. Fifty-two specimens including holotype.

Other localities.—Lower Mare formation, in small stream 100 meters west of Quebrada Mare Abajo. Thirty-three specimens; Mare formation at W-14, on hillside above west bank of Quebrada Mare Abajo. Twenty-two specimens; Mare formation, in stream 250 meters south-southwest of the mouth of Quebrada Las Pailas. Eight

specimens; Mare formation at W-25, south flank of Punta Gorda anticline. Five specimens; Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. Six specimens; Playa Grande formation (Maiquetía member) at W-26 in Quebrada Las Bruscas, about 125 meters upstream from junction with Quebrada Las Pailas. One specimen; Abisinia formation at W-30, eastern edge of Playa Grande village. Four specimens including one large fragment and three juveniles.

Comparisons.—This abundant fossil is probably the same species as the one referred to as *O. reticularis* Lamarck by Schepman [in] Martin (1888) and as *O. venulata* Lamarck (=*O. spicata* Röding) by Lorié (1889), having been collected by me at the same locality and from the same formation as were Martin's specimens. *O. reticularis* is an Eastern American Miocene to Recent species, and *O. spicata* is the late Pliocene to Recent West American analogue, and although our *O. schepmani,* n. sp. is close to both, it is differentiated from them by either its more distended shoulder area, or by its more pupoid nucleus, or by its slightly concave rather than slightly convex spire whorls. It is true that many specimens of *O. schepmani* are not inflated at the shoulder, but these intergrade with those that are, and all examples of *O. schepmani* exhibit the slightly concave spire whorls, the subulate tip, and the bulbous nucleus. The well-known Miocene to Recent *O. sayana* Ravenel (formerly *O. litterata* Lamarck) is distinguished from *O. schepmani* by its steeper and more concave spire whorls. The Recent Eastern Pacific *O. splendidula* Sowerby (see Keen, 1958, p. 422, fig. 626) is another related species, but the anterior tip of the labium is not so pinched as on the Venezuelan *O. schepmani.* There are a number of late Cenozoic fossil species of *Oliva* from the southeastern United States and the Caribbean area that are similar to, but not identical with *O. schepmani,* and these are the following:

O. idonea Conrad (see Gardner, 1948, p. 258, pl. 38, figs. 1, 8). St. Marys formation (Miocene) of Virginia. The maximum diameter falls farther forward than on *O. schepmani.*

O. eborea Conrad (see Gardner, 1948, p. 258, pl. 38, fig. 15). St. Marys formation (Miocene) of Virginia. The aperture is subtriangular, and the outer lip flares more widely in front than on *O. schepmani.*

O. liodes Dall (See Gardner, 1948, p. 258, pl. 38, figs. 1, 8). St. Marys formation (Miocene) of Virginia. The maximum diameter falls farther forward than on *O. schepmani.*

O. carolinensis (Conrad) (see Olsson and Harbison, 1953, p. 184, pl. 29, figs. 4, 4a). Upper Miocene of North Carolina. The spire is more elevated than on *O. schepmani.*

O. cylindrica Sowerby (see Pilsbry, 1921, p. 335, pl. 23, figs. 2, 3). Miocene of the Dominican Republic, Costa Rica ?, and Colombia. This is close to *O. schepmani,* but the spire whorls are not slightly concave as on the Cabo Blanco shell.

O. dimidiata Pilsbry and Johnson (see Pilsbry, 1921, p. 336, pl. 23, fig. 8). Miocene of the Dominican Republic. Smaller than *O. schepmani* and with a more arcuate body whorl.

O. reticularis trochala Woodring (1928, pp. 226-227, pl. 13, figs. 3-5). Miocene of Jamaica. Similar to *O. schepmani,* but the sutures are not so strongly channeled, and the outer edge of the suture does not form a definite ledge.

O. cercadica Maury (1925b, p. 348). Miocene of the Dominican Republic. This is perhaps the nearest form to *O. schepmani* of the many relatives, the principal difference being that the anterior end of the labium of *O. schepmani* is pinched in perceptibly more than on *O. cercadica.*

Remarks.—O. schepmani, n. sp. may be the same as that referred to by Rutsch (1934, pp. 79-82, pl. 5, figs. 8-11) as *O.* cf. *reticularis* Lamarck from the upper Miocene-Pliocene beds at Punta Gavilan and Sabanas Altas in the State of Falcon, Venezeula. The Cabo Blanco specimens are unquestionably the same as those labeled *Oliva fusiformis* Lamarck (1811, Mus. Nat. Hist. Paris An., vol. 16, p. 318) in the Cabo Blanco collection (No. 18249) of the

U. S. National Museum, but Recent specimens of *O. fusiformis* in the Museum seem to me to have a slightly more produced spire and a somewhat stubbier body whorl than do the Venezuelan fossils.

Olivella (Olivella) petiolita ? (Duclos) Pl. 34, figs. 1, 2

1835. *Oliva petiolita* Duclos, [in] Chenu, Illustrations conchyliologiques, vol. 4, *Oliva* p. 5, pl. 1, figs. 21, 22.
1835. *Oliva esther* Duclos, Histoire naturelle coquilles univalves marines. Genre Olive, pl. 3, figs. 7, 8.
1864. *Oliva esther* Duclos, Krebs, The West Indian Marine Shells, p. 38.
1871. *Oliva petiolita* Duclos, Marrat [in] Sowerby, Thes. Conchyl., vol. 4, *Oliva,* No. 172, p. 33, pl. 23, figs. 394, 395, 418.
1878. *Oliva* (*Olivella*) *petiolita* Duclos, Weinkauff, Conchylien-Cabinet, vol. 5, pt. 1, pp. 134-135, pl. 35, figs. 5-8.
1883. *Olivella petiolita* (Duclos), Tryon, Man. Conch., vol. 5, p. 66, pl. 14, figs. 61-63.
1883. *Olivella petiolita* var. *esther* (Duclos), Tryon, Man. Conch., vol. 5, pp. 66-67, pl. 14, fig. 65.
1901. *Olivella esther* (Duclos), Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, p. 392.
1956. *Olivella* (*Olivella*) *petiolita* (Duclos), Olsson, Acad. Nat. Sci. Philadelphia, Proc., vol. 108, p. 174, pl. 8, figs. 8, 8a; pl. 12, figs. 1, 1a.
1958. *Olivella* (*Olivella*) *petiolita* (Duclos), Keen, Sea Shells of Tropical West America, p. 424.

The Recent Venezuelan shells referred tentatively to *O. petiolita* are sturdy and ovate, are composed of about six whorls in all, and have a moderately high conical spire whose sides are slightly convex and whose apex is obtuse. The sutural areas are canaliculate, the summit of each succeeding whorl not quite reaching the middle of the antecedent sutural channel. Parietal callus heavy, white, extending to the penultimate suture, its distal margin clearly defined and more or less parallel with the side of the whorl from the suture to near the top of the fasciolar band. Columellar lip covered in large part by a strongly lirate pad of callus, the outer lip smooth along the inner margin. Base with an obtuse V-shaped notch, the posterior outlet a simple, narrow groove. Coloration, except for faint residual markings on the upper fourth of the penultimate whorl, is confined to the body whorl, the preceding ones dull hyaline white. Colors of body white and brown, the pattern made up of irregular columns of coalescing arrowheads whose tips face to the left. The outline of the arrowheads is light brown, the centers dull white. Darker browns prevail below the summit of the whorl and along the labrum, some

of the coloration pervading the inner margin of the outer lip. Aperture evenly suffused with a pale purplish white tinge. On the fasciole there is a revolving band of chestnut; above this there is a slightly wider band of white, and below the chestnut band the base and pillar are white.

Dimensions.—Figured specimen, length 17.5 mm.; max. width 8 mm. This specimen is the largest and best preserved of 11 examples.

Locality.—Recent, on beach of Playa Grande Yachting Club, Distrito Federal.

Remarks.—The Playa Grande shells are identical to specimens labeled *O. petiolita* in the Academy of Natural Sciences of Philadelphia (No. 247570) and are a little larger but also identical to specimens labeled *O. esther* in the U. S. National Museum. My specimens are certainly the same as Olsson's *O. petiolita* from the north coast of Venezuela, and seem to meet in every way, including size, the description of Dall's *esther* from Puerto Rico. In describing *O. petiolita* Duclos, Tryon (1883) stated that it was "Yellowish white, fasciculated and reticulated with chestnut color, and with a narrow chestnut revolving band upon the fasciole. Length, 12-18 mill. West coast of America, from Panama to Mazatlan." And, concerning *O. petiolita* var. *esther* Duclos, Tryon wrote as follows: "Shell heavy, with short spire, and strong callus on the upper part of the columella. Yellowish white, fasciculated with chestnut at the suture, with a chestnut band upon the fasciole, and minute longitudinal zigzag markings of the same color upon the body whorl. Length, 6 mill. Habitat unknown. A shorter, heavier form than *petiolita,* judging from the figure, yet doubtfully distinct: the shells usually known under this name are certainly *O. petiolita.*" The illustrations of Duclos' original *O. petiolita* and *O. esther,* are, I must confess, not clear enough for me to determine whether the Venezuelan shells are the same, though I can say that Duclos' *O. esther* has a different coloration than our Playa Grande specimens.

Range and distribution.—According to Olsson, *Olivella petiolita* (Duclos) occurs in the West Indies and the Caribbean region along the coast of Venezuela westward to Panamá. It has also been reported from the Eastern Pacific, although this is not confirmed by Olsson.

Olivella (Olivella) venezuelensis Olsson Pl. 34, figs. 3-8

1956. *Olivella* (*Olivella*) *venezuelensis* Olsson, Acad. Nat. Sci. Philadelphia, Proc., vol. 108, pp. 181-182, pl. 13, fig. 3.

Shell of medium size, solid, ovate conical. Surface of the body whorl often whiter than the rest of the shell, such examples bearing numerous fine longitudinal striations which terminate abruptly and nearly vertically at the top of the fasciolar band but curve to the right above at the suture. These striations are not visible on any other part of the shell. Whorls about seven in all. Nucleus rather small, hyaline, erect, consisting of about two volutions, the last one tumid and gradational with the first whorl of the conch. The first two whorls of the conch are narrow, the earlier one convex and subcarinate at the periphery. Later whorls increase rapidly in height, are slightly convex, trapezoidal in outline, and sharp-edged at the base just above the suture. Body whorl obtusely shouldered, nearly flat-sided to slightly convex medially, and rounded anteriorly. Spire moderately elevated, rather broadly conical. Whorls separated by channeled sutures, the top of the succeeding whorl level with the middle of the channel. Surface smooth and polished, the base and spire of the shell cream-colored in contrast with the white of the body. Aperture subtriangular, acutely angled above, somewhat flaring and widest below. Parietal callus heavy, swollen, the outer limit clearly defined, descending obliquely from the penultimate suture to the lower third of the shell where it veers abruptly to encircle the fasciolar area. From the top of the outer lip to the penultimate suture the callus is thickened into an oblique, slightly curved ridge. Superimposed on the columella is an inner pad of callus which is thickest at the pillar and extends from the side of the terminal notch up the columella for about four-fifths the length of the aperture. On the upper part of the columella above the pad there are two or three short denticles. The pad itself is corrugated with oblique folds, the lower ones curving outward and downward, but only the last two continuing within the aperture. Of all the folds, the lowest but one is by far the largest, this forming the margin of the pillar. The lowest fold, which is usually biplicate, is separated from the one above by a strongly channeled groove, and forms a lip around the terminal notch. Outer lip smooth within, generally somewhat thinner at its

margin than it is behind. Terminal notch broad, fairly deep, obliquely directed, U-shaped. Fasciolar band a slightly raised swath of callus which terminates against the outer edge of the columellar callus just below the middle of the body whorl and continues around the base to occupy the lower fourth of the outer lip. The anterior fasciole is large and also smoothed over with callus.

Dimensions.—Holotype (Olsson), length 27.2 mm.; max. width 12.1 mm.; average adult, length 23 mm.; max. width 10.5 mm.; smallest specimen, length 1.1 mm.; max. width 0.55 mm.

Type locality.—The occurrence as given by Olsson is "Upper Miocene. Punta Blanco beds to the north of La Guaira, Venezuela". These beds undoubtedly refer to the fossiliferous deposits of the Cabo Blanco group which lie 3.5 to approximately 10.5 kilometers west of La Guaira. Because no specific locality for Olsson's single specimen is given, and because my collection contains 52 specimens from the Mare formation and 13 from the Maiquetía member of the Playa Grande formation, I would propose that the type locality be assigned to the Lower Mare formation which is well exposed in the small stream 100 meters west of Quebrada Mare Abajo.

Other localities—Lower Mare formation, in small stream 100 meters west of Quebrada Mare Abajo. Nineteen specimens; lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. Twenty-six specimens; Mare formation at W-14, on hillside above west bank of Quebrada Mare Abajo. One specimen; Mare formation in stream 250 meters south-southwest of mouth of Quebrada Las Pailas. Six specimens; Playa Grande formation (Maiquetía member) at W-23 on north flank of Punta Gorda anticline. Thirteen specimens.

Comparisons—Olsson's description and figure of this species are based on a single worn specimen which does not show the two-toned nature of the surface. Nevertheless it is reasonably certain that my specimens are referable to his species. *O. venezuelensis* is remarkably similar to Recent examples of *O. dama* (Mawe) from Baja California, Mexico, but it seems to me that *O. venezuelensis* is a narrower shell with a longer spire and less developed pillar. In its longitudinally striate body, *O. venezuelensis* reminds one of *O. bipli-*

cata (Sowerby) from the west coast of the United States and Mexico although in other respects the two species are quite dissimilar. On the Atlantic side of the continent, *O. venezuelensis* is somewhat like *O. fargoi* Olsson and Harbison (1953, p. 187, pl. 29, fig. 6; pl. 39, fig. 4) from Clewiston and North St. Petersburg, Florida, although *O. venezuelensis* is readily discriminated from *O. fargoi* by its lower spire, by its more extensive callus, and by its longer column of plaits on the inner lip. In the Antillean-Caribbean area, *O. muticoides* (Gabb) from the Miocene of the Dominican Republic (see Maury, 1917, p. 232, pl. 11, fig. 1) is a related species but is smaller and narrower than *O. venezuelensis* and, among other dissimilarities, seems to have a blunter spire and a less oblique suture on the body whorl. The illustration by Maury (1917, pl. 11, fig. 2) of Gabb's *O. canaliculata* is even closer to *O. venezuelensis* than *O. muticoides*, but whereas the outer edge of the columellar callus on *O. venezuelensis* is straight and nearly parallel with the inner margin of the columella, on *O. canaliculata* and *O. muticoides* the callus is narrower and bowed inward. The wider columella callus also serves to distinguish the Cabo Blanco species from *O. acra* Woodring (1928, pp. 230-231, pl. 13 figs. 8-10) occuring in the Bowden Miocene beds of Jamaica.

Olivella (Olivella) gracilis ternuculata, new subspecies Pl. 34, figs. 9, 10

Shell slender, svelte, regularly ovate. Spire high, symmetrical, rather sharply tapered, about half the total length of the shell. Whorls seven in all, two of them forming the smooth hyaline nucleus. Initial nuclear whorl small and indistinct, the last convex, grading insensibly into the first whorl of the conch, the nucleus defined from the conch by a change in shell texture. The first post-nuclear whorl or two is flat-sided, the later ones gently convex, increasing rapidly in height. Sutures channeled, the summit of the succeeding whorl being level with the middle of the antecedent sutural channel. Aperture subtriangular, widest below. Outer lip not thickened, smooth within, the gutter at the commissure deep and narrow. Columella obtusely angulated along the apertural margin, the pillar a little twisted. Parietal wall with a neat, well-defined thinnish coat of callus starting at the penultimate suture and continuing down the

body, the distal margin of the callus nearly parallel with the side of the whorl to about the middle of the inner lip, swerving therefrom to the left and then descending between the fasciole and pillar. Columella with two or three feeble, obliquly curved, short lirae, the posteriormost more or less in line with the top of the fasciolar band. Fasciolar band wide, the posterior edge slightly raised, terminating against the callus of the parietal wall. The fasciolar area is divided into two vague segments, the upper one constituting the flat fasciolar band, the lower segment slightly thickened. Pillar composed of several folds, the lowest of these being the largest and the only one that continues into the aperture. The columella above this fold or ridge is broadly depressed into a shallow trough. Lower lip consists of a biplicate fold which is smaller than the basal columellar ridge above, and is separated from it by a deep narrow groove. Siphonal notch shallow and broad. Surface of body whorl with numerous fine gently curved axial lineations extending from the suture to the fasciolar band. These lineations appear on the body whorl only, the preceding whorls being polished.

Dimensions.—Holotype, length 16 mm.; max. width 6 mm.

Type locality.—Lower Mare formation, in small stream 100 meters west of Quebrada Mare Abajo. One specimen, the holotype.

Comparisons.—This high-spired, slender shell is closely related to *O. gracilis* (Broderip and Sowerby) (1929, Zool. Jour. London, vol. 4, p. 379), particularly to such slender forms as that illustrated by Keen (1958, p. 424, fig. 635). *O. gracilis* is a West American species ranging from Pliocene to Recent, and about the only difference I can detect between *O. gracilis s. s.* and the proposed subspecies *O. ternuculata* is in the nature of the parietal callus which is nearly parallel with the side of the whorl on *O. ternuculata,* but slightly to moderately oblique with the side of the whorl on *O. gracilis gracilis.* More specimens of the Venezuelan fossil are needed to determine the validity of this distinction. The Recent Western Atlantic analogue of *O. gracilis, O. nivea* (Gmelin) (see Olsson, 1956, pp. 172-173, pl. 11, figs. 3, 3a) is a little stouter and more curvaceous in outline than *O. ternuculata,* and the fasciolar band extends higher up on the body whorl than on the Venezuelan fossil.

O. gracilis ternuculata, n. subsp. is also similar to the late Miocene or Pliocene *O. wilsoni* Olsson (1956, p. 183, pl. 14, figs 4, 4a.) from Alligator Creek, near Acline, Florida, but *O. wilsoni* has a thicker parietal callus and the fasciole is unsegmented.

Olivella (Olivella) spissilabiata, new species Pl. 34, figs. 11-14

Shell of medium size, sturdy, moderately slender, ovate, porcelaneous. Post-nuclear whorls hardly convex, rapidly increasing in height, separated by rather wide and deep sutural channels in which the suture itself is not visible, the summit of each whorl nearly level with the base of the sutural channel. Parietal callus extending from near the penultimate suture to the top of the pillar, the callus delimited from the whorl proper by a feebly impressed groove which encircles the callus just below the penultimate suture and continues, bowed slightly to the left, down the right side of the callus to the top of the last suture; on the labial side, the margin of the callus parallels the side of the body to the top of the fasciolar band, swerving therefrom to the left and then descending to unite with the distal side of the pillar. The callus is thickest in the area between the sutures where it is evenly convex, and is thinnest in the flattened area adjacent to the middle of the columella. Face of columella thickened by a long narrow platform of callus extending from the posterior end of the columella to the base, the platform narrowing toward the pillar. Columella platform corrugated by six to eight short, slightly oblique plicae, the uppermost of these in line with the top of the fasciolar band near the posterior end of the columella. On the pillar there ar two short plicae and a strong basal ridge entering the aperture. Above this ridge the columella is excavated into a broad rather shallow trough. Below the ridge there is a biplicate fold emarginating the lower lip, the emargination separated from the ridge above by a prominent narrow sulcus. Aperture subtriangular, widest below. Outer lip a little thickened, smooth within, somewhat rolled on the face, marked behind by a narrow, weakly impressed groove paralleling the margin along its entire length and continuing to the dorsal side of the siphonal notch where it bows partially around it before losing its identity. Fasciolar band wide, its posterior edge slightly ridged, the band terminating against

the columellar callus a short distance below the top of the columella. Siphonal notch moderately deep and broad, U-shaped, obliquely directed.

Dimensions.—Holotype (3-1/2 whorls), length 13 mm.; width 5.8 mm.

Type locality.—Lower Mare formation, in small stream 100 meters west of Quebrada Mare Abajo. One specimen, the holotype.

Other localities.—Abisinia formation at W-30, eastern edge of Playa Grande village. Five specimens, all of them worn.

Remarks.—The salient characteristic of this species is the *Marginella*-like outer lip, produced by the faint groove on the back side. The holotype is the only specimen exhibiting this feature, possibly because the other five examples from the Abisinia formation are so badly worn and corroded. The white procelaneous shell and relatively wide sutural channels are other distinguishing marks.

Olivella (Niteoliva) verreauxii (Ducros) Pl. 34, figs. 15-18

1850. *Oliva mutica* Say, Reeve, Conch. Icon., vol. 6, *Oliva,* pl. 28, sp. 86b, c; pl. 29, sp. 93a, b. Not of Say 1822.
1857. *Oliva Verreauxii* Ducros, Revue critique du genre *Oliva* de Bruguières, p. 97, pl. 3, figs. 86a, b.
1883. *Oliva Verreauxii* Ducros, Tryon, Man. Conch., vol. 5, p. 64, pl. 14, figs. 41, 42.
1891. *Olivella Verreauxi* Duclos [*sic*], Baker, Acad. Nat. Sci. Philadelphia, Proc., vol. 43, p. 50.
1901. *Olivella verreauxi* Duclos [*sic*], Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, p. 393.
1956. *Olivella* (*Niteoliva*) *vereauxii* (Ducros), Olsson, Acad. Nat. Sci. Philadelphia, Proc., vol. 108, p. 191, pl. 9, fig. 3.
1959. *Olivella verreauxii* (Ducros), Nowell-Usticke, A Check List of the Marine Shells of St. Croix, p. 74.

Shell small, ovate, porcelaneous fairly solid. Whorls, including the nucleus, six. Nucleus composed of about two smooth hyaline whorls, the initial appressed, the last narrow but convex, grading insensibly into the conch. Spire conical, the divergence near 55 degrees, the apex slightly blunted. Earliest whorls of conch hardly convex, the later ones straight-sided. Sutural areas broadly but shallowly channeled, the summit of the whorl below level with the middle of the channel. Aperture subtriangular, about half the length of the shell, widest and slightly flaring below. Outer lip thin, the inner margin smooth on some specimens, lirate on others,

the lirae numbering 14 to 18 and extending for shorter or longer distances into the aperture, one of them, however, reaching the edge of the lip. Parietal wall and columella with a thick callus extending obliquely from the penultimate suture to the base, the callus thinning opposite the middle of the columella, merging below with the anterior fasciole, the fasciole itself often thickened into a strong fold or ridge. Superimposed on the inner lip is a raised pad whose upper and distal margins are well defined, the upper margin thickened and truncated somewhat obliquely and lying about a fourth of the distance down from the top of the aperture, the distal margin curving outward and thickening toward the base. Including the posterior emargination, the pad bears seven or eight oblique folds, the posterior one forming the margin of the pad the largest. The lower lip of the pillar is a strong biplicate fold with a prominent medial sulcus or groove. Fasciolar area unequally divided, the top of the posterior band terminating against the columellar callus a short distance below the top of the aperture. Posterior outlet a relatively shallow gutter. Anterior notch rather broad and deep, U-shaped, obliquely directed.

Dimensions.—Specimen D147a, length 7.1 mm.; max. width 3.7 mm. Outer lip lirate within; specimen D147b, length 8.6 mm. max. width 4.5 mm. Outer lip smooth within.

Locality.—Abisinia formation at W-30, eastern edge of Playa Grande village. Of the 22 examples of this species from the Abisinia formation, 15 of them bear lirations on the inside of the outer lip, whereas 7 are smooth. It is suggested that the presence or absence of lirations depends on the sex of the animal.

Remarks.—Allowing for minor variations, the Cabo Blanco fossils seem referable to *O. verreauxii* (Ducros). *O. verreauxii* is closely related to *O. minuta* (Link) but is somewhat more slender, more regularly ovate, and less heavily callused than that. The specimens also resemble *O. minuta marmosa* Olsson and McGinty (1958, p. 38, pl. 1, figs. 2, 2a) from Bocas Island, Panamá, but is perhaps a trifle more slender. According to Olsson and McGinty, the Recent *O. minuta marmosa* differs constantly from the Recent *O. minuta minuta* in being smaller and lighter in color.

Range and distribution.—The living *O. verreauxii* has been re-

ported from Vera Cruz, Mexico, and from the islands of Puerto Rico and St. Croix. This is the first record of it as a fossil.

Olivella (Niteoliva) minuta (Link) Text-figures 1, 2

1807. *Porphyria minuta* Link, Beschreibung der Naturalien-Sammlung der Universität zu Rostock, p. 98. Refers to Martini, Conchylien-Cabinet, vol. 2, p. 182, pl. 50, fig. 545.
1817. *Voluta nitidula* Dillwyn, A Descriptive Catalogue of Recent Shells, vol. 1, p. 521, No. 45.
1835. *Oliva zigzag* Duclos, Histoire naturelle coquilles univalves marines. Genre Olive, pl. 2, figs. 1-4.
1850. *Oliva mutica* Say, Reeve, Conch. Icon., vol. 6, *Oliva,* pl. 28, sp. 86a. Not of Say 1822.
1864. *Oliva minuta* (Link), Krebs, The West Indian Marine Shells, p. 39.
1871. *Oliva mutica* Say, Marrat [in] Sowerby, Thes. Conchyl., vol. 4. p. 29, No. 151, pl. 21, figs. 359-361; pl. 25 (351), figs. 465-467. Not of Say 1822.
1873. *Oliva nitidula* (Dillwyn), Guppy, Sci. Assoc. Trinidad, Proc., vol. 2, p. 91.
1888. *Oliva nitidula* (Dillwyn), Schepman [in] Martin, Bericht, über eine Reise nach Nederlandisch West-Indian und darauf gegründete Studien, Leiden: II—Geologische Studien, Appendix.
1956. *Olivella* (*Niteoliva*) *minuta* (Link), Olsson, Acad. Nat. Sci. Philadelphia, Proc., vol. 108, pp. 190-191, pl. 9, figs. 1-2b; pl. 12, figs. 2, 2a.
1959. *Olivella minuta* (Link), Nowell-Usticke, A Check List of the Marine Shells of St. Croix, p. 74.

Fig. 1.

Fig. 2.

Olivella (*Niteoliva*) *minuta* (Link)

Shell small, moderately sturdy, broadly ovate, the spire conical, the tip somewhat projecting. Whorls a little over six in all, the hyaline nucleus composed of about two of them. The first post-nuclear whorl is a little convex, its sides nearly vertical; the slope of the next two whorls is straight, and the body whorl is sometimes a little flattened on the left or labial side. Sutures channeled and open,

the summit of the whorl below level with the middle of the channel, and the edge of the whorl above the channel fairly sharp. Parietal callus heavy, wedging and thinning out to the penultimate suture, obliquely bisecting the ventral surface of the body, swollen in front of the commissure. Columella excavated within, emarginated at the base by a fold which emerges from the aperture and curvaceously descends along the labial side of the siphonal notch. Superimposed on the columella is a well-defined pad of callus corrugated by seven or eight short plicae. The posterior margin of the pad is narrowly thickened and truncated, and the pad widens and becomes broadly thickened on the side of the pillar. Between the bottommost plica and the basal fold of the columella there is a strong groove imparting a biplicate effect. Aperture subtriangular, a little wider anteriorly. Outer lip thin, the far inner margin either smooth or lirate; the lirae number about 19 and extend for shorter or longer distances into the aperture; none of the lirae, however, reaches the inner edge of the lip which is thin and always smooth. Posterior outlet a short but fairly deep and wide gutter. Anterior notch moderately deep, obtusely V-shaped to U-shaped, obliquely directed. Fasciolar area divided, the upper band narrower than the lower; the top of the band abuts against the columellar callus about in line with the top of the columellar pad which itself is not far below the posterior end of the aperture. Surface of body whorl, where a little weathered, is scored with numerous exceedingly fine axial lineations.

Dimensions.—Specimen I147a, length 10 mm.; max. width 5.2 mm., No. 26391 PRI.

Localities.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. Six specimens, at least three of which are smooth inside the outer lip; lower Mare formation, in small stream 100 meters west of Quebrada Mare Abajo. Two specimens, both with the outer lip lirate within.

Remarks.—The Cabo Blanco shell is doubtless the same as the one identified as *O. nitidula* by Schepman as it comes from the same locality. *O. nitidula* (Dillwyn) is synonymous with *O. minuta* (Link), a fairly variable species. The Cabo Blanco shell is not quite so globose as the typical *O. minuta,* and the parietal callus is more

expansive, occupying obliquely nearly half the ventral face of the body whorl. Aside from these perhaps inconsequential variations the Venezuelan fossil is identical. *O. minuta* (Link) has often been confused with *O. mutica* (Say), but Olsson stated the two are distinct on the basis of morphologic and radular characteristics. Most records of *O. mutica* from the West Indies are probably, according to Olsson, referable to *O. minuta*. Although similar to *O. verreauxii* (Ducros) which is also found as a fossil in the Abisinia formation of the Cabo Blanco group, my specimens of *O. minuta* are separable by their stubbier form and heavier callus.

Range and distribution.—The living *O. minuta, s.s.* is a Caribbean species. So far as I know, the record of it as a Caribbean fossil is the Cabo Blanco shell, first reported as *O. nitidula* by Martin in 1888.

Olivella (Minioliva) fundarugata, new species Pl. 35, figs. 1-8

Shell small, rather sturdy, polished, slenderly ovate, the spire a little longer than the aperture. Whorls about 5-1/2 in all, the nucleus consisting of a little over 1 of them. Nucleus thin and pellucid, depressed into the apex, the initial turn obtuse, the last stage convex. Post-nuclear whorls hardly convex to subtabulate, inset one into the other, the summit of the whorls thin. Sutures narrowly channeled, the channeling produced by the moderate extension of the whorl in front. On some specimens the suture is seen to be bordered by a single revoling thread. This thread may lie, as it does on the paratype, just above the summit of the following whorl. Occasionaly it is level with it or a trifle lower, in which case it is not visible. On the last whorl of the paratype this sutural thread lies immediately atop the parietal callus but unites with it in front of the top of the outer lip. Surface smooth, but sometimes with numerous fine axial lineations beneath the polish. The holotype, but none of the other specimens, is colored burnt orange and white, the white occurring around the summit of the whorls, at the base, and in the aperture; through the burnt orange run axial lineations of light orange. Aperture cuneate, widest anteriorly. Outer lip thin, smooth within, joined subparalled with the whorl at the sutural channel, the gutter separating the outer lip from the whorl deep and narrow. Columella and parietal wall with a coat of thick, clearly defined callus whose

lateral margin descends with a slight inward curvature to the base where it wedges out between the fasciolar band and the pillar. The upper margin of the callus is swollen from the commissure across the top of the columella. Pillar with a strong and generally single fold emerging from the aperture and continuing as an emargination around the end of the terminal notch. Fasciolar band feebly ridged; its posterior margin abuts against the labial callus at the middle of the columella, and terminates behind at the end of the outer lip. Basal lip wide, excavated into a shallow U-shaped or semilunar notch.

Dimension.—Holotype (G150a), length 3.7 mm.; max. width 1.5 mm.; paratype (Q151a), length (4 whorls) 4 mm.; max. width 2 mm.

Type locality.—Mare formation near W-14, on hillside above west bank of Quebrada Mare Abajo. Eleven specimens.

Other localities.—Playa Grande formation (Maiquetiá member) at W-4, Quebrada Las Pailas. Three specimens, including paratype; Playa Grande formation (Maiquetía member) at W-26, Quebrada Las Bruscas, approximately 120 meters upstream from junction with Quebrada Las Pailas. Eleven specimens, the largest (three whorls intact) 3.2 mm. X 1.3 mm., the smallest 1.5 mm. X 0:7 mm. On some of these the sutural thread is visible, on others it is not; Mare formation, in stream 250 meters south-southwest of mouth of Quebrada Las Pailas. Two specimens; La Salina, west of Puerto Cabello, State of Carabobo. One specimen, entire, measuring 3.1 mm. X 1.4 mm.

Comparisons.—The nearest related species is the Recent Panamanian *O. inconspicua* (C. B. Adams), particularly the example illustrated by Olsson (1956) on his plate 10, figure 5. That Eastern Pacific shell, however, although close to *O. fundarugata,* n. sp. is not as heavily callused. Furthermore *O. inconspicua* is white, whereas the holotype of *O. fundarugata* is burnt orange in color, although on all the other specimens of the Venezuelan fossil, the original color has been bleached out.

Olivella (Minioliva) subfilifera, new species Pl. 35, figs. 9, 10

Shell small, highly polished, milky white, moderately thin,

slenderly ovate, the spire and aperture of approximately the same length. Whorls about 4-1/2 or 5 in all, the thin pellucid nucleus sunken into the apex. Nucleus consisting of a little over one turn, the obtuse tip indistinct and fused, the last stage subglobose. Postnuclear whorls hardly convex to planulate, each whorl telescoped a little into the succeeding, the summits thin-edged and sometimes frayed, the sutural channel between the summit and the base of the preceding whorl narrow and moderately deep. Aperture cuneate, widest anteriorly. Outer lip thin, sharp, smooth within, joined subparallel with the whorl, the gutter narrow and fairly deep, the lower and outer corner of the lip projecting a little downward. Inner margin of columella obtusely angulate above the pillar, the pillar itself consisting of a simple twist of thickened callus. Columella sheathed with a thin smooth coating of enamel which extends to the end of the aperture where it may thicken somewhat opposite the commissure. The margin of the enamel is generally raised slightly above the surface, but on some specimens it merges with it. The distal margin of the columellar enamel is bowed slightly toward the aperture, and terminates at the side of the pillar. Enclosed by the summit of the whorl there is a revolving thread immediately atop the suture, this thread joining the posterior margin of the enamel near the gutter of the aperture. Fasciolar area fairly broad, not distinct. The upper margin terminates against the labial enamel a little below the middle of the columella, the margin sometimes defined from the whorl surface by a feebly impressed groove; more often, however, the separation between the fasciolar band and the whorl surface is defined by a difference in shell texture. Siphonal notch wide and shallowly excavated.

Dimensions.—Holotype, length 2.8 mm.; max. width 1.15 mm.

Type locality.—Mare formation near W-13, on hillside above west bank of Quebrada Mare Abajo. Eight specimens.

Comparisons.—*O. subfilifera,* n. sp. is similar on the one hand to the Western Atlantic *O. bayeri* Abbott (1951, Nautilus, vol. 64, No. 4, pp. 111-112, pl. 7, figs. 2a, b) and on the other to the Eastern Pacific *O. inconspicua* (C. B. Adams), particularly to the example illustrated by Olsson (1956) on his plate 10, figure 5. *O. bayeri,* which occurs from off Lake Worth to Key West, Florida, in 25 to

118 fathoms, is a larger and thinner shell than the Venezuelan fossil, and the inner lip is often microscopically scored with numerous short wavy axial lines, none of which has been observed on *O. subfilifera.* In size and general appearance the Venezuelan fossil is closely related to the Recent Panamanian *O. inconspicua,* the only differences being that the pillar fold of *O. inconspicua* is heavier than that of *O. subfilifera* and the outer lip not so sharp as on the latter. Yet another analogue is *O. perplexa* Olsson (1956, pp. 209-210, pl. 16, fig. 7) found along the Atlantic and Gulf coasts of Florida. However, the basal lip on that species is subtruncate, and the lower corner of the outer lip does not project down as it does on the Venezuelan *O. subfilifera.* From what has been said, *O. subfilifera,* n. sp. partakes of many of the characteristics of the three species mentioned above but does not seem to be precisely the same as any of them.

Olivella (Minioliva) maiquetiana, new species Pl. 35, figs. 11-14

Shell small, glossy, light creamy tan in color, the spire relatively low. Whorls four including the hyaline white nucleus. Nucleus consisting of 1-1/4 whorls, the tip obtuse and indistinct, the later stage immersed a little in the apex. Post-nuclear whorls hardly convex, telescoped or inset one into the other, the body whorl moderately convex, its summit, as well as that of the other whorls, extending well above the suture. Sutures narrowly channeled, the summit of the whorls thinly edged and occasionally frayed. Aperture a little over half the length of the shell, elongate subtriangular, widest just above the pillar. Outer lip thin, smooth within, joined subparallel with the whorl, the gutter deep and narrow. Columella excavated a little above the pillar, covered with a moderately thick, well-defined sheath of smooth callus which extends to the posterior end of the aperture and is swollen on the parietal wall opposite the commissure. Distal margin of callus raised, bowed in toward the aperture at about the middle of the columella. Pillar consists of a single smooth slightly twisted fold, the columellar callus wedging out between the fold and the fasciolar area. Fasciolar area weakly developed, sometimes simple, but generally divided into two segments; the posterior band terminates at the columellar callus a little below the middle

of the columella. Base of shell subtruncate, feebly emarginate; the emargination disappears at the anterior end of the outer lip. Siphonal notch moderately wide, slightly excavated.

Dimensions.—Holotype (Q153a), length 1.2 mm.; max. width 0.75 mm.; paratype (Q153b), length 1.8 mm.; max. width 0.95 mm.

Type locality.—Playa Grande formation (Maiquetía member) at W-4, Quebrada Las Pailas. Seven specimens.

Comparisons.—A similar shell is the Recent *O. perplexa* Olsson (1956, pp. 209-210, pl. 16, fig. 7) from the east and west coasts of Florida, the Venezuelan fossil differing from that in being more regularly oval and in having a shorter spire. The Recent Eastern Pacific *O. inconspicua* (C. B. Adams), especially the variant illustrated by Olsson (1956) under his figure 5 on plate 10 is perhaps even closer to *O. maiquetiana,* n. sp. although the Panamanian shell can be differentiated by its broader siphonal notch, the heavier fold on the pillar, its slightly higher spire, and its less deeply immersed nucleus.

Olivella (Minioliva) salinae, new species Pl. 35, figs. 15, 16

Shell small, solid, ovate, porcelaneous-glossy, the spire low, terraced in profile. Whorls about four in all, each post-nuclear one deeply telescoped into the succeeding. Nucleus hyaline white, consisting of about one moderately swollen whorl immersed in the apex, the tip of the nucleus obtuse and indistinct. Post-nuclear whorls hardly convex to tabulate, the sides nearly vertical, the body whorl moderately convex. The summit of the whorls extends high above the suture. Sutures deeply and rather narrowly channeled in the telescoped area. Summit of whorls often frayed. Aperture a little over half the length of the shell, subtriangular, widest anteriorly. Outer lip thin, smooth within, joined subparallel with the whorl, the gutter narrow and moderately deep. Columella obtusely angled at the curve with the pillar, the pillar composed of a smooth moderately thick fold which continues around the siphonal notch as a progressively diminishing emargination until it disappears at the anterior margin of the outer lip. Columella covered with a smooth sheath of callus which extends to about the ultimate suture. On the parietal whorl, in line with the commissure, the callus is swollen, but it thins as it descends along the columella and finally wedges out

vaguely between the outer margin of the pillar and the fasciolar area. Fasciolar band moderately wide, the posterior margin clearly defined; the top of the band terminates against the labial callus at about the middle of the columella. Fasciolar area slightly ridged in the middle, with a faint groove separating the ridge from the pillar, and with an even fainter groove on the posterior side of the ridge. Siphonal notch broad, shallowly excavated.

Dimensions.—Holotype, length 2 mm.; max. width 1.05 mm.

Type locality.—La Salina, west of Puerto Cabello, State of Carabobo. Two specimens.

Comparisons.—*Olivella salinae* is similar to the preceding *O. maiquetiana*, n. sp. from the Cabo Blanco area but is a little larger and sturdier, has a broader fasciolar area, a thinner callus, and a slightly wider siphonal notch.

Jaspidella caribbeana, new species Pl. 35, figs. 19, 20

1888. ? *Oliva jaspidea* Gmelin, Schepman, [in] Martin, Bericht über eine Reise nach Nederlandisch West-Indien und drauf gegründete Studien, Leiden: II—Geologische Studien, Appendix. Not of Gmelin 1791.

Shell small, slender, cylindrically ovate, polished. Spire symmetrical, about half the length of the shell. Whorls a little over five in all, terminating in an obtuse glassy nucleus, the nucleus a little sunken into the apex. Post-nuclear whorls hardly convex, rapidly increasing in height, the thin-edged summit of each succeeding whorl projecting slightly above the base of the preceding whorl, the sutural channel moderately deep and narrow. Atop the sutures there is a low revolving thread hidden by the summit of the following whorl. Aperture and outer lip broken back, the aperture probably subcuneate when whole. Columella subangularly concave above the base, the base consisting of a single large twisted fold on the face of which there is a short axial groove. Columella and parietal wall without glaze. Fasciolar area compounded of two gentle ridges, the posterior margin of the fasciolar band terminating at the columella a little above the middle. Basal lip broken away. Inner lip smooth above base.

Dimensions.—Holotype, length 4.2 mm.; max. width 1.75 mm.

Type locality.—Lower Mare formation, in stream 100 meters west of Quebrada Mare Abajo. One broken specimen.

Remarks.—The type species of *Jaspidella* as given by Olsson (1956, pp. 212-213, pl. 15, figs. 1, 1a) is *J. jaspidea* (Gmelin). That is not so slender as the new species, the fold at the base of the columella is broader and not so twisted, and there are unequal threadlike lirations on the columella above the base. *J. sanctidominici* (Maury) (1917, p. 233, pl. 11, fig. 4) from the Miocene at Los Quemados in the Dominican Republic is more broadly ovate than *J. caribbeana,* n. sp., and the whorls are not telescoped as are those of the Venezuelan shell. *J. caribbeana* may be the olivid referred to by Schepman ([in] Martin, 1888) as *Oliva jaspidea* Gmelin. Martin's shells were collected from what is now known as the Mare formation, and among the 23 species identified by Schepman are four species of *"Oliva",* one of which is classified as *O. jaspidea.* The newly described *Jaspidea caribbeana* was obtained by me from the same locality as Schepman's *Oliva jaspidea,* but my *O. caribbeana,* although possibly the same as Schepman's *O. jaspidea,* does not seem to be the same as the *O. jaspidea* of Gmelin.

Jaspidella ? praecipua, new species Pl. 35, figs. 17, 18

Shell small, ovate, polished, smooth. Spire low and steplike. Whorls about 3-1/2 including 1 of the nucleus. Nucleus subglobose, sunken a little into the apex, obtuse at the tip. Post-nuclear whorls subtabulate, rather prominently shouldered, the sides slightly convex; the summit of each whorl projects a little above the base of the preceding; body whorl moderately convex. Sutures narrowly channeled, bordered by a faint revolving thread. Aperture lenticular; the anterior end shallowly undercuts the base of the columella. Outer lip broken away at the margin, thickened at the summit where it joins the whorl obtusely, smooth within, and seemingly gutterless at the posterior outlet. Columella sinuous, the inner lip with a narrow wash or glaze which extends to the posterior end of the aperture. Base of columella emarginated with a fairly sharp fold emerging from the aperture, the emargination continues feebly around the basal lip. Fasciolar band narrow, slightly convex; its posterior margin abuts the labial wash at about the middle of the

columella and delimited from the whorl surface by a fine, feebly impressed groove. Basal lip oblique, subtruncate.

Dimensions.—Holotype, length 1 mm.; max. width 0.5 mm.

Type locality.—Mare formation near W-14, on hillside above west bank of Quebrada Mare Abajo. One specimen, the holotype.

Remarks.—The specimen described, although tiny, is believed to have grown to near maturity. I have seen no closely related species, although in a general way it is reminiscent of *J. blanesi* Ford (see Olsson, 1956, pp. 213-214, pl. 8, fig. 7), a Recent shell found from Florida to Panamá. *J. praecipua* differs from *J. blanesi* in its shorter spire and shouldered whorls as well as by the pronounced undercutting of the columella by the aperture.

"Olivella" species Pl. 36, figs. 1, 2

A single specimen, broken off to the last whorl and badly corroded, is small, moderately slender, ovate. The aperture is lenticular, widest a little below the middle. Columella shallowly excavated above the pillar, the pillar emarginated by a fold emerging from the aperture. The penultimate whorl seems to be inset a little into the ultima, and the sutures are narrowly channeled. It is surmised that the summit of the whorls is thin-edged and projects a little above the base of the antecedent whorl. There is no callus on the columellar lip or parietal wall but whether this is natural or due to weathering cannot be determined. If there is normally a thin glaze or wash on the inner lip and none on the parietal wall, the shell would be classified under *Jaspidella.* The fasciolar band is worn down and cannot be seen.

Dimensions.—Figured specimen (ultimate whorl only), length 3 mm.; max. width 2 mm.

Locality.—Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. One worn and incomplete specimen.

Remarks.—This shell may be the same as one of the previously described olivids but is too far gone to make any valid comparison.

Ancilla (Eburna) tankervillei (Swainson) Pl. 36, figs. 3, 4

1825. *Ancillaria Tankervillei* Swainson, Quart. Jour. Sci., Lit., and Art. vol. 18, p. 283.

1859. *Ancillaria Tankervillii* Swainson, [in] Sowerby, Thes. Conchyl., pt. 19, pp. 61-62, sp. 22, pl. 1, figs. 4, 5.
1864. *Ancillaria Tankervillii* Swainson, Reeve, Conch. Icon., vol. 15, pl. 1, sp. 2a, 2b.
1864. *Eburnea Tankervillii* (Swainson), Krebs, The West Indian Marine Shells, p. 36.
1878. *Ancillaria Tankervillii* Swainson, Mörch, Catalogue of West-India Shells, p. 12.
1878. *Ancillaria Tankervillei* Swainson, Weinkauff, [in] Martini and Chemnitz, Conchylien-Cabinet., vol. 5, pt. 1a, pp. 5-6.
1883. *Ancilla Tankervillei* (Swainson), Tryon, Man. Conch., vol. 5. p. 95, pl. 38, fig. 39.
1890. *Ancillaria Tankervillei* Swainson, Dall, Wagner Free Inst. Sci., Trans., vol. 3, pt. 1, p. 47.
1940. *Ancilla tankervillei* (Swainson), Smith, World-wide Sea Shells, p. 73, fig. 998.
1958. *Ancilla tankervilli* (Swainson), Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, p. 95.

The single weathered Recent specimen is cream-colored, and has vague, pale brown blotches on the labral area of the dorsum. The spire is glazed over with a thin coating of enamel, and the shoulder of the last two whorls is rounded and prominent.

Dimensions.—Figured specimen (A269a), length 34.8 mm.; max. width 14.2 mm.

Locality.—Recent, on beach at Playa Grande Yachting Club, Distrito Federal. One specimen.

Range and distribution.—This species occurs along the northern coast of South America, and on the Island of Margarita, Venezuela.

Ancilla (Eburna) venezuelana, new species Pl. 36, figs. 5, 6

Shell of medium size, thin, ovate, the spire moderately produced, a little convex in outline, the tip papilliform. Whorls about 6-1/2 in all, the nuclear 2-1/2 smooth, shiny, milky white, the initial turn appressed and blunt, the succeeding relatively narrow but well rounded, the last with nearly straight sides, the "labral" side steeper than the opposite one. Post-nuclear whorls slightly swollen at the shoulder and base, the ultima a little concave below the suture. Spire and upper half of body whorl glazed over with enamel which obscures the sutures of the conch; the sutures of the nucleus (which is unglazed) are finely impressed. Joined to the summit of the outer lip is a fairly broad ridge of callus extending a short distance across the parietal wall, and above this ridge, at the base of the preceding whorl, there is a smaller fold of callus which, as it continues around

the earlier stage of the whorl is covered by the surface wash. The shell texture of the body whorl is two-toned, that of the lower somewhat darker than the upper half, the division sharp, and defined by a fine impressed line starting opposite or a little above the commissure and encircling the whorl to a little below the middle of the outer lip. The base of the lower band coincides with the top of the fasciolar area, the latter lighter in tone. Aperture long, subovate, widest medially. Columella excavated submedially, the pillar twisted into two unequal plaits, the anterior one much the broader. The terminal end of the pillar is bent a little forward and to the left. Bordering the posterior plait of the pillar is a parallel groove which widens and shallows a little anteriorward and terminates posteriorly in a pseudo-umbilical chink. Fasciolar area smooth, bipartite, the anterior segment much the wider; the area bears a narrow ridge extending from the base of the outer lip to about the middle of the columella, continuing therefrom within the aperture. On either side of this ridge there is a shallow but sharply rimmed channel, the posterior one the wider; the rims also continue for some distance into the aperture. Bordering the posterior channel is a well-defined narrow band sunk slightly below the level of the fasciolar area. Terminal notch large, broadly U-shaped, aligned nearly vertically, flexured at the base of the lower lip. On one specimen (I269) the parietal wall is fairly thickly enameled, the enamel ascending to near the suture of the penultimate whorl. On the holotype, the parietal wall is uncallused except for the short ridge emerging from the commissure. The unglazed area of the shell is composed of numerous longitudinal stripes and striae.

Dimensions.—Holotype, length 30.3 mm.; max. width 13.5 mm.

Type locality.—Lower Mare formation, in small stream 100 meters west of Quebrada Mare Abajo. One specimen, the holotype.

Other localities.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. One specimen; upper Mare formation near W-14, on hillside above west bank of Quebrada Mare Abajo. One specimen.

Comparisons.—The new species is closely related to the preceding species *A. tankervillei* (Swainson) but is a little stouter and less prominently shouldered than that. Furthermore, on all examples

of *A. tankervillei* I have seen the surface is more or less wholly washed over with enamel whereas the wash of *A. venezuelana,* n. sp. extends down to the middle of the body whorl. Under the wash, the shell surface of *A. tankervillei* is probably like that of the Cabo Blanco fossil although the lower band of *A. venezuelana* is considerably broader. Another form which *A. venezuelana* resembles is *A. shepardi* Dall (1890b, p. 46, pl. 4, fig. 4) from the lower Miocene Silex beds of the Tampa Bay region of Florida. The latter, however, is readily distinguished from the Venezuelan shell by its more acute spire and oval aperture as well as other sculptural details. *A. lamellata* Guppy (1866d, p. 579, pl. 26, fig. 9) from the Manzanilla Miocene of Trinidad is much wider at the base than *A. venezuelana* and is spirally striate on the spire and upper part of the body whorl; on *A. venezuelana* such markings are absent.

MITRIDAE

Mitra (Uromitra) nodulosa (Gmelin) Pl. 36, figs. 7, 8

1791. *Voluta nodulosa* Gmelin, Syst. Nat., p. 3445.
1811. *Mitra granulosa* Lamarck, Mus. Hist. Nat. Paris An., vol. 17, p. 21.
1844. *Mitra granulosa* Lamarck, Reeve, Conch. Icon., vol. 2, pl. 9, sp. 62.
1864. *Mitra nodulosa* (Gmelin), Krebs, The West Indian Marine Shells, p. 37.
1878. *Mitra nodulosa* (Gmelin), Mörch, Catalogue of West-India Shells, p. 12.
1882. *Mitra* (*Scabricola*) *granulosa* Lamarck, Tryon, Man. Conch., vol. 4, p. 133, pl. 38, fig. 138.
1889. *Mitra nodulosa* (Gmelin), Dall, U. S. Nat. Mus., Bull. 37, p. 110.
1891. *Mitra granulosa* Lamarck, Baker, Acad. Nat. Sci. Philadelphia, Proc., vol. 43, p. 50.
1901. *Mitra nodulosa* (Gmelin), Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, p. 396.
1921. *Mitra granulosa* Lamarck, Pilsbry, Acad. Nat. Sci. Philadelphia, Proc., vol. 73, p. 340.
1935. *Mitra granulosa* Lamarck, Richards, Jour. Paleont., vol. 9, No. 3, p. 257.
1937. *Mitra nodulosa* (Gmelin), Smith, East Coast Marine Shells, p. 128, pl. 51, fig. 14.
1946. *Mitra nodulosa* (Gmelin), Jaume, Soc. Malac. Cubana "Carlos de La Torre", Rev., vol. 4, No. 3, p. 108.
1954. *Mitra nodulosa* (Gmelin), Abbott, American Seashells, p. 248, pl. 26b.
1958. *Mitra nodulosa* (Gmelin), Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 17.
1958. *Mitra* (*Uromitra*) *nodulosa* (Gmelin), Abbott, Acad. Nat. Sci. Philadelphia, Mon. No. 11, p. 82.
1958. *Mitra nodulosa* (Gmelin), Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, p. 95, pl. 9, 1 fig.
1959. *Mitra nodulosa* (Gmelin), Nowell-Usticke, A Check List of the Marine Shells of St. Croix, pp. 74, 75-76.

The Recent Venezuelan shell is solid, with slightly convex, nar-

rowly shouldered whorls and incised sutures. Surface sculptured by nodulous longitudinal ribs, with shallow spiral furrows or grooves in the interspaces, the grooves crossing the ribs lightly. On one adult there are 17 ribs and a dozen or so rows of grooves on the body whorl, and four rows of grooves on the upper whorls. Columella bearing four white folds, the upper strong, the lower feeble. Terminal notch deep, U-shaped, the margins of the notch parallel. Outer lip worn back, but on perfect examples of the species the rim of the lip is finely scalloped and the inner margin immediately adjacent to the edge shallowly fluted. However, there are no true lirae, and the aperture is smooth. Color brownish orange with a narrow circlet of white at the summit adjacent to the suture.

Dimensions.—Figured specimen, length 25 mm.; max. width 11 mm. Apex worn down.

Locality.—Recent, on beach at Playa Grande Yachting Club, Distrito Federal. Three specimens, the largest with about 22 axial ribs.

Range and distribution.—This species, or the synonymous *M. granulosa* Lamarck, ranges from Cape Hatteras, North Carolina, through the West Indies to the southern Caribbean. As a fossil it has been reported from the Pleistocene of Cuba and Barbados, and from the Miocene of the Dominican Republic.

VOLUTIDAE

Voluta musica Linnaeus Pl. 40, figs. 7, 8

1758. *Voluta musica* Linnaeus, Syst. Nat., ed. 10, p. 733.
1811. *Voluta carneolata* Lamarck, Mus. Hist. Nat. Paris An., vol. 17, p. 67.
1832. *Voluta musica* Linnaeus, Deshayes, Encycl. Méth., vol. 3, p. 1140, pl. 380, fig. 1.
1849. *Voluta musica* Linnaeus, Reeve, Conch. Icon., vol. 6, pl. 8, sp. 18.
1864. *Voluta musica* Linnaeus, Krebs, The West Indian Marine Shells p. 36.
1878. *Voluta musica* Linnaeus Mörch, Catalogue of West-India Shells p. 12.
1881. *Voluta musica* Linnaeus, Gabb, Acad. Nat. Sci. Philadelphia, Jour., ser. 2, vol. 8, p. 355.
1882. *Voluta musica* Linnaeus, Tryon, Man. Conch., vol. 4, pp. 83-84, pl. 24, figs. 29, 30. The following species of Lamarck are listed as varietal forma of *V. musica* by Tryon: *thiarella, guinaica, carneolata,* and *laevigata.*
1889. *Voluta musica* Linnaeus, Lorié, Samml. Geol. Reichs-Mus. Leiden, ser. 2, vol. 1, p. 137.
1890. *Voluta musica* Linnaeus, Dall, Wagner Free Inst. Sci., Trans. vol. 3, pt. 1, pp. 69, 70, 76, 77, 85.

1895. *Voluta musica* Linnaeus, Gregory, Geol. Soc. London, Quart. Jour., vol. 51, p. 287.
1901. *Voluta musica* Linnaeus, Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, p. 396.
1933. *Voluta musica* Linnaeus, Trechmann, Geol. Mag., vol. 70, No. 823, p. 38, pl. 4, fig. 10.
1937. *Voluta musica* Linnaeus, Smith, East Coast Marine Shells, p. 127, figs. 24, 49, pl. 54, fig. 5.
1942. *Voluta musica carneolata* Lamarck, Smith, A Review of the Volutidae, pp. 6-7, pl. 1, fig. 1.
1954. *Voluta musica* Linnaeus, Abbott, American Seashells, p. 250, pl. 13g.
1954. *Voluta musica* Linnaeus, Pilsbry and Olsson, Bull. Amer. Paleont., vol. 35, No. 152, p. 290, pl. 3, fig. 6.
1958. *Voluta musica* Linnaeus, Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, p. 96, pl. 16, 2 figs.
1959. *Voluta musica* Linnaeus, Rodriguez, Bull. Marine Sci. Gulf and Caribbean, vol. 9, No. 3, p. 277.

Among the varietal forms of *V. musica* illustrated by Maxwell Smith (1942, pl. 1) my single Recent specimen is closest to *V. m. carneolata* Lamarck in form and markings. The nucleus is amber, and the aperture a pale flesh color. There are eight axial folds on the shoulder of the body whorl, and 10 or 11 plicae on the columella, the plicae continuing into the aperture, the last but one the stoutest as it enters the aperture. Although the apex is worn down there seems to have been three nuclear whorls. The short blackish stripes on the outer lip tend to be paired below.

Dimensions.—Length 56 mm.; max. width 32 mm.

Locality.—Recent, on beach at Playa Grande Yachting Club, Distrito Federal. One specimen.

Remarks.—*Voluta musica* is a species of considerable variation probably because of its sensitive response to local ecological conditions. It differs from *V. virescens* Solander in having three rather than two nuclear whorls, in bearing fewer and larger columellar plications (9-12 as compared with 12-15 on *V. virescens*), and in its gently curved rather than straight columella. Also *V. musica* generally has a lighter ground color than *V. virescens* which is greenish brown to dark brown.

Range and distribution.—*Voluta musica* is living in the Caribbean Sea from the West Indies to northern South America. It has been reported as fossil from the Pleistocene of Barbados, from the reef limestone at Spanish Lagoon on the Island of Aruba, which limestone is thought by J. H. Westermann (1932) to be of Pleistocene or Holocene age. Gabb recorded the species from the Pliocene clay beds of the Limon Peninsula, Costa Rica, stating that "There is

an abundant fossil in the deposit corresponding with the recent shell in all of its essential details, except in a persistently narrower mouth. But the fossils differ among themselves in shape and tuberculation, more than from the living shells. I have, therefore, retained the Linnaean name."

CANCELLARIDAE

Cancellaria torula, new species Pl. 40, figs. 9-11

Shell rather small, broadly ovate. Nucleus decollate, the postnuclear whorls moderately convex, the body whorl globose, shouldered near the summit. Sculpture reticulate, consisting, on the body whorl, of 14 or so low flat spiral ribs crossed by about 28 higher and somewhat narrower axial ribs, the intersections nodular. Columella with three strong plaits, the upper or posterior one much the larger, the upper and middle ones subparallel and nearly horizontal, both with a growth of callus on their undersides, the lowest plait the smallest and oblique. Above the posterior shelflike plait, the columella is deeply excavated. On the parietal wall above the excavated area there is a prominent, irregularly thickened, rounded, *Distorsio*-like ridge which extends well within the aperture but merges, at the labium, with the ninth spiral rib down from the summit. It is the position and prominence of this ridge that serves to differentiate this shell from *C. reticulata* (Linnaeus) and its numerous congeners.

Dimensions.—Holotype (anterior and posterior ends broken away), length 13 mm.; max. width 10.5 mm.

Type locality.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. One mutilated specimen, the holotype.

Remarks.—Following is a list of related Cenozoic species of *Cancellaria* from the Americas. The strong, irregularly thickened, *Distorsio*-like ridge on the parietal wall distinguishes *C. torula,* n. sp. from them.

C. reticulata (Linnaeus) (1767, Syst. Nat., ed. 12, p. 1190, as *Voluta*). Recent (5-30 fathoms) from Cape Hatteras, North Carolina, to the Gulf of Mexico, Campeche Bay, and the southern Caribbean; Pleistocene at New Orleans pumping station No. 7 (Maury, 1922, p. 74), at Fort Pierce, Florida, (Richards 1938, p. 1294), and in South Carolina (Dall, 1890, p. 43).

C. conradiana Dall (1890, p. 42, pl. 3, fig. 13). Common in the Pliocene of Florida.

C. amoena Olsson and Harbison (1953, p. 179, pl. 28, fig. 7). Pliocene? at Clewiston, Florida.

C. yolandia Pilsbry and Olsson (1941, pp. 21-22, pl. 4, fig. 3). Jama formation (Pliocene) of western Ecuador.

C. penita Olsson (1942a, pp. 211-212, pl. 8, figs. 4, 8). Charco Azul formation (lower Pliocene), Costa Rica.

C. reticulata leuzingeri Rutsch (1934, pp. 89-90, pl. 7, figs. 10, 11; pl. 8, figs. 1, 2, 5). Upper Miocene-Pliocene, Punta Gavilan and Sabanas Altas, State of Falcon, Venezuela.

C. reticulata var. Harris (1895), p. 99, pl. 3, fig. 9). Upper Miocene, in Galveston well (2,158-2,920 feet), Texas.

C. rotunda Dall (see Gardner, 1948, p. 264, pl. 38, fig. 2). Duplin marl (upper Miocene) of North Carolina.

C. tabulata Gardner and Aldrich (1919, pp. 23-25, pl. 1, fig. 9). Duplin formation (upper Miocene) of North Carolina and South Carolina; Yorktown formation (Miocene) of Virginia.

C. reticulata leonensis Mansfield (1930, pp. 46-47, pl. 3, fig. 12). Upper Miocene, Leon County, Florida.

C. sp. ind. aff. *reticulata* (Linnaeus) Rutsch (1942, pp. 164-165. Not figured. Springvale formation (late Miocene) of Trinidad.

C. bradleyi Nelson (See Olsson, 1932, p. 156, pl. 17, figs. 6, 8). Tumbez formation (upper Miocene) of Peru.

C. dariena Toula (1908, p. 703, pl. 25, fig. 13). Middle Miocene of the Panamá Canal Zone, Colombia, Costa Rica, and Martinique (?)

C. cossmanni Olsson (1922, pp. 253-254, pl. 6, figs. 9, 11). Middle Miocene of Costa Rica and Colombia.

C. mauryae Olsson (1922, pp. 254-255, pl. 6, fig. 5). Middle Miocene of Costa Rica, and *fide* Woodring (1928, p. 219), of the Dominican Republic (as *C. barretti* Maury, *non* Guppy).

C. barretti Guppy (1866a, p. 289, pl. 17, fig. 11). Middle-upper Miocene of Jamaica, and Mexico (?). This species is reported by Tucker and Wilson (1932, p. 46, pl. 3, fig. 3) from Florida, but the Floridian shell may not be the same.

C. lavelana H. K. Hodson (1931, p. 44, pl. 24, fig. 12). Middle-

upper Miocene east of La Vela de Coro lighthouse, State of Falcon, Venezuela.

C. sursalta Marks (1949, p. 461, pl. 78, fig. 4). Lower-middle Miocene, Guayas Province, southwestern Ecuador, in Zacachún corehole at 140-150 feet.

MARGINELLIDAE

Marginella (Marginella) prunum (Gmelin) Pl. 36, figs. 9, 10

1791. *Voluta prunum* Gmelin, Syst. Nat., vol. 1, pt. 6, p. 3446, No. 33.
1798. *Voluta prunum* Gmelin, Encycl. Méth., pl. 376, figs. 8a, b
1817. *Voluta prunum* Gmelin, Dillwyn, A Descriptive Catalogue of Recent Shells, p. 530.
1822. *Marginella caerulescens* Lamarck, An. sans Vert., vol. 7, p. 356.
1825. *Voluta prunum* Gmelin, Wood, Index Testaceologicus, p. 94, pl. 20, fig. 68.
1830. *Marginella caerulescens* Lamarck, Deshayes, Encycl. Méth., vol. 2, p. 411.
1834. *Marginella caerulescens* Lamarck, Kiener, Icon. Coq. Viv., p. 13, pl. 1, fig. 4.
1846. *Marginella caerulescens* Lamarck, Sowerby, Thes. Conchyl., vol. 1, p. 383, pl. 77, figs. 153, 154.
1853. *Marginella caerulescens* Lamarck, d'Orbigny, [in] La Sagra, Hist. phys., polit. nat. l'Ile de Cuba, Mollusques, vol. 2, p. 96.
1864. *Marginella caerulescens* Lamarck, Guppy, Sci. Assoc. Trinidad, Trans., p. 35.
1864. *Marginella subcaerulea* Martini, Krebs, The West Indian Marine Shells, p. 45.
1864. *Marginella prunum* (Gmelin), Reeve, Conch. Icon., vol. 15, *Marginella,* pl. 11, sp. 45a, b.
1865. *Marginella prunum* (Gmelin), Küster, Conchylien-Cabinet, vol. 5, pt. 4, pl. 1, fig. 9.
1867. *Marginella caerulescens* Lamarck, Guppy, Sci. Assoc. Trinidad Proc., pt. 2, p. 160.
1869. *Marginella prunum* (Gmelin), Redfield, Amer. Jour. Conch., vol. 5, pt. 2, No. 5, p. 90, sp. 45.
1870. *Marginella prunum* (Gmelin), Redfield, Amer. Jour. Conch., vol. 6, pt. 2, No. 6, Appendix, p. 251.
1878. *Marginella prunum* (Gmelin), Mörch, Catalogue of West-India Shells, p. 11.
1883. *Marginella prunum* (Gmelin), Tryon, Man. Conch., vol. 5, pp. 29-30, pl. 8, figs. 58, 59.
1890. *Marginella prunum* (Gmelin), Dall, Wagner Free Inst. Sci., Trans., vol. 3, pt. 1, pp. 50-51.

Shell moderately large, light in weight, more or less oblong in shape. Spire short, not callused, the angle of divergence about 92 degrees, the apex blunt. Whorls five in all, the glassy nucleus appressed. Sutures fine. Body whorl gently rounded at the shoulder, tapering slightly and evenly below. Aperture the full length of the body, subtriangular, widest at the base, the posterior notch well

excavated and emarginated by the callus extending around it from the outer lip. Outer lip thickened, folded back away from the aperture, the hind margin raised a little above the whorl surface, the inner margin completely smooth; extremities of lip callused, the callus also emarginating the basal lip whence it ascends part way up the columella before thinning out as a wash; the wash extends over the parietal wall, spreads in a wide swath across the lower part of the dorsum, parallels the back of the outer lip in a narrow band, and then thinly circles the top of the whorl at the suture. The upper corner of the outer lip is strongly angulated, the angulation rising above and bordering the posterior notch. Columella with four strong rounded folds, the lower two closer together and more oblique than the upper two, the spaces between them deep, the uppermost fold situated at about the middle of the columella. Basal lip subtruncate, the inner margin shallowly channeled. Surface smooth but with microscopic longitudinal growth lineations. Exterior of body is light tan to cream; the enamel wash is also cream-colored; the lips, the columellar folds, and spaces between the folds are white; the aperture is light reddish brown or chocolate; the crease under the rear margin of the outer lip is light orange interrupted by longitudinal narrow stripes of slate gray, the upper stripe a short one, the lower a long one extending from near the middle to the base.

Dimensions.—Figured specimen, length 26.5 mm.; max. width 15 mm.

Locality.—Recent, on beach southeast of Higuerote, State of Miranda. A single specimen.

Remarks.—The unique characteristic of this shell is the sharply angulated upper corner of the outer lip.

Comparisons.—*Marginella pulchra* Gray (Zool. Beechey's Voyage, p. 135, pl. 36, fig. 20, 1839) from the Caribbean is much like *Marginella prunum* but is marked with two faint bands, one below the shoulder, the other near the base. Tryon united the following species with *M. prunum*:

M. caerulescens Lamarck (1822, An. sans Vert., vol. 7, p. 356)

M. sapotilla Hinds (1844, Zool. Soc. London Proc., p. 74)

M. buchardi Dunker (1852, Zeitschr. f. Malakozool., yr. 9, p. 61)

M. martini Petit (1835, Jour. Conchyl., vol. 4, p. 367, pl. 11, fig. 8)

Of these, *M. caerulescens* is now considered the same as *M. prunum*; the Eastern Pacific *M. sapotilla* from Panamá is the analogue of *M. prunum* but is ovate rather than oblong; *M. burchardi*, whose habitat is unknown, is distinct from *M. prunum* but *M. martini* from Rio de Janeiro may, according to Redfield (1870, p. 242), be a variation of *M. prunum*.

Range and distribution.—The living *M. prunum* is a Western Atlantic species ranging from the West Indies to northern South America, and perhaps to Brazil. Dall (1890) reported it as a rare form in the Caloosahatchee Pliocene of Florida, but this occurrence has not been confirmed by later investigators. Guppy reported *M. caerulescens* from the Pliocene at Matura, Trinidad, and although there is no reason to doubt its occurrence there, it was not confirmed by Maury (1925b) in her work on Trinidad.

Marginella (Egouana ?) laguairana, new species Pl. 36, figs. 11, 12

Shell porcelaneous, conoidal, of medium size, the spire moderately short, concave, the tip produced to form a papilliform apex. Whorls four or five, the ventral side of the apex and spire covered with callus, the callus extending over the parietal wall and labium to the base where it is thick. On the lower lip the distal margin of the callus is broken away revealing on the base a long, deep "umbilical" groove which probably is normally covered over by the callus. Body whorl olivid in shape. Sutures, where not covered with callus, are extremely fine. Aperture filled with calcareous sandstone, generally narrow, but a little more so posteriorly. The outer lip was broken off the holotype before the shell was photographed but it is known to be moderately thick and to have a smooth inner margin. Columella gently convex above, a little excavated below, bearing four strong flat-topped folds or ridges, the uppermost of which is situated a little below the middle and is nearly horizontal, the others being progressively more oblique downward. Although only a portion of the folds can be seen, they appear to increase in size anteriorward, the basal one considerably more elevated and broader than the others. Anterior extremity broken but probably more or less truncate.

Dimensions.—Holotype, length 18 mm.; width across shoulder, excluding outer lip, 8.5 mm.

Type locality.—Mare formation at W-25, south flank of Punta Gorda anticline. One imperfect specimen, the holotype.

Comparisons.—This *Oliva*-shaped species with its concave spire, papilliform apex, thickly callused labium, and nondenticulate labrum has no near relatives among the many marginellids of the Caribbean area. It distantly resembles *M. calypsonis* Maury (1925b, pp 351-352, pl. 34, figs. 12, 13) from the upper Miocene at Springvale, Trinidad, but that has a thicker outer lip, a less heavily callused inner lip, and narrower columellar plaits than the new Venezuelan species *M. laguairana.*

Marginella (Prunum) circumvittata, new species Pl. 36, figs. 13-16

1888. *Marginella marginata* (Born), Schepman, [in] Martin, Bericht über eine Reise nach Nederlandisch West-Indien und darauf gegründete Studien, Leiden: II—Geologische Studien, Appendix. Not of Born 1780, Test. Mus. Caes. Vindobonensis, p. 220, pl. 9, figs. 5, 6.

Shell moderately large, robust, oblong-oval, the dorsum completely encircled by a thick broad elevated and ridged band of callus. Generally this callus completely covers and rises above the spire, but on one specimen the dorsal side of the spire is wholly uncovered revealing that the shell has 4-1/2 whorls in all, including 1-1/2 of the nucleus; that the initial whorl of the nucleus is loosely coiled, full, and appressed; that the spire is conical and blunt at the apex; and that the sutures are feebly impressed. Dorsum evenly inflated on the upper half. Aperture extending the full length of the shell, nearly straight, narrow. Outer lip thick, broadest medially where it is nearly a third the width of the shell, the face of the lip somewhat flattened, rolled to the back where it merges with the marginal callus of the dorsum, the inner margin of the lip completely smooth. Face of labium flattened along the inner side, swollen over most of its area, the labium nearly two-thirds the width of the shell. Columella bearing four plaits from the middle to the base, the posterior plait nearly horizontal, the others increasing in obliqueness toward the base, the basal one the broadest. All of the plaits enter the aperture, and increase progressively in size and length anteriorward. Terminal notch shallow, the posterior outlet a simple, fairly wide channel.

Dimensions.—Holotype (G173a), length 20 mm.; max. width 12.1 mm.; paratype (G173b), length 18.8 mm.; max. width 11.1 mm.

Type locality.—Mare formation at W-14, on hillside above west bank of Quebrada Mare Abajo. Twenty-six specimens.

Other localities.—Mare formation, in stream 250 meters south-southwest of mouth of Quebrada Las Pailas. Three specimens; lower Mare formation, in small stream 100 meters west of Quebrada Mare Abajo. Twelve specimens.

Comparisons.—*M. circumvittata,* n. sp. may be the form identified by Schepman (in Martin, 1888) as *M. marginata* (Born) as both Martin's and my specimens are from the same locality. However, the Recent *M. marginata* from West Africa always has the dorsal part of the spire uncallused, the outer lip is not so broad as on *M. circumvittata,* the posterior columellar fold is oblique rather than horizontal as on *M. circumvittata,* and the shell is less heavily callused than the Venezuelan one. Actually, the Cabo Blanco fossil is more like the Caribbean *M. cincta* Kiener (1824, Icon. Coq. Viv., p. 21, pl. 32) and *M. crassilabrum* Sowerby (1846, Zool. Soc. London Proc., p. 96), but the front of *M. circumvittata* is flatter, and the outer lip wider than that of *M. cincta,* and the outer lip of *M. circumvittata* is less arcuate than that of *M. crassilabrum.* Being preoccupied, the name *M. crassilabrum* was changed to *M. labrosa* by Redfield (Amer. Jour. Conch., vol. 6, pt. 2, No. 6, p. 239) in 1870. Among fossil forms, the new species is close to Rutsch's *M. colinensis* Hodson (Rutsch, 1934, pp. 94-95, pl. 2, figs. 12, 13; pl. 5, fig. 13) from the upper Miocene-Pliocene deposits at Punta Gavilan and Sabanas Altas in the State of Falcon, Venezuela, but that is a more broadly ovate form. There is some question in my mind as to the identity of Rutsch's *M. colinensis* with *M. gatunensis colinensis* F. Hodson (1927, p. 76, pl. 40, figs. 15, 17, 19) as Hodson's *M. colinensis* is swollen longitudinally along the middle of the dorsum.

Persicula (Gibberula) glandula, new species Pl. 37, figs. 1-4

Shell small, moderately solid, obconic, the surface smooth and polished, the glazed spire low and broad. Whorls about three in all, the nucleus glassy, slightly protroberant, one-whorled. Body whorl subangulate at the shoulder, hardly convex on the sides, moderately tapering. Aperture fairly narrow, nearly as long as the shell, the margins subparallel. Outer lip thickened somewhat, the face flattish

and widened a little above, the upper corner angularly rounded and a little effuse, the inner margin feebly notched within the curve of the shoulder, the margin below bearing eight or nine evenly spaced denticles. Columella and parietal wall callused or enameled, the callus on the wall somewhat swollen, the margin of the callus adherent to, but sharply defined from the surface of the whorl. Parietal wall faintly ridged longitudinally, the ridge extending down to the posterior columellar fold. Anterior half of columella bearing four or five folds increasing in size toward the base, the basal or pillar fold the strongest and most oblique and continuing around the base to emarginate the siphonal notch. The lower two or three columellar folds continue into the aperture, the upper ones do not. Anterior extremity excavated into a U-shaped notch. Anterior fasciole wedge-shaped, slightly convex on the holotype, sulcate on the paratype, the shell material subhyaline and contrasted with the porcelaneous surface of the body whorl.

Dimensions.—Holotype, length 2.1 mm.; max. width 1.7 mm.; paratype, length 1.9 mm.; max. width 1.4 mm.

Type locality.—Mare formation at W-14, on hillside above west bank of Quebrada Mare Abajo. Two specimens.

Comparisons.—*P. glandula,* n. sp. is closest to the Miocene to Recent *P. lavalleeana* (d'Orbigny) and the Pliocene *P. floridana* (Dall) (1890, p. 49, pl. 5, fig. 6), but both of those are more evenly rounded at the shoulder. According to Abbott (1958, p. 87), the well-known Western Atlantic *P. minuta* (Pfeiffer), *non* (Gray), is the alias of *P. lavalleeana* (d'Orbigny). The Venezuelan fossil is also comparable to the following species of *Gibberula* described by Gardner (1937, pp. 400-403, pl. 47, figs. 25-28) from the Miocene of the Alum Bluff group of Florida: *G. dryados* Maury, *G. chondra* Gardner, *G. waltoniana* Gardner, and *G.* species Gardner. On none of those, however, is the body whorl subangulate at the shoulder as it is on *P.* (*G.*) *glandula.*

Persicula (Gibberula) lavalleeana (d'Orbigny) Pl. 37, figs. 5, 6

1840. *Marginella minuta* Pfeiffer, Wiegmann's Archiv. f. Naturgesch., vol. 1, p. 259. Not of Gray 1826.
1842. *Marginella Lavalleeana* d'Orbigny, [in] La Sagra, Hist. phys., polit. nat. I'lle de Cuba, Mollusques, vol. 2, p. 101; Atlas, pl. 20, figs. 36-38 as *Lavalleana.*

1846. *Marginella minima* Guilding, [in] Sowerby, Thes. Conchyl., vol. 12, p. 388, pl. 78, fig. 220.
1864. *Marginella Lavelleana* d'Orbigny, Krebs, The West Indian Marine Shells, p. 44.
1865. *Marginella Lavalleana* d'Orbigny, Reeve, Conch. Icon., vol. 15, pl. 27, sp. 154.
1870. *Marginella Lavalleana* d'Orbigny, Redfield, Amer. Jour. Conch., vol. 6, No. 2, pt. 6, Appendix, p. 240.
1878. *Marginella Lavalleana* d'Orbigny, Mörch,, Catalogue of West-India Shells, p. 12.
1879. *Marginella Lavalleana* d'Orbigny, Weinkauff, Conchylien-Cabinet, vol. 5, pt. 4, p. 112, pl. 21, fig. 12.
1883. *Gibberula minuta* (Pfeiffer), Tryon, Man. Conch., vol. 5, p. 43, pl. 12, fig. 61.
1883. *Gibberula minima* (Guilding), Tryon, Man. Conch., vol. 5, p. 44, pl. 12, fig. 62.
1889. *Marginella minima* Guilding, Dall, U. S. Nat. Mus., Bull. 37, p. 108.
1889. *Marginella minuta* Pfeiffer, Dall, U. S. Nat. Mus., Bull. 37, p. 108.
1890. *Marginella Lavalleana* d'Orbigny, Dall, Wagner Free Inst. Sci., Trans., vol. 3, pt. 1, p. 49.
1904. *Marginella minuta* Pfeiffer, Martin, Maryland Geol. Sur., Miocene, p. 170, pl. 44, fig. 4.
1922. *Marginella minima* Guilding, Maury, Bull. Amer. Paleont., vol. 9, No. 38, p. 79.
1922. *Marginella minuta* Pfeiffer, Maury, Bull. Amer. Paleont., vol. 9, No. 38, p. 79.
1937. *Marginella minuta* Pfeiffer, Smith, East Coast Marine Shells, p. 130, pl. 50, fig. 15.
1954. *Persicula* (*Gibberula*) *minuta* (Pfeiffer), Abbott, American Seashells, pp. 257-258, fig. 56m.
1955. *Marginella minuta* Pfeiffer, Perry and Schwengel, Marine Shells of the Western Coast of Florida, p. 173, pl. 53, fig. 357.
1958. *Persicula lavalleana* (d'Orbigny), Olsson and McGinty, Bull. Am. Paleont., vol. 39, No. 177, p. 17.
1958. *Persicula* (*Gibberula*) *lavalleeana* (d'Orbigny), Abbott, Acad. Nat. Sci. Philadelphia, Mon. No. 11, p. 87.
1958. *Persicula lavalleena* (d'Orbigny), Coomans, Caraibisch Marien-Bioolgisch Inst., Collected Papers 6, p. 98.
1959. *Persicula lavalleana* (d'Orbigny), Nowell-Usticke, A Check List of the Marine Shells of St. Croix, p. 79.

Shell worn, small, broadly obconic, smooth, polished. Spire low, the apex obtuse. Whorls a little over three including the nucleus which is hyaline and blunt, and consists of a little over one turn. Sutures fine, faintly visible under the surface glaze. Body whorl rounded at the shoulder, the sides a little tapering. Aperture linear, the margins subparallel. Outer lip thickened, the face of the lip flattened over most of the length, the inner margin with nine or so teeth, the upper corner of the lip rather sharply rounded and a little effuse. Labial plications four, the posterior one feeble, the next two moderately strong and nearly horizontal, the lower of the two

a little longer, the lowest fold large, oblique, merging with the emarginate border of the anterior notch. Anterior notch shallowly excavated, the posterior outlet a short simple groove. Columella and parietal wall with a thin coating of enamel.

Dimensions.—Figured specimen, length 1.6 mm.; max. width 1 mm.

Locality.—Playa Grande formation (Maiquetía member) at W-26 in Quebrada Las Bruscas, about 120 meters upstream from junction with Quebrada Las Pailas. One specimen. No. 26297 PRI.

Remarks.—Although the body whorl is a mite less pyriform than some Recent examples of *P. lavalleeana,* the Cabo Blanco fossil seems to be the same. Unlike the preceding species *P. glandula,* n. sp., the present shell is rounded at the shoulder instead of subangulate.

Range and distribution.—Persicula lavalleeana (d'Orbigny) ranges from Miocene to Recent. It is said to occur in the Choptank Miocene of Maryland, in the Pliocene of North Carolina and Florida, and in the Pleistocene of west Florida at North Creek. The living shell ranges from Florida to northern South America.

Persicula (Rabicea) interruptelineata (Megerle von Mühlfeld)
Pl. 37, figs. 7, 8

1818. *Voluta interrupta-lineata* Megerle von Mühlfeld, Gesell. Naturf. Freunde Berlin Mag., vol. 8, p. 6, figured.
1822. *Marginella interrupta* Lamarck, An. sans Vert., vol. 7, p. 362.
1830. *Marginella interrupta* Lamarck, Deshayes, Encycl. Méth., vol. 2, p. 414.
1834. *Marginella itnerrupta* Lamarck, Kiener, Icon. Coq. Viv., p. 25, pl. 5, fig. 21.
1844. *Marginella interrupta* Lamarck, Deshayes, An. sans Vert., vol. 10, p. 446.
1846. *Marginella interrupta* Lamarck, Sowerby, Thes. Conchyl., vol. 1, p. 395, pl. 78, figs. 201-205.
1853. *Marginella interrupta* Lamarck, d'Orbigny, [in] La Sagra, Hist. phys., polit. nat. l'Ile de Cuba, Mollusques, vol. 2, p. 97.
1864. *Marginella interrupta* Lamarck, Reeve, Conch. Icon., *Marginella,* pl. 14, sp. 62.
1864. *Marginella interrupta-lineata* (Mühlfeld), Krebs, The West Indian Marine Shells, pp. 43-44.
1865. *Marginella interrupta* Lamarck, Küster, Conchylien-Cabinet, vol. 5, pt. 4, pl. 3, figs. 16-8.
1867. *Marginella interrupta* Lamarck, Guppy, Sci. Assoc. Trinidad, Proc., pt. 3, p. 160 (part).
1870. *Marginella interrupte-lineata* Megerle, Redfield, Amer. Jour. Conch., vol. 6, pt: 2, No. 6, Appendix, pp. 238-239.

1878. *Marginella interrupto-lineata* Megerle von Mühlfeld, Mörch, Catalogue of West-India Shells, p. 11.
1883. *Marginella* (*Persicula*) *interrupte-lineata* (Mühlfeld), Tryon, Man. Conch., vol. 5, p. 37, pl. 11, figs. 16, 17.
1887. *Persicula* (*Rabicea*) *interrupta* (Lamarck), Fischer, Man. Conchyl., p. 603.
1901. *Marginella interrupte-lineata* (Mühlfeld), Dall and Simpson, U. S. Fish Com., Bull. vol. 20 for 1900, pt. 1, p. 395.
1932. *Marginella interruptolineata* (Megerle von Mühlfeld), Pilsbry and Lowe, Acad. Nat. Sci. Philadelphia, Proc., vol. 84 (1933), p. 62.
1958. *Persicula interruptolineata* (Mühlfeld), Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, p. 98.

The Venezuelan shell referred to this species is small and more or less oval in outline. Spire entirely concealed by a spread of callus from the parietal wall, the apical area flattish. Aperture as long as the shell, the margins subparallel and curving arcuately in conformity with the shape of the body. Outer lip thick, the back side with one or more weak longitudinal furrows, the ventral face completely smooth, the inner margin feebly denticulate throughout its length, the teeth numbering 23, 25, and 27, respectively, on the specimens examined. Body flattened on the columella face, the columellar margin with eight or nine folds which increase in size progressively toward the base; lower lip with two strong entering folds or ridges, the upper one bifid or tending to be so, the basal one broad, emarginating the side of the anterior canal. Basal lip thickened behind by an extension of the callus from the outer lip, the dorsal margin of the callus raised slightly above the whorl surface. Fasciolar area smooth, a little swollen. Anterior extremity notched semicircularly, the posterior outlet a moderately deep simple channel. Labial face with a wash of enamel paralleling the columella for part of its length but swerving below the apex and well above the base to merge with the callus of those areas. Ground cream-colored, the lips and denticles white, the body marked with narrow interrupted stripes of chestnut brown. There are 26 rows of stripes, the stripes subequal in width, variable in length, all of them tapering to a point toward the labral side of the shell. On all three Recent specimens the stripes are not present in a large area on the ventral surface of the shell, which area is dull white. Above the posteriormost row of stripes there is a row or two of rather widely spaced chestnut-brown maculations of irregular shape, and above these, on the dorsal side of the apex, there are several more such maculations. A similar row

of maculations is present around the posterior border of the fasciolar area. Near the back edge of the outer lip there is a continuous longitudinal chestnut-brown line which joins the nearest maculation on both extremities.

Dimensions.—Figured specimen, length 12 mm.; max. width 7.2 mm.

Localities.—Recent, on beach at Playa Grande Yachting Club, Distrito Federal. Three specimens; Abisinia formation at W-30, eastern edge of Playa Grande Village. One specimen, worn.

Range and distribution.—The Recent *P. interruptelineata* occurs along the northern coast of South America from Cartagena, Colombia, to the Guianas and Trinidad. It has also been reported from Margarita Island, Curaçoa, Puerto Rico, and elsewhere in the West Indies.

Persicula (Rabicea) interrupta mareana, new subspecies Pl. 37, figs. 9-14

1867. *Marginella interrupta* Lamarck, Guppy, Sci. Assoc. Trinidad, Proc., pt. 3, p. 160 (part). Not of Lamarck [= *Persicula interrupte-lineata* (Megerle von Mühlfeld)].
1888. *Marginella interrupta* Lamarck, Schepman, [in] Martin Bericht über eine Reise nach Nederlandisch West-Indien und drauf gegründete Studien, Leiden: II—Geologische Studien, Appendix. Not of Lamarck.
1889. *Marginella interrupta* Lamarck, Lorié, Samml. Geol. Reichs-Mus. Leiden, ser. 2, vol. 1, pp. 136-137, 142 (part). Not of Lamarck.

Shell of medium size, sturdy, oblong-oval to subovate in outline, the body proper narrowly ovate. Front of shell undulatory, the parietal wall heavily callused, the callus rising slightly above the apex which it partially encircles and then continues around the posterior outlet to join the thickened margin of the outer lip. At the summit of the ventral face of the body, the callus is both swollen and pinched, the swelling occurring on the distal side. Spire hidden under a thick coating of callus; this coat merges with the callus of the parietal wall and outer lip. Aperture as long as the body, moderately narrow, subangularly arcuate, the margins subparallel. Outer lip thickened, the face smooth and a little wider along the middle, the back of the lip wide, reinforced with a varying number, but sometimes as many as five longitudinal bands of callus; these bands coalesce at the base to form a callus which extends as a raised ridge above the back of the terminal notch, and continues therefrom to

the side of the body face where the ridge becomes obsolescent; near the summit, the labral bands of callus abut against or merge with the callus emarginating the posterior outlet. The inner margin of the outer lip is denticulate from one end to the other, the number of denticles ranging from 22 to 29; the denticles are subequal in size and diminish in strength as they approach both ends of the lip; they are a little wider at the edge and play out inward. Face of columella flattened, the margin bowed a little into the aperture above the middle. Columellar lip bearing 8 to 13 folds which decrease in size upward. A nearly vertical fold forms the pillar or lower lip, the fold continuing to the base and emarginating the border of the terminal notch. The first fold above the pillar is the largest and longest of the series; this is usually faintly grooved along the middle as it emerges from the aperture but continues across the base as a single ridge playing out before it reaches the side; upward from this, the folds become progressively smaller and disappear on the posterior end of the columellar margin; the uppermost ones do not persist within the aperture; on some specimens there are short feeble plicae between the lower folds. Anterior notch deep, obliquely directed, the sides subparallel, the terminal end on the back sunken. Anal outlet grooved, the top of the outlet a subtriangular re-entrant. Labium nearly always marked with a longitudinal protruberance of callus situated at about midsection. A number of unweathered specimens still retain the color markings under the originally highly polished surface; the markings consist of about two dozen interrupted spiral stripes of chocolate-brown on a straw-colored ground; the stripes play out abruptly on the side of the ventral face; in places on the dorsum the stripes develop into short lenticular bars or triangular spots and seem so to be situated that they fall on the interspaces of the spiral ribs which make up the middle layer of shell. This middle layer is normally completely covered by a thin, highly polished epidermal layer of shell through which the stripes appear, the epidermis itself composed of fine long axial striations which not infrequently bunch together below the apical callus to form feeble axial folds.

Dimensions.—Holotype (I171c), length 18.8 mm.; max. width 11.6 mm.; paratype (I171b), length 18.6 mm.; max. width 11.5 mm.; paratype (T171a), length 8.2 mm.; max. width 11.7 mm.

Type locality.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. Two hundred forty-seven specimens.

Other localities.—Lower Mare formation, in small stream 100 meters west of Quebrada Mare Abajo. Sixty-nine specimens; Mare formation at W-14, on hillside above west bank of Quebrada Mare Abajo. Six specimens; Mare formation, in stream 250 meters south-southwest of mouth of Quebrada Las Pailas. Twenty-seven specimens; Playa Grande formation (Maiquetía member) at W-26, in Quebrada Las Bruscas, about 125 meters upstream from junction with Quebrada Las Pailas. One specimen; Abisinia formation at W-30, eastern edge of Playa Grande village. Six worn specimens.

Comparisons.—This is one of the most abundant of the fossils found in the Mare formation and is presumed to be the same species that Schepmann identified as *Marginella interrupta* Lamarck which is a synonym for the prior-named *Persicula interruptelineata* (Megerle von Mühlfeld). We have three Recent specimens of *P. interruptelineata* from the beach at the Playa Grande Yachting Club, some four kilometers west-northwest of the type locality of *P. interrupta mareana,* n. subsp., and although the fossil and Recent shells are indeed much alike, *P. mareana* is distinguished from *P. interruptelineata* in being a larger, more heavily callused shell, in being more acuminate and pinched in at the anterior tip of the body, in having a more decisive terminal notch, and in having coarser spiral strips which occur under the surface layer rather than on it. Other Recent specimens of *P. interruptelineata* from the Caribbean that I have examined at the Museum of Comparative Zoology are less readily distinguished from the Cabo Blanco fossil, although the anterior plait of the columella is generally considerably sharper on the fossil. *P. interrupta mareana,* n. subsp. is also close to the Miocene *P. venezuelana lavelana* F. Hodson (Hodson, Hodson, and Harris, 1927, p. 78, pl. 40, figs. 3, 10, 11) from the State of Falcon, Venezuela, but the anterior end of the body is blunter than on *P. mareana,* whereas the Cabo Blanco shell is pinched in at the base and sharp-edged along the labial margin of the siphonal notch.

Remarks.—*P. i. mareana,* n. subsp. is contained in the United States National Museum's collection No. 18408 from Cumaná,

Venezuela, and is probably the same shell as the one referred to *P. interrupta* (Lamarck) by Guppy (1867).

Persicula (Rabicea ?) hodsoni, new species Pl. 38, figs. 5-8

Shell of medium size, oblong-oval in outline, the body proper ovate, acuminate anteriorly, the apex swollen and produced slightly above the top of the outer lip and completely covered with smooth enamel, the enamel neatly encircling the summit and posterior outlet, terminating at the top of the outer lip. From the apex the enamel continues down the columellar face as an adherent glaze, thickens at the base which it encircles, and terminates at the anterior end of the outer lip, the margin of the enamel at the base sharply defined from, and raised above the surface of the whorl. Aperture as long as the body, moderately wide, arcuate, the margins subparallel. Outer lip thin, slightly flaring at the extremities as viewed from within, the curve at the summit and base subangular. The inner margin of the outer lip is usually not denticulate but is instead flecked with a series of short brown stripes or bars which show through from the middle layer of the shell. Rarely the outer lip is feebly denticulate farther in, the short lirae lying adjacent to the marginal stripes. Face of columella flattened medially, the margin bowed a little into the aperture above the middle. Columellar lip bearing 11 to 14 folds, which above the penultimate decrease progressively in size upward. The penultimate fold is the largest and longest and is rendered faintly biplicate by a feeble groove as it emerges from within the aperture; but, as it continues across the base it becomes a single ridge which plays out before reaching the side. The basal fold forms the moderately broad pillar, and continues around the siphonal notch as a pronounced emargination. Siphonal notch deep, U-shaped, obliquely directed. Posterior outlet broadly channeled, moderately deep, the emarginate summit of the outlet a V-shaped recess. Well-preserved specimens are highly polished and are marked with about 18 interrupted spiral stripes of pale brown which sometimes show through the tan or straw-colored epidermal layer of shell.

Dimensions.—Holotype (I172b), length 12.7 mm.; max. width 7.8 mm.; paratype (T172a), length 13.3 mm.; max. width 8.5 mm.

Type locality.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. Nineteen specimens.

Other localities.—Lower Mare formation, in small stream 100 meters west of Quebrada Mare Abajo. Seven specimens; Mare formation at W-14, on hillside above west bank of Quebrada Mare Abajo. Six specimens; Mare formation, in stream 250 meters south-southwest of mouth of Quebrada Las Pailas. Four specimens, including paartype; Abisinia formation at W-30, eastern edge of Playa Grande village. Forty-six specimens.

Remarks.—This fine shell is named for Dr. Floyd Hodson in recognition of his contributions to the Tertiary paleontology of Venezuela. The labial half of *P. hodsoni,* n. sp. is a good deal like that of the preceding described *P. interrupta mareana,* n. subsp., but the labral side, with its thin, unemarginate lip is entirely distinct. The outer lip is like that of the Recent West Indian *P. catenata* (Montagu) (1803, Testacea Britanica, p. 236, pl. 6, fig. 2), but *P. catenata* is a stubbily pyriform shell with a depressed apex, and is marked with a few rows of loops instead of many rows of interrupted stripes as on *P. hodsoni.*

Persicula (Rabicea) venezuelana lavelana (F. Hodson)
Pl. 37, figs. 15, 16; Pl. 38, figs. 1-4

1927. *Marginella venezuelana lavelana* F. Hodson, Bull. Amer. Paleont., vol. 13, No. 49, p. 78, pl. 40, figs. 3, 10, 11.
1934. *Persicula* (*Rabicea*) *venezuelana lavelana* F. Hodson, Rutsch, Schweiz. Palaeont. Gesell. Abh., vol. 54-55, pp. 91-92, pl. 6, figs. 9-12.

The Cabo Blanco shells are of medium size, robust, top-shaped. Spire flat, generally completely covered by callus; on a few specimens, however, the callus does not obscure the apex, and on those it is seen that the one-whorled nucleus is mammilliform, that the top of the nucleus is nearly level with the summit of the body whorl, and that the first post-nuclear whorl is sunken. Whorls three in all including the nucleus. Aperture as long as the shell, moderately narrow, subcrescentic, the margins subparallel. Outer lip thickened, widest medially, flattened a little on the face, the inner margin rather closely denticulate, the number of denticles ranging from 18 to 24; the back of the outer lip is generally broad, not distinctly marginate but of a different cast than the dorsum proper; the ex-

tremities of the outer lip, however, are somewhat emarginate, the emargination encircling the apex as a low ridge to join the spread of enamel near the summit of the parietal wall; at the base, the emargination forms an elevated keel or ridge which continues over the deeply excavated anterior notch to, and sometimes under the distal margin of the labial enamel, there becoming obsolescent. Columella enameled, bearing 7 to 11 plaits, the strong basal plait forming the obliquely curved pillar. The fold above the basal one is the largest and longest, is rendered biplicate and rarely triplicate by a narrow shallow groove or grooves, is nearly horizontal on the face of the columella, and curves downward as it extends toward the side of the body. The folds above the penultima are more or less horizontally disposed and become progressively a little shorter and smaller posteriorly. Anterior notch short, deep, obliquely directed, the sides nearly parallel. Posterior outlet relatively wide, long, and deep. Parietal wall enameled, the enamel often swollen into a longitudinal bulge lying between the top of the wall and the penultimate plait of the columella. Several specimens without this swelling exhibit instead a longitudinal crease lying along the ends of the upper labial plaits. The middle layer of shell is spirally ridged, the ridges normally obscured by the smooth epidermal layer of the shell, but undoubtedly giving rise to the spiral stripes that are sometimes visible through the outer layer of shell.

Dimensions.—Specimen G174a, length 14.8 mm.; max. width 10 mm.; specimen J174b, length 12.3 mm.; max. width 9 mm.; largest specimen, length 17.9 mm.; max. width 13.1 mm.

Localities.—Mare formation at W-14, on hillside above west bank of Quebrada Mare Abajo. Five specimens; lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. Eight specimens; lower Mare formation, in small stream 100 meters west of Quebrada Mare Abajo. Four specimens; Abisinia formation at W-30, eastern edge of Playa Grande village. The two worn specimens are somewhat doubtfully referred to *P. lavelana,* as the inner margin of the outer lip is not denticulate.

Comparisons.—The Cabo Blanco shell seems to be referable to Hodson's *P. venezuelana lavelana* but is also so close to Recent examples of *P. obesa* (Redfield) (1848, p. 164, pl. 10, figs. 5a, b)

from northern South America that there may be justification in considering the Venezuelan fossil the same as, or a variant of *P. obesa*. The Cabo Blanco form is virtually identical with Recent specimens labelled *obesa* from Cumaná (No. 54999 in the U. S. National Museum) but according to Rutsch, the true *P. obesa* is a little taller and more slender than *P. v. lavelana*.

Range and distribution.—*Persicula venezuelana lavelana* (F. Hodson) is an upper Miocene to Pleistocene form in Venezuela, and has been found over a distance of about 310 kilometers, from south of La Vela de Coro in the State of Falcon on the west to Cabo Blanco in Distrito Federal on the east.

Hyalina (Volvarina) lustra, new species Pl. 38, figs. 11, 12

Shell small, rather thin, milky white, highly polished, subcylindrically obconical, the spire low, the apex almost flat. Whorls about 2-1/2, the sutures exceedingly fine, faintly visible through the glaze under magnification. Aperture long, subtriangular, narrowest at the posterior end. Outer lip about the same thickness as the shell proper, nearly vertical, the edge along the middle rolled a little toward the aperture, the inner margin smooth. Columella slanted, more or less straight throughout, bearing four strong, elevated, narrow plaits, the lowest one a little smaller than the others, the posterior three subequal, the uppermost situated at about the middle of the columella. Parietal wall with a nearly imperceptible wash of callus. Basal lip thin, gently rounded.

Dimensions.—Holotype, length 3.5 mm.; max. width 1.9 mm.

Type locality.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. One specimen, the holotype.

Other localities.—Mare formation at W-14, on hillside above west bank of Quebrada Mare Abajo. Two specimens.

Comparisons.—*H. lustra,* n. sp. is of the same genre as the Recent *H. lactea* (Kiener) (1841, p. 42, pl. 13, fig. 3) and *H. tenuilabra* (Tomlin) (1917, p. 287). *H. lactea,* which ranges from the Florida Keys to the Caribbean Sea, is more cylindrical than *H. lustra* and the columellar plaits are weaker. *H. tenuilabra* (also known as *pallida* Donovan) is reported from the Caloosahatchee

beds of Florida (Dall, 1890b, p. 54) and is found living from southeast Florida to the Caribbean Sea. That species (see Abbott, 1958, p. 86, pl. 2f and g) is rather sharply contracted on the lower side of the body whorl, and the columellar folds do not extend as high as on *H. lustra.*

Cysticus ? species **Pl. 38, figs. 9, 10**

Internal mold small, distorted, rudely and stubbily obconical, the spire low, obtuse at the apex. Aperture semilunate, narrowed at the posterior outlet, widened anteriorly. Outer lip thick, angulated at the shoulder, the inner margin with four impressed spiral grooves continuing into the aperture, the uppermost groove, about a fourth of the way down from the summit the shallowest, the succeeding ones progressively deeper, the areas between the grooves broad and a little convex upward. Columellar margin straightish above, strongly curved below, no impression of folds visible. Basal lip swollen, the anterior canal represented by a shallow moderately wide channel.

Dimensions.—Figured specimen, length 7.5 mm.; max. width 5.9 mm.

Locality.—Playa Grande formation (Catia member) at W-22, on dip slope 100 meters west of Costa fault. The single example is composed of a compacted fine-grained calcareous sand representing the filling within the original shell.

Remarks.—The generic designation is most uncertain.

CONIDAE

Conus (Conus) mus Hwass **Pl. 38, figs. 13-16**

1792. *Conus mus* Hwass, [in] Bruguière, Encyl. Méth., vol. 1, pt. 2, p. 630.
1792. *Conus barbadensis* Hwass, [in] Bruguière, Encycl. Méth., vol. 1, pt. 2, p. 632.
1792. *Conus jamaicensis* Hwass, [in] Bruguière, Encycl. Méth., vol. 1, pt. 2, p. 700.
1864. *Conus mus* Hwass, Krebs, The West Indian Marine Shells, p. 5.
1873. *Conus mus* Hwass, Gabb, Amer. Philos. Soc. Trans., vol. 15, p. 230.
1878. *Conus mus* Hwass, Mörch, Catalogue of West-India Shells, p. 13.
1884. *Conus mus* Hwass, Tryon, Man. Conch., vol. 6, p. 19, pl. 5, figs. 72, 73.
1889. *Conus mus* Hwass, Dall, U. S. Nat. Mus., Bull. 37, p. 94.
1891. *Conus mus* Hwass, Baker, Acad. Nat. Sci. Philadelphia, Proc., vol. 43, p. 49.

1901. *Conus mus* Hwass, Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, p. 384.
1921. *Conus mus* Hwass, Pilsbry, Acad. Nat. Sci. Philadelphia, Proc., vol. 73, p. 331.
1924. *Conus mus* Hwass, Emery, Nautilus, vol. 38, No. 2, p. 61.
1928. *Conus mus* Hwass, Woodring, Carnegie Inst. Washington Pub. No. 385, p. 205.
1935. *Conus mus* Hwass, Richards, Jour. Paleont., vol. 9, No. 3, p. 257.
1937. *Conus mus* Hwass, Smith, East Coast Marine Shells, p. 133, pl. 51, fig. 6.
1937. *Conus mus* Hwass, Lyman, Nautilus, vol. 50, No. 3, pp. 103-104.
1939. *Conus mus* Hwass, McGinty, Nautilus, vol. 53, No. 2, p. 38.
1942. *Conus mus* Hwass, Jaume and Pérze Farfante, Soc. Cubana Hist. Nat. "Felipe Poey", Mem., vol. 16, No. 1, p. 42.
1942. *Conus citrinus* Clench (*non* Gmelin), Johnsonia, vol. 1, No. 6, pp. 7-9, pl. 4, figs. 5, 6.
1946. *Conus citrinus* Gmelin, Jaume, Soc. Malac. "Carlos de La Torre", Rev., vol. 4, No. 3, p. 109. Not of Gmelin 1791.
1954. *Conus mus* Hwass, Abbott, American Seashells, p. 262, pl. 14-o.
1958. *Conus mus* Hwass, Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 17.
1958. *Conus citrinus* Gmelin, Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, p. 99, pl. 15, 1 fig. Not of Gmelin, 1791.
1958. *Conus mus* Hwass, Abbott, Acad. Nat. Sci. Philadelphia, Mon. No. 11, p. 93.
1959. *Conus mus* Hwass, Nowell-Usticke, A Check List of the Marine Shells of St. Croix, p. 79.

The Recent shells referred to this species are fairly common. Whorls about 8-1/2 including the nucleus which is two-whorled, glassy, smooth, obtuse at the apex. Spire whorls shouldered near the base, flat to slightly concave on the ramp. Shoulder of whorls with 11 to 14 low, somewhat irregular, white knobs between which are brown splashes. Sculpture consists of fairly numerous spiral threads on the body becoming more cordlike near the base. There are four spiral threads on the whorls of the spire, the posterior one at the suture the broadest, the others of equal size. Shell traversed by numerous axial growth lines. Color a dull bluish gray, with axial bands of brown. A well-defined spiral band of white is present on the body whorl, situated a little above the middle of the columella, descending to about the lower third of the labrum. The banding is visible in the aperture. The periostracum is dark olive-brown, silky, and with fine axial striations.

Dimensions.—Specimen A181b, length 24.2 mm.; max. width 14 mm.; largest specimen, length 29 mm.; max. width 18.8 mm.; smallest specimen, length 12.9 mm.; max. width 8 mm.

Locality.—Recent, on beach of Playa Grande Yachting Club, Distrito Federal. Thirty-one specimens.

Remarks.—Although the Playa Grande specimens are from the type locality of *C. citrinus* Gmelin (1791, Syst. Nat., ed. 13, vol. 1, pt. 6, p. 3389), they do not seem to be referable to that species but rather to *C. mus* Hwass. According to Abbott (1954) *C. citrinus* is the rare yellow form of *C. regius* Gmelin (1791, Syst. Nat., ed. 13, p. 3379), and although many of my faded specimens are yellowish, all of them reveal the color bands in the aperture as in *C. mus* of Hwass. The interior of the aperture of *C. regius* is white.

Range and distribution.—*Conus mus* is living in the Western Atlantic from southeast Florida to northern South America. It is abundant in intertidal and reef areas, and the beach where the Playa Grande specimens were collected is locally strewn with beachrock. *C. mus* is also recorded from the Pleistocene in Barbados and around Matanzas Bay, Cuba, and in the Miocene of the Dominican Republic.

Conus (Conus) species Pl. 39, figs. 1, 2

Shell worn and faded, small, solid, with a moderately short spire, obtuse at the tip. Whorls six in all, the smooth, glassy white nucleus with about two of them. Spire whorls flat-sided, the last subangularly rounded at the shoulder, the shoulder worn completely smooth but giving the suggestion, from a few spots of dull white, that the shoulder of the unweathered shell may be a little knobby. The body is worn smooth, but on the labium there are about ten widely and subequally spaced spiral threads that show on the planed surface through a 10-power hand lens. The spire is light tan in color, and the ground color of the body is a faint dull pink. Around the shoulder and on the lower half of the body whorl, the shell is suffused and clouded a dull slaty blue that shows faintly through the aperture.

Dimensions.—Length 9.7 mm.; max. width 6.3 mm.

Locality.—Recent, on beach of the Playa Grande Yachting Club, Distrito Federal. One specimen.

Remarks.—This single specimen was found with, and may be a variant of *C. mus* Hwass, which it resembles in form but not in coloration, lacking in particular the whitish band around the middle. The shell is too worn for definitive comparison.

Conus (Conus) cf. regius Gmelin Pl. 39, figs. 3, 4

1791. *Conus regius* Gmelin, Syst. Nat., ed. 13, p. 3379.
1791. *Conus leucostictus* Gmelin, Syst. Nat., ed. 13, p. 3388.
1791. *Conus insularis* Gmelin, Syst. Nat., ed. 13, p. 3389. Refers to Martini, pl. 61, fig. 683.
1792. *Conus cedonulli caracanus* ? Hwass, [in] Bruguière, Encycl. Méth., vol. 1, pt. 2, p. 603.
1792. *Conus cedonulli grenadensis* Hwass [in] Bruguière, Encycl. Méth., vol. 1, pt. 2, p. 603. Refers to Martini, pl. 61, fig. 683.
1792. *Conus nebulosus* Hwass, [in] Bruguière, Encycl. Méth., vol. 1, pt. 2, p. 606. Not of Gmelin 1791.
1792. *Conus eques* Hwass, [in] Bruguière, Encycl. Méth., vol. 1, pt. 2, p. 705.
1798. *Cucullus corona civica* Röding, Mus. Boltenianum, p., 8.
1848. *Conus nebulosus* Hwass, Kiener, Icon. Coq. Viv., *Conus,* p. 16, pl. 24, figs. 2, 2a.
1864. *Conus leucostictus* 'Hwass' Krebs, The West Indian Marine Shells, p. 5.
1878. *Conus leucostictus 'Hwass'* Mörch, Catalogue of West-India Shells, p. 13.
1901. *Conus nebulosus* Solander, Dall and Simpson, U. S. Fish Com., Bull. vol. 20 for 1900, pt. 1, p. 384.
1937. *Conus nebulosus* Solander, Smith, East Coast Marine hells, p. 134, pl. 51, fig. 21.
1942. *Conus regius* Gmelin, Clench, Johnsonia, vol. 1, No. 6, pp. 3-5, pl. 3, figs. 1.4.
1944. *Conus regius* Gmelin, Patterson, Nautilus, vol. 58, No. 2, p. 38.
1946. *Conus regius* Gmelin, Smith, Nautilus, vol. 60, No. 1, p. 1.
1954. *Conus regius* Gmelin, Abbott, American Seashells, p. 262, pl. 14m.
1958. *Conus regius* Gmelin, Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 17.
1958. *Conus regius* Gmelin, Abbott, Acad. Nat. Sci. Philadelphia, Mon. No. 11, pp. 91-92.
1958. *Conus regius* Gmelin, Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, p. 99, pl. 15, 1 fig.
1959. *Conus regius* Gmelin, Nowell-Usticke, A Check List of the Marine Shells of St. Croix, p. 79.

Shell small, immature, the spire regular, a little produced, gently concave in profile. Post-nuclear whorls at least six, the nucleus decollate on all of my specimens, the apex probably obtuse. Early post-nuclear whorls narrow, angulately convex, the later ones slightly concave on the ramp and distinctly shouldered a short distance above the suture; the shoulder is rather prominently nodulous. Spire whorls sculptured by two to three spiral threads crossed by numerous raised axial striae. Body whorl gently convex above, slightly concave near the base, marked with about 21 slightly elevated, faintly tuberculated spiral riblets, the riblets at the base somewhat stronger than those above, all of the spirals crossing the columella. Traversing the body longitudinally are feeble, subequally spaced wrinkles produced from the nodes on the shoulder and ex-

tending to the upper part of the base. Shoulder of body whorl bears about 20 subequal tubercles. Aperture moderately narrow, oblique, the sides subparallel; the aperture widens slightly and gradually anteriorward. Base obtusely notched. Outer lip broken and corroded along the edge so that it is not known whether or not the inner margin of the lip is crenulate as is the typical adult *C. regius*. On the parietal wall just under the commissure there is a shallow sulcus.

Dimensions.—Figured specimen, length (minus nucleus) 12 mm.; max. width 7 mm.

Locality.—Abisinia formation at W-30, eastern edge of Playa Grande village. Three young and worn examples.

Remarks.—The nodulous shoulder, the faintly beaded spiral riblets, the longitudinal growth wrinkles, the concave spire, and the spiral threads on the spire whorls are the characteristics that lead me to suggest that the young fossils may be referable to *C. regius* Gmelin. Conidae with truly nodulated shoulders, either living or fossil, are rare in the Caribbean region but are much more abundant along the west coast of the Americas where at least 11 Recent species or subspecies have been described (see Hanna and Strong, 1949, and Keen, 1958).

Range and distribution.—The range of the living Western Atlantic *C. regius* Gmelin is from southern Florida to Brazil. If my identification is correct, this is the first record of it as fossil (Pleistocene).

Conus (Leptoconus) jaspideus caboblanquensis, new subspecies
Pl. 39, figs. 5-16

1888. *Conus echinulatus* Kiener, *Conus pygmaeus* Reeve, Schepman, [in] Martin, Bericht über eine Reise nach Nederlandisch West-Indien und darauf gegründete Studien, Leiden: II—Geologische Studien, Appendix.

This species is one of the most diversely ornamented of any of the gastropods in the Cabo Blanco group. The shells vary from nearly smooth to nearly completely nodulated. The base of all of the specimens is always spirally banded or ridged, but above the base the spiral markings vary from microscopic lineations to broad flat ribs separated by prominent grooves. Within the range of vari-

ation some examples are close to *C. pygmaeus* Reeve (1844, Conch. Icon., vol. 1, pl. 47, sp. 260), others resemble the Pliocene to Recent *C. stearnsii* Conrad (1869, p. 104, pl. 10, fig. 1), a few are like the living *C. jaspideus* Gmelin (1791, Syst. Nat., ed. 13, p. 3387), and occasional ones are near the Pleistocene to Recent *C. verrucosus* Hwass (see Clench, 1942c, pp. 13-14, pl. 8, figs. 1-4). Despite the great variation in the sculpture of the body whorl, certain characteristics—the papilliform nucleus, the shape of the spire whorls, the frilling of the outer lip—are so constant, and the superficial features so gradational, there is no doubt that we are dealing with the same species. In the appendix to his Geologische Studien, Martin (1888) recorded the presence of *C. echinulatus* Kiener (=*C. verrucosus* Hwass) and *C. pygmaeus* Reeve from what is now known as the Mare formation of the Cabo Blanco group in Venezuela. Since the locality of Martin's Conidae is the same as that from which my specimens were collected, I believe it probable that *C. jaspideus caboblanquensis,* n. subsp. is the same as the two species listed by Martin, and that his shells, like mine, are individual variants of one and the same species. Whether any of the variants should be referred to *C. pygmaeus* or *C. verrucosus* is, I think, debatable, and, therefore, the new subspecific name is proposed.

Adult shell of medium size, moderately solid, the angle of spire 76-81 degrees. Whorls 9-1/2 including the nucleus. Nucleus smooth, pupoid or papilliform, consisting of a little over two volutions, the initial tightly coiled and more or less fused with the succeeding, the last globose and larger than the first post-nuclear whorl. The nucleus as a whole forms a nipple-like protruberance at the tip of the spire. The first post-nuclear whorl is narrow and subangulately convex, the angulation forming the medial periphery; the second post-nuclear whorl is carinate around the middle; this carina occurs nearer and nearer the base and forms a shoulder on all subsequent whorls. The ramp above the carina of the third post-nuclear whorl is flattish but succeeding ramps become more and more concave with growth. Sutures fine, distinct. Whorls of the spire covered with prominent, closely spaced fasciolar striae curved to conform with the excavation of the anal outlet which forms a rather deep notch oriented parallel with the short axis of the shell. Generally there are no fine spiral striae on the spire but under a 10-power lens the last whorl occasion-

ally exhibits the merest suggestion of spiral lineation. Ultimate whorl acutely shouldered at the summit, the body slightly convex above, a little concave at the side above the anterior fasciole. Aperture oblique, a little wider toward the base. Base of shell shallowly excavated into an oblique, obtusely angled notch. Outer lip thin at the edge, the inner margin faintly frilled or fluted, the number and character of the frills dependent on the coverage and strength of the external spirals. Invariably, however, the flutings on the inner edge of the outer lip fade upward, and are restricted to the margin of the lip. Anterior fasciole raised, convex, fashioned of three or four rather widely spaced spiral cords and covered completely with closely spaced sigmoidally curved growth striae. Above the anterior fasciole there are two revolving cords, and above these four to six wide revolving bands arranged in a shingle-like pattern with the posterior edge of each band a little higher than the anterior edge. The bands are separated by wide shallow grooves, the uppermost of which is near the middle of the body whorl. Fine axial growth striae cover the surface.

So much for the details of sculpture that are constant. The variability of ornamentation is in the lineation of the upper half of the body whorl and in the amount of beading or nodulation that is present. At one extreme is the *C. pygmaeus* variation with no beads, and with the upper half of the body whorl smooth but with faint rather widely spaced stripes of color built into the shell substance itself. Twenty-eight of the 59 specimens from the type locality fall within this group. At the other extreme is the *C. verrucosus* variation, represented by but one specimen of the 59 from the type locality. On this specimen there are 14 spiral ridges from the top of the anterior fasciole to the shoulder of the whorl and all of these are provided with beads or nodulations, there being about 26 subequally spaced ones on the summit row but only one or two on the spiral ridge just above the anterior fasciole. The beads are largest around the middle of the whorl and decrease in size above and below. Between the extremes there are so many gradations and intergradations that no basis is seen for separation.

A number of the specimens of *C. j. caboblanquensis*, n. subsp. still exhibit faded colorations of light tan, brown, or light peach on what seems to have been a whitish or cream-colored ground. The

color pattern is variable although basically it consists of narrow, often interrupted spiral lineations or stripes of peach or brown, these suffused by irregular, axially disposed, zigzagged streaks of light brown.

Dimensions—Holotype (J180a), length 29.9 mm.; max. width 16.5 mm. Somewhat beaded; paratype (J180b), length 23.7 mm.; max. width 13.0 mm. Highly beaded; paratype (J180f), length 21.7 mm.; max. width 13.1 mm. Completely beaded.

Type locality—Lower Mare formation in small stream 100 meters west of Quebrada Mare Abajo. Fifty-nine specimens.

Other localities—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. One hundred twenty-seven specimens. Mare formation at W-14, on hillside above west bank of Quebrada Mare Abajo. Twenty-four specimens; Mare formation in stream 250 meters south-southwest of mouth of Quebrada Las Pailas. Twenty-six specimens; Mare formation at W-25, south flank of Punta Gorda anticline. One poor specimen, the identification of which is questionable; Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. Four specimens; Playa Grande formation (Maiquetía member) at W-4, Quebrada Las Pailas. Seven specimens; Playa Grande formation (Maiquetía member) at W-26, in Quebrada Las Bruscas, approximately 120 meters upstream from junction with Quebrada Las Pailas. Eight specimens; Abisinia formation at W-30, eastern edge of Playa Grande village. Five specimens, four immature, one a weathered adult.

Comparisons.—The smooth, nonbeaded variety of *C. jaspideus caboblanquensis* is close to *C. pygmaeus* Reeve but seems to differ in being more pointed anteriorly and in having a more deeply excavated anterior notch. Furthermore, large specimens of *C. caboblanquensis* are relatively narrower, and small specimens relatively wider than shells of *C. pygmaeus* of similar length. The partially beaded variation of *C. caboblanquensis* is near *C. stearnsii* Conrad, but that species has a higher spire and the nucleus is not papilliform. The highly beaded variation of *C. caboblanquensis* is like *C. verrucosus* Hwass but may be differentiated from that by its shorter spire, by being proportionately a little wider at the shoulder, and in its somewhat more delicate shell.

In his recent monograph on the marine mollusks of Grand Cayman Island, Abbott (1958, pp. 88-91, pl. 3a - j) considered many of the species mentioned above to be synonymous with, or variants of, *C. jaspideus* Gmelin and showed that *C. jaspideus* exhibits the same range of variation as does the fossil *C. caboblanquensis*. Adult specimens of *C. caboblanquensis* seem consistently to be broader across the shoulder and to have a shorter spire than the various forms of *C. jaspideus* but there is no doubt that it is of the same stock, and if not the same species perhaps the progenitor of the Recent shell. However, as the Venezuelan shell has been found only as a fossil (in the Playa Grande, Mare, and Abisinia formations), and as the fossils are generally broader than the *jaspideus* clan, the new subspecific name *caboblanquensis* is proposed.

Conus (Dendroconus) planitectum, new species Pl. 40, figs. 1, 2

Shell corroded, large, thick, pyriform, the spire low and obtuse, with a divergence of about 146 degrees. Post-nuclear whorls at least eight, the nucleus decollate causing the apex to appear blunt and truncated. Spire whorls hardly convex to flat, the sutures narrow. Body whorl broadly and evenly rounded at the shoulder, the sides tapering rather rapidly toward the base, the profile nearly straight save for a slight contraction near the base above the anterior fasciole. Aperture moderately wide, oblique, the sides nearly parallel. Base shallowly notched, the notch reinforced with incremental layering of shell material. Outer lip thick, the margin rolled toward the aperture from about the middle to near the anterior end, the lip broken back posteriorly. Surface with axial growth striae but seemingly devoid of spiral markings anywhere.

Dimensions.—Holotype (nucleus decollate), length 59 mm.; max. width 36.5 mm.

Type locality.—Playa Grande formation (Maiquetía member) at W-4, Quebrada Las Pailas. One specimen, the holotype.

Comparisons.—Among living Western Atlantic Conidae, the nearest species is *C. ranunculus* Hwass (see Clench, 1942, pp. 32-34, pl. 15, figs. 6, 7). In Venezuelan waters *C. ranunculus* has been found along the Paria Peninsula, at Porlamar on the Island of Margarita, and on Aves Island. It differs from *C. planitectum*, n. sp. in the some-

what lesser divergence of the spire (117 degrees), in being less pyriform, and in being sculptured at the base with spiral threads. Among fossil species, the following ones resemble *C. planitectum* but differ as noted.

Conus brankampi Hanna and Strong (1949, p. 314, pl. 8, fig. 14) from the Pliocene on the south side of Carrizo Mountain, Imperial County, California. The spire is gently concave whereas on *C. planitectum* it is gently convex.

Conus apicum Woodring (1928, pp. 202-203, pl. 9, fig. 3) from the Bowden Miocene of Jamaica. The spire is also slightly concave, and there are obscure wavy threads on the anterior half of the shell.

Conus veatchi Olsson (1922, p. 216, pl. 2, figs. 5, 8) from the Miocene of Costa Rica. This has fine irregular spirals on the base, it is proportionally wider across the shoulder than *C. planitectum,* and the arc from shoulder to spire is sharper than on the Venezuelan shell.

Conus bravoi Spieker (1922, p. 41, pl. 1, fig. 6) from the Miocene of Peru has a somewhat higher spire and is less pyriform than *C. planitectum.*

Conus williamgabbi Maury (1917, p. 200, pl. 5, fig. 2) from the Miocene of the Dominican Republic is subangulately rounded at the shoulder of the body whorl, whereas the shoulder of the Venezuelan species is smoothly and evenly rounded.

Conus (Lithoconus) cf. daucus Hwass **Pl. 40, figs. 3, 4**

1792. *Conus daucus* Hwass, [in] Bruguière, Encycl. Méth., vol. 1, p. 651, var. A.
1830. *Conus mamillaris* Green, Trans. Albany Inst., vol. 1, p. 123, pl. 3, fig. 6.
1843. *Conus arausiensis* Chemnitz, Reeve, Conch. Icon., vol. 1, pl. 20, sp. 114.
1864. *Conus daucus* Linnaeus, Krebs, The West Indian Marine Shells, p. 4.
1864. *Conus daucus* var. *luteus* Krebs, The West Indian Marine Shells, p. 4.
1878. *Conus daucus* Linnaeus, Mörch, Catalogue of West-India Shells, p. 13.
1879. *Conus daucus* Linneaus, Dall, Wagner Free Inst. Sci., Trans., vol. 3, pt. 1, p. 28.
1933. *Conus daucus* Hwass, Trechmann, Geol. Mag., vol. 70, No. 823, p. 37.
1937. *Conus daucus* Bruguière, Smith, East Coast Marine Shells, p. 134, pl. 52, fig. 8.
1942. *Conus daucus* Hwass, Clench, Johnsonia, vol. 1, No. 6, pp. 21-22, pl. 9, figs. 4, 5.
1953. *Conus* (*Lithoconus*) *daucus* Hwass, Olsson and Harbison, Acad. Nat. Sci. Philadelphia, Mon. No. 8, pp. 172-173.
1954. *Conus daucus* Hwass, Abbott, American Seashells, pp. 260-261, pl. 14a.
1958. *Conus daucus* Hwass, Abbott, Acad. Nat. Sci. Philadlphia, Mon. No. 11, p. 93.

1958. *Conus daucus* Bruguière, Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, p. 99, pl. 15, 1 fig.
1959. *Conus daucus* Hwass, Nowell-Usticke, A Check List of the Marine Shells of St. Croix, p. 80.

The single worn and broken fossil referred to this species is small and thick, with a low, slightly concave spire the apex of which is blunt and a little produced. Whorls about eight in all including the nucleus which is indistinct. Spire whorls flattish, marked with two to four spiral threads crossed by fine growth striae. Body whorl slightly overlapping the penultima, the shoulder subangulate. Lower half of body whorl and most of the outer lip are broken away. Aperture narrow and oblique. No surface markings are visible on the upper half of the body. There is a distinct orange cast on the surface, but it is not known whether this is natural or derived secondarily from the enclosing sediment.

Dimensions.—Length (base missing), 11.7 mm.; max. width 9.1 mm.

Locality.—Abisinia formation at W-30, eastern edge of Playa Grande village. One broken specimen.

Remarks.—This immature and poorly preserved shell resembles *C. spurius* Gmelin (*proteus* of authors) on the one hand, and *C. daucus* on the other. *C. daucus* is solidly colored in orange or lemon-yellow, and as there is a more or less uniform bleached orange cast on the fossil, it is tentatively referred to *C. daucus*.

Range and distribution.—*Conus daucus* Hwass ranges from Florida to the southern Caribbean. It has been reported from the Pliocene of Florida and the Pleistocene of Barbados. The Abisinia formation in which the present shell occurs is believed to be Pleistocene.

Conus (Chelyconus) federalis, new species Pl. 40, figs. 5, 6

Shell moderately large and solid, the spire nearly straight-sided in profile, the angle of divergence 120-130 degrees. Post-nuclear whorls at least eight, the nucleus decollate. Earliest post-nuclear whorls subangularly convex, the later ones a little concave, the summit of the last two encroaching slightly on the whorl preceding. The angulation of the first whorls is medial; with growth the angulation develops into a subnodulous shoulder near the base of the

whorl, and with further development the shoulder disappears. Whorls thickened at the summit into a subsutural collar below which are three spiral threads or riblets rendered crenulate by the numerous curved axial growth lines that traverse the shell. These growth lines on the fasciole have a relatively small curvature indicating that the anal notch of the shell is not deeply indented. The spiral riblets on the spire are confined to the posterior half of the whorl, the anterior half being more or less smooth. Sutures narrowly channeled to slightly gaping. Body whorl subrounded and smooth at the shoulder, slightly concave at the base, ornamented with about 32 subequal to unequal low revolving cords with occasional interstitial threads; the lowest nine or ten threads above the fasciole become successively larger toward the base and develop into rounded riblets with distinct concave interspaces. The anterior fasciole is a little convex, fashioned of about four fused spiral ribs crossed by numerous fine axial incrementals. Body of shell traversed by numerous fine and coarse axial growth markings which tend to nodulate the basal spiral ribs. Aperture oblique, widest anteriorly. Outer lip broken along the rim, the anal notch also destroyed. Lower lip long, bayonet-like, a narrow sulcus separating it from the adjacent fasciole. Anterior canal broad, the notch virtually absent. Around the middle of the body whorl and above the anterior fasciole there is a faded white band, with clouds, suffusions, and streaks of light tan over the rest of the surface.

Dimensions.—Holotype (nucleus decollate), length 45.4 mm.; max. width 23.9 mm.

Type locality.—Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. One specimen, the holotype.

Comparisons.—*C. federalis,* n. sp. is close to the Recent *C. juliae* Clench (1942, pp. 26-27, pl. 12, fig. 4) dredged nine miles off Fort Walton, Florida, in 15 fathoms, but one difference that is immediately noticeable is that the spire of *C. juliae* is higher and considerably more attenuated. In the Eastern Pacific the nearest analogue is *C. purpurascens* Broderip (in Sowerby, 1833, Conch. Ill., p. 1 [117], pl. 25, fig. 13) which inhabits the coast from Baja California to Ecuador, in tide pools and rocky shores; the principal dif-

ference is that *C. federalis* is more pointed anteriorly. *C. purpurascens* is an extremely variable form both in shape and coloration. The "typical" shell has a low spire and strongly shouldered whorls, but there are endless variations to the rounded form known as *C. regalitatis* Sowerby. Krebs (1864, p. 6) listed *C. purpurascens* from Guadeloupe in the West Indies, but according to Hanna and Strong (1949, p. 300) this may have been an error of locality or identification.

TEREBRIDAE

Terebra (Strioterebrum) gatunensis kugleri Rutsch — Pl. 40, figs. 12, 13; Pl. 45, figs. 24, 25

1888. *Terebra rudis* ? Gray, Schepman, [in] Martin, Bericht über eine reise nach Nederlandisch West-Indien und drauf gegründete Studien, Leiden: II—Geologische Studien, Appendix. Not of Gray 1834.
1934. *Terebra (Strioterebrum) gatunensis kugleri* Rutsch, Schweiz. Palaeont. Gesell., Abh., vols. 54-55, pp. 106-108, pl. 8, figs. 18, 19; pl. 9, figs. 12, 13.

The Cabo Blanco shell referred to *T. kugleri* is of medium size, slender, the spire acuminate, the apex often slightly bent, the angle of spire below the apex about 15 degrees. Fully grown, the species has nearly 18 whorls in all, the nucleus consisting of 1-1/2 or 2 of them. Nucleus smooth, subhyaline, the tip fused and indistinct, the initial turn full, a little offset from the last which is bulbous and larger than the first post-nuclear whorl, and is defined from the conch by the appearance of axial riblets. First post-nuclear whorl flat-sided, sculptured by 14 to 18 curved axial ribs extending from suture to sutre with four or five spiral grooves in the interspaces. Subsequent whorls are provided with a collar immediately below the suture the collar marked with subequal longitudinal riblets. Below the collar the sculpture consists of rather narrow, subequal axial cords and lower spiral ridges, the intercepts beaded, the general pattern subreticulate. Mature shells have an average of 33 axial cords on the penultimate whorl, but there may be as many as 38 and as few as 30, one specimen having only 25. Generally there are four spiral ridges below the collar, but here again the number may vary; one specimen has but three and several have five or six. The spacing of the spiral ridges is also variable. On some of the specimens the ridges are more or less equal, on others the interspace is wider below the first or second spiral ridge. On a number

of specimens the posterior spiral ridges are stronger than the anterior, but this is not constant. The subsutral collar is prominent and broad, occupying a little over a third of the whorl; it is crenulated by broad axial riblets or folds about equal in number to the axial cords below but larger than those. The collar is thicker posteriorly and projects slightly beyond the preceding whorl. On later whorls, the furrow below the collar is fairly deep and wide, but on the earliest whorls, the space below the collar is represented by a fine groove. Surface covered with numerous axial growth striate. Sutures narrowly impressed, hardly distinguishable. Aperture sinuously lenticular. Outer lip broken back on all specimens. Columella with two strong folds of about the same size; the lower one forms the margin of the canal. Parietal wall with a thin covering of enamel, rather deeply excavated above the posterior of the columellar folds. Siphonal fasciole flattish to undulatory, built up of arched incrementals, bordered by a strongly keeled ridge which continues around to form an emargination on the side of the terminal notch. Above the keel, the base is severely contracted into a deep broad furrow. Last whorl with an average of 13 coarse nodulous spiral ribs of unequal size, and nearly obsolescent axial cords, the ribs usually present in the furrow at the base. Anterior canal short, broad, and deep, recurved backward at the extremity, the siphonal notch large and broadly U-shaped.

Dimensions.—Figured specimen (J186a), length 38.3 mm.; max. width 9.5 mm.; largest specimen, length 56.9 mm.; max. width 12.2 mm.

Cabo Blanco localities.—Lower Mare formation, in small stream 100 meters west of Quebrada Mare Abajo. Twenty-five specimens; lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. Twenty-four specimens; Mare formation at W-14, on hillside above west bank of Quebrada are Abajo. Three specimens; Mare formation, in stream 250 meters south-southwest of mouth of Quebrada Las Pailas. Eight specimens; Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. One worn and broken specimen, the identity of which is doubtful (see pl. 45, figs. 22, 23).

Remarks.—This species is near *T. dislocata* (Say) (1822, p. 235)

which ranges from Miocene to Recent. However, the Cabo Blanco shells have a greater number of axial cords, the groove below the subsutural collar is more pronounced, and the two columellar folds are not fused as they are on *T. dislocata*. It is not unlikely that the Cabo Blanco *T. g. kugleri* is identical with what Schepman referred to as *T. rudis* Gray since it is listed from the same locality that our shells are from. Dall (1890b, p. 24) believed Gray's *T. rudis* to be synonymous with Say's prior-named *T. dislocata*. In all probability Schepman's *T. rudis* is not the *T. rudis* of Gray (1834, Zool. Soc. London Proc., p. 60), and Rutsch has, therefore, re-named the Venezuelan shell *T. gatunensis kugleri*.

Type locality.—Punta Gavilan beds, (upper Miocene-Pliocene) at Punta Gavilan on the coast of Falcon, Venezuela. Rutsch also reported *T. kugleri* at Sabanas Altas, about 27 kilometers west-northwest of Punta Gavilan. The Cabo Blanco localities given above are in the Distrito Federal, Venezuela, about 220 kilometers southeast of Punta Gavilan.

Terebra (Strioterebrum) trispiralis, new species Pl. 40, figs. 14, 15

Shell small, slender, moderately solid, the angle of spire about 16 degrees below the somewhat more tapering apex. Nucleus decollate. Post-nuclear whorls remaining nine, the perfect example probably with 10 or 11. Earlier whorls subpyramidal, the sides with more of a slope than on the later whorls. Sculpture consists of spiral ribs and axial cords, tuberculated at their intersections. The axial cords are higher but a little smaller than the spiral ribs, they extend from suture to suture, and, on the ultimate whorl, there are 17 of them. There are three coarse spiral ribs on each whorl, the bottom one followed by a spiral thread at the suture. On all whorls, the lowest rib is the largest; on all but the last several whorls the two upper ribs are about equal in size; on the penultimate and ultimate whorls, the upper subsutural rib at the summit is a little larger than the rib below. On the body whorl the largest rib is at the periphery, and under this there are two beaded spiral riblets followed below by five crenulated spiral fillets of varying size to the top of the siphonal fasciole. Siphonal fasciole moderately convex, composed of incrementals arched upward. Aperture sublenticular.

Outer lip broken back. Base of columella thickened into a fold which margins the canal. Immediately above the fold there is a faint sulcus rendering the base of the columella vaguely biplicate, the marginal thickening being by far the more pronounced. Parietal wall with a sheath of enamel which continues to the anterior extremity of the shell, the margin of the enamel raised slightly above the surface. Anterior canal short, moderately deep and broad, a little twisted, the extremity excavated into a shallow, broadly U-shaped notch.

Dimensions.—Holotype, length (9 whorls) 12.5 mm.; max. width 2.5 mm.

Type locality.—Lower Mare formation, in small stream 100 meters west of Quebrada Mare Abajo. One specimen, the holotype.

Comparisons.—I have seen no close counterpart of this species although it does have a little in common with *T. spirifera* Dall var. *midiensis* Olsson (1922, p. 211, pl. 1, fig. 7) from the Miocene at Middle Creek, Costa Rica. Like *T. trispiralis,* n. sp., the Costa Rican shell is also sculptured by three beaded spiral ribs, the difference being that the posterior or subsutural rib is the largest of the triad on *T. midiensis* whereas on *T. trispiralis* the anterior rib is the largest.

Terebra (Strioterebrum) quadrispiralis, new species Pl. 41, figs. 1-4

Shell small, slender, elongate, the angle of spire 13 degrees. Nucleus and tip of spire decollate, whorls remaining eight. Sculpture consisting of four broad low spiral ribs and (on the ultimate whorl) 19 moderately elevated axial cords, the intersections prominently beaded. Of the ribs, the one forming the subsutural collar at the summit is a trifle wider than the three below, and is separated from them by a furrow that is a little wider than the shallow interspaces of the others. The three lower ribs are about equal in size, and under the interspace of the lowest one there is a nodulous spiral thread immediately atop the finely incised suture. The axial cords extend from suture to suture. Their regular interspaces are about the same width as the cords themselves. Base short, constricted into a moderate waist above the fasciole, sculptured by about eight beaded or crenulated spiral riblets of varying size, the two of them just below the periphery of the whorl the strongest. Aperture arcuately

sublenticular, constricted a little anteriorly to form the moderately deep, somewhat twisted canal which is recurved a little backward at the extremity where there is a small depression between the basal and outer lips. Outer lip broken back. Base of columella with two folds, the upper one feeble, the lower one strong, forming an emargination along the side of the canal. Columella and parietal wall enameled, the distal margin of the enamel sharply defined from, and raised slightly above the surface of the whorl. Siphonal fasciole moderately large, hardly convex, incrementally striated, separated from the waist above by a low but moderately sharp keel.

Dimensions.—Holotype (I190a,) length (8 whorls) 13.5 mm., max. width 4 mm.; paratype (G190b), length (5 whorls) 9 mm.; max. width 3.6 mm.

Type locality.—Lower Mare formation at W-13, on hillside, above west bank of Quebrada Mare Abajo. One specimen, the holotype.

Other localities.—Mare formation at W-14, on hillside above west bank of Quebrada Mare Abajo. One broken and worn specimen, the paratype.

Comparisons.—Although none is identical, there are three species, all from middle-upper Miocene deposits, that resemble *T. quadrispiralis,* n. sp. The nearest, perhaps, is *T. alaquaënsis ulaqua* Mansfield (1935, p. 17, pl. 1, fig. 3) from Vaughan Creek, Walton County, Florida, but this has a wider subsutural rib than *T. quadrispiralis,* and the beads are not so large. The second is *T. spirifera,* Maury (1917, pp. 188-189, pl. 3, figs. 15, 16) from Cercado de Mao and the Río Cana in the Dominican Republic. Maury's species, which is not to be confused with *T. bipartita spirifera* Dall (1903, pl. 59, fig. 13), is at once distinguished from *T. quadrispiralis* by the two sharp folds on the columella. The third form, *T. eleutheria* Woodring (1928, p. 139, pl. 3, figs. 9-11) from Bowden, Jamaica, has narrower spiral ribs and smaller beads than *T. quadrispiralis.*

Terebra (Hastula) cinerea (Born) Pl. 41, figs. 5-8

1780. *Buccinum cinereum* Born, Testacea Musei Caesarei Vindobonensis, p. 267, pl. 10, figs. 11, 12.
1864. *Terebra cinerea* (Born), Krebs, The West Indian Marine Shells, p. 33.

1878. *Terebra cinerea* (Born), Mörch, Catalogue of West-India Shells, p. 12.
1885. *Terebra cinerea* (Born), Tryon, Man. Conch., vol. 7, p. 31, pl. 9, fig. 67.
1889. *Terebra* (*Hastula*) *cinerea* Gmelin, Dall, U. S. Nat. Mus., Bull. 37, p. 94.
1889. *Terebra* (*Hastula*) *cinerea* Gmelin, Dall, Mus. Comp. Zool. Bull., vol. 18, p. 63.
1891. *Terebra cinerea* Gmelin, Baker, Acad. Nat. Sci. Philadelphia, Proc., vol. 43, p. 49.
1901. *Terebra* (*Hastula*) *cinerea* (Born), Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, p. 382.
1922. *Terebra cinerea* (Born), Maury, Bull. Amer. Paleont., vol. 9, No. 38, p. 58.
1926. *Terebra cinerea* (Born), Weisbord, Nautilus, vol. 39, No. 3, p. 84.
1937. *Terebra* (*Hastula*) *cinerea* (Born), Smith, East Coast Marine Shells, p. 133, pl. 51, fig. 2.
1938. *Terebra cinerea* Gmelin, Richards, Geol. Soc. Amer., Bull., vol. 49, pt. 2, p. 1293.
1946. *Terebra* (*Hastula*) *cinerea* (Born), Jaume, Soc. Malac. "Carlos de La Torre", Rev., vol. 4, No. 3, p. 109.
1952. *Terebra cinerea* (Born), Pulley, Texas Jour. Sci., vol. 4, No. 2, p. 177, pl. 3, fig. 10.
1954. *Terebra cinerea* (Born), Abbott, American Seashells, p. 266, pl. 26g.
1958. *Terebra cinerea* (Born), Coomans, Caraibisch Marien-Biologisch Inst., Collected Papers 6, p. 101, pl. 9, 1 fig.
1959. *Terebra cinerea* (Born), Nowell-Usticke, A Check List of the Marine Shells of St. Croix, p. 81.

Venezuelan Recent shell slender, the angle of spire 15-18 degrees. Whorls flat-sided, with small faint axial riblets extending half way down, the ultima with about 40 of them. Color cream, with a brown ring below the suture and a light brown stripe emerging from the aperture. The characteristic minute punctations on the surface have been smoothed off.

Dimensions.—Recent specimen (apex decollate), length 29 mm.; width 7.2 mm.; fossil specimen (apex decollate), length 13.5 mm.; max. width 4.2 mm.

Localities.—Recent, on beach of Playa Grande Yachting Club, Distrito Federal. Four worn specimens; Abisinia formation at W-30, eastern edge of Playa Grande village. One specimen with 22 riblets.

Range and distribution.—This is a shallow-water species ranging from the Gulf of Mexico and southeast Florida, to northern South America. It has been reported from the Pleistocene of Louisiana at New Orleans pumping station No. 7 by Maury, and from the Pleistocene of Florida, in spoil banks of Crane Creek, 4.5 miles west of Melbourne, by Richards. *T. jamaicensis* C. B. Adams (see Clench and Turner, 1950, pp. 297-298, pl. 38, fig. 22) may be the same.

Terebra (Hastula) hastata mareana, new subspecies Pl. 41, figs. 9-12

Shell elongate-pupoid, the tip of the spire abruptly tapering, the angle of spire below the tip, 11 to 13 degrees. Whorls nearly 15 including the nucleus which consists of about 2-1/2 of them. Nucleus subhyaline, the initial whorl rather loosely coiled, the last somewhat globose and larger than the first post-nuclear whorl from which it seems a little offset. Post nuclear whorls flat-sided, sculptured by axial costae accompanied, on the later whorls, by axial striae. The costae, which range in number from 25 to 36 on the last whorl, extend from suture to suture, encroach just a little on the base of the preceding whorl, and are smooth and subtriangular, are broad at the base and sharply rounded at the crest; on the body whorl the costae play out about four-fifths of the way down from the suture so that base is smoothish except for the axial striae. The costae generally are staggered from whorl to whorl but on all specimens there are some which are in line with the ones above. Sutures finely channeled, undulatory. Aperture lenticular. Outer lip thin at the edge, joined subparallel with the whorl. Inner lip and parietal wall enameled, the enamel adherent. Pillar formed by a strong twisted fold at the base of the columella, the fold margining the side of the siphonal canal. The siphonal fasciole is a convex bulge, with a sulcus or depression on either side; above the upper sulcus there is a raised ridge which wedges out to form an emargination at the extremity of the canal. Siphonal canal short, broad, and deep, the anterior end a slightly recurved lip, the extremity excavated into a broad, U-shaped notch.

Dimensions.—Holotype (T187a), length 29.2 mm.; max. width 7.1 mm., No. 26330; paratype (J187b), length (nucleus decollate 27 mm., max. width 8 mm., No. 26331 PRI.

Type locality.—Mare formation, in stream 250 meters south-southwest of the mouth of Quebrada Las Pailas. Four specimens, including holotype.

Other localities.—Lower Mare formation, in small stream 100 meters west of Quebrada Mare Abajo. Four specimens, including paratype; lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. Two specimens.

Remarks—The Venezuelan fossil is much like the living *T. hastata* (Gmelin), and if not identical with it may well be its progenitor. In comparing my shell with specimens *T. hastata* from various localities, the only differences I can detect are that the fossil has one more whorl than the true *T. hastata* and possesses a greater number of axial costae, the range being 25 to 36 as compared with 19 to 26 on the living forms. To emphasize the general similarity, yet distinguish the fossil from the living *T. hastata*, the subspecific name of *T. hastata mareana* is proposed for the Cabo Blanco shell.

TURRIDAE

Clathodrillia gibbosa (Born) Pl. 41, figs. 13-15

1778. *Murex gibbosus* Born, Index Rerum Naturalium Musei Caesarei Vindobonensis. Pt. 1. Testacea, p. 325.
1780. *Murex gibbosus* Born, Testacea Musei Caesarei Vindobonensis, p. 321, pl. 11, figs. 12, 13.
1839-40. *Pleurotoma gibbosa* (Born), Kiener, Icon. Coq. Viv., *Pleurotoma,* p. 35, pl. 16, fig. 2.
1843. *Pleurotoma gibbosa* (Born), Reeve, Conch. Icon., vol. 1, pl. 5, sp. 30.
1884. *Drillia gibbosa* (Born), Tryon, Man. Conch., vol. 6, p. 179, pl. 9, fig. 54.
1918. *Clathodrillia gibbosa* (Born), Dall, U. S. Nat. Mus., Proc., vol. 54, No. 2238, pp. 317, 323.
1940. *Turris gibbosa* (Born), Smith, World-wide Sea Shells, p. 80, fig. 1110.
1953. *Clathrodrillia gibbosa* (Born), Olsson and Harbison, Acad. Nat. Sci. Philadelphia, Mon. No. 8, p. 368, pl. 16, figs. 1, 1a.

Cabo Blanco shell of medium size, moderately sturdy, turrited, the angle of spire about 22 degrees. Whorls 13-1/2 in all, the nucleus consisting of 2-1/2 of them. Nuclear whorls smooth, the first and second a little canted, the second swollen, the last only slightly convex, defined from the conch by the first axial rib. Early post-nuclear whorls subtrapezoidal, the later ones slightly convex, tabulately shouldered, the shelf or ramp above the shoulder rather deeply excavated and bordered immedately by a narrow, thickened collar at the suture. Sutures finely incised. Sculpture consisting of elevated axial ribs crossed by spiral fillets or bands which are stronger in the interspaces of the axial ribs than they are on the crest. The axial ribs increase progressively in number with the growth of the shell, and are broader on the earlier whorls than on the later. On the penultimate whorl there are 26 to 29 high narrow subequal axial ribs with much wider interspaces. The ribs terminate anteriorly at the suture and posteriorly at the edge of the shelf; on the shelf itself they

become incremental, curve sharply and protractively, and ascend the subsutural collar to the suture. The spiral fillets, of which there are five or six on the penultimate whorl, are compounded of fine threads. The sculpture pattern is more or less clathrate, and the crests of the axial ribs are faintly nodulous. On the body whorl, the axial ribs extend from the shoulder to the base, and on the base they continue as cords to the top of the anterior fasciole. Also on the base there are three to five unequal revolving cords, and the top of the anterior fasciole is margined by a sharp narrow revolving ridge. Traversing the whole of the surface are numerous longitudinal growth striae and very fine spiral threadlets. Anterior fasciole wedge-shaped, built up of numerous fine incrementals which are arched upward high on the fasciole but are somewhat sinuous below. Aperture lenticular. Outer lip thin at the edge, convexly arcuate forward, the inner margin strongly fluted. A short distance back of the edge is the last axial rib, and farther back there is a broad elevated humped varix, the varix located above, but in line with the terminal notch, covering the width of about four axial ribs, and extending upward to the ramp. Columella and parietal wall heavily and smoothly callused, the callus thickened into a prominent parietal tooth at the anal notch, the distal margin of the callus raised slightly. Anal notch cut deeply into the shelf, the inner side of the notch semicircular, the apertural side narrowed by the ascending summit of the outer lip, the inner margin of the notch somewhat thickened. Anterior canal short rather broad, bent back, the terminus deeply excavated into a squarish, slightly oblique notch. A definite stromboid notch occurs a short distance above the base of the outer lip, the notch appearing at the margin of the shallow exterior furrow which encircles the base and terminates at the callus a little above the middle of the columella.

Dimensions.—Figured specimen (apex decollate), length 52.5 mm.; max. width 18.2 mm.

Cabo Blanco localities.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. Six specimens; lower Mare formation, in small stream 100 meters west of Quebrada Mare Abajo. Three specimens; upper Mare formation, in stream 250 meters south-southwest of mouth of Quebrada Las Pailas. One specimen.

Remarks.—The Cabo Blanco fossil is so close to the Recent *C. gibbosa* from the type locality of Cumaná, Venezuela, that it is believed to be the same. The fossil has a few more axial ribs (26-29) than the Recent *C. gibbosa* from Cumaná figured by Olsson and Harbison, and on one specimen I have seen from Cumaná, the shoulder of the Recent shell is a little more angulate. These differences probably fall within the normal range of individual variation.

Range and distribution.—The habitat of the Recent *C. gibbosa* (Born) as known to date is the southern Caribbean. This is the first report of the species as a fossil.

Clathodrillia mareana, new species Pl. 41, figs. 16, 17

Shell of medium size, turrited, the angle of spire about 33 degrees. Post-nuclear whorls a little over 11, the nuclear ones decollate except for the last, the demarcation between the nucleus and conch marked by the first axial rib. Early post-nuclear whorls subtrapezoidal, the later ones slightly convex, tabulately shouldered, the fasciolar sinus or shelf above the shoulder rather deeply and concavely furrowed and bordered by a slightly swollen unkeeled collar at the suture. Sutures finely incised, minutely undulated by the costals of the preceding whorl. Sculpture consisting of elevated axial ribs crossed by spiral fillets or bands which are more pronounced in the interspaces than they are on the crest of the ribs. The ribs increase progressively in number with the growth of the shell, and are broader on the earlier whorls than on the later. On the ultimate whorl there are 25 to 29 high narrow subequal axial ribs with much wider interspaces, the ribs terminating anteriorly at the suture; posteriorly they tend to become obsolescent at the shoulder but continue as sharply curved protractive incrementals across the fasciolar shelf, ascending the subsutural collar to the suture. The spiral fillets or bands, of which there are generally four to six on the penultimate whorl, are compounded of fine threads, and often a few feeble spiral threads or cords are visible on the fasciolar sinus. The sculpture is more or less clathrate, and the crests of the axial ribs are faintly nodulous. On the body whorl, the axial ribs extend from the shoulder

to the basal constriction and there they continue as cords or incrementals to the top of the anterior fasciole. Also on the base there are four or five unequal revolving cords, with the top of the anterior fasciole being margined by a sharp narrow revolving ridge. Traversing the whole of the surface are numerous longitudinal growth striae. Anterior fasciole moderately convex, wedge-shaped, built up of numerous concentric incrementals which are arched upward high on the fasciole but are somewhat sinuous below. Aperture clavate, widest above the middle. Outer lip broken back on all specimens but it is believed to be thin and nonvaricate. The notch at the posterior fasciole is also broken away but there is a shallow stromboid notch a short distance above the base of the outer lip, with a shallow exterior furrow leading away from it and encircling the body where it terminates at the far margin of the columella near the top. Columella heavily and smoothly callused, the callus adherent and often with a shallow longitudinal depression on the distal side of the parietal wall. Anterior canal short, bent back a little, the terminus excavated into a fairly broad and deep, slightly oblique, U-shaped notch.

Dimensions.—Holotype (tip of spire missing), length 35 mm.; max. width 13 mm.

Type locality.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. Six specimens.

Other localities.—Upper Mare formation near W-14, on hillside above west bank of Quebrada Mare Abajo. One specimen, the identification doubtful; Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. One specimen; Playa Grande formation (Maiquetía member) at W-4, Quebrada Las Pailas. One specimen.

Comparisons—This fossil species occurs together with the fossil *C. gibbosa* (Born) in the Cabo Blanco area just as a similar Recent Caribbean shell labelled *gibbosa* is placed together with the Recent varicated *C. gibbosa* in the collection at the Academy of Natural Sciences of Philadelphia. The principal differences between the new species and my fossil *C. gibbosa* are these: the spire angle of *C. mareana,* n. sp. is greater; *C. mareana* lacks the parietal node or tooth of *C. gibbosa;* the callus is not raised along the margin as on the typical *C. gibbosa;* and on none of the specimens of *C. mareana*

is there the prominent dorsal hump of *C. gibbosa*. On the other hand, the sculpture, the shape and number of whorls, and general appearance are so much like *C. gibbosa* that one wonders if in truth we are not dealing with the same species, the differences being attributable perhaps to the stage of maturity of the shell or to the sex of the animal. However, with only a few examples available, the differences noted above (particularly in the angle of spire) are taken as evidence in considering the present shell distinct from *Clathodrillia gibbosa* (Born). *C. mareana,* n. sp. seems to be closely related to the Recent *C. ostrearum* (Stearns) from Florida as figured by Olsson and Harbison (1953, p. 368, pl. 16, figs. 2-3b), but that has a keeled subsutural collar and fewer axial ribs than the Venezuelan fossil. A Caribbean Miocene relative is *Pleurotoma venusta* Sowerby (1849, p. 50, pl. 10, fig. 7), but typically, *P. venusta* is characterized by a dorsal hump or varix. The other widespread Caribbean Miocene turrid, *Pleurotoma consors* Sowerby (1849, p. 50) is much more slender than *Clathodrillia mareana,* n. sp.

Kurtziella tropica, new species Pl. 41, figs. 18-21

Shell small, moderately slender, turrited, the angle of spire about 25 degrees. Whorls nearly eight in all, including the nucleus. Nuclear whorls 1-1/2, smooth, hyaline, the initial tightly coiled, the last inflated but narrow. The first post-nuclear whorl is convex with a faint angulation near the middle, cancellated by numerous fine arcuately transverse riblets and about five minutely beaded spiral threads of which the one at the periphery is slightly more prominent than the others. The demarcation between the nucleus and conch is defined by the abrupt initiation of the cancellate sculpture on the first post-nuclear whorl. Remaining post-nuclear whorls strongly angulate submedially, sculptured by 14 axial costae or folds and closely spaced, fine, delicately beaded or frosted spiral threads. The axial costae start on the ramp about halfway down from the upper suture and continue in full strength to the lower suture, the costae being slightly nodulous on the peripheral angulation. On the spire and upper half of the body whorl the spiral threads are equal to subequal in size and are very fine; on the lower half of the body whorl, from opposite the commissure to the top of the stem, there

are about five somewhat larger spiral threads with two or three finer threads between; on the stem to the top of the anterior fasciole, the threads are again numerous, very fine, subequal, and minutely granulate. Sides of body whorl flattish, the flat-sided area lying between the shoulder angulation and commissure thread. Sutures finely impressed. Anterior fasciole hardly distinguishable, built up of spiral threads. Aperture oblanceolate, moderately wide, slightly oblique. Outer lip partially broken, thin-edged, recurved slightly toward the aperture, smooth within. Parietal wall smoothly glazed. Anterior canal short, broad, fairly deep, bent back slightly, the terminal notch arcuate, shallow, and nonemarginate.

Dimensions.—Holotype, length 4.6 mm.; max. width 1.8 mm.

Type locality.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. Two specimens, including the holotype The second specimen is worn and immature, and its identification is doubtful.

Comparisons.—This species is like *K. limonitella* (Dall) (Dall, 1883, U. S. Nat. Mus., Proc., vol. 6, 1884, p. 329, pl. 10, fig. 10) from the southern United States (Pliocene to Recent), but differs from that in having a flat-sided body whorl and heavier spiral cords on the base. *K. limonitella margaritifera* Olsson and Harbison (1953, p. 392, pl. 23, figs. 2, 2a), another Pliocene to Recent form from west Florida, is much more strongly carinate than *K. tropica,* n. sp., and has a wider aperture. Among the numerous Mangeliinae in the Bowden Miocene of Jamaica, the present shell is reminiscent of *Cryoturris euengonia* Woodring (1928, p. 180, pl. 7, fig. 5), but that has a more rapidly tapering spire, and the sides of the body whorl are not flattened. In the Pliocene of Florida, *Cryoturris serta* Olsson and Harbison (1953, p. 393, pl. 23, figs. 1-1b) is another similar species, but the first post-nuclear whorl of *Cryoturris serta* is sculptured by fine axial riblets only, whereas on *K. tropica* the first post-nuclear whorl is sculptured reticulately by axial riblets and spiral threads. An even closer similarity is seen between the Venezuelan *K. tropica* and *Mangilia magnoliana* Olsson (1916, p. 124, pl. 2, fig. 11) from the upper Miocene Duplin formation at Natural Well, North Carolina. The latter does not have the larger spiral threads on the base as does *K. tropica,* nor is the anterior canal as prominent,

but otherwise the tropical *K. tropica* and the more northern *K. magnoliana* appear to be akin.

Kurtziella caribbeana, new species Pl. 42, figs. 1, 2

Shell small, moderately slender, turrited, the angle of spire about 25 degrees as measured along the carinae of the last three whorls. Whorls about 6-1/2 including the 1-1/2 smooth nuclear ones. Initial whorl of the nucleus tightly coiled and canted, the last convex, defined from the conch by the first of the microscopic, arcuate axial threads. The earliest post-nuclear whorl is well rounded and sculptured, to begin with, by fine arcuate axial threadlets; a little farther on the whorl becomes somewhat angulate near the middle at the incoming of four spiral threads which, together with the axial ones, produce a cancellate or reticulate pattern. Later, the third spiral from the top forms a submedial carina, and a fifth spiral thread is introduced near the anterior suture, the whorl now having two spiral threads above the carina and two below. Thereafter all of the whorls are strongly angulated or carinated submedially. Above the carina, the slopes of the ramp are concave; below the carina, the sides of the whorl are directed inward, sharply so on the third whorl of the spire, moderately so on the succeeding ones. Sutures finely impressed, distinct. The axial sculpture of the lower whorls consists of narrow, rather sharply rounded costae, nodulous at the carina, straight to a little flexuous on the ramp where they tend to become obsolescent near the posterior suture, strong and straight below the carina and continuing to the anterior suture. On the body whorl, the 12 axial costae extend to the anterior fasciole, weakening perceptibly, however, toward the base. The intercostal areas are shallowly concave, wider than the costae themselves. The spiral sculpture of the adult whorls consists, above the carina, of closely spaced, microscopic, frosted threadlets of more or less equal size. On the first of the strongly carinate whorls there is a fine spiral threadlet and several microscopic striae below the carina; on the succeeding whorl there is a spiral thread just under the carina and another at the suture, with an intermediate thread developing as the penultimate whorl is approached; in the spaces between these threads there are microscopic spiral striae or lineations. Body whorl flat-sided around the middle, ornamented with fine subequal spiral threads,

the one emerging from the suture a little sharper than the others. Anterior fasciole hardly differentiated, built up of fine threads and an occasional transverse groove. Aperture oblanceolate, moderately narrow. Outer lip broken back, probably thin at the edge as it is at the union with the whorl where it forms an acute angle. Columella somewhat sinuous, smoothly callused, the distal margin of the callus sunk slightly below the surface of the whorl. Anterior canal rather short, of moderate width, the extremity thin, shallowly notched.

Dimensions.—Holotype, length 3.4 mm.; max. width 1.1 mm.

Type locality.—Playa Grande formation (Maiquetía member) at W-26 in Quebrada Las Bruscas, about 120 meters upstream from its junction with Quebrada Las Pailas. One specimen, the holotype.

Comparisons.—This species resembles the previous species *K. tropica,* n. sp. from the lower Mare formation, but differs in the following respects: *K. tropica* (which is a more fully grown shell) has 14 axial costae, *K. caribbeana,* n. sp., 12; on the slope below the carina all of the spiral threads on *K. tropica* are about equal in size whereas on the nether slope of the present shell there are two or three threadlets that are sharper than the others; on *K. tropica* the distal margin of the columella is level with the surface of the whorl, on *K. caribbeana* it is sunken a little below; the angle made by the summit of the outer lip with the whorl is obtuse on *K. tropica,* acute on *K. caribbeana;* the anterior canal of *K. tropica* is a little wider than that of *K. caribbeana,* and the terminal notch is a little more excavated than on the latter. Whether these differences are significant remains to be seen when more material becomes available, but at present I would consider the two species distinct.

Kurtziella venezuelana, new species Pl. 42, figs. 3-5

Shell small, moderately slender, turrited, the angle of spire 26-29 degrees. Whorls about eight in all, the smooth white hyaline nucleus composed of 1-1/2 of them. Tip of initial nuclear whorl tightly coiled, the wall erect; last nuclear whorl convex and narrow, the demarcation between the nucleus and conch defined by the first fine axial thread. The first 1-1/2 post-nuclear whorls are also hyaline, convex, reticulated or cancellated by numerous fine, arcuately transverse riblets and four equally spaced spiral threads. Thereafter the

whorls are porcelaneous, the axials are stronger and fewer, and the spiral threads sharper; the periphery of the whorls is strongly angulated submedially, the slope or ramp above the carina somewhat concave in the intercostal areas, the sides of the base of the whorl directed inward at a slight angle from the perpendicular. On the later whorls there are 10 strong axial costae extending from suture to suture, the costae slightly offset from whorl to whorl, the interspaces somewhat wider than the costae themselves. Surface covered with finely beaded or frosted spiral threads and cords. On the lower half of the whorls there are three spiral cords, one at the angulated periphery, another flexuous one immediately above the suture, and a third midway between. A smaller secondary cord occurs between the primaries, and on either side of the secondaries there is a still smaller tertiary thread. On the ramp or upper slope of the whorls there is a secondary spiral cord a short distance above the carina, with two tertiary threads between the secondary cord and carina, and about six tertiary threads above the secondary cord to the suture, the sutures being covered. On the body whorl the axial costae converge toward, and become obsolescent on the base, and there are numerous finely beaded spiral threads and cords alternating in size. Anterior fasciole convex, hardly differentiated, made up of half a dozen spiral threads and a few fine transverse grooves. Aperture subtriangular, widest near the middle. Outer lip broken below, the summit joined to the whorl at an obtuse angle, the last axial fold occurring near the elge of the lip. Columella and parietal wall with a smooth, impressed callus. Anterior canal of moderate length and width, the extremity thin and more or less truncate.

Dimensions.—Holotype, length 5.2 mm.; max. width 2.5 mm.

Type locality.—Mare formation near W-14, on hillside above west bank of Quebrada Mare Abajo. One specimen, the holotype.

Comparisons.—*K. venezuelana,* n. sp. superficially resembles the preceding described *K. tropica,* n. sp., but is distinguishable from that by its fewer axial costae which, unlike those of *K. tropica,* extend from suture to suture. *K. venezuelana* is even closer to *Saccharoturris consentanea* (Guppy) (Guppy and Dall, 1896, p. 307, pl. 27, fig. 4) from the Bowden Miocene of Jamaica (see Woodring, 1928, p. 183, pl. 7, fig. 11), but the peripheral keel of the Jamaican

species is considerably sharper. *K. limonitella margaritifera* Olsson and Harbison (1953, p. 392, pl. 23, figs. 2, 2a), a Pliocene and Recent species from west Florida, has a shorter and broader anterior canal than *K. venezuelana*. *Mangilia quadrata monocingulata* Dall (1889a, p. 102, pl. 11, fig. 15) dredged off Barbados in 100 fathoms is another similar shell but the whorls of *M. monocingulata* are more acutely angled above and below the peripheral keel, and that species lacks the flexuous spiral cord just above the suture. *K. eritima* (Bush) as described and illustrated by Gardner (1948, pp. 270-271, pl. 37, fig. 13) is yet another form exhibiting kinship to *K. venezuelana*, but the earliest post-nuclear whorls are not reticulate as they are on *K. venezuelana*, the spiral threads are coarser and more irregular than on *K. venezuelana*, and the anterior canal is shorter and broader than is that of the Venezuelan fossil. *K. eritima* ranges from upper Miocene to Recent, the living form having been recorded from Cape Hatteras, North Carolina, to the West Indies in less than 50 fathoms.

Kurtziella ? morona, new species Pl. 42, figs. 6-8

Shell immature, small, sturdy, fusiform. Whorls four in all, the last two strongly shouldered. Nucleus smooth, consisting of a little over one whorl, the tip somewhat canted, the last stage moderately stout. Nucleus defined from the conch at the line where the first axial thread and a spiral thread just above the suture appear. First post-nuclear whorl subangularly rounded and later subangular at the shoulder, the sutural area narrowly channeled under the now prominent basal threads; the sculpture consists of narrow, curved, axial riblets and spiral threadlets. The riblets are numerous to start with, but farther along on the whorl they are less numerous and wider apart, though still narrow. Of the spiral markings, there is one prominent thread just below the shoulder, and a low spiral ridgelet between that and the basal collar; above the shoulder there is a faint spiral thread on the convex summit between the shoulder and posterior suture. The sculpture on the last half of the first post-nuclear whorl is subreticulate. On the penultimate and ultimate whorls the surface is eroded, but it can be seen that the axial costae (there are about 10 on the last full volution) develop into broader

folds with a tendency to be knobby at the shoulder, the last ones on the labrum seeming to be coronated; on the ramp of the ultimate whorl, the costae are weaker than they are below, although they tend to become obsolescent on the base below the convexity. Spiral markings are wanting on the base, but it is not known whether this is due to corrosion or is natural. Aperture broadly clavate, widest above the middle. Outer lip broken far back. Inner lip and parietal wall callused; the callus swerves over atop the unobtrusive anterior fasciole. Anterior canal rather short and narrow, bent back, the extremity somewhat emarginate, the notch small and semicircular.

Dimensions.—Holotype, length 1.55 mm.; max. width 0.9 mm.

Type locality.—La Salina, west of Puerto Cabello, State of Carabobo. One worn and immature specimen, the holotype.

Remarks.—It is difficult to establish the generic position of this shell because of the weathered surface layer and missing outer lip. The steplike whorls, the reticulation of the first post-nuclear whorl, the nodulation of the costae at the shoulder, and the backward bend of the siphonal canal characterize the new species. Such features fit the genus *Kurtziella,* although the known representatives of that genus are ornamented with numerous frosted or minutely beaded spiral threads. These threads may be present on well-preserved adult specimens, but there is no way of telling from the single worn example. The three precedingly described species of *Kurtziella* are not subtabulately shouldered as is the present *K.* ? *morona,* n. sp. but are sharply carinate submedially.

Mangelia (Agathotoma) aff. fusca (C. B. Adams) Pl. 42, figs. 9, 10

1845. *Pleurotoma fusca* Adams, Boston Soc. Nat. Hist., Proc., vol. 2, p. 4.
1950. *Pleurotoma fusca* Adams, Clench and Turner, Occas. Papers on Mollusks, vol. 1, No. 15, pl. 29, fig. 9.

The single corroded fossil referred to *M. fusca* is small, sturdy, ovate, the angle of spire near 29 degrees. Whorls about six in all, the ones of the spire feebly carinate above the middle, the ultima gently convex. Sculpture consists of nine strong axial costae and what seem to be revolving threads, some of them coarse. The axial costae extend from suture to suture, are more or less in line from one whorl to the other, and are separated by wide interspaces. Aperture len-

ticular, the posterior prolonged into a pronounced oblique anal notch, the anterior end broken and thus seeming to undercut the base of the columella. Columella heavily coated with callus; the callus extends to the parietal wall and continues as an emargination around the anal notch. Outer lip thickened behind by the last axial rib, the inner margin seemingly smooth, the edge swollen a little into a rounded tooth or node below the anal notch. Basal lip broken back.

Dimensions.—Length 3.5 mm.; max. width 1.8 mm.

Locality.—Abisinia formation at W-30, eastern edge of Playa Grande village. One specimen.

Remarks.—Aside from the apparent re-entrant under the base of the columella, this shell is similar to several Recent species of *Pleurotoma* from Jamaica described by C. B. Adams, the closest perhaps being *Pleurotoma fusca.* The Venezuelan shell is too worn to identify accurately but analagous forms from the eastern Pacific are placed in the subgenus *Agathotoma* by Keen (1958).

Syntomodrillia ? biconica, new species Pl. 42, figs. 11, 12

Shell small, biconical, with a rapidly tapering, acuminate spire, the angle of spire about 36 degrees. Whorls about 10 including the smooth nucleus, the apex of which is decollate. Number of nuclear whorls estimated at 2-1/2, the last one a little subangular and bulging at the periphery. Post-nuclear whorls more or less planulate but slightly concave above and slightly swollen below, the body whorl well rounded at the convexity, rather sharply contracted at the base. Lower whorls a little thickened below the suture, the fairly broad collar thus formed followed by a narrowish shallow sinus. Sculpture consists of somewhat flexuous axial costae and rather feeble revolving riblets. The axial costae extend from suture to suture but are much thicker and subnodulous on the lower two-thirds of the whorl than they are in the fasciolar sinus where they are much subdued as they curve protractively and ascend the subsutural collar. There are 14 axial costae on the body whorl; these tend to become obsolescent at the base. On the penultimate whorl there are two or three minor revolving threads in the sinus area and four equally spaced revolving riblets below, the riblets separated by shallow, slightly narrower interspaces. On the ultimate whorls

there are 14 riblets from the fasciolar sinus to the top of the anterior fasciole, the riblets being more pronounced in the intercostal areas on the convexity but crossing the costae at the base. Sutures finely incised, undulatory. Aperture ovate-elongate. Outer lip broken along the edge. Anterior canal moderately long and deep, slightly bent, terminating in a shallow, nonemarginate notch. Inner lip callused, the callus appressed to the columella and extending to the parietal wall. The rift along the distal side of the columella of the holotype is an imperfection. Anterior fasciole rather long, convex, wedge-shaped, nearly smooth.

Dimensions.—Holotype, length 13 mm.; max. width 5.2 mm.

Type locality.—Lower Mare formation, in small stream 100 meters west of Quebrada Mare Abajo. One specimen, the holotype.

Remarks.—The correct generic classification of this new species awaits the finding of better material, although except for the character of the outer lip which is broken on the holotype, the form seems to meet most of the specifications set forth by Woodring (1928, pp. 160-161) for *Syntomodrillia* or perhaps for *Agladrillia* also erected by Woodring (1928, pp. 157-158).

Comparisons.—This species has the same general appearance as *Drillia esculenta* Pilsbry and Johnson (1917, p. 156; Pilsbry, 1921, p. 321, pl. 16, fig. 18) from the Miocene of the Dominican Republic, but the latter's spire is a little concave in profile, and the last whorl has a stout dorsal varix not present on *S. ? biconica,* n. sp. *Drillia scala* Pilsbry and Johnson (1917, p. 156; Pilsbry, 1921, p. 321, pl. 16, figs. 16, 17), also from the Miocene of the Dominican Republic, has strongly convex whorls, and there is pronounced latero-dorsal varix. *Drillia arata* Conrad (1862, p. 285; see Gardner, 1948, p. 267, pl. 37, figs. 27, 28) from the late Tertiary of Virginia lacks the subsutural collar of *S. biconica,* and is a more slender shell. *Agladrillia uquala* Mansfield (1935, pp. 24-25, pl. 1, fig. 10) from the top of the middle Miocene in Vaughan Creek, Walton County, Florida, is more slender than *S. ? biconica* but the sculpture of the two species is similar. *S. woodringi* Bartsch (1934, p. 27, pl. 8, figs. 5, 7, 9), dredged by the *Blake* in 103 fathoms off Barbados, has a less rapidly tapering spire than the Venezuelan fossil, and the whorls are more swollen.

"Drillia" species "a" **Pl. 42, figs. 13, 14**

Shell solid, lightly polished, slender, of medium size. Last whorl (the others missing) gently convex, a little constricted at the base, sculptured by 12 or 13 strong, slightly flexuous axial ribs which are two-thirds to one-half as wide as the smooth concave interspaces. Spiral markings occur only at the base where there are five wavy bands or fillets with fine grooves between them. The axial ribs extend from the suture to the top of the anterior fasciole, the spiral bands at the base curving irregularly down on the ribs and up in the interspaces. Anterior fasciole small, thick, slightly convex, bearing four low, flat spiral riblets. Suture finely incised, somewhat undulating, the ribs of the adjacent whorl a little offset in some places, more or less aligned in others. Aperture and outer lip broken far back, the summit area of the lip thickened. Columella and parietal wall callused, the margin of the callus slightly raised. Anterior canal short, rather narrow, the terminal notch emarginate and broadly U-shaped. In the area of the posterior outlet there is a rather wide but faint sinus, the labial side of the sinus formed by a slight elevation of the callus reflected through from the rib underneath.

Dimensions.—Last whorl, length 6.8 mm.; width 4.8 mm.

Locality.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. One specimen.

Remarks.—There is not much that can be said about this single fragment. The absence of spiral markings in the intercostal areas suggests that the subgenus is *Lissodrillia* Bartsch and Rehder (1939, pp. 129-130) although the type species, *Cerrodrillia* (*Lissodrillia*) *schroederi* Bartsch and Rehder (1939, pp. 130-131, pl. 17, fig. 8) from Florida, is a smaller and more delicate shell.

"Drillia" species "b" **Pl. 42, figs. 15, 16**

Shell small, slender, elongate-conical. Whorls nearly seven including the smooth nucleus which consists of about 1-1/2 of them. Apex of nucleus obtuse, the last whorl of the nucleus narrow and slightly convex. Spire whorls nearly completely stripped of the surface layer of shell. Ultimate whorl well rounded, rather sharply constricted at the base, the lower part of the base broken away. Sculpture of ultima consisting of 11 or 12 broad, rounded, elevated axial

costae, the interspaces seemingly smooth, and generally a little wider than the costae. At the summit there appears to be a collar, the costae terminating at the base of the collar. Also on the body whorl, the costae tend to become obsolescent below the convexity. Aperture proper broadly semilunar, the anterior canal broken away but probably narrowish. Columella heavily callused, the callus with a longitudinally oblique groove near the base, the margin of the callus raised.

Dimensions.—Length 3.6 mm.; max. width 1.3 mm.

Locality.—Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. Two specimens, both worn and broken.

Remarks.—This is a smaller and less sturdy shell than the preceding species "*Drillia*" species "a" and has a more rounded body whorl. The specimens are too poorly preserved for even definitive generic determination.

ACTEONIDAE

Acteon ? species Pl. 45, figs. 22, 23; Pl. 46, figs. 5, 6

Shell small, thin, the spire moderately elevated, the apex obtuse. Whorls about 4-1/2 in all, the nucleus indistinct. Post-nuclear whorls rapidly expanding, inflated, the ultima narrowly and feebly tabulate at the summit and gently subcarinate at the periphery. Penultimate whorl seemingly smooth, but under the microscope a few extremely faint spiral striae may be discerned. Last whorl sculptured by microscopic spiral striae or grooves crossed by narrow feeble microscopic axial folds separated by interspaces at first as wide as, and later a little wider than the folds themselves. The axial markings become obsolescent below the periphery, but the spiral grooves are a little sharper at the base than they are above. Locally there are minute narrow rectangular pits in the interspaces of the axial threads and at the base. The lower half of the shell is broken away on a bias but the columella seems to have been provided with a narrow oblique fold.

Dimensions.—Length 1.1 mm.; max. width 0.7 mm.

Locality.—Mare formation at W-14, on hillside above west bank of Quebrada Mare Abajo. One specimen.

Remarks.—The generic designation of this immature and broken shell is doubtful, but it is referred to *Acteon* because of what seem to be punctate spiral grooves occurring in places on the last whorl. If it is *Acteon,* the presence of axial ribbing may necessitate the erection of a new subgenus.

RINGICULIDAE

Ringicula (Ringiculella) maiquetiana, new species Pl. 42, figs. 17-20

Shell small but sturdy, ovate, the apex obtuse. Whorls four including the nucleus. Nucleus smooth, consisting of about 1-1/2 whorls, the initial small, loosely coiled, appressed, the last rapidly expanding, the passage from nucleus to conch transitional. Whorls of conch a little convex, slightly tabulate at the shoulder, the sutures distinct and finely incised. Spiral sculpture consisting of fine grooves, the number and strength of which vary from shell to shell. These grooves are most pronounced on the body whorl from about the middle to the base; above the middle they are always fainter, and on some specimens they are absent on the shoulder area; below the suture of the last two whorls there is also a spiral groove or two. The grooves divide the surface into flat bands or fillets with little or no relief, these of equal to subequal width except for the smoothish area above the middle which may be a little to a great deal broader. On the penultimate whorl there are also faint axial threads or riblets scarcely visible under a magnification of 20X. Aperture oblique, rudely lenticular, widest near the base. Outer lip thickened, not denticulate within, widening a little below the middle to form an obtuse swelling, the lip callus reflected behind on the labrum and extending a short distance above the suture. Parietal wall with a moderately thin to moderately thick sheath of callus which seems to be without a denticle. Pillar short, heavily reinforced, bears two strong folds, the anterior one marginal, the posterior nearly horizontal. Anterior notch rather deeply excavated, obtusely V-shaped, slightly oblique, bordered by the continuation of the labral callus. Posterior canal rudimentary, situated in the ascending callus between the parietal wall and outer lip.

Dimensions.—Holotype, length 1.4 mm.; max. width 0.9 mm.; paratype, length 1.2 mm.; max. width 0.7 mm.

Type locality.—Playa Grande formation (Maiquetía member) at W-4, Quebrada Las Pailas. Five specimens.

Remarks.—There is no denticle on the parietal wall of this shell but otherwise it meets the description for the subgenus *Ringiculella* Sacco. The shell is variable in shape and in the character of the spiral grooves on the surface.

Comparisons.—The Recent *R. semistriata* d'Orbigny (see Dall and Simpson, 1901, p. 362, pl. 57, fig. 11) which inhabits the western Atlantic from North Carolina, to the West Indies, has a prominent tooth on the parietal wall, and is squattier than *R. maiquetiana,* n. sp. The Pliocene ringiculids from Florida, *R. floridana* Dall (1890b, p. 14, pl. 3, fig. 8) and *R. floridana guppyi* Dall (1890b, pp.14-15, pl. 3, fig. 7) also differ from *R. maiquetiana* by having a toothlike process on the parietal wall as do the following Miocene species from Florida:

R. floridana guppyi Dall. Reported by Mansfield (1930, pp. 29-30, pl. 1, figs. 5, 8) from the Choctawhatchee formation, Leon County.

R. blountensis Mansfield (1935, p. 15, pl. 1, fig. 13). Vaughan Creek, Walton County.

R. chipolana Dall (1896b, p. 25; 1903, pl. 58, fig. 9). Chipola formation at Alum Bluff, Liberty County.

R. boyntoni Gardner (1937, p. 275, pl. 37, figs. 40, 41). Chipola formation at Boynton Landing, Washington County.

R. semilimata Dall (1896d, p. 24; 1903, pl. 60, fig. 24). Chipola formation; Oak Grove sand; Shoal River formation.

R. stiphera Gardner (1937, p. 276, pl. 37, figs. 43, 44). Oak Grove sand; Shoal River formation.

In Latin America, the following fossil species of *Ringicula* have been described or listed:

R. floridana Dall, by Jaume and Pérez Farfante (1942, p. 42) from the Pleistocene near Matanzas, Cuba.

R. costaricensis Olsson (1942a, pp. 231-232, pl. 6, figs. 7, 8) from the Charco Azul formation (Pliocene) in Quebrada Peñitas, Costa Rica. This differs from *R. maiquetiana,* n. sp. in having a strong denticle on the parietal wall and a completely smooth surface.

R. hypographa Brown and Pilsbry (1912b, p. 505, text-fig. 2) from the Gatun formation (middle Miocene) at Gatun, Panamá Canal Zone. This also has a denticle on the parietal wall, and the outer lip is a little swollen medially.

R. tridentata Guppy (see Woodring, 1928, p. 132, pl. 2, fig. 22) from the Miocene of Jamaica, the Dominican Republic, and doubtfully from Trinidad (Mansfield, 1925, p. 4). As the name implies, this species is tridentate, with a denticle on the parietal wall and two folds on the pillar.

R. dominicana Maury (1917, pp. 185-186, pl. 3, fig. 11) from the Miocene of the Dominican Republic and Costa Rica. This is also tridentate.

Ringicula, doubtful species, junior Guppy (Guppy and Dall, 1897, p. 305) from the Ditrupa bed (Miocene) of Trinidad. This is described as follows: "Oblong-ovate, turrited; 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]". The description is based on incomplete and young specimens, but they seem to differ from the small but fully developed *R. maiquetiana* in being more prominently ribbed and in having one more whorl.

BULLIDAE

Bulla amygdala Dillwyn Pl. 43, figs. 1-4

1817. *Bulla amygdala* Dillwyn, Descriptive Catalogue of Recent Shells, vol. 1, p. 480.
1893. *Bulla amygdala* Dillwyn, Pilsbry, Man. Conch., vol. 15, p. 329, pl. 38, figs. 49, 50, 62-65.
1901. *Bulla amygdala* Dillwyn, Dall and Simpson, U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, pp. 363-364.
1924. *Bullaria amygdalis* (Dillwyn), Emery, Nautilus, vol. 38, No. 2, p. 60.
1935. *Bulla amygdala* Dillwyn, Richards, Jour. Paleont., vol. 9, No. 3, p. 257.
1954. *Bulla amygdala* Dillwyn, Abbott, American Seashells, p. 277.
1955. *Bulla amygdala* Dillwyn, Perry and Schwengel, Marine Shells of the Western Coast of Florida, p. 195, pl. 29, fig. 282.
1958. *Bulla amygdala* (Dillwyn), Abbot, Nat. Sci. Philadelphia, Mon. No. 11, p. 99.

This species is represented in the Cabo Blanco area by both Recent and fossil examples. The Recent shell is thin, moderately globose, subcylindrical. Outer lip thick where it rises from the vertex.

Columella arcuate, with a heavy crescentic sheath of callus which has a narrow furrow or chink behind it at the lower lip, the callus extending to the parietal wall, its margin neatly defined throughout from the whorl surface. Apical perforation round, deep, the inner wall spirally striate. Surface smooth and with a dull gloss but with longitudinal growth lines and exceedingly numerous, often finely strigitate, spiral striae that can be seen only under magnification. However, there are no spiral grooves or fillets anywhere on the surface. Predominant color mahogany, with numerous small flecks, blotches or small spots of dark brown and white. Two faint bands of brown encircle the body, one of them above the middle, the other below the middle. Aperture purplish, the columellar callus whitish.

The fossil shell referred to *B. amygdala* is slightly more solid than the Recent shell, and the posterior channel is well developed. The color is faded, but the banding shows up vaguely. Although the surface is worn there is no suggestion of spiral grooves at the extremities.

Dimensions.—Figured Recent specimen, length 20.5 mm.; max. width 13 mm.; figured fossil specimen (labrum broken away), length 18 mm.

Localities.—Recent, on beach of Playa Grande Yachting Club, Distrito Federal. Three specimens; Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. One specimen.

Remarks.—Dillwyn applied the name *amygdala* to oval-oblong shells of the *B. ampulla* complex on which the "outer lip is contracted or pressed inwards about its middle toward the pillar". On the Venezuelan specimens the outer lip is broken along the edge but it is probable that the flexuring is slight. The surface is devoid of spiral grooves, and such smooth forms are referred to by some authors as *B. amygdala.* However, there is a growing tendency to consider the *amygdala-occidentalis-striata* trinity in the western Atlantic to be variants of one species, and the intergrading forms I have seen in the collections at the Museum of Comparative Zoology, the Academy of Natural Sciences of Philadelphia, and the United States National Museum, would seem to substantiate this view.

Range and distribution.—Bulla amygdala Dillwyn in the Western Atlantic ranges from Florida to South America, and it has been

reported in the Pleistocene of Cuba. The age of the Cabo Blanco fossil is probably Pliocene.

Bulla occidentalis A. Adams Pl. 43, figs. 5, 6

1850. *Bulla occidentalis* A. Adams, [in] Sowerby, Thes. Conchlyl., vol. 2, p. 577, pl. 123, figs. 72. 73.
1878. *Bullea occidentalis* (A. Adams), Mörch, Catalogue of West-India Shells, p. 8.
1883. *Bullaria occidentalis* (A. Adams), Dall, U. S. Nat. Mus. Proc., vol. 6, p. 324.
1889. *Bullaria occidentalis* (A. Adams), Dall, U. S. Nat. Mus. Bull. 37, p. 88.
1892. *Bullaria occidentalis* (A. Adams), Singley, Geol. Survey Texas 4th An. Rept., p. 332.
1903. *Bullus occidentalis* (A. Adams), Vanatta, Acad. Nat. Sci. Philadelphia, Proc., vol. 55, p. 757.
1913. *Bullaria occidentalis* (A. Adams), Brown and Pilsbry, Acad. Nat. Sci. Philadelphia, Proc., vol. 65, p. 494.
1922. *Bullaria occidentalis* (A. Adams), Maury, Bull. Amer. Paleont., vol. 9, No. 38, pp. 50-51.
1923. *Bullaria occidentalis* (A. Adams), Clench. Nautilus, vol. 37, No. 2, p. 55.
1924. *Bullaria occidentalis* (A. Adams), Emery, Nautilus, vol. 38, No. 2, p. 60.
1937. *Bulla occidentalis* A. Adams, Smith, East Coast Marine Shells, p. 140, pl. 53, fig. 10.
1938. *Bulla occidentalis* A. Adams, Richards, Geol. Soc. Amer. Bull., vol. 49, p. 1294.
1940. *Bulla occidentalis* A. Adams, Stenzel, Nautilus, vol. 54, No. 1, p. 20.
1942. *Bulla occidentalis* A. Adams, Jaume and Pérez Farfante, Soc. Cubana Hist. Nat. "Felipe Poey", Mem., vol. 16, No. 1, p. 42.
1952. *Bulla occidentalis* A. Adams, Pulley, Texas Jour. Sci., vol. 4, No. 2, p. 178.
1953. *Bulla occidentalis* A. Adams, Olsson and Harbison, Acad. Nat. Sci. Philadelphia, Mon. No. 8, p. 165, pl. 25, fig. 1.
1954. *Bulla occidentalis* A. Adams, Abbott, American Seashells, p. 277, pl. 26p.
1955. *Bulla occidentalis* A. Adams, Perry and Schwengel, Marine Shells of the Western Coast of Florida, p. 192, pl. 39, fig. 280.
1958. *Bulla occidentalis* A. Adams, DuBar, Florida Geol. Sur. Geol. Bull. No. 40, p. 183, pl. 10, fig. 6
1958. *Bulla occidentalis* A. Adams, Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 18.
1958. *Bulla occidentalis* A. Adams, Abbott, Acad. Nat. Sci. Philadelphia, Mon. No. 11, p. 99.
1959. *Bulla occidentalis* A. Adams, Nowell-Usticke, A Check List of the Marine Shells of St. Croix, p. 84.

The single Recent shell tentatively referred to *B. occidentalis* is broken and worn, large and thin, subcylindrical. Apical perforation relatively small, round and deep, spirally striate, the threads rendered finely cancellate and strigitate by the numerous axial growth lineations which converge into the perforation from the body surface of the shell. Base with about nine fine spiral grooves; the grooves as such become obsolescent toward the labral area where they appear

as strigitate bands with no relief. Aperture relatively wide and expanded below, the base rounded. Callus thin on the parietal wall but thickened on the lower lip where it is reflexed slightly. The present color is a bleached white and slate-gray, the aperture mottled lavender, the columellar callus an off-white.

Dimensions.—Length 29 mm.; max. width 17 mm.

Locality.—Recent, on beach east of Higuerote, State of Miranda. One broken specimen.

Remarks.—*B. occidentalis* A. Adams is generally distinguished from *B. striata* Bruguière in having a more expanded aperture, in being less compressed at the apical end, and in being less sharply engraved by spiral grooves at the base. However, some authorities maintain that *B. occidentalis* A. Adams, *B. striata* Bruguière, and *B. amygdala* Dillwyn exhibit intergradations in shape and sculpture, and feel that there may be no actual differences between them.

Range and distribution.—The living *B. occidentalis* ranges from off Cape Hatteras, North Carolina, to Florida, and through the West Indies to northern South America. As a fossil it occurs in the Pleistocene of the Panamá Canal Zone, Cuba, and Florida, and in the Pliocene of Florida.

Bulla striata Bruguière Pl. 43, figs. 7-10

1789. *Bulla striata* Bruguière, Encycl. Méth., vol. 1, p. 572.
1798. *Bulla striata* Bruguière, Encycl. Méth., vol. 2, pl. 358, figs. 2a, 2b.
1822. *Bulla striata* Bruguière, Lamarck, An. sans Vert., vol. 6, pt. 2, p. 33.
1836. *Bulla striata* Bruguière, Deshayes, An. sans Vert., vol. 7, p. 668.
1836. *Bulla striata* Bruguière, Philippi, Enumeratio Molluscorum Siciliae (Berolini), p. 121.
1837. *Bulla striata* Bruguière, d'Orbigny, Voy. l'Amérique Mérid., Mollusques, pp. 312-313.
1845. *Bulla striata* Bruguière, d'Orbigny, [in] La Sagra, Hist. Fís., Polít. Nat. Isla de Cuba, vol. 5, Moluscos, p. 62.
1864. *Bulla striata* Bruguière, Krebs, The West Indian Marine Shells, p. 93, According to Krebs = *B. maculosa* Mart.
1864. *Bulla striata* Bruguière, Guppy, Sci. Assoc. Trinidad, Trans., p. 36.
1867. *Bulla striata* Bruguière, Guppy, Sci. Assoc. Trinidad, Proc., p. 155 (part).
1881. *Bulla striata* Bruguière, Gabb, Acad. Nat. Sci. Philadelphia, Jour., ser. 2, vol. 8 p. 370.
1889. *Bullaria striata* (Bruguière), Dall, U. S. Nat. Mus., Bull. 37, p. 88.
1890. *Bulla striata* Bruguière, Dall, Wagner Free Inst., Sci. Trans., vol. 3, pt. 1, pp. 17-18.
1891. *Bulla striata* Bruguière, Baker, Acad. Nat. Sci. Philadelphia, Proc., vol. 43, p. 49.
1891. *Bulla striata* Bruguière, Heilprin, Acad. Nat. Sci. Philadelphia, Proc., vol. 43, p. 142.

1893. *Bullaria striata* (Bruguière), Pilsbry, Man. Conch., vol. 15, p. 332, pl. 37, figs. 42-46.
1895. *Bulla striata* Bruguière, Gregory, Geol. Soc. London Quart. Jour., vol. 51, p. 287.
1922. *Bullaria striata* (Bruguière), Maury, Bull. Amer. Paleont., vol. 9, No. 38, p. 50.
1924. *Bullaria striata* (Bruguière), Emery, Nautilus, vol. 38, No. 2, p. 60.
1926. *Bullaria striata* (Bruguière), Hanna, California Acad. Sci., Proc., ser. 4, vol. 14, No. 18, pp. 442-443, pl. 20, fig. 9.
1929. *Bullaria striata* (Bruguière), Weisbord, Nautilus, vol. 39, No. 3, p. 84.
1937. *Bulla striata* Bruguière, Gardner, U. S. Geol. Sur., Prof. Paper 142-F, p. 272.
1937. *Bulla striata* Bruguière, Smith, East Coast Marine Shells, p. 140, pl. 53, fig. 17.
1938. *Bulla striata* Bruguière, Richards, Geol. Soc. Amer., Bull., vol. 49, p. 1294.
1939. *Bulla striata* Bruguière, Mansfield, State of Florida Dept. Conserv., Geol. Bull., No. 18, pp. 18, 39.
1953. *Bulla striata* Bruguière, Olsson and Harbison, Acad. Nat. Sci. Philadelphia, Mon. No. 8, p. 164, pl. 25, figs. 2, 2a.
1954. *Bulla striata* Bruguière, Abbott, American Seashells, p. 277, pl. 13p.
1955. *Bulla striata* Bruguière, Perry and Schwengel, Marine Shells of the Western Coast of Florida, p. 193, pl. 39, fig. 281.
1958. *Bulla striata* Bruguière, DuBar, Florida Geol. Sur., Geol. Bull., No. 40, p. 212.

Shell relatively small, the Recent specimen oblong-subcylindrical, the fossils oblong-ovate to ovate. Aperture narrow above, wider below, the base rather acutely rounded. Outer lip slightly curved. Parietal callus thin, gently arcuate, the callus extending to the lower lip where it thickens and is a little reflexed. Apical perforation round and deep, spirally threaded within. Base with as many as a dozen unequally spaced fine spiral grooves, the apex with a few faint ones. The unweathered surface is smooth, has a dull sheen, and bears longitudinal lineations and wrinkles as well as closely spaced exceedingly fine spiral striations visible only under a lens. Exterior mottled, clouded and spotted with mahogany, dark brown, and white, the aperture mottled with dull purple, the columellar wash with a faint brownish tinge reflected through from the whorl surface, the lower lip whitish.

Dimensions.—Recent shell, length 14 mm.; max. width 7.6 mm. Fossil shell (Abisinia formation), length 8.5 mm.; max. width 5.25 mm.

Localities.—Recent, on beach at Playa Grande Yachting Club, Distrito Federal. One specimen; Abisinia formation at W-30, eastern edge of Playa Grande village. One specimen; La Salina, west of Puerto Cabello, State of Carabobo. Two badly weathered specimens.

Comparisons.—The fossil specimens are hardly distinguishable from *B. vendryesiana* Guppy (See Woodring, 1928, pp. 130-131, pl. 2, figs. 20, 21) of the Jamaican Miocene save for the fact that the parietal callus is thinner than on the Jamaican species.

Range and distribution.—Miocene ? to Recent. The living form ranges from Florida to northern South America in the Western Atlantic, and inhabits the Mediterranean Sea and the Eastern Atlantic along the coasts of Portugal and Morocco. It is reported from the Pleistocene of Florida and Barbados, and from the Pliocene of Yucatan (Mexico), Costa Rica, California (Coyote Mountain), and Florida. Gardner (1937, p. 272) records the race of *B. striata* in the Chipola Miocene of Florida, but whether the Chipola forms are identical with *B. striata, s.s.* cannot be determined without better preserved examples from that formation.

ATYIDAE

Rhizorus bruscasensis, new species Pl. 43, figs. 11, 12

Shell small, fragile, the body narrowly cylindrical but contracted at the apex, the posterior spine broken off, the labium nearly straight over most of its length. Surface smooth except for seven or eight fine spiral grooves on the anterior fourth of the shell, the spaces between them of somewhat unequal width. Under the microscope, and with just the right light, similar lineations of even finer cut can be faintly discerned farther up the body. From fragments off of the holotype it is seen that the base of the columella is enameled, and that there is no umbilical groove to speak of. Aperture narrow, as long as the shell. Outer lip thin, curved over the body.

Dimensions.—Holotype (upper two-thirds of shell), length 1.05 mm.

Type locality.—Playa Grande formation (Maiquetía member) in Quebrada Las Bruscas at W-26, approximately 120 meters upstream from junction with Quebrada Las Pailas. One frail and broken specimen, the holotype.

Comparisons.—The generic name *Rhizorus* Montfort is applied to shells generally known as *Volvula* A. Adams (not Gistel). The present species is like the Miocene to Recent *Volvula oxytata* Bush (1885c, p. 468, pl. 45, fig. 12) and such congeners of *V. oxytata* as

V. cylindrica Gabb (1873, p. 246) (not Carpenter, 1864, Rept. British Assoc. Adv. Sci. for 1863, p. 647) from the Miocene of the Dominican Republic and Costa Rica, *V. oxytata dodona* Gardner (1937, pp. 267-268, pl. 37, fig. 25) from the Miocene Oak Grove sand of Florida, and *V. oxytata hosfordensis* Mansfield (1930, pp. 28-29, pl. 1, fig. 9) from the upper Miocene of Leon County, Florida, but may be distinguished from all of those by its nearly straight, rather than arcuate labium. The Recent *Rhizorus acutus* (d'Orbigny) (see Abbott, 1954b, p. 281, pl. 26L), which is found from North Carolina through the West Indies, has an even more arcuate labium than *V. oxytata*. *V. tritica* Olsson and Harbison (1953, p. 163, pl. 25, figs. 3, 3a) from the Pliocene at St. Petersburg, Florida, has a "short, non-spiniform apex" with a mere trace of spirals at the base, although otherwise the St. Petersburg and Venezuelan shells are nearly identical. On *V. phoinicoides* Gardner (1937, p. 268, pl. 36, fig. 26) from the Miocene Shoal River formation of Florida, the labium is gently concave rather than nearly straight as on the Venezuelan *R. bruscasensis*, n. sp. In frailty and general appearance *R. bruscasensis* is a great deal like *Volvula parallela* Pilsbry and Johnson (1917, p. 151; Pilsbry, 1921, p. 313, text fig. 11) from the Miocene of the Dominican Republic, the principal differences being that the Venezuelan shell is constricted on the left side of the apex as well as the right, and its pillar is more strongly reinforced than that of the Dominican species. Yet another form to which *R. bruscasensis* is related is the upper Miocene *Volvula* species Harris (1895, pp. 96-97) found between 2,552 and 2,650 feet in the "deep well at Galveston", Texas. From Harris' description, however, I would surmise that *R. bruscasensis* is more slender. *Volvula iota* (Conrad) from the Miocene of New Jersey and Maryland, and its subspecies *marylandica, diminuta, calverta,* and *patuxentia* described by Martin (1904, pp. 134-135, pl. 39, figs. 6-9) from the Miocene of Maryland are all spirally grooved both anteriorly and posteriorly.

ACTEOCINIDAE

Cylichnella mareana, new species — Pl. 47, figs. 1, 2

Shell small, smooth, slender, cylindrically ovate. Apex slightly sunken, callused. Surface devoid of markings except for microscopic

longitudinal growth lines. The outer lip, broken while handling, was seen to be thin and straight, the summit raised above the top of the body whorl. Aperture long, narrow above, gradually widening anteriorly. Base acutely rounded. Columella with a strong oblique fold at the base, the fold merging with the broad lower lip behind which, and parallel with it, is a narrow shallow groove. Parietal wall with a thin coating of callus, the callus thickened a little toward the columellar fold.

Dimensions.—Holotype, length 2 mm.; max. width 1 mm.

Type locality.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. One specimen, the holotype.

Remarks.—The slender cylindrical shape, the strong columellar fold, and the absence of spiral grooves anywhere on the surface are the outstanding features of this shell. I have seen no closely related forms although the Miocene to Recent *C. biplicata* (H. C. Lea) as identified by Gardner (1937, p. 266, pl. 37, figs. 21, 22), and the living *C. bidentata* (Guppy) as illustrated by Pilsbry (1921, p. 311, fig. 6) are somewhat akin. In addition to the different type of columellar fold, both those species are spirally lineated anteriorly and are broader than *C. mareana,* n. sp.

PYRAMIDELLIDAE

Orinella ? salinae, new species Pl. 43, figs. 13, 14

Shell small, moderately solid, porcelaneous, umbilicate, biconical, with a rapidly tapering spire whose divergence is about 37 degrees. Whorls about 4-1/2 in all, the nucleus composed of a little over one of them. Nucleus smooth, the tip full, loosely coiled, and obliquely immersed in the apex; the last stage merges gradually into the conch, the latter defined by the flattening of the side. Postnuclear whorls rectilinear, slightly concave, the ultimate whorl angulated or carinated at the periphery. The carination develops from the low narrow swelling or thickening encircling the base of the spire whorls at the suture; a similar swelling is present at the summit of the whorls, this even fainter than the one at the base. Sutures narrowly and shallowly channeled. Last whorl obtusely beveled at the peripheral carina, slightly concave below. Surface

weathered, smoothish, but marked here and there with irregular, coarse, curved, axial growth lines. Aperture oval. Outer lip broken back, thickened somewhat at the junction of the whorl. Basal lip moderately broad, effuse, somewhat pointed anteriorly, faintly sulcate along the middle, skewed a little to the left. Lower lip heavily enameled, the straight outer margin of the enamel bordering and raised above the umbilicus. Umbilical depression rather small, arcuate, widening and shallowing anteriorly from the deep, slanting perforation above, its margin at the whorl somewhat raised and thickened. Columella with a strong, sharp, medial, horizontal fold, which is level with, and nearly joins the top of the umbilical emargination. Parietal wall lightly enameled.

Dimensions.—Holotype, length 1.4 mm.; max. width 0.8 mm.

Type locality.—La Salina, west of Puerto Cabello, State of Carabobo. One specimen, the holotype.

Remarks.—The classification is uncertain. The type of *Orinella* Dall and Bartsch (1904, p. 6) is the Recent Japanese *Orina pinguicula* A. Adams (1870) which is uniplicate and deeply umbilicated, and has a subquadrangular aperture. *Orinella ? salinae,* n. sp. has a small umbilicus, an oval aperture, and an effuse, pointed, basal lip. Strongly uniplicate Pyramidellidae are rare, and it is believed that this Venezuelan fossil species is new. *O. vanhyningi* Bartsch (1944e, pp. 106-107, pl. 9, fig. 3) from Boca Ciega Bay, Florida, and *O. pliocena* Bartsch (1955, p. 15, pl. 2, fig. 9) from the Pliocene deposits of North St. Petersburg, Florida, are much more elongated than *O. salinae,* and are not carinated.

Orinella? (Cricolophus) humboldti, new subgenus, new species
Pl. 43, figs. 15, 16

Shell small, solid, porcelaneous, with a rapidly tapering spire, the angle of spire 41-44 degrees. Nucleus smooth, full, consists of one loosely coiled whorl the tip of which is obliquely immersed in the apex. The differentiation between the nucleus and the conch is marked by the appearance on the latter of a faint spiral thread just above the suture, this thread develops into a strong suprasutural annulation with growth. Post-nuclear whorls at least four, the earlier ones slightly concave, the later ones flat-sided to slightly convex, the sutural areas narrowly excavated, the sutures them-

selves finely incised. Around the summit of the whorls there is a faint narrow subangular to subrounded swelling, and at the base, bordering the sutural excavation, there is a strong raised rounded spiral ridge, the breadth of which on the lowest whorl of the holotype is about a fourth that of the whorl itself. The base of the shell is missing but it is inferred from the character of the spire whorls that the single columellar fold is strong, sharp, and oblique, that the aperture is broadly oval, and that the anterior extremity is not particularly produced. Surface virtually devoid of markings.

Dimensions.—Holotype (nucleus plus four whorls), length 1.4 mm.; max. width 0.97 mm.

Type locality.—La Salina, west of Puerto Cabello, State of Carabobo. One specimen, the holotype.

Remarks.—This sturdy, uniplicate, smooth-surfaced shell with its prominent suprasutural ridge is unlike any other I have seen and I therefore propose the name *Cricolophus* as a subgenus. The type species, *O. humboldti,* is named in honor of the renowned naturalist Alexander von Humboldt.

Eulimella ? binata, new species Pl. 43, figs. 17-19

Shell small, thin, elongate-turrited. The only specimen is broken, and consists of two lower whorls. Whorls nearly flat-sided, moderately constricted below at the sutural area, the upper margin of the sutural area weakly carinated, the carina forming the periphery of the last whorl. Base short, convex. Aperture ovate, smooth within, the outer and basal lips thin. Columella with two oblique, closely spaced parallel folds, the anterior one raised and sharp, the posterior low and rounded, the groove between them shallow. Emerging from the commissure there is a narrow, feebly impressed groove which extends across the face but terminates before reaching the dorsum. Surface weathered, locally with vague axial growth markings and a suggestion of some microscopic spiral lineations.

Dimensions.—Holotype (two whorls), length 0.85 mm.; max. width 0.5 mm.

Type locality.—Playa Grande formation (Maiquetía member) at W-4, Quebrada Las Pailas. One specimen, the holotype.

Remarks.—Although there is only a little to go on, this species

is believed to be new as I have seen no other pyramidellid with the faintly impressed grooves emerging from the commissure.

Odostomia playagrandensis, new species Pl. 43, figs. 20, 21

Shell small, shiny on unweathered surface, nonumbilicate, elongate conical, the angle of spire near 30 degrees. Whorls four in all, the nucleus composed of a little over one of them. Initial turn of the nucleus convex, deeply immersed in the apical depression, the last stage of the whorl vaguely defined from the conch by the first axial thread. Post-nuclear whorls a little convex, somewhat constricted at the suture, and slightly shouldered at the summit, the ultimate whorl flat-sided above, subangularly rounded at the periphery, moderately produced, and evenly rounded at the base. Sutures narrowly and shallowly excavated. Axial sculpture consists of scarcely visible but fairly numerous axial costae (and feeble folds) separated by shallow, slightly wider interspaces, the costae becoming obsolescent toward the periphery on the ultimate whorl. Spiral sculpture consists of microscopic, subequally spaced incisions which tend to develop into elongate pits under corrosion. Aperture subtrigonally ovate, widest below, the interior filled with sand on the holotype. Outer lip thin, angulated a little at the summit. Base of holotype broken, probably rounded on intact specimens. Inner lip slightly curved, lamellar.

Dimensions.—Holotype, length 1.4 mm.; max. width 0.65 mm.

Type locality.—Playa Grande formation (Maiquetía member) at W-4, Quebrada Las Pailas. One specimen, the holotype.

Remarks.—With its feeble yet rather regular and persistent axial folds and finely impressed spiral lineations, this shell seems to fit into the subgenus *Evalea* A. Adams, although with the columella obscured it is not possible to confirm the determination. There are a number of species of *Odostomia* from the Pliocene of Florida described by Bartsch (1955), but *O. playagrandensis* is not identical with any of them.

Odostomia ? ambigua, new species Pl. 16, figs. 13, 14; Pl. 17, figs. 1, 2

Shell minute, not fully mature, rather delicate, turrited, the angle of spire about 20 degrees. Whorls 4-1/2 in all. Nucleus smooth, one-whorled, the tip inclined and immersed. First post-nuclear whorl

convex, roundly shouldered at the summit, the next two whorls strongly angulate at the periphery, the posterior slope or ramp concave, the lower sides converging a little inward. Sutures finely impressed. Sculpture consists of low fine axial riblets and exceedingly fine spiral lineations scarcely visible under the microscope. The axial riblets extend from suture to suture, and on the last whorl, where there are about 18 of them, they extend part way down the base before becoming obsolescent. The intercostal areas are shallow and about as wide as the riblets themselves. The body whorl is slightly concave below the suture, and is subangularly rounded at the periphery instead of being acutely angulate as on the two preceding whorls. Base moderately short, gently convex, seemingly smooth under a magnification of 20X. Aperture more or less ovate, slightly produced and a little effuse at the curve between the lower and basal lips. Outer lip thin, joined subacutely to the whorl. Basal lip subtruncate, also thin. Columella short, slender, straightish, defined sharply from the body but not bordered by an umbilical groove. Apertural side of parietal wall with a thin wash of enamel extending up from the columella.

Dimensions.—Holotype, length 0.6 mm.; max. width 0.25 mm.

Type locality.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. One specimen, the holotype.

Remarks.—Although this tiny shell seems to be a new species, its generic classification under *Odostomia* of the Pyramidellidae is doubtful.

Odostomia (Evalea) antilleana, new species Pl. 44, figs. 1-4

Shell small, elongate conical, the spire moderately high, the angle of spire about 41 degrees. Whorls 4-1/2 including the nucleus which consists of one of them. The tip of the nucleus is loosely coiled and obliquely immersed, the last stage of the whorl angulated at the summit and provided with two spiral grooves which terminate abruptly at the conch. Post-nuclear whorls gently rounded, rather rapidly expanding, separated by shallowly channeled sutures; body whorl flattened around the middle on the labral area but subangulate at the periphery on the ventral side, the obtuse angulation in

line with, and continuing from the suture at the outer lip. Surface weathered, but here and there from the middle of the spire to the base faint microscopic spiral bands are present. Additionally, the surface is marked with double-curved growth lineations some of which are pronounced for so small a shell. Aperture relatively large, ovate, widest below. Outer lip thin, obtusely angulated at the summit, rather sharply rounded at the curve of the basal lip, the margin between these points straight, reflecting the flattening of the body whorl at the labrum. Basal lip subrounded, a little produced and effuse. Columella curved and reflected, bordered by a narrow umbilical chink, and provided with a nearly horizontal fold posterior to the middle of the columella at its insertion with the parietal wall. Parietal wall thinly sheathed with enamel.

Dimensions.—Holotype, length 2.7 mm.; max. width 1.3 mm.; paratype, length (last two whorls) 2.0 mm.; max. width 1.3 mm.

Type locality.—Lower Mare formation, in small stream 100 meters west of Quebrada Mare Abajo. One specimen, the holotype.

Other localities.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. One specimen, the paratype.

Comparisons.—*Odostomia antilleana,* n. sp. has a relatively short body whorl, and it is this feature which distinguishes it from the several not dissimilar species of the subgenus *Evalea* on the Pacific Coast described by Dall and Bartsch (1909). There are also a number of species on the Atlantic-Caribbean side of the Americas that this shell resembles, and among them are the Miocene *O. sanctidominici* and *O. yaquica* of Maury (1917, pp. 315-316, pl. 25, figs. 21 and 22, respectively) from the Dominican Republic. Neither of those, however, is obtusely shouldered at the summit of the last whorl as is *O. antilleana* nor are they subangulate around part of the middle as is the Venezuelan shell. The family Pryamidellidae is well represented in the Miocene of the Dominican Republic, and among the numerous species of *Odostomia* there are four that, like the Venezuelan *O. antilleana,* do possess a peripheral angulation or carina. These, described by Pilsbry and Johnson (1917), and illustrated by Pilsbry (1921), are *O. pyrgulopsis, O. bathyraphe, O. superans,* and *O. circumvincta.* On all of the above the carination of

the last whorl continues above the suture, whereas the angulation of *O. antilleana* is level with the suture; a further difference is that the Dominican shells are much more prominently channeled at the suture. Of the several Recent species from Jamaica described by C. B. Adams, *O. antilleana,* n. sp. is closest perhaps to *O. canaliculata* (see Clench and Turner, 1950, p. 262, pl. 40, fig. 3) although that species is readily separated by its rectilinear whorls, its narrower spire divergence (20 degrees as compared with 41 degrees for *antilleana*), and its more widely channeled sutures.

Odostomia (Evalea) mareana, new species Pl. 44, figs. 5, 6

Shell small, shiny, elongate conical, the angle of spire around 22 degrees. Nucleus decollate. Post-nuclear whorls at least five (probably six or seven on a complete specimen), more or less rectilinear, with a fine threadlike carina bordering the sutural channel at the base, this carina appearing on the periphery of the body whorl. To the naked eye the surface seems smooth but under the microscope it is seen to be marked with fine subequally spaced spiral lineations which occur throughout except on the base of the shell which is completely smooth. Sutural areas channeled, the upper slope of the channel beveled to the carinal thread at the base of the whorl. Aperture subquadrately oval, the margin of the outer and inner lips more or less parallel. Basal lip sharply rounded, produced slightly, and somewhat effuse; outer lip thin; inner lip lamellar, erect, the umbilical chink adjacent narrow. Columella provided with a sharp, nearly horizontal fold at its insertion.

Dimensions.—Holotype (five post-nuclear whorls), length 2.5 mm.; max. width 1.2 mm.

Type locality.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. One specimen, the holotype.

Comparisons.—*O. mareana,* n. sp. is somewhat comparable to *O. marylandica* Martin (1904, p. 221, pl. 54, fig. 6) from the Miocene Calvert formation of Maryland, although the latter is readily distinguished by its truncated basal lip. The new Venezuelan species is a little closer to *O. vexator* Pilsbry and Johnson (1917, p. 180; Pilsbry, 1921, p. 393, text fig. 27) from the Miocene of the Domini-

can Republic, differing from it, however, in its greater angle of divergence—about 22 degrees for *O. mareana*, about 14 degrees for *O. vexator*. The nearest species I have seen is the Recent *O. canaliculata* C. B. Adams from Jamaica illustrated by Clench and Turner (1950, pp. 262-263, pl. 40, fig. 3). Unfortunately the nuclear whorls are wanting on the Venezuelan fossil so that a definitive comparison cannot be made until more perfect specimens of *O. mareana* become available. There are, nevertheless, some differences that can be detected: *O. canaliculata* is slightly more slender, its columellar fold is thicker, it has no umbilical chink, and it lacks, presumably, the microscopic spiral lineations that are characteristic of *O. mareana*.

Odostomia (Parthenina) meridioamericana, new species Pl. 44, figs. 7, 8

Shell small, sturdy, turrited, the angle of spire about 30 degrees. Nucleus smooth, elevated, and although partially destroyed and creviced, it seems to be composed of at least two helicoid whorls having their axis almost at right angles to that of the post-nuclear whorls, in the first of which the nucleus is immersed. Post-nuclear whorls three, moderately convex, the summit of each succeeding whorl projecting beyond the base of the preceding, the whorls subrounded to subangular at the summit, slightly constricted at the suture. Surface sculptured by low, equally spaced axial riblets crossed by smaller spiral threads. There are 20-22 axial riblets and five or six spiral threads on the penultimate whorl, the threads a little stronger in the axial interspaces than they are on the riblets, the interspaces not as wide as the riblets themselves. On the ultimate whorl the sculpture plays out subtly below the convexity, and the base is smoothish. Aperture more or less oval. Outer lip slightly thickened at the moderately acute angle it forms with the junction of the whorl. Columella heavily callused, fairly straight medially, the lower parietal wall with a feeble low fold or bulge observable well within the aperture. Adjacent to the columella there is a pseudo-umbilical pit that seems to have been produced by corrosion.

Dimensions.—Holotype, length 1.7 mm.; max. width 0.7 mm.

Type locality.—Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. One specimen, the holotype.

Remarks.—This new vitrinellid seems referable in every respect to the subgenus *Parthenina* of the genus *Odostomia* as established in the key by Dall and Bartsch (1909).

Chrysallida caribbeana, new species Pl. 44, figs. 9, 10

Shell small, solid, reticulated, moderately elongate, conical, the angle of spire 24-27 degrees. Nucleus smooth, the tip decorticated, revealing the apex with a pair of small nostril-like perforations, the last turn of the nucleus abutting obliquely against and wedged into the first whorl of the conch. The four post-nuclear whorls are nearly rectilinear, the sutural areas rather prominently excavated. Surface sculptured by equally spaced axial riblets and spiral cords of which there are 18 and 4, respectively, on the penultimate whorl. The axials are slightly larger than the spirals, the intersections are tuberculated, and the depressed interspaces formed by this network are squarish. The axial riblets are connected across the sutural areas, although within the sutural areas their size is greatly reduced. Ultimate whorl slightly convex above, the base moderately produced and gently rounded, sculptured by five spiral cords and numerous fine curved axial lineations. The spiral cords of the base decrease in size anteriorward, the topmost one, which is prolonged from the summit of the whorl, being the largest, the next one somewhat smaller, the third still smaller, and the last two, which are subequal, the smallest. The three lowest cords may be seen to continue within the aperture above the columellar fold. Aperture ovate, smooth within. Outer lip thin at the rim, but immediately behind it is thickened by the last axial riblet which extends, as do the others, to the topmost cord of the base. Basal lip thick, sharply rounded. Columella with a strong sharp oblique fold a little below the middle, the fold bordered anteriorly by a deep narrow groove or channel. The fold and its complimentary channel extend slightly beyond the distal margin of the columella, the channel emarginated at the far end by the fold which curves around it. Below the terminus of the fold on the holotype there is a slitlike notch that may be due to a chipping or imperfection of the shell material.

Dimensions.—Holotype, length 1.8 mm.; max. width 0.75 mm.

Type locality.—Playa Grande formation (Maiquetía member)

at W-30, north flank of Punta Gorda anticline. One specimen, the holotype.

Comparisons.—In some respects this new species recalls the Recent variant of *C. seminuda* (C. B. Adams) (see Perry and Schwengel, 1955, pp. 122-123, pl. 23, fig. 164) from Florida, but that has broader spiral ribs and a higher and weaker columellar fold.

Chrysallida salinensis, new species Pl. 44, figs. 11-14

Shell small, sturdy, rather broadly biconical, the angle of spire about 49 degrees. Whorls four in all, the nucleus smooth, full, composed of one volution, the tip loosely coiled and obliquely immersed into the apex, the demarcation between the nucleus and conch defined by the appearance of the first curved axial thread. First post-nuclear whorl rectilinear, the penultimate hardly convex, the ultimate subangularly rounded at the periphery, all of the whorls separated by shallowly channeled, moderately broad sutural areas. Whorls sculptured by well-developed nodulous axial ribs of which about 24 occur on the penultima. Intercostal spaces generally a little wider than the ribs, the ribs crossed by four spiral cords, the three upper ones of equal size and equally spaced, the lowest, bordering the sutural area, a little larger than the others, all of them smaller than the axial ribs and rendering them nodulous at their interceptions. The spaces enclosed by the ribs and cords are shallow pits which are rectangular between the equi-spaced cords and squarish in the space above the lowest cord. The axial ribs enter the sutural areas obliquely, there becoming raised threads which abut against the summit of the succeeding whorl. On the last whorl the axial ribs continue with diminishing strength from the periphery down the base toward the distal margin of the columella. A short distance below the peripheral spiral cord of the ultima there is another slightly smaller cord (this covered on the spire by the summits of the later whorls), and under that there is a still smaller cord. Base moderately produced, marked by four or five faint spiral bands. Aperture oval. Outer lip generally thickened at the junction with the body, smooth within. Basal lip attentuated, effuse, acutely rounded at the anterior margin, the effusion faintly channeled medially, and skewed a little to the left. Columella with a short straight

inner margin below the columellar fold. Columellar fold feeble on the face of the inner lip but becomes stronger as it continues obliquely within the aperture where it is bordered posteriorly by a moderately prominent groove. Parietal wall lightly enameled.

Dimensions.—Holotype, length 1.4 mm.; max. width 0.7 mm.; paratype, length 1.25 mm.; max. width 0.6 mm.

Type locality.—La Salina, west of Puerto Cabello, State of Carabobo. Seven specimens.

Comparisons.—This species is comparable to but not identical with the Miocene *C. granulata* (H. C. Lea) (1843b, p. 255, pl. 36, fig. 54) from Petersburgh, Virginia, and *C. melanoidis* (Conrad) (1829a, pp. 207, 226, pl. 9, fig. 19) from the Miocene at St. Mary's River, Maryland. Among other differences, *C. granulata* is not nearly so effuse anteriorly as *C. salinensis,* n. sp., and on *C. melanoidis* (see Martin, 1904, p. 220, pl. 54, fig. 1) the whorls of the spire are girdled with four equally distinct, raised revolving ribs in contrast with the Venezuelan shell on which the basal spiral cord of the whorl is definitely larger than the superior ones. The preceding species *C. caribbeana,* n. sp., from the Playa Grande formation (Maiquetía member) of the Cabo Blanco group is also similar to the present species although *C. caribbeana* can be distinguished by its much heavier columellar plait, by its smaller spire angle, and generally heavier and more uniform spiral ribs. Of the 21 species of *Chrysallida* described by Bartsch (1955) from the Pliocene at North St. Petersburg, Florida, *C. salinensis* is closest perhaps to *C. locklini* Bartsch (1955, pp. 73-74, pl. 16, fig. 10) although the Venezuelan shell is readily discriminated from that by its much longer, more effuse, and more pointed basal lip.

Chrysallida cribrata, new species Pl. 44, figs. 15, 16

Shell small, reticulated, elongate conical, most of the spire missing on the holotype, the angle of divergence estimated at about 15 degrees. Post-nuclear whorls slightly convex, shallowly channeled at the sutures, the body whorl flattened around the middle, the base moderately and regularly produced. Whorls sculptured by four beaded spiral ribs, one thin, nonbeaded spiral cord at the base of the sutural excavation immediately above the suture itself, and 22

axial ridges (on the penultimate whorl) which are slightly oblique and about the same size or a little broader (on the spire whorls) than the spiral ribs. The two sets of costae form a reticulated pattern, and beads are developed at their interceptions. On the last two whorls the second spiral rib from the top bears the largest beads and is a trifle stouter than the others, the one above being smaller, the two below being about equal in size. Base with five revolving crenated cords, the topmost the largest, the ones below flattened and decreasing progressively in width anteriorward. The axial costae of the last whorl extend to the topmost spiral of the base; from that cord down, the axials are of threadlike proportions and render the spiral cords crenate rather than beaded. Aperture elongate oval. Outer lip thickened slightly at the summit, the rim a little scalloped, the inner margin faintly fluted. Basal lip broken. Columella slightly curved, its enamel raised above and partially overriding the narrow umbilical chink. The columellar fold is low, nearly horizontal, and lies posterior to the middle. Parietal wall lightly enameled. Lower lip flattened and somewhat broadened anteriorly, the flattened face of the lip faintly sulcate.

Dimensions.—Holotype (2-1/2 whorls), length 2 mm.; max. width 1 mm.

Type locality.—Mare formation at W-25, south flank of Punta Gorda anticline. One specimen, the holotype.

Comparisons.—A related species is *C. granulata* (H. C. Lea) from the Miocene at Petersburg, Virginia (see Martin, 1904, p. 220, pl. 54, fig. 2). On the Virginian form the revolving cords on the base are flatter and do not diminish in size anteriorly as do those on the new species. Also, on *C. granulata* the spiral ribs on the back of the ultimate whorl show no differentiation in size, whereas on *C. cribrata* the second spiral from the top is the largest of the four, and the most strongly beaded. The Recent *C. communis* (C. B. Adams) (see Turner, 1956, pp. 39-40, pl. 10, fig. 5) from the Pacific side of Panamá is also similar to the Venezuelan fossil but is differentiated by its more attenuated base with the more numerous spiral cords, and by its strongly fluted aperture. The Recent *C. jadisi* (Olsson and McGinty) (1958, p. 43, pl. 1, figs. 11, 11a) from the Atlantic side of Panamá at Bocas Island has fewer axial ribs (18 as com-

pared with 22), narrower sutural excavations, and more indefinite spiral cords on the base than the fossil *C. cribrata,* n. sp. In the Pliocene at North St. Petersburg, Florida, two species are described by Bartsch that are closely akin to *C. cribrata,* and these are *C. pilsbryi* Bartsch (1955, p. 76, pl. 16, fig. 6) and *C. mcgintyi* Bartsch (1955, pp. 76-77, pl. 16, fig. 7). Both, however, are more rapidly tapering than *C. cribrata,* with *C. pilsbryi* having two more axial ribs than *C. cribrata* and *C. mcgintyi* two less than *C. cribrata.*

Turbonilla marella, new species Pl. 44, figs. 17, 18

Shell small, porcelaneous, slender, subcylindrically tapering, the angle of spire nine degrees. Holotype with but five whorls remaining, the upper part of the spire and nucleus decollate. Surface sculptured with strong axial ribs (14 on the last full whorl) separated by excavated interspaces of about the same width. On the spire whorls the ribs extend from suture to suture; on the body whorl most of the axial ribs extend a little beyond the periphery where they terminate, but a few of them, much enfeebled, continue a short distance on the base. The ribs are generally more or less straight but some of them are slightly bowed to the left as viewed with the spire upright. Spiral markings are present in the interspaces but are visible only under high magnification. The sutures are finely impressed. Aperture small, subquadrate. Outer lip broken back. Base subtruncate. Columella short, straight, enameled, the enamel extending to the parietal wall where its margin is raised slightly above the whorl. Base of shell thickly enameled.

Dimensions.—Holotype (five whorls), length 2.7 mm.; max. width 0.8 mm.

Type locality.—Mare formation at W-14, on hillside above west bank of Quebrada Mare Abajo. One specimen, the holotype.

Remarks.—This species partakes of the subgenera *Turbonilla* and *Chemnitzia.* It would undoubtedly be referred to the latter were it not for the tendency of some of the axial ribs to extend over the periphery proper as on *Turbonilla, s.s.*

Comparisons.—*T. marella* with its subtruncate base is reminiscent of *T. belotheca* Dall (1889b, p. 335, pl. 26, fig. 76d) a living species in the Gulf of Mexico and the waters of Barbados at depths

of 50 to 100 fathoms. *T. belotheca,* however, is larger, its axial costae are more oblique, and some of them are bowed to the right instead of to the left as on the Venezuelan fossil. In the Miocene of the Dominican Republic the genus *Turbonilla* is represented by 21 species (see Maury, 1917, and Pilsbry, 1921) but with none of them is *T. marella,* n. sp. identical. From the Pliocene at North St. Petersburg, Florida, Bartsch (1955) has described 16 species of *Chemnitzia* and with none of those is the Venezuelan shell identical. The distinguishing characteristics of *T. marella* are its flat-sided and tightly joined whorls.

Turbonilla (Chemnitzia) pustulella, new species Pl. 44, figs. 19, 20

Shell small, moderately sturdy, elongate conical, the angle of spire about 22 degrees, the details of sculpture somewhat variable. Nucleus smooth, porcelaneous, consisting of about 2-1/2 whorls, the initial helicoid, the next planorboid and immersed a little into the first post-nuclear whorl, its axis at right angles to that of the conch proper; the last stage of the nucleus merges normally into the conch. The initial whorl of the nucleus resembles a swollen pimple, and is situated a little to the left of the medial line on one specimen, far to the left on another. The demarcation between the nucleus and the conch is defined by the abrupt appearance of the first axial rib. Post-nuclear whorls four, somewhat convex, the earlier ones a little more rounded and a little more constricted at the suture than the later ones. Sutures finely impressed. Sculpture consisting of strong, moderately narrow to moderately wide, rounded axial ribs, the intercostal areas smooth, rather shallowly concave, narrower than the ribs themselves on the first post-nuclear whorl, but as wide as, to a little wider than the ribs thereafter. The ribs extend from suture to suture, and there are about 14 of them on the last full volution; on the ultimate whorl they terminate at the periphery. Base short, somewhat convex, completely smooth. Aperture subquadrate, smooth within. Outer lip with the last axial rib immediately behind, joined obtusely to the whorl. Basal lip subtruncate. Columella short, straightish, rather stout, one of the specimens with a fairly thick sheath of enamel extending to the parietal wall; on the other two examples, including the holotype, the parietal wall is merely glazed with enamel.

Dimensions.—Holotype, length 1.2 mm.; max. width 0.35 mm., No. 26364 (figured); paratype, length 1.35 mm.; max. width 0.4 mm., No. 26400 (unfigured) PRI.

Type locality.—La Salina, west of Puerto Cabello, State of Carabobo. Three specimens.

Comparisons.—*T. pustulella,* n. sp. is of the same general design as *T. atlasi* Bartsch (1955, pp. 24-25, pl. 4, figs. 5a, b) from the Pliocene of North St. Petersburg, Florida, but is considerably smaller and has fewer whorls than that species.

Turbonilla (Chemnitzia ?) species Pl. 45, fig. 1

The single specimen lacks all but the ultimate whorl. This whorl is moderately convex, and is sculptured by about 18 strong, nearly straight axial ribs of equal size separated by slightly narrower concave interspaces. The axial ribs extend from the suture to the periphery where they terminate abruptly and evenly, and each interspace is pitted at the periphery. Surface corroded, but there is no suggestion of spiral lineations in the intercostal areas. Base rounded, short, smooth. Aperture angularly ovate. Columella straight, fairly stout. The angle between the parietal wall and the summit of the outer lip is moderately acute.

Dimensions.—Body whorl only, length 1.7 mm.; width 1.22 mm.

Locality.—Mare formation at W-25, south flank of Punta Gorda anticline. One incomplete specimen.

Remarks.—There are several species of *Chemnitzia* from the Pliocene of Florida, described by Bartsch (1955) which this Venezuelan shell resembles in a general way, but there is not enough left of it to make an effective comparison.

Turbonilla (Nisiturris) pupapicula, new species Pl. 45, figs. 2, 3; Pl. 46, figs. 1, 2

Shell minute, turrited, the spire relatively short, the angle of divergence approximately 19 degrees. Whorls about 5-1/2 in all, the nucleus composed of a little less than three of them. The nucleus is smooth, relatively large, pupoid; the initial whorl is a small loosely coiled mammillate protruberance inclined a little over the summit

of the first post-nuclear whorl at the dorsum, helicoidally joined to the succeeding nuclear whorl; the latter is greatly expanded in height and breadth, planorboid, placed obliquely with reference to the post-nuclear whorls; the last stage of the nucleus is twisted to merge finally into the configuration of the conch from which it is defined by the first axial rib. Post-nuclear whorls slightly convex, the ultima well rounded. Sutures distinct, narrowly incised. Sculpture consists of straightish to slightly curved, strong, rounded, axial ribs with moderately deep interspaces that are usually wider than the ribs themselves. There are about 14 ribs on the last full volution, terminating, along with the intercostal areas, at or a little below the periphery of the last whorl. Under a magnification of 20X the interspaces are seen to bear a few subequally spaced spiral threads of which there are about five on the penultimate whorl. Base short, convex, devoid of markings. Aperture generally ovate. Outer lip joined to the whorl at an obtuse angle. Columella slightly arcuate, enameled. Basal lip subangularly rounded.

Dimensions.—Holotype (broken slightly at base), length 1.0 mm.; max. width 0.3 mm.

Type locality.—Playa Grande formation (Maiquetía member) at W-4, Quebrada Las Pailas. Four specimens.

Comparisons.—This is not to be confused with *Pyrgiscus magnacrista*, n. sp. with which it occurs. The present species has fewer axial ribs, a more arcuate columella, and, more significantly, a pupoid-mammillate apex rather than a high helicoid one. The nearest related species is *Turbonilla gatunensis* Brown and Pilsbry (1912, p. 510, text figs. 4b, c) from the Miocene Gatun beds at the Lower Locks of the Panamá Canal. *T. gatunensis* is larger than *T. pupapicula*, n. sp., it has several more whorls, and the intercostal spaces, which are gradually effaced at the periphery, do not bear spiral threads as do those on the Venezuelan shell.

Pyrgiscus magnacrista, new species — Pl. 45, figs. 4, 5; Pl. 46, figs. 3, 4

Shell small, elongate-turrited, the angle of spire around 18 degrees. Nucleus large in relation to the shell as a whole, smooth, porcelaneous, consisting of 2-1/2 helicoid whorls about one-fifth immersed in the first whorl of the conch and oriented at right angles

to the succeeding turns. The initial nuclear whorl is loosely coiled and projects slightly from the following one which is greatly expanded both in height and breadth; the last stage of the nucleus merges into the conch from which it is defined by the abrupt appearance of the first axial rib. Post-nuclear whorls at least 4-1/2, moderately convex, sculptured by strong, generally straight but occasionally flexuous or curved axial ribs extending from suture to suture. There are approximately 18 axial ribs on the first post-nuclear whorl at the early stage of which they are angularly curved or protractive at the summit, and about 16 on the last whorl of the holotype. Except for the ones on the first post-nuclear whorl where they are narrower than the ribs, the interspaces are as wide as and then wider than the ribs themselves. The intercostal areas are moderately deep and are marked with a few faint, unequally spaced spiral threads. On the last whorl the axial ribs and their interspaces terminate sharply at the periphery where there is a single row of rectangular pits, one in each of the interspaces. The sutures are finely impressed but distinct. Base short, convex, completely smooth. Aperture subangularly ovate. Outer lip joined to the whorl at an obtuse angle. Columella simple, moderately sturdy, the margin nearly straight.

Dimensions.—Holotype (juvenile, with nucleus and 1-1/2 post-nuclear whorls), length 1.65 mm.; max. width 0.3 mm. (Q26a); figured specimen (Pl. 45, fig. 5), with nucleus and a little over three whorls, estimated length 2.0 mm.; estimated width of last whorl 0.7 mm. (this has been lost); specimen with 4-1/2 whorls minus nucleus and base, length 1.8 mm.; max. width of lowest whorl 0.75 mm. (Q26b).

Type locality.—Playa Grande formation (Maiquetía member) at W-4, Quebrada Las Pailas. Five specimens collected.

Comparisons.—This species is characterized by its large helicoid nucleus, the crowded axial ribs on the first post-nuclear whorl, the faint spiral threads in the intercostal areas which can be seen under a magnification of 20X, and the smooth base. It is reminiscent of *P. beatula* Pilsbry and Johnson (1917, p. 174; Pilsbry, 1921, p. 391, pl. 36, fig. 2) from the Miocene of the Dominican Republic, but that species is spirally striated on the base, and is not as tapering as the Venezuelan shell.

Pyrgiscus granadensis, new species Pl. 45, figs. 6, 7

Shell small, sturdy, subcylindrical, elongate turrited, the angle of spire about eight degrees. Upper part of spire and nucleus decollate. Post-nuclear whorls four, moderately convex, the sutures fine but distinct. Sculpture consists of strong, more or less equal, slightly wavy, axial costae (13 on the last full volution), with low microscopic spiral ridges (about five on the penultimate whorl), and a faint, narrow spiral collar at the summit bordering the suture. The axial costae extend from suture to suture on the spire whorls and terminate at the periphery of the ultimate whorl; on the spire they are narrower than, to as wide as the interspaces, but on the body whorl they are somewhat wider than the interspaces. Aperture small, oval, nearly perpendicular to the long axis of the shell, seemingly completely smooth within. Outer lip and basal lips broken back. Columella short, thick, a little twisted. Base of shell short, well rounded, smooth.

Dimensions.—Holotype (four whorls), length 1.5 mm.; max. width 0.7 mm.

Type locality.—Mare formation at W-25, south flank of Punta Gorda anticline. One specimen, the holotype.

Comparisons.—Of the 24 species of *Pyrgiscus* described by Bartsch from the Pliocene of North St. Petersburg, Florida, the Venezuelan shell is nearest *P. thestiusi* Bartsch (1955, p. 41, pl. 7, figs. 8a, b). It is distinguished from *P. thestiusi* by its more convex whorls and the smaller angle of spire which is about 8 degrees as compared with 18 degrees or so for the Florida shell.

Pyrgiscus facetus, new species Pl. 45, figs. 8, 9

This species is described from a single example with only the two lower whorls remaining. The preservation is excellent, however, and the sculpture of the whorls is distinctive enough to warrant the assumption that the species is new.

Shell small, solid, porcelaneous, elongate conical. Last two whorls evenly rounded, the base of the ultima short. Whorls sculptured by strong, rounded, generaly straight but occasionally curved axial ribs of which there are 21 on the last full volution. Intercostal spaces wider than the ribs on the penultimate whorl, but on the

dorsum of the ultima the costae and intercostals are about of the same width. At the lower suture the intercostal spaces are impressed with a single row of fairly deep rectangular pits; from the posterior margin of the pits to the upper suture the spaces are crossed by faint, closely spaced spiral grooves dividing the area between them into flat, narrow, subequal bands of which there are approximately 18 on the body whorl. Sutures finely incised. Base with a total of about 13 low, subequal, finely crenated spiral threads under the coat of enamel which, on perfect specimens, must cover a considerable portion of the base. The axial ribs on the body whorl generally terminate in strength between the row of pits at the periphery, but continue weakly a short distance below the periphery tending to converge toward the umbilical area. Aperture subangularly oval, smooth within. Outer lip broken back, the shell of the labral area, even excluding the costae, thick. Columella moderately stout, slightly flexuous, the inner margin straight, the lower lip tending to flatten and widen anteriorly. Parietal wall and base with a sheath of smooth enamel.

Dimensions.—Holotype (body whorl and part of penultimate), length 1.9 mm.; width 1.4 mm.

Type locality.—Playa Grande formation (Maiquetía member) at W-26 in Quebrada Las Bruscas, about 120 meters upstream from junction with Quebrada Las Pailas. One specimen, the holotype.

Comparisons.—The nearest related species is the Miocene to Recent *P. interrupta* (Totten) (Totten, 1835, p. 352, fig. 7). As stated by Dall (1892, p. 259), *P. interrupta* is a variable species, but on all individuals the axial ribs cease at the periphery of the ultima, the columella is slender, and the base is produced. On *P. facetus* the ribs continue weakly beyond the periphery, the columella is relatively stout and slightly flexuous, and the base is short. *P. puncta* (C. B. Adams) (see Verrill and Bush, 1900, p. 530, pl. 64, figs. 19, 19a), a Recent shell reported from Jamaica and Bermuda, has more numerous axial ribs and spiral lineations than the new Venezuelan fossil, *P. facetus*.

Pyrgiscus bruscasensis, new species Pl. 45, figs. 10-13

Shell small, thin, turrited, elongate conical, the angle of spire

about 11 degrees. Nucleus and topmost whorls of the conch missing. Post-nuclear whorls remaining seven, the first four weakly and obtusely angulated near or just below the middle, the later ones evenly and moderately rounded. Sutures narrowly incised, distinct. Axial sculpture consists of elevated rounded ribs of which there are about 18 on the last full volution. The ribs extend from suture to suture and are generally straightish although at the summit of the whorls they curve, often sharply, to the left as viewed with the spire upright. The intercostal spaces are slightly wider than the ribs, and are marked by more or less equally spaced spiral threads which are relatively sharp on the lower half of the whorls but are evanescent or cannot be seen at all on the upper half. The number of visible intercostal threads increases with growth, there being about three on the earliest whorls and six or so on the penultimate whorl; on the body whorl the threads around the middle are the more prominent. Base of shell moderately produced, evenly convex, marked by feeble continuations of the axial ribs and by closely spaced, exceedingly fine spiral striae. Aperture ovate. Outer lip thin but reinforced behind by the last axial rib, the axial ribs of the surface showing faintly through the subtranslucency of the labrum and aperture. Columella delicate, bears a single fine but sharp corkscrew plait just below which, on the face of the columella, is a tiny nodulation.

Dimensions.—The holotype was broken in two while handling; five whorls measure 1.7 mm. in length; the two lowest whorls, detached from the five upper ones, measure 1.0 mm.; the maximum width of the last whorl is 0.7 mm.

Type locality.—Playa Grande formation (Maiquetía member) at W-26 in Quebrada Las Bruscas, about 120 meters upstream from junction with Quebrada Las Pailas. One specimen, broken in two parts, one of five whorls, the other of two.

Comparisons.—*P. bruscasensis,* n. sp. distantly resembles *P. riomaoënsis* Maury (1917, p. 314, pl. 25, fig. 18) from the Miocene of the Dominican Republic, and *P. latonae* Bartsch (1955, pp. 47-48, pl. 9, figs. 1a, b) from the Pliocene of North St. Petersburg, Florida. Among other differences, the Venezuelan shell is distinguished from *P. riomaoënsis* in having fewer whorls and narrowly

incised sutures, and from *P. latonae* in its more decisively developed columellar plait.

Pyrgiscus curucutiensis, new species Pl. 45, figs. 14, 15

Shell small, turrited, elongate conical, the angle of spire 19 degrees. Nucleus and tip of spire decollate, remaining whorls five, the sides hardly convex, the periphery of the ultima subangularly rounded. Axial sculpture consisting of low, fairly broad axial ribs extending from suture to suture but terminating at the periphery of the ultima. The summits of the ribs are generally slightly coronated, and the fine, impressed suture undulates over them. The interspaces are at first slightly narrower and then slightly wider than the ribs, and are marked by two rows of rectangular pits, one of which is at the periphery and the other at a progressively increasing distance below the suture. The pits are elongated in the spiral direction, the upper row situated one-fifth to one-third the height of the whorl below the suture. In the intercostal areas below the upper row of pits there are four or five faint spiral threads that are barely visible under a 10-power lens. Base short, convex, sculptured by five faint spiral fillets of about equal size separated by narrow grooves. Aperture relatively broad, vaguely kidney-shaped, narrowed a little anteriorly. Outer lip broken back medially, thickened at the junction with the whorl, the last axial rib immediately back of the margin. Columella straight, provided with a single fairly sharp, gyrating plication under which the lower lip, though broken, seems to be broadly channeled.

Dimensions.—Holotype (five whorls), length 2.5 mm.; max. width 0.8 mm.

Type locality.—Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. One specimen, the holotype.

Remarks.—This *Terebra*-like shell is characterized by its sharply monoplicate columella and the row of slitlike pits in the intercostal spaces below the suture. I have seen no near counterparts, although it is reminiscent of *Mormula marshalli* Bartsch (1955, pp. 31-32, pl. 5, figs. 5a, b) from the Pliocene at North St. Petersburg, Florida. The Venezuelan shell, however, differs in exhibiting no tendency to

develop varices as that species does, nor is it provided with the strong spiral folds within the aperture.

MELANELLIDAE

Melanella (Polygireulima) spatha, new species Pl. 45, figs. 16-19

Shell small, porcelaneous, rather sturdy, the spire elongate conical, the angle of spire about 37 degrees, the tip of the spire noticeably more slender than the conch proper. Whorls a little over six in all, those of the conch flat-sided. Nucleus smooth, subhyaline, consisting of about 1-1/2 whorls, the initial one full, the last convex but relatively long thereby attenuating the apical tip. Surface devoid of sculpture. Sutures distinct. Ultimate whorl obtusely angulated at the periphery, the base a little produced. Aperture entire, subangularly ovate, moderately broad. Outer lip broken back. Columella gently concave, the parietal wall lightly callused, the callus thickened at the lower lip, the lip bordered by a narrow, shallow longitudinal groove. At the curve of the lower and basal lips there is a short spatulate depression with a small wrinkle in the middle.

Dimensions.—Holotype (S138a), length (three whorls) 2 mm.; max. width 1.2 mm.; paratype (S138b), length 1.8 mm.; max. width 0.9 mm.

Type locality.—Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. Three specimens, all of them broken.

Comparisons.—The distinguishing characteristics of this species are the relatively wide angle of spire, the pronounced subangulation of the periphery, and the rudimentary, fibrillate canal. It is reminiscent of the Miocene to Recent *M. conoidea* (Kurtz and Stimpson) as described by Olsson and Harbison (1953, p. 332, pl. 59, fig. 7) and *M. conoidea nisoformis* Olsson and Harbison (1953, p. 333, pl. 59, figs. 8, 8a) from the Pliocene at St. Petersburg, Florida, but is more rapidly tapering than either of those.

Melanella species Pl. 45, figs. 20, 21

Shell small, imperforate, slender, elongate conical, the angle of spire about 21 degrees. Post-nuclear whorls flat-sided, the sutures

fine, in places fused. Aperture relatively small, oval. Base gently rounded.

Dimensions.—Length (seven whorls), 1.7 mm.; max. width 0.6 mm.

Locality.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. One specimen.

Remarks.—The single example is broken and worn so that little can be said about its affinities.

ELLOBIIDAE

Melampus flavus (Gmelin) Pl. 47, figs. 3-5

1789. *Bulimus monile* Bruguière, Encycl. Méth., vol. 1, p. 338.
1792. *Voluta flava* Gmelin, Syst. Nat., p. 3436.
1852. *Melampus torosa* Mörch, Cat. Conchyl. Yoldi, vol. 1, p. 38.
1863. *Melampus flavus* (Gmelin), Binney, Bost Soc. Nat. Hist. Jour., vol. 7, p. 166.
1868. *Melampus flavus* (Gmelin), Tryon, Amer. Jour. Conch., vol. 4, pt. 1, No. 3, p. 8, pl. 18, fig. 6.
1885 *Melampus flavus* (Gmelin), Dall, U. S. Nat. Mus., Proc., vol. 8, p. 281, pl. 18, fig. 2.
1889. *Melampus flavus* (Gmelin), Dall, U. S. Nat. Mus., Bull. 37, p. 92, pl. 47, fig. 1.
1900. *Melampus flavus* (Gmelin), Pilsbry, Connecticut Acad. Arts and Sci., Trans., vol. 10, pp. 504, 509.
1901. *Melampus flavus* (Gmelin), Dall and Simpson U. S. Fish Com., Bull., vol. 20 for 1900, pt. 1, p. 368, pl. 54, fig. 9.
1922. *Melampus flavus,* (Gmelin), Maury, Bull. Amer. Paleont., vol. 9, No. 38, p. 55.
1937. *Melampus flavus* (Gmelin), Smith, East Coast Marine Shells, p. 146, pl. 55, fig. 12; pl. 67, fig. 1.
1952. *Melampus flavus* (Gmelin), Pulley, Texas Jour. Sci., vol. 4, No. 2, p. 179.
1958. *Melampus flavus* (Gmelin), Olsson and McGinty, Bull. Amer. Paleont., vol. 39, No. 177, p. 19.
1959. *Melampus flavus* (Gmelin), Halle and Dineen, Nautilus, vol. 73, No. 1, pp. 29-30, pls. 5, 6.

Shell conoidal, the spire short. Whorls about nine in all, the uniwhorled nucleus hyaline, the post-nuclear whorls scarcely convex, the ultima gently shouldered, slightly concave below the suture. Sutures narrow, distinct. Surface marked with numerous longitudinal lineations and fine wrinkles, and, on all but the body whorl, there are longitudinal slits or grooves around the middle, the slits parallel with the growth lines but less abundant and not extending to the sutures. Aperture more or less triangular or lenticular, narrow above, lined with 10 or 11 strong, somewhat irregular lirae which do not

continue within nor reach the smooth inner edge of the outer lip. Columella with a strong narrow fold and a broader but less elevated swelling underneath. Lower lip bearing a thick oblique fold margining the side of the anterior canal. Anterior canal short, rather narrow, bent a little to the left, the extremity hardly notched. Base of columella thickened with enamel, the enamel rising a little above the closed umbilical area. Anterior fasciole represented by a convexity which merges into the enamel at the base of the columella. Parietal wall with an undifferentiated highly polished glaze. Apex a dull glassy gray, the conch dull tan, the body chestnut-brown. On the body there are three equidistant bands, the broadest just below the shoulder, a slightly narrower one below the middle, and a faint narrow stripe near the base. The two upper bands are creamy tan to dull white, the lowest stripe light brown. Apertural lirae glossy white, the interspaces purplish. The inner margin of the outer lip has the same coloration as the surface.

Dimensions.—Figured specimen, length 11.9 mm.; max. width 8.1 mm.

Locality.—Recent, on beach at Playa Grande Yachting Club, Distrito Federal. One specimen.

Comparisons.—This and *M. coffeus* (Linnaeus) vary much in form, color, and other characters, and there are specimens which can only be separated with difficulty. However, according to Tryon and Dall and Simpson, *M. flavus* generally has fewer and more irregular lirae in the aperture, and the shouldering is less pronounced. The genus *Melampus* is currently being studied by Holle and Dineen (1959).

Range and distribution.—Florida to northern South America.

MELANIIDAE

Pachychilus caboblanquensis, new species Pl. 1, figs. 1-3

Shell of medium size, ovate, imperforate, substranslucent, rather thin but strong. Spire elevated, most of it missing. Sutures well defined, simple. Whorls slightly convex, number not known. Aperture large, oval, a little oblique. Outer lip broken back but probably thin; basal lip effuse, not emarginate; lower lip thickened, somewhat reflected, the outer margin rather sharp. Columella and parietal

wall callused, the columella itself arcuate. Parietal wall obtusely angulated a little below the commissure; the angulation continues into the aperture but not on the whorl proper. Ground color cream or buff with faint blotchy longitudinal bands of chestnut on the dorsum; the blotches show through the aperture. At the suture there is a narrow band of orange-brown bordered below by a narrow band with a pale, ashy tone. On the body whorl there is another ashen band, this one wider but vaguer than that near the suture, visible faintly on the dorsum below the periphery. Surface with exceedingly numerous granulose striae arrayed in spiral crinkles, as well as faint transverse growth markings, the former barely visible under a 10-power lens.

Dimensions.—Holotype (last 2-1/2 whorls), length 28 mm.; max. width 15 mm.; length of aperture 16 mm.

Type locality.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. One broken specimen, the holotype.

Remarks.—I am indebted to Dr. William J. Clench for the generic classification of the single specimen as *Pachychilus*. Although of fresh-water origin, the new species is associated with the marine fauna of the Mare formation, having been washed in with it during Mare time.

INCERTAE SEDIS

Incertae sedis "a" Pl. 46, figs. 9, 10; Pl. 47, figs. 10, 11

Shell minute, thin, subtranslucent to subtransparent, broadly ovate, with a low spire, a subangularly rounded periphery, and a short convex base. Whorls 2-1/2, the apical one appressed, the next narrow and convex, the last subangulate around the periphery where the shell is a frosted white in contrast to the glassiness of the base, the peripheral angulation in line with the suture. Aperture broadly semilunar. Outer lip broken along the edge, thin, joined to the whorl at an acute angle. Columella short, the column faintly visible through the surface, the base of the columella undercut by the aperture in such fashion that the lower end of the columella projects as a short tip. A rather sharply defined but scarcely visible, button-like glaze covers part of parietal wall and columella, the margin of the

glaze extending from the posterior outlet across the lower part of the wall and swinging around sharply to the anterior tip of the columella. Lower and basal lips thin, the latter rounded. Surface devoid of markings.

Dimensions.—Length 0.55 mm.; max. width 0.5 mm.

Locality.—Lower Mare formation at W-13, on hillside above west bank of Quebrada Mare Abajo. One specimen.

Remarks.—The single example is barely beyond the embryonic stage of growth, and I am unable to place it even generically.

Incertae sedis "b" Pl. 47, figs. 12, 13

Shell small, fusiform-turrited, the angle of spire 38-42 degrees. Surface layer for the most part peeled off. Whorls nearly seven in all, the smooth nucleus consisting of a little over two of them. Initial nuclear whorl indistinct, the last convex, defined from the conch by the first axial fold. Post-nuclear whorls steplike, moderately convex, the earlier ones subangularly shouldered, the later ones with the shoulder more rounded. Sculpture consists of widely spaced, narrow axial folds (11 on the last full volution) and vague spiral cords, the imprint of the latter barely visible locally; among the spiral cords there seems to be a more prominent one at the shoulder and one at the periphery of the whorl. Aperture seemingly broadly oval, the anterior end, as well as the columella and outer lips broken away. Summit of outer lip thickened a little, joined to the whorl at about a right angle.

Dimensions.—Incomplete specimen, length 3.2 mm.; max. width 1.8 mm.

Locality.—Playa Grande formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline. One broken and decorticated specimen.

Remarks.—The axial ribs are a little stronger on the earlier post-nuclear whorls than on the later. Not much can be done about identifying this shell as much of it is broken and nearly the entire surface layer stripped away.

LIST OF NEW GENERA AND NEW SUBGENERA

Brachybittium (subgenus of *Bittium*)
Type: *Bittium* (*Brachybittium*) *caraboboense*, new species
Brachystyloma.
Type: *Brachystyloma caribbeana*, new species.
Cricolophus (subgenus of *Orinella?*).
Type: *Orinella ?* (*Cricolophus*) *humboldti*, new species
Defolinia (subgenus of *Caecum*)
Type: *Caecum* (*Defolinia*) *tomaculum*, new species
Liotiastralium (subgenus of *Astraea*).
Type: *Astraea* (*Liotiastralium*) *venezuelana*, new species
Litotrema (subgenus of *Anachis*).
Type: *Anachis* (*Litotrema*) *exuta*, new species.
Otiomyllon.
Type: *Otiomyllon venezuelanum*, new species.
Streptorygma.
Type: *Streptorygma erugata*, new species.

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PLATES

Explanation of Plate 1

Figure — Page

1-3. **Pachychilus caboblanquensis** Weisbord, n. sp. 482
Holotype (1226a). 26000 PRI. Length 28 mm., width 16 mm. Mare formation. Fig. 3, magnification of surface 30X.

4-6. **Emarginula multiradiata** Weisbord, n. sp. 44
Holotype (H104a). 26001 PRI. Length 18.5 mm.; width 12.8 mm. altitude 5.5 mm. Mare formation.

7,8. **Emarginula mareana** Weisbord, n. sp. 46
Holotype (J105a). 26002 PRI. Width 13.8 mm. Mare formation.

9,10. **Emarginula ? tropica** Weisbord, n. sp. 47
Holotype (S106a). 26003 PRI. Width 3.4 mm. Playa Grande formation (Maiquetía member).

11,12. **Hemitoma octoradiata** (Gmelin) 48
(A291a). 26004 PRI. Length 19 mm.; width 14.5 mm., altitude 10 mm. Recent.

13-17. **Fissurella (Fissurella) nimbosa** (Linnaeus) 60
Figs. 13-15, (A160a). 26005 PRI. Length 18.8 mm., width 13 mm., Altitude 8.5 mm. Recent.
Figs. 16, 17, (A160c). 26006 PRI. Length 30 mm., width 21.5 mm., altitude 12 mm. Recent.


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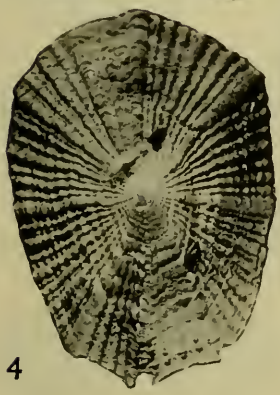
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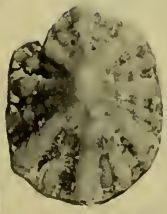
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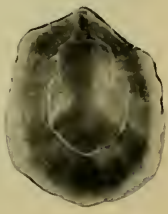
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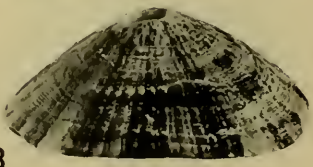
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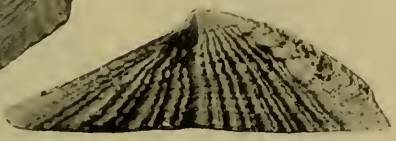
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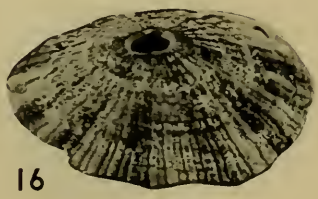
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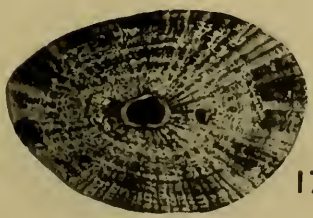
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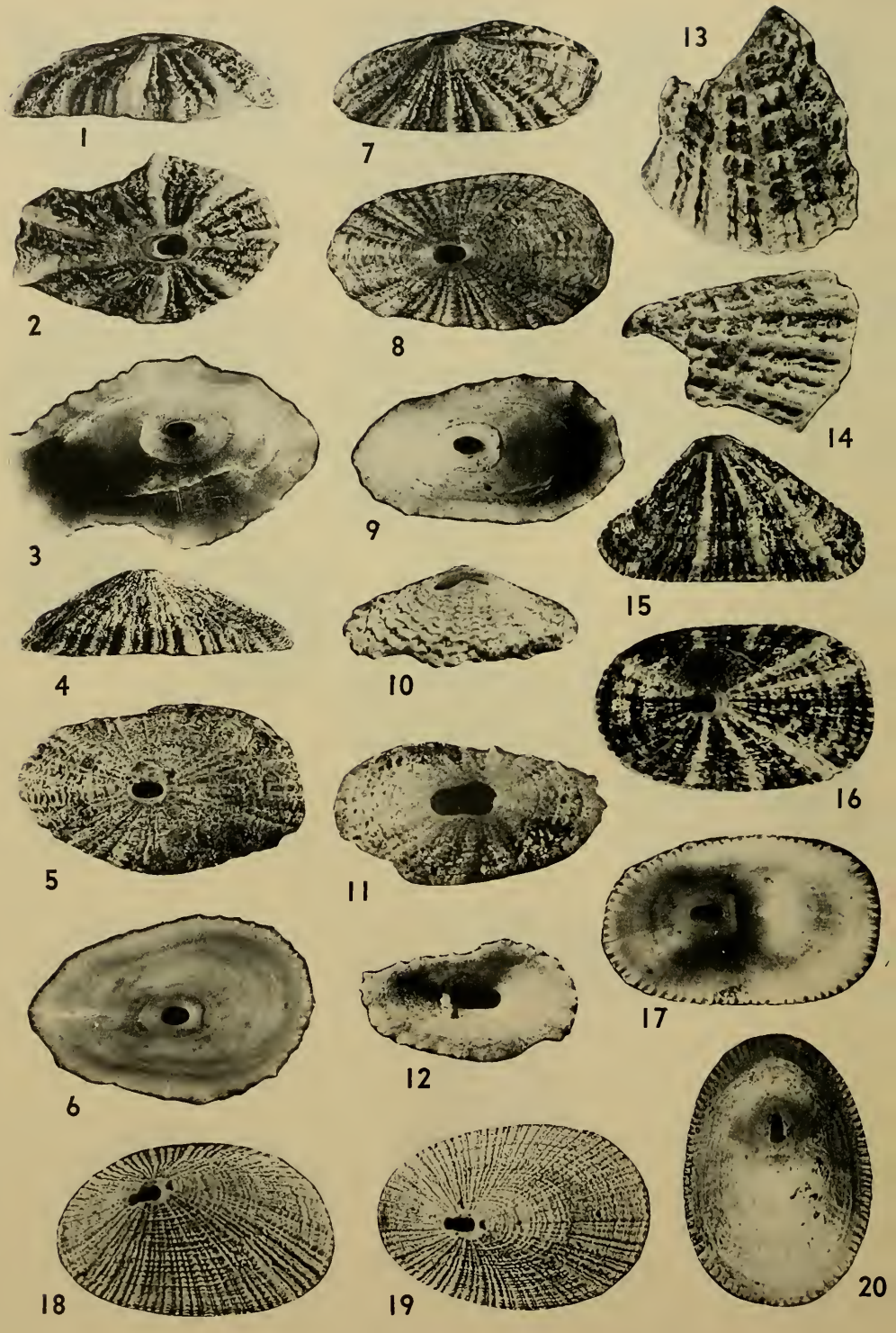
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Explanation of Plate 2

Figure — Page

1-3. **Fissurella (Cremides) angusta** Gmelin 61
(A163a). 26007 PRI. Length 18 mm., width 11.1 mm., altitude 5.1 mm. Recent.

4-6. **Fissurella (Cremides) rosea** (Gmelin) 62
(A161a). 26008 PRI. Length 21.2 mm.; width 13.8 mm.; altitude 6.3 mm.; external length of orifice 2 mm. Recent.

7-9. **Fissurella (Cremides) rosea** ? (Gmelin) 63
(D158a). 26009 PRI. Length 10 mm. width 5.5 mm.; altitude 3 mm.; external length of orifice 1.2 mm. Abisinia formation.

10-12. **Fissurella (Cremides) longipora** Weisbord, n. sp. 65
Holotype (I159a). 26010 PRI. Length 4.1 mm., width 2.5 mm., altitude 1.5 mm.; external length of orifice 0.9 mm. Mare formation.

13,14. **Fissurella** ? **species** 65
(H157a). 26011 PRI. Length of fragment 3.1 mm. Mare formation.

15-20. **Diodora cayenensis** (Lamarck) 50
Figs. 15-17, (A164a). 26012 PRI. Young specimen enlarged 4X. Length 10 mm., width 6.4 mm., altitude 5.2 mm.; external length of orifice 1.5 mm. Recent.
Figs. 18-20, (T164b). 26013 PRI. Length 28.4 mm.; width 19.5 mm. altitude 15.2 mm., external length of orifice including rear wall about 4.4 mm. Mare formation.

Explanation of Plate 3

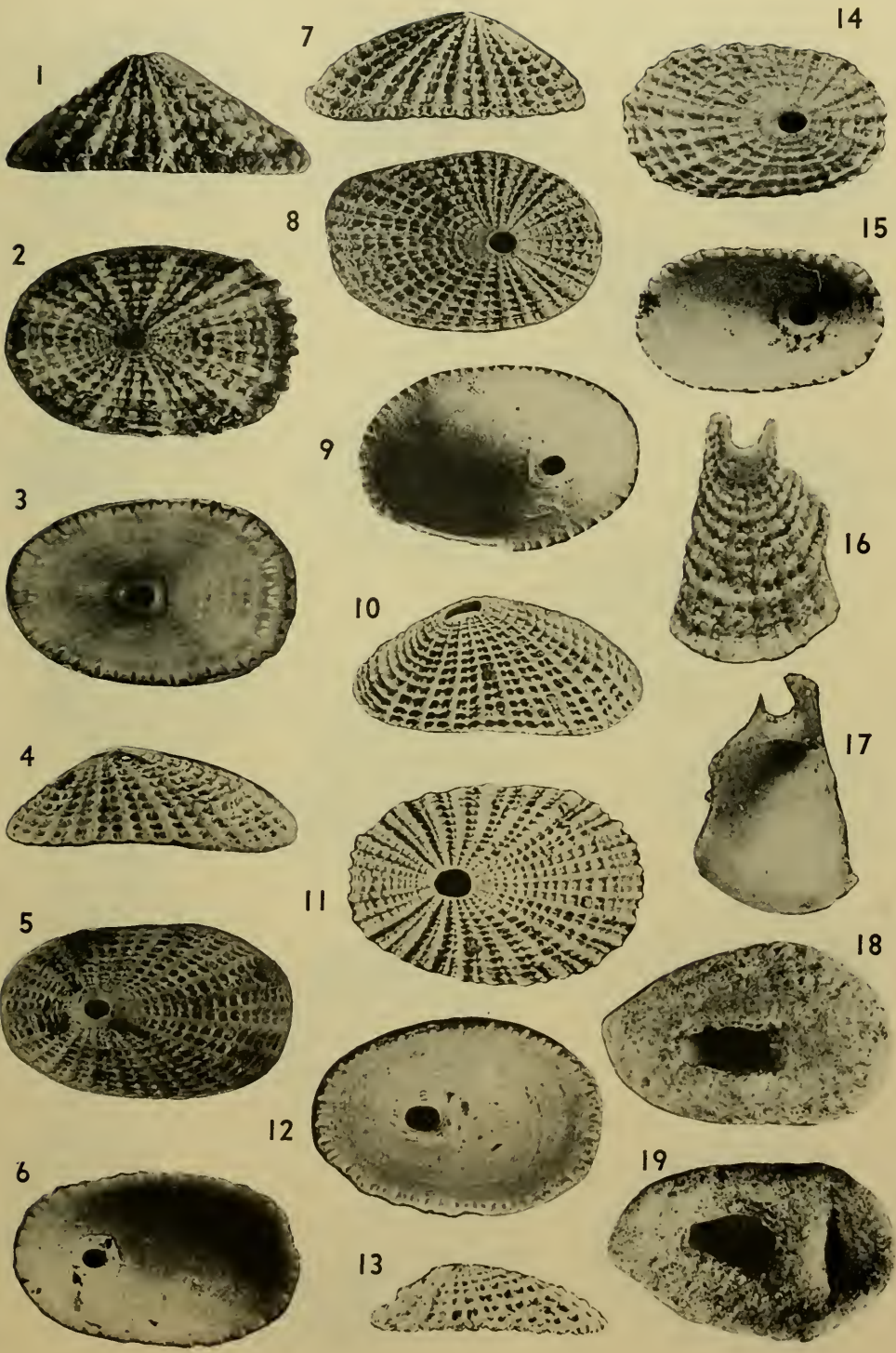
Figure — Page

1-3. **Diodora listeri** (d'Orbigny) 53
(A166a). 26014 PRI. Length 18.2 mm., width 12.1 mm.; altitude 8.4 mm.; external length of orifice 2.2 mm. Recent.

4-15. **Diodora meta** (von Ihering) 54
Figs. 4-6, (A167a). 26015 PRI. Length 10 mm..; width 6.1 mm.; altitude 3 mm.; external length of orifice 0.8 mm. Recent.
Figs. 7-9, (H165a). 26016 PRI. Length 12.8 mm., width 8.7 mm.; altitude 1.4 mm. Mare formation.
Figs. 10-12, (C165a). 26017 PRI. Length 11.1 mm.; width 7.5 mm.; altitude 4.2 mm.; external length of orifice 1.6 mm. La Salina.
Figs. 13-15, (D165a). 26018 PRI. Length 7.2 mm.; width 4.3 mm.; altitude 2.2 mm.; External length of orifice 0.8 mm. Abisinia formation.

16,17. **Diodora ? anomala** Weisbord, n. sp. 57
Holotype (S168a). 26019 PRI. Length of posterior slope from rear margin of orifice 4.5 mm. Playa Grande formation (Maiquetía member).

18,19. **Diodora dorsenula** Weisbord, n. sp. 58
Holotype (H169a). 26020 PRI. Length of specimen (of which only the apical area is present) 4 mm. Mare formation.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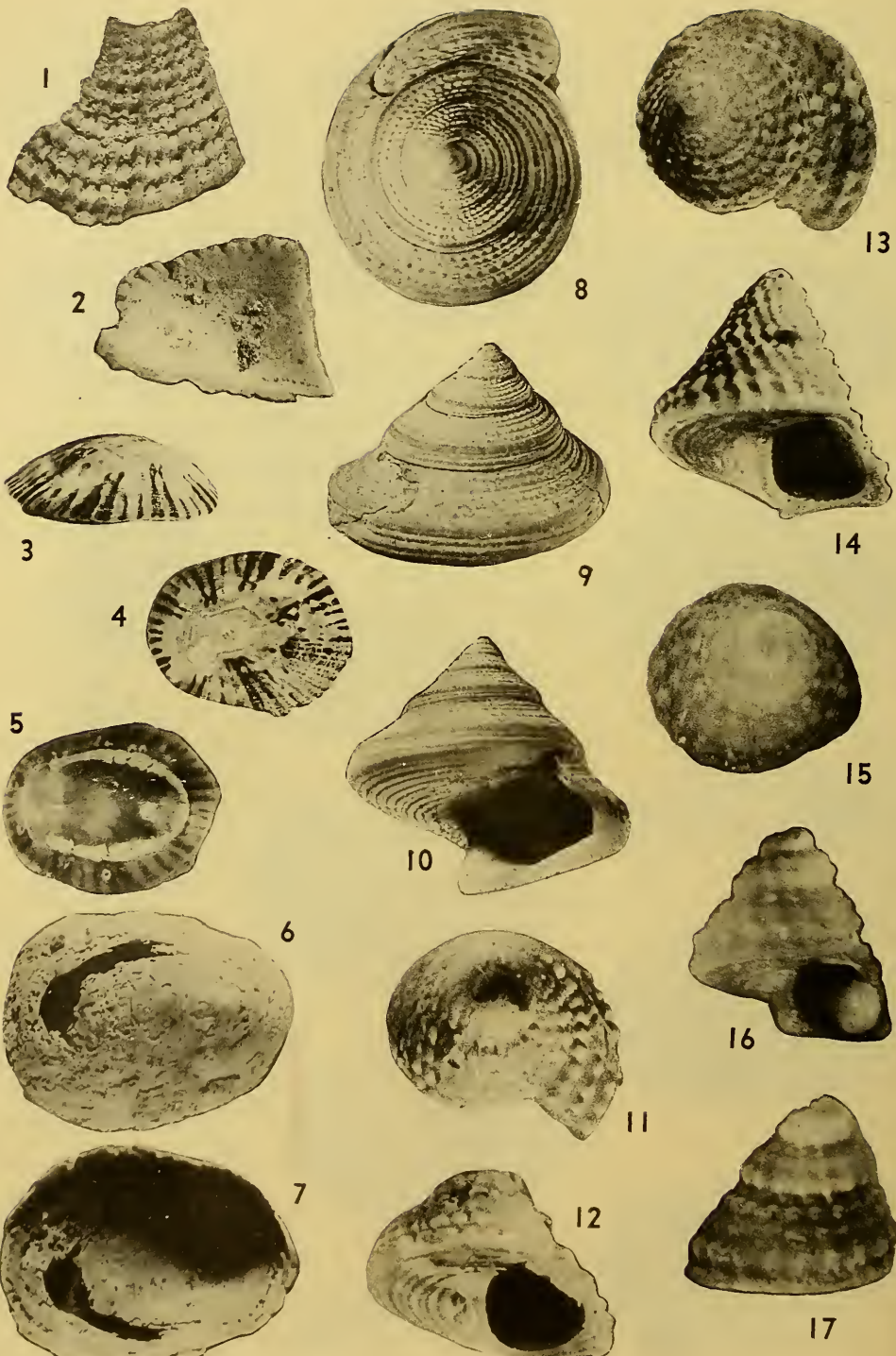
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Explanation of Plate 4

Figure — Page

1,2. **Diodora** species 59
(S170a). 26021 PRI. Length of slope fragment 4 mm. Playa Grande formation (Maiquetía member).

3-5. **Acmaea antillarum** (Sowerby) 66
(A137a). 26022 PRI. Length 17 mm.; width 13.5 mm.; altitude 4 mm. Recent.

6,7. **Acmaea** cf. **postulata** (Helbling). 68
(D137a). 26023 PRI. Length 8.2 mm.; width 6.5 mm. altitude 2.2 mm. Abisinia formation.

8-10. **Calliostoma caribbeanum** Weisbord, n. sp. 70
Holotype (I111a). 26024 PRI. Altitude 8 mm.; width 9 mm. Mare formation.

11,12. **Calliostoma puntagordanum** Weisbord, n. sp. 71
Holotype (S112a). 26025 PRI. Enlarged about 15X. Altitude 2.7 mm.; width 2.4 mm. Playa Grande formation (Maiquetía member).

13-17. **Calliostoma curucutianum** Weisbord, n. sp. 72
Figs. 13, 14, holotype (H113a). 26026 PRI. Altitude 2.3 mm.; width 2.1 mm. Mare formation.
Figs. 15-17, paratype (S114a). 26027 PRI. Enlarged about 25X. Altitude 1.3 mm.; width 1.2 mm. Playa Grande formation (Maiquetía member).

Explanation of Plate 5

Figure — Page

1. **Livona pica** (Linnaeus) 73
(B271a). 26028 PRI. Diameter 19 mm. Recent.

2-7. **Tegula (Agathistoma) viridula** (Gmelin) 76
Figs. 2-4, (A277a). 26029 PRI. Altitude 15.8 mm., width 17.2 mm. Recent.
Fig. 5, (A277b). 26030 PRI. Operculum. Maximum diameter 5.5 mm.; altitude 1 mm. Recent.
Figs.6, 7, (D277a). 26031 PRI. Altitude 17.8 mm.; width 18. 5 mm. Abisinia formation.

8-10. **Tegula (Agathistoma) puntagordana** Weisbord, n. sp. 78
Holotype (S278a). 26032 PRI. Altitude 15.8 mm.; width 16 mm. Playa Grande formation (Maiquetía member).

11-13. **Tegula (Agathistoma) trilirata** Weisbord, n. sp. 79
Holotype (I279a). 26033 PRI Altitude 12.7 mm.; width 15.8 mm. Mare formation.

14-16. **Tegula phalera** Weisbord, n. sp. 81
Holotype (S93a). 26034 PRI. Altitude 1.8 mm.; width 2.6 mm. Playa Grande formation (Maiquetía member). Enlarged about 12.5X.

17-19. **Tegula (Agathistoma) maculostriata** (C. B. Adams) 75
(A656a). 26035 PRI. Altitude 8 mm.; width 9.1 mm. Recent. Enlarged about 4.4X.

20-22. **Arene maiquetiana Weisbord,** n. sp. 82
Holotype (S92a). 26036 PRI. Altitude 2 mm.; width 2.2 mm. Playa Grande formation (Maiquetía member). Fig. 20, enlarged about 13X, figs. 21, 22 about 16X.


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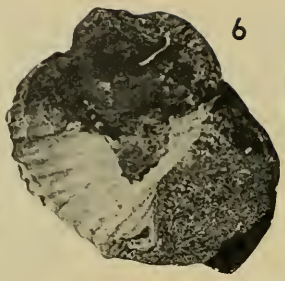
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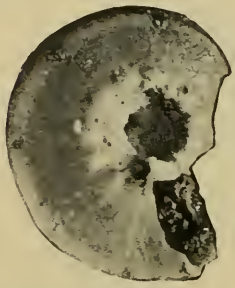
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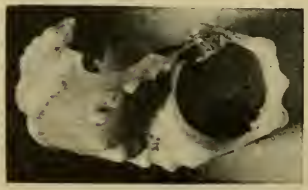


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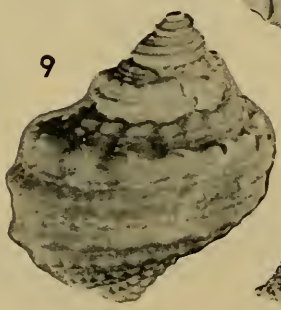
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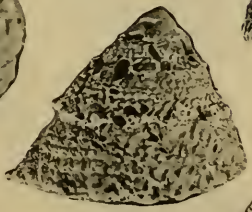
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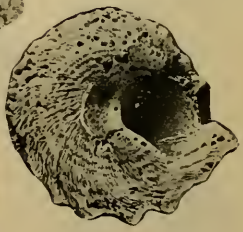
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Explanation of Plate 6

Figure — Page

1-3. **Arene (Marevalvata) laguairana** Weisbord, n. sp. 83
Holotype (S91a). 26037 PRI. Maximum diameter 3.3 mm. Playa Grande formation (Maiquetía member).

4,5. **Turbo caboblanquensis** Weisbord, n. sp. 84
Holotype (S11a). 26038 PRI. Length 2.3 mm.; width 1.7 mm. Playa Grande formation (Maiquetía member).

6,7. **Turbo (Taeniaturbo ?) marensis** Weisbord, n. sp. 86
Holotype (I217a). 26039 PRI. Width of last whorl 26 mm. Lower Mare formation.

8,9. **Turbo (Marmorostoma) crenulatus venezuelensis** Weisbord, n. subsp. 87
Holotype (S218a). 26040 PRI. Length 16.5 mm.; width 14 mm. Playa Grande formation (Maiquetía member).

10,11. **Turbo** species "a" 90
(J219a). 26041 PRI. Operculum. Length 16.5 mm.; width 14.5 mm.; altitude 5.5 mm. Lower Mare formation.

12,13. **Turbo** species "b" 92
(S220a). 26042 PRI. Operculum. Length 14 mm.; width 12.5 mm.; altitude 5 mm. Playa Grande formation (Maiquetía member).

14,15. **Turbo** species "c" 93
(S221a). 26043 PRI. Operculum, Length 23.7 mm.; width 21 mm.; altitude 9 mm. Playa Grande formation ,Maiquetía member).

16-18. **Astraea (Astralium) brevispina** (Lamarck) 94
(B270a). 26044 PRI. Altitude 36 mm.; width 41 mm. Recent.

Explanation of Plate 7

Figure — Page

1,2. **Astraea (Lithopoma) tuber** (Linnaeus) 97
(A107a). 26045 PRI. Altitude 23.7 mm.; width 23.7 mm. Recent.

3,4. **Astraea (Lithopoma ?) diffidentia** Weisbord, n. sp. 98
Holotype (G108a). 26046 PRI. Altitude 4 mm.; width 3 mm. Mare formation.

5-7. **Parviturbo venezuelensis** Weisbord, n. sp. 99
Holotype (H118a). 26047 PRI. Altitude 1.2 mm.; width 1.3 mm. Mare formation.

8,9. **Tricolia affinis cruenta** Robertson 101
(A3a). 26048 PRI. Length 3.1 mm.; width 2.4 mm. Recent.

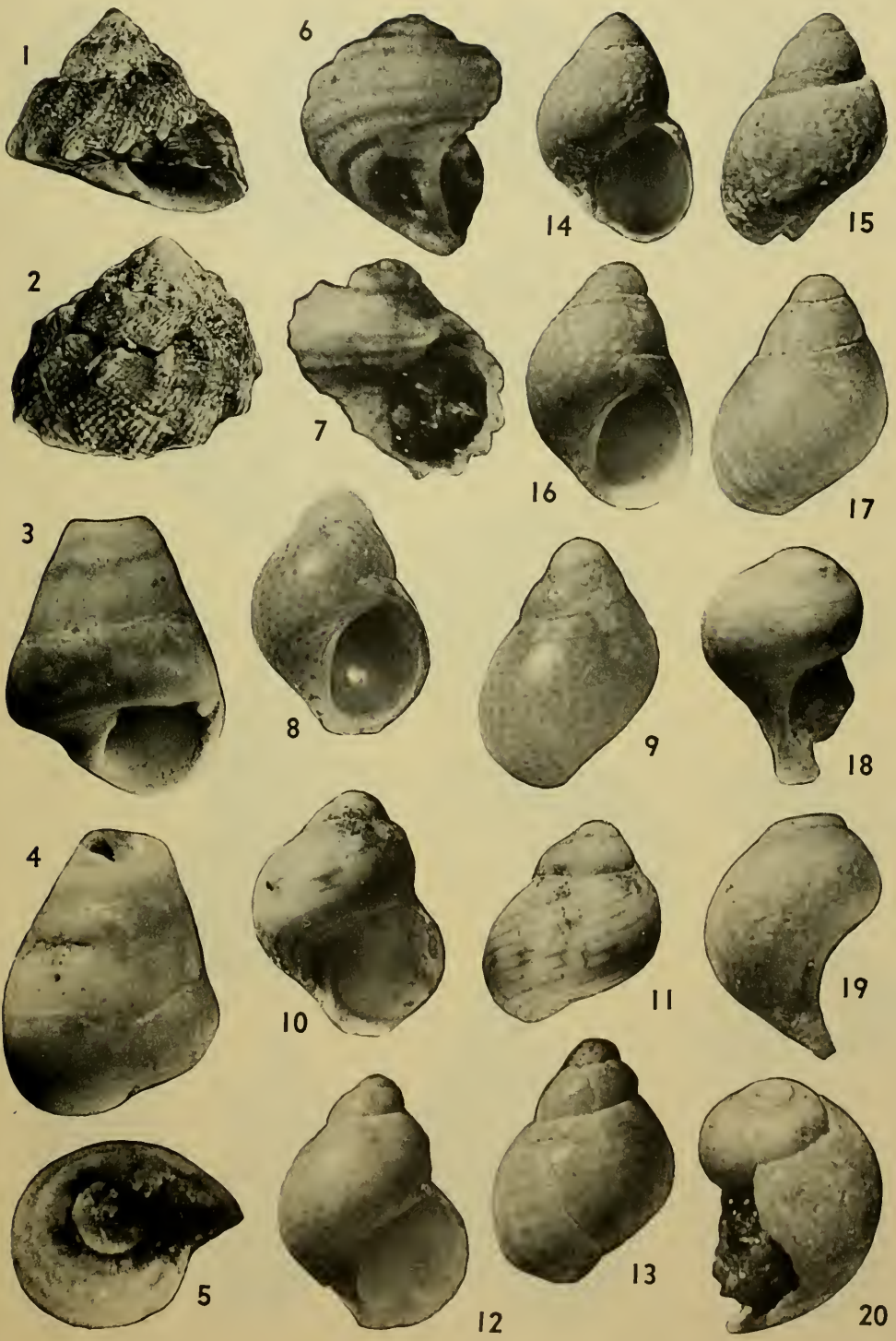
10,11. **Tricolia tessellata** (Potiez and Michaud) 108
(D4a). 26049 PRI. Length 3 mm.; width 2.2 mm. Abisinia formation.

12,13. **Tricolia rubrica** Weisbord, n. sp. 102
Holotype (I5a). 26050 PRI. Length 3.1 mm.; width 2.1 mm. Lower Mare formation.

14,15. **Tricolia mareana** Weisbord, n. sp. 104
Holotype (I6a). 26051 PRI. Length 3.8 mm.; width 2.1 mm. Lower Mare formation.

16,17. **Tricolia fasciata** Weisbord, n. sp. 105
Holotype (G7a). 26052 PRI. Length 3.7 mm.; width 2.5 mm. Mare formation.

18-20. **Tricolia maiquetiana** Weisbord, n. sp. 107
Holotype (S10a). 26053 PRI. Length 1.9 mm.; width 1.2 mm. Playa Grande formation (Maiquetía member).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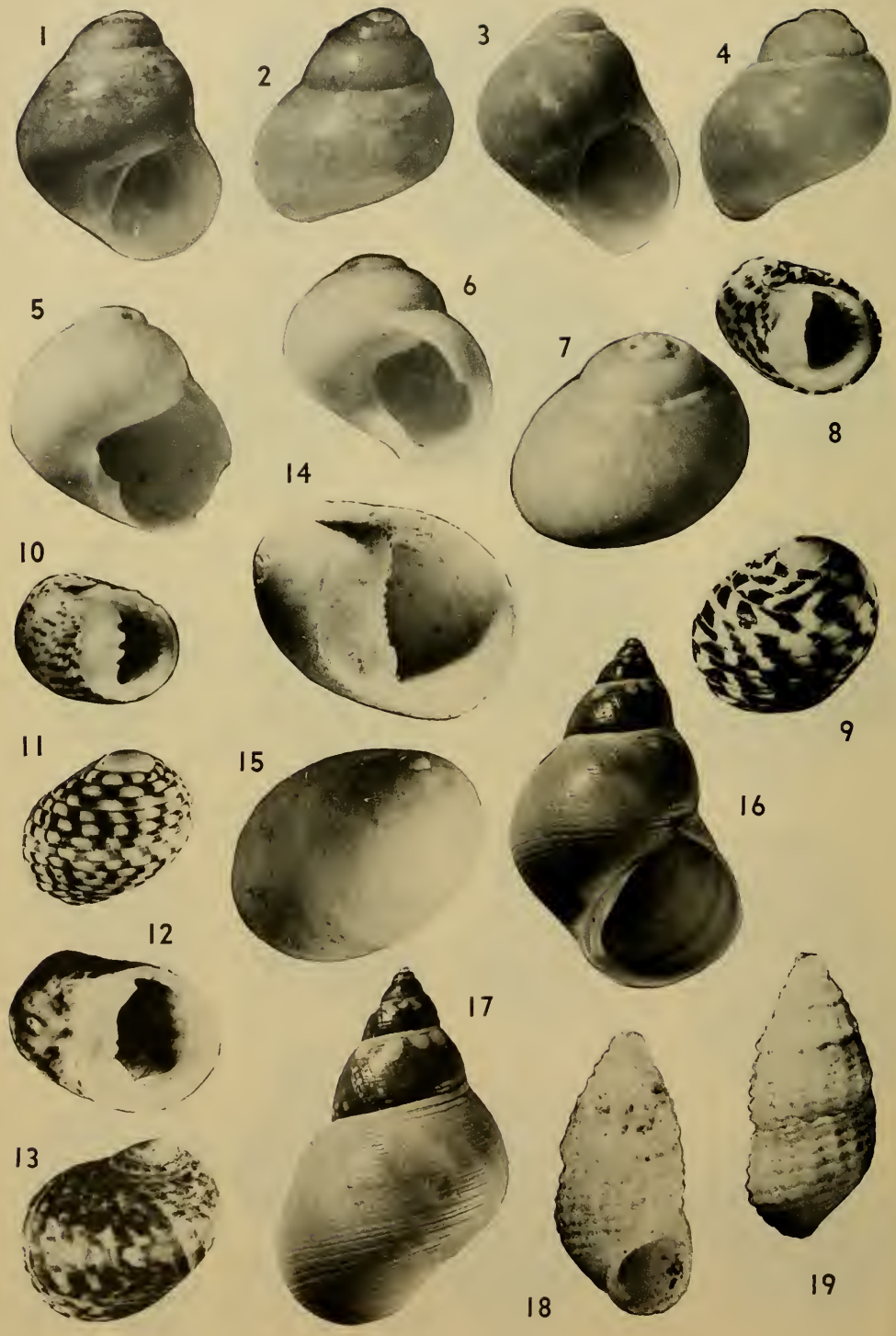
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Explanation of Plate 8

Figure — Page

1-4. **Gabrielona sphaera** Weisbord, n. sp. — 109
Figs. 1, 2, (C9a). 26054 PRI. Holotype. Length 1.2 mm.; width 1.05 mm. Mare formation.
Figs. 3, 4, (I8a). 26055 PRI. Paratype. Length 2.3 mm.; width 1.9 mm. Mare formation.

5-7. **Gabrielona bruscasensis** Weisbord, n. sp. — 111
Holotype (R16a). 26056 PRI. Length 1.3 mm.; width 1.2 mm. Playa Grande formation (Maiquetía member). Figs. 5, 6, two different views of front; fig. 7, view of back.

8,9. **Nerita tessellata** Gmelin — 111
(A286a). 26057 PRI. Altitude 17 mm.; width 18.5 mm. Recent.

10,11. **Nerita versicolor** Gmelin — 113
(A288a). 26058 PRI. Altitude 17.3 mm.; width 17.1 mm. Recent.

12,13. **Nerita peloronta** Linnaeus — 114
(A287a). 26059 PRI. Altitude 23 mm.; width 24.8 mm. Recent.

14,15. **Smaragdia viridis venezuelensis** Weisbord, n. subsp. — 116
Holotype (S145a). 26060 PRI. Length 3.9 mm.; width 3 mm. Playa Grande formation (Maiquetía member).

16,17. **Littorina (Melarhaphe) nebulosa** (Lamarck) — 117
(B73a). 26061 PRI. Length 15.8 mm.; width 9 mm. Recent.

18,19. **Alvania meridioamericana** Weisbord, n. sp. — 126
Holotype (G83a). 26062 PRI. Length 3 mm.; width 1.3 mm. Mare formation.

Explanation of Plate 9

Figure — Page

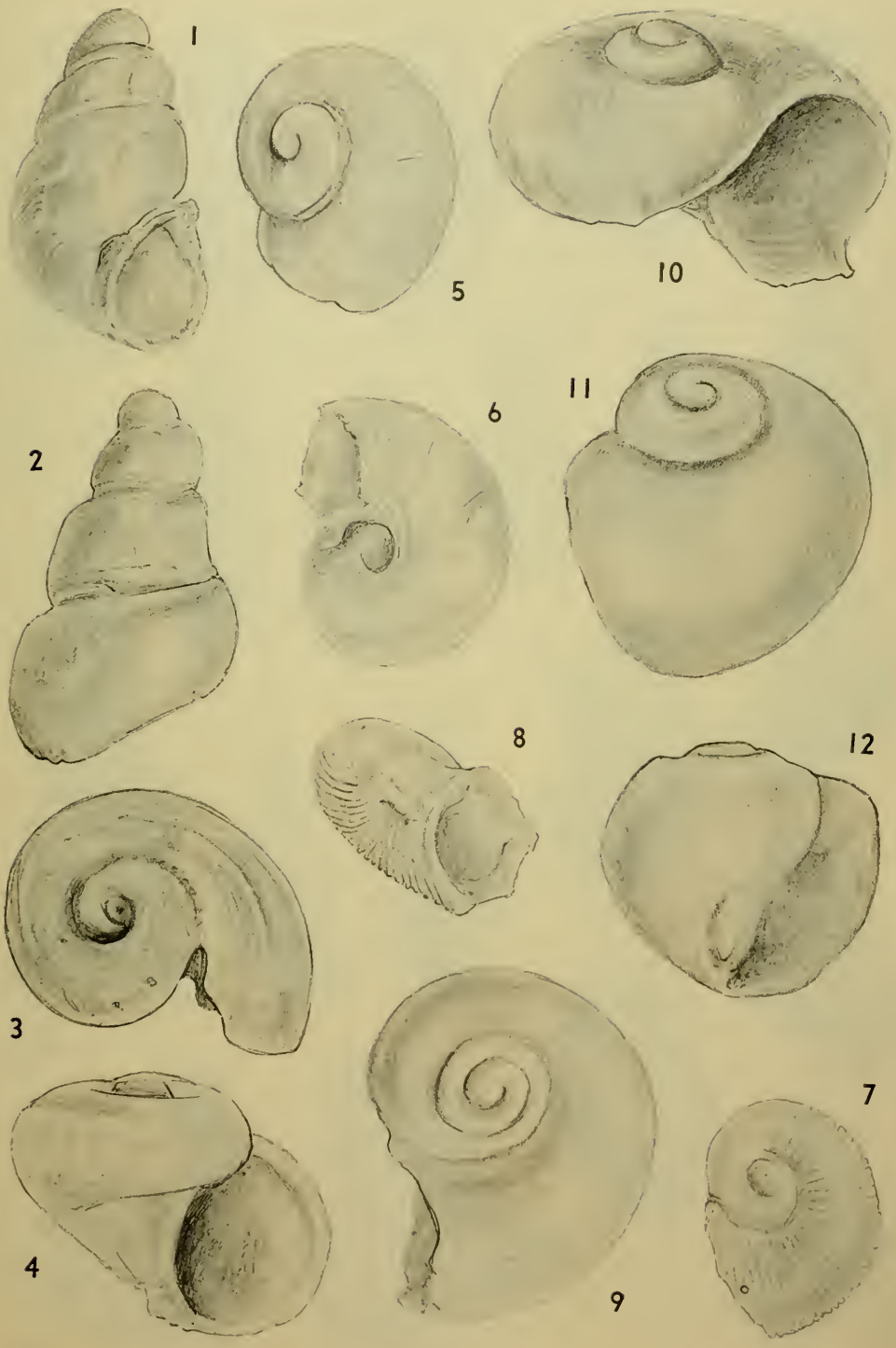
1,2. **Alvania playagrandensis** Weisbord, n. sp. 127
Holotype (S84a). 26063 PRI. Length 1.4 mm.; width 0.7 mm. Playa Grande formation (Maiquetía member). Enlarged 37X.

3-6. **Vitrinella mareana** Weisbord, n. sp. 133
Figs. 3, 4, holotype (I54a). 26064 PRI. Altitude 0.4 mm.; diameter 0.6 mm. Lower Mare formation. Enlarged 70X.
Figs. 5, 6, paratype (I54b). 26065 PRI. Altitude 0.3 mm.; diameter 0.5 mm. Lower Mare formation. Enlarged 70X.

7,8. **Cyclostromella venezuelana** Weisbord, n. sp. 136
Holotype (I63a). 26066 PRI. Altitude 0.2 mm.; diameter 0.4 mm. Lower Mare formation. Enlarged 80X.

9,10. **Cyclostremiscus (Ponocyclus) maiquetiensis** Weisbord, n. sp. 137
Holotype (Q62a). 26067 PRI. Altitude 0.45 mm.; diameter 0.75 mm. Playa Grande formation (Maiquetía member). Enlarged 77X.

11,12. **Otiomyllon venezuelanum** Weisbord, n. gen. and n. sp. 143
Holotype (Q128a). 26068 PRI. Altitude 0.45 mm.; diameter 0.55 mm. Playa Grande formation (Maiquetía member). Enlarged 80X.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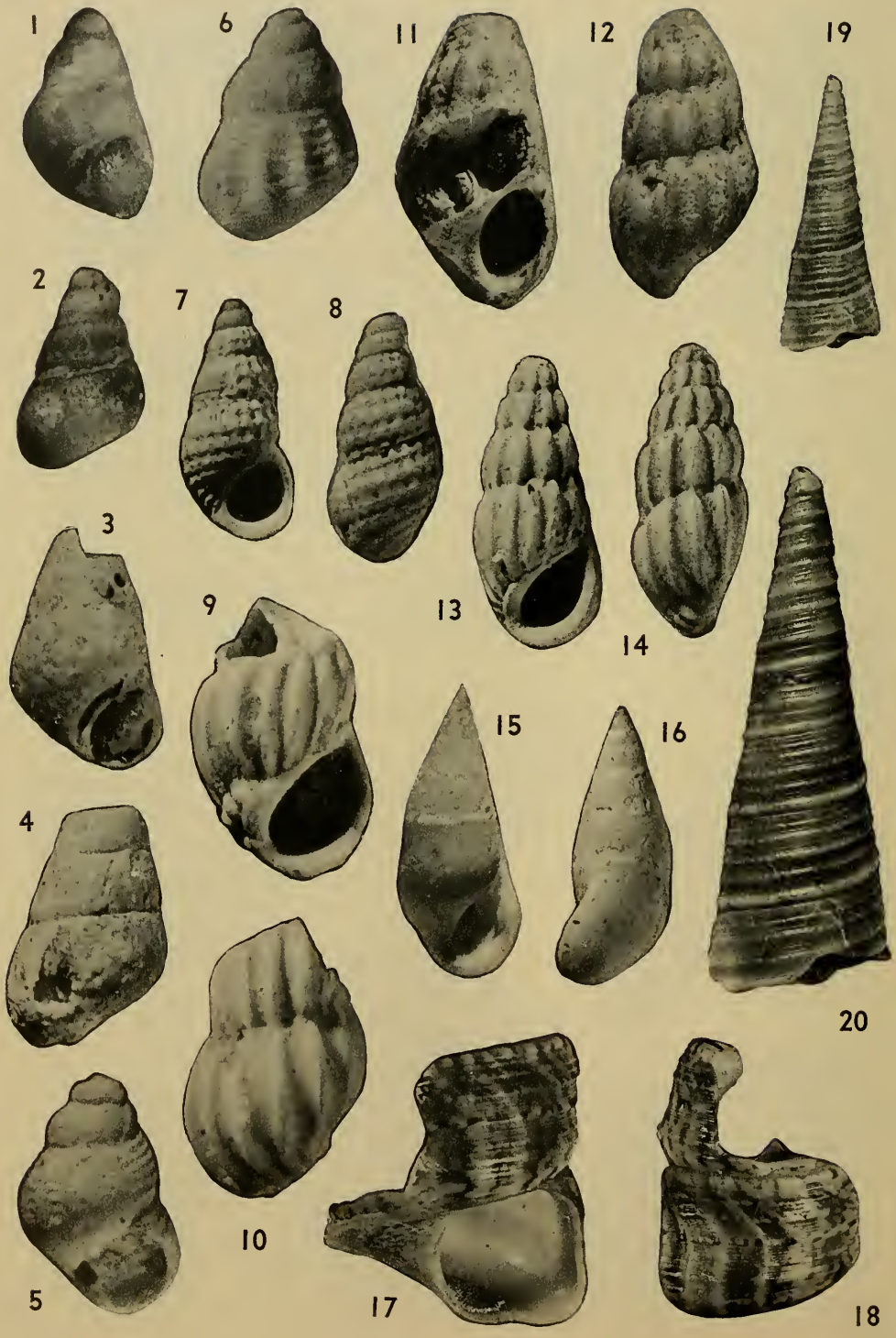
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Explanation of Plate 10

Figure — Page

1,2. **Alvania playagrandensis** Weisbord, n. sp. 127
Holotype (S84a). 26063 PRI. Length 1.4 mm., width 0.7 mm. Playa Grande formation (Maiquetía member).

3,4. **Alvania** ? species 129
(S85a). 26069 PRI. Length 2 mm.; width 1.1 mm. Playa Grande formation (Maiquetía member).

5,6. **Rissoa trabeata** Weisbord, n. sp. 119
Holotype (C65a). 26070 PRI. Length 1.1 mm.; width 0.7 mm. La Salina.

7,8. **Rissoina (Phosinella) puntagordana** Weisbord, n. sp. 119
Holotype (S67a). 26071 PRI. Length 2.5 mm.; width 0.9 mm. Playa Grande Grande formation (Maiquetía member).

9,10. **Rissoina (Eurissolina) bicrepida** Weisbord, n. sp. 121
Holotype (S68a). 26072 PRI. Length 3 mm.; width 2.2 mm. Playa Grande formation (Maiquetía member).

11,12. **Rissoina (Schwartziella ?) maiquetiana** Weisbord, n. sp. 122
Holotype (S69a). 26073 PRI. Length 3 mm.; width 1.5 mm. Playa Grande formation (Maiquetía member).

13,14. **Rissoina (Schwartziella) venezuelana** Weisbord, n. sp. 123
Holotype (H70a). 26074 PRI. Length 3.7 mm.; width 2 mm. Mare formation.

15,16. **Rissoina (Cibdezebina) caribella** Weisbord, n. sp. 125
Holotype (S71a). 26075 PRI. Length 3.7 mm.; width 1.8 mm. Playa Grande formation (Maiquetía member).

17-20. **Turritella variegata** (Linnaeus) 144
Figs. 17, 18, (B207a). 26076 PRI. Length 21 mm.; width 20.6 mm. (2 lower whorls). Recent. Figs. 19, 20, (B207b). 26077 PRI. Length 24.8 mm.; width 8.9 mm. (9 whorls). Recent.

Explanation of Plate 11

Figure | Page

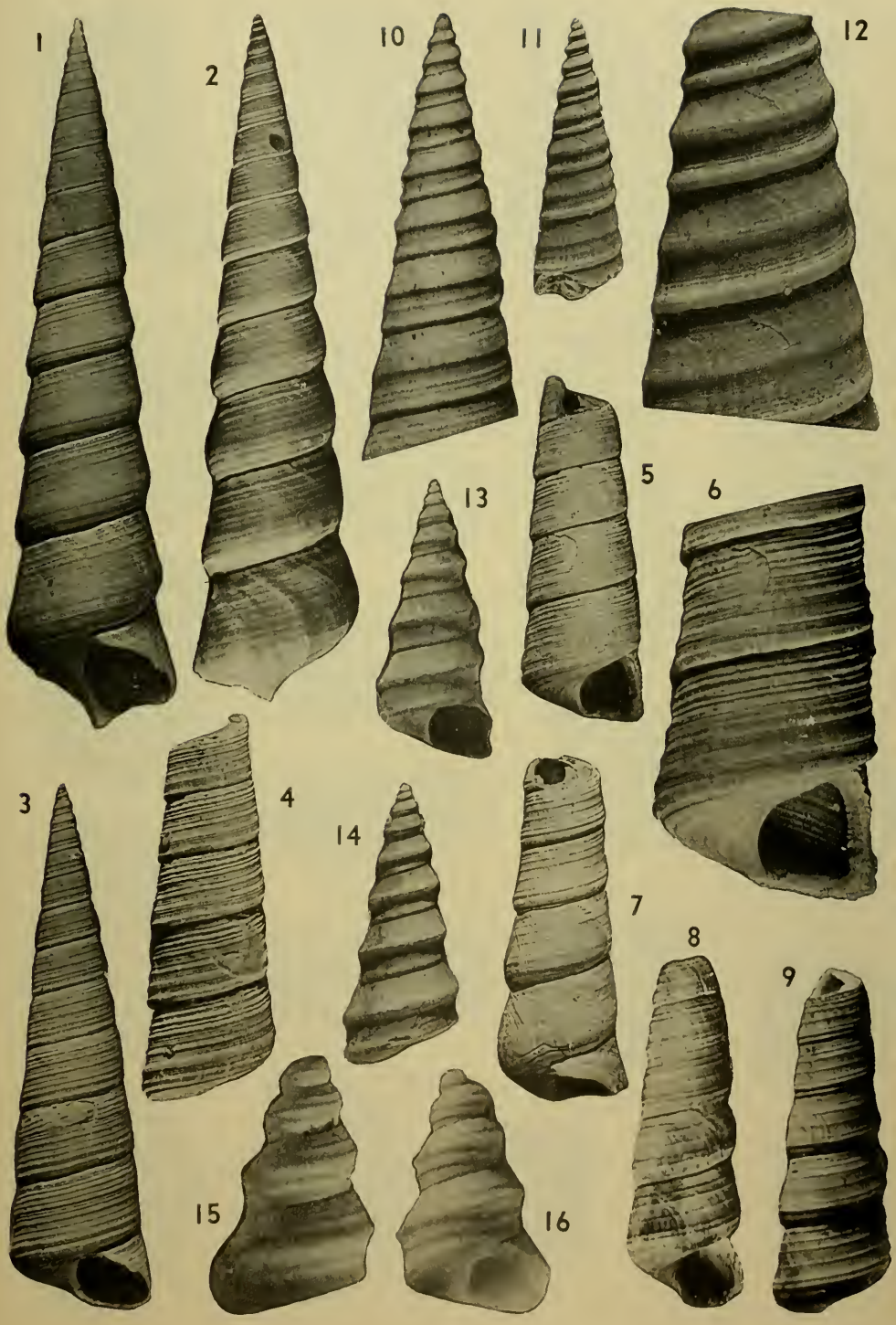
1-16. **Turritella maiquetiana** Weisbord, n. sp. 146

Figs. 1, 2, holotype (I206a). 26078 PRI. Length 101 mm.; width 23 mm. Mare formation. Fig. 3, (C206a). 26079 PRI. Length 78.6 mm., width 20 mm. Mare formation.

Figs. 4-6, (J206a). 26080 PRI. Length (5 yhorls) 58 mm.; width 22 mm. Figs. 4, 5, views of back and front; fig. 6 enlarged to show lirae within aperture. Lower Mare formation. Fig. 7, (Q206a). 26081 PRI. Length (5 whorls) 71 mm.; width 26.5 mm. Playa Grande formation (Maiquetía member). Figs. 8, 9, (Q206b). 26082 PRI. Length (5 whorls) 53 mm.; width 19 mm. Play Grande formation (Maiquetía member). Fig. 10, (Q206c). 26083 PRI. Length (11 spire whorls) 22.8 mm.; width 8 mm. Enlarged about 3X. Playa Grande formation (Maiquetía member).

Figs. 11, 12, (Q206d). 26084 PRI. Length 17 mm.; width 6 mm. Fig. 11 enlarged about 2.5X, fig. 12 about 6X. Playa Grande formation (Maiquetía member).

Figs. 13, 14, (Q206e). 26085 PRI. Length 6.2 mm.; width 2.6 mm. Views of nucleus and early post-nuclear whorls, front and back. Playa Grande formation (Maiquetía member). Figs. 15, 16, Q206f). 26086 PRI. Length 2.5 mm.; width 1.4 mm. Views showing axial sculpture on apical whorls, back and front. Playa Grande formation (Maiquetía member).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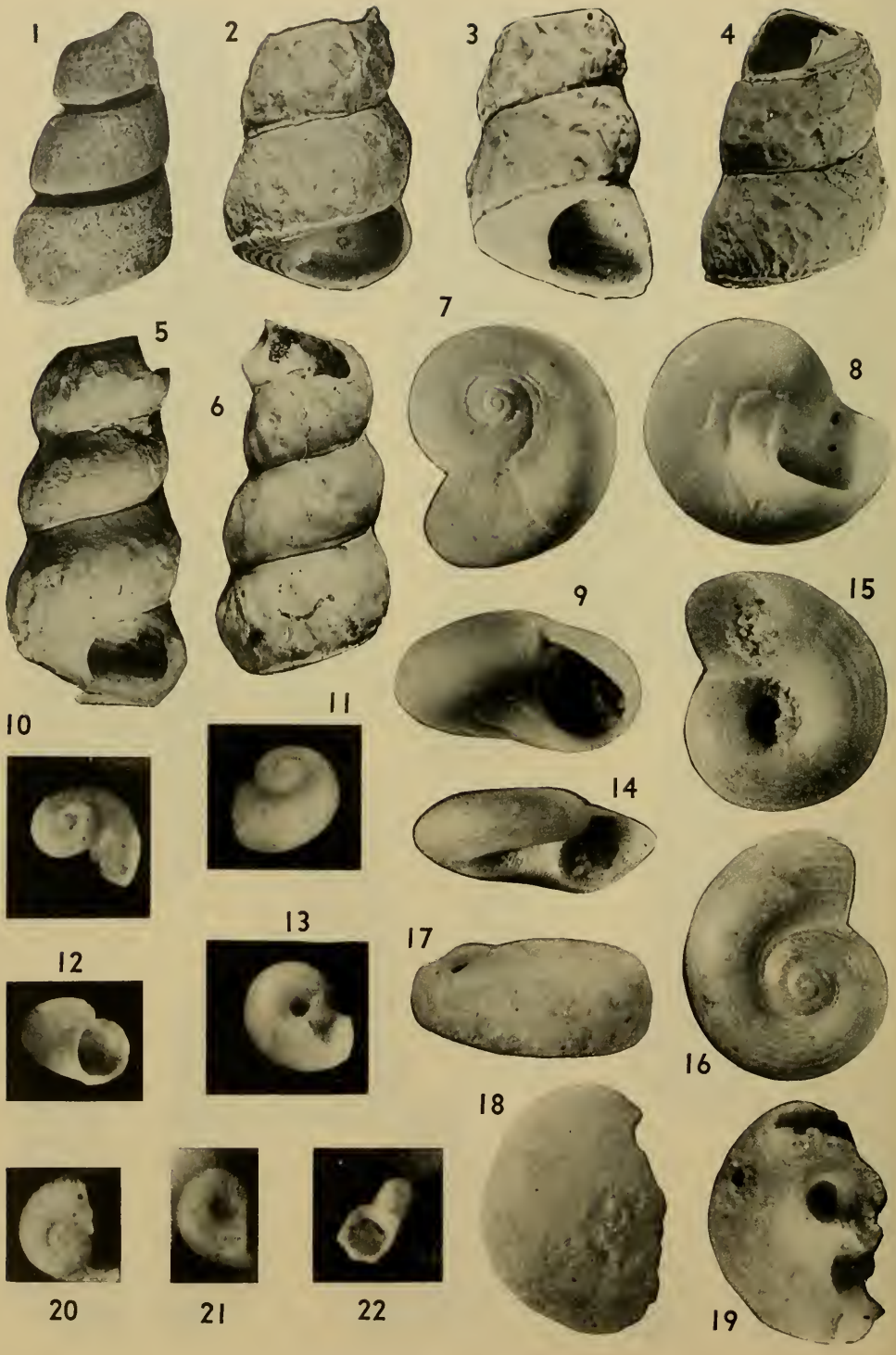
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Explanation of Plate 12

Figure — Page

1. **Turritella** species 150
(L206a). 26087 PRI. Length 26 mm.; width 15 mm. Playa Grande formation (Catia member).

2-6. **Springvaleia leroyi secunda** Weisbord, n. subsp. 150
Figs. 2-4. Holotype (I208a). 26088 PRI. Length (2 basal whorls) 31.8 mm.; width 22.3 mm. Lower Mare formation. Figs. 5, 6. paratype (I208b). 26089 PRI. Length (3 intermediate whorls) 26.8 mm.; width 12.7 mm. Lower Mare formation.

7-9. **Teinostoma (Pseudorotella) antilleanum** Weisbord, n. sp. 131
Holotype (S55a). 26089 PRI. Diameter 2.2 mm.; altitude 1.2 mm. Playa Grande formation (Maiquetía member).

10-13. **Vitrinella mareana** Weisbord, n. sp. 133
Figs. 10, 11, holotype (I54a). 26064 PRI. Diameter 0.6 mm.; altitude 0.4 mm. Lower Mare formation. Figs. 12, 13, paratype (I54b). 26065 PRI. Diameter 0.5 mm.; altitude 0.3 mm. Lower Mare formation.

14-16. **Vitrinella (Striovitrinella) venezuelana** Weisbord, n. sp. 134
Holotype (C59a). 26091 PRI. Max. diameter 2 mm.; min. diameter 1.5 mm.; altitude 0.8 mm. Mare formation.

17-19. **"Circulus" duracinus** Weisbord, n. sp. 135
Holotype (I56a). 26092 PRI. Diameter 1.7 mm.; altitude 0.8 mm. Lower Mare formation.

20-22. **Cyclostromella venezuelana** Weisbord, n. sp. 136
Holotype (I63a). 26066 PRI. Diameter 0.4 mm.; altitude 0.2 mm. Lower Mare formation.

Explanation of Plate 13

Figure — Page

1-3. **Cyclostremiscus (Ponocyclus) maiquetiensis** Weisbord, n. sp. 137
Holotype (Q62a). 26067 PRI. Diameter 0.75 mm.; altitude 0.45 mm. Playa Grande formation (Maiquetía member).

4-6. **Cyclostremiscus salinensis** Weisbord, n. sp. 139
Paratype (C57b). 26093 PRI. Diameter 1.05 mm.; altitude 0.95 mm. La Salina.

7-9. **Cyclostremiscus caraboboensis** Weisbord, n. sp. 140
Holotype (C61a). 26094 PRI. Diameter 1.2 mm.; altitude 0.9 mm. La Salina.

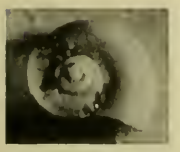
10-12. **Cyclostremiscus puntagordensis** Weisbord, n. sp. 141
Holotype (S60a). 26095 PRI. Diameter 1.4 mm.; altitude 0.9 mm. Playa Grande formation (Maiquetía member).

13,14. **Otiomyllon venezuelanum** Weisbord, n. gen. and n. sp. 143
Holotype (Q128a). 26068 PRI. Diameter 0.55 mm.; altitude 0.45 mm. Playa Grande formation (Maiquetía member).

15-16. **Architectonica nobilis** Röding 152
(I209a). 26096 PRI. Diameter 29.2 mm.; altitude 17.4 mm. Lower Mare formation.

17,18. **Serpulorbis catella** Weisbord, n. sp. 156
Holotype (D77a). 26097 PRI. Diameter of larger end of tube 0.6 mm.; length of tube 2.9 mm. Views of superior and attached surfaces. Abisinia formation.

19,20. **Serpulorbis** cf. **papulosus** (Guppy) 169
(I78a). 26098 PRI. Length of tube 13 mm.; diameter of larger end of tube 4.7 mm. Lower Mare formation.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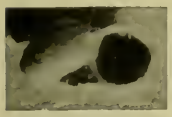
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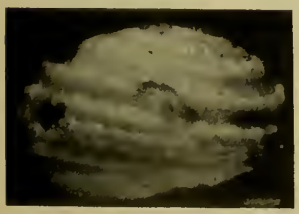
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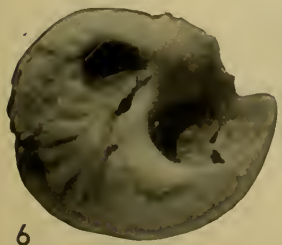
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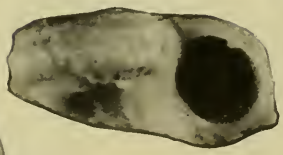
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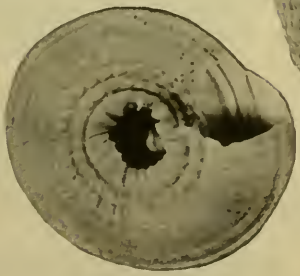
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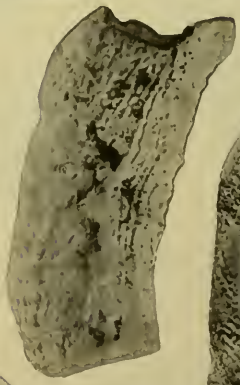
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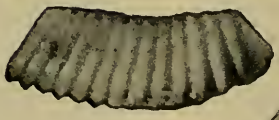
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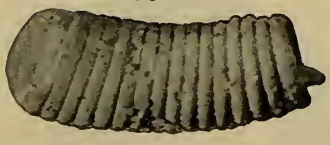
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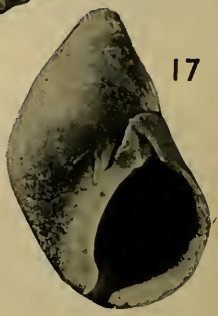
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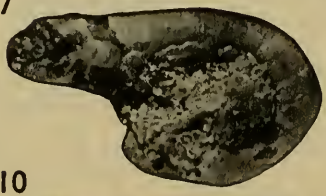
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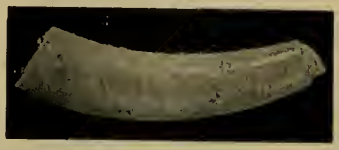
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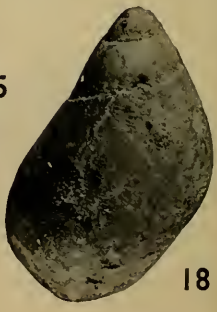
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Explanation of Plate 14

Figure — Page

1-4. **Serpulorbis incomptus** Weisbord, n. sp. 159
Figs. 1, 2, holotype (I79a). 26099 PRI. Diameter of tube 0.7 mm. Views of superior and inferior sides. Lower Mare formation.
Figs. 3, 4, paratype (I79b). 26100 PRI. Diameter of tube 0.95 mm. Views of superior and inferior sides.

5,6. **Serpulorbis aff. conicus** (Dillwyn) 159
(O80a). 26101 PRI. Max. diameter of tube 1.5 mm. Views of superior and inferior sides. Playa Grande formation (Catia member).

7. **Serpulorbis pallidus** Weisbord, n. sp. 161
Holotype (M81a). 26102 PRI Diameter of tube 0.35 mm. View of superior surface. Playa Grande formation (Catia member).

8,9. **Serpulorbis birugosus** Weisbord, n. sp. 157
Holotype (A82a). 26103 PRI. Diameter of larger end of tube 0.75 mm. View of superior surface. Fig. 8 enlarged about 7X, fig. 9 about 20X. Recent.

10,11. **Caecum (Caecum) regulare** Carpenter 161
Fig. 10, (C86a). 26104 PRI. Diameter of tube at aperture 0.6 mm. La Salina.
Fig. 11, (C86b). 26105 PRI Diameter of tube at aperture 0.5 mm. La Salina.

12. **Caecum (Caecum) marense** Weisbord, n. sp. 163
Holotype I87a). 26106 PRI. Max. diameter of tube 0.4 mm. Lower Mare formation.

13,14. **Caecum (Caecum) puntagordanum** Weisbord, n. sp. 164
Holotype (H88a). 26107 PRI. Max. diameter of tube 0.7 mm. Mare formation.
Paratype (S88b). 26108 PRI. Max. diameter of tube 0.8 mm. Playa Grande formation (Maiquetía member).

15. **Caecum (Defolinia) tomaculum** Weisbord, n. subgen. and n. sp. 165
Holotype (H89a). 26109 PRI. Diameter of tube at aperture 0.4 mm. Mare formation.

16. **Caecum (Fartulum) venezuelanum** Weisbord, n. sp. 166
Holotype (T319a). 26110 PRI. Max. diameter of tube 0.7 mm. Mare formation.

17,18. **Planaxis (Supplanaxis) nucleus** ? (Bruguière) 167
(D121a). 26111 PRI. Length 9.5 mm., width 6.1 mm. Abisinia formation.

Explanation of Plate 15

Figure — Page

1,2. **Cerithium litteratum playagrandensis** Weisbord, n. subsp. 170
Holotype (S265a). 26112 PRI. Length 19 mm.; width 8 mm. Playa Grande formation (Maiquetía member).

3,4. **Cerithium** cf. **eburneum** Bruguière 172
(C266a). 26113 PRI. Length 10.5 mm.; width 4.5 mm. La Salina.

5,6. **Bittium (Brachybittium) caraboboense** Weisbord, n. subgen. and n. sp. 176
Holotype (C49a). 26114 PRI. Length 1.75 mm.; width 1 mm. Enlarged about 20X. La Salina.

7,8. **Bittium (Brachybittium) venezuelanum** Weisbord, n. sp. 177
Holotype (C50a). 26115 PRI. Length 1.5 mm.; width 0.85 mm. Enlarged about 24X. La Salina.

9,10. **Bittium (Brachybittium) salinae** Weisbord, n. sp..... 178
Paratype (C51b). 26116 PRI. Length (broken at base) 0.8 mm., width 0.5 mm. Enlarged about 37X. La Salina.

11-14. **Bittium (Brachybittium) palitoense** Weisbord, n. sp. 179
Figs. 11, 12, holotype (C52a). 26117 PRI. Length (tip of nucleus missing) 2.25 mm.; width 1 mm. Enlarged about 18X. La Salina.
Figs. 13, 14, paratype (C52b). 26118 PRI. Length 2.1 mm.; width 0.95 mm. Enlarged about 19X. La Salina.

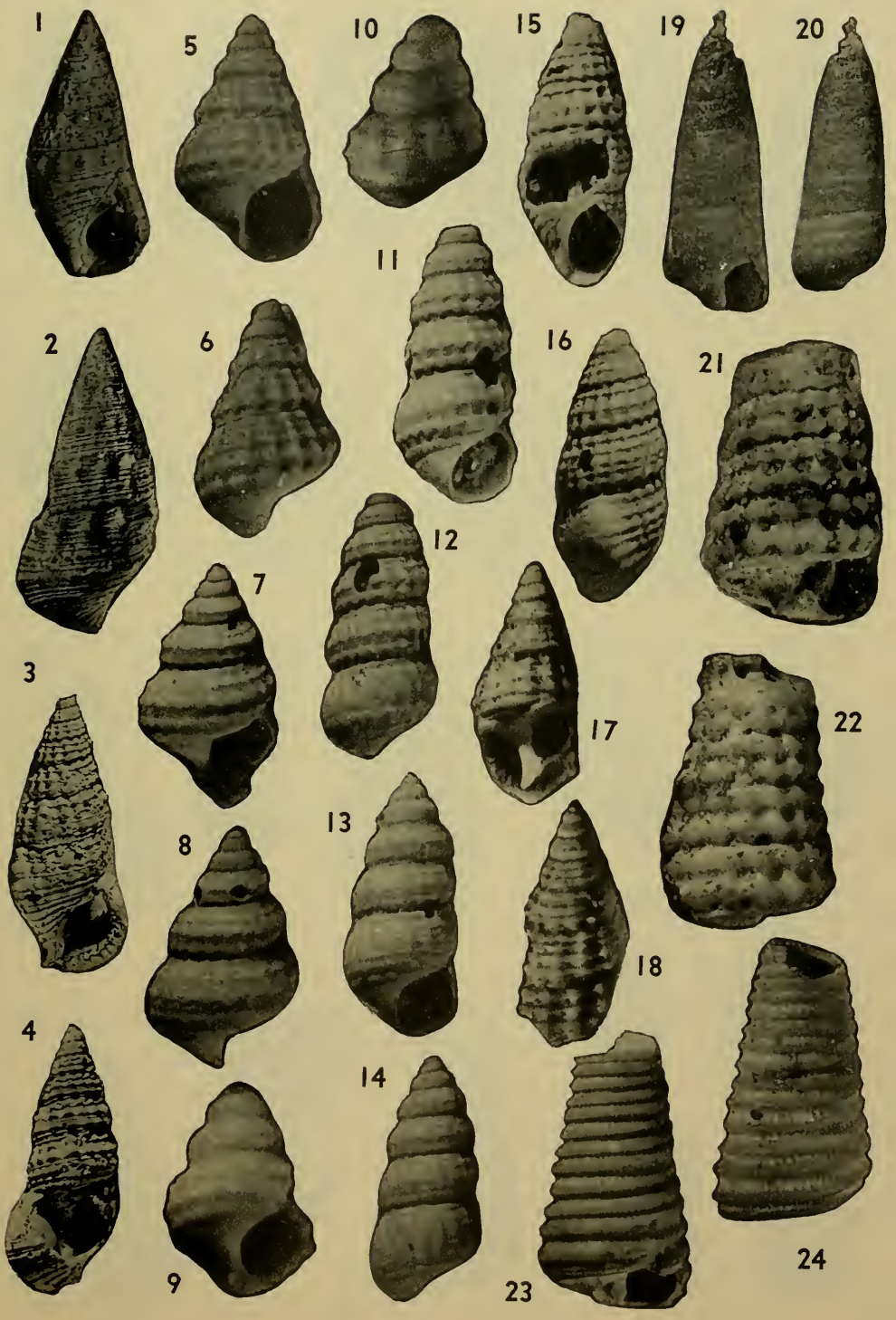
15,16. **Bittiolum caribense** Weisbord, n. sp. 181
Holotype (C53a). 26119 PRI. Length (nucleus decollate) 3 mm.; width 1.1 mm. La Salina.

17,18. **Cerithiopsis maiquetiensis** Weisbord, n. sp. 182
Holotype (Q96a). 26120 PRI. Length (8 whorls including nucleus) 1.8 mm., width 0.75 mm. Enlarged about 18X. Playa Grande formation (Maiquetía member).

19,20. **Cerithiopsis tela** Weisbord, n. sp..... 183
Holotype (G98a). 26121 PRI. Length (tip of spire missing) 4.5 mm.; width 1.8 mm. Enlarged about 10X. Mare formation.

21,22. **Cerithiopsis (Laskeya) emersonii** ? (C. B. Adams) 184
(H97a). 26122 PRI. Length (4 whorls) 2 mm.; width 1.2 mm. Enlarged 20X. Mare formation.

23,24. **Seila adamsii** ? (H. C. Lea) 192
(S117a). 26123 PRI. Length (partial specimen) 4.1 mm.; width 1.3 mm. Playa Grande formation (Maiquetía member).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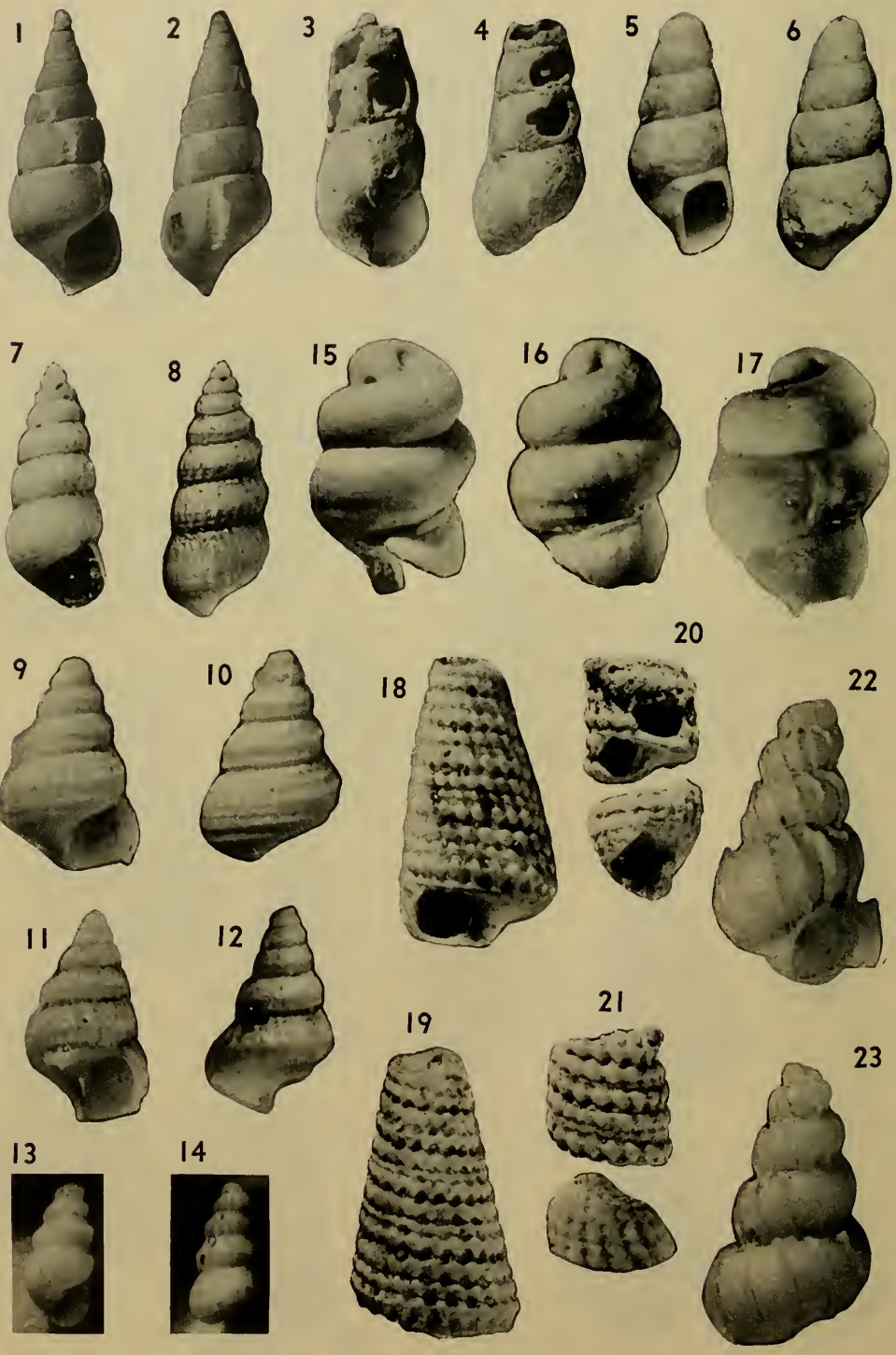
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Explanation of Plate 16

Figure — Page

1,2. **Alaba insculpta** Weisbord, n. sp. 191
Holotype (C2a). 26124 PRI. Length 4 mm.; width 1.5 mm. Mare formation.

3-6. **Alaba incerta** ? (d'Orbigny) 189
Figs. 3, 4 (S1a). 26125 PRI. Length (3 whorls) 3.7 mm.; width 1.7 mm. Playa Grande formation (Maiquetía member). Figs. 5, 6, (D2a). 26126 PRI. Length (4-1/2 whorls) 2.6 mm.; width 1.1 mm. Abisinia formation.

7,8. **Alabina cereola** Weisbord, n. sp. 186
Holotype (Q90a). 26127 PRI. Length 2.1 mm.; width 0.75 mm. Playa Grande formation (Maiquetía member).

9,10. **Alabina venezuelana** Weisbord, n. sp. 188
Holotype (G94a). 26128 PRI. Length 1 mm.; width 0.7 mm. Mare formation.

11,12. **Alabina cereola** Weisbord, n. sp. 186
Paratype (Q95a). 26129 PRI. Length 1.1 mm.; width 0.65 mm. Playa Grande formation (Maiquetía member).

13,14. **Odostomia ? ambigua** Weisbord, n. sp. 462
Holotype (I66a). 26130 PRI. Length 0.6 mm.; width 0.25 mm. Enlarged 33X. Lower Mare formation.

15-17. **Portoricia salinensis** Weisbord, n. sp. 174
Holotype (C64a). 26131 PRI. Length (uppermost 3 whorls, including nucleus) 2 mm.; width 1.4 mm. La Salina.

18,19. **Triphora (Cosmotriphora) decorata** (C. B. Adams) 194
(S101a). 26132 PRI. Length (5 lower whorls) 2.9 mm.; width 1.6 mm. Playa Grande formation (Maiquetía member).

20,21. **Triphora (Cosmotriphora) caribbeana** Weisbord, n. sp. 196
Holotype (H102a). 26133 PRI. Length of largest fragment 2 mm.; width 1.7 mm. Length of 2 fragments, assembled, 3 mm. Fig. 20, front view of fragments separated from same specimen; fig. 21, rear view of same fragments, the lower tilted. Mare formation.

22,23. **Epitonium (Asperiscala) venezuelense** Weisbord, n. sp. 197
Holotype (I31a). 26134 PRI Length (4 whorls) 2.9 mm.; width 1.8 mm. Lower Mare formation.

Explanation of Plate 17

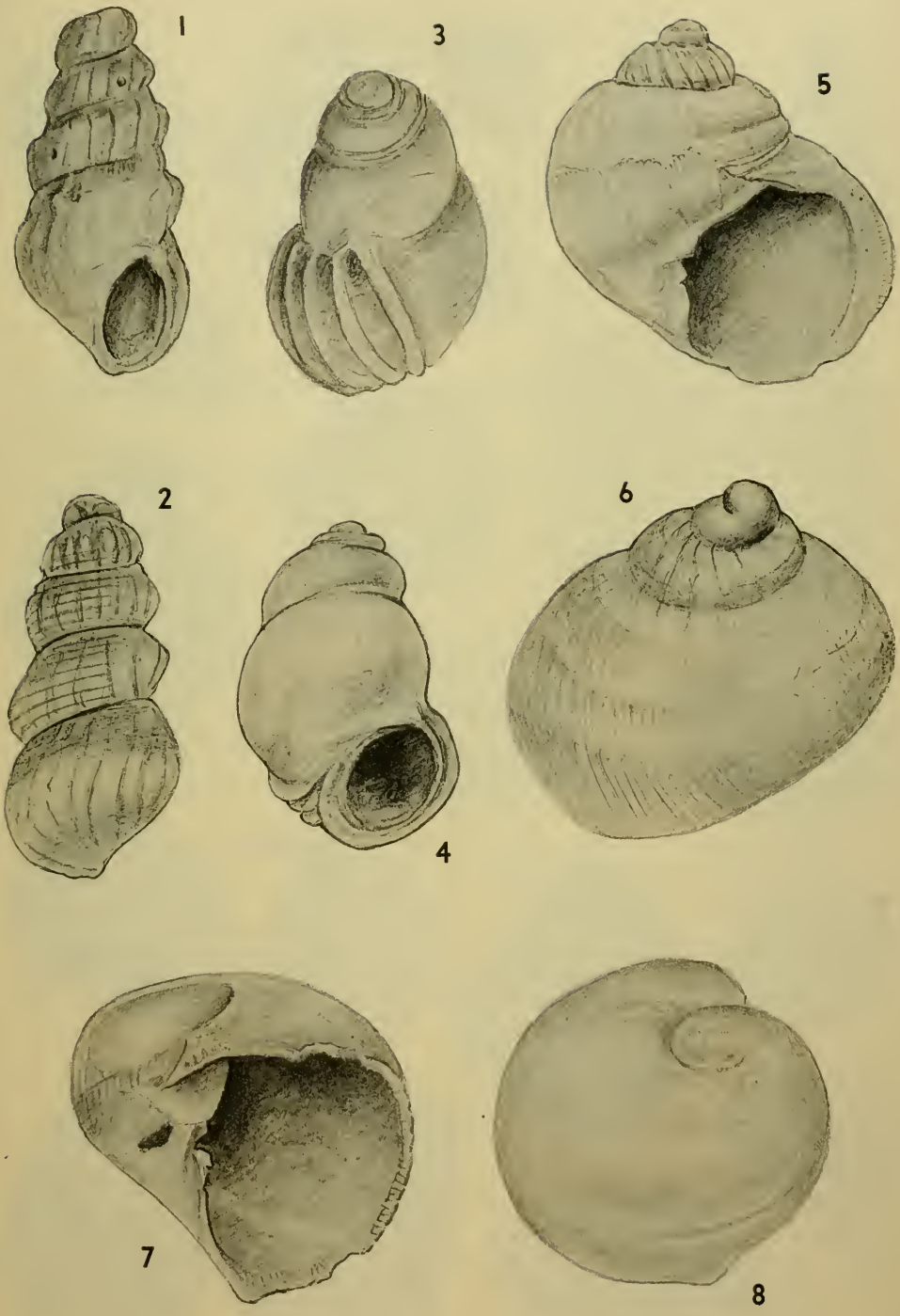
Figure — Page

1,2. **Odostomia ? ambigua** Weisbord, n. sp. 462
Holotype (I66a). 26130 PRI. Length 0.6 mm., width 0.25 mm. Enlarged 83X. Lower Mare formation.

3,4. **Epitonium (Asperiscala ?) marenum** Weisbord, n. sp. 200
Holotype (I33a). 26135 PRI. Length 0.5 mm.; width 0.3 mm. Enlarged 90X. Lower Mare formation.

5,6. **Vanikoro antillensis** Weisbord, n. sp. 205
Holotype (H15a). 26136 PRI. Length 1.5 mm.; width 1.2 mm. Enlarged about 34X. Mare formation. See pl. 18, figs. 16, 17.

7,8. **Sinum ? peculiaris** Weisbord, n. sp. 250
Holotype (I127a). 26137 PRI. Altitude 1.2 mm.; diameter 1.1 mm. Enlarged 41X. Lower Mare formation. See pl. 23, figs. 7, 8.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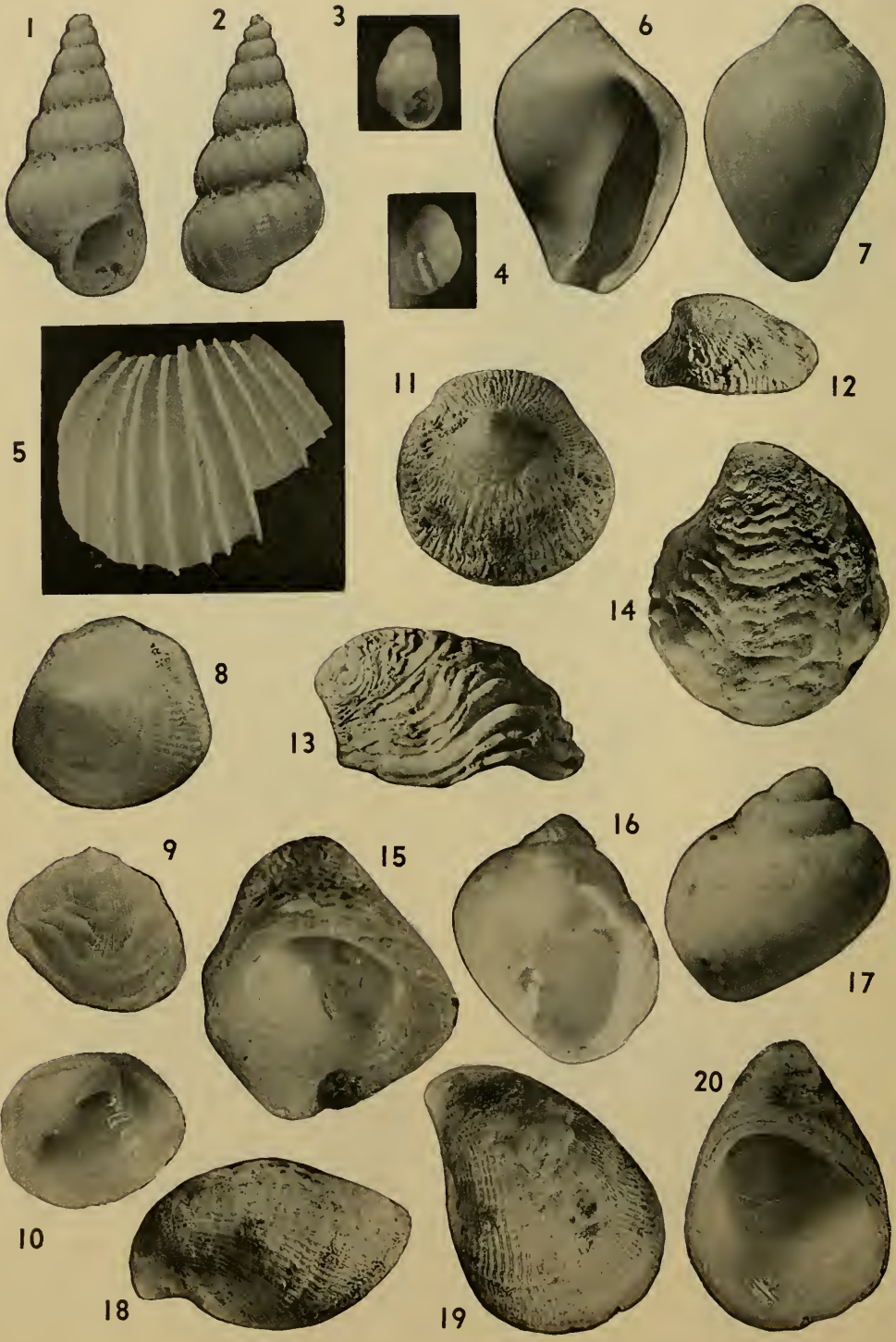
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Explanation of Plate 18

Figure — Page

1,2. **Epitonium (Asperiscala) laguairense** Weisbord, n. sp. 199
Holotype (H32a). 26138 PRI. Length 4.5 mm.; width 2.1 mm. Mare formation.

3,4. **Epitonium (Asperiscala?) marenum** Weisbord, n. sp. 200
Holotype (I33a). 26135 PRI. Length 0.5 mm.; width 0.3 mm. Enlarged 30X. Lower Mare formation.

5. **Epitonium** species 201
(I35a). 26139 PRI. Height of whorl 4.2 mm. Lower Mare formation.

6,7. **Erato venezuelana** Weisbord, n. sp. 224
Holotype (I134a). 26140 PRI. Length 4.9 mm. Lower Mare formation.

8-12. **Cheilea equestris** (Linnaeus) 202
Figs. 8-10, (A294a). 26141 PRI. Thin-shelled form. Diameter 11.5 mm.; altitude 6.5 mm. Recent.
Figs. 11, 12, (A249b). 26142 PRI. Heavy-ribbed form. Diameter 10.6 mm., altitude 6.3 mm. Recent.

13-15. **Hipponix antiquatus** (Linnaeus) 204
(A268a). 26143 PRI. Length 16.5 mm.; width 13.3 mm. Recent.

16,17. **Vanikoro antillensis** Weisbord, n. sp. 205
Holotype (H15a). 26136 PRI. Length 1.5 mm.; width 1.2 mm. Enlarged 24X. Mare formation. See pl. 17, figs. 5, 6.

18-20. **Capulus (Krebsia) incurvatus** (Gmelin) 207
(A267a). 26144 PRI. Length 15.2 mm.; width 10 mm. Recent.

Explanation of Plate 19

Figure — Page

1,2. **Capulus (Krebsia) incurvatus** (Gmelin) 207
(D267a). 26145 PRI. Length 6.6 mm.; width 6 mm. Abisinia formation.

3-5. **Crepidula phalaena** Weisbord, n. sp. 208
Holotype (J200a). 26146 PRI. Length 17.2 mm.; width 11.5 mm. Lower Mare formation.

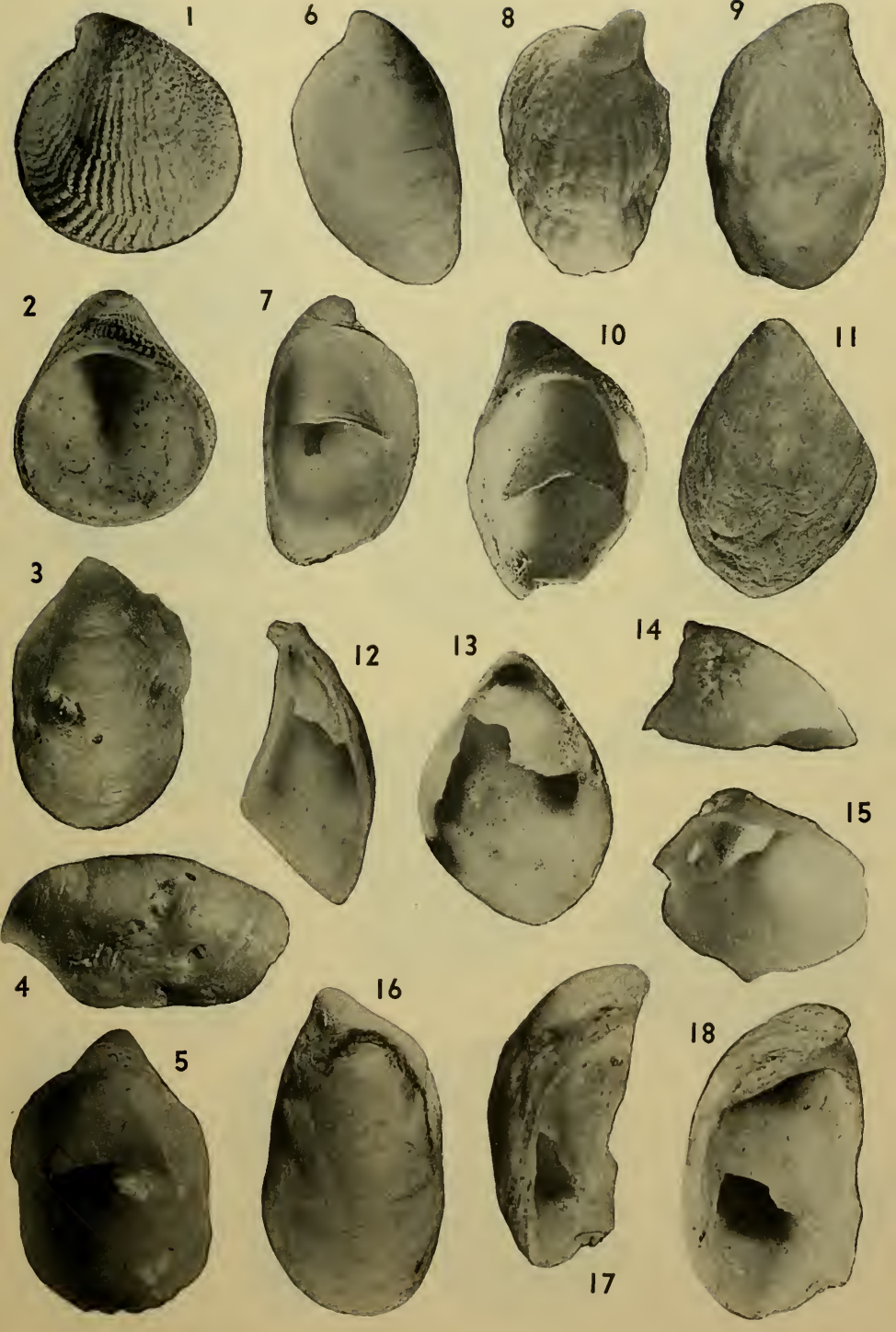
6,7. **Crepidula avirostra** Weisbord, n. sp. 209
Holotype (J201a). 26147 PRI. Length 18 mm.; width 10 mm. Lower Mare formation.

8-10. **Crepidula corcovada** Weisbord, n. sp. 211
Holotype (J202a). 26148 PRI. Length 13 mm.; width 8.5 mm., max. altitude 10.5 mm. Lower Mare formation.

11-13. **Crepidula plana triangula** Weisbord, n. subsp. 212
Holotype (J203a). 26149 PRI. Length 20 mm.; width 14.5 mm.; max. altitude 6 mm. Lower Mare formation.

14,15. **Crepidula juliella** Weisbord, n. sp. 213
Holotype (I204a). 26150 PRI. Diameter 2.5 mm.; altitude 1.5 mm. Lower Mare formation.

16-18. **Crepidula phalaena** Weisbord, n. sp. 208
(G200b). 26151 PRI. Largest specimen. Length 36.5 mm.; width 20 mm. Mare formation.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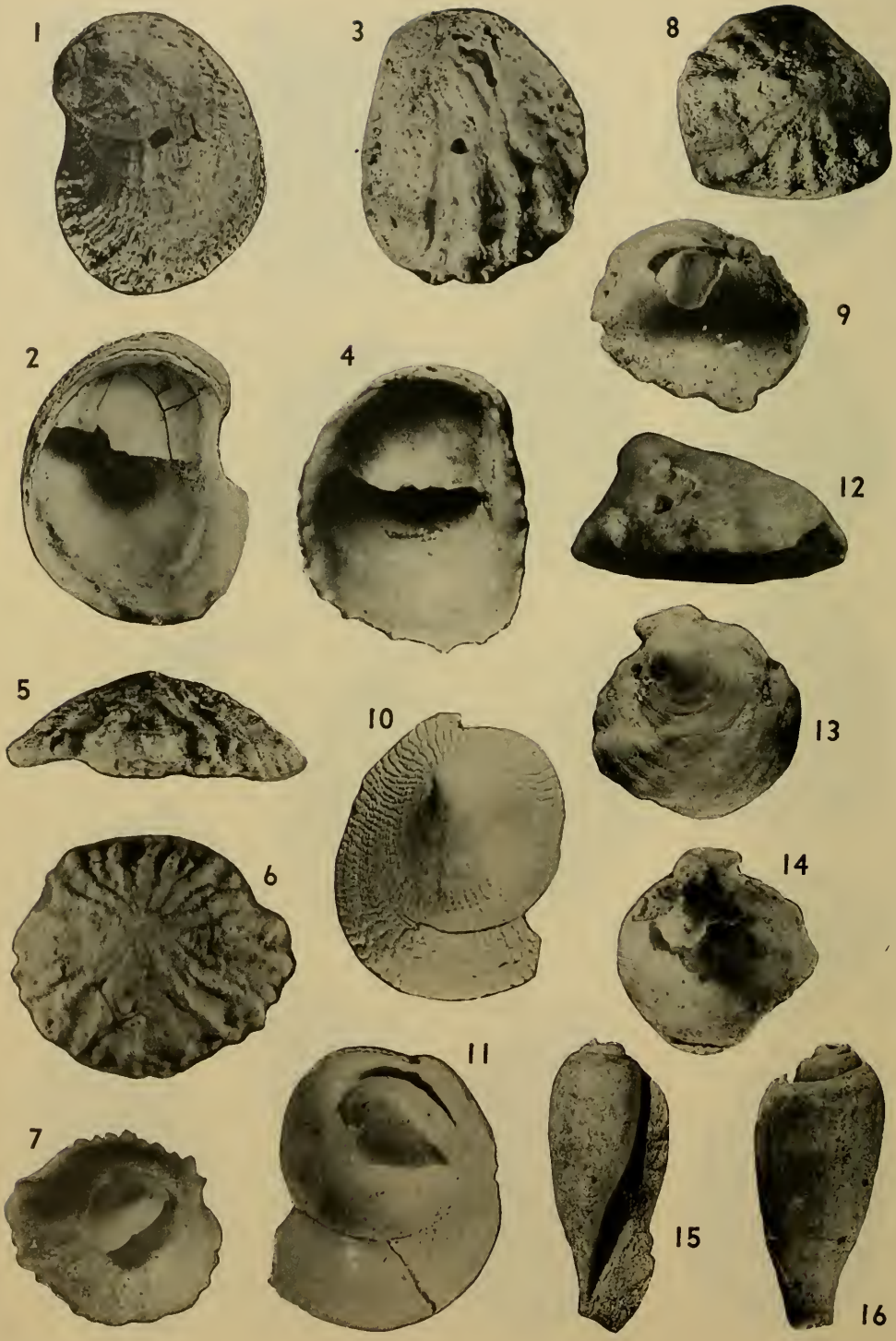
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Explanation of Plate 20

Figure — Page

1-4. **Crepidula (Bostrycapulus) aculeata venezuelana** Weisbord, n. subsp. 213
Figs. 1, 2, holotype (J205a). 26152 PRI. Length 23 mm.; width 17.5 mm. Lower Mare formation. Figs. 3, 4, paratype (I205b). 26153 PRI. Length 18 mm., width 14.2 mm. Lower Mare formation.

5-9. **Crucibulum (Crucibulum) auricula** (Gmelin) 215
Figs. 5-7, (T274a). 26154 PRI. Length 25.8 mm.; width 22 mm. Mare formation. Figs. 8, 9, (A274a). 26155 PRI. Length 11 mm.; width 10.5 mm. Recent.

10,11. **Crucibulum (Dispotaea) marense** Weisbord, n. sp. 218
Holotype (G275a). 26156 PRI. Length (reconstructed) 24 mm.; width (reconstructed) 22 mm. Mare formation.

12-14. **Crucibulum (Dispotaea) venezuelanum** Weisbord, n. sp..... 219
Holotype (J276a). 26157 PRI. Diameter 2.6 mm.; altitude 1.4 mm. Mare formation.

15,16. **Strombus** ? species indeterminate Brown and Pilsbry 223
(M210a). 26158 PRI. Length (3 whorls) 51 mm.; width 21.8 mm. Playa Grande formation (Catia member).

Explanation of Plate 21

Figure — Page

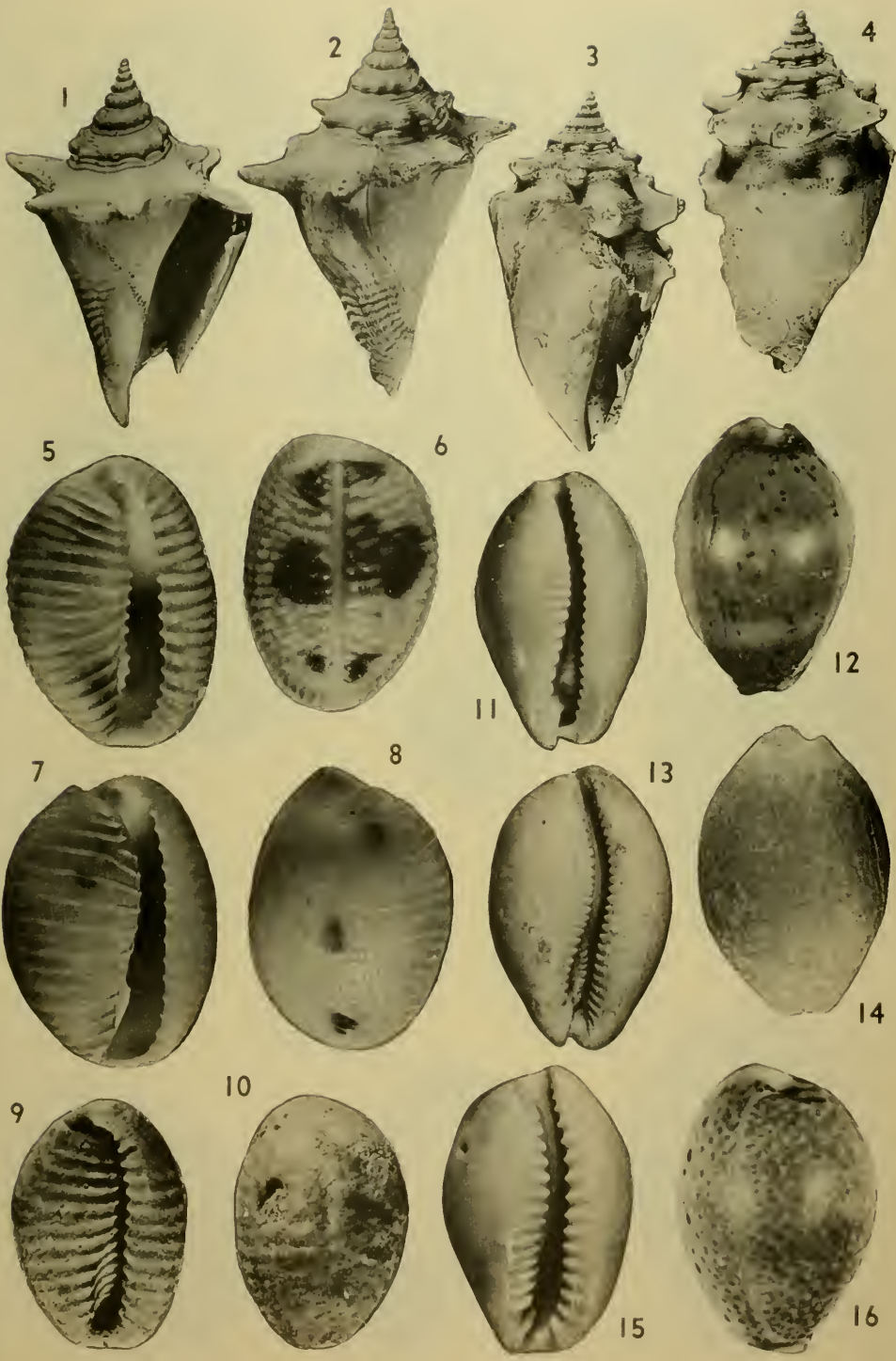
1-4. **Strombus pugilis pugilis** Linnaeus 220
Figs. 1, 2, (G263a). 26159 PRI. Immature specimen. Length 59 mm.; width (including spines) 41 mm. Mare formation.
Figs. 3, 4, (E263a). 26160 PRI. Adult specimen. Length (tip missing) 76 mm.; width (including spines) 43 mm. Upper Mare formation.

5-10. **Trivia pediculus** (Linnaeus) 226
Figs. 5, 6, (A199a). 26161 PRI. Length 12 mm.; width 8 mm. Recent. Figs. 7, 8, (A199b). 26162 PRI. Specimen showing arrested development. Length 10.1 mm.; width 7.4 mm. Recent. Figs. 9, 10, (D199b). 26163 PRI. Length 7.9 mm.; width 5.5 mm. Abisinia formation.

11,12. **Cypraea (Luria) cinerea** Gmelin 228
(A194a). 26164 PRI. Length 21.5 mm.; width 14.6 mm. Recent.

13,14. **Cypraea (Luria) cinerea catiana** Weisbord, n. subsp. 230
Holotype (K198a). 26165 PRI. Length 32 mm.; width 21 mm. Playa Grande formation.

15,16. **Cypraea (Erosaria) spurca acicularis** Gmelin 232
(A195a). 26166 PRI. Length 21 mm.; width 14 mm. Recent.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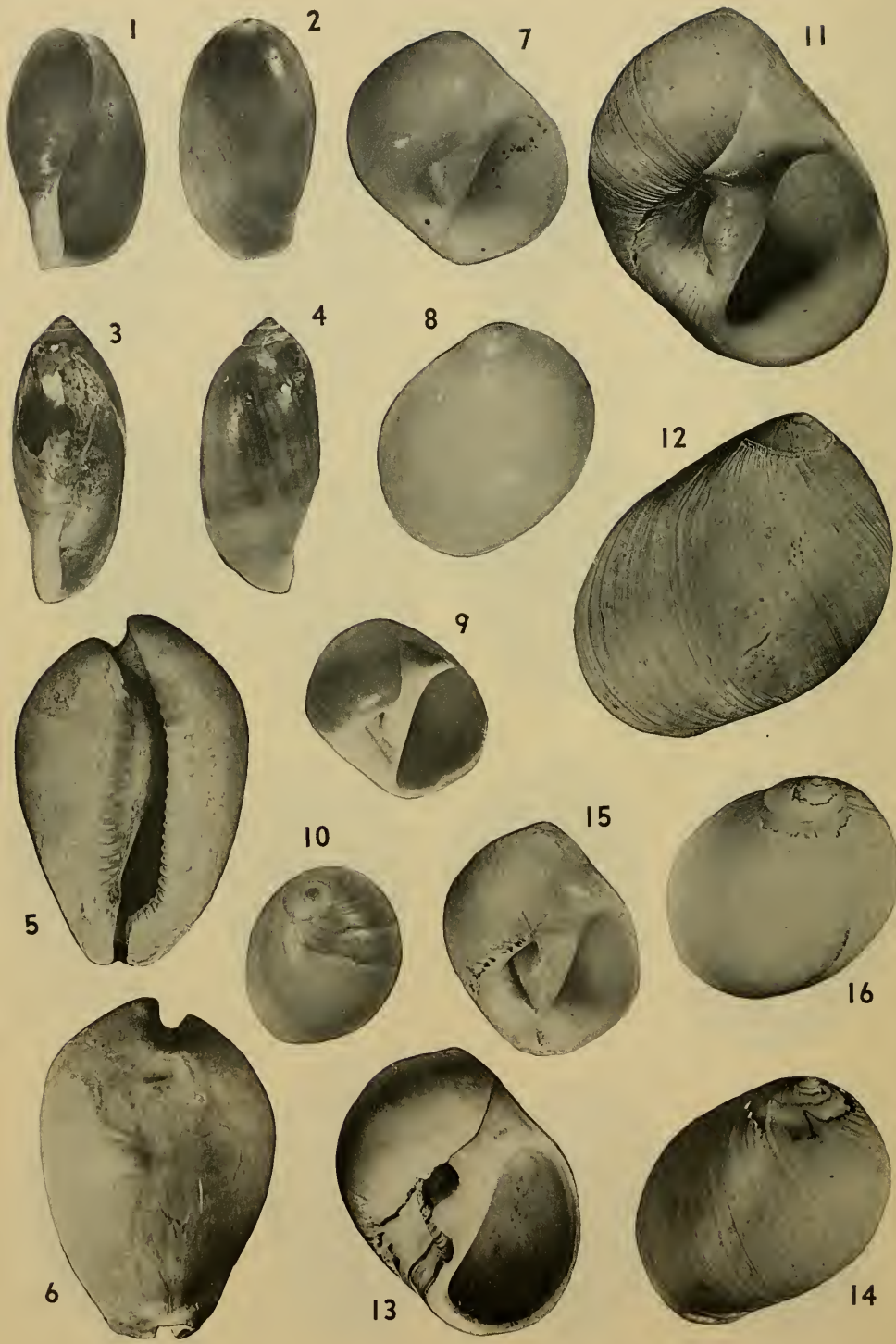
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Explanation of Plate 22

Figure — Page

1,2. **Cypraea (Luria) cinerea** Gmelin 228
(A194b). 26167 PRI. Immature specimen. Length 14.4 mm.; width 8.1 mm. Recent.

3,4. **Cypraea (Trona) zebra** Linnaeus 234
(A196a). 26168 PRI. Immature specimen. Length 23 mm.; width 12 mm. Recent.

5,6. **Cypraea (Muracypraea) henekeni** Sowerby 236
(I97a). 26169 PRI. Length 67 mm.; width 45 mm. Lower Mare formation.

7,8. **Polinices lacteus** (Guilding) 238
(A223a). 26170 PRI. Length 18.3 mm.; width 15.2 mm. Recent.

9,10. **Polinices hepaticus** (Röding) 240
(A224a). 26171 PRI. Length 11.1 mm.; width 10.1 mm. Recent.

11-16. **Polinices subclausus** (Sowerby) 241
Figs. 11, 12, (I225b). 26172 PRI. Specimen without prominent funicle. Length 41 mm.; width 31.6 mm. Lower Mare formation. Figs. 13, 14, (I225c). 26173 PRI. Specimen with funicle and deep umbilical channel. Length 18 mm.; width 15 mm. Lower Mare formation. Figs. 15, 16, (I225a). 26174 PRI. Specimen with prominent funicle. Length 28.5 mm.; width 23 mm. Lower Mare formation.

Explanation of Plate 23

Figure — Page

1,2. **Natica (Naticarius) canrena** (Linnaeus) 244
(A222a). 26175 PRI. Length 17 mm.; width 18 mm. Recent.

3,4. **Stigmaulax guppiana** ? (Toula) 247
(G222a). 26176 PRI. Length (base missing) 11 mm.; estimated width 11 mm. Mare formation.

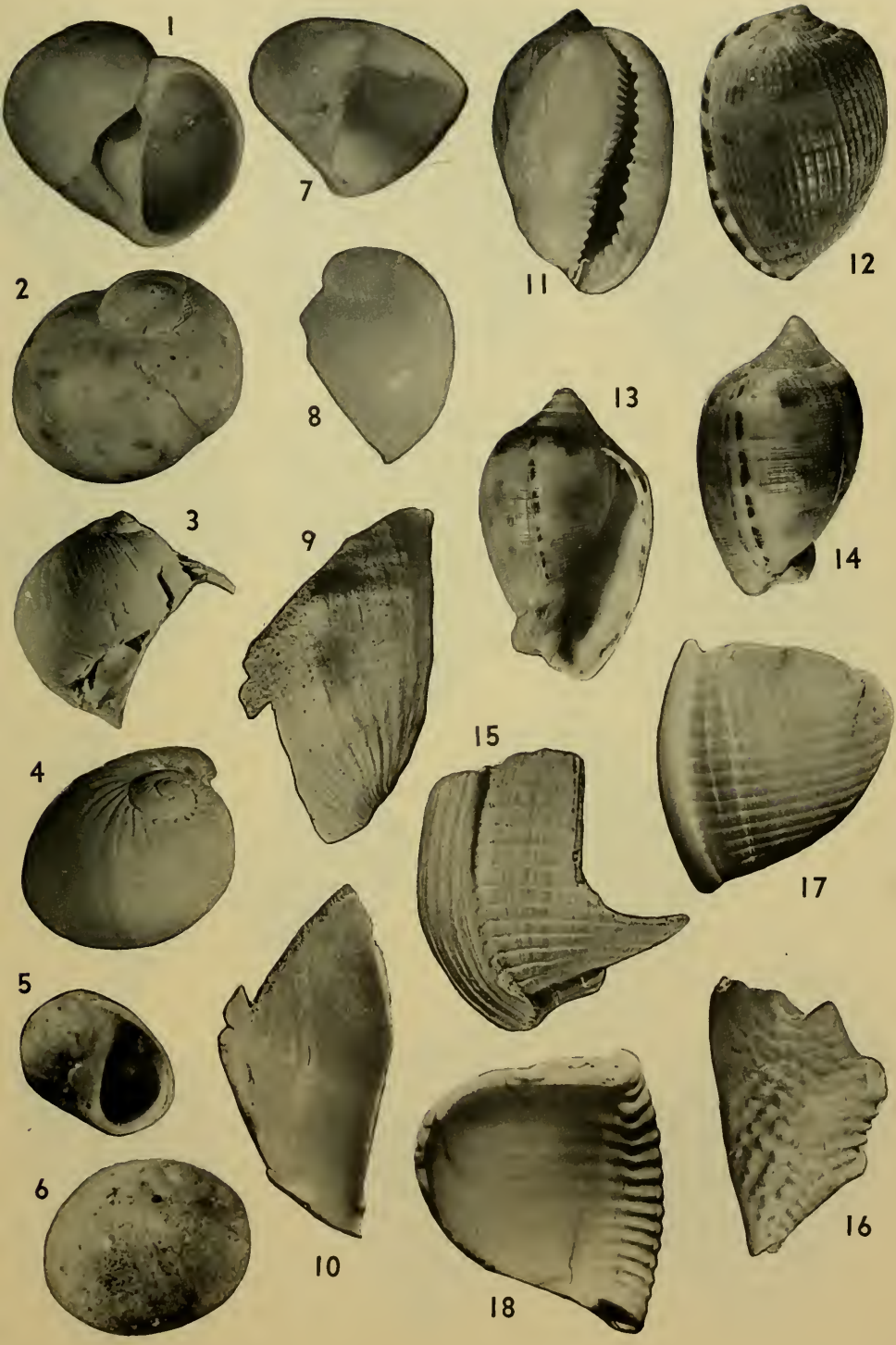
5,6. **Tectonatica venezuelana** Weisbord, n. sp. 248
Holotype (I99a). 26177 PRI. Altitude 1.9 mm.; diameter 2 mm. Fig. 5 enlarged 12X. Fig. 6 enlarged 15X. Lower Mare formation.

7,8. **Sinum** ? **peculiaris** Weisbord, n. sp. 250
Holotype (I127a). 26137 PRI. Altitude 1.2 mm.; diameter 1 mm. Lower Mare formation. See Pl. 17, figs. 7, 8.

9,10. **Cassis** aff. **madagascariensis** Lamarck 251
(T260a). 26178 PRI. Length of fragment 95 mm. Illustration about half natural size. Mare formation.

11-14. **Cypraecassis testiculus** (Linnaeus) 252
Figs. 11, 12, (A259a). 26179 PRI. Length 30.5 mm.; width 20.2 mm. Recent. Figs. 13, 14, (A259b). 26180 PRI. Young specimen. Length 23.2 mm.; width 14.5 mm. Recent.

15-18. **Semicassis (Tylocassis) granulata** (Born) 254
Fig. 15, (G216a). 26181 PRI. Fragment of labrum. Length 22.5 mm. Mare formation. Fig. 16, (G216b). 26182 PRI. Parietal shield. Length 22.5 mm. Mare formation. Figs. 17, 18, (I216a). 26183 PRI. Fragment of labrum. Length 28 mm. Lower Mare formation.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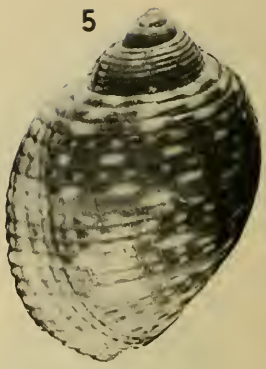
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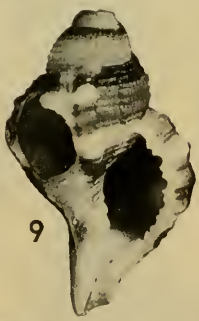
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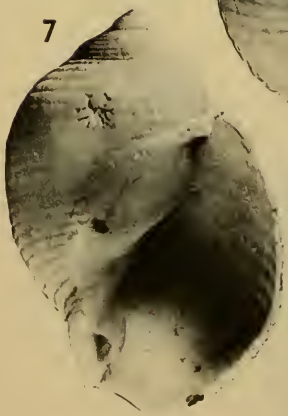
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Explanation of Plate 24

Figure — Page

1,2. **Malea ringens mareana** Weisbord, n. subsp. 272
Holotype (I258a). 26184 PRI. Length 47 mm.; width 36 mm. Lower Mare formation.

3,4. **Tonna galea** ? (Linnaeus) 274
(T255a). 26185 PRI. Length of fragment 67 mm. Upper Mare formation.

5,6. **Tonna (Cadus) maculosa** (Dillwyn) 275
(A257a). 26186 PRI. Length 44.5 mm.; width 31.5 mm. Recent.

7,8. **Tonna (Cadus) maculosa catiana** Weisbord, n. subsp. 277
Holotype (K257a). 26187 PRI. Length 73.5 mm.; width 50 mm. Playa Grande formation (Catia member).

9-12. **Cymatium (Septa) pileare martinianum** (d'Orbigny) 257
Figs. 9, 10, (A246a). 26188 PRI. Young specimen. Length (3-1/2 whorls) 19 mm. width 11.4 mm. Recent. Figs. 11, 12, (C244a). 26189 PRI. Length (last whorl) 52 mm.; width 30 mm. La Salina.

Explanation of Plate 25

Figure — Page

1-4. **Cymatium (Septa) krebsii** (Mörch) 260
Figs. 1, 3, (I244a). 26190 PRI. Length 30.5 mm.; width 16 mm. Lower Mare formation. Figs. 2, 4, (I244b). 26191 PRI. Length 39 mm.; width 21.5 mm. Outer lip with 2 columns of denticles. Lower Mare formation.

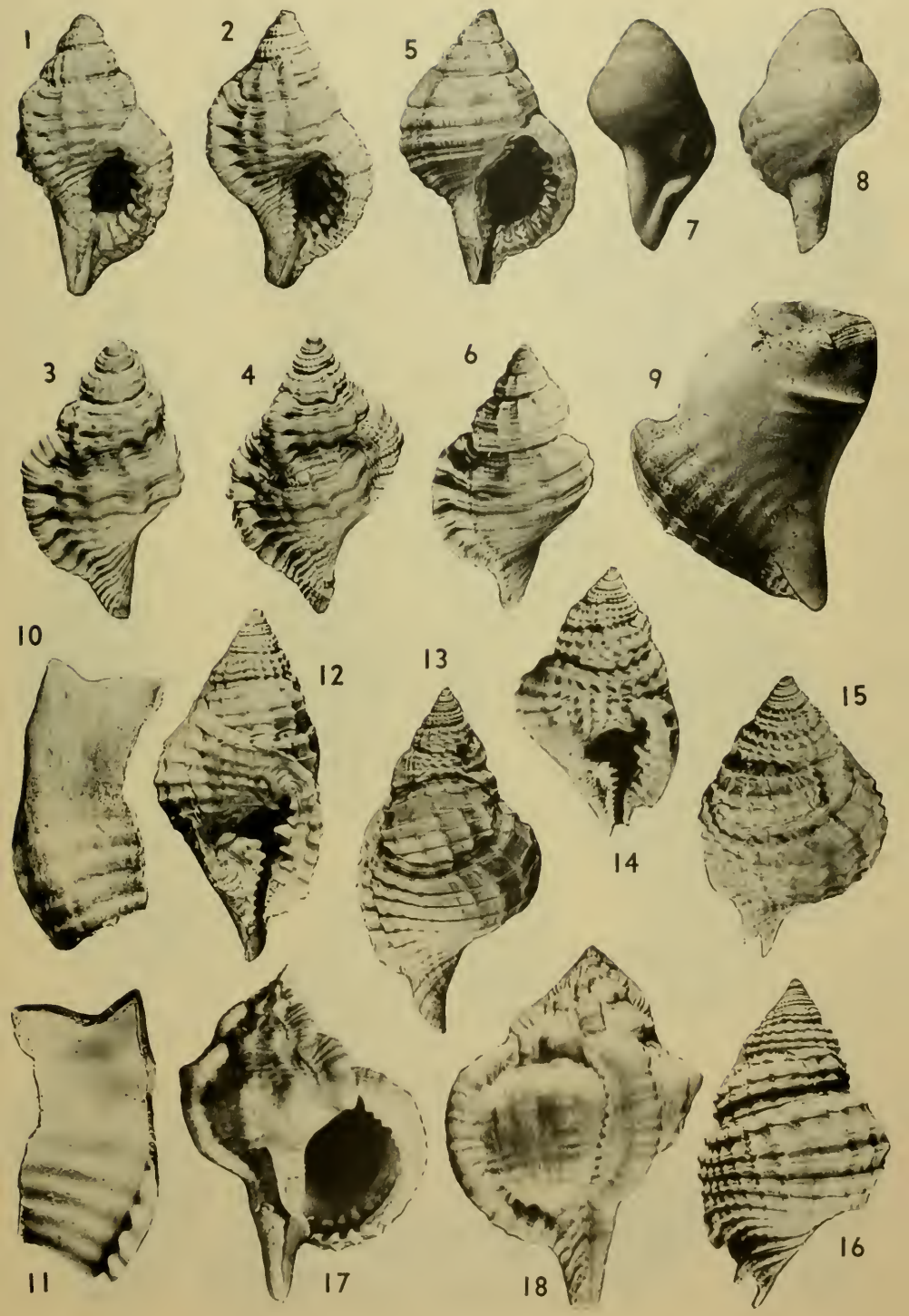
5,6. **Cymatium (Monoplex) parthenopeum** (von Salis) 262
(E245a). 26192 PRI. Lengh 41 mm.; width 25.5 mm. Upper Mare formation.

7,8. **Cymatium** ? species 265
(I20a). 26193 PRI. Immature specimen. Length 2 mm.; width 1 mm. Lower Mare formation.

9-11. **Charonia** species 266
Fig. 9, (G261a.) 26194 PRI. Fragment of inner lip. Length 60 mm. Mare formation. Figs. 10, 11, (G261b). 26195 PRI. Fragment of labrum. Length 60 mm. Mare formation.

12-16. **Distorsio (Rhysema) clathrata** (Lamarck) 267
Figs. 12, 13, (J248a). 26196 PRI. Length 57 mm.; width 29 mm. Lower Mare formation. Figs. 14-16, (T248a). 26197 PRI. Length 42 mm.; width 25 mm. Upper Mare formation.

17,18. **Murex (Murex) chrysostomus** Sowerby 282
(I241a). 26198 PRI. Length (siphonal canal incomplete) 51 mm.; width 35.5 mm. Lower Mare formation.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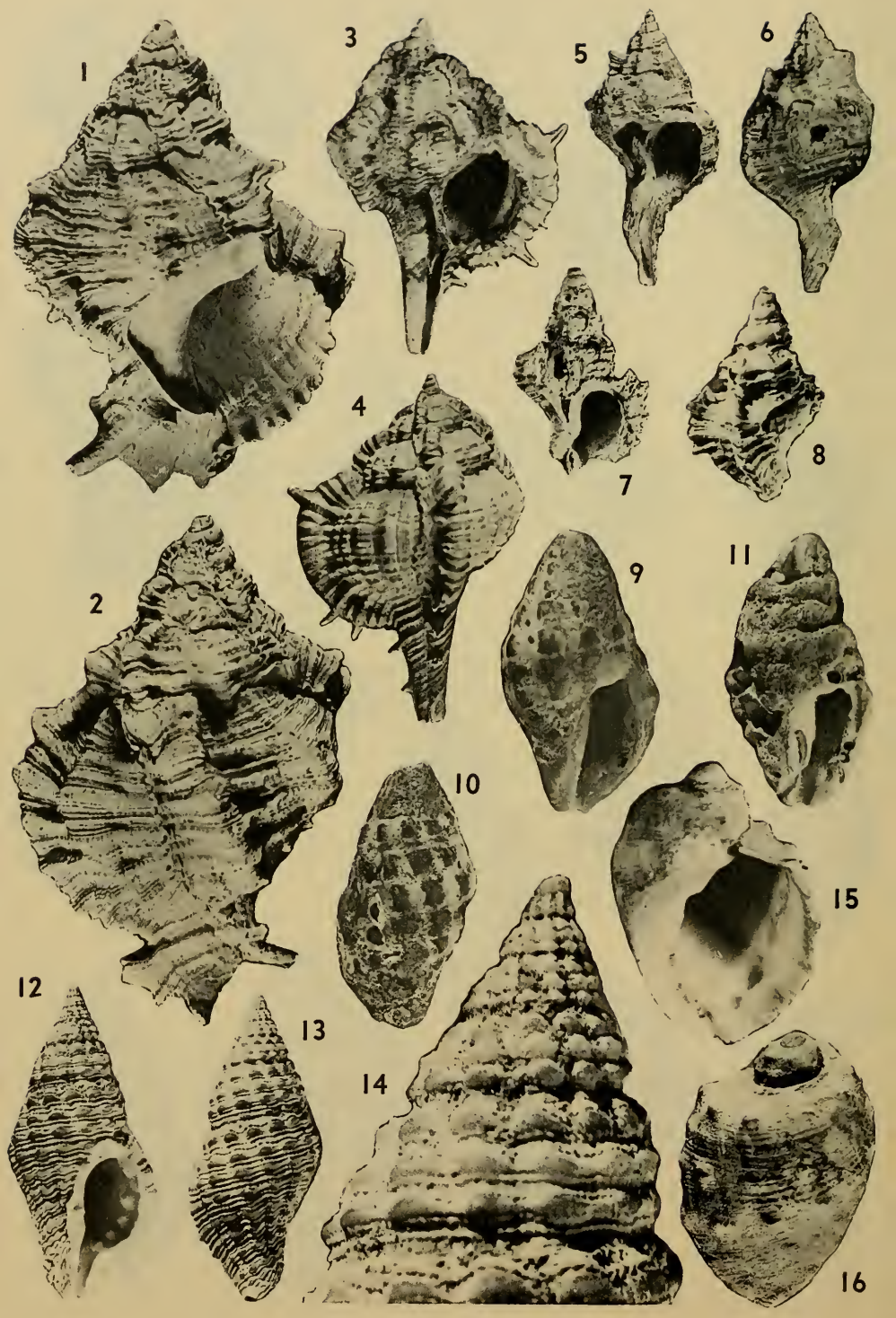
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Explanation of Plate 26

Figure — Page

1,2. **Murex (Phyllonotus) pomum** Gmelin 285
(G242a). 26199 PRI. Length 76 mm.; width 49 mm. Mare formation.

3,4. **Murex (Murex) recurvirostris recurvirostris** Broderip 278
(T240a). 26200 PRI. Length (anterior end of canal broken away) 51 mm.; width (excluding spines) 31 mm. Upper Mare formation.

5,6. **Murex (Chicoreus ?) brevifrons ?** Lamarck 291
(C239a). 26201 PRI. Length 32 mm.; width 15.2 mm. Young specimen. La Salina.

7,8. **Murex (Favartia) puntagordanum** Weisbord, n. sp. 292
Holotype (S243a). 26202 PRI. Length (anterior end of canal severed off) 13 mm.; width (including varices) 8 mm. Playa Grande formation (Maiquetía member).

9-11. **Drupa (Morula) nodulosa** (C. B. Adams) 293
Figs. 9, 10, (A115a). 26203 PRI. Length 11 mm.; width 6 mm. Recent. Fig. 11, (D115b). 26204 PRI. Length 11 mm.; width 6 mm. Abisinia formation.

12-14. **Drupa (Morula) gilbertharrisi** Weisbord, n. sp. 295
Holotype (J116a). 26205 PRI. Length 21 mm.; width 9.8 mm. Fig. 14, tip of spire enlarged 8X. Lower Mare formation.

15,16. **Purpura patula** (Linnaeus) 297
(T227a). 26206 PRI. Length 50 mm.; width 33 mm. Found on surface of upper Mare formation but may be a Recent specimen transported by bird.

Explanation of Plate 27

Figure — Page

1,2. **Thais (Stramonita) rustica** (Lamarck) 299
(A229a). 26207 PRI. Length of body whorl 23 mm.; width 23 mm. Recent.

3,4. **Thais (Stramonita) haemastoma** (Linnaeus) 300
(J228a). 26208 PRI. Length 53.5 mm.; width (including nodes) 35 mm. Lower Mare formation.

5,6. **Thais (Stramonita) chocolata** (Duclos) 303
(I230a). 26209 PRI. Length 43.5 mm.; width 32 mm. Lower Mare formation.

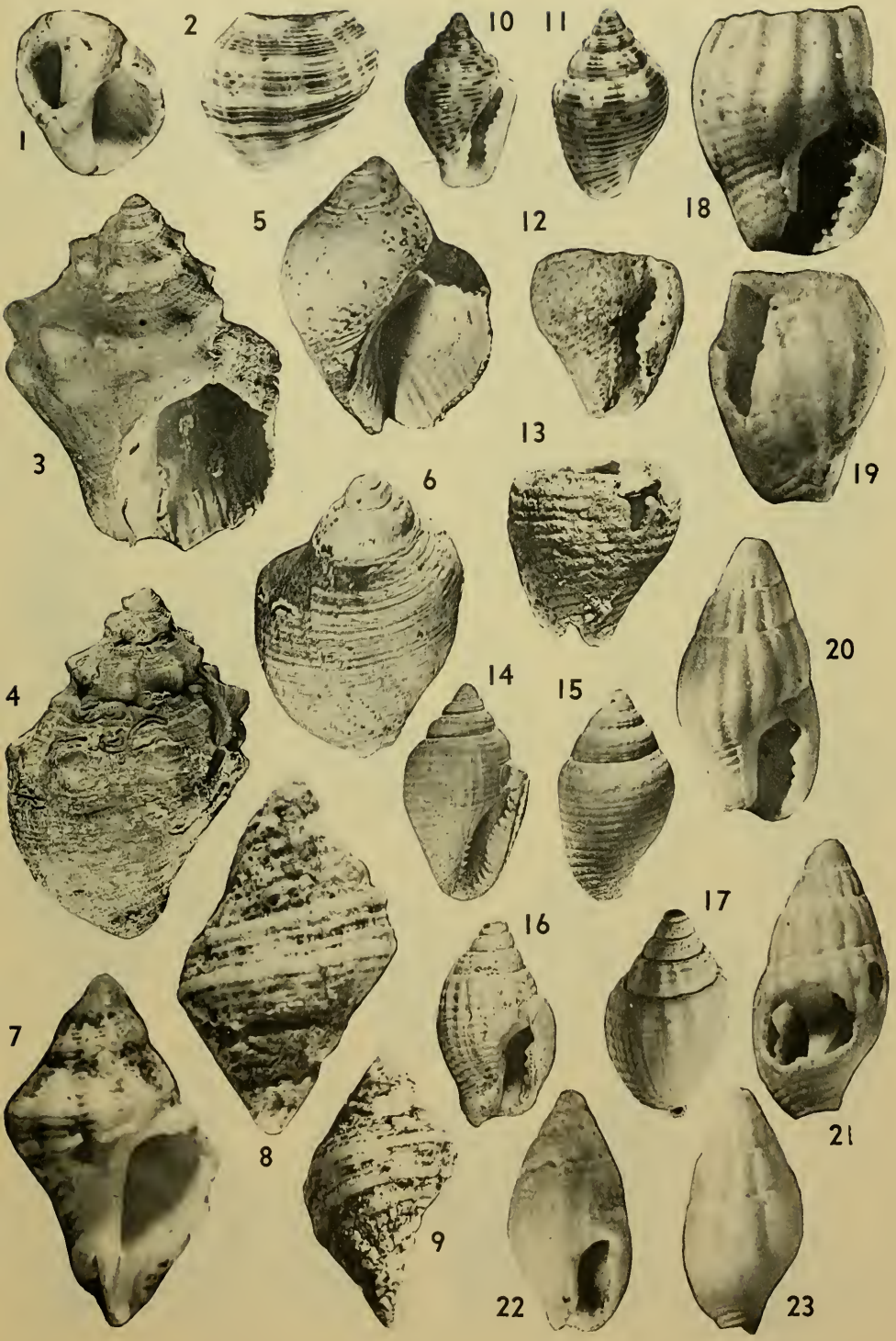
7-9. **Coralliophila caribaea** Abbott 304
(A292a). 26210 PRI. Length 11.5 mm.; width 6.5 mm. Recent.

10-13. **Columbella mercatoria** (Linnaeus) 306
Figs. 10, 11, (A280a). 26211 PRI. Length 14.6 mm.; width 9 mm. Recent. Figs. 12, 13, (D280a). 26212 PRI. Length of last whorl 10.8 mm.; width 9.8 mm. Abisinia formation.

14,15. **Columbella williamgabbi** Weisbord, n. sp. 308
Holotype (I281a). 26213 PRI. Length 21.4 mm.; width 12.7 mm. Lower Mare formation.

16,17. **Columbella mareana** Weisbord, n. sp. 309
Holotype (G281a). 26214 PRI. Length 14 mm. ;width 10.3 mm. Mare formation.

18-23. **Anachis (Costoanachis) obesa** (C. B. Adams) 310
Figs. 18, 19, (D125a). 26215 PRI. Length of last whorl 2.6 mm.; width 2 mm. Abisinia formation. Figs. 20, 21, (I123a). 26216 PRI. Length 5 mm.; width 2.8 mm. Lower Mare formation. Figs. 22, 23 (T214a). 26217 PRI. Length 4.2 mm.; width 2.2 mm. Upper Mare formation.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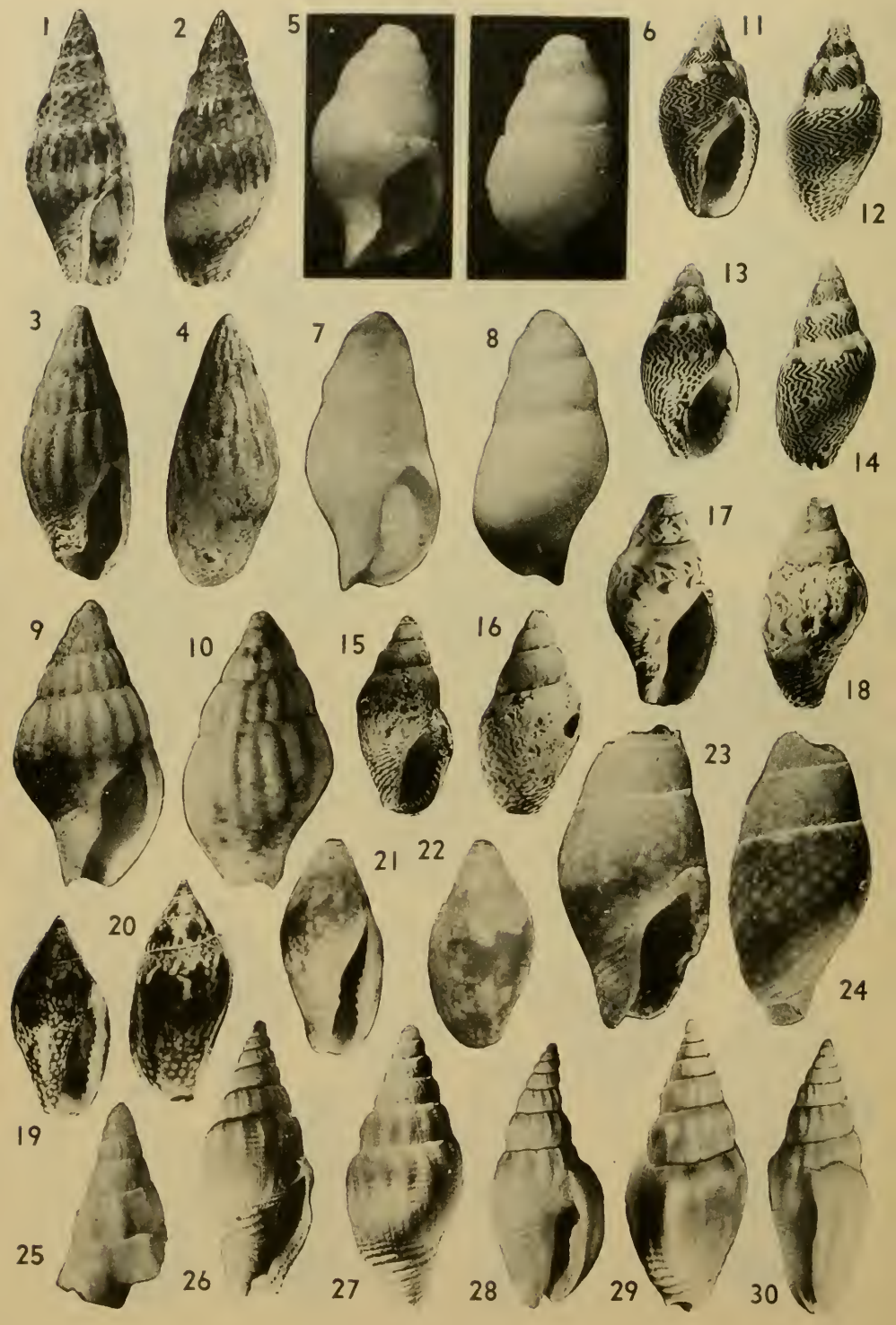
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Explanation of Plate 28

Explanation of Plate 29

Figure — Page

1-4. **Strombina caboblanquensis** Weisbord, n. sp. 323
Figs. 1, 2, paratype (I213a). 26233 PRI. Length 19.2 mm.; width 9.5 mm. Lower Mare formation. Figs. 3, 4, holotype (J213a). 26234 PRI. Length 23.1 mm.; width 10.2 mm. Lower Mare formation.

5,6. **Strombina ? galba** Weisbord, n. sp. 329
Holotype (T45a). 26235 PRI. Length 2.9 mm.; width 1.3 mm. Upper Mare formation.

7,8. **Alcira ? tropicana** Weisbord, n. sp. 330
Holotype (I44a). Length 1.1 mm.; width 0.85 mm. Lower Mare formation.

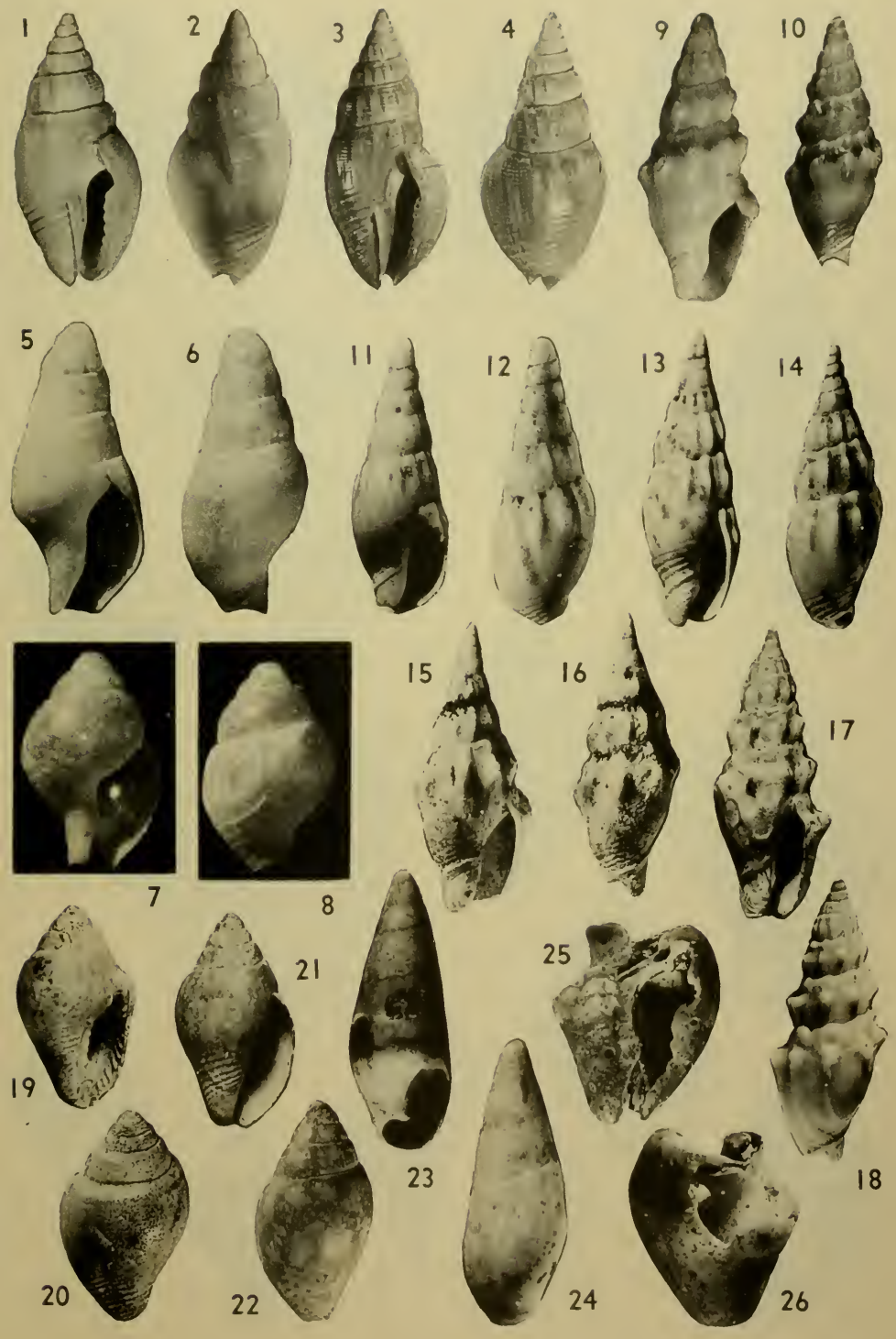
9-18. **Mazatlania aciculata** (Lamarck) 330
Figs. 9, 10, (A233a). 26236 PRI. Length (6 whorls) 14 mm.; width 5.8 mm. Recent. Front view enlarged 3X, back view 2.5X. Figs. 11, 12, (D143a). 26238 PRI. Young specimen. Length 7.5 mm.; width 3.1 mm. Abisinia formation. Figs. 13, 14, (D233a). 26239 PRI. Length 14 mm.; width 5.1 mm. Abisinia formation. Figs. 15, 16, (D233b). 26240 PRI. Length 12 mm.; width 5.1 mm. Nodulous variant. Abisinia formation. Figs. 17, 18, (J233a). 26241 PRI. Length (nucleus decollate) 17.3 mm.; width 7.2 mm. Nodulous variant. Lower Mare formation.

19,20. **Pyrene (Euryprene) venezuelanum** Weisbord, n. sp. 332
Holotype (I283a). 26242 PRI. Length 18.7 mm.; width 11.3 mm. Lower Mare formation.

21,22. **Pyrene (Euryprene ?) occidentalis** Weisbord, n. sp. 334
Holotype (J282a). 26243 PRI. Length 22.1 mm.; width 12.2 mm. Lower Mare formation.

23,24. **Brachystyloma caribbeana** Weisbord, n. gen and n. sp. 336
Holotype (D135a). 26244 PRI. Length 8.4 mm.; width 4.9 mm. Abisinia formation.

25,26. **Engina** ? species 338
(A247a). 26245 PRI. Length of fragment 6 mm.; width 5.2 mm. Recent.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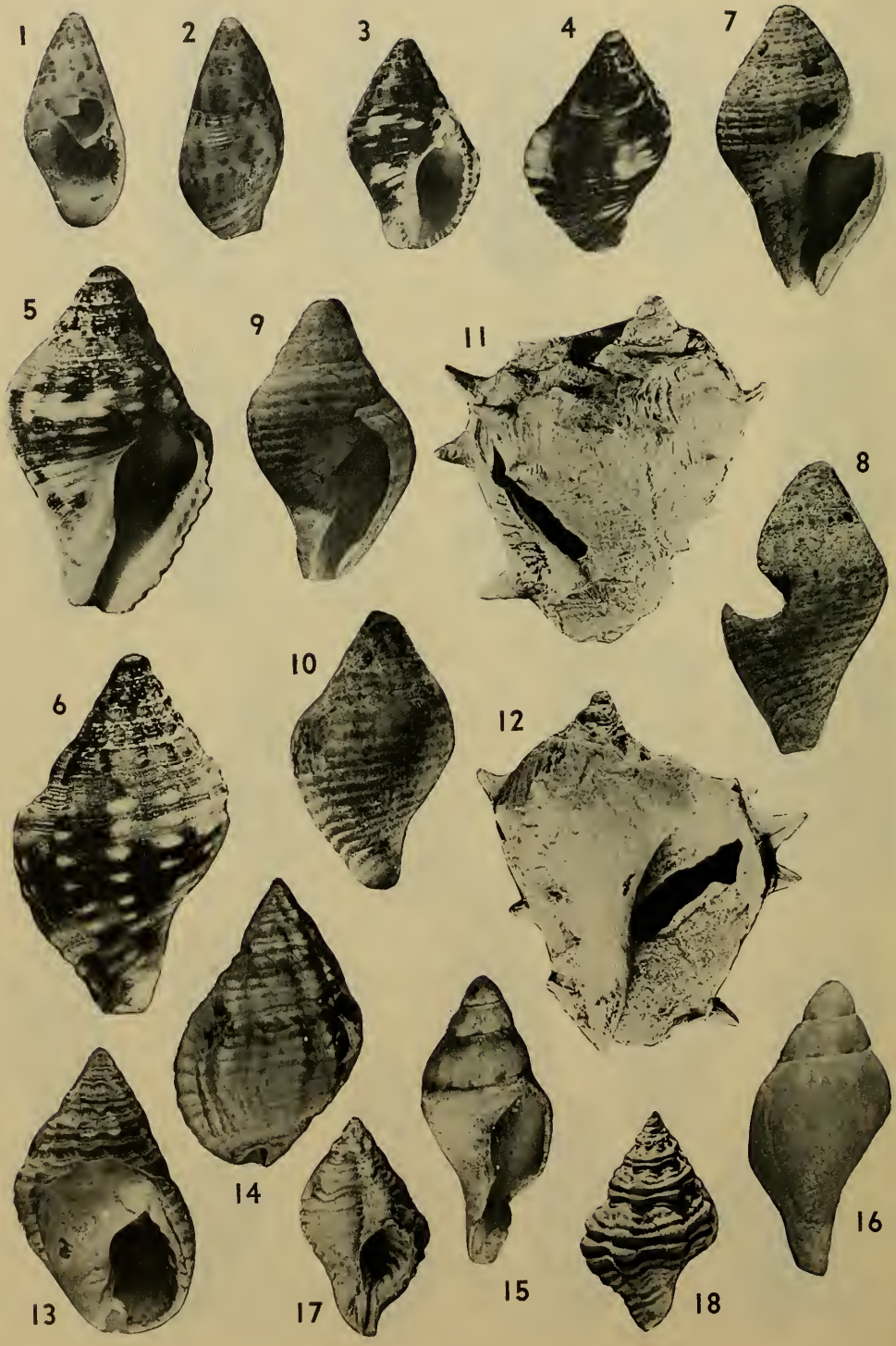
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Explanation of Plate 30

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1,2. **Pisania pusio** (Linnaeus) 339
(A285a). 26246 PRI. Length (4 whorls) 26.5 mm.; width 12.5 mm. Recent.

3-6. **Cantharus (Pollia) auritulus** (Link) 341
Figs. 3, 4, (A284a). 26247 PRI. Length 23.5 mm.; width 14.9 mm. Recent. Figs. 5, 6, (A658a). 26248 PRI. Length 16.4 mm.; width 10.4 mm. Recent.

7-10. **Cantharus (Pollia) tinctus** ? Conrad 343
Figs. 7, 8, (D140a). 26249 PRI. Length 11 mm.; width 6.3 mm. Abisinia formation. Figs. 9, 10, (D141a). 26250 PRI. Length 9 mm.; width 5.8 mm. Abisinia formation.

11,12. **Melongena melongena** (Linnaeus) 345
(C262a). 26251 PRI. Length 51 mm.; width (excluding spines) 38 mm. La Salina.

13,14. **Nassarius (Phrontis) vibex** (Say) 349
(C215a). 26252 PRI. Length 14 mm.; width 8.2 mm. La Salina.

15,16. **Fasciolaria semistriata mareana** Weisbord, n. subsp. 353
Holotype (J282b). 26253 PRI. Length 9.4 mm.; width 4.9 mm. Lower Mare formation.

17,18. **Latirus (Polygona) recticanalis** Weisbord, n. sp. 356
Holotype (R264a). 26254 PRI. Length (5 whorls) 15 mm.; width 8.7 mm. Playa Grande formation (Maiquetía member).

Explanation of Plate 31

Figure — Page

1,2. **Fasciolaria hollisteri** n. sp. 351
Holotype (J234a). 26255 PRI. Length 158 mm.; width 74 mm. Lower Mare formation.

3,4. **Fasciolaria (Pleuroploca ?) crassinoda** Weisbord, n. sp. 354
Holotype (I235a). 26256 PRI. Length 138 mm.; width (including nodes) 76 mm. Lower Mare formation.


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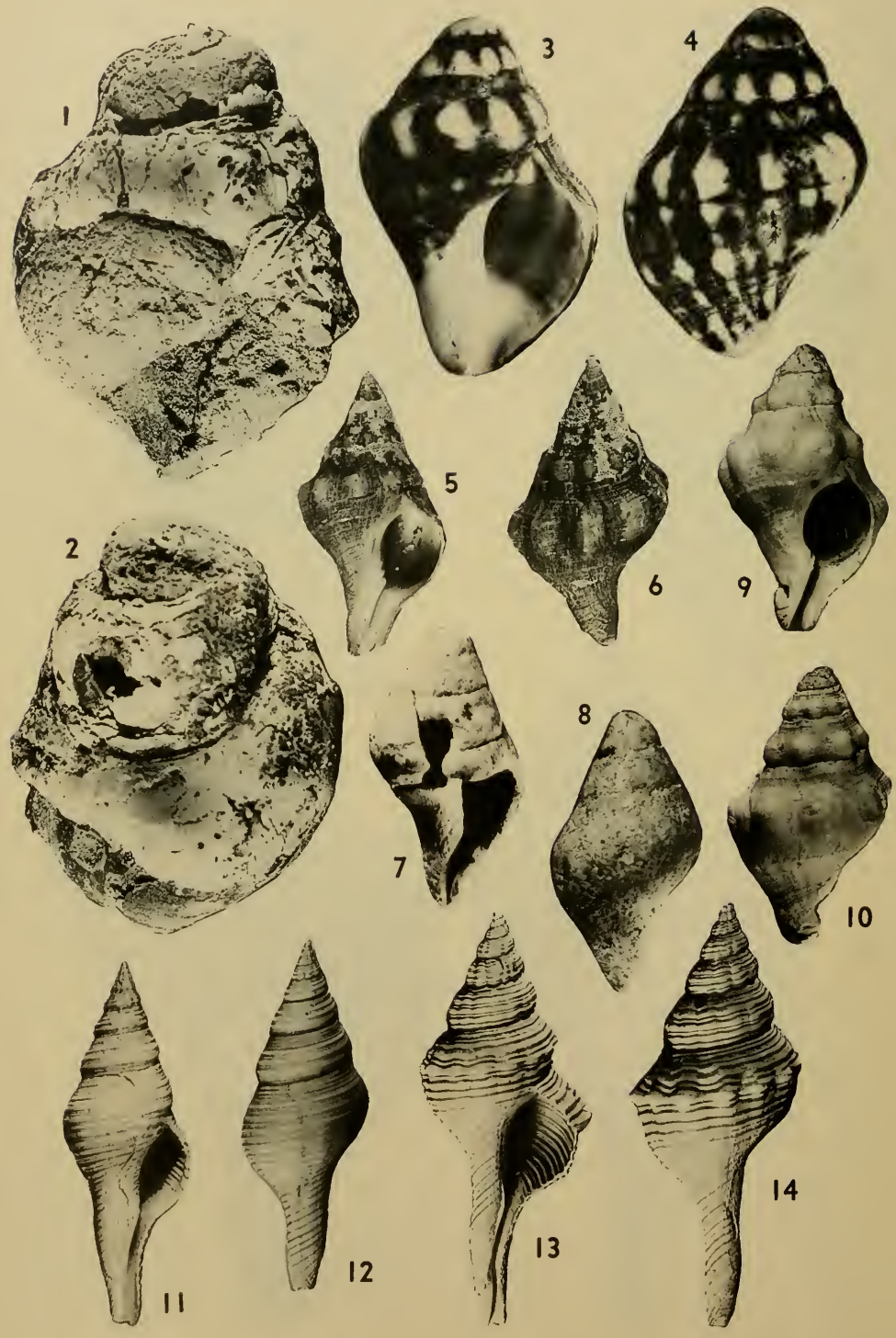
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Explanation of Plate 32

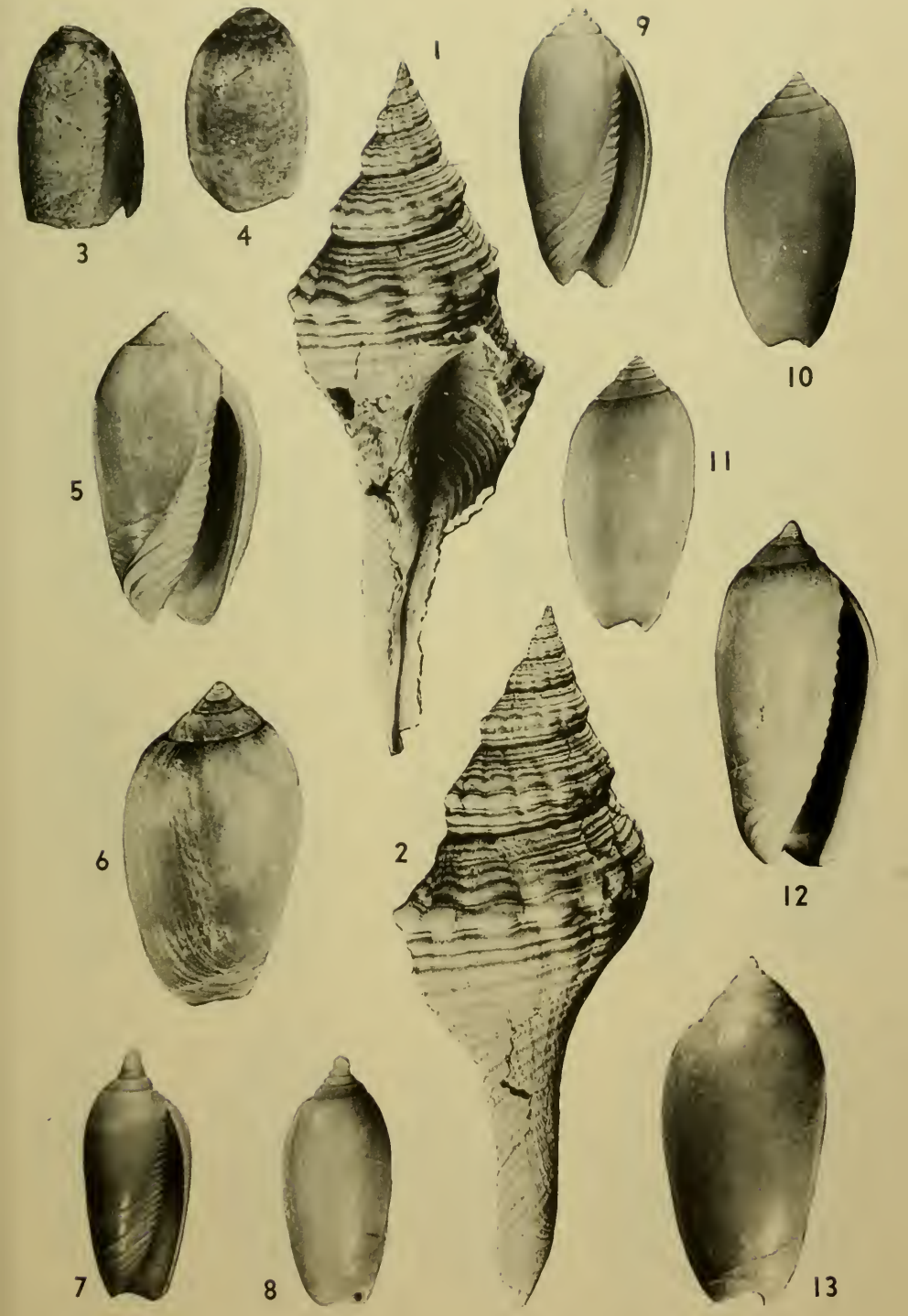
Explanation of Plate 33

Figure — Page

1,2. **Fusinus closter caboblanquensis** Weisbord, n. subsp. 364
Paratype (T238a). 26264 PRI. Length 142 mm.; width (including nodes) 59 mm. Upper Mare formation.

3,4. **Oliva (Ispidula) reticularis** Lamarck 368
(A211a). 26265 PRI. Length of fragment 21.3 mm.; width 13.3 mm. Recent.

5-13. **Oliva (Ispidula) schepmani** Weisbord, n. sp. 370
Figs. 5, 6, holotype (I212a). 26266 PRI. Length 46.5 mm.; width 24.5 mm. Lower Mare formation. Figs. 7, 8, paratype (I212b). 26267 PRI. Young specimen. Length 22.8 mm.; width 10.1 mm. Lower Mare formation. Figs. 9-11, paratype (G212a). 26268 PRI. Length 37 mm.; width 13.8 mm. Mare formation. Figs. 12, 13, paratype (J212a). 26269 PRI. Length 51.4 mm.; width 24.7 mm. Lower Mare formation.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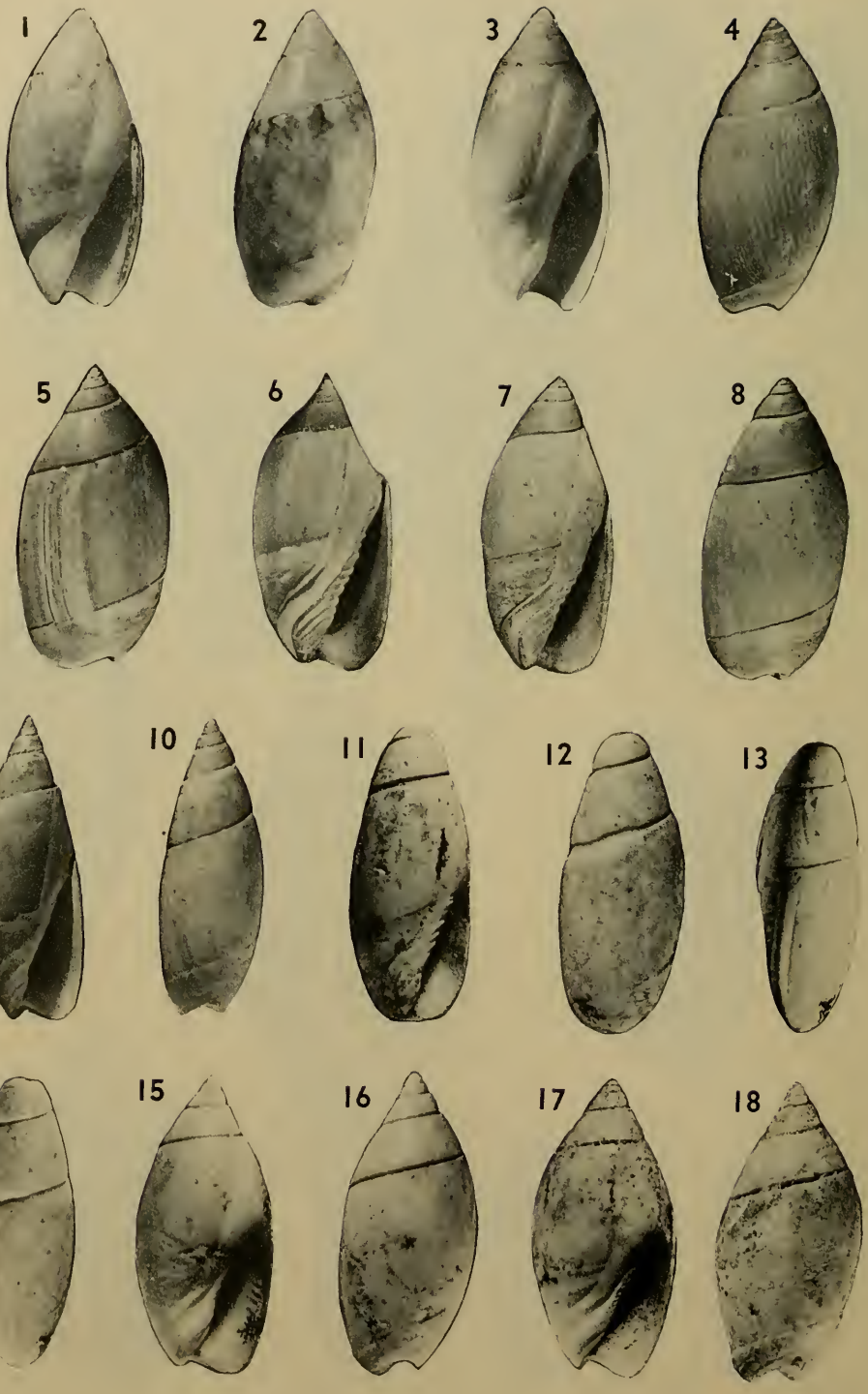
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Explanation of Plate 34

Explanation of Plate 35

Figure — Page

1-8. **Olivella (Minioliva) fundarugata** Weisbord, n. sp. 385
Figs. 1, 2, holotype (G150a). 26278 PRI. Length 3.7 mm.; width 1.5 mm. Mare formation. Figs. 3, 4, paratype (G150b). 26279 PRI. Length 2.5 mm.; width 1.05 mm. Mare formation. Figs. 5-8, (Q151a). 26280 PRI. Length (4 whorls) 4 mm.; width 2 mm. Playa Grande formation (Maiquetía member).

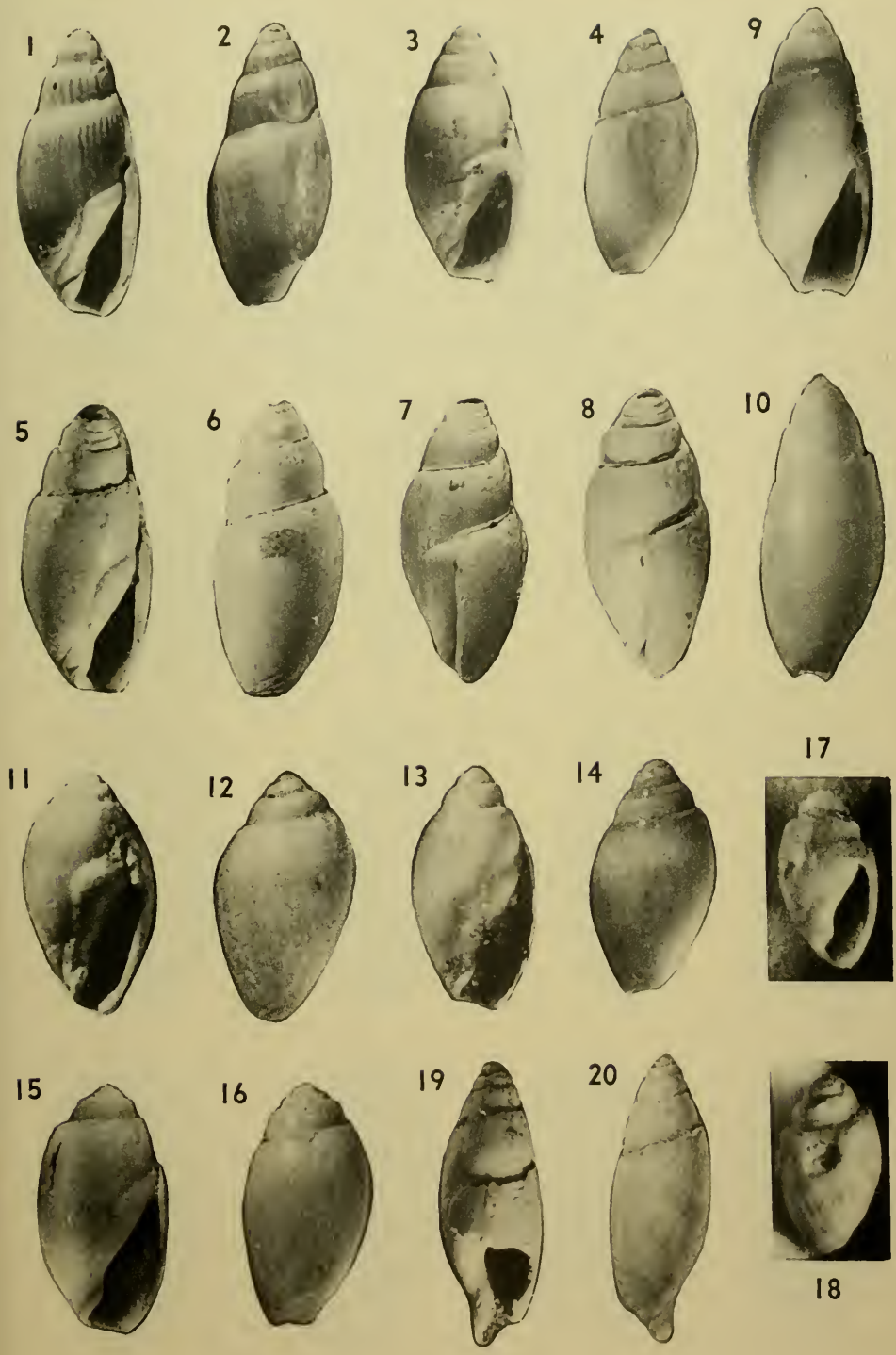
9,10. **Olivella (Minioliva) subfilifera** Weisbord, n. sp. 386
Holotype (I152a). 26281 PRI. Length 2.8 mm.; width 1.15 mm. Lower Mare formation.

11-14. **Olivella (Minioliva) maiquetiana** Weisbord, n. sp. 388
Figs. 11, 12, holotype (Q153a). 26282 PRI. Length 1.2 mm.; width 0.75 mm. Playa Grande formation (Maiquetía member). Figs. 13, 14, paratype (Q153b). 26283 PRI. Length 1.8 mm.; width 0.95 mm. Playa Grande formation (Maiquetía member).

15,16. **Olivella (Minioliva) salinae** Weisbord, n. sp. 389
Holotype (C154a). 26284 PRI. Length 2 mm.; width 1.05 mm. La Salina.

17,18. **Jaspidella ? praecipua** Weisbord, n. sp. 391
Holotype (G120a). 26285 PRI. Length 1 mm.; width 0.5 mm. Mare formation.

19,20. **Jaspidella caribbeana** Weisbord, n. sp. 390
Holotype (J155a). 26286 PRI. Length 4.2 mm.; width 1.75 mm. Lower Mare formation.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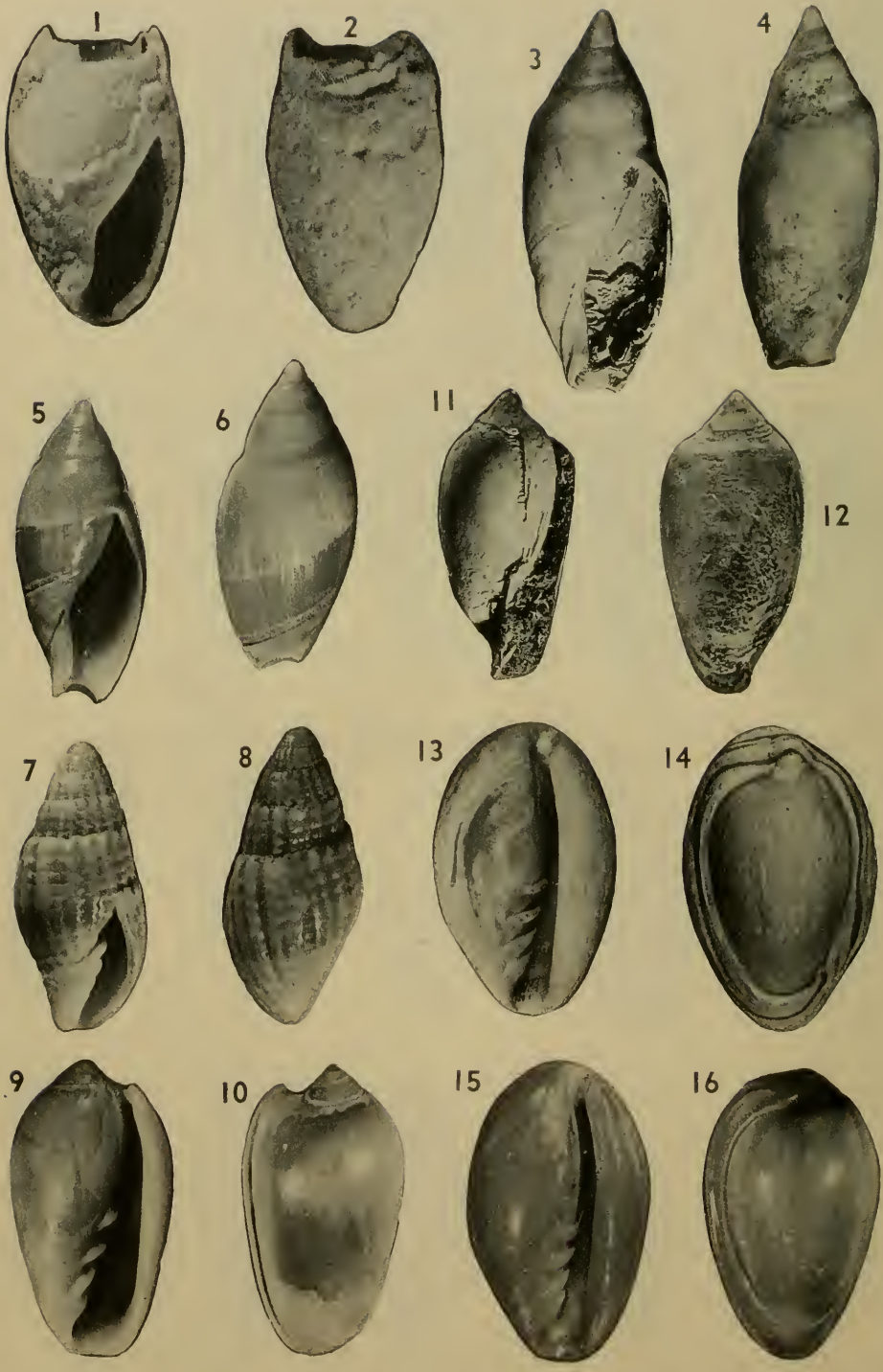
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Explanation of Plate 36

Figure — Page

1,2. **"Olivella"** species 392
(S48a). 26287 PRI. Length (last whorl) 3 mm.; width 2 mm. Playa Grande formation (Maiquetía member).

3,4. **Ancilla (Eburna) tankervillei** (Swainson) 392
(A269a). 26288 PRI. Length 34.8 mm.; width 14.2 mm. Recent.

5,6. **Ancilla (Eburna) venezuelana** Weisbord, n. sp. 393
Holotype (J269a). 26289 PRI. Length 0.3 mm.; width 13.5 mm. Lower Mare formation.

7,8. **Mitra (Uromitra) nodulosa** (Gmelin) 395
(A290a). 26290 PRI. Length 25 mm.; width 11 mm. Recent.

9,10. **Marginella (Marginella) prunum** (Gmelin) 400
(B176a). 26292 PRI. Length 26.5 mm.; width 15 mm. Recent.

11,12. **Marginella (Egouana ?) laguairana** Weisbord, n. sp. 402
Holotype (H177a). 26291 PRI. Length 18 mm.; width across shoulder excluding outer lip 8.5 mm. Mare formation.

13-16. **Marginella (Prunum) circumvittata** Weisbord, n. sp. 403
Figs. 13, 14, holotype (G173a). 26293 PRI. Length 20 mm.; width 12.1 mm. Mare formation. Figs. 15, 16, paratype (G173b). 26294 PRI. Length 18.8 mm.; width 11.1 mm. Mare formation.

Explanation of Plate 37

Figure — Page

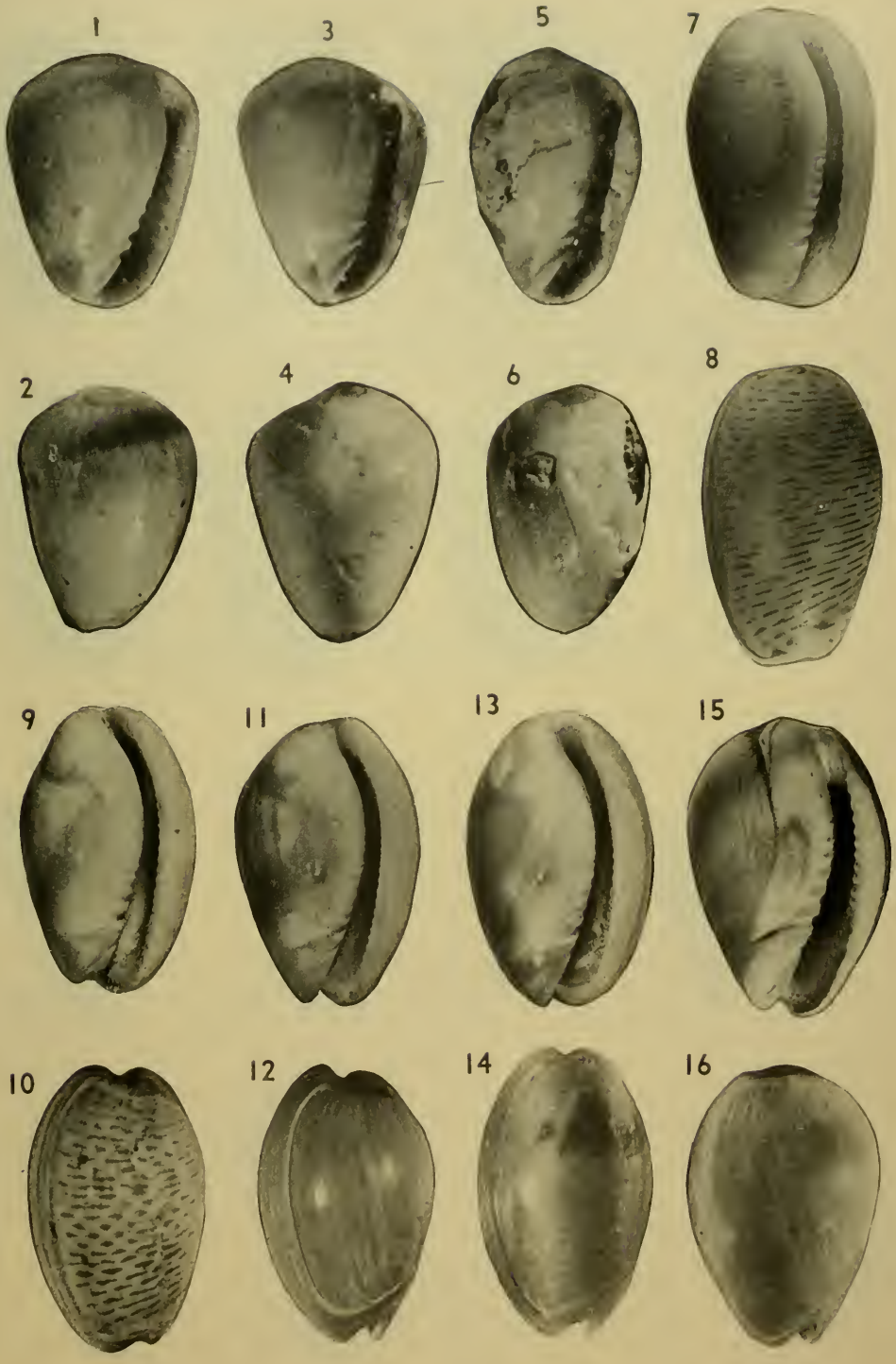
1-4. **Persicula (Gibberula) glandula** Weisbord, n. sp. 404
Figs. 1, 2, holotype (G178a). 26295 PRI. Length 2.1 mm.; width 1.7 mm. Mare formation. Figs. 3, 4, paratype (G178b). 26296 PRI. Length 1.9 mm.; width 1.4 mm. Mare formation.

5,6. **Persicula (Gibberula) lavalleeana** (d'Orbigny) 405
(R179a). 26297 PRI. Length 1.6 mm.; width 1 mm. Playa Grande formation (Maiquetía member).

7,8. **Persicula (Rabicea) interruptelineata** (Megerle von Mühlfeld) 407
(A175a). 26278 PRI. Length 12 mm.; width 7.2 mm. Recent.

9-14. **Persicula (Rabicea) interrupta mareana** Weisbord, n. subsp. 409
Figs. 9, 10, Holotype (I171c). 26299 PRI. Length 18.8 mm.; width 11.6 mm. Lower Mare formation. Figs. 11, 12, paratype (I171b). 26300 PRI. Length 18.6 mm.; width 11.5 mm. Lower Mare formation. Figs. 13, 14, paratype (T171a). 26301 PRI. Length 18.2 mm.; width 11.7 mm. Mare formation.

15,16. **Persicula (Rabicea) venezuelana lavelana** (F. hodson). 413
(G174a). 26302 PRI. Length 14.8 mm.; width 10 mm. Mare formation.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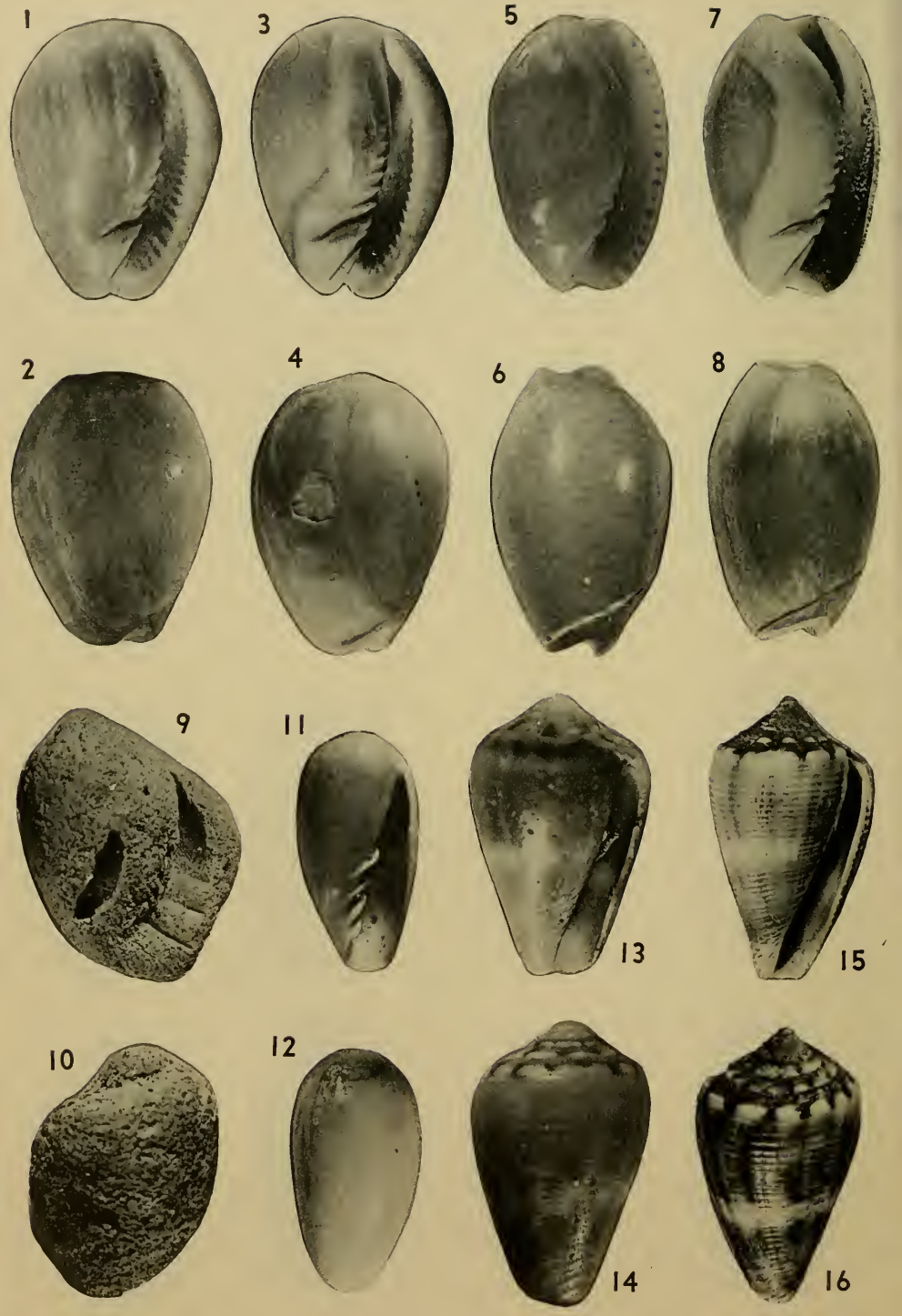
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Explanation of Plate 38

Figure — Page

1-4. **Persicula (Rabicea) venezuelana lavelana** (F. Hodson) 413
Figs. 1, 2, (J174b). 26303 PRI. Length 12.3 mm.; width 9 mm. Lower Mare formation. Figs. 3, 4, (G171d). 26304 PRI. Length 12.6 mm.; width 8.9 mm. Mare formation.

5-8. **Persicula (Rabicea ?) hodsoni** Weisbord, n. sp. 412
Figs. 5, 6, holotype (I172b). 26305 PRI. Length 12.7 mm.; width 7.8 mm. Lower Mare formation. Figs. 7, 8, paratype (T172a). 26306 PRI. Length 13.3 mm.; width 8.5 mm. Upper Mare formation.

9,10. **Cysticus** ? species 416
(O74a). 26307 PRI. Length 7.5 mm.; width 5.9 mm. Playa Grande formation (Catia member).

11,12. **Hyalina (Volvarina) lustra** Weisbord, n. sp. 26308 415
Holotype (I103a). 26308 PRI. Length 3.5 mm.; width 1.9 mm. Lower Mare formation.

13-16. **Conus (Conus) mus** Hwass 416
Figs. 13, 14, (A181a). 26309 PRI. Length 15.8 mm.; width 9.8 mm. Recent. Figs. 15, 16, (A181b). 26310 PRI. Length 24.2 mm.; width 14 mm. Recent.

Explanation of Plate 39

Figure — Page

1,2. **Conus (Conus)** species 418
(A653a). 26311 PRI. Length 9.7 mm.; width 6.3 mm. Recent.

3,4. **Conus (Conus) cf. regius** Gmelin 419
(D183a). 26312 PRI. Length (without nucleus) 12 mm.; width 7 mm. Abisinia formation.

5-16. **Conus (Leptoconus) jaspideus caboblanquensis** Weisbord, n. subsp. 420
Figs. 5, 6, holotype (J180a). 26313 PRI. Length 29.9 mm.; width 16.5 mm. Lightly beaded. Lower Mare formation. Figs. 7, 8, paratype (J180b). 26314 PRI. Length 23.7 mm.; width 13 mm. Highly beaded. Lower Mare formation. Figs. 9, 10, paratype (J180f). 26315 PRI. Length 21.7 mm.; width 13.1 mm. Completely beaded. Lower Mare formation. Figs. 11, 12, (J180c). 26316 PRI. Length 24.7 mm.; width 15 mm. Partly beaded. Lower Mare formation. Figs. 13, 14, (J180d). 26317 PRI. Length 27.8 mm.; width 15.8 mm. Specimen showing color pattern. Lower Mare formation. Figs. 15, 16, (J180e). 26318 PRI. Immature shell. Length 12 mm.; width 6 mm. Lower Mare formation.

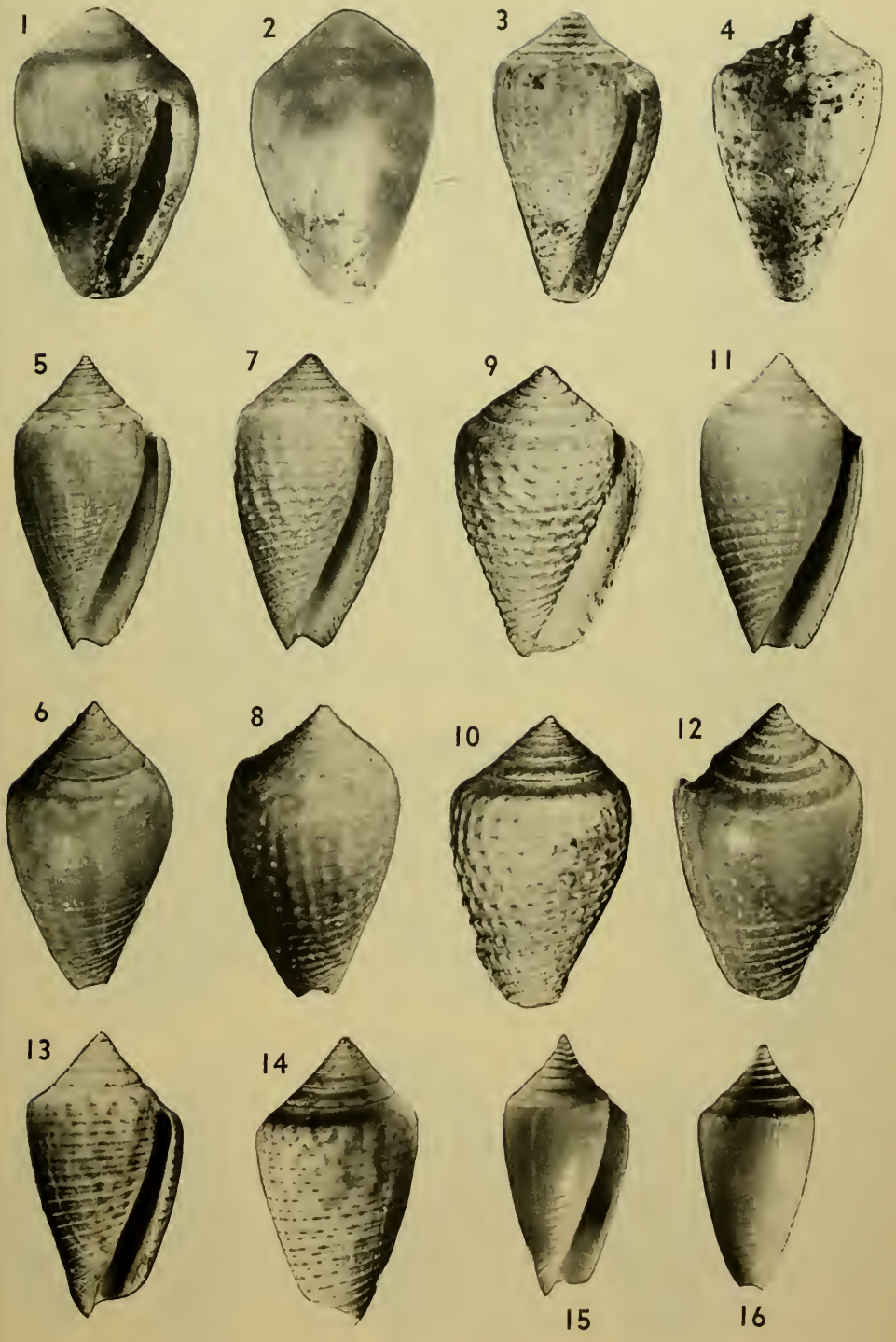
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Figure — Page

1,2. **Conus (Dendroconus) planitectum** Weisbord, n. sp. 424
Holotype (Q185a). 26319 PRI. Length (nucleus decollate) 59 mm.; width 36.5 mm. Playa Grande formation (Maiquetía member).

3,4. **Conus (Lithoconus) cf. daucus** Hwass 425
(D184a). 26320 PRI. Length (base missing) 11.7 mm.; width 9.1 mm. Abisinia formation.

5,6. **Conus (Chelyconus) federalis** Weisbord, n. sp. 426
Holotype (S182a(. 26321 PRI. Length (nucleus decollate) 45.4 mm.; width 23.9 mm. Playa Grande formation (Maiquetía member).

7,8. **Voluta musica** Linnaeus 396
(A289a). 26322 PRI. Length 56 mm.; width 32 mm. Recent.

9-11. **Cancellaria torula** Weisbord, n. sp. 398
Holotype (I110a). 26323 PRI. Length (anterior and posterior ends broken away) 13 mm.; width 10.5 mm. Lower Mare formation.

12,13. **Terebra (Strioterebrum) gatunensis kugleri** Rutsch 428
(J186a). 26324 PRI. Length 38.3 mm.; width 9.5 mm. Lower Mare formation.

14,15. **Terebra (Strioterebrum) trispiralis** Weisbord, n. sp. 430
Holotype (J189a). 26325 PRI. Length (9 whorls) 12.5 mm.; width 2.5 mm. Lower Mare formation.

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Figure — Page

1-4. **Terebra (Strioterebrum) quadrispiralis** Weisbord, n. sp. 431
Figs. 1, 2, holotype (I190a.). 26326 PRI. Length (8 whorls) 13.5 mm.; width 4 mm. Lower Mare formation. Figs. 3, 4, paratype (G190b). 26327 PRI. Length (5 whorls) 9 mm.; width 3.6 mm. Mare formation.

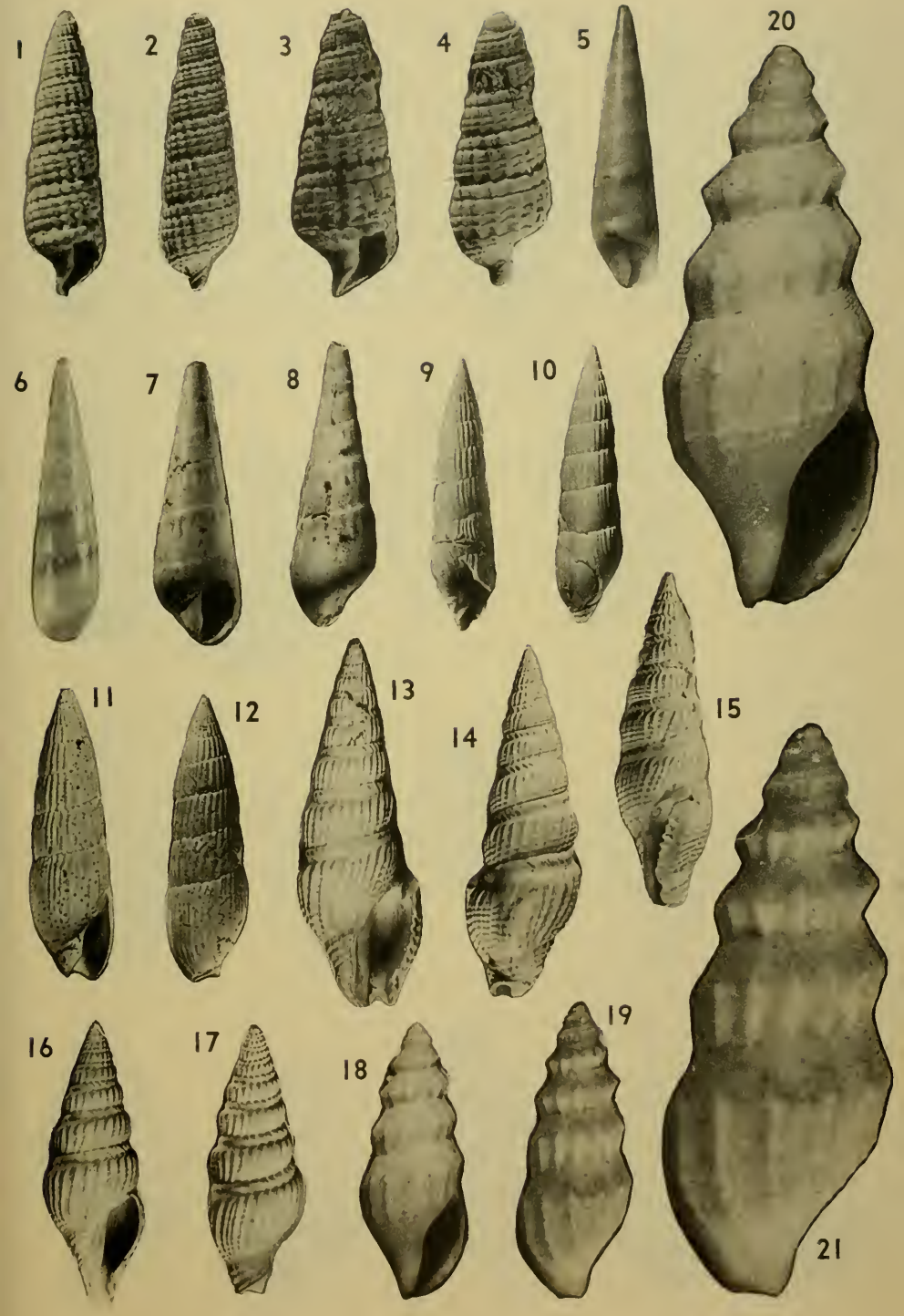
5-8. **Terebra (Hastula) cinerea** (Born) 432
Figs. 5, 6, (A192a). 26328 PRI. Length (apex decollate) 29 mm.; width 7.2 mm. Recent. Figs. 7, 8, (D188a). 26329 PRI. Length (apex decollate) 13.5 mm.; width 4.2 mm. Abisinia formation.

9-12. **Terebra (Hastula) hastata mareana** Weisbord, n. subsp. 434
Figs. 9, 10, holotype (T187a) 26330 PRI. Length 29.2 mm.; width 7.1 mm. Upper Mare formation. Figs. 11, 12, paratype (J187b). 26331 PRI. Length (nucleus decollate) 27 mm.; width 8 mm. Lower Mare formation.

13-15. **Clathodrillia gibbosa** (Born) 435
(I253a). 26332 PRI. Length (apex decollate) 52.5 mm.; width 18.2 mm. Lower Mare formation.

16,17. **Clathodrillia mareana** Weisbord, n. sp. 437
Holotype (I254a). 26333 PRI. Length (tip of spire missing) 35 mm.; width 13 mm. Lower Mare formation.

18-21. **Kurtziella tropica** Weisbord, n. sp. 439
Holotype (I12a). 26334 PRI. Length 4.6 mm.; width 1.8 mm. Figs. 18, 19 enlarged about 9X; figs. 20, 21 enlarged about 17X. Lower Mare formation.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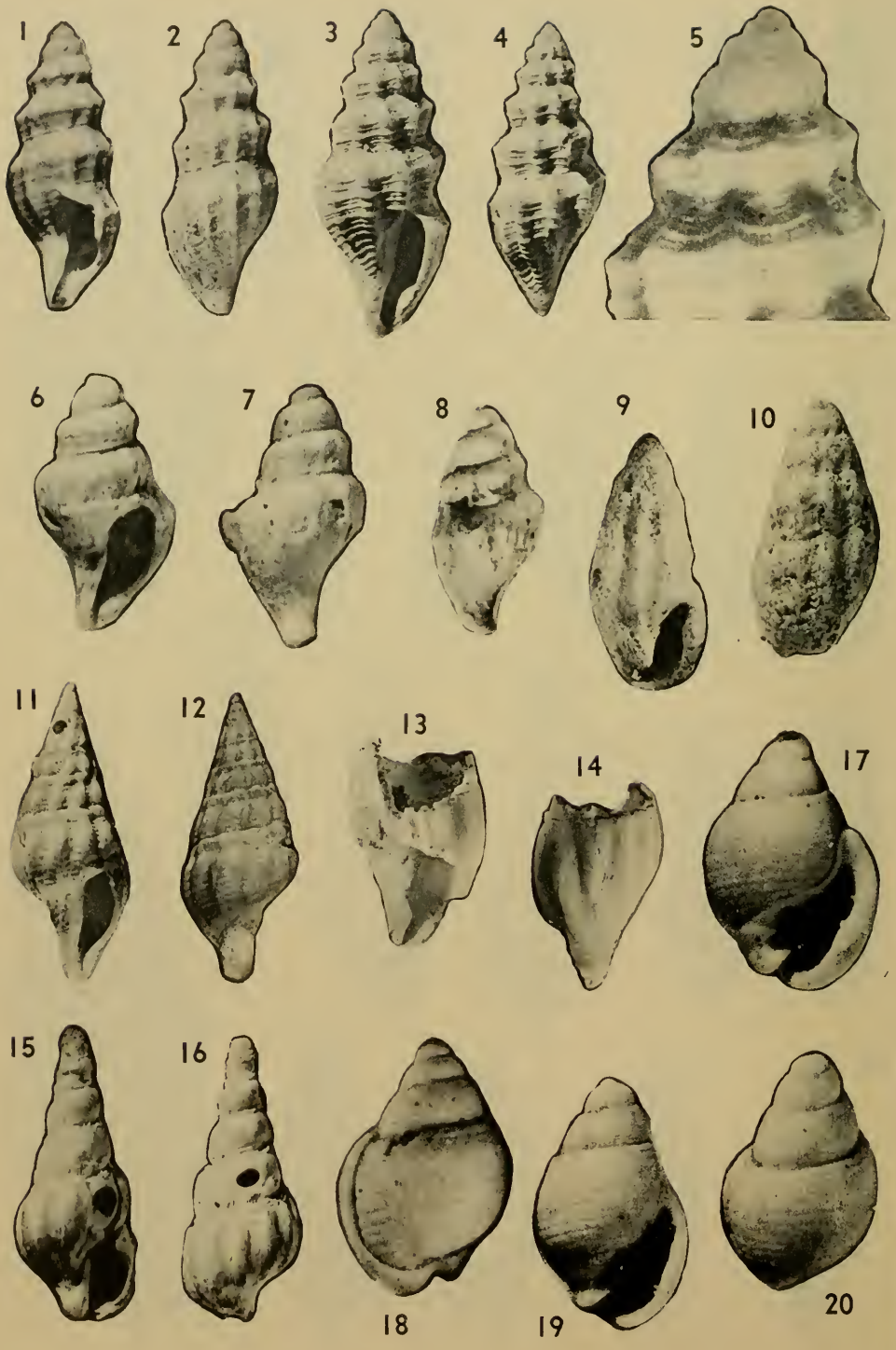
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Explanation of Plate 42

Figure — Page

1,2. **Kurtziella caribbeana** Weisbord, n. sp. .. 441
Holotype (R14a). 26335 PRI. Length 3.4 mm.; width 1.1 mm. Playa Grande formation (Maiquetía member).

3-5. **Kurtziella venezuelana** Weisbord, n. sp. .. 442
Holotype (G13a). 26336 PRI. Length 5.2 mm.; width 2.5 mm. Fig. 3, enlarged nearly 9X, fig. 4 nearly 8X, fig. 5 about 40X. Mare formation.

6-8. **Kurtziella ? morona** Weisbord, n. sp. .. 444
Holotype (C29a). 26337 PRI. Length 1.55 mm.; width 0.9 mm. La Salina.

9,10. **Mangelia (Agathotoma)** aff. **fusca** (C. B. Adams) .. 445
(D252a). 26338 PRI. Length 3.5 mm.; width 1.8 mm. Abisinia formation.

11,12. **Syntomodrillia ? biconica** Weisbord, n. sp. .. 446
Holotype (J250a). 26339 PRI. Length 13 mm.; width 5.2 mm. Lower Mare formation.

13,14. **"Drillia"** species "a" .. 448
(I251a). 26340 PRI. Length (last whorl) 6.8 mm.; width 4.8 mm. Lower Mare formation.

15,16. **"Drillia"** species "b" .. 449
(S19a). 26341 PRI. Length 3.6 mm.; width 1.3 mm. Playa Grande formation (Maiquetía member).

17-20. **Ringicula (Ringiculella) maiquetiana** Weisbord, n. sp. .. 450
Figs. 17, 18, holotype (Q119a). 26342 PRI. Length 1.4 mm.; width 0.9 mm. Playa Grande formation (Maiquetía member). Figs. 19, 20, paratype (Q119b). 26343 PRI. Length 1.2 mm. Playa Grande formation (Maiquetía member).

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Figure — Page

1-4. **Bulla amygdala** Dillwyn 452
Figs. 1, 2, (A273a). 26344 PRI. Length 20.5 mm.; width 13 mm. Recent. Figs. 3, 4, (S273a). 26345 PRI. Length 18 mm. Playa Grande formation (Maiquetía member).

5,6. **Bulla occidentalis** A. Adams 454
(B272a). 26346 PRI. Length 29 mm.; width 17 mm. Recent.

7-10. **Bulla striata** Bruguière 455
Figs. 7, 8, (A272a). 26342 PRI. Length 14 mm.; width 7.6 mm. Recent. Figs. 9, 10, (D272a). 26348 PRI. Length 8.5 mm.; width 5.25 mm. Abisinia formation.

11,12. **Rhizorus bruscasensis** Weisbord, n. sp. 457
Holotype (R30a). 26349 PRI. Length (upper two-thirds of body whorl) 1.05 mm. Fig. 11, front view of body whorl. Fig. 12, back view of outer lip (broken away from body). Playa Grande formation (Maiquetía member).

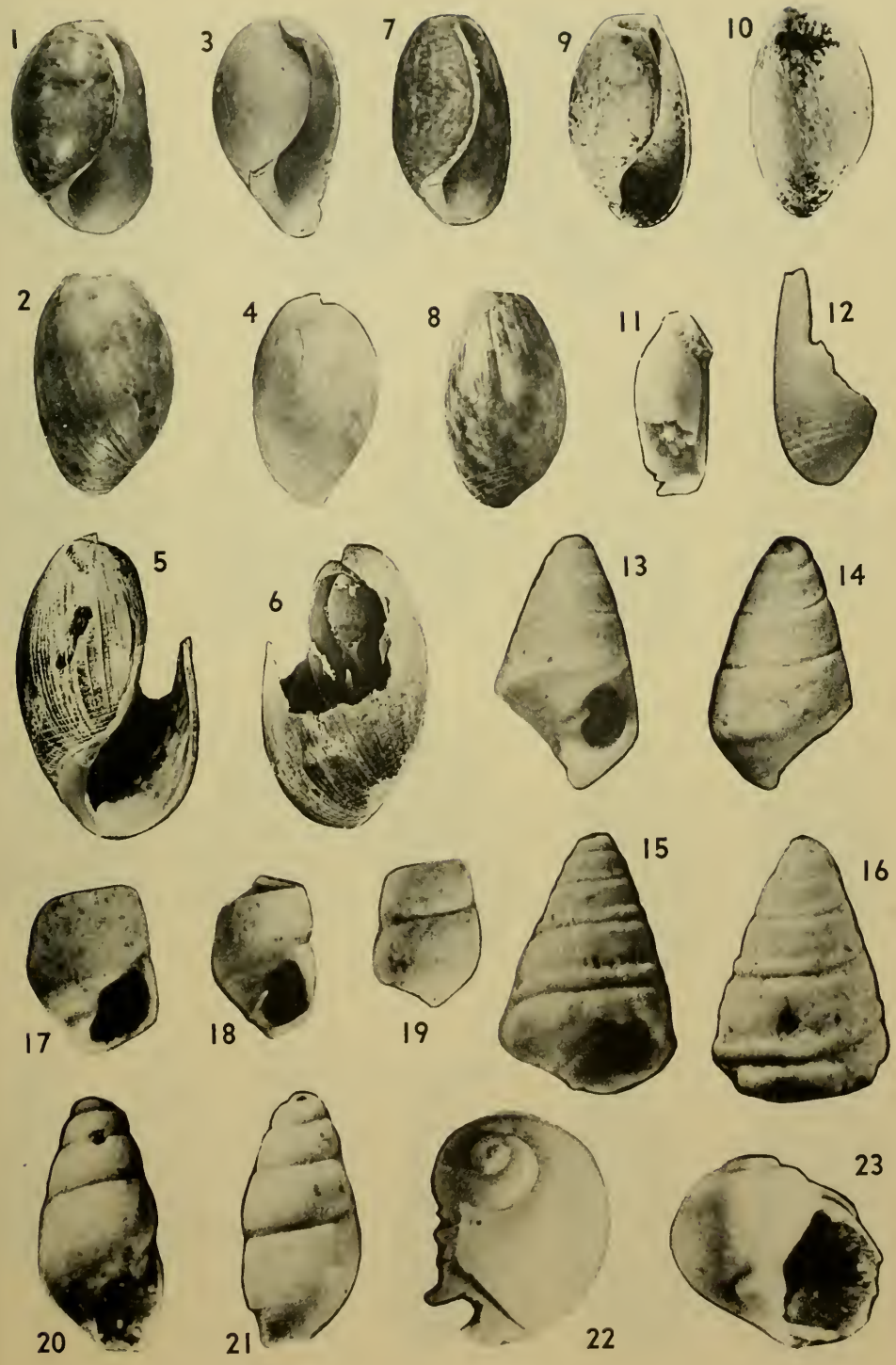
13,14. **Orinella ? salinae** Weisbord n. sp. 459
Holotype (C36b). 26350 PRI. Length 1.4 mm.; width 0.8 mm. La Salina.

15,16. **Orinella ? (Cricolophus) humboldti** Weisbord, n. subgen. and n. sp. 460
Holotype (C36a). 26351 PRI. Length (5 whorls) 1.4 mm.; width 0.97 mm. La Salina.

17-19. **Eulimella ? binata** Weisbord, n. sp. 461
Holotype (Q126a). 26352 PRI. Length (last 2 whorls) 0.85 mm.; width 0.5 mm. Two front views and one of back. Playa Grande formation (Maiquetía member).

20,21. **Odostomia playagrandensis** Weisbord, n. sp. 462
Holotype (Q43a). 26353 PRI. Length 1.4 mm.; width 0.65 mm. Playa Grande formation (Maiquetía member).

22,23. **Tectonatica antilleana** Weisbord, n. sp. 249
Holotype (S100a). 26354 PRI. Length (broken at base) 0.9 mm.; width 1.1 mm. Playa Grande formation (Maiquetía member).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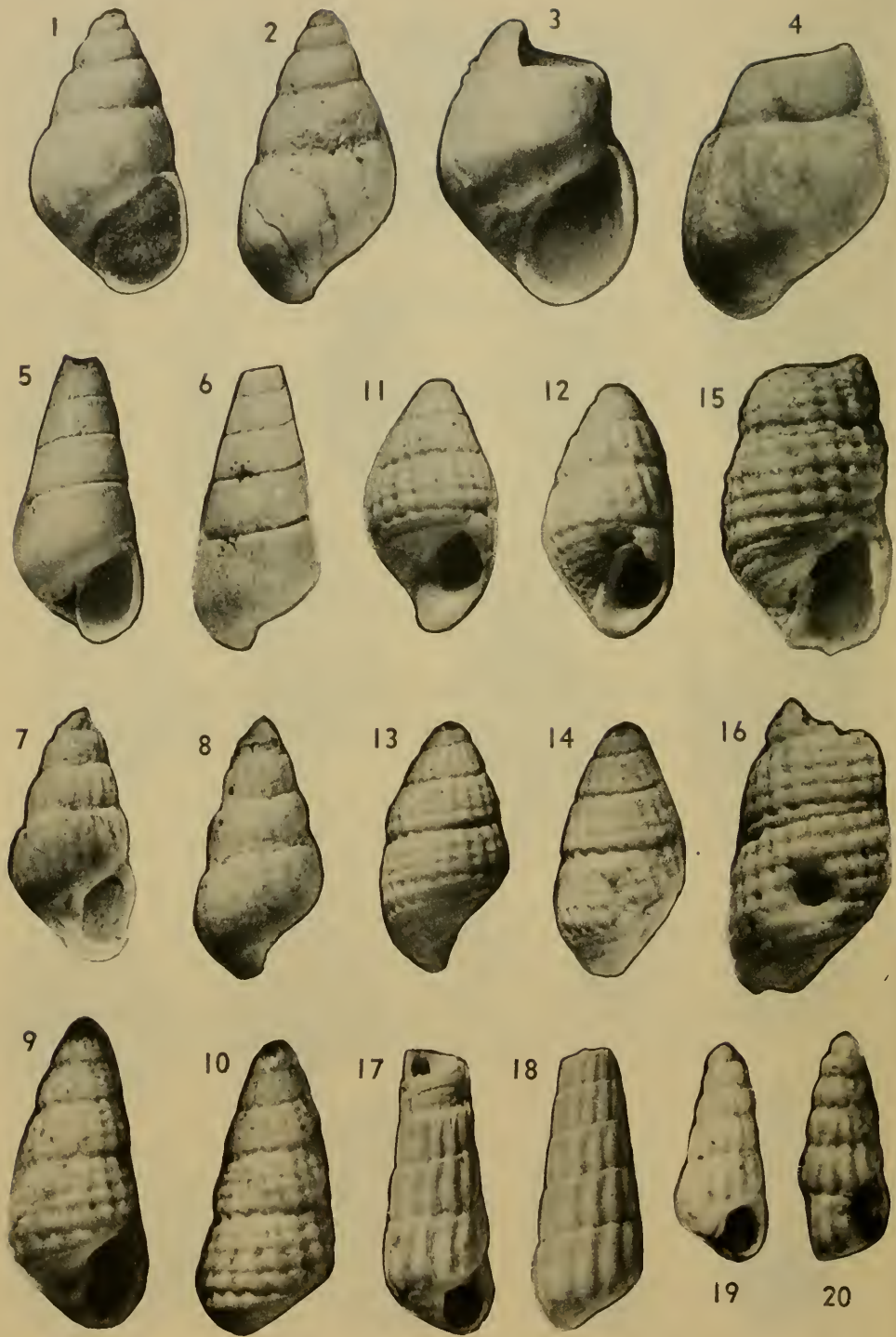
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Explanation of Plate 44

Figure — Page

1-4. **Odostomia (Evalea) antilleana** Weisbord, n. sp. 463
Figs. 1, 2, holotype (J17a). 26355 PRI. Length 2.7 mm.; width 1.3 mm. Lower Mare formation.
Figs. 3, 4, paratype (I38a). 26356 PRI. Length (last 2 whorls) 2 mm.; width 1.3 mm. Lower Mare formation.

5,6. **Odostomia (Evalea) mareana** Weisbord, n. sp. 465
Holotype (I37a). 26357 PRI. Length (5 whorls) 2.5 mm.; width 1.2 mm. Lower Mare formation.

7,8. **Odostomia (Parthenina) meridoamericana** Weisbord, n. sp. 466
Holotype (S39a). 26358 PRI. Length 1.7 mm.; width 0.7 mm. Playa Grande formation (Maiquetía member).

9,10. **Chrysallida caribbeana** Weisbord, n. sp. 467
Holotype (S40a). 26359 PRI. Length 1.8 mm.; width 0.75 mm. Playa Grande formation (Maiquetía member).

11-14. **Chrysallida salinensis** Weisbord, n. sp. 468
Figs. 11, 12, holotype (C42a). 26360 PRI. Length 1.4 mm.; width 0.7 mm. La Salina.
Figs. 13, 14, paratype (C42b). 26361 PRI. Length 1.25 mm.; width 0.6 mm. La Salina.

15,16. **Chrysallida cribrata** Weisbord, n. sp. 469
Holotype (H41a). 26362 PRI. Length 2-1/2 whorls) 2 mm.; width 1 mm.

17,18. **Turbonilla marella** Weisbord, n. sp. 471
Holotype (F21a). 26363 PRI. Length (5 whorls) 2.7 mm.; width 0.8 mm. Mare formation.

19,20. **Turbonilla (Chemnitzia) pustulella** Weisbord, n. sp. 472
Holotype (C25a). 26364 PRI. Length 1.2 mm.; width 0.35 mm. La Salina.

Explanation of Plate 45

Figure — Page

1. **Turbonilla (Chemnitzia ?)** species 473
(H28a). 26365 PRI. Length of body whorl 1.7 mm.; width 1.2 mm. Mare formation.

2,3. **Turbonilla (Nisiturris) pupapicula** Weisbord, n. sp. 473
Holotype (Q27a). 26366 PRI. Length 1 mm.; width 0.3 mm. Playa Grande formation (Maiquetía member.

4,5. **Pyrgiscus magnacrista** Weisbord, n. sp. 474
Fig. 4, holotype (Q26a). 26367 PRI. Juvenile specimen. Length 1.65 mm., width 0.3 mm. Side view showing orientation of nucleus with respect to conch. Playa Grande formation (Maiquetía member). Fig. 5, (O26b). 26368 PRI. Length (nucleus + 3 whorls) 2 mm.; width 0.7 mm. View of back. Playa Grande fomation (Maiquetía member).

6,7. **Pyrgiscus granadensis** Weisbord, n. sp. 476
Holotype (H22a). 26369 PRI. Length (4 whorls) 1.5 mm.; width 0.7 mm. Mare formation.

8,9. **Pyrgiscus facetus** Weisbord, n .sp. 476
Holotype (R23a). 26370 PRI. Length (body whorl and part of penultima) 1.9 mm.; width 1.4 mm. Playa Grande formation (Maiquetía member).

10-13. **Pyrgiscus bruscasensis** Weisbord, n. sp. 477
Holotype (R24a). 26371 PRI. Length about 2.7 mm.; width 0.7 mm. Front and back views of the same specimen, the two basal whorls (figs. 11 and 13) detached from but fitting into the upper fragment (figs. 10 and 12). Playa Grande formation (Maiquetía member).

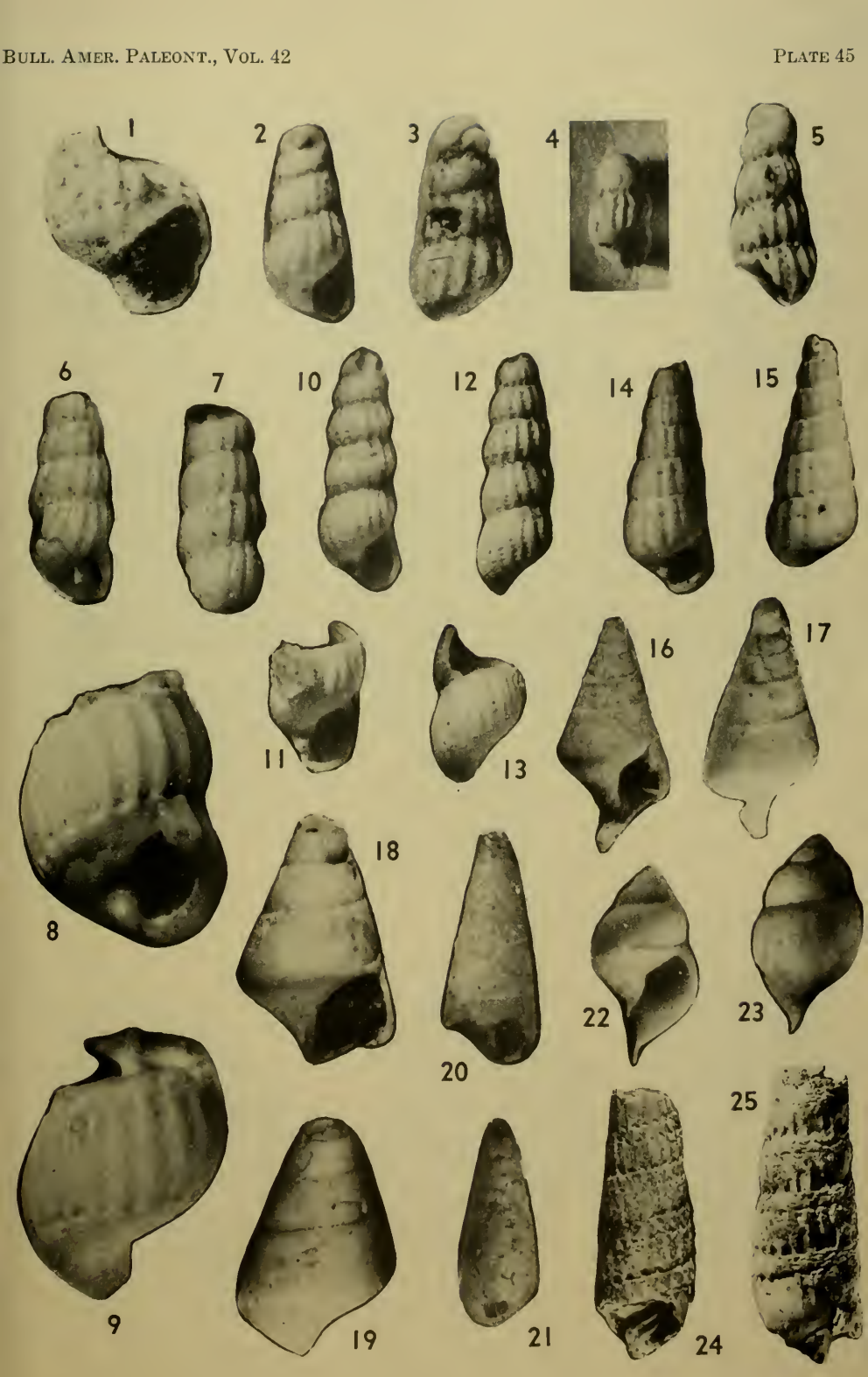
14,15. **Pyrgiscus curucutiensis** Weisbord, n. sp 479
Holotype (S191a). 26372 PRI. Length (5 whorls) 2.5 mm.; width 0.8 mm. Playa Grande formation (Maiquetía member).

16-19. **Melanella (Polygireulima) spatha** Weisbord, n. sp. 480
Figs. 16, 17, holotype (S138a). 26373 PRI. Length (3 whorls) 2.2 mm.; width 1.2 mm. Enlarged about 30X. Playa Grande formation (Maiquetía member). Figs. 18, 19, paratype (S138b). 26374 PRI. Length (4 whorls) 1.8 mm.; width 0.9 mm. Enlarged about 20X. Playa Grande formation (Maiquetía member).

20,21. **Melanella** species 480
(I139a). 26375 PRI. Length (7 whorls) 1.7 mm.; width 0.6 mm. Lower Mare formation.

22,23. **Acteon** ? species 449
(F130a). 26376 PRI. Length 1.1 mm.; width 0.7 mm. Mare formation.

24,25. **Terebra (Strioterebrum) gatunensis kugleri** Rutsch 428
(S193a). 26377 PRI. Length (4 whorls) 20 mm.; width 7.5 mm. Playa Grande formation (Maiquetía member).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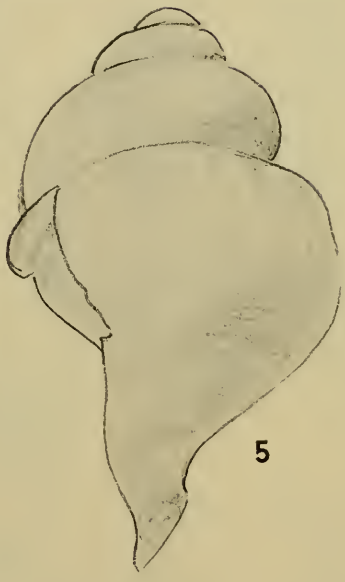
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Explanation of Plate 46

Figure — Page

1,2. **Turbonilla (Nisiturris) pupapicula** Weisbord, n. sp. 473
Holotype (Q27a). 26366 PRI. Length 1 mm.; width 0.3 mm. Enlarged 43X. Playa Grande formation (Maiquetía member). See Pl. 45, figs. 2, 3.

3,4. **Pyrgiscus magnacrista** Weisbord, n. sp 474
Holotype (Q26a). 26367 PRI. Length 1.65 mm.; width 0.3 mm. Side views. Enlarged about 32X. Playa Grande formation (Maiquetía member). See Pl. 45, fig. 4.

5,6. **Acteon** ? species 449
(F130a). 26376 PRI. Length 1.1 mm.; width 0.7 mm. Enlarged about 68X. Mare formation. See Pl. 45, figs. 22, 23.

7,8. **Benthonella ? loriei** Weisbord, n. sp. 129
Holotype (I34a). 26378 PRI. Length 0.5 mm.; width 0.3 mm. Enlarged about 76X. Lower Mare formation.

9,10. **Incertae sedis "a"** 483
(I142a). 26379 PRI. Length 0.55 mm.; width 0.5 mm. Enlarged 80X. Lower Mare formation.

Explanation of Plate 47

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1,2. **Cylichnella mareana** Weisbord, n. sp. 458
Holotype (I131a). 26380 PRI. Length 2 mm.; width 1 mm. Lower Mare formation.

3-5. **Melampus flavus** (Gmelin) 481
(A293a). 26381 PRI. Length 11.9 mm.; width 8.1 mm. Recent.

6,7. **Benthonella ? loriei** Weisbord, n. sp 129
Holotype (I34a). 26378 PRI. Length 0.5 mm.; width 0.3 mm. Lower Mare formation. See Pl. 46, figs. 7, 8.

8,9. **Murex (Murex) recurvirostris recurvirostris** Broderip 278
(F18a). 26382 PRI. Length 1.5 mm.; width 1.2 mm. Embryonic shell. Mare formation.

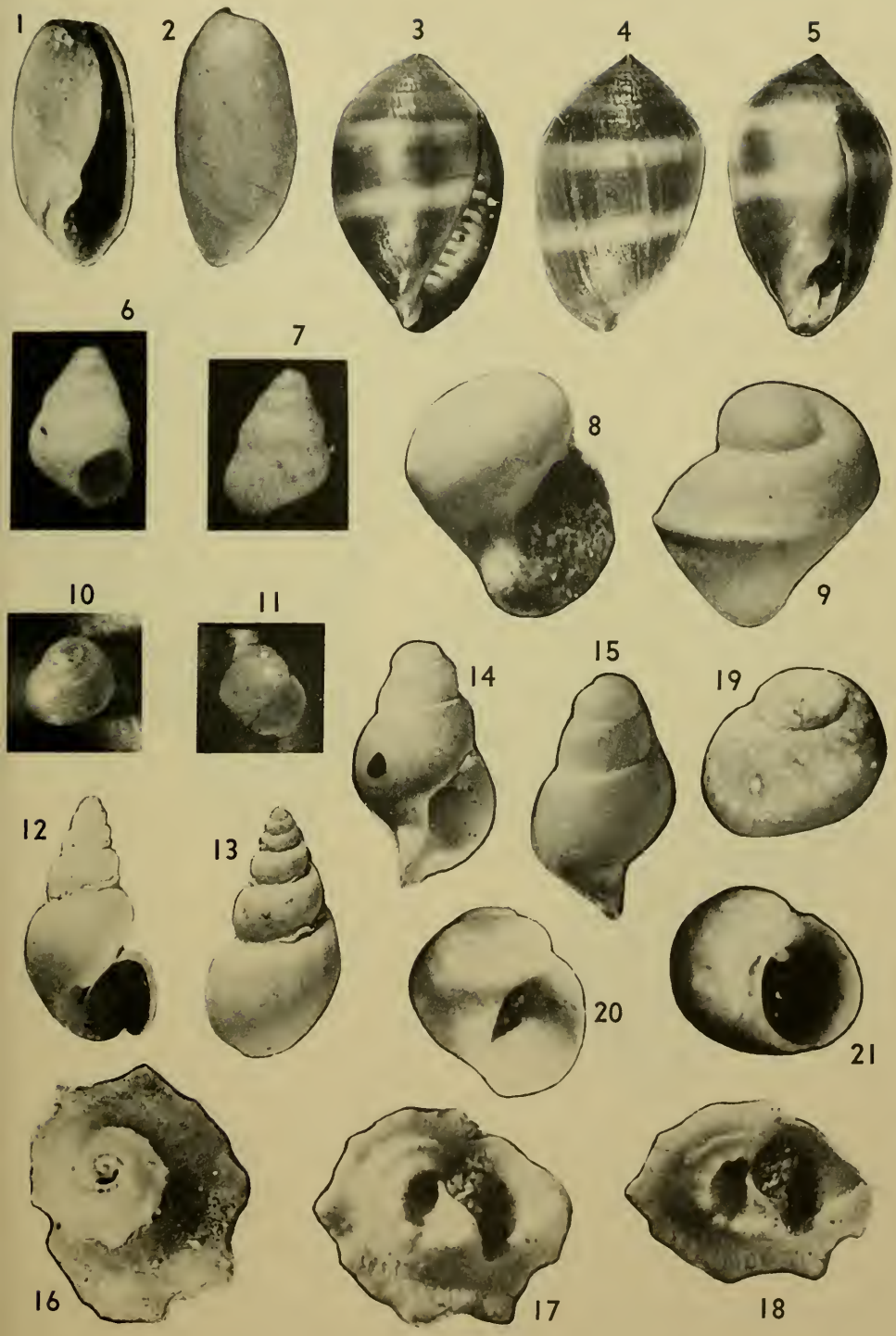
10,11. **Incertae sedis** "a" 483
(I142a). 26379 PRI. Length 0.55 mm.; width 0.5 mm. Lower Mare formation. See Pl. 46, figs. 9, 10.

12,13. **Incertae sedis** "b" 484
(S249a) 26383 PRI. Incomplete specimen, length 3.2 mm.; width 1.8 mm. Playa Grande formation (Maiquetía member).

14,15. **Streptorygma erugata** Weisbord, n. gen. and n. sp. 337
Holotype (I144a). 26384 PRI. Length 2.7 mm.; width 1.5 mm. Lower Mare formation.

16-18. **Astraea (Liotistralium) venezuelana** Weisbord, n. subgen., n. sp. 95
Holotype (S109a). 26385 PRI. Maximum diameter including spines 2.7 mm. altitude 1.1 mm. View of apex and 2 views of base. Playa Grande formation (Maiquetía member).

19-21. **Tricolia depressa** Weisbord, n. sp. 106
Holotype (I655a). 26386 PRI. Altitude 1 mm.; max. diameter 0.85 mm. Views of top, front, and base. Lower Mare formation.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Explanation of Plate 48

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1,2. **Murex (Chicoreus) brevifrons** Lamarck 288
(E242a). 26387 PRI. Length 129 mm.; width 84 mm. Upper Mare formation.

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