BULLETINS
OF
AMERICAN PALEONTOLOGY

★

VOL. LV

★

1968 - 1969

Paleontological Research Institution
Ithaca, New York 14850
U. S. A.

INDEX

No separate index is included for the volume. Each number is indexed separately. Contents of the volume are listed in the beginning of the volume.

CONTENTS OF VOLUME LV

BULLETINS
OF
AMERICAN
PALEONTOLOGY

(Founded 1895)

Vol. 55

No. 246

SOME LATE CENOZOIC STONY CORALS FROM NORTHERN VENEZUELA

By

NORMAN E. WEISBORD

1968

Paleontological Research Institution
Ithaca, New York 14850, U.S.A.

BULLETINS OF AMERICAN PALEONTOLOGY

and

PALAEONTOGRAPHICA AMERICANA

Complete titles and price list of separate available numbers may be had on application.

For reprint, Vols. 1-23, Bulletins of American Paleontology see Kraus Reprint Corp., 16 East 46th St., New York, N.Y. 10017, U.S.A.

For reprint, vol. I, Palaeontographica Americana see Johnson Reprint Corporation, 111 Fifth Ave., New York, N.Y. 10003, U.S.A.

Subscription may be entered at any time by volume or year, with average price of $18.00 per volume for Bulletins. Numbers of Palaeontographica Americana invoiced per issue. Purchases in U.S.A. for professional purposes are deductible from income tax.

For sale by

Paleontological Research Institution
1259 Trumansburg Rd.
Ithaca, New York 14850
U.S.A.

BULLETINS
OF
AMERICAN
PALEONTOLOGY

(Founded 1895)

Vol. 55

No. 246

SOME LATE CENOZOIC STONY CORALS FROM NORTHERN VENEZUELA

By

NORMAN E. WEISBORD

November 21, 1968

Paleontological Research Institution
Ithaca, New York 14850, U.S.A.

Library of Congress Catalog Card Number: BS 68-138

Printed in the United States of America

CONTENTS

SOME LATE CENOZOIC STONY CORALS FROM NORTHERN VENEZUELA

Norman E. Weisbord
Department of Geology
Florida State University

ABSTRACT

Fourteen species of stony corals — 12 of them hermatypic and two ahermatypic — are described, compared, and illustrated. With the exception of one hydrozoan all of the other forms are scleractinians in the class Anthozoa. Nine of the species are fossil, four are Recent, and one is both fossil and Recent. Among the fossils is a new subspecies which is given the name *Manicina areolata puntagordensis.*

An analysis is made of all of the fossils known to occur in the Cabo Blanco Group, Distrito Federal, and in the Guaiguaza Clay, State of Carabobo. The fossils are tabulated by "Class" and "Formation" to show the percentages of species in each category that have survived to Recent time. It is thought that a more sensitive division of the Cenozoic era into epochs may be worked out by utilizing not only the Mollusca as did Lyell, but other groups of organisms as well.

The Bibliography deals mostly with Cenozoic Anthozoa and Hydrozoa, but other citations applying in one way or another to the present work are included.

INTRODUCTION

The present paper deals with some stony corals, both fossil and Recent, from northern Venezuela, and is the ninth in a series published by the writer since 1957. The fossil corals were collected near La Salina de Guaiguaza in the State of Carabobo, and in the Cabo Blanco area 115 kilometers to the east, in the Distrito Federal. The Recent corals were collected on the beach of the Playa Grande Yachting Club in the Cabo Blanco area, and on the beach at Higuerote 100 kilometers or so to the east-southeast, in the State of Miranda.

Of the 14 species of corals obtained, nine are fossil, four are Recent, and one is both fossil and Recent. Thirteen of the corals are scleractinians, and one is a milleporid hydrozoan. Twelve of the species are hermatypic and two are ahermatypic. Scleractinian corals deposit a heavy exoskeleton of calcium carbonate in the crystalline form of aragonite, and ecologically they are divisible into two groups: hermatypic and ahermatypic. Hermatypic corals live in tropical and subtropical shallow waters of the oceans and contain intracellular symbiotic algae known as zooxanthellae. Some hermatypic species extract calcium from sea water ten times faster in sunlight than in darkness and, under favorable conditions, contribute greatly to the development of coral reefs. Ahermatypic corals, which are found at all latitudes and depths, have no zooxanthellae and extract calcium from sea water at low rates irrespective of light conditions. The two species of ahermatypic corals described in this work — *Phyllangia americana* Edwards and Haime and *Paracyathus defilippii* Duchassaing and Michelotti were collected from the Maiquetía Member of the Playa Grande Formation and are shallow water forms. The hermatypic corals were collected from the Playa Grande, Mare, and Abisinia Formations of the Cabo Blanco Group, in the Guaiguaza Clay, and on the beaches at Cabo Blanco and Higuerote.

The fossil corals are not abundant either in the number of species or number of specimens, and in this respect the condition is not unlike that off the coast of northern Venezuela today where coral reefs are scattered, small, and patchy. Some of the fossil corals occur in the "*Lithothamnium*" reef of the Maiquetía Member but even here they are relatively scarce. There are only some 55 living species of shallow-water scleractinian corals (Smith, 1954) and perhaps ten hydrocorals in the Western Atlantic from Bermuda through the Gulf of Mexico and the Caribbean to Brazil. Nine of the ten fossil species from the Cabo Blanco-Guaiguaza localities appear to be identical with Recent West Indian species and even the new subspecies *Manicina areolata puntagordensis* seems to be closely related to the *Manicina areolata* of Linnaeus. This suggests that in northern South America there have been few species changes among the stony corals from early Pliocene to Recent time, and that the survival rate of the Scleractinia like that of the Foraminiferida over the last 12 million years or so has been high. In contrast the survival rate of the Mollusca, especially in the class Gastropoda, during the same interval has been considerably lower.

The "synonymy" of a particular species discussed under Systematic Descriptions is, in effect, a list of references to that species, and rests on the opinion of the author responsible for the identification. Under Bibliography, most of the citations refer to publications dealing with Cenozoic corals throughout the world though other references that are peripheral but related to the subject of this work, are included.

The specimens illustrated on Plates 1-12 have been deposited with the Paleontological Research Institution, Ithaca, New York.

The remaining duplicate material is in the Department of Geology, Florida State University, Tallahassee, Florida.

ACKNOWLEDGMENTS

For the help given me in the preparation of this paper I am indebted to John W. Wells of Cornell University, to Donald F. Squires of the U.S. National Museum, to Katherine V. W. Palmer of the Paleontological Research Institution, and to the National Science Foundation.

I wish especially to thank Dr. Wells for checking my identifications and for allowing me free access to his West Indian coral collection and personal library. This work has profited from his observations and comments. Dr. Squires accorded me the excellent working facilities at the U.S. National Museum, and placed at my disposal the Museum's renowned collection of Recent and Tertiary coelenterates to which he has dedicated so much of his efforts. Dr. Palmer once again has taken on the task of editing and publishing, and for this I am grateful. Finally, I wish to express my appreciation to the National Science Foundation for its support of my studies on the late Cenozoic invertebrates of northern Venezuela. The present paper is one of several resulting from that study.

The photographs accompanying this paper were taken and processed by Gerritt Mulders of Tallahassee, and by Werner Vagt of Florida State University.

COLLECTING LOCALITIES

The localities at which the stony corals were collected are listed below and are shown on the geologic map of the writer's 1957 paper. The letter preceding each locality is also used as a prefix for each species number. The specimens obtained at stations "A" and "B" are Recent, at all of the others, fossil. Station "C" is in the state of Carabobo. Stations "D" to "Y" represent formations of the Cabo Blanco Group in the coastal region of Distrito Federal. For each locality the formation and lithology are noted.

A. Beach at Playa Grande Yachting Club, Distrito Federal. Recent. Moderately coarse and mostly noncalcareous beach sand and calcareous beach rock.

B. Beach southeast of Higuerote, State of Miranda. Recent. Fine micaceous beach sand.

C. Drainage ditch, about one meter deep, near south shore of La Salina de Guaiguaza, 5.6 kilometers west of Puerto Cabello, State of Carabobo. Guaiguaza Clay. Gray and brownish clay.
D. Eastern edge of Playa Grande village at W-30. Abisinia Formation. Granule to pebble gravel.
H. Fiften meters south of axis of Punta Gorda anticline near W-25. Mare Formation. Highly fossiliferous wedge of loosely coherent calcareous sandstone.
I. Hillside above west bank of Quebrada Mare Abajo at W-13. Lower Mare Formation. Uniformly coarse gritty sand.
J. Small stream 100 meters west of Quebrada Mare Abajo. Lower Mare Formation. Uniformly coarse gritty sand.
N. Near W-21 and to the south of that station in stream flowing along the north flank of the Litoral anticline. Playa Grande Formation (Catia Member). Tan siltstones and sandstones with knobs of hard sandstone.
S. On and near the *"Lithothamnium"* reef at W-23, north flank of Punta Gorda anticline. Playa Grande Formation (Maiquetía Member). Reef of calcareous algae with layer of cobbles at base.

LIST OF THE STONY CORALS FROM NORTHERN VENEZUELA

The stony corals described in this paper are listed below. Under the heading Formation, the abbreviation Re refers to Recent; Ab = Absinia Formation; Sal = Guaiguaza Clay; Ma = Mare Formation; PGm = Playa Grande Formation (Maiquetía Member); PGc = Playa Grande Formation (Catia Member). The Abisinia Formation is believed to be early Pleistocene in age, the Guaiguaza Clay late Pliocene, and the Mare and Playa Grande Formations early Pliocene.

Species	Formation	Previously recorded range of known species
HYDROZOA		
Millepora alcicornis Linnaeus	Re	Mio-Plio. - Recent
ANTHOZOA		
Acropora prolifera (Lamarck)	Re	Pleistocene - Recent
Siderastrea (Siderastrea) radians (Pallas)	Re	Miocene - Recent
Siderastrea (Siderastrea) siderea (Ellis and Solander)	PGm	Miocene - Recent
Porites furcata Lamarck	Re	Miocene - Recent
Porites branneri Rathbun	Sal	Recent
Diploria strigosa (Dana)	Re, Ab, PGc	Pleistocene - Recent
Manicina areolata puntagordensis, (n. subsp.	PGm	———
Solenastrea hyades (Dana)	Sal, Ma	Miocene - Recent
Solenastrea cf. S. bournoni Edwards and Haime	Ma	Miocene - Recent
Oculina diffusa Lamarck	Ab	Mio-Plio. - Recent
Oculina sp. cf. O. valenciennesi Edwards and Haime	Ma	Recent
Phyllangia americana Edwards and Haime	PGm	Recent
Paracyathus defilippii Duchassaing and Michelotti	PGm	Recent

STRATIGRAPHY

The fossil corals described in this paper were collected from both the Cabo Blanco Group and the Guaiguaza Clay. The stratigraphy of these deposits as established by the writer is summarized below. The thicknesses given are tentative as they are based on surveys and measurements of limited accuracy.

La Salina de Guaiguaza Area Estado Carabobo	115 kms.	Cabo Blanco Area Distrito Federal
		CABO BLANCO GROUP SUBRECENT Bench-forming beach rock and reworked clays, sands and gravels. Thickness 3 meters max.
		Disconformity
		ABISINIA FORMATION (Lower Pleistocene) Clays, silts, sands, and gravels, the latter locally with marine fossils. Thickness 13 meters max.
GUAIGUAZA CLAY (Upper Pliocene) Gray and brown fossiliferous clays. Thickness exposed in ditch about one meter. (See Weisbord, 1962, p. 23).		
		Disconformity
		MARE FORMATION (Lower Pliocene) Uniformly coarse friable sandstone at base grading upward to soft siltstones. Highly fossiliferous. Thickness 19 meters max.
		Angular unconformity to disconformity
		PLAYA GRANDE FORMATION (MAIQUETIA MEMBER) (Lower Pliocene) Shales, siltstones, calcareous sandstones, and conglomerates. Bioherms of coralline algae. Fossils moderately abundant. Thickness 68 meters plus.
		Fault
		PLAYA GRANDE FORMATION (CATIA MEMBER) (Lower Pliocene) Calcareous siltstones and sandstones, conglomerates, some shales and impure limestones, and occasional barnacle coquinas. Fossils moderately abundant, in places occurring as molds and casts. Thickness 156-233 meters.

Angular unconformity
LAS PAILAS FORMATION
(Middle Tertiary)
Nonfossiliferous mudstones, siltstones, sandstones, and conglomerates. Thickness 375 meters plus.

One of the interesting aspects of the Cabo Blanco Group is that although there is an angular unconformity between the Mare and Playa Grande Formations (see geologic map in Weisbord, 1957) there is a general similarity of their faunas. The two formations are exposed in Quebrada Mare Abajo where the Mare beds, at a higher elevation, dip gently to the north, and the underlying strata of the Maiquetía Member of the Playa Grande Formation dip 24 to 30 degrees to the north. This unconformity, which is clearly displayed, would seem to indicate folding and erosion of the Maiquetía before deposition of the Mare, yet if the fossils are a guide all of these events must have taken place early in Pliocene time. It is suggested that the Playa Grande Formation was laid down in the lower Pliocene and that Mare sedimentation was initiated late in the lower Pliocene or early in the middle Pliocene. This means that if the duration of the whole of the Pliocene epoch was 10 million years or so, the uplift and erosion of the Playa Grande and the initial deposition of the Mare could have been effected within a span of 2 or 3 million years. Whether this interval of diastrophism at the end of the lower Pliocene was local to northern Venezuela or was regional or continental in scope has yet to be determined.

ANALYSIS OF THE FOSSILS FROM THE CABO BLANCO GROUP AND FROM THE GUAIGUAZA CLAY

In the tables that follow there is listed, under the hierarchy of "Class", the total number of fossil species collected in each formation and the percentage of those species that have survived to Recent time. The purpose of the synthesis is to establish survival percentages for all hierarchies of taxa, and to compare the percentages with those proposed by Sir Charles Lyell for the Mollusca. It was Lyell who first subdivided the Tertiary period into chronologic epochs by determining in a fossil assemblage from a particular stratigraphic unit the per cent of marine mollusks that were still living (in neighboring seas), and assigning to each of his epochs an age name based on the ratio of Recent forms it contained to the total number of molluscan fossils present. The mollusks were chosen not only because they were abundant and relatively well known, but also because they could be positioned stratigraphically in clearly defined standard geologic sections. Lyell's Tertiary calendar was conceived, in effect, on the evolution, extinction, or survival of animals during the passage of time. Simply stated, the longer the lapse of time the less chance is there for a species to survive to the Recent either because it evolves or because it becomes extinct; conversely, the shorter the lapse of time the greater is the chance for survival, and we know now, thanks to Lyell's guidance, that in Pleistocene deposits more Recent species will be present than in the Pliocene, more in the Pliocene than in the Miocene, and more in the Miocene than in earlier epochs. Lyell's method of relative age determination can be applied logically to organisms other than the Mollusca, but what must be taken into consideration is that longevity varies greatly among animals and that the survival rate among mollusks may be greater or less than for other biologic groups in the same depositional unit. Thus, whereas a 35 per cent survival rate of the mollusks may be indicative of the lower Pliocene in northern Venezuela, a survival rate of 80 per cent of the Foraminiferida is also indicative of the lower Pliocene in northern Venezuela. Therefore once the survival percentages for all classes of organisms within a formation are worked out it should be possible to apply the percentages of one or more groups (*i.e.* 80% Foraminiferida = 35% Mollusca = 60% Bryozoa) in establishing age, and it is to illustrate this concept that the "mortality tables" for the several classes of fossils in the Cabo Blanco Group and Guaiguaza Clay are presented.

In previous publications on the late Cenozoic fossils of northern Venezuela, the data of the percentage tables were compiled solely from my own collections and my own analyses. In the present work, however, I have added data on the Venezuelan Foraminiferida culled from the excellent papers of Bermúdez (1960, 1961) and Bermúdez and Fuenmayor (1962, 1966), in which 145 species (140 of them from the Playa Grande formation and 72 of them from the Mare Formation) are identified, described and discussed, and the new species illustrated.

The ages assigned to the formations of the Cabo Blanco Group (lower Pleistocene for the Abisinia Formation and lower Pliocene for the Mare and Playa Grande Formations) are based on the percent of Recent species of Mollusca contained in them. This judgment is reinforced in some measure by stratigraphic evidence which clearly indicates that the Abisinia Formation overlies the Mare, and that the Mare overlies the Playa Grande. The assignment of an upper Pliocene age for the Guaiguaza Clay is also based on the Mollusca, but unlike in the Cabo Blanco area, field evidence in the form of natural exposures is wanting.

It may be noted, in referring to the percentage tables, that generally, as well as specifically for the classes Gastropoda, Pelecypoda, Foraminiferida, and others, there is a successively larger number of Recent species from the older to younger formations of the Cabo Blanco Group. This confirms, of course, the whole point of Lyell's principle — that the younger a Tertiary deposit is the more species that are still living (Recent) will it contain. However, the survival rate of organisms is not the same in all taxonomic hierarchies or in all regions. Lyell's divisions were proposed on the survival rate of molluscan species in sections in Italy and France, and on a reasonable but somewhat arbitrary percentage scale for each epoch. Lyell might just as well have taken as his standard the Paleocene to Pleistocene sections from Louisiana to Florida in the Gulf Coast of the United States, and would have arrived at a similar conclusion: the younger the beds the greater the number of Recent species would it contain regardless of the taxon or taxa considered. Not only that, but a somewhat arbitrary bracket of percentages for each class of organisms would have had to be imposed for each epoch. These percentages may differ locally, regionally, and globally for even a single class of organisms, but I rather suspect that if all taxa in a given formation were determinable it should be possible to apply Lyell's law for smaller and smaller divisions of Tertiary time as it has for the major divisions of the Tertiary period.

Focussing on the particular as it relates to northern Venezuela, it is seen that the most highly fossiliferous unit of the Cabo Blanco Group is the Mare Formation. The most numerous of the 322 fossils now known are the 230 mollusks divided among the classes Scaphopoda (8 species), Gastropoda (140 species), and Pelecypoda (82 species). Considering the phylum Mollusca as a whole, 26 to 40 per cent of the species are known to be living today, and on this ratio the Mare Formation is assigned a lower Pliocene age. The next largest class represented is the Foraminiferida with 72 species of which 60 or 83 per cent are found in the Recent. In decreasing order of abundance are the bryozoans (class Gymnolaemata) with 10 species of which 60 per cent are living, the barnacles (Cirripedia) with 5 species of which 20-40 per cent are living, the corals (Anthozoa) with 3 species of which 100 per cent are living, and 2 serpulid worms (Polychaetia) of which 50 per cent are living.

Extrapolating from the data given for both the Mare and Playa Grande Formations, I would expect, given a large enough fossil assemblage to work with, that in northern Venezuela and perhaps in the circum-Caribbean region, lower Pliocene sediments would be represented by a molluscan fauna with about 38 per cent of the species occurring in the Recent, and by about 80 per cent of the Foraminiferida (including both pelagic and benthonic forms). With considerably less data to go on, the corals of the lower Pliocene of Venezuela might include 75 per cent of Recent species, the bryozoans about 45 per cent, barnacles around 20 per cent, and serpulid polychaetes roughly 25 per cent.

Organisms with a short life span are better time-markers than long-lived ones, but the latter are still subject, over a longer period of time, to the same cycle of genesis, proliferation, and extinction or evolution as the former. The Foraminiferida of the lower Pliocene in northern Venezuela have a far greater per cent of Recent species than any class in the Mollusca and, in fact, the percentages are so high from the late Miocene on, that micropaleontologists have been reluctant in the past to use the smaller foraminifers as age indicators. Nevertheless the percentage of extinct or Recent species in each epoch or smaller division of Tertiary time is fixed in a sense by natural law, and although the percent of Recent foram species is high in the Miocene it is *statistically* higher in the Pliocene and still higher in the Pleistocene. Reciprocally, the *extinction* per cent is measurably higher the farther and farther back we go from the datum of Recent time, and it matters little what group or groups of fossils are dealt with in dating the Tertiary so long as a sufficient number of species are available to insure statistical validity.

PERCENTAGE OF RECENT SPECIES BY CLASS AND FORMATION

Abisinia Formation
(Lower Pleistocene)

Class or Order	Total number of species	Number of Recent species	Per cent of Recent species
Anthozoa (Scleractinia)	2	2	100
Gymnolaemata (Cheilostomata)	1	1	100
Polychaetia (Sedentarida)	1	1	100
Cirripedia	1	1	100
Gastropoda	34	26–31	76–88
Pelecypoda	18	15–16	83–90
Total	57	46–52	81–91

Guaiguaza Clay
(Upper Pliocene)

Class or Order	Total number of species	Number of Recent species	Per cent of Recent species
Anthozoa (Scleractinia)	2	2	100
Scaphopoda	2	1	50
Gastropoda	25	9	36
Pelecypoda	14	11	79
Total	43	23	53

Mare Formation
(Lower Pliocene)

Class or Order	Total number of species	Number of Recent species	Per cent of Recent species
Foraminiferida	72	60	83
Anthozoa (Scleractinia)	3	3	100
Gymnolaemata (Cheilostomata)	10	6	60
Polychaetia (Sedentarida)	2	1	50
Cirripedia	5	1–2	20–40
Scaphopoda	8	4–5	50–63
Gastropoda	140	23–52	16–34
Pelecypoda	82	32–38	39–46
Total	322	130–167	40–52

Playa Grande Formation (Undifferentiated)
(Lower Pliocene)

Class or Order	Total number of species	Number of Recent species	Per cent of Recent species
Chlorophyceae (Dasycladales)	1	—	—
Foraminiferida	140	106	76
Anthozoa (Scleractinia)	5	4	80
Gymnolaemata (Cheilostomata)	6	3	50
Polychaetia (Sedentarida)	4	—	—
Cirripedia	8	2	25
Scaphopoda	9	3–5	33–55
Gastropoda	84	9–20	11–24
Pelecypoda	72	30–37	42–52
Total	329	157–177	48–54

Playa Grande Formation (Maiquetía Member)
(Lower Pliocene)

Class or Order	Total number of species	Number of Recent species	Per cent of Recent species
Chlorophyceae (Dasycladales)	1	—	—
Anthozoa (Scleractinia)	4	3	75
Gymnolaemata (Cheilostomata)	4	3	75
Polychaetia (Sedentarida)	1	—	—
Cirripedia	3	0–1	0–33
Scaphopoda	6	3	50
Gastropoda	79	7–25	9–32
Pelecypoda	53	23–29	47–60
Total	151	39–64	26–43

Playa Grande Formation (Catia Member)
(Lower Pliocene)

Class or Order	Total number of species	Number of Recent species	Per cent of Recent species
Anthozoa (Scleractinia)	1	1	100
Gymnolaemata (Cheilostomata)	2	—	—
Polychaetia (Sedentarida)	3	0–1	0–33
Cirripedia	6	1	16
Scaphopoda	2	1	50
Gastropoda	5	0–2	0–40
Pelecypoda	26	8–10	31–40
Total	43	11–15	26–35

SYSTEMATIC DESCRIPTIONS
COELENTERATA
HYDROZOA
MILLEPORINA

Millepora alcicornis Linnaeus Pl. 1, figs. 1-4

1707-25. Corallium asperum candicans adulterinum, Sloane, A Voyage to the Islands of Madera, Barbados, Nieves, S. Cristophers and Jamaica, pl. 17, fig. 1; pl. 18, fig. 1; pl. 19. [*Fide* Boschma, 1948, pp. 23, 25.]
1758. *Millepora alcicornis* Linnaeus, Systema Naturae, ed. 10, p. 791.
1766. *Millepora alcicornis* Linnaeus, Pallas, Elenchus Zoophytorum, p. 260.
1767. *Millepora alcicornis* Linnaeus, Systema Naturae, ed. 12, pt. 2, p. 1282.
1771. *Millepora alcicornis* Linnaeus, Knorr, Deliciae Naturae [Dordrecht], pl. A6, fig. 3. [*Fide* Boschma, 1948a, pp. 23, 26.]
1789. *Millepora alcicornis* Linnaeus, Browne, P., The Civil and Natural History of Jamaica, Index III, Index IV.
1790, 1796. *Millepora alcicornis* Linnaeus var. *digitata, corniculata, ramosa,* Esper, Die Pflanzenthiere, vol. 1, pt. 6, pp. 193-202; Esper, Fortsetzungen der Pflanzenthiere, *Millepora*, pls. 5, 6, 7. [*Fide* Deshayes and Edwards *in* Lamarck, 1836, p. 308, and Boschma, 1948a, pp. 23, 26.]
1816. *Millepora alcicornis* Linnaeus, Lamarck, Hist. nat. Anim. sans Vert., ed. 2, p. 308.
1829-39. *Millepora alcicornis* Linnaeus, Guérin-Méneville, Iconographie du Règne Animal de G. Cuvier, pl. 3, fig. 11.
1834. *Palmipora alcicornis* (Linnaeus), Blainville, Manuel d'Actinologie ou du Zoophytologie, pl. 58, fig. 2.
1836. *Millepora alcicornis* Linnaeus, Deshayes and Edwards *in* Lamarck, Hist. nat. Anim. sans Vert., ed. 2, vol. 2, p. 308.
1836-49. *Millepora alcicornis* Linnaeus, Edwards *in* Cuvier, Le Règne Animal, 3d ed., vol. 10, pl. 89, fig. 1.
1846. *Millepora alcicornis* Linnaeus, Dana, U.S. Exploring Exped., vol. 7, Zoophytes, pp. 543, 544.
1850. *Millepora alcicornis* Lamarck, Milne Edwards and Haime, Palaeontogr. Soc. London, Mon., vol. 3, pt. 3, p. lviii.
1850. *Palmipora alcicornis* Blainville, Duchassaing, Animaux Radiaires des Antilles, p. 18.
1859. *Millepora alcicornis* (Pallas), Dana, Synopsis Rept. Zoophytes U.S. Exploring Expedition, pp. 104-105.
1860. *Millepora alcicornis* Linnaeus, Milne Edwards and Haime, Histoire naturelle des Coralliaires ou Polypes proprement dits, vol. 3, p. 228.
1861. *Millepora alcicornis* Linnaeus, Duchassaing and Michelotti, R. Accad. Sci. Torino, Mem., ser. 2, vol. 19, p. 360.
1864b. *Millepora alcicornis* Linnaeus, Verrill, Mus. Comp. Zool., Bull., vol. 1, No. 3, p. 59.
1866. *Millepora alcicornis* Linnaeus, Duchassaing and Michelotti, R. Accad. Sci. Torino, Mem., ser. 2, vol. 23, p. 196.
1868a. *Millepora alcicornis* Linnaeus, Verrill, Connecticut Acad. Arts Sci., Trans., vol. 1, pt. 2, p. 363.
1870. *Millepora alcicornis* Linnaeus, Duchassaing, Revue des Zoophytes et des Spongiaires des Antilles, p. 33.
1871. *Millepora alcicornis* Linnaeus, Pourtalès, Mus. Comp. Zool., Mem., vol. 2, No. 4, p. 86.
1876. *Millepora alcicornis* Linnaeus, Duncan and Nelson, Ann. Mag. Nat. Hist., ser. 5, vol. 17, pp. 354-359; vol. 18, p. 78.

1876a. *Millepora alcicornis* Linnaeus, Moseley, Roy. Soc. London, Philos. Trans., vol. 166, pp. 91, 113, 114, 116.
1877c. *Millepora alcicornis* Linnaeus, Arango y Molina, R. Acad. Cienc. Méd., Fís. y Nat. Habana, An., vol. 14, p. 283.
1878. *Millepora alcicornis* Linnaeus, Rice, Amer. Jour. Sci., ser. 3, vol. 16 (116), No. 91, art. 16, pp. 180-182, figs. 1-20.
1878a. *Millepora alcicornis* Linnaeus, Carter, Ann. Mag. Nat. Hist., ser. 5, vol. 1, pp. 298-311; 1878c. vol. 2, pp. 304-324.
1879. *Millepora alcicornis* Linnaeus, Klunzinger, Die Korallenthiere des Rothen Meeres, pt. 3, p. 86.
1879. *Millepora alcicornis* Linnaeus, Dana, Corals and Coral Islands, pp. 103, 104, 105, 386.
1880. *Millepora alcicornis* Linnaeus, Pourtalès, *in* Agassiz, Mus. Comp. Zool., Mem., vol. 7, No. 1, pl. 20, figs. 1-6.
1881. *Millepora alcicornis* Linnaeus, Moseley, Voyage H. M. S. Challenger, Rept. Sci. Results, Zoology, vol. 2, pt. 7, pp. 1, 19, 20, 21.
1886. *Millepora alcicornis* Linnaeus, Quelch, Voyage H. M. S. Challenger, Rept. Sci. Results, Zoology, vol. 16, pt. 46, pp. 10, 11, 190-191.
1888. *Millepora alcicornis* Linnaeus, Agassiz, Mus. Comp. Zool., Bull., vol. 15, p. 138, fig. 443.
1895. *Millepora alcicornis* Linnaeus, Nutting, State Univ. Iowa, Lab. Nat. Hist. Bull., vol. 3, Nos. 1, 2, p. 134.
1898b. *Millepora alcicornis* Linnaeus, Hickson, Zool. Soc. London, Proc., pp. 252, 253, 254, 256.
1899. ? *Millepora* sp. Duerden, Inst. Jamaica, Jour., vol. 2, p. 622. [*Fide* Squires, 1958b, p. 259.]
1900a. *Millepora alcicornis* Linnaeus, Verrill, Connecticut Acad. Arts Sci., Trans., vol. 10, art. 14, p. 571.
1901c. *Millepora alcicornis* Linnaeus, Verrill, Connecticut Acad. Arts Sci., Trans., vol. 11, pp. 182, 197, text-fig. 13.
1902a. *Millepora alcicornis* Linnaeus, Vaughan, U.S. Fish Commis., Bull., vol. 20 for 1900, pt. 2, p. 318, pls. 35, 37, 38.
1904. *Millepora alcicornis* Linnaeus, Branner, Mus. Comp. Zool., Bull., vol. 44, pp. 268, 270, 272.
1905-1906. *Millepora alcicornis* Linnaeus, Verrill, Connecticut Acad. Arts Sci., Trans., vol. 12, pt. 2, p. 118, 141, 188, pl. 30A, fig. 2, text-fig. 36.
1909. *Millepora alcicornis* Linnaeus, Hartmeyer, Meereskunde Berlin, Jahrg. 3, No. 2, pp. 17, 18, text-fig. 4.
1912. *Millepora alcicornis* Linnaeus, Cary, Carnegie Inst. Washington, Yearbook No. 10, p. 144.
1918a. *Millepora alcicornis* Linnaeus, Vaughan, Carnegie Inst. Washington, Publ. No. 213, Papers Dept. Marine Biol., vol. 9, pp. 206, 326.
1919. *Millepora alcicornis* Linnaeus, Nutting, Univ. Iowa, Studies Nat. Hist., vol. 8, No. 3, p. 116.
1919a. *Millepora alcicornis* Linnaeus, Vaughan, U.S. Nat. Mus., Bull. 103, No. 9, p. 507.
1925. *Millepora alcicornis* Linnaeus, Hoffmeister, Carnegie Inst. Washington, Publ. No. 343, Papers Dept. Marine Biol., vol. 22, pp. 11, 12, 82.
1928. *Millepora alcicornis* Linnaeus, Kühn, Fossilium Catalogus. I: Animalia. Pars 36, p. 100.
1933. *Millepora alcicornis* Linnaeus, Boone, Vanderbilt Marine Mus., Bull., vol. 4, p. 27.
1935b. *Millepora alcicornis* Linnaeus, Yonge, Carnegie Inst. Washington, Publ. No. 452, Papers Tortugas Lab., vol. 29, No. 9, p. 206.
1937. *Millepora alcicornis* Linnaeus, Abe, Palao Trop. Biol. Sta., Studies, vol. 1. No. 2 [=*M. tenera* Boschma, *fide* Boschma 1950b, p. 296.]
1939. *Millepora alcicornis* Linnaeus, Butsch, Barbados Mus. and Hist. Soc., Jour., vol. 6, No. 3, p. 138, pl. 2, figs. 7-8.

1940. *Millepora alcicornis* Linnaeus, Wolcott, Animal Biology, fig. 71A. [*Fide* Boschma 1948a, pp. 25, 27.]
1948b. *Millepora alcicornis* Linnaeus, Boschma, K. Nederland. Akad. Wetensch., Proc., Sect. Sci., vol. 51, No. 7, pp. 818, 820, 821.
1948. *Millepora alcicornis* Linnaeus, Smith, Atlantic Reef Corals, pp. 62, 65, 100.
1948a. *Millepora alcicornis* Linnaeus, Boschma, R. Mus. nat. Hist. Leiden, Zool. Verhandel., No. 1, pp. 3, 6, 7, 8, 9, 11, 12, 13, 14, 15, 16, 17, 18-19, 23-28, 46-48, 52, 54, 56, 58, 60, 61, 79-81, 100-102, 105.
1949a. *Millepora alcicornis* Linnaeus, Boschma, K. Nederland. Akad. Wetensch., Proc., Sect. Sci., vol. 52, No. 1, pp. 4-5, 12, pl. 1, figs. 1-5; text-figs. 2a, 2c, 4a, 4b.
1950a. *Millepora alcicornis* Linnaeus, Boschma, R. Mus. nat. Hist. Leiden, Zool. Meded., vol. 31, p. 50.
1954. *Millepora alcicornis* Linnaeus, Fontaine, Inst. Jamaica, Ann. Rept. 1953-1954, p. 27.
1955. *Millepora alcicornis* Linnaeus, G. Voss and N. Voss, Bull. Marine Sci. Gulf and Caribbean, vol. 5, No. 3, pp. 217, 223.
1956b. *Millepora alcicornis* Linné, Boschma, Treatise on Invertebrate Paleontology, (F) Coelenterata, p. F94, fig. 76A.
1956. *Millepora alcicornis* Linnaeus, Ginsburg, Amer. Assoc. Petrol. Geol., Bull., vol. 40, No. 10, pp. 2407, 2410.
1957. *Millepora* aff. *M. alcicornis* Linnaeus, Wells, *in* Woodring, U.S. Geol. Sur., Prof. Paper 306-A, p. 21.
1958a. *Millepora alcicornis* Linnaeus, Zans, Geol. Sur. Dept., Jamaica, W.I., Bull., No. 3, pp. 20, 31.
1958b. *Millepora alcicornis* Linnaeus, Squires, Amer. Mus. Nat. Hist., Bull., vol. 115, art. 4, pp. 227, 228, 231, 232, 238, 259, pl. 28, figs. 1, 2; pl. 43, figs. 1, 2.
1958. *Millepora alcicornis* Linnaeus, Newell, New York Acad. Sci., Trans., ser. 2, vol. 21, p. 125.
1959. *Millepora alcicornis* Linnaeus, Zans, Geonotes, vol. 2, No. 1, pp. 28, 30.
1959b. *Millepora alcicornis* Linnaeus, Goreau, Ecology, vol. 40, pp. 75, 76, 82.
1959. *Millepora alcicornis* Linnaeus, Kornicker, Bonet, Cann, and Hoskin, Inst. Marine Sci. Univ. Texas, Publ., vol. 6, p. 18.
1959. *Millepora alcicornis* Linnaeus, T. Goreau and N. Goreau, Biol. Bull., vol. 117, No. 2, pp. 239, 243, 248.
1959. *Millepora alcicornis* Linnaeus, Newell, Imbrie, Purdy, and Thurber, Amer. Mus. Nat. Hist., Bull., vol. 117, No. 4, p. 207.
1960b. *Millepora alcicornis* Linnaeus, T. Goreau and N. Goreau, Biol. Bull., vol. 119, No. 3, pp. 417, 418, 426.
1960b. *Millepora alcicornis* Linnaeus, Lewis, Canadian Jour. Zool., vol. 38, No. 6, pp. 1136, 1138, 1139, 1141, pl. 4, fig. 8.
1961b. *Millepora alcicornis* Linnaeus, Boschma, K. Nederland. Akad. Wetensch. Proc., ser. C, vol. 64, pp. 292, 293.
1961. *Millepora alcicornis* Linnaeus, Duarte Bello, Acuario Nac. [Cuba], Ser. Educac. No. 2, pp. 82-83, figs. 71, 72.
1962c. *Millepora alcicornis* Linnaeus, Boschma, K. Nederland. Akad. Wetensch., Proc., ser. C, vol. 65, No. 4, pp. 302, 304, 305, 306, 307, 308, 310.
1962. *Millepora alcicornis* Linnaeus, Stoddart, Atoll Research Bull., No. 87, pp. 18, 20, 25, 26.
1963. *Millepora alcicornis* Linnaeus, Almy and Carrión-Torres, Caribbean Jour. Sci., vol. 3, Nos. 2-3, pp. 139, 141, 161, pl. 2a.
1963. *Millepora alcicornis* Linnaeus, J. A. Jones, Bull. Marine Sci. Gulf and Caribbean, vol. 13, No. 2, p. 284.
1964. *Millepora alcicornis* Linnaeus, Rivero, Geos, No. 11, p. 112.

1964g. *Millepora alcicornis* Linnaeus, Boschma, K. Nederland. Akad. Wetensch., Proc., ser. C, vol. 67, No. 4, p. 195.
1964. *Millepora alcicornis* Linnaeus, Storr, Geol. Soc. Amer., Spec. Papers, No. 79, pp. 45, 46, 63, 67, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, pl. 5, fig. 2.
1964. *Millepora alcicornis* Linnaeus, Roos, Studies on the Fauna of Curaçao and other Caribbean Islands, vol. 20, No. 81, p. 18.
1965. *Millepora alcicornis* Linnaeus, Neumann, Bull. Marine Sci., vol. 15, No. 4, p. 1004.

The single corallum in the collection is an upstanding arborescent plate. The main branches of the plate are flattened and irregularly fused at the base and upward, but are separated into individual or dichotomous fronds at the growing edge. Subsidiary branches project outward and upward from the colony, and these branches are often rounded and obtusely pointed at the tip. The coenosteum is completely pitted by minute subrounded cavities between the trabeculae. The outline of the dactylopores and gastropores is generally irregular though occasionally it is stellate, the stellate appearance having been produced fortuitously by the manner in which the trabeculae were corroded. The alveolae are circular in outline and occupy moderately deep hemispherical depressions. The distribution of the alveolae is erratic; on some areas of the corallum they are so crowded they nearly touch one another, but on others they are scarce or absent. Several alveolae with a calcified membrane have been noted, and these display a radial structure. Occasionally a number (five to seven or so) of dactylopores forming a cycle around a gastropore can be observed, but clearly defined cyclosystems are the exception

Measurements. — Specimen B562a: corallum (broken off at base) height 50 mm, width 54 mm, thickness at base 5 mm; diameter of dactylopores 0.11 mm to 0.14 mm; diameter of gastropores 0.21 to 0.29 mm; diameter of alveolae 0.32 mm to 0.50 mm.

Locality. — Washed up on beach southeast of Higuerote, State of Miranda. One dead Recent specimen.

Remarks. — It is difficult to identify Western Atlantic species of *Millepora* with assurance, but the single specimen is so close to what Vaughan (1902a, pls. 35, 37, 38) referred to as the digitiform variety of *M. alcicornis* and so similar to the *M. alcicornis* illustrated by Boschma in his figure 76A on page F92 of the Treatise of Paleontology (1956) that I refer the Venezuelan specimen to that species.

The species of *Millepora* in the Western Atlantic are *M. alcicornis* Linnaeus, *M. complanata* Lamarck, *M. squarrosa* Lamarck, *M. braziliensis* Verrill, and *M. nitida* Verrill. All of these are similar in some aspects but may be distinguished perhaps by a salient character or two as noted below.

M. alcicornis. The corallum is an upstanding plate composed of flattened and fused fronds which are often digitiform at the growing edge. Secondary, antler-like branches may also be present.

M. complanata. The corallum consists of thin upstanding plates, the free edge of which is usually truncated. The dactylopores and gastropores are generally stellate.

M. squarrosa. The corallum forms a broad upstanding plate with thin edges and is covered by irregular ridges and tubercles.

M. braziliensis. The corallum consists of thick erect branches. The surface is uneven.

M. nitida. The corallum forms low rounded clumps which have smooth surfaces, and are obtuse, rounded, or even clavate at the ends.

Range and distribution. — The geologic range of *Millepora alcicornis* Linnaeus is Mio-Pliocene to Recent.

The geographic extent of the living form of *M. alcicornis* is now believed to be confined to the Western Atlantic between Bermuda on the north and northern South America on the south. Specific regions are the following: Bermuda; the Bahamas (Bimini area at Rabbit Cay, Turtle Rocks, South Bimini, Abaco, Harrington Sound, and Moselle Bank); Florida (the Keys and Tortugas); Mexico (Alacran Reef); British Honduras (Lighthouse and Glover's Reefs, Rendezvous Cay); southeast of Cuba; Jamaica (Ocho Rios and Pelican Cay Reefs: on the former the species has been found on the back reef, the reef crest, the buttress zone, and the seaward slope); Panama Canal Zone; Colombia (Cartagena); Puerto Rico (Mayaguez, La Parguera, and Culebra); St. Thomas; St. Eustatius; Guadeloupe; Curaçao; Bonaire; Antigua; Barbados (2-6 fathoms); Trinidad; and possibly Brazil.

The Pleistocene locality is Mt. Hope in the Panama Canal

Zone, and the upper Miocene-Pliocene locality is Cubagua, Venezuela. It has been pointed out by Wells (*in* Woodring, 1957, p. 21) that there is an *alcicornis*-like *Millepora* in the Gatuncillo Formation (middle-upper Eocene) of the Madden Basin, Panama.

The skeleton of the living *M. alcicornis*, a hydrozoan, is composed entirely of aragonite like many Recent species of scleractinian corals.

Synonymy. — The following forms are considered by Boschma (1948a) and others to be synonymous with *M. alcicornis*: *M. candida* Duchassaing and Michelotti, *M. carthaginiensis* Duchassaing and Michelotti, *M. crista-galli* Duchassaing and Michelotti, *M. crustacea* Esper, *M. delicatula* Duchassaing and Michelotti, *M. digitata* Duchassaing and Michelotti, *M. esperi* Duchassaing, *M. fasciculata* Duchassaing, *M. forskali* Milne Edwards, *M. gothica* Duchassaing and Michelotti, *M. moniliformis* Dana, *M. pumila* Dana, *M. ramosa* Pallas, *M. schrammi* Duchassaing and Michelotti, and *M. trinitatis* Duchassaing and Michelotti.

ANTHOZOA
SCLERACTINIA

Acropora prolifera (Lamarck) Pl. 2, figs.1-3

1707. ? Corallium porosum, album minus muricatum, Sloane, A Voyage to the Islands of Madera, Barbados, Nieves, S. Cristophers and Jamaica, vol. 1, p. 53, pl. 17, fig. 2.
1816. *Madrepora prolifera* Lamarck, Hist. nat. Anim. sans Vert., vol. 2, p. 281.
1834. *Madrepora prolifera* Lamarck, Blainville, Manuel d'Actinologie ou de Zoophytologie . . . p. 390.
1846. *Madrepora prolifera* Lamarck, Dana, U.S. Exploring Exped., Zoophytes, vol. 7, p. 480.
1859. *Madrepora prolifera* Lamarck, Dana, Synopsis Report Zoophytes U.S. Exploring Exped., p. 90.
1860. *Madrepora prolifera* Lamarck, Milne Edwards and Haime, Histoire naturelle des Coralliaires ou Polypes, vol. 3, p. 139.
1861. *Madrepora prolifera* Lamarck, Duchassaing and Michelotti, R. Accad. Sci. Torino, Mem., ser. 2, vol. 19, p. 357.
1864b. *Madrepora prolifera* Lamarck, Verrill, Mus. Comp. Zool., Bull., vol. 1, p. 40.
1866. *Madrepora prolifera* Lamarck, Duchassaing and Michelotti, R. Accad. Sci. Torino, Mem., ser. 2, vol. 23, p. 188.
1870. *Madrepora prolifera* Lamarck, Duchassaing, Revue des Zoophytes et des Spongiaires des Antilles, p. 32.
1871. *Madrepora prolifera* Lamarck, Pourtalès, Mus. Comp. Zool., Mem., vol. 2, No. 4, p. 84.
1877c. *Madrepora prolifera* Lamarck, Arango y Molina, R. Acad. Cienc. Méd., Fís. y Nat. Habana, An., vol. 14, p. 282.
1880. *Madrepora prolifera* Lamarck, Pourtalès *in* Agassiz, Mus. Comp. Zool., Mem., vol. 7, No. 1, pl. 19, figs. 1-9.

1886. *Madrepora prolifera* Lamarck, Quelch, Voyage H. M. S. Challenger, Rept. Sci. Results, Zoology, vol. 16, pt. 46, pp. 10, 11, 12, 149.
1888. *Madrepora prolifera* Lamarck, Agassiz, Mus. Comp. Zool., Bull., vol. 14, pp. 81, 82, fig. 47.
1888. *Madrepora prolifera* Lamarck, Rathbun, U.S. Nat. Mus., Proc., vol. 10, pp. 13, 17.
1890. *Madrepora prolifera* Lamarck, Heilprin, Acad. Nat. Sci. Philadelphia, Proc., vol. 42, p. 304.
1893b. *Madrepora prolifera* Lamarck and *M. muricata* forma *prolifera* Lamarck, Brook, Catalogue of the Madreporarian Corals in the British Museum (Natural History), vol. 1, pp. 24, 26-27.
1895. *Madrepora prolifera* Lamarck, Gregory, Geol. Soc. London, Quart. Jour., vol. 51, p. 282.
1895. *Madrepora prolifera* Lamarck, Nutting, State Univ. Iowa, Lab. Nat. Hist. Bull., vol. 3, Nos. 1-2, p. 215.
1900a. *Acropora prolifera* (Lamarck), Gregory, Ann. Mag. Nat. Hist., ser. 7, vol. 6, pp. 29-31.
1901. *Acropora prolifera* (Lamarck), Verrill, Connecticut Acad. Arts and Sci., Trans., vol. 11, pt. 1, art. 4, pp. 165, 168.
1901a. *Isopora muricata* forma *prolifera* (Lamarck), Vaughan, Rijksmus. Geol. en Mineral., Samml., ser. 2, vol. 2, No. 1, pp. 10, 12, 69.
1902a. *Acropora muricata* var. *prolifera* (Lamarck), Verrill, Connecticut Acad. Arts and Sci., Trans., vol. 11, pt. 1, art. 5, p. 216.
1902a. *Isopora muricata* forma *prolifera* (Lamarck), Vaughan, U.S. Fish Comm., Bull., vol. 20 for 1900, pt. 2, p. 313, pl. 22, fig. 1; pls. 23-25.
1902d. *Madrepora muricata* forma *prolifera* (Lamarck), Duerden, Nat. Acad. Sci., Mem., vol. 8, pp. 542, 543, 545.
1909. *Madrepora muricata* forma *prolifera* Lamarck, Hartmeyer, Meereskunde Berlin, Jahrg. 3, p. 10, pl. 1, fig. 2.
1911. *Acropora prolifera* (Lamarck) Vaughan, Carnegie Inst. Washington, Yearbook No. 9, p. 135.
1913b. *Acropora prolifera* (Lamarck), Vaughan, Carnegie Inst. Washington, Yearbook No. 11, p. 156.
1915d. *Acropora prolifera* (Lamarck), Vaughan, Washington Acad. Sci., Jour., vol. 5, No. 17, p. 597.
1916a. *Acropora prolifera* (Lamarck) Vaughan, Carnegie Inst. Washington, Yearbook No. 14, p. 228.
1919a. *Acropora prolifera* (Lamarck), Vaughan, U.S. Nat. Mus., Bull. 103, No. 9, pp. 480, 482.
1927b. *Acropora prolifera* (Lamarck), van der Horst, Bijdr. Dierk. Amsterdam, vol. 25, p. 161.
1939. *Acropora muricata* var. *prolifera* (Lamarck), Butsch, Barbados Mus. Nat. Hist. Soc., Jour., vol. 6, No. 3, p. 137, pl. 2, fig. 2.
1943. *Acropora prolifera* (Lamarck), Smith, Florida Acad. Sci., Proc., vol. 6, No. 1, pp. 43, 46.
1944. *Acropora prolifera* (Lamarck), Wells, Jour. Paleont., vol. 18, No. 5, p. 446.
1948. *Acropora prolifera* (Lamarck), Smith, Atlantic Reef Corals, p. 60.
1954. *Acropora prolifera* (Lamarck), Smith, U.S. Fish and Wildlife Serv., Fish. Bull., vol. 55, No. 89, p. 293.
1954. *Acropora prolifera* (Lamarck), Fontaine, Inst. Jamaica, Ann. Rept. 1953-1954, p. 24.
1957. *Acropora prolifera* (Lamarck), Newell and Rigby, Soc. Econ. Paleont. and Mineral., Special Publ. No. 5, p. 58.
1958. *Acropora prolifera* (Lamarck), Zans, Geol. Sur. Dept. Jamaica, W.I., Bull. No. 3, p. 31.

1958b. *Acropora prolifera* (Lamarck), Zans, Geonotes, vol. 1, No. 2, p. 25.
1959. *Acropora prolifera* (Lamarck), Zans, Geonotes, vol. 2, No. 1, pp. 28, 32.
1959b. *Acropora prolifera* (Lamarck), Goreau, Ecology, vol. 40, No. 1, pp. 70, 75, 85.
1959a. *Acropora prolifera* (Lamarck), Goreau, Biol. Bull., vol. 116, No. 1, pp. 59, 63, 64, 65.
1961. *Acropora prolifera* (Lamarck), Duarte Bello, Acuario Nac. [Cuba], Ser. Educac. No. 2, pp. 9, 12, 13, figs. 1, 2.
1962. *Acropora prolifera* (Lamarck), Stoddart, Atoll Research Bull., No. 87, pp. 17, 18, 19.
1963. *Acropora prolifera* (Lamarck), Almy and Carrión-Torres, Caribbean Jour. Sci., vol. 3, Nos. 2-3, pp. 136, 137, 142, 146, 161, pl. 5a.
1964. *Acropora prolifera* (Lamarck), Goreau, Science, vol. 145, No. 3630, p. 385.
1964. *Acropora prolifera* (Lamarck), Roos, Studies on the Fauna of Curaçao and other Caribbean Islands, vol. 20, No. 81, p. 47.
1964. *Acropora prolifera* (Lamarck), Rivero, Geos [Venezuela], No. 11, p. 113.

The single specimen collected is so worn that the identification is provisional. The small, broken corallum is branched, with two of the branches diverging from the larger stem in the form of a "V". The branches are cylindrical, gently tapering, and subcircular in cross section, consisting of an axial corallite with somewhat smaller radial corallites around it. The corallites are worn down to low mounds or protuberances but normally they must have formed tubular projections scattered all over the branches as well as at the end of the branches. The calices are less than 2 mm in diameter, and the 12 septa are well developed. The corallites grow at an angle to the branch, and as the corallites have been worn down to the degree that their calices are now parallel with the branch, the columella appears to be off-centered.

Measurements. — Specimen B563a: length of largest branch of corallum (broken at both ends) 46 mm; diameter of branch at large end 9 mm, at small end 5 mm; average diameter of axial calice 1.1 mm, of radial calice 0.7 mm.

Locality. — Washed up on beach southeast of Higuerote, State of Miranda. One dead specimen. Recent.

Comparisons. — It is difficult to determine with assurance whether the Higuerote specimen is *Acropora prolifera* (Lamarck) or *Acropora cervicornis* (Lamarck). Vaughan (1902a, p. 313) differentiated *A. prolifera* by its more crowded branches, a character that the Venezuelan form seems to display. As the two species are close, citations to *A. cervicornis* are appended below.

Remarks.—*Acropora prolifera* (Lamarck) was originally known as *A. muricata* (Linnaeus). The *A. muricata* complex in the West Indies was later subdivided into *A. cervicornis, A. prolifera,* and *A. palmata* by Lamarck. Subsequently, and largely through the work of Brook (1893b), these three American species were again united under the name of *A. muricata* (Linnaeus), a name which found acceptance by a number of authors. In 1900a, however, Gregory reapplied the individual Lamarckian names to the three species, and that trend has persisted to the present.

Range and distribution.—The range of *Acropora prolifera* (Lamarck) is Pleistocene to Recent, the Pleistocene form reported from the Fresh Creek fossil reef on Andros Island, the Bahamas. The living *A. prolifera* is known from the Bahamas, Florida (Tortugas), Mexico (off Vera Cruz), British Honduras (Rendezvous Cay, Turneffe, Pedro Bank), Jamaica (on the well-sheltered inner reef of Portland Bight), Haiti, Puerto Rico (Culebra), St. Thomas, Curaçao (Caracas Bay), Venezuela (Puerto La Cruz), and Barbados (1-8 fathoms).

Addendum.—References to *Acropora cervicornis* (Lamarck) are the following:

1707. Corallum album porosum maximum muricatum Sloane, A Voyage to the Islands of Madera, Barbados, Nieves, S. Cristophers and Jamaica, vol. 1, p. 51, pl. 18, fig. 3. [*Fide* Vaughan, 1902a, p. 312.]
1758. *Millepora muricata* (pars) Linnaeus, Systema Naturae, ed. 10, vol. 1, p. 792.
1766. *Madrepora muricata* (Linnaeus), Pallas, Elenchus Zoophytorum, p. 327. [*Fide* Vaughan, 1902a, p. 313.]
1767. *Madrepora muricata* (Linnaeus), Knorr, Deliciae Naturae, pl. AII, fig. 1. [*Fide* Vaughan 1902a, p. 313.]
1768. *Madrepora* and *Millepora muricata* (pars) Linnaeus, Pallas, Lyst der Plant-Dieren, p. 404.
1786. *Madrepora muricata* var. *a* Ellis and Solander, The Natural History of many curious and uncommon Zoophytes. [*Fide* Vaughan, 1902a, p. 313.]
1816. *Madrepora cervicornis* Lamarck, Hist. nat. Anim. sans Vert., vol. 2, p. 281.
1834. *Madrepora cervicornis* Lamarck, Blainville, Manuel d'Actinologie ou de Zoophytologie, p. 390.
1834. *Heteropora cervicornis* (Lamarck), Ehrenberg, K. Akad. Wiss. Berlin, Abhandl., p. 334.
1836. *Madrepora cervicornis* Lamarck, Lamarck, Hist. nat. Anim. sans Vert., ed. 2, p. 449.
1846. *Madrepora cervicornis* Lamarck, Dana, U.S. Exploring Exped., vol. 7, Zoophytes, pp. 479-480.
1847. *Madrepora cervicornis* Lamarck, Duchassaing, Soc. Géol. France, Bull., sér. 2, vol. 4, p. 1095.

1850. *Madrepora cervicornis* Lamarck, Duchassaing, Animaux Radiaires des Antilles, p. 17.
1859. *Madrepora cervicornis* Lamarck, Dana, Synopsis Rept. Zoophytes, U.S. Exploring Exped., p. 89.
1860. *Madrepora cervicornis* Lamarck, Milne Edwards and Haime, Histoire naturelle des Coralliaires ou Polypes, vol. 3, pp. 136-137.
1861. *Madrepora cervicornis* Lamarck, Duchassaing and Michelotti, R. Accad. Sci. Torino, Mem., ser. 2, vol. 19, p. 357.
1866. *Madrepora cervicornis* Lamarck, Duchassaing and Michelotti, R. Accad. Sci. Torino, Mem., ser. 2, vol. 23, p. 188.
1870. *Madrepora cervicornis* Lamarck, Duchassaing, Revue des Zoophytes et des Spongiaires des Antilles, p. 32.
1871. *Madrepora cervicornis* Lamarck, Pourtalès, Mus. Comp. Zool., Mem., vol. 2, No. 4, p. 84.
1880. *Madrepora cervicornis* Lamarck, Pourtalès *in* Agassiz, Mus. Comp. Zool., Mem., vol. 7, No. 1, pl. 18, figs. 1-9.
1886. *Madrepora cervicornis* Lamarck, Quelch, Voyage H.M.S. Challenger, Rept. Sci. Results, vol. 16, pt. 46, pp. 10, 11, 12, 149.
1888. *Madrepora cervicornis* Lamarck, A. Agassiz, Mus. Comp. Zool., Bull., vol. 14, pp. 82, 86.
1888. *Madrepora cervicornis* Lamarck, Rathbun, U.S. Nat. Mus., Proc., vol. 10, p. 13.
1889. *Madrepora cervicornis* Lamarck, Duerden, Inst. Jamaica, Jour., vol. 2, p. 621.
1891. *Madrepora cervicornis* Lamarck, Jukes-Brown and Harrison, Geol. Soc. London, Quart. Jour., vol. 47, p. 226.
1893b. *Madrepora (Eumadrepora) muricata* forma *cervicornis* Lamarck, Brook, Catalogue of the Madreporarian Corals in the British Museum (Natural History), vol. 1, pp. 24, 27-28, 29.
1895. *Madrepora cervicornis* Lamarck, Gregory, Geol. Soc. London, Quart. Jour., vol. 51, p. 282.
1895. *Madrepora cervicornis* Lamarck, Nutting, State Univ. Iowa, Lab. Nat. Hist. Bull., vol. 3, Nos. 1-2, p. 134.
1900a. *Madrepora cervicornis* Lamarck, Gregory, Ann. Mag. Nat. Hist., ser. 7, vol. 6, No. 31, pp. 21-31.
1901c. *Acropora cervicornis* (Lamarck), Verrill, Connecticut Acad. Arts Sci., Trans., vol. 11, pt. 1, art. 4, pp. 165, 167-168.
1901. *Isopora muricata* (Linnaeus) forma *muricata s.s.* = *cervicornis* (Lamarck), Vaughan, R. Mus. Geol. Min. Leiden, Samml., ser. 2, vol. 2, No. 1, pp. 8, 9, 10, 11, 12, 69-71.
1902a. *Acropora muricata* var. *cervicornis* (Lamarck), Verrill, Connecticut Acad. Arts Sci., vol. 11, pt. 1, art. 5, p. 216.
1902a. *Isopora muricata* s.s. = *cervicornis* (Lamarck), Vaughan, U.S. Fish Comm., Bull., vol. 20, for 1900, pt. 2, p. 313, pl. 21; pl. 22, fig. 2.
1902b. *Isopora muricata* (Linnaeus) forma *cervicornis* (Lamarck), Spencer, Geol. Soc. London, Quart. Jour., vol. 58, p. 361.
1909. *Madrepora muricata* (Linnaeus) forma *cervicornis* Lamarck, Hartmeyer, Meereskunde Berlin, Jahrg. 3, No. 2, pp. 9, 10, pl. 1, fig. 1.
1911. *Acropora cervicornis* (Lamarck), Vaughan, Carnegie Inst. Washington, Yearbook No. 9, p. 135.
1913b. *Acropora cervicornis* (Lamarck), Vaughan, Carnegie Inst. Washington, Yearbook No. 11, p. 156.
1919. *Isopora cervicornis* (Lamarck), Nutting, Univ. Iowa Studies Nat. Hist. vol. 8, No. 3, p. 101.
1919c. *Acropora muricata* (Linnaeus), Vaughan, Smithsonian Inst., Ann. Rept. 1917, pl. 25.

1927b. *Acropora cervicornis* (Lamarck), van der Horst, Bijdr. Dierk. Amsterdam, vol. 25, p. 161.
1929. *Acropora cervicornis* (Lamarck), Felix, Fossilium Catalogus. I: Animalia, pars 44, pp. 606-607.
1936b. *Acropora cervicornis* (Lamarck), Wells, Amer. Jour Sci., ser. 5, vol. 31 (231), No. 182, p. 100.
1939. *Acropora muricata* var. *cervicornis* (Lamarck), Butsch, Barbados Mus. Histor. Soc., Jour., vol. 6, No. 3, p. 137, pl. 2, fig. 3.
1943. *Acropora cervicornis* (Lamarck), Smith, Florida Acad. Sci., Proc., vol. 6, No. 1, pp. 43, 46.
1943. *Acropora cervicornis* (Lamarck), Vaughan and Wells, Geol. Soc. Amer., Spec. Paper, No. 44, p. 300, pl. 8, fig. 1.
1948. *Acropora cervicornis* (Lamarck), Smith, Atlantic Reef Corals, pp. 75, 76, pl. 2.
1954. *Acropora cervicornis* (Lamarck), Smith, U.S. Fish Wildlife Serv., Fish. Bull., vol. 55, No. 89, p. 293.
1954. *Acropora cervicornis* (Lamarck) = *muricata* (Linnaeus), Fontaine. Inst. Jamaica, Ann. Rept. 1953-1954, p. 24.
1956. *Acropora cervicornis* (Lamarck), Ginsburg, Amer. Assoc. Petrol. Geol., Bull., vol. 40, No. 10, p. 2407.
1957. *Acropora cervicornis* (Lamarck), Newell and Rigby, Soc. Econ. Paleont., Spec. Publ. No. 5, pp. 42, 58, pl. 3, fig. 2.
1958a. *Acropora cervicornis* (Lamarck), Zans, Geol. Sur. Dept. Jamaica, W.I., Bull. No. 3, pp. 21, 31.
1958b. *Acropora cervicornis* (Lamarck), Zans, Geonotes, vol. 1, No. 2, pp. 23, 24, 25.
1958. *Acropora cervicornis* (Lamarck), Moore, Inst. Marine Sci. Univ. Texas, Publ., vol. 5, pp. 152, 154.
1959. *Acropora cervicornis* (Lamarck), Kornicker, Bonet, Cann and Hoskin, Inst. Marine Sci. Univ. Texas, Bull., vol. 6, pp. 13, 18, fig. 14.
1959. *Acropora cervicornis* (Lamarck), Zans, Geonotes, vol. 2, No. 1, pp. 28, 31, 32.
1959. *Acropora cervicornis* (Lamarck), Rodriguez, Bull. Marine Sci. Gulf and Caribbean, vol. 9, No. 3, p. 274.
1959. *Acropora cervicornis* (Lamarck), Newell, Imbrie, Purdy, and Thurber, Amer. Mus. Nat. Hist., Bull., vol. 117, art. 4, pp. 194, 213, 214, fig. 13(7).
1959b. *Acropora cervicornis* (Lamarck), Goreau, Ecology, vol. 40, No. 1, pp. 70, 72, 74, 75, 79, 81, 82, 83, 85.
1959. *Acropora cervicornis* (Lamarck), T. Goreau and N. Goreau, Biol. Bull., vol. 117, No. 2, pp. 239, 241, 242, 243, 245, 246, 248.
1960b. *Acropora cervicornis* (Lamarck), Lewis, Canadian Jour. Zool., vol. 38, No. 6, pp. 1133, 1140, pl. 5, fig. 11; pl. 6, fig. 12.
1960c. *Acropora cervicornis* (Lamarck), Lewis, Barbados Mus. and Nat. Hist. Soc., Jour., vol. 28, No. 1, p. 11.
1960b. *Acropora cervicornis* (Lamarck), T. Goreau and N. Goreau, Biol. Bull., vol. 119, No. 3, p. 421.
1961. *Acropora cervicornis* (Lamarck), Duarte Bello, Acuario Nac. [Cuba], Ser. Educac. No. 2, pp. 9, 12.
1961. *Acropora muricata* (Linnaeus) *cervicornis* (Lamarck), Westermann and Kiel, Natuurwet. Studiekr. Suriname en Nederlandse Antillen, No. 24, p. 136.
1961a. *Acropora cervicornis* (Lamarck), Goreau, Endeavour, vol. 20, No. 77, p. 33.
1961. *Acropora cervicornis* (Lamarck), Zans, Geol. Sur. Dept. Jamaica, W.I., Bull., No. 3, p. 31.

1962. *Acropora cervicornis* (Lamarck), Kornicker and Boyd, Amer. Assoc. Petrol. Geol., vol. 46, No. 5, pp. 646, 647, 650, 651, 655, 657, 662, 663, 664, 667, figs. 9, 10, 16 (6), 22, 23, 24, 28, 30, 31.
1962. *Acropora cervicornis* (Lamarck), Stoddart, Atoll Research Bull., No. 87, pp. 17, 19, 20, 21, 22, 23, 25, 26, 27, 28, figs. 11, 12.
1963. *Acropora cervicornis* (Lamarck), Shinn, Jour. Sed. Petrol., vol. 33, No. 2, pp. 300, 301, fig. 11.
1963. *Acropora cervicornis* (Lamarck), Almy and Carrión-Torres, Caribbean Jour. Sci., vol. 3, Nos. 2-3, pp. 141, 142, 145, 161, pl. 4a.
1963. *Acropora cervicornis* (Lamarck), Jones, Bull. Marine Sci. Gulf and Caribbean, vol. 13, No. 2, p. 282.
1964. *Acropora cervicornis* (Lamarck), Buisonjé, K. Nederland. Akad. Wetensch., Proc., ser. B, vol. 67, No. 1, pp. 64, 65.
1964. *Acropora cervicornis* (Lamarck), Roos, Studies on the Fauna of Curaçao and other Caribbean Islands, vol. 20, No. 81, pp. 6, 7, 47, pl. 12a.
1964a. *Acropora cervicornis* (Lamarck), Goreau, Science, vol. 145, No. 3630, p. 385, fig. 2.
1964. *Acropora cervicornis* (Lamarck), Storr, Geol. Soc. Amer., Spec. Papers, No. 79, p. 72.
1964. *Acropora cervicornis* (Lamarck), Folk and Robles, Jour. Geol., vol. 72, No. 3, pp. 261, 262, 268, pl. 3, fig. A.
1966. *Acropora cervicornis* (Lamarck), Stanley, Amer. Assoc. Petrol. Geol., Bull., vol. 50, No. 9, pp. 1931, 1937, 1938, pl. 1, fig. 8.
1966. *Acropora cervicornis* (Lamarck), Shinn, Jour. Paleont., vol. 40, No. 2, pp. 233-240, pl. 27, text-figs. 1-6.
1967. *Acropora cervicornis* (Lamarck), Mesolella, Science, vol. 156, No. 3775, pp. 638, 639, fig. 2.

The range of *Acropora cervicornis* (Lamarck) is Pleistocene to Recent. The living form is known from the Bahamas (Bimini) to Barbados, with intervening localities at Florida and the Tortugas (2-10 fathoms), Mexico (Blanquilla and Alacran Reefs), British Honduras (Rendezvous Cay, Turneffe, Lighthouse Reef, Glover's Reef, Pedro Bank), Cuba, Jamaica, Puerto Rico (off Gallardo Bank, 10 fathoms), Antigua, St. Thomas, Curaçao (3-6 fathoms), and Venezuela (Tortuga and Margarita Islands).

According to Vaughan (1918, p. 482), the *A. cervicornis* variant of *A. muricata* occurs in the Pleistocene of Moín Hill (Costa Rica), at Mount Hope in the Panama Canal Zone, and "is general in the West Indian and eastern Central American Pleistocene reefs where they were not exposed to the beat of the heavy surf." The species is also known from the Pleistocene of the Fresh Creek fossil reef in the Great Bahama Bank (Newell and Rigby, 1957), in the Key Largo Limestone of Florida (Stanley, 1966), at Sugar Loaf in the Island of St. Eustatius (Westermann and Kiel), from the Island of Guadeloupe, and in uplifted reefs in Barbados (Mesolella, 1967).

Siderastrea (Siderastrea) radians (Pallas) Pl. 2, figs. 4, 5

1766. *Madrepora radians* Pallas, Elenchus Zoophytorum, pp. 322-323.
1767. *Madrepora astroites* Linnaeus, Systema Naturae, ed. 12, p. 1276 (not Pallas, 1766).
1786. *Madrepora galaxea* Ellis and Solander, Natural History of Zoophytes, p. 168, pl. 47, fig. 7.
1791. *Madrepora galaxea* Ellis and Solander, Gmelin, Systema Naturae, ed. 13, pt. 6, p. 3765.
1791. *Madrepora astroites* Linnaeus, Gmelin, Systema Naturae, ed. 13, pt. 6, p. 3767.
1794. *Madrepora astroites* Linnaeus, Esper, Fortsetzungen Pflanzenthiere, vol. 1, pp. 12-16, pl. 35.
1801. *Astraea galaxea* (Ellis and Solander), Lamarck, Hist. nat. Anim. sans Vert., p. 371.
1807. *Astraea radians* (Pallas), Fischer von Waldheim, Muséum Demidoff, vol. 3, p. 295.
1815. *Astraea radians* seu *astroites* (Linnaeus), Oken, Lehrb. Naturg., vol. 3, No. 1, p. 65.
1816. *Astraea galaxea* (Ellis and Solander), Lamarck, Hist. nat. Anim. sans Vert., vol. 2, p 267.
1816. *?Astraea punctifera* Lamarck, Hist. nat. Anim. sans Vert., vol. 2, p. 260.
1821. *Astraea galaxea* (Ellis and Solander), Lesueur, Mus. Nat. Hist. nat. Paris, Mém., vol. 6, p. 285, pl. 16, fig. 13.
1821. *Astraea galaxea* (Ellis and Solander), Lamouroux, Exposition Méthodique Polypiers, p. 60, pl. 47, fig. 7.
1824. *?Astraea punctifera* Lamarck, Lamouroux, Encyclopédie, Méthodique, Zoophytes, p. 132.
1830. *Astraea (Siderastrea) galaxea* (Ellis and Solander), Blainville, Dictionnaire des Sciences Naturelles, vol. 60, p. 335.
1830. *Astraepora punctifera* (Lamarck), Blainville, Dictionnaire des Sciences Naturelles, vol. 60, p. 349.
1834. *Astraeopora punctifera* (Lamarck), Blainville, Manuel d'Actinologie ou de Zoophytologie, p. 383.
1834. *Siderastraea galaxea* (Ellis and Solander), Blainville, Manuel d'Actinologie ou de Zoophytologie, p. 370.
1834. *Astraea astroites* (Linnaeus), Ehrenberg, K. Akad. Wiss. Berlin, Abhandl., p. 319.
1834. *Explanaria galaxea* (Ellis and Solander), Ehrenberg, K. Akad. Wiss. Berlin, Phys., Abhandl., 1832, p. 306.
1836. *?Astrea punctifera* Lamarck, Hist. nat. Anim. sans Vert., ed. 2, vol. 2, p. 407.
1836. *Astraea galaxea* (Ellis and Solander), Lamarck, Hist. nat. Anim. sans Vert., ed. 2, vol. 2, p. 418.
1846. *Siderina galaxea* (Ellis and Solander), Dana, U.S. Exploring Exped., vol. 7, Zoophytes, pp. 218-220, pl. 10, figs. 12, 12b. [Not figs. 12a, 12d *fide* Vaughan, 1919, p. 439.]
1848b. *Siderastraea galaxea* (Ellis and Solander), Milne Edwards and Haime, Ann. Sci. Nat. Paris, C. R., vol. 27, p 495.
1849. *Siderastraea galaxea* (Ellis and Solander), Milne Edwards and Haime, Ann. Sci. Nat. Paris, Zoologie, sér. 3, vol. 12, p. 139.
1850. *Astraea galaxea* (Ellis and Solander), Duchassaing, Animaux Radiaires des Antilles, p. 15.
1851. *Siderastraea galaxea* (Ellis and Solander), Milne Edwards and Haime, Mus. Nat. Hist. nat. Paris, Arch., vol. 5, p. 106.
1853. *Madrepora galaxea* Ellis and Solander, Nelson, Geol. Soc. London, Quart. Journ., vol. 9, p. 211.

1855. *Astraea galaxea* (Ellis and Solander), Duchassaing, Soc. Géol. France, Bull., sér. 2, vol. 12, p. 754.
1857. *Astraea radians* (Pallas), Milne Edwards and Haime, Histoire Naturelle des Coralliaires, vol. 2, pp. 506-507.
1859. *Siderina galaxea* (Ellis and Solander), Dana, Synopsis Rept. Zoophytes U.S. Exploring Expedition, p. 28.
1861. *Astrea radians* (Pallas), Duchassaing and Michelotti, R. Accad. Sci. Nat. Torino, Mem., ser. 2, vol. 19, p. 354.
1864. *Siderastraea radians* (Pallas), Verrill, Mus. Comp. Zool., Bull., vol. 1, p. 55.
1866. *Astraea radians* (Pallas), Duchassaing and Michelotti, R. Accad. Sci. Nat. Torino, Mem., ser. 2, vol. 23, pp. 182-183.
1870. *Astraea radians* (Pallas), Duchassaing, Revue des Zoophytes et des Spongiaires des Antilles, p. 31.
1871. *Siderastraea galaxea* (Ellis and Solander), Pourtalès, Mus. Comp. Zool., Mem., vol. 2, No. 4, p. 81.
1875. *Siderastrea galaxea* E. & H., Pourtalès, *in* Gabb, Geol. Mag., decade 2, vol. 2, p. 545.
1877. *Siderastraea radians* (Pallas), Lindström, K. Svenska Vetensk.-Akad. Stockholm, Handl., vol. 14, No. 6, p. 23.
1877c. *Siderastraea galaxea* (Ellis and Solander), Arango y Molina, R. Acad. Cienc. Méd., Fís. y Nat. Habana, An., vol. 14, p. 281.
1880. *Siderastraea galaxea* (Milne Edwards and Haime) and (Blainville), Pourtalès, *in* Agassiz, Mus. Comp. Zool., Mem., vol. 7, pt. 1, pl. 11, figs. 14-21; pl. 15, figs. 1-12.
1886. *Siderastraea galaxea* (Ellis and Solander), Quelch Voyage of H.M.S. Challenger, Rept. Sci. Results, Zoology, vol. 16, pt. 46, pp. 12, 113.
1888b. *Siderastraea galaxea* (Ellis and Solander), Heilprin, Acad. Nat. Sci. Philadelphia, Proc., vol. 40, p. 306.
1888. *Siderastraea radians* (Pallas), Ortmann, Zool. Jahrb., Syst., vol. 3, p. 181.
1889. *Siderastraea galaxea* (Ellis and Solander), Duerden, Inst. Jamaica, Jour., vol. 2, p. 621.
1890. *Siderastraea radians* (Pallas), Ortmann, Zeitschr. f. Wissensch. Zool. Leipzig, vol. 50, p. 298.
1890. *Siderastraea galaxea* (Ellis and Solander), Heilprin, Acad. Nat. Sci. Philadelphia, Proc., vol. 42, p. 305.
1891. *Siderastraea galaxea* (Ellis and Solander), Jukes-Brown and Harrison, Geol. Soc. London, Quart. Jour., vol. 47, p. 226.
1895. *Siderastraea galaxea* (Ellis and Solander), Nutting, State Univ. Iowa, Lab. Nat. Hist. Bull., vol. 3, Nos. 1-2, pp. 99, 134.
1895. *Astraea radians* (Pallas), Gregory, Geol. Soc. London, Quart. Jour., vol. 51, pp. 277-278, 285.
1899. *Astrea radians* (Pallas), Guppy, Victoria Inst. Trinidad, Proc., vol. 3, p. 169.
1900a. *Siderastrea radians* (Pallas), Verrill, Connecticut Acad. Arts Sci., Trans., vol. 10, p. 552.
1901. *Siderastrea radians* (Pallas), Vaughan, R. Mus. Geol. Min. Leiden, Samml., ser. 2, vol. 2, No. 1, pp. 8, 11, 12, 61-62.
1901b. *Siderastrea radians* (Pallas), Verrill, Connecticut Acad. Arts Sci., Trans., vol. 11, art. 3; pp. 88, 152, 153-155; 1901c, art. 4, pp. 181, 186, pl. 30, fig. 1.
1902. *Siderastrea radians* (Pallas), Verrill, Connecticut Acad. Arts Sci., Trans., vol. 11, pt. 2, art. 10, p. 485.
1902a. *Siderastrea radians* (Pallas), Vaughan, U.S. Fish Comm., Bull., vol. 20 for 1900, pt. 2, p. 309, pl. 15; pl. 16, fig. 2.

1904b. *Siderastrea radians* (Pallas), Duerden, Carnegie Inst. Washington, Publ. No. 20, pp. 1-130, pls. 1-11, text-figs. 1-13.
1908b. *Siderastrea radians* (Pallas), Gravier, Soc. Biol. Paris, C. R., vol. 64, pp. 1081-1082.
1909. *Siderastrea radians* (Pallas), Hartmeyer, Meereskunde Berlin, Jahrg. 3, No. 2, p. 11, pl. 2, fig. 2.
1909c. *Siderastrea radians* (Pallas), Gravier, Mus. Nat. Hist. nat. Paris, Bull., vol. 15, pp. 365-368.
1909d. *Siderastrea radians* (Pallas), Gravier, Inst. Océanogr. Paris, Ann., vol. 1, pp. 4, 5, 17-24, pl. 5, figs. 16-20; pl. 6, figs. 24-27; pl. 7, figs. 28-33; pl. 8, figs. 34-38; pl. 9, fig. 39.
1910a. *Siderastrea radians* (Pallas), Gravier, Assoc. Française Avancem. Sci., C. R., vol. 38, pp. 704-705.
1911. *Siderastrea radians* (Pallas), Vaughan, Carnegie Inst. Washington, Yearbook No. 9, p. 139.
1913b. *Siderastrea radians* (Pallas), Vaughan, Carnegie Inst. Washington, Yearbook No. 11, pp. 156, 162.
1913. *Siderastrea radians* (Pallas), Mayer, Carnegie Inst. Washington, Yearbook No. 11, p. 126.
1914. *Siderastrea radians* (Pallas), Mayer, Carnegie Inst. Washington, Publ. No. 183, Papers Tortugas Lab., vol. 6, No. 1, pp. 19, 20.
1915d. *Siderastrea radians* (Pallas), Vaughan, Washington Acad. Sci., Jour., vol. 5, p. 597.
1916a. *Siderastrea radians* (Pallas), Vaughan, Carnegie Inst. Washington, Yearbook No. 14, p. 228.
1916c. *Siderastrea radianes* (Pallas), Vaughan, Nat. Acad. Sci., Proc., vol. 2, pp. 96, 98.
1918b. *Siderastrea radians* (Pallas), Vaughan, Carnegie Inst. Washington, Publ. No. 213, Papers Dept. Marine Biol., vol. 9, p. 325.
1918a. *Siderastrea radians* (Pallas), Mayer, Carnegie Inst. Washington, Publ. No. 252, Papers Dept. Marine Biol., vol. 12, No. 7, pp. 175, 176.
1919a. *Siderastrea radians* (Pallas), Vaughan, U.S. Nat. Mus., Bull. 103, No. 9, pp. 225, 232, 300, 436, 437, 439-441, 442, 444, 516, pl. 114, fig. 1.
1925e. *Siderastrea radians* (Pallas), Boschma, Amer. Acad. Arts Sci., Proc., vol. 60, pp. 451, 456, 458.
1927b. *Siderastrea radians* (Pallas) van der Horst, Bijdr. Dierk. Amsterdam, vol. 25, p. 160.
1929. *Siderastrea radians* (Pallas), Felix, Fossilium Catalogus. I: Animalia, pars 44, pp. 560-561.
1930a. *Siderastrea radians* (Pallas), Yonge, British Mus. (Nat. Hist.) Great Barrier Reef Exped. 1928-29, Sci. Rept., vol. 1, No. 2, p. 44.
1932a. *Siderastrea radians* (Pallas), Wells, Carnegie Inst. Washington, Yearbook No. 31, p. 291.
1935b. *Siderastrea radians* (Pallas), Yonge, Carnegie Inst. Washington, Publ. No. 452, Papers Tortugas Lab., vol. 29, No. 9, pp. 201-208, pl. 1, figs. 1-4.
1937. *Siderastrea radians* (Pallas), Yonge, Carnegie Inst. Washington, Publ. No. 475, Papers Tortugas Lab., vol. 31, No. 9, pp. 209, 211.
1943. *Siderastrea radians* (Pallas), Smith, Florida Acad. Sci., Proc., vol. 6, No. 1, p. 43.
1943. *Siderastrea radians* (Pallas), Vaughan and Wells, Geol. Soc. Amer., Spec. Papers, No. 44, pp. 55, 68, 126, 294, 305, pl. 2, fig. 3; pl. 12, figs. 2, 3.
1948. *Siderastrea (Siderastrea) radians* (Pallas), Smith, Atlantic Reef Corals, pp. 60, 72, 78, pl. 6.
1954. *Siderastrea radians* (Pallas), Fontaine, Inst. Jamaica, Ann. Rept. 1953-1954, p. 24.

1954. *Siderastrea radians* (Pallas), Smith, U.S. Fish Wildlife Serv., Fishery Bull., vol. 55, No. 89, p. 293.
1955. *Siderastrea radians* (Pallas), G. Voss and N. Voss, Bull. Marine Sci. Gulf Caribbean, vol. 5, No. 3, p. 224.
1956a. *Siderastrea (Siderastrea) radians* (Pallas), Wells, Treatise on Invertebrate Paleontology, Part F, Coelenterata, p. F384, fig. 276, 1a.
1957. *Siderastrea radians* (Pallas), Alloiteau, Contribution à la Systematique des Madréporaires, p. 400, fig. 260 bis.
1958a. *Siderastrea radians* (Pallas), Zans, Geol. Sur. Dept. Jamaica, W.I., Bull. No. 3, p. 31.
1958. *Siderastrea radians* (Pallas), Forest, Inst. Océanogr. Paris, Ann., vol. 37, pp. 20, 21.
1958. *Siderastrea radians* (Pallas), Squires, Amer. Mus. Nat. Hist., Bull., vol. 115, art. 4, pp. 248-249, pl. 35, figs. 1, 3, 4; pl 36, fig. 3.
1958b. *Siderastrea radians* (Pallas), Zans, Geonotes, vol. 1, No. 2, p. 20.
1959. *Siderastrea radians* (Pallas), T. Goreau and N. Goreau, Biol. Bull., vol. 117, No. 2, pp. 242, 243, 248.
1959. *Siderastrea radians* (Pallas), Newell, Imbrie, Purdy, and Thurber, Amer. Mus. Nat. Hist., Bull., vol. 117, art. 4, p. 211.
1959b. *Siderastrea radians* (Pallas), Goreau, Ecology, vol 40, pp. 70, 73, 75, 82, 85.
1959. *Siderastrea radians* (Pallas), Kornicker, Bonet, Cann, and Hoskin, Inst. Marine Sci. Univ. Texas, Publ., vol. 6, p. 19.
1959. *Siderastrea radians* (Pallas), Zans, Geonotes, vol. 2, No. 1, pp. 28, 33, 34.
1960b. *Siderastrea radians* (Pallas), Lewis, Canadian Jour. Zool., vol. 38, No. 6, pp. 1134, 1135, 1141.
1960c. *Siderastrea radians* (Pallas), Lewis, Barbados Mus. Nat. Hist. Soc., Jour., vol. 28, No. 1, p. 11.
1961. *Siderastrea radians* (Pallas), Duarte Bello, Acuario Nac. [Cuba], Ser. Educac. No. 2, pp. 10, 72-73, figs. 61-62.
1962. *Siderastrea radians* (Pallas), Kornicker and Boyd, Amer. Assoc. Petrol. Geol., Bull., vol. 46, No. 5, pp. 655, 656, 668, fig. 16(13), table 3.
1962. *Siderastrea radians* (Pallas), Stoddart, Atoll Research Bull., No. 87, pp. 17, 19, 21, 22, fig. 11.
1963. *Siderastrea radians* (Pallas), Almy and Carrión-Torres, Caribbean Jour. Sci., vol. 3, Nos. 2-3, pp. 136, 139, 141, 142, 148, 162, pl. 7b.
1963. *Siderastrea radians* (Pallas), J. A. Jones, Bull. Marine Sci. Gulf and Caribbean, vol. 13, No. 2, p. 282.
1964. *Siderastrea radians* (Pallas), Buisonjé, K. Nederland. Akad. Wetensch., Proc., ser. B, vol. 67, No. 1, pp. 64, 65.
1964. *Siderastrea radians* (Pallas), Roos, Studies of the Fauna of Curaçao and other Caribbean Islands, vol. 20, No. 81, p. 9.
1964a. *Siderastrea radians* (Pallas), Goreau, Science, vol. 145, No. 3630, p. 385.
1964. *Siderastrea radians* (Pallas), Storr, Geol. Soc. Amer., Spec. Papers, No. 79, pp. 60, 67, 80.
1964. *Siderastrea radians* (Pallas), Rivero, Geos, No. 11, p. 112.
1965. *Siderastrea radians* (Pallas), Kissling, Bull. Marine Sci., vol. 15, No. 3, pp. 605, 607, 610, fig. 6E.
1965. *Siderastrea radians* (Pallas), Neumann, Bull. Marine Sci., vol. 15, No. 4, p. 1004.
1966. *Siderastrea radians* (Pallas), Stanley, Amer. Assoc. Petrol. Geol., Bull., vol. 50, No. 9, p. 1931, pl. 1, fig. 10.
1966. *Siderastrea radians* (Pallas), Rigby and McIntire, Brigham Young Univ., Geol. Studies, vol. 13, pp. 23, 44.
1967. *Siderastrea radians* (Pallas), Mesolella, Science, vol. 156, No. 3775, p. 638.

The single Venezuelan specimen collected is a young one. The corallum is encrusting, cerioid, slightly hemispherical and undulatory, and ash gray in color. The calices are subhexagonal in outline, with diameters ranging from 2.8 mm to 4.5 mm. There are 26 to 36 septa in four cycles, the last cycle incomplete. The summits of the septa are nearly horizontal at the boundary of the adjoining calice, but inward toward the columella they steepen, gradually at first but then precipitously at the columellar cavity. The sides of the septa are vertical and are studded with small pointed nodules; the upper margins are serrulated by small denticles of which there are 12 or so on the longer septa. The columella is small and papillose.

Measurements. — Specimen B569a: corallum length 25 mm, width 23 mm, thickness 4 mm; length of calices 3.1 mm to 4.5 mm, width 2.8 mm to 3.7 mm.

Locality. — Washed up on beach southeast of Higuerote, State of Miranda. One dead specimen. Recent.

Comparisons. — *Siderastrea radians* (Pallas) is often found with, and closely resembles *Siderastrea siderea* (Ellis and Solander). It is distinguished from *S. siderea* by its deeper and narrower columellar cavity, and by its smaller calices with fewer septa; there are always fewer than 48 septa on adults of *S. radians,* as compared with 48 or more on *S. siderea*. Another similar species is *S. stellata* Verrill from Albrolhos Reef and Bahía, Brazil, but that has longer calices (up to 6 mm), more coarsely dentate septa, and a less developed columella than *S. radians*.

S. radians is essentially a near-shore species occupying a variety of habitats from strong surf at one extreme to sediment-laden waters at the other.

Range and distribution. — If the *S. galaxea* reported by Pourtalès from the Dominican Republic is synonymous with *S. radians*, as most authors believe, then *S. radians* ranges from Middle Miocene to Recent.

The living form of *S. radians* is common in the Western Atlantic in shallow water, and has been reported from the Red Sea, off the Islands of San Thomé and Fernando Po in the Gulf of Guinea, and in the Cape Verde Islands. Western Atlantic localities are Bermuda (Gallows Island); the Bahamas (Harrington Sound, Bimini, Abaco); the Florida Keys (Spanish Harbor); the west coast of Florida (St. George's Sound); the Tortugas (Bird Key Reef, Loggerhead Key, Fort Jefferson); Mexico (Vera Cruz, Isla Verde, Isla de Lobos, Alacran Reef); Panama; British Honduras (Rendezvous Cay, Turneffe); Cuba; Puerto Rico (tide pools, back-and-patch reefs, cays); Jamaica (Kingston 5-6 ft.); St. Thomas; Guadelope; Curaçao (Westpunt Baai, St. Michaels Baai, Piscadera Baai, Spanish Water); and Barbados. The Pleistocene *S. radians* occurs inthe Bahamas (Fresh Creek fossil reef); Florida (Key Largo Limestone); the Panama Canal Zone (Mt. Hope); Curaçao; and the Barbados in low level reefs. *S. radians* from the Mio-Pliocene of Cubagua Island, Venezuela is noted by Rivero (1964), and the Miocene *S. galaxea* (Ellis and Solander), which is placed in synonymy with *S. radians* (Pallas), was reported by Pourtalès in 1875 from the Dominican Republic.

Siderastrea (Siderastrea) siderea (Ellis and Solander) Pl. 3, figs.1-5

1786. *Madrepora siderea* Ellis and Solander, Natural History of Zoophytes, p. 168, pl. 49, fig. 2.
1791. *Madrepora siderea* Ellis and Solander, Gmelin, Systema Naturae, ed. 13, pt. 6, p. 3765.
1816. *Astraea siderea* (Ellis and Solander), Lamarck, Hist. nat. Anim. sans Vert., vol. 2, p. 267.
1821. *Astraea siderea* (Ellis and Solander), Lesueur, Mus. Nat. Hist. nat. Paris, Mém., vol. 6, p. 286, pl. 16, fig. 14.
1821. *Astraea siderea* (Ellis and Solander), Lamouroux, Exposition Méthodique Polypiers, p. 60, pl. 49, fig. 2.
1824. *Astraea siderea* (Ellis and Solander), Lamouroux, Encyclopédie Méthodique, Zoophytes, vol. 2, p. 126.
1830. *Astraea (Siderastraea) siderea* (Ellis and Solander), Blainville, Dictionnaire des Sciences Naturelles, vol. 60, p. 335.
1834. *Astraea (Siderastraea) siderea* (Ellis and Solander), Blainville, Manuel d'Actinologie ou de Zoophytologie, p. 370.
1834. *Astraea trichophylla* Ehrenberg, K. Akad. Wiss. Berlin, Phys. Abhandl. 1832, p. 319. [*Fide* Gregory, 1895, p. 279.]
1836. *Astraea siderea* (Ellis and Solander), Lamarck, Hist. Nat. Anim. sans Vert., ed. 2, vol. 2, p. 417.
1846. *Pavonia siderea* (Ellis and Solander), Dana, U.S. Exploring Exped., Zoophytes, vol. 7, pp. 331-332.
1849. ? *Siderastrea globosa* Milne Edwards and Haime, Ann. Sci. Nat. Paris, sér. 3, vol. 12, p. 141. [*Fide* Gregory, 1895, p. 279.]
1849. *Siderastrea siderea* (Ellis and Solander), Milne Edwards and Haime, Ann. Sci. Nat. Paris, sér. 3, vol. 12, p. 141.
1851. *Siderastrea siderea* (Ellis and Solander), Milne Edwards and Haime, Mus. Nat. Hist. nat. Paris, Arch., vol. 5, p. 105.
1857. *Astraea siderea* (Ellis and Solander), Milne Edwards and Haime, Histoire naturelle des Coralliaires, vol. 2, p. 509, pl. D7, fig. 2.
1857. ? *Astraea globosa* Milne Edwards and Haime, Histoire naturelle des Coralliaires, vol. 2, p. 510.

1859. *Pavonia siderea* (Ellis and Solander), Dana, Synopsis Rept. Zoophytes U.S. Exploring Expedition, pp. 53, 157.
1861. *Astrea siderea* (Ellis and Solander), Duchassaing and Michelotti, R. Accad. Sci. Torino, Mem., ser. 2, vol. 19, p. 354.
1863a. *Siderastraea crenulata* Blainville var. *antillarum* Duncan, Geol. Soc. London, Quart. Jour., vol. 19, p. 435. [*Fide* Gregory, 1895, p. 279.]
1863a. *Siderastraea grandis* Duncan, Geol. Soc. London, Quart. Jour., vol. 19, p. 441, pl. 16, figs. 5a, 5b. [*Fide* Gregory, 1895, p. 279.]
1864a. *Siderastraea grandis* Duncan, Geol. Soc. London, Quart. Jour., vol. 20, p. 40.
1864b. *Siderastrea siderea* (Ellis and Solander), Verrill, Mus. Comp. Zool., Bull., vol. 1, No. 3, p. 55.
1865. *Siderastraea crenulata* Blainville var. *antillarum* Duncan, Duncan and Wall, Geol. Soc. London, Quart. Jour., vol. 21, p. 11.
1866. *Astraea siderea* (Ellis and Solander), Duchassaing and Michelotti, R. Accad. Sci. Torino, Mem., ser. 2, vol. 23, p. 183.
1868d. *Astraea grandis* Duncan, Duncan, Geol. Soc. London, Quart. Jour., vol. 24, pp. 18, 20.
1868a. *Siderastraea stellata* Verrill, Connecticut Acad. Arts and Sci., Trans., vol. 1, pt. 2, Art. 5, No. 4, pp. 352-353. [*Fide* Gregory, 1895, p. 279.]
1870. *Astraea grandis* Duncan, Duchassaing, Revue des Zoophytes et des Spongiaires des Antilles, p. 31. [*Fide* Gregory, 1895, p. 279.]
1870. *Astraea crenulata* (*non* Blainville), Duchassaing, Revue des Zoophytes et des Spongiaires des Antilles, p. 31. [*Fide* Gregory, 1895, p. 279.]
1871. *Siderastraea siderea* Blainville, Pourtalès, Mus. Comp. Zool., Mem., vol. 2, No. 4, p. 81.
1875. *Siderastrea siderea* Blainville, *in* Gabb, Geol. Mag., decade 2, vol. 2, p. 545.
1877c. *Siderastraea siderea* (Ellis and Solander), Arango y Molina, R. Acad. Cienc. Med., Fis. y Nat. Habana, An., vol. 14, p. 281.
1895. *Astraea siderea* (Ellis and Solander), Gregory, Geol. Soc. London, Quart. Jour., vol. 51, pp. 278-279, 285.
1900a. *Siderastraea siderea* (Ellis and Solander) Blainville, Verrill, Connecticut Acad. Arts Sci., Trans., vol. 10, art. 14, p. 554.
1901b. *Siderastraea siderea* (Ellis and Solander) Blainville, Verrill, Connecticut Acad. Arts Sci., vol. 11, pt. 1, art. 3, pp. 151-152, 154, 155, pl. 30, figs. 1-2.
1901c. *Siderastrea siderea* (Ellis and Solander) Blainville, Verrill, Connecticut Acad. Arts Sci., Trans., vol. 11, pt. 1, art. 4, pp. 181, 186.
1902a. *Siderastrea siderea* (Ellis and Solander), Vaughan, U.S. Fish Comm., Bull., vol. 20 for 1900, pt. 2, pp. 309-310, pl. 14, figs. 1-2; pl. 16, fig. 1.
1902d. *Siderastraea siderea* (Ellis and Solander), Duerden, Nat. Acad. Sci. Washington, Mem., vol. 8, pp. 588-591, pl. 22, figs. 150-152; pl. 23, figs. 153-156; pl. 24, figs. 157-160.
1902a. *Siderastraea siderea* (Ellis and Solander), Spencer, Geol. Soc. London, Quart. Jour., vol. 58, p. 349.
1904b. *Siderastrea siderea* (Ellis and Solander), Duerden, Carnegie Inst. Washington, Publ. No. 20, p. 3.
1908b. *Siderastrea siderea* (Ellis and Solander), Gravier, Soc. Biol. Paris, vol. 64, pp. 1081, 1082.
1909d. *Siderastrea siderea* (Ellis and Solander), Gravier, Inst. Océanogr. Paris, Ann., vol. 1, No. 2, pp. 22, 23.
1913b. *Siderastrea siderea* (Ellis and Solander), Vaughan, Carnegie Inst. Washington, Yearbook No. 11, p. 156.
1913. *Siderastrea siderea* (Ellis and Solander), Brown and Pilsbry, Acad. Nat. Sci. Philadelphia, Proc., vol. 65, p. 497.
1914b. *Siderastrea siderea* (Ellis and Solander), Mayer, Carnegie Inst. Washington, Publ. No. 183, Papers Tortugas Lab., vol. 6, No. 1, pp. 19, 20.

1915c. *Siderastrea siderea* (Ellis and Solander), Vaughan, Washington Acad. Sci., Jour., vol. 5, No. 17, p. 597.
1916. *Siderastrea siderea* (Ellis and Solander), Vaughan, Carnegie Inst. Washington, Yearbook No. 14, pp. 221, 228, 229.
1917a. *Siderastrea siderea* (Ellis and Solander), Vaughan, U.S. Geol. Sur., Prof. Paper 98-T, p. 375.
1919a. *Siderastrea siderea* (Ellis and Solander), Vaughan, U.S. Nat. Mus., Bull. 103, No. 9, pp. 212, 214, 215, 217, 219, 225, 232, 253, 255, 256, 377, 387, 436, 437, 438, 440, 443-447.
1920. *Siderastrea siderea* (Ellis and Solander), Gravier, Résultats Campagnes Scientifiques du Prince de Monaco, No. 55, p. 96, pl. 12, figs. 179-180.
1924. *Siderastraea siderea* (Ellis and Solander), Woodring, Brown, and Burbank, Republic Haiti Geol. Sur., pp. 173, 178.
1926. *Siderastrea siderea* (Ellis and Solander), Vaughan and Hoffmeister, Carnegie Inst. Washington, Publ. No. 344, Papers Dept. Marine Biol., vol. 23, p. 110.
1927a. *Siderastraea siderea* (Ellis and Solander), Felix, Fossilium Catalogus. I: Animalia, pars 35, pp. 372-373.
1927b. *Siderastrea siderea* (Ellis and Solander), van der Horst, Bijdr. Dierk. Amsterdam, vol. 25, p. 160.
1929. *Siderastraea siderea* (Ellis and Solander), Felix, Fossilium Catalogus. I: Animalia, pars 44, p. 561.
1932a. *Siderastrea siderea* (Ellis and Solander), Wells, Carnegie Inst. Washington, Yearbook No. 31, p. 291.
1935b. *Siderastrea siderea* (Ellis and Solander), Yonge, Carnegie Inst. Washington, Publ. No. 452, Papers Tortugas Lab., vol. 29, No. 9, pp. 201-202, 207-208.
1939. *Siderastraea siderea* Blainville, Butsch, Barbados Mus. Hist. Soc., Jour., vol. 6, No. 3, pp. 135-136, pl. 1, fig. 2.
1940a. *Siderastrea siderea* (Ellis and Solander), Rutten, K. Nederland. Akad. Wetensch., Proc., vol. 43, No. 7, p. 826.
1943. *Siderastrea siderea* (Ellis and Solander), Smith, Florida Acad. Sci., Proc., vol. 6, No. 1, p. 43.
1943. *Siderastrea siderea* (Ellis and Solander), Vaughan and Wells, Geol. Soc. Amer., Spec. Papers, No. 44, p. 305, pl. 13, fig. 1.
1944. *Siderastrea siderea* (Ellis and Solander), Wells, Jour. Paleont., vol. 18, No. 5, p. 446.
1948. *Siderastrea (Siderastrea) siderea* (Ellis and Solander), Smith, Atlantic Reef Corals, pp. 60, 72, 79, pl. 7.
1954. *Siderastrea siderea* (Ellis and Solander), Fontaine, Inst. Jamaica, Ann. Rept. 1953-1954, p. 24.
1954. *Siderastrea siderea* (Ellis and Solander), Smith, U.S. Fish and Wildlife Serv., Fish. Bull., vol. 55, No. 89, p. 293.
1955. *Siderastrea siderea* (Ellis and Solander), G. Voss and N. Voss, Bull. Marine Sci. Gulf and Caribbean, vol. 5, No. 3, p. 223.
1956. *Siderastrea (Siderastrea) siderea* (Ellis and Solander), Wells, Treatise on Invertebrate Paleontology, F (Coelenterata), pp. F384-F385, fig. 276, 1c.
1956. *Siderastrea siderea* (Ellis and Solander), Ginsburg, Amer. Assoc. Petrol. Geol., Bull., vol. 40, No. 10, p. 2410.
1956. *Siderastrea siderea* (Ellis and Solander), Menzel, Oceanogr. Inst. Florida State Univ., Contrib., No. 61, p. 3.
1957. *Siderastrea siderea* (Ellis and Solander), Newell and Rigby, Soc. Econ. Paleont. Mineral., Special Publ. No. 5, p. 58.
1958a. *Siderastrea siderea* (Ellis and Solander), Zans, Geol. Sur. Dept. Jamaica, W.I., Bull., No. 3, p. 31.

1958b. *Siderastrea siderea* (Ellis and Solander), Squires, Amer. Mus. Nat. Hist., Bull., vol. 115, art. 4, pp. 249-250, pl. 36, figs. 1-2.
1958. *Siderastrea siderea* (Ellis and Solander), Moore, Inst. Marine Sci. Univ. Texas, Publ., vol. 5, pp. 152, 154.
1959. *Siderastrea siderea* (Ellis and Solander), T. Goreau and N. Goreau, Biol. Bull., vol. 117, No. 2, pp. 242, 243, 248.
1959. *Siderastrea siderea* (Ellis and Solander), Newell, Imbrie, Purdy, and Thurber, Amer. Mus. Nat. Hist., Bull., vol. 117, art. 4, pp. 211, 213, 215.
1959b. *Siderastrea siderea* (Ellis and Solander), Goreau, Ecology, vol. 40, pp. 70, 73, 74, 75, 79, 81, 85.
1959. *Siderastrea siderea* (Ellis and Solander), Kornicker, Bonet, Cann, and Hoskin, Inst. Marine Sci. Univ. Texas, Publ., vol. 6, p. 19.
1959. *Siderastrea siderea* (Ellis and Solander), Zans, Geonotes, vol. 2, No. 1, pp. 28, 33.
1960b. *Siderastrea siderea* (Ellis and Solander), Lewis, Canadian Jour. Zool., vol. 38, pp. 1134, 1137, 1138, 1139, 1140, 1142, 1144, pl. 6.
1960c. *Siderastrea siderea* (Ellis and Solander), Lewis, Barbados Mus. Nat. Hist. Soc., Jour., vol. 28, No. 1, p. 11.
1961. *Siderastrea siderea* (Ellis and Solander), Westermann and Kiel, Natuurwetensch. Studiekr. Suriname en Nederlandse Antillen. No. 24, p. 136.
1961. *Siderastrea siderea* (Ellis and Solander), Duarte Bello, Acuario Nac. [Cuba], Ser. Educac. No. 2, pp. 10, 74-75, figs. 63-64.
1962. *Siderastrea siderea* (Ellis and Solander), Stoddart, Atoll Research Bull., No. 87, pp. 17, 19, 21, 23, 25, 26, 28, figs. 11-12.
1963. *Siderastrea siderea* (Ellis and Solander), Almy and Carrión-Torres, Caribbean Jour. Sci., vol. 3, Nos. 2-3, pp. 137, 141, 142, 148, 162, pl. 7c.
1963. *Siderastrea siderea* (Ellis and Solander), J. A. Jones, Bull. Marine Sci. Gulf and Caribbean, vol. 13, No. 2, p. 282.
1964a. *Siderastrea siderea* (Ellis and Solander), Goreau, Science, vol. 145, No. 3630, p. 385.
1964. *Siderastrea siderea* (Ellis and Solander), Roos, Studies on the Fauna of Curaçao and other Caribbean Islands, vol. 20, No. 81, pp. 9, 47, pls. 4b (5), 5a (3).
1964. *Siderastrea siderea* (Ellis and Solander), Storr, Geol. Soc. Amer., Spec. Papers, No. 79, pp. 18, 78, 80, 82, 84.
1964. *Siderastrea siderea* (Ellis and Solander), Buisonjé, K. Nederland. Akad. Wetensch., Proc., ser. B, vol. 67, No. 1, pp. 64, 65.
1964. *Siderastrea siderea* (Ellis and Solander), Rivero, Geos, No. 11, pp. 112, 113.
1965. *Siderastrea siderea* (Ellis and Solander), Kissling, Bull. Marine Sci., vol. 15, No. 3, pp. 605, 607, 610, fig. 6F.
1966. *Siderastrea siderea* (Ellis and Solander), Stanley, Amer. Assoc. Petrol. Geol., Bull., vol. 50, No. 9, pp. 1931, 1938, pl. 1, fig. 13.
1966. *Siderastrea siderea* (Ellis and Solander), Rigby and McIntire, Brigham Young Univ., Geol. Studies, vol. 13, pp. 29, 30, 33, 34, 35, 40.
1967. *Siderastrea siderea* (Ellis and Solander), Mesolella, Science, vol. 156, No. 3775, p. 638.

The corallum is large, massive, and cerioid, and is probably hemispherical in shape though it is so corroded and riddled by large burrows of a boring pelecypod that its true form cannot be made out. The corallites are tall, moderately slender, crowded, and unequal. The calices are irregularly pentagonal or hexagonal, seemingly shallow, separated by a thin but well-defined common wall, and range from about 5 mm to 6 mm in length and about 4 mm to 5 mm in width. The septa of adjoining calices abut against the wall (which is flush with the surface) and oppose each other end to end or are alternate in position. The number of septa, which depends in part on the dimensions of the calice, varies from 42 to 70. In the average mature calice there are 55 to 60 septa or 10 to 11 septa per millimeter length of the calice. There are four complete cycles of septa plus a number of quinaries, but in small calices the fourth cycle may be incomplete in some systems. The septa are thin and closely spaced, the primary ones reaching the columella but the tertiaries fused with the secondaries part way along the length of the latter, and the quaternaries fused with the tertiaries. The septa are dentate along the summit, with 12 to 14 pairs of slightly staggered, diminutive, laterally projecting denticles on the longest septa some 2 mm or so in length. The sides of the septa are granulate. The columella is small and its structure in the upper part obscured by the simple convergence of the primary septa.

The synapticulae are rather regularly disposed and extend from the wall about three-fourths the distance to the columella, with six or seven of them present between septa of full length. The costae are finely and coarsely tuberculate, the tubercles large in some series, small in others. The tubercules are arranged in oblique or not quite vertical columns along the length of the costae, and in a costa 0.7 mm in width there are four rows of tubercles, those in the two middle columns large, the ones in the outer columns small. On some of the costae small tubercles alternate with large ones in the same column. Lengthwise along the costae there are five large tubercles in one millimeter of length, and depending on their location, as many as seven small tubercles in one millimeter of length. A number of the larger tubercles are perforate.

Measurements. — Specimen S567a: corallum length 78 mm, width 63 mm, height 86 mm.

Locality. — Playa Grande Formation (Maiquetía Member) at W-23, north flank of Punta Gorda anticline at *Lithothamnium* reef. One specimen.

Remarks. — The few calices that can be seen on the Venezuelan specimen are extremely shallow, but they are all corroded, and none of them is on a fresh surface. Their true configuration therefore is not known. It is assumed, however, that the calices normally are fairly deep as on *Siderastrea siderea* (Ellis and Solander), and as all other characters conform to *S. siderea*, the Venezuelan fossil is referred to that species.

Range and distribution. — The range of *Siderastrea siderea* is Miocene to Recent. The Miocene form is found in Cuba, Jamaica (Bowden), Haiti, the Dominican Republic (Zone H, Rio Cana), Vieques Island, and Trinidad. The Pliocene locality is Cabo Blanco, Venezuela (this report). In the Pleistocene the species has been recorded from Bermuda, the Bahamas, Florida, the Panama Canal Zone (Mt. Hope), Costa Rica, Cuba, Jamaica, the Dominican Republic (Barahona), St. Eustatius, Curaçao, Aruba, and Barbados (in reefs up to 480 feet in elevation). In the Western Atlantic the living form is reported from Bermuda, the Bahamas, Florida (Tortugas), Mexico (Blanquilla and Alacran Reefs, Isla de Lobos, and off Vera Cruz), Panama, British Honduras (Rendezvous Cay, Lighthouse Reef, Glover's Reef, and Pedro Bank), Jamaica, Puerto Rico (Culebra), St. Thomas, Venezuela (Puerto La Cruz and Tortuga), Curaçao, and Barbados (1 to 10 fathoms).

The living *Siderastrea siderea* has also been reported from the Red Sea, Cape Verde Islands, the Gulf of Guinea, and off the Island of San Thomé.

Porites furcata Lamarck   Pl. 4, figs. 1-4

1816. *Porites furcata* Lamarck, Hist. nat. Anim. sans Vert., vol. 2, p. 271.
1821. *Porites recta* Lesueur, Mus. Nat. Hist. nat. Paris, Mém., vol. 6, p. 288, pl. 16, fig. 16. [*Fide* Felix, 1929, p. 614.]
1827. *Porites furcata* Lamarck, Deslongchamps, Encyclopédie Méthodique, Zoophytes, p. 653.
1826. *Porites furcata* Lamarck, Blainville, Dictionnaire des Sciences naturelles, vol. 43, p. 51.
1830. *Heliopora furcata* (Lamarck), Blainville, Dictionnaire des Sciences naturelles, vol. 60, p. 357.
1834. *Heliopora furcata* (Lamarck), Blainville, Manuel d'Actinologie ou de Zoophytologie, p. 392.
1836. *Porites furcata* Lamarck, Hist. nat. Anim. sans Vert., ed. 2, vol. 2, p. 437.
1846. *Porites furcata* Lamarck, Dana, U.S. Exploring Exped., vol. 7, Zoophytes, p. 555.
1849. *Porites furcata* Lamarck, Milne Edwards, *in* Cuvier, Règne Animal, Zoophytes, Atlas, pl. 84 bis.
1851. *Porites furcata* Lamarck, Milne Edwards and Haime, Ann. Sci. Nat., Zool., sér. 3, vol. 16, pp. 24-25, pl. 1, figs. 1-1c.

1859. *Porites furcata* Lamarck, Dana, Synopsis Rept. Zoophytes U.S. Exploring Exped., p. 107.
1860. *Porites furcata* Lamarck, Milne Edwards and Haime, Histoire naturelle des Coralliaires ou Polypes, vol. 3, p. 174.
1861. *Porites furcata* Lamarck, Duchassaing and Michelotti, R. Accad. Sci. Torino, Mem., vol. 19, p. 358.
1864b. *Porites furcata* Lamarck, Verrill, Mus. Comp. Zool., Bull., vol. 1, No. 3, p. 42.
1866. *Porites furcata* Lamarck, Duchassaing and Michelotti, R. Accad. Sci. Torino, Mem., vol. 23, p. 189.
1870. *Porites furcata* Lamarck, Duchassaing, Revue des Zoophytes et des Spongiaires des Antilles, p. 32
1871. *Porites furcata* Lamarck, Pourtalès, Mus. Comp. Zool., Mem., vol. 2, No. 4, p. 85.
1875. *Porites furcata* Lamarck, Pourtalès, *in* Gabb, Geol. Mag., decade 2, vol. 2, p. 545.
1877c. *Porites furcata* Lamarck, Arango y Molina, R. Acad. Cienc. Méd., Fís. y Nat. Habana, vol. 14, p. 283.
1879. *Porites furcata* Lamarck, Dana, Corals and Coral Islands, 2d ed., p. 387.
1880. *Porites furcata* Lamarck, Pourtalès, *in* Agassiz, Mus. Comp. Zool., Mem., vol. 7, No. 1, pl. 12, fig. 7; pl. 16, figs. 13-20.
1886. *Porites furcata* Lamarck, Quelch, Voyage H. M. S. Challenger, Rept. Sci. Results, Zoology, vol. 16, pt. 46, pp. 13, 179.
1888. *Porites furcata* Lamarck, Rathbun, U.S. Nat. Mus., Proc., vol. 10, pp. 361-364, pl. 15, figs. 1-3; pl. 17, fig. 1
1888. *Porites furcata* Lamarck, Ortmann, Zool. Jahrb., Syst., vol. 3, p. 157.
1888. *Porites furcata* Lamarck, Agassiz, Mus. Comp. Zool., Bull., vol. 14, p. 82.
1890. *Porites furcata* Lamarck, Heilprin, Acad. Nat. Sci. Philadelphia, Proc., vol. 42, p. 305.
1895. *Porites furcata* Lamarck, Gregory, Geol. Soc. London, Quart. Jour., vol. 51, pp. 283-284.
1895. *Porites furcata* Lamarck, Nutting, State Univ. Iowa, Lab. Nat. Hist. Bull., vol. 3, Nos. 1-2, p. 134.
1899. *Porites furcata* Lamarck, Duerden, Inst. Jamaica, Jour., vol. 2, No. 6, p. 620.
1901b. *Porites furcata* Lamarck, Verrill, Connecticut Acad. Arts Sci., Trans., vol. 11, pt. 1, art. 3, p. 158; 1901c, art. 4, p. 170.
1901b. *Porites polymorpha* Verrill *(pars)*, Connecticut Acad. Arts Sci., Trans., vol. 11, pt. 1, art. 3, p. 158. [*Fide* Vaughan, 1919, p. 499.]
1902a. *Porites porites* forma *furcata* Lamarck, Vaughan, U.S. Fish Comm., Bull., vol. 20 for 1900, pt. 2, p. 316, pl. 30; pl. 31, fig. 1.
1906. *Porites furcata* Lamarck, Bernard, Catalogue of the Madreporarian Corals in the British Museum (Natural History), vol. 6, pt. 2, pp. 5, 7, 8, 10, 11, 14, 34, 61, 64, 65, 70, 73, 82-83.
1909. *Porites porites* (Pallas) forma *furcata* Lamarck, Hartmeyer, Meereskunde Berlin, Jahrg. 3, No. 2, pp. 9, 12, pl. 1, fig. 5.
1912b. *Porites furcata* Lamarck, Vaughan, Carnegie Inst. Washington, Yearbook No. 10, p. 156, pl. 5, figs. 5c, 6c, 7-8; pl. 6, figs. 1a-1c.
1914b. *Porites furcata* Lamarck, Mayer, Carnegie Inst. Washington, Publ. No. 183, Papers Tortugas Lab., vol. 6, No. 1, p. 19.
1915c. *Porites furcata* Lamarck, Vaughan, Washington Acad. Sci., Jour., vol. 5, p. 597.
1915a. *Porites furcata* Lamarck, Vaughan, Carnegie Inst. Washington, Yearbook No. 13, pp. 224, 225.
1916a. *Porites furcata* Lamarck, Vaughan, Carnegie Inst. Washington, Yearbook No. 14, p. 228.

1916b. *Porites furcata* Lamarck, Mayer, Carnegie Inst. Washington, Yearbook No. 14, p. 212.
1916c. *Porites furcata* Lamarck, Vaughan, Nat. Acad. Sci., Proc., vol. 2, p. 95.
1918b. *Porites furcata* Lamarck, Vaughan, Carnegie Inst. Washington, Publ. No. 213, Papers Dept. Marine Biol., vol. 9, pp. 325, 326.
1918a. *Porites furcata* Lamarck, Mayer, Carnegie Inst. Washington, Publ. No. 252, Papers Tortugas Lab., vol. 12, No. 7, p. 175.
1919a. *Porites furcata* Lamarck, Vaughan, U.S. Nat. Mus., Bull. 103, No. 9, p. 499.
1924. *Porites* sp. aff. *P. furcata* Lamarck, Woodring, Brown, and Burbank, Republ. Haiti Geol. Sur., p. 178.
1927b. *Porites furcata* Lamarck, van der Horst, Bijdr. Dierk. Amsterdam, vol. 25, p. 161.
1929. *Porites furcata* Lamarck, Felix, Fossilium Catalogus. I: Animalia, pars 44, p. 614.
1932a. *Porites furcata* Lamarck, Wells, Carnegie Inst. Washington, Yearbook No. 31, p. 291.
1939. *Porites clavaria* Lamarck, Butsch, Barbados Mus. Hist. Soc., Jour., vol. 6, No. 3, p. 138, pl. 2, fig. 4.
1943. *Porites furcata* Lamarck, Smith, Florida Acad. Sci., Proc., vol. 6, No. 1, p. 43.
1944. *Porites furcata* Lamarck, Wells, Jour. Paleont., vol. 18, No. 5, p. 446.
1948. *Porites furcata* Lamarck *(pars)*, Smith, Atlantic Reef Corals, pp. 7, 66, 80-81, pl. 8.
1954. *Porites furcata* Lamarck, Fontaine, Inst. Jamaica, Ann. Rept. 1953-1954, p. 24.
1954. *Porites furcata* Lamarck, Smith, U.S. Fish and Wildlife Serv., Fish. Bull., vol. 55, No. 89, pp. 291-293.
1955. *Porites furcata* Lamarck, G. Voss and N. Voss, Bull. Marine Sci. Gulf and Caribbean, vol. 5, No. 3, p. 223.
1958b. *Porites porites furcata* Lamarck, Squires, Amer. Mus. Nat. Hist., Bull., vol. 115, art. 4, p. 251, pl. 39, fig. 1.
1958. *Porites furcata* Lamarck, Moore, Inst. Marine Sci. Univ. Texas, Publ., vol. 5, pp. 152, 154.
1959. *Porites furcata* Lamarck, T. Goreau and N. Goreau, Biol. Bull., vol. 117, No. 2, pp. 241, 242, 243, 245, 246, 248, 249.
1959. *Porites furcatus* Lamarck, Newell, Imbrie, Purdy, and Thurber, Amer. Mus. Nat. Hist., Bull., vol. 117, art. 4, p. 221.
1959b. *Porites furcata* Lamarck, Goreau, Ecology, vol. 40, pp. 70, 74, 75, 79, 85.
1959. *Porites porites* var. *furcata* Lamarck, Kornicker, Bonet, Cann and Hoskin, Inst. Marine Sci. Univ. Texas, Publ., vol. 6, pp. 17, 19.
1959. *Porites porites* forma *furcata* Lamarck, Zans, Geonotes, vol. 2, No. 1, pp. 28, 34.
1960b. *Porites furcata* Lamarck, Lewis, Canadian Jour. Zool., vol. 38, pp. 1131-1140.
1960c. *Porites furcata* Lamarck, Lewis, Barbados Mus. Nat. Hist. Soc., Jour., vol. 28, No. 1, p. 11.
1961. *Porites porites* var. *furcata*, Duarte Bello, Acuario Nac. [Cuba], Ser. Educac. No. 2, pp. 9, 68-69, figs. 57-58.
1962. *Porites furcata* Lamarck, Stoddart, Atoll Research Bull., No. 87, pp. 17, 19.
1963. *Porites porites* var. *furcata* Lamarck, Almy and Carrión-Torres, Caribbean Jour. Sci., vol. 3, Nos. 2-3, pp. 141, 149, 150, 162, pl. 9b.
1964a. *Porites furcata* Lamarck, Goreau, Science, vol. 145, No. 3630, p. 385.
1964. *Porites furcata* Lamarck, Storr, Geol. Soc. Amer., Spec. Papers, No. 79, pp. 45, 46, 74, 80, 84, 86.

1964. *Porites furcata* Lamarck *(pars)*, Roos, Studies on the Fauna of Curaçao and other Caribbean Islands, vol. 30, No. 81, p. 10.
1965. *Porites furcata* Lamarck, Kissling, Bull. Marine Sci., vol. 15, No. 3, p. 603.
1966. *Porites furcata* Lamarck, Stanley, Amer. Assoc. Petrol. Geol., Bull., vol. 50, No. 9, p. 1931, pl. 1, fig. 14.
1966 *Porites furcata?* Lamarck, Rigby and McIntire, Brigham Young Univ., Geol. Studies, vol. 13, p. 32.

The single Recent specimen consists of one irregular branch bent in the middle, broken off at the attached end, slightly dilated as well as blunted at the free end, and subcircular in cross section. The calices are shallow, pentagonal to hexagonal in outline, and joined by a common wall which is thin. The columella is represented by a tubercle or opening around which there are generally five pali. In most calices there are 12 denticulate septa, but in an occasional one there may be up to 15. The color of the corallum is a faded cream.

Measurements. — Specimen A575a: Length of branch 32.5 mm, diameter at broken end 7.5 mm, diameter at larger end 11.5 mm; diameter of calices at larger end of branch 1.29 mm to 1.57 mm; thickness of wall between calices 0.011 mm to 0.018 mm.

Locality. — Washed up on beach at Playa Grande Yachting Club, Distrito Federal. One dead specimen. Recent.

Comparisons. — Specimen A575a closely resembles the following: *Porites porites* (Pallas) illustrated by Smith (1948, pl. 10); *Porites porites* forma *furcata* Lamarck illustrated by Vaughan (1902, pl. 30; pl. 31, fig. 1); *Porites porites* var. *furcata* Lamarck illustrated by Squires (1959a, pl. 39, fig. 1); and the *Porites furcata* Lamarck illustrated by Rathbun (1888b, pl. 17, fig. 1). I would unhesitatingly identify the Venezuelan form as *Porites furcata* were it not for the fact that the free end of the branch is somewhat dilated as in *P. porites* rather than tapered to a slightly smaller diameter as it generally is in *P. furcata*. However, the calices are a little smaller than in the typical *P. porites,* and there are generally five pali instead of six as there often are in *P. porites*. In *P. clavaria* Lamarck the calices range from 1.5 to 2.0 mm in diameter, and there are also six pali. References to *P. clavaria* Lamarck prior to 1895 and a discussion of that species are given by Gregory (1895, pp. 282-284). The corallum of *P. divaricata* Lesueur is composed of thin delicate branches less than 6 mm in diameter, whereas on the Venezuelan form the diameter is 7.5 mm to 11.5 mm. In most respects, therefore, the Venezuelan specimen here described is closest to *Porites furcata* Lamarck.

Range and distribution. — The geologic range of *P. furcata* is given as Miocene to Recent. The living species has been recorded from the Bahamas to Barbados in depths of 1.5 feet to over 60 feet (10 fathoms). The localities are the following: Bahamas; Florida (Spanish Harbor off Big Pine Key, and the Tortugas); Mexico (Blanquilla and Alacran Reefs, Isla de Lobos?, and off Vera Cruz where specimens are washed up on the shingle banks of Isla Verde and Isla Sacrificios, possibly from Anegada Reef); British Honduras (Rendezvous Cay and Glover's Reef); Cuba; Jamaica; Curaçao (Spanish Water, Caracas Bay); St. Thomas; Venezuela (Puerto La Cruz); and Barbados.

The Pleistocene form of *P. furcata* has been reported from the Key Largo Limestone of Florida; from Moín Hill, Costa Rica (at *niveau* "a" of Pittier); from Mount Hope in the Panama Canal Zone; from the Dominican Republic (Barahona); and from the "West Indies and eastern Central America" (Vaughan).

In the Miocene *P. furcata* was found in the Dominican Republic by Gabb (1875), and a form resembling *P. furcata* has been reported in the Thomonde Formation of Haiti by Woodring.

Porites branneri Rathbun Pl. 10, fig. 4

1888b. *Porites branneri* Rathbun, U.S. Nat. Mus., Proc., vol. 10, pp. 355, 356, pl. 19, fig. 2.
1901a. *Porites branneri* Rathbun, Vaughan, R. Mus. Geol. Min. Leiden, Samml., ser. 2, vol. 2, pp. 76, 77.
1901b. *Porites Branneri* Rathbun, Verrill, Connecticut Acad. Arts Sci., Trans., vol. 11, pt. 1, pp. 162-163, pl. 31, figs. 6-6a.
1901c. *Porites Branneri* Rathbun, Verrill, Connecticut Acad. Arts Sci., Trans., vol. 11, pt. 1, art 4, p. 196.
1902a. *Porites branneri* Rathbun, Vaughan, U.S. Fish Comm., Bull., vol. 20 for 1900, pt. 2, p. 317.
1904. *Porites branneri* Rathbun, Greely, *in* Branner, Mus. Comp. Zool., Bull., vol. 44, Geol. Ser., vol. 7, pp. 268, 269, 270, 272.
1906. Porites Braziliensis secunda Bernard (=*Porites branneri* Rathbun), Catalogue of the Madreporarian Corals in the British Museum (Natural History), vol. 6, pp. 29, 30.
1927b. *Porites branneri* Rathbun, van der Horst, Bijdr. Dierk. Amsterdam, vol. 25, p. 161.
1948. *Porites branneri* Rathbun, Smith, Atlantic Reef Corals, pp. 60, 71, 80.
1954. *Porites branneri* Rathbun, Smith, U.S. Fish and Wildlife Serv., Fish. Bull., vol. 55, No. 89, p. 293.
1958a. *Porites branneri* Rathbun, Zans, Geol. Sur. Dept. Jamaica, W.I., Bull. No. 3, 31.

1962. *Porites branneri* Rathbun, Stoddart, Atoll Research Bull., No. 87, p. 19.
1964. *Porites branneri* Rathbun, Roos, Studies on the Fauna of Curaçao and other Caribbean Islands, vol. 20, No. 81, p. 47.
1966. *Porites branneri* Rathbun, Rigby and McIntire, Brigham Young Univ., Geol. Studies, vol. 13, pp. 29, 30, 33, 37, 38, 41.

The two specimes referred to *Porites branneri* Rathbun are fragmentary and corroded. One of the specimens is a flattened irregular cylinder open at both ends and hollow nearly throughout, and the other (C575a) a nondescript doubled-over expanse, one face of which is illustrated under figure 4 on Plate 10. The corallum is unusually porous due to the weathering effect imposed on the naturally loose and open structure. The calices are crowded, small, and shallow, polygonal in outline, and separated by a thin fenestrated wall. There are 12 granulose septa and three to six papillose pali, the pali occurring before the main septa. In a number of calices the columellar area is ringlike with a small pit in the center. Other morphologic details can not be made out because of poor preservation.

Measurements. — Specimen C575a: Corallum fragment, height 12.5 mm, width 20.2 mm; diameter of calices 0.79 mm to 1.43 mm; thickness of corallum wall 2.5 mm to 3.0 mm.

Locality. — In wall of drainage ditch near south shore of Salina de Guaiguaza, 5.6 kilometers west of Puerto Cabello, State of Carabobo. Guaiguaza Clay. Upper Pliocene. Two fragments.

Comparisons. — The porous structure, the lacelike appearance of the surface, and the small hole in the center of the columellar process are the characters differentiating *P. branneri* from other species of the *Porites porites* complex.

Range and distribution. — This is the first report of *Porites branneri* as a fossil (late Pliocene). The species is known to be living, however, in Brazil (Parahyba do Norte, Candeias Reef off Pernambuco, Natal, and Maceio Reef off Alâgoas), Curaçao (Caracas Bay), British Honduras (Pedro Bank), Mexico (Isla de Lobos), and the Bahamas.

Remarks. — As it is possible that *Porites branneri* Rathbun and *Porites porites* (Pallas) have been confused by some authors, there is listed below all of the references to *P. porites* that have come to my attention:

1758. Corallium poris stellatus Seba, Locupletissimi Rerum Naturalium Thesauri, vol. 3, p. 202, pl. 109, fig. 11.
1766. *Madrepora porites* (pars) Pallas, Elenchus Zoophytorum, p. 324.
1767. *Madrepora porites* (pars) Pallas, Linnaeus, Systema Naturae, ed. 12, pt. 2, p. 1279.
1786. *Madrepora porites* Pallas, Ellis and Solander, The Natural History of many curious and uncommon Zoophytes, p. 172, pl. 47, fig. 2.
1789. *Madrepora porites* (pars) Pallas, Esper, Die Pflanzenthiere in Abbildung nach der Natur, vol. 1, pts. 3-4, pp. 135-139, pls. 21-21a.
1791. *Madrepora porites* (pars) Pallas, Gmelin, Systema Naturae, ed. 13, pt. 6, p. 3774.
1801. *Madrepora porites* Pallas, Lamarck, Syst. Anim. sans Vert., p. 371.
1807. *Porites polymorphus* (pars) Link, Beschreibung der Naturalien-Sammlung der Universität zu Rostock, p. 163. [*Fide* Vaughan 1902b, p. 57.]
1816. *Porites clavaria* Lamarck, Hist. Nat. Anim. sans Vert., vol. 2, p. 270. [*Fide* Vaughan 1902b, p. 57.]
1820. *Madrepora porites* Pallas, Schweigger, Handbuch der Naturgeschichte, p. 413.
1853. *Madrepora porites* Pallas, Nelson, Geol. Soc. London, Quart. Jour., vol. 9, p. 211.
1888b. *Porites clavaria* Lamarck, Heilprin, Acad. Nat. Sci. Philadelphia, Proc., vol. 40, p. 306.
1895. *Porites clavaria* Lamarck, Gregory, Geol. Soc. London, Quart. Jour., vol. 51, p. 282. [*Fide* Vaughan, 1902a, p. 314.]
1901. *Porites polymorpha* Link, Verrill, Amer. Jour. Sci., ser. 4, vol. 13, p. 77.
1901b. *Porites polymorpha* Link, Verrill, Connecticut Acad. Arts Sci., Trans., vol. 11, pt. 1, art. 3, pp. 158-159, pl. 31, figs. 3-3a. [*Fide* Smith, 1948, p. 81.]
1901a. *Porites porites* (Pallas), Vaughan, R. Mus. Geol. Mineral. Leiden, Samml., vol. 2, pp. 8, 9, 10, 11, 12, 73-74.
1902b. *Porites porites* (Pallas), Spencer, Geol. Soc. London, Quart. Jour., vol. 58, p. 361.
1902a. *Porites porites* (Pallas), Vaughan, U.S. Fish Comm., Bull., vol. 20 for 1900, pp. 314-316, pl. 28.
1902a. *Porites porites* forma *clavaria* Lamarck, Vaughan, U.S. Fish Comm., Bull., vol. 20 for 1900, p. 316, pl. 29; pl. 31, fig. 2. [*Fide* Vaughan 1919a, p. 498.]
1902b. *Porites porites* (Pallas), Vaughan, Biol. Soc. Washington, Proc., vol. 15, pp. 56-58.
1906. *Porites porites* (Pallas), Bernard, Catalogue of the Madreporarian Corals in the British Museum (Natural Histry), vol. 6, pt. 2, pp. 11, 16, 31, 32, 43.
1909. *Porites porites* (Pallas) var. Vaughan, Carnegie Inst. Washington, Yearbook No. 7, p. 135.
1909. *Porites porites* (Pallas) forma *clavaria* Lamarck, Hartmeyer, Meereskunde Berlin, Jahrg. 3, No. 2, p. 9, pl. 1, fig. 4.
1912b. *Porites clavaria* Lamarck, Vaughan, Carnegie Inst. Washington, Yearbook No. 10, pp. 148, 152, 156, pl. 4, fig. c; pl. 6, figs. 3,4. [*Fide* Vaughan 1919, p. 498.]
1913. *Porites porites* (Lamarck), Brown and Pilsbry, Acad. Nat. Sci. Philadelphia, Proc., vol. 65, p. 497.
1915d. *Porites clavaria* Lamarck, Vaughan, Washington Acad. Sci., Jour., vol. 5, p. 597. [*Fide* Vaughan 1919, p. 498.]
1916a. *Porites clavaria* Lamarck, Vaughan, Carnegie Inst. Washington, Yearbook No 14, p. 228. [*Fide* Vaughan 1919, p. 498.]
1916c. *Porites clavaria* Lamarck, Vaughan, Nat. Acad. Sci., Proc., vol. 2, pp. 95, 98. [*Fide* Vaughan 1919, p. 498.]

1918b. *Porites porites* (Pallas), Vaughan, Carnegie Inst. Washington, Publ. No. 213, Papers Dept. Marine Biol., vol. 9, pp. 325, 326.
1919a. *Porites porites* (Pallas), Vaughan, U.S. Nat. Mus., Bull. 103, No. 9, pp. 498-499.
1919c. *Poriites porites* (Pallas), Vaughan, Smithsonian Inst., Ann. Rept. for 1917, p. 205, pl. 8.
1927b. *Porites porites* (Pallas), van der Horst, Bijdr. Dierk. Amsterdam, vol. 25, p. 161.
1927a. *Porites porites* (Pallas), Felix, Fossilium Catalogus. I: Animalia, pars 35, pp. 472-473.
1929. *Porites porites* (Pallas), Coryell and Ohlsen, New York Acad. Sci., Scientific Survey of Porto Rico and the Virgin Islands, vol. 3, pt. 3, pp. 230-232, pl. 44, fig. 2.
1929. *Porites porites* (Pallas), Felix, Fossilium Catalogus. I: Animalia, pars 44, p. 616.
1939. *Porites clavara ?* Lamarck, Butsch, Barbados Mus. Hist. Soc., Jour., vol 6, No. 3, p. 138, pl. 2, fig. 4.
1943. *Porites porites* (Pallas), Vaughan and Wells, Geol. Soc. Amer., Special Papers, No. 44, pp. 16, 68, 315, pl. 23, figs. 1, 1a, 2.
1948. *Porites porites* (Pallas), Smith, Atlantic Reef Corals, pp. 7, 66, 81, pls. 9, 10.
1954. *Porites porites* (Pallas), Fontaine, Inst. Jamaica, Ann. Rept. 1953-1954, p. 24.
1954. *Porites porites* (Pallas), Smith, U.S. Fish and Wildlife Serv., Fish. Bull., vol. 55, No. 89, p. 293.
1955. *Porites porites* (Pallas), G. Voss and N. Voss, Bull. Marine Sci. Gulf and Caribbean, vol. 5, No. 3, pp. 216, 223.
1956. *Porites porites* (Pallas), Ginsburg, Amer. Assoc. Petrol. Geol., Bull., vol. 40, No. 10, p. 2410.
1958b. *Porites porites* (Pallas), Squires, Amer. Mus. Nat. Hist., Bull., vol. 115, art. 4, p. 251.
1958a. *Porites porites* (Pallas), Zans, Geol. Sur. Dept. Jamaica, W.I., Bull. No. 3, p. 31.
1958b. *Porites porites* (Pallas), Zans, Geonotes, vol. 1, No. 2, p. 23.
1959. *Porites porites* (Pallas), Newell, Imbrie, Purdy, and Thurber, Amer. Mus. Nat. Hist., Bull., vol. 117, art. 4, pp. 211, 213, 215.
1959b. *Porites porites* (Pallas), Goreau, Ecology, vol. 40, pp. 70, 73, 74, 75, 76, 81, 85.
1959. *Porites porites* (Pallas), T. Goreau and N. Goreau, Biol. Bull., vol. 117, No. 2, pp. 242, 243, 248.
1960a. *Porites porites* (Pallas), Lewis, Canadian Jour. Zool., vol. 38, No. 2, pp. 1134, 1135, 1136, 1137, 1138, 1139, 1140, 1144, pl. 3, fig. 6; pl. 4, fig. 9; pl. 7, fig. 14.
1960c. *Porites porites* (Pallas), Lewis, Barbados Mus. Nat. Hist. Soc., Jour., vol. 28, No. 1, p. 11.
1962. *Porites porites* (Pallas), Kornicker and Boyd, Amer. Assoc. Petrol. Geol., Bull., vol. 46, No. 5, pp. 645, 651, 655, 657, 660, 662, 670, figs. 9, 16(7), 20, 22.
1962. *Porites porites* (Pallas), Stoddart, Atoll Research Bull., No. 87, pp. 17, 19, 20, 24, 25, 26, 27, figs. 11-12.
1963. *Porites porites* (Pallas), Almy and Carrión-Torres, Caribbean Jour. Sci., vol. 3, Nos. 2-3, pp. 136, 137, 139, 142, 149, 162.
1963. *Porites porites* (Pallas), Shinn, Jour. Sed. Petrol., vol. 33, No. 2, p. 300.
1963. *Porites porites* (Pallas), J. A. Jones, Bull. Marine Sci. Gulf and Caribbean, vol. 13, No. 2, pp. 282, 284.

1964. *Porites porites* (Pallas), Roos, Studies on the Fauna of Curaçao and other Caribbean Islands, vol. 20, No. 81, pp. 10, 23, 24, 26, 27, 28, 29, 30, 31, 33, 35, 38, 41, 42, 45, 47.
1964. *Porites porites* (Pallas), Storr, Geol. Soc. Amer., Spec. Papers, No. 79, pp. 38, 45, 46, 60, 72, 74, pl. 3 figs. 1, 2.
1965. *Porites porites* (Pallas), Kissling, Bull. Marine Sci., vol. 15, No. 3, pp. 603, 605, 608, 610, fig. 6A.
1966. *Porites porites* (Pallas), Stanley, Amer. Assoc. Petrol. Geol., Bull., vol. 50, No. 9, pp. 1931, 1938, pl. 1, fig. 6.
1966. *Porites porites* (Pallas), Rigby and McIntire, Brigham Young Univ., Geol. Studies, vol. 13, pp. 28, 30.
1967. *Porites porites* (Pallas) Mesolella, Science, vol. 156, No. 3775, p. 639.

The range of *Porites porites* (Pallas) is given by authors as Miocene to Recent. The Miocene occurrence is in the La Cruz Marl near Santiago, Cuba (Vaughan). In the Pleistocene, the species has been found in the Key Largo Limestone of Florida, in the Isthmus of Panama (Black Swamp, near Mt. Hope), and in low-level reefs of Curaçao and Barbados. The living *P. porites* is recorded from Bermuda, the Bahamas (Bimini), Florida (Spanish Harbor, Key Largo, the Tortugas), Mexico (Vera Cruz, Isla de Lobos, and Alacran Reef), British Honduras (Rendezvous Cay, Turneffe, Lighthouse Reef, Glover's Reef), Jamaica (Lime Cay, Rockham Cay, and Ocho Rios Reef where it occurs in the back reef, lagoon, reef crest, and seward slope), Puerto Rico, Curaçao (Piscadera Baai, Spaansche Water, St. Michiels Baai, Kaap Malmeeuw, Awa di Oostpunt, and Caracas Bay), and Barbados (along the west coast).

A synonymy of *P. porites* (Pallas) by Coryell and Ohlsen (1929) includes the following: *P. polymorphus* Link, *P. clavaria* Lamarck, *P. flexuosa* Dana, *P. flabelliformis* Lesueur, *P. solanderi* Duchassaing and Michelotti, *P. plumieri* Duchassaing and Michelotti, *P. macrocephala* Duchassaing and Michelotti, *P. recta* Lesueur, *P. valida* Duchassaing and Michelotti, *P. nodifera* Klunzinger.

Diploria strigosa (Dana) Pl. 6, figs. 3-5; Pl. 7, figs. 1-4

1846. *Meandrina strigosa* Dana, U.S. Exploring Exped., Zoophytes, vol. 7, pp. 257-258, pl. 14, figs. 4a-4b.
1849. *Meandrina heterogyra, M. sinuosissima, M. crassa,* Milne Edwards and Haime, Ann. Sci. Nat., sér. 3, vol. 11, pp. 281-282. [*Fide* Vaughan 1919, p. 420.]
1857. *Meandrina heterogyra, M. sinuosissima, M. crassa,* Milne Edwards and Haime, Histoire Naturelle des Coralliaires, vol. 2, pp. 392-394.
1859. *Meandrina strigosa* Dana, Dana, Synopsis Rept. Zoophytes U.S. Exploring Expedition, p. 37.
1861. *?Leptoria hieroglyphica, M. fragilis,* Duchassaing and Michelotti, R.

Accad. Sci. Nat. Torino, Mem., ser. 2, vol. 19, p. 351. [*Fide* Vaughan 1901, p. 51.]
1864a. *Macandrina sinuosissima* M. E. and H., Duncan, Geol. Soc. London, Quart. Jour., vol. 20, pp. 22, 36.
1864b. *Macandrina strigosa* (Dana), Verrill, Mus. Comp. Zool., Bull., vol. 1, No. 3, p. 49.
1866. *Meandrina serrata, M. heterogyra, M. sinuosissima,* Duchassaing and Michelotti, R. Accad. Sci. Nat. Torino, Mem., ser. 2, vol. 23, p. 175.
1866. *?Leptoria hieroglyphica* Duchassaing and Michelotti, R. Accad. Sci. Nat. Torino, Mem., ser. 2, vol. 23, p. 176.
1868d. *Macandrina siuosissima* M. E. and H., Duncan, Geol. Soc. London, Quart. Jour., vol. 24, p. 24.
1870. *Meandrina serrata, M. heterogyra,* and *M. sinuosissima; ?Leptoria hieroglyphica, L. fragilis,* Duchassaing, Revue des Zoophytes et des Spongiaires des Antilles, p. 29.
1871. *Macandrina strigosa* Dana, Pourtalès, Mus. Comp. Zool., Mem., vol. 2, No. 4, p. 74.
1875. *Meandrina strigosa* Duncan, Pourtalès *in* Gabb, Geol. Mag., decade 2, vol. 2, p. 545.
1877. *Macandrina sinuosissima, ?M. filograna* Lindström, K. Svenska Vetensk.-Akad. Stockholm, Handl., vol. 14, No. 6, p. 22. [*Fide* Vaughan 1901, p. 52.]
1877c. *Macandrina strigosa* Dana, Arango y Molina, R. Acad. Cienc. Méd., Fís. y Nat. Habana, An., vol. 14, p. 277.
1880. *Macandrina strigosa* Dana, Pourtalès *in* Agassiz, Mus. Comp. Zool., Mem., vol. 7, No. 1, pl. 9, figs. 6-9.
1886. *Macandrina strigosa* Dana, Quelch, Voyage of H.M.S. Challenger, Rept. Sci. Results, Zoology, vol. 16, pt. 46, pp. 10, 92-94.
1888b. *Macandrina strigosa* Dana, Heilprin, Acad. Nat. Sci. Philadelphia, Proc., vol. 40, p. 306.
1889. *Macandrina strigosa* Dana, Murray and Irvine, Roy. Sci. Edinburgh, Proc., vol. 17, p. 109.
1890. *Macandrina strigosa* Dana, Heilprin, Acad. Nat. Sci. Philadelphia, Proc., vol. 42, p. 306.
1890. *Macandrina labyrinthica* Ortmann, Zeitschr. Wiss. Zool. Leipzig, vol. 50, p. 301. [*Fide* Vaughan, 1901, p. 52.]
1895. *Macandrina filograna* (Esper), Gregory, Geol. Soc. London, Quart. Jour., vol. 51, pp. 265-266. [*Fide* Vaughan 1901, p. 52.]
1898. *Macandrina filograna* (Esper), Vaughan *in* Hill, Mus. Comp. Zool., Bull., vol. 28, No. 5, p. 275.
1901b. *Macandrina cerebrum* (Ellis and Solander), Verrill, Connecticut Acad. Arts Sci., Trans., vol. 11, pt. 1, art. 3, pp. 74-78, pl. 10, fig. 4; pl. 12, fig. 4; pl. 14, figs. 4-5.
1901a. *Platygira viridis* (Lesueur), Vaughan, R. Mus. Geol. Min. Leiden, Samml., ser. 2, vol. 2, No. 1, pp. 51-57.
1902. *Macandra cerebrum* (Ellis and Solander), Verrill, Connecticut Acad. Arts Sci., Trans., vol. 11, pt. 2, art. 10, p. 484.
1902. *Platygira viridis* (Lesueur), Vaughan, U.S. Fish Comm., Bull., vol. 20 for 1900, pp. 306-308, pls. 9-13.
1902d. *Macandrina labyrinthica* (Ellis and Solander), Duerden, Nat. Acad. Sci. Washington, Mem., vol. 8, pp. 582-585, pls. 20-22, figs. 138-147.
1907. *Macandra cerebrum* (Ellis and Solander), Verrill, Connecticut Acad. Arts Sci., Trans., vol. 12, art. 2, p. 169.
1915d. *Macandrina strigosa* Dana, Vaughan, Washington Acad. Sci., Jour., vol. 5, No. 17, p. 596.
1915. *Macandrina strigosa* Dana, Vaughan, Carnegie Inst. Washington, Yearbook No. 13, pp. 224-225.

1916. *Macandrina strigosa* Dana, Vaughan, Carnegie Inst. Washington, Yearbook No. 14, p. 227.
1918b. *Macandrina strigosa* Dana, Vaughan, Carnegie Inst. Washington, Publ. No. 213, Papers Dept. Marine Biol., vol. 9, p. 326.
1919a. *Macandrina strigosa* Dana, Vaughan, U.S. Nat. Mus., Bull. 103, No. 9, p. 420.
1927b. *Macandra strigosa* (Dana), van der Horst, Bijdr. Dierk. Amsterdam, vol. 25, p. 160.
1928. *Macandrina cerebrum* (Ellis and Solander), Matthai, Catologue of the Madreporarian Corals in the British Museum (Natural History), vol. 7, pp. 55-63, pl. 8, figs. 7-8; pl. 9, figs. 1-9; pl. 11, fig. 4; pl. 34, fig. 2; pl. 46, fig. 1; pl. 48, figs. 2-3; pl. 50, fig. 2; pl. 55, fig. 18.
1929. *Macandra strigosa* (Dana), Felix, Fossilium Catalogus. I: Animalia, pars 44, pp. 538-540.
1932a. *Macandra strigosa* (Dana), Wells, Carnegie Inst. Washington, Yearbook No. 31, p. 291.
1943. *Diplora strigosa* (Dana), Smith, Florida Acad. Sci., Proc., vol. 6, No. 1, p. 45.
1943. *Diploria strigosa* (Dana), Vaughan and Wells, Geol. Soc. Amer., Special Papers, No. 44, pp. 169, 319, pl. 27, fig. 1.
1944. *Diploria strigosa* (Dana), Wells, Jour. Paleont., vol. 18, No. 5, p. 446.
1948. *Diploria strigosa* (Dana), Smith, Atlantic Reef Corals, pp. 61, 70, 84-85, pl. 17.
1954. *Diploria strigosa* (Dana), Fontaine, Inst. Jamaica, Ann. Rept. 1953-1954, p. 24.
1954. *Diploria strigosa* (Dana), Smith, U.S. Fish and Wildlife Serv., Fish Bull., vol. 55, No. 89, p. 293.
1956. *Diploria strigosa* (Dana), Parker and Curray, Amer. Assoc. Petrol. Geol., Bull., vol. 40, No. 10, p. 2434.
1956a. *Diploria strigosa* (Dana), Wells, Treatise on Invertebrate Paleontology, F (Coelenterata), pp. F348, F402, figs. 248B, 295, 5b.
1957. *Diploria strigosa* (Dana), Newell and Rigby, Soc. Econ. Paleont. Mineral., Spec. Publ., No. 5, p. 58.
1958b. *Diploria strigosa* (Dana), Squires, Amer. Mus. Nat. Hist., Bull., vol. 115, art. 4, pp. 253-254, pl. 42, fig. 1.
1958. *Diploria strigosa* (Dana), Moore, Inst. Marine Sci. Univ. Texas, Publ., vol. 5, pp. 152-154.
1958a. *Diploria strigosa* (Dana), Zans, Geol. Sur. Dept. Jamaica, W. I., Bull., No. 3, pp. 15, 32.
1958b. *Diploria strigosa* (Dana), Zans, Geonotes, vol. 1, No. 2, p. 23.
1959. *Diploria strigosa* (Dana), T. Goreau and N. Goreau, Biol. Bull., vol. 117, No. 2, pp. 242, 243.
1959. *Diploria strigosa* (Dana), Newell, Imbrie, Purdy and Thurber, Amer. Mus. Nat. Hist., Bull., vol. 117, art. 4, pp. 211, 215.
1959b. *Diploria strigosa* (Dana), Goreau, Ecology, vol. 40, No. 1, pp. 70, 73, 74, 75, 76, 79, 81, 85.
1959. *Diploria strigosa* (Dana), Kornicker, Bonet, Cann and Hoskin, Inst. Marine Sci. Univ. Texas, Publ., vol. 6, p. 19.
1959. *Diploria strigosa* (Dana), Zans, Geonotes, vol. 2, No. 1, pp. 28, 32.
1960b. *Diploria strigosa* (Dana), Lewis, Canadian Jour. Zool., vol. 38, No. 6, pp. 1134, 1136, 1137, 1138, 1139, 1140, 1142, 1144.
1960c. *Diploria strigosa* (Dana), Lewis, Barbados Mus. and Nat. Hist. Soc., Jour., vol. 28, No. 1, p. 11.
1961. *Diploria strigosa* (Dana), Duarte Bello, Acuario Nac. [Cuba], Ser. Educac. No. 2, pp. 9, 34-35, figs. 23, 24.
1961. *Diploria strigosa* (Dana), Westermann and Kiel, Natuurwetensch. Studiekr. Suriname en Nederlandse Antillen, No. 24, p. 136.

1961. *Diploria strigosa* (Dana), Carr and Thorpe, From the Cam to the Cays, pl. facing p. 81.
1962. *Diploria strigosa* (Dana), Kornicker and Boyd, Amer. Assoc. Petrol. Geol., Bull., vol. 46, No. 5, pp. 648, 655, 656, 662, 668, figs. 7, 16(1), table 3.
1962. *Diploria strigosa* (Dana) Stoddart, Atoll Research Bull., No. 87, pp. 17, 19, 20, 23, 24, 28, fig. 12.
1962. *Diploria strigosa* (Dana), Kornicker and Squires, Limnol. and Oceanogr., vol. 7, No. 4, p. 449.
1963. *Diploria strigosa* (Dana), Almy and Carrión-Torres, Caribbean Jour. Sci., vol. 3, Nos. 2-3, pp. 139, 141, 142, 151, 161, pl. 10b2.
1964. *Diploria strigosa* (Dana), Storr, Geol. Soc. Amer., Special Papers, No. 79, pp. 45, 46, 60, 69, 74, 82, 86.
1964. *Diploria strigosa* (Dana), Roos, Studies on the Fauna of Curaçao and other Caribbean Islands, vol. 20, No. 81, pp. 11, 35, pl. 5b(2).
1964. *Diploria strigosa* (Dana), Rivero, Geos. No. 11, p. 113.
1964. *Diploria strigosa* (Dana), Goreau, Science, vol. 145, No. 3630, p. 385.
1964. *Diploria strigosa* (Dana), Buisonjé, K. Nederland. Akad. Wetensch., Proc., ser. B, vol. 67, No. 1, p. 64.
1966. *Diploria strigosa* (Dana), Stanley, Amer. Assoc. Petrol. Geol., Bull., vol. 50, No. 9, pp. 1929, 1930, 1931, 1937, pl. 1, fig. 2.
1966. *Diploria strigosa* (Dana), Rigby and McIntire, Brigham Young Univ., Geol. Studies, vol. 13, pp. 3, 22, 31, 33, 34, 35, 39, 40, 41, 43, 44, 45, pl. 7, fig. 4; pl. 8, fig. 1.
1967. *Diploria strigosa* (Dana), Mesolella, Science, vol. 156, No. 3775, p. 638.

Two bleached Recent fragments of this species were collected on the beach, three badly corroded and oxidized fragments were collected from the Abisinia Formation (Pleistocene), and one complete corallum was found loose on the surface of the Playa Grande formation (Pliocene). The best preserved specimen of the lot is the last-mentioned (N565a), and the corallum of that is a thick, rounded-oblong disk, gently and evenly convex in profile, and light brown in color. The upper and lower surfaces of the corallum are marked by sinuous, discontinuous, and occasionally elongated valleys that are generally interconnected but in some places closed off at one end by the colline. The valleys range from 3.5 mm to 9 mm in width, taking into consideration all of the specimens available and range from 4 mm to 5 mm in depth. The collines are worn down on most of the specimens, and are subacute to flattish, with a thickness of 1.5 to 2 mm. The septa are exsert, and as they are arched over the colline on one of the Recent specimens (A565a), it is inferred that this is their normal disposition on unweathered coralla. The number and arrangement of the septa are variable — 12 to 21 per centimeter, the highest number obtaining where there is a regular alternation of primary and secondary septa, the lowest where no secondary septa can be seen.

On specimen N565a there is an average of 16 septa to the centimeter, or 32 on both sides of the colline, and this indicates that there is not a full complement of secondary septa. The paliform lobes of the primary septa are well developed. The summit or inner margin of the primary septa is serrated by irregularly spaced pairs of short laterally directed spines (as many as ten pairs and as few as four), and the sides of the septa are studded with small scattered granulations. The columella consists of closely twisted trabeculae.

Measurements. — Specimen A565a: corallum fragment, length 25 mm, width 14 mm; collines narrowly grooved toward the edge of the corallum; width of valleys 3.5 mm to 5 mm, average depth of valleys 4 mm; septa per centimeter 21. Specimen A565b: corallum fragment, length 32 mm, width 24 mm; septa per centimeter 12-15. Specimen D565: average number of septa per centimeter 13. Specimen N565a: corallum length 120 mm, width 80 mm, thickness 30 mm; collines not grooved on superior surface, grooved in a number of places on the inferior surface; width of valleys 4.5 mm to 9 mm, average about 5.5 mm; depth of valleys 4 mm - 5 mm; average number of septa per centimeter 16.

Localities. — Recent, on beach at Playa Grande Yachting Club, Distrito Federal. Two fragments. Abisinia Formation, eastern edge of Playa Grande village at W-30. Three poorly preserved fragments. Playa Grande Formation (Catia Member) in the vicinity of W-21, north flank of Litoral anticline. One corallum.

Remarks. — Of the three well-known tropical American species of *Diplora* — *D. strigosa* (Dana), *D. labyrinthiformis* (Linnaeus), and *D. clivosa* (Ellis and Solander) — the Cabo Blanco forms, both Recent and fossil, seem closest to *D. strigosa*. The widespread *D. labyrinthiformis* is differentiated from *D. strigosa* by the prominent longitudinal depression along the colline, and *D. clivosa* is distinguished from *D. strigosa* by the large gibbosities of the corallum and by its relatively narrow valleys.

Remarks and distribution. — The finding of *D. strigosa* in the Cabo Blanco area extends the range of the species back to the Pliocene and adds a new Pleistocene and Recent locality.

Diploria strigosa (Dana) has hitherto been known from the Quaternary only. Pleistocene occurrences are in the Bahamas (Fresh Creek fossil reef); Florida (Key Largo Limestone); Costa

Rica (Monkey Point in slightly elevated reefs); Santo Domingo; St. Eustatius (White Wall); Curaçao (Westpunt); Aruba (Daimarie); Bonaire (Fontein); and Barbados. The living species has been reported from Bermuda; the Bahamas (2.5 fathoms and over off Rabbit Cay); south of the Louisiana coast (East Flower Garden Bank); Florida (Miami area and Tortugas); Mexico (Alacran and Blanquilla Reefs, Vera Cruz, Isla de Lobos); British Honduras (Rendezvous Cay, Turneffe, Lighthouse and Glover's Reefs, Pedro Bank); Cuba; Jamaica (shallow water); Haiti; Puerto Rico; Antigua; St. Thomas; Curaçao (Sta. Martha Baai, St. Michiels Baai, Caracas Bay, Spanish Water, Spanish Port); Venezuela (Puerto La Cruz); and Barbados.

Manicina areolata puntagordensis, new subspecies

Pl. 4, fig. 5; Pl. 5, figs. 1-5; Pl. 12, fig. 4

The corallum is heavy, hemispherical, subovate in outline. The calicular or upper surface is convex and strongly ridged. The noncalicular or basal surface is flat and nearly entirely veneered by a thin epitheca of calcium carbonate in concentric rings, the epitheca encroaching locally on the sides of the corallum a short distance above the base. Near the center of the lower surface is a peduncular scar representing the vestige of a short stalk or attachment area. There are 12 or 13 nonperforate exsert septa to the centimeter, or 24 to 26 on both sides of the colline. Most or all of the septa meet at the columella which is relatively thin, continuous, compressed, more or less laminar, and elevated a millimeter or so above the trough of the valley floor. Intercalated between some of the primary septa is a thin secondary septum, and there are three or four of the latter per centimeter. All of the septa continue over the colline but only the principal ones abut against the columella where they are a little curved. The summit of the septa is marked by a row of paired pointed denticles directed laterally, and there are about 35 subequally spaced pairs on a septum 13 mm. in length from the columella to the edge of the colline. The sides of the septa are granulated by regular rows of small beads. The costae are about one millimeter apart. The valleys are wide and V-shaped, and the slopes are longer and straighter on one side, shorter and more sinuous on the other. The longer valleys tend to narrow on the lateral slope of the corallum. The troughs of the valleys are accentuated by the thin, vertically projecting columellar walls which unite with the columellas of adjacent valleys to form sharply truncate and angular enclosures at their head. However, on the lower side of the corallum most of the valleys seem to be open-ended. The overall slope of the valleys ranges from an extreme of roughly 20 degrees on one slope to an extreme of about 60 degrees on the other. The colline is narrow and single a short distance above the base of the corallum, but as it continues to the top of the calicular surface it broadens markedly and becomes gently bipartite or grooved.

Measurements. — Holotype (S566a): Corallum length 119 mm, width 92 mm, thickness 63 mm; width of colline 1 mm (and ungrooved) on side near base increasing to 5 mm (and grooved) near end of ridge on top of calicular surface; width of valley near head 13 to 15 mm, near base of corallum 7 to 10 mm; average height of colline on top of corallum 11-12 mm; length of septa from columella to crest of colline 9 to 13 mm.

Locality. — North flank of Punta Gorda anticline at W-23 near *Lithothamnium* reef. One specimen, the holotype. Playa Grande Formation (Maiquetía Member).

Comparisons. — It should be noted, in reading the description and comparing the illustrations of the Venezuelan fossil under discussion, that the subdued septa, the V-shaped valleys, and the unequal smooth slopes of the valleys are due to corrosion, and that if well-preserved specimens were available these particular features would resemble those of *Manicina areolata* (Linnaeus), *Manicina gyrosa* (Ellis and Solander), and *Manicina mayori* Wells. (The last named — *M. mayori* — is now believed by Dr. Wells to be the same as *M. areolata* (Linnaeus) but much larger in size and somewhat different in shape). What does seem, however, to be an inherent character of the Venezuelan fossil is the elevated, solid, compressed, and continuous columella and the sharp angles made by convergent columellas at the heads of the valleys as contrasted with the lower, broader, and more trabecular columella and the more rounded valley-heads of the *M. areolata* complex. The new subspecies then differs from *M. areolata* in its prominent and more or less laminar columella.

The Venezuelan specimen resembles certain Recent specimens of *Mancina mayori* in the collections at Cornell University and the

United States National Museum, but is particularly close to the illustration by Matthai (1928, p. 94, pl. 63, fig. 6) of *Mancina gyrosa* (Ellis and Solander). The latter is Ehrenberg's worn example "(Reg. No. 2859), without locality." The difference is in the angulation of the convergent valley-heads which is not nearly so sharp as on the Venezuelan form, nor is the columella as salient and as solid as on the Venezuelan form.

As *Manicina mayori* is now believed to be the same as *M. areolata,* as some authors would place *M. mayori* in synonymy with *M. gyrosa,* and as *M. areolata* is the oldest name of the complex, the new subspecific name of *puntagordensis* is applied to *Manicina areolata.*

The references that I have been able to find concerning *Manicina areolata* (Linnaeus) are listed below:

1758. *Madrepora areolata (pars)* Linnaeus, Systema Naturae, ed. 10, p. 795.
1766. *Madrepora areolata (pars)* Linnaeus, Pallas, Elenchus Zoophytorum, pp. 295-296.
1767. *Madrepora areola (pars)* Linnaeus, Systema Naturae, ed. 12, pt. 2, p. 1274.
1786. *Madrepora areolata* Linnaeus, Ellis and Solander, Natural History of Zoophytes, p. 161, pl. 47, figs. 4-5. [*Non* fig. 4, *fide* Gregory, 1895, p. 264.]
1788. *Madrepora areola* Linnaeus, Esper, Die Pflanzenthiere, vol. 1, pp. 84-87, pl. 4, figs. 1-2; pl. 5, figs. 1-4.
1791. *Madrepora areola* Linnaeus, Gmelin, Systema Naturae, ed. 13, pt. 6, p. 3761.
1807. *Maeandrina areola* (Gmelin), Link, Beschreibung der Naturalien-Sammlungen der Universität zu Rostok, pt. 3, p. 162.
1807. *Maeandrina areola* (Linnaeus), Fischer von Waldheim, Muséum Demidoff, vol. 3, p. 298.
1815. *Maeandra areola* (Linnaeus), Oken, Lehrbuch der Naturgeschichte, vol. 1, p. 70.
1816. *Maeandrina areolata* (Linnaeus), Lamarck, Hist. nat. Anim. sans Vert., vol. 2, p. 247.
1821. *Maeandrina areolata* (Linnaeus), Lesueur, Mus. Nat. Hist. nat. Paris, Mém., vol. 6, pp. 283-285, pl. 16, fig. 11.
1821. *Maeandrina areolata* (Linnaeus), Lamouroux, Exposition Méthodique, p. 55, pl. 47, figs. 4, 5.
1823. *Maeandrina areolata* (Linnaeus), Blainville, Dictionnaire des Sciences Naturelles, vol. 29, p. 357.
1827. *Maeandrina areolata* (Linnaeus), Deslongchamps, Encyclopédie Méthodique, Zoophytes, pt. 2, p. 508.
1830. *Maeandrina areolata* (Linnaeus), Blainville, Dictionnaire des Sciences Naturelles, vol. 60, p. 323.
1834. *Maeandrina areolata* (Linnaeus), Blainville, Manuel d'Actinologie ou de Zoophytologie, p. 357.
1834. *Manicina areolata* (Linnaeus), Ehrenberg, K. Akad. Wiss. Berlin, Phys. Abhandl. f. 1832, p. 327.
1834. *Manicina hispida, M. praerupta, M. manica,* Ehrenberg, K. Akad. Wiss. Berlin, Phys. Abhandl. f. 1832, p. 327.

1836. *Maeandrina areolata* (Linnaeus), Lamarck, Hist. nat. Anim. sans Vert., ed. 2, vol. 2, p. 388.
1841. *Manicina areolata* (Linnaeus), Leuckart, Observationes Zoologicas de Zoophytis Coralliis, p. 61, pl. 3, figs. 3-4. [From Gregory, 1895, p. 265.]
1846. *Manicina areolata* (Linnaeus), *M. hispida* Ehrenberg, *M. praerupta* Ehrenberg, *M. dilatata* Dana, Dana, U. S. Exploring Exped., Zoophytes, vol. 7, pp. 191-194, pl. 9, fig. 3.
1847. *Manicina areolata* (Linnaeus), Duchassaing, Soc. Géol. France, Bull., sér. 2, vol. 4, p. 1095.
1848b. *Manicina areolata* (Linnaeus), Edwards and Haime, Acad. Sci. Paris, C. R., vol. 27, p. 493.
1849. *Manicina areolata* (Linnaeus), *M. valenciennesii*, *M. crispata*, *M. sebacana*, *M. strigilis* Edwards and Haime, Ann. Sci. Nat. Paris, sér. 3, vol. 11, pp. 286-288.
1851. *Manicina areolata* (Linnaeus), *M. hisipida* Edwards and Haime, Mus. Nat. Hist. nat. Paris, Arch., vol. 5, p. 91.
1855. *Manicina areolata* (Linnaeus), Duchassaing, Soc. Géol. France, Bull., sér. 2, vol. 12, p. 756.
1857. *Manicina areolata* (Linnaeus), *M. strigilis*, *M. crispata*, *M. valenciennesi*, *M. hispida* Edwards and Haime, Historie naturelle des Coralliaires, vol. 2, pp. 397-401.
1861. *Manicina areolata* (Linnaeus), *M. dilatata* Dana, *M. valenciennesi* Edwards and Haime, *M. crispata* and *M. danai* Duchassaing and Michelotti, R. Acad. Sci. Torino, Mem., ser. 2, vol. 19, p. 350.
1864b. *Manicina areolata* (Linnaeus), Verrill, Mus. Comp. Zool., Bull., vol. 1, No. 3, p. 48.
1866. *Manicina areolata* (Linnaeus), *M. crispata* and *M. valenciennesi* Edwards and Haime, and *M. danai* Duchassaing and Michelotti, R. Acad. Sci. Torino, Mem. ser. 2, vol. 23, p. 176.
1868d. *Manicina areolata* (Linnaeus), Duncan, Geol. Soc. London, Quart. Jour., vol. 24, pp. 16, 23.
1871. *Manicina areolata* Ehrenberg, Pourtalès, Mus. Comp. Zool., Mem., vol. 2, No. 4, p. 72.
1873c. *Manicina areolata* (Linnaeus,) Duncan, Geol. Soc. London, Quart. Jour., vol. 29, pp. 555, 561, 562.
1875. *Manicina areolata* Ehrenberg, Pourtalès *in* Gabb, Geol. Mag., decade 2, vol. 2, p. 545.
1879. *Manacina areolata* (Linnaeus), Dana, Corals and Coral Islands, ed. 2. p. 380.
1880b. *Manicina areolata* Ehrenberg, Pourtalès, Mus. Comp. Zool., Mem., vol. 7, No. 1, pls. 5, 6.
1886. *Manicina areolata* (Linnaeus), Quelch, Voyage H.M.S. Challenger, Rept. Sci. Results, Zoology, vol. 16, pt. 46, pp. 11, 12, 13, 34, 35, 36, 77, 90, 91.
1888. *Manicina areolata* (Linnaeus), Ortmann, Zool. Jahrb., Syst., vol. 3, p. 171.
1888. *Maeandrina areolata* (Linnaeus), Agassiz, Mus. Comp. Zool., Bull., vol. 14, I, p. 82.
1888b. *Manicina areolata* (Linnaeus), Wilson, Jour. Morph., vol. 2, No. 2, pp. 191-252, pls. 1-7.
1890. *Manicina areolata* (Linnaeus), Ortmann, Zeitschr. f. Wissensch. Zool., vol. 50, pt. 2, p. 305.
1895. *Manicina areolata* (Linnaeus), Gregory, Geol. Soc. London, Quart. Jour., vol. 51, pp. 264, 265.
1895. *Manicina pliocenica* Gane, Johns Hopkins Univ. Circ., vol. 15, No. 121, p. 10.

1899. *Manicina areolata* (Linnaeus), Duerden, Inst. Jamaica, Jour., vol. 2, No. 6, p. 621.
1899. *Manicina areolata* (Linnaeus), Guppy, Victoria Inst. Trinidad, Proc., vol. 3, p. 169.
1900. *Manicina areolata* (Linnaeus), Vaughan, U.S. Geol. Sur., Mon. 39, pp. 38-40, 48, 210, pl. 1, figs. 2, 3.
1900. *Manicina pliocenica* Gane, Gane, U.S. Nat. Mus., Proc., vol. 22, No. 1193, pp. 192, 193.
1901b. *Manicina areolata* (Linnaeus), Verrill, Connecticut Acad. Arts Sci., Trans., vol. 11, pt. 1, art. 3, pp. 66, 81-83, 183.
1901b. *Maeandra areolata* (Linnaeus), varieties *M. hispida* Edwards and Haime, *M. confertifolia, M. laxifolia,* and *M. columellaris* Verrill, Connecticut Acad. Arts Sci., Trans., vol. 11, pt. 1, art. 3, pp. 81-84, pl. 11, figs. 1, 2; pl. 12, figs. 1-3. [*Fide* Matthai 1928, p 81.]
1901a. *Manicina areolata* (Linnaeus), Vaughan, R. Mus. Geol. Min., Samml., ser. 2, vol. 2, p. 13.
1902d. *Manicina areolata* (Linnaeus), Duerden, Nat. Acad. Sci., Washington, Mem., vol. 8, pp. 502-508, 520, 577-579, figs. 13a-e, 14a-c, pls. 18, 19, figs. 129-137.
1902a. *Manicina areolata* (Linnaeus), Vaughan, U.S. Fish Comm., Bull., vol. 20 for 1900, pt. 2, pp. 291, 305, pl. 4, figs. 2, 3.
1904b. *Manicina areolata* (Linnaeus), Duerden, Carnegie Inst. Washington, Publ. No. 20, pp. 3, 8, 57, 68, 92.
1909. *Manicina areolata* (Linnaeus), Hartmeyer, Meereskunde Berlin, Jahrg. 3, No. 2, pp. 12, 13, figs. 1-2.
1912b. *Maeandra areolata* (Linnaeus), Vaughan, Carnegie Inst. Washington, Yearbook No. 10, p. 156, pl. 4, figs. 5-6; pl. 5, figs. 1-4.
1913. *Maeandra areolata* (Linnaeus), Mayer, Carnegie Inst. Washington, Yearbook No. 11, p. 126.
1913. *Manicina areolata* (Linnaeus), Brown and Pilsbry, Acad. Nat. Sci. Philadelphia, Proc., vol. 65, p. 497.
1914b. *Maeandra areolata* (Linnaeus), Mayer, Carnegie Inst. Washington, Publ. No. 183, Papers Tortugas Lab., vol. 6, No. 1, pp. 19, 20.
1915a. *Maeandra areolata* (Linnaeus), Vaughan, Carnegie Inst. Washington, Yearbook No. 13, pp. 224, 225.
1915d. *Maeandra areolata* (Linnaeus), Vaughan, Washington Acad. Sci., Jour., vol. 5, No. 17, p. 596.
1916a. *Maeandra areolata* (Linnaeus), Vaughan, Carnegie Inst. Washington, Yearbook No. 14, p. 225, 227.
1916c. *Maeandra areolata* (Linnaeus), Mayer, Carnegie Inst. Washington, Yearbook No. 14, p. 212.
1916. *Maeandra areolata* (Linnaeus), Vaughan, Nat. Acad. Sci., Proc., vol. 2, pp. 95, 98, 100.
1918a. *Maeandra areolata* (Linnaeus), Mayer, Carnegie Inst. Washington, Publ. No. 252, Papers Dept. Marine Biol., vol. 12, No. 7, p. 175.
1918b. *Maeandra areolata* (Linnaeus), Vaughan, Carnegie Inst. Washington, Publ. No. 213, Papers Dept. Marine Biol., vol. 9, pp. 325, 326.
1919a. *Manicina areolata* (Linnaeus), Vaughan, U.S. Nat. Mus., Bull. 103, No. 9, pp. 214, 215, 225, 419.
1924b. *Manicina areolata* (Linnaeus), Matthai, Indian Mus. Calcutta, Mem., vol. 8, p. 26.
1925c. *Maeandra areolata* (Linnaeus), Boschma, Carnegie Inst. Washington, Yearbook No. 24, pp. 223. 224.
1926a. *Manicina areolata* (Linnaeus), Matthai, Roy. Soc. London, Philos. Trans., ser. B, vol. 214, pl. 26, figs. 1, 2; pl. 27, figs. 15, 16, 18-19; pl. 28, figs. 1-3.

1927b. *Macandra areolata* (Linnaeus), van der Horst, Bijdr. Dierk. Amsterdam, vol. 25, p. 160.
1928. *Manicina areolata* (Linnaeus), Matthai, Catologue of the Madreporarian Corals in the British Museum (Natural History), vol. 7, pp. 8, 15, 55, 80-91, 92, 97, 99, 104, 108, 109, 160, 162, 167, 168, pl. 20, figs. 1-10; pl. 21, figs. 1-9; pl. 53, figs. 1-4; pl. 55, figs. 10, 14; pl. 63, fig. 7; pl. 64, fig. 6; pl. 68, figs. 3-4; pl. 69, figs. 4-7.
1929c. *Manicina areolata* (Linnaeus), Boschma, Carnegie Inst. Washington, Publ. No. 391, Papers Tortugas Lab., vol. 26, pp. 129-147, 9 figs.
1932a. *Macandra areolata* (Linnaeus), Wells, Carnegie Inst. Washington, Yearbook No. 31, p. 291.
1935a. *Maeandra areolata* (Linnaeus), Yonge, Carnegie Inst. Washington, Publ. No. 452, Papers Tortugas Lab., vol. 29, pp. 185-198, pls. 1-3.
1936b. *Manicina areolata* (Linnaeus), Wells, Amer. Jour. Sci., ser. 5, vol. 31 (231), No. 182, p. 118-119.
1937. *Maeandra areolata* (Linnaeus), Yonge, Carnegie Inst. Washington, Publ. No. 475, Papers Tortugas Lab., vol. 31, No. 9, pp. 209, 211.
1939. *Macandra areolata* (Linnaeus), Butsch, Barbados Mus. Hist. Soc., Jour., vol. 6, No. 3, p. 136, pl. 1, fig. 3.
1943. *Manicina areolata* (Linnaeus), Smith, Florida Acad. Sci., Quart. Jour., vol. 6, No. 1, p. 46.
1943. *Manicina areolata* (Linnaeus), Vaughan and Wells, Geol. Soc. Amer., Special Papers, No. 44, pp. 1, 25, 26, 171, 296, pl. 4.
1948. *Manicina areolata* (Linnaeus), Smith, Atlantic Reef Corals, pp. 61, 69, 86-87, 111, pls. 19-21.
1954. *Manicina areolata* (Linnaeus), Fontaine, Inst. Jamaica, Ann. Rept. 1953-1954, p. 25.
1954. *Manicina areolata* (Linnaeus), Smith, U.S. Fish and Wildlife Serv., Fish. Bull., vol. 55, No. 89, p. 293.
1955. *Manicina areolata* (Linnaeus), G. Voss and N. Voss, Bull. Marine Sci. Gulf and Caribbean, vol. 5, No. 3, p. 224.
1957. *Manicina areolata* (Linnaeus), Alloiteau, Contribution à la Systématique des Madréporaires fossiles, vol. 1, p. 258.
1957. *Manicina areolata* (Linnaeus), Newell and Rigby, Soc. Econ. Paleont. Mineral., Spec. Publ. No. 5, p. 58.
1958a. *Manicina areolata* (Linnaeus), Zans, Geol. Sur. Dept. Jamaica, W.I., Bull. No. 3, p. 32.
1958b. *Manicina areolata* (Linnaeus), Squires, Amer. Mus. Nat. Hist., Bull., vol. 115, art. 4, pp. 227, 228, 229, 230, 231, 232, 238, 239, 254-255, pl. 37, figs 1-3.
1958c. *Manicina areolata* (Linnaeus), Zans, Geonotes, vol. 1, No. 2, p. 20.
1959. *Manicina areolata* (Linnaeus), T. Goreau and N. Goreau, Biol. Bull., vol. 117, No. 2, pp. 239, 242, 243, 244, 248, 249.
1959. *Manicina areolata* (Linnaeus), Zans, Geonotes, vol. 2, No. 1, pp. 28, 35.
1959. *Manicina areolata* (Linnaeus), Newell, Imbrie, Purdy, and Thurber, Amer. Mus. Nat. Hist., Bull., vol. 117, art. 4, pp. 221, 224.
1959b. *Manicina areolata* (Linnaeus), Goreau, Ecology, vol. 40, No. 1, pp. 70, 73, 75, 81, 85.
1960a. *Manicina areolata* (Linnaeus), T. Goreau and N. Goreau, Biol. Bull., vol. 118, No. 3, pp. 419-429, figs. 1-3.
1960b. *Manicina areolata* (Linnaeus), T. Goreau and N. Goreau, Biol. Bull., vol. 119, No. 3, p. 426.
1960b. *Manicina areolata* (Linnaeus), Lewis, Canadian Jour. Zool., vol. 38, No. 6, p. 1134.
1960c. *Manicina areolata* (Linnaeus), Lewis, Barbados Mus. Nat. Hist. Soc., Jour., vol. 28, No. 1, p. 11.

1961. *Mancinia areolata* (Linnaeus), Westermann and Kiel, Natuurwetensch. Studiekr. Suriname en Nederlandse Antillen, No. 24, p. 136.
1961. *Manicina areolata* (Linnaeus), Duarte Bello, Acuario Nac. [Cuba], Ser. Educac. No. 2, pp. 9, 48, 49, figs. 37, 38.
1962. *Manicina areolata* (Linnaeus), Stoddart, Atoll Research Bull., No. 87, pp. 17, 19, 22.
1962. *Manicina areolata* (Linnaeus), Kornicker and Boyd, Amer. Assoc. Petrol. Geol., Bull., vol. 46, No. 5, p. 656, fig. 16(2).
1963. *Manicina areolata* (Linnaeus), Almy and Carrión-Torres, Caribbean Jour. Sci., vol. 3, Nos. 2-3, pp. 139, 141, 142, 152, 161, pl. 11(b).
1964. *Manicina areolata* (Linnaeus), Roos, Studies on the Fauna of Curaçao and other Caribbean Islands, vol. 20, No. 81, p. 47.
1964. *Manicina areolata* (Linnaeus), Fabricius, Senckenbergiana Lethea, vol. 45, pp. 299-323, pls. 28-30, text-figs. 1-7.
1964. *Manicina areolata* (Linnaeus), Storr, Geol. Soc. Amer., Spec. Papers, No. 79, pp. 45, 46, 80, 82, 84, 86.
1964. *Manicina areolata* (Linnaeus), Goreau, Science, vol. 145, No. 3630, p. 385.
1964. *Manicina areolata* (Linneaus), Hoskins, Amer. Assoc. Petrol. Geol., vol. 48, No. 10, p. 1690, 1699, pl. 2, fig. 13.

Manicina aerolata (Linnaeus) is reported to range from Miocene to Recent. The Miocene occurrence is in the Nivajé Shale of the Dominican Republic. In the Pliocene the species has been recorded from the Caloosahatchee River, Florida. Pleistocene localities are in Costa Rica (Monkey Point and Limon), the Panama Canal Zone (in the oyster shell layers of Black Swamp, near Mt. Hope), the Dominican Republic, Guadeloupe, St. Bartholomew, St. Eustatius (Sugar Loaf), St. Kitts (Brimstone Hill), and Barbados. The living form is found, generally in shallow water, from the Bahamas to Barbados, including Florida and the Tortugas; Mexico (Alacran Reef); British Honduras (Rendezvous Cay, Lighthouse Reef, Pedro Bank); Panama; Colombia: Cuba; Jamaica (Bluefields Bay, Ocho Rios Reef); Dominican Republic; Puerto Rico (Ensenada Honda, Mayaguez, Aguadilla, Cayo Icacos); Antigua; St. Thomas (Sail Rock 20-23 fathoms); Grenada; Curaçao (Spanish Water); and Venezuela. The species has also been reported from the Cape of Good Hope (Simmon's Bay) by Quelch, 1866, p. 91.

Solenastrea hyades (Dana) Pl. 8, figs. 4-8; Pl. 9, figs. 1-4

1846. *A*[strea] *Orbicella hyades* Dana, U.S. Exploring Exped., Zoophytes, vol. 7, p. 212, pl. 10, fig. 15.
1846. *A*[strea] *Orbicella excelsa* Dana, U.S. Exploring Exped., Zoophytes, vol. 7, p. 212, pl. 10. fig. 16. [*Fide* Vaughan 1919a, pp. 395-398.]
1857. *Heliastrea ? hyades* (Dana), Milne Edwards and Haime, Histoire Naturelle des Coralliaires, vol. 2, p. 478
1859. *Orbicella hyades* Dana, Synopsis Rept. Zoophytes U.S. Exploring Expedition, p. 26.

1861. *Solenastrea hyades* (Dana), Duchassaing and Michelotti, R. Accad. Sci. Torino, Mem., ser. 2, vol. 19, p. 353.
1866. *Solenastraea hyades* (Dana), Duchassaing and Michelotti, R. Accad. Sci. Torino, Mem., ser. 2, vol. 23, p. 181.
1870. *Solenastraea hyades* (Dana), Duchassaing, Revue des Zoophytes et des Spongiaires des Antilles, p. 30.
1871. *Solenastraea excelsa (pars)* (Dana), Pourtalès, Mus. Comp. Zool., Mem., vol. 2, No. 4, p. 77. [*Fide* Verrill 1901b, p. 104.]
1879. *Solenastraea hyades* (Dana), Dana, Corals and Coral Islands, ed. 2, p. 380.
1901b. *Solenastraea hyades* (Dana), Verrill, Connecticut Acad. Arts Sci., Trans., vol. 11, pt. 1, art. 3, pp. 97, 98, 99, 100, 104-106, pl. 15, figs. 5-5a.
1902d. *Solenastraea hyades* (Dana), Duerden, Nat. Acad. Sci. Washington, Mem., vol. 8, pp. 567-569, pl. 10, figs. 74-79; pls. 11-13, figs. 80-91.
1917a. *Solenastrea hyades* (Dana), Vaughan, U.S. Geol. Sur., Prof. Paper 98-T, pp. 368, 372, 374, p. 98.
1919a. *Solenastrea hyades* (Dana), Vaughan, U.S. Nat. Mus., Bull. 103, No. 9, pp. 395-398.
1927. *Cyphastraea hyades* (Dana), Felix, Fossilium Catalogus. I: Animalia, pars 35, pp. 327, 328.
1939. *Solenastraea hyades* (Dana), Thomas, *in* MacGregor, Roy. Soc. London, Philos. Trans., ser. B, Biol. Sci., vol. 229, p. 80.
1943. *Solenastrea hyades* (Dana), Smith, Florida Acad. Sci., Proc., vol. 6, No. 1, pp. 44, 45.
1948. *Solenastrea hyades* (Dana), Smith, Atlantic Reef Corals, pp. 61, 88, 89, pls. 23, 24.
1954. *Solenastrea hyades* (Dana), Smith, U.S. Fish and Wildlife Serv., Fish. Bull., vol. 55, No. 89, p. 293.
1959. *Solenastrea hyades* (Dana), Zans, Geonotes, vol. 2, No. 1, pp. 29, 32.
1959b. *Solenastrea hyades* (Dana), Goreau, Ecology, vol. 40, No. 1, pp. 70, 85.
1961. *Solenastraea hyades* (Dana), Westermann and Kiel, Natuurwetensch. Studiekr. Suriname en Nederlandse Antillen, No. 24, p. 136.
1961. *Solenastrea hyades* (Dana), Duarte Bello, Acuario Nac. [Cuba], Ser. Educac., No. 2, pp. 10, 78-79, figs. 67, 68.
1962. *Solenastrea hyades* (Dana), Kornicker and Squires, Limnol. and Oceanogr., vol. 7, No. 4, pp. 447, 450.

The fossil corallum occurs as a thick irregular discoidal incrustation, or is hemispherical to spheroidal, or is an elongated dome, the last probably having been a projecting lobe which was broken off from a much larger compact mass. Several of the specimens bear irregular bumps or gibbosities on the surface, but on some of the fragments the surface is uniform. The calices are subcircular to suboval, but polygonal where crowded, with diameters ranging from a little less than 2 mm to 4.5 mm, the average being a little over 3 mm. Most of the calices touch each other, but on specimen J567 they are separated by 1 to 2 mm, and on specimen C570a by 2 to 4 mm. The margin of the calices is slightly elevated and regularly beaded, the beading caused by the thickening of each septum at the margin. Where there is a space between the calices, low ridges arising at the beaded margin extend part way across the coenosteum, and the spaces are somewhat blistered in appearance. The calices are shallowly and regularly concave, with a depth of a millimeter or so. In mature calices there are some 24 thin imperforate septa, 12 of them, or those of the first two cycles extending to the columella, the 12 tertiaries depressed a little and extending about halfway toward the columella. Most of the Tertiary septa are curved toward, and fused with, the septa of the second cycle at about the mid-point of their length. All of the septa are minutely serrulate on the summit, with about 10 pairs of irregularly spaced denticles directed laterally on a primary septum 1 mm in length. The septal faces are granulated, and the paliform lobes are small. The costae are thin and closely spaced, with the summit margin serrulated locally and with widely spaced lamellar dissepiments. The exotheca is vesicular. The columella is small and consists of twisted septal processes.

Measurements. — Specimen J568a: corallum hemispherical, length 79 mm, width 68 mm, height 60 mm; calices 2 to 4.5 mm in diameter. Specimen I568: corallum elongate-domal, basal diameter 26 mm, height 28 mm; calices 3 to 3.5 mm in diameter. Specimen H568: corallum discoidal, length 55 mm, width 46 mm, thickness (excluding gibbosity) 27 mm; calices 3 to 4.5 mm in diameter. Specimen C570a: corallum fragment, length 35 mm, width 28 mm, thickness 14.5 mm; diameter of calices 1.8 to 2.9 mm.

Localities. — Hillside above west bank of Quebrada Mare Abajo at W-13. Lower Mare Formation. Four incomplete specimens. Small stream 100 meters west of Quebrada Mare Abajo. Lower Mare Formation. One corallum, nearly whole. South flank of Punta Gorda anticline at W-25. Mare Formation. Two specimens. Drainage ditch about one meter deep near south shore of La Salina de Guaiguaza, 5.6 kilometers west of Puerto Cabello, State of Carabobo. Eight specimens. Guaiguaza Clay.

Comparisons. — *Solenastrea hyades* (Dana) and *Solenastrea bournoni* Edwards and Haime are closely related. According to Vaughan (1919a, p. 401) and to Smith (1948, pp. 88, 89) the calices of *S. hyades* are consistently larger (3 mm to 3.5 mm) than those of *S. bournoni* (2 mm to 2.5 mm) and, perhaps more significant, the tertiary septa of *S. hyades* are generally curved toward, and fused with, the sides of the secondaries, whereas on *S. bournoni* the tertiary septa are generally relatively straight and their inner margins free.

Range and distribution. — The range of *Solenastrea hyades* is middle Miocene to Recent. The Miocene occurrences are in the Gurabo Formation of the Dominican Republic, in the La Cruz Marl of Cuba, and at Cienaga near Habana, Cuba. In the Pliocene the species is found in the Caloosahatchee Marl of Florida, and in the Mare Formation and Guaiguaza Clay of Venezuela (this report). In the Pleistocene *S. hyades* has been reported from Florida and from the Island of Montserrat. The species is living in the Bahamas; in Florida (Key West, near Miami, at Caesar's Creek and near Osprey, Cedar Keys); in Cuba; and in Jamaica.

Solenastrea cf. **S. bournoni** Edwards and Haime — Pl. 12, figs. 1-3

1849. *Solenastrea Bournonii* Edwards and Haime, Ann. Sci. Nat., sér. 3, Zoologie, vol. 12, pp. 121-122.
1857. *Solenastrea Bournonii* Edwards and Haime, Histoire naturelle des Coralliaires . . . , vol. 2, p. 497.
1861. *Cyphastrea oblita, Plesiastrea Carpinetti, Solenastrea Ellisii, Solenastrea micans, Leptastrea caribaea* Duchassaing and Michelotti, R. Accad. Sci. Torino, Mem., ser. 2, vol. 19, pp. 253-354; *Solenastrea micans*, pl. 9, figs. 10, 11. [*Fide* Vaughan, 1919a, pp. 398-401.]
1864a. *Plesiastraea distans* Duncan, Geol. Soc. London, Quart. Jour., vol. 20, pp. 37-38, pl. 4, figs. 4a, 4b. [*Fide* Vaughan, 1919a, p. 398.]
1864a. *Pleisiastraea globosa* Duncan, Geol. Soc. London, Quart. Jour., vol. 20, p. 38, pl. 4, fig 5. [*Fide* Vaughan, 1919a, p. 399.]
1866. *Cyphastraea oblita, Plesiastraea Carpinetti* Duchassaing and Michelotti; *Plesiastraea distans, Plesiastraea globosa* Duncan; *Leptastraea caribaea, Solenastraea Ellisii, Solenastraea micans* Duchassaing and Michelotti, R. Accad. Sci. Torino, Mem., ser. 2, vol. 23, pp. 180, 181, 182. [*Fide* Vaughan, 1919a, pp. 398-401.]
1868d. *Solenastraea Ellisii; Plesiastraea distans, Plesiastraea globosa* Duncan, Geol. Soc. London, Quart. Jour., vol. 24, p. 25.
1886. *Cyphastraea micans, Cyphastraea oblita, Pleasiastraea carpinetti, Leptastraea caribaea* Duchassaing and Michelotti, Quelch, Voyage H.M.S. Challenger, Rept. Sci. Results, Zoology, vol. 16, pt. 46, p. 12.
1901b. *Solenastrea Bournoni* Edwards and Haime, Verrill, Connecticut Acad. Arts Sci., Trans., vol. 11, pt. 1, art. 3, p. 104.
1917a. *Solenastrea bournoni* Milne Edwards and Haime, Vaughan, U.S. Geol. Sur., Prof. Paper 98-T, pp. 368, 372, 374, pls. 99, 100.
1919a. *Solenastrea bournoni* Milne Edwards and Haime, Vaughan, U.S. Nat. Mus., Bull. 103, No. 9, pp. 398-401.
1943. *Solenastrea bournoni* Edwards and Haime, Vaughan and Wells, Geol. Soc. Amer., Special Papers, No. 44, p. 321, pl. 29, figs. 7, 7a.
1948. *Solenastrea bournoni* Edwards and Haime, Smith, Atlantic Reef Corals, pp. 61, 71, 88.
1954. *Solenastrea bournoni* Edwards and Haime (= *hyades ?* Dana) Fontaine, Inst. Jamaica, Ann. Rept. 1953, 1954, p. 25.
1954. *Solenastrea bournoni* Edwards and Haime, Smith, U.S. Fish and Wildlife Serv., Fish. Bull., vol. 55, No. 89, p. 293.
1959. *Solenastrea bournoni* Milne Edwards and Haime, Zans, Geonotes, vol. 2, No. 1, pp. 29, 32.

1959b. *Solenastrea bournoni* Edwards and Haime, Goreau, Ecology, vol. 40, No. 1, p. 85.
1961. *Solenastrea bournoni* Milne Edwards and Haime, Duarte Bello, Acuario Nac. [Cuba], Ser. Educac., No. 2, pp. 10, 76, 77, figs. 65, 66.
1962. *Solenastrea bournoni* Milne-Edwards and Haime, Stoddart, Atoll Res. Bull., No. 87, pp. 17, 19.
1962. *Solenastrea bournoni* Edwards and Haime, Kornicker and Squires, Limnol. and Oceanogr., vol. 7, No. 4, pp. 447, 448.
1963. *Solenastrea bournoni* Milne Edwards and Haime, Almy and Carrión-Torres, Caribbean Jour. Sci., vol. 3, Nos. 2-3, pp. 142, 154, 162, pl. 13b.
1964. *Solenastrea bournoni* Edwards and Haime, Roos, Studies on the Fauna of Curaçao and other Caribbean Islands, vol. 20, No. 81, pp. 11, 25, 35, 48.

The corallum is hemispherical and tumid, with a large irregular area of attachment below, and a gibbous calicular surface above. The calices are subcircular to subovate, and subequal to unequal in size. Most of the calices are separated by varying distances up to 2.5 mm, but a few of them touch each other. The margins of the calices are somewhat elevated and beaded, the beading produced by the thickening of the septa at the margin and by the abutment there with the costae of the coenosteum. The calices are shallowly and regularly concave (about a millimeter in depth), with steep inner sides and a flattish columellar area. The coenosteum between the calices is corroded, but in less weathered areas it is seen to be minutely granulated. The costae around the margins of the calices are also covered by minute granules. The costae are moderately prominent, are separated by linear grooves, and extend down the calice on to the intercalicular space part way between the cups. There are 30 to 32 septa on the average, though as few as 22 and as many as 37 have been counted. Generally the number of septa depends on the size and maturity of the calice. The septa occur in three cycles. The primary and secondary ones are thicker at the margin of the calice than inward and extend to the columella. Rarely, however, a secondary septum joins a primary one close to the columella. The tertiary septa are much thinner and more depressed than the others and do not reach the columella. Nearly all of the tertiaries have free inner margins, but here and there a tertiary septum joins a secondary septum. All of the septa are serrulate at the summit. The septal faces are granulose, the granulations small, pointed, and imperforate. The pali before the main septa are small and irregularly papillose. The columella is small.

Measurements. — Specimen H570a: corallum length 27 mm, width 21 mm, height 19 mm; the maximum diameter of the calices ranges from 2.6 mm to 3.9 mm.

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

Comparisons. — The Venezuelan fossil closely resembles the Recent form of *Solenastrea bournoni* Edwards and Haime, differing from that, however, by the greater number of septa (30-32 compared with an average of about 24 in *S. bournoni*), by the larger calices (2.6 mm to 3.9 mm compared with 2.0 mm to 2.5 mm), and in the absence of blisters in the space between the calices. If the average size of the calices and the number of septa are variable characters in Recent specimens of *S. bournoni* from different localities (I have counted, for example, as many as 40 septa in large calices on a corallum from Bluefields Bay, Jamaica, where most of the calices bear about 24 septa), then the slightly larger calices and larger number of septa on the Venezuelan fossil suggest that it is a variant of *S. bournoni* rather than a distinct species. As for the blisters on the coenosteum, these may or may not be present on the typical *S. bournoni*, so that their absence on the single Venezuelan specimen may well be fortutitous or due to corrosion.

The separation of *S. hyades* and *S. bournoni* into two species has yet to be established, but the fact that most of the tertiary septa are free rather than fused persuades me to relate the Venezuelan form to *S. bournoni*.

Range and distribution. — The range of *Solenastrea bournoni* Edwards and Haime is Miocene to Recent. Miocene occurrences are in the Dominican Republic (Zone H, Río Cana) and Cuba (La Cruz Marl). In the Pliocene the species has been reported from Shell Creek and the Caloosahatchee Marl of Florida. In the Pleistocene it is recorded from the Dominican Republic. The living *S. bournoni* is found in the Bahamas; in Florida (the Tortugas 8-9 fathoms); British Honduras (Rendezvous Cay); Cuba; Jamaica; Puerto Rico (Caballo Ahogado, 5 feet, and Bahía de Boquerón, 4 feet); the Virgin Islands; and Curaçao (Piscadera Baai, Sta. Martha Baai, 10-45 meters).

Oculina diffusa Lamarck Pl. 8, figs. 1-3

1816. *Oculina diffusa* Lamarck, Hist. nat. Anim. sans Vert., vol. 2, p. 285.

1825. *Oculina diffusa* Lamarck, Blainville, Dictionnaire des Sciences Naturelles, vol. 35, p. 354.
1827. *Oculina diffusa* Lamarck, Deslongchamps, Encyclopédie Méthodique, Zoophytes, pt. 2, p. 575.
1836. *Oculina diffusa* Lamarck, Lamarck, Hist. nat. Anim. sans Vert., ed. 2, vol. 2, p. 456.
1846. *Oculina diffusa* Lamarck, Dana, U.S. Exploring Exped., vol. 7, Zoophytes, pp. 397, 398.
1850. *Oculina diffusa* Lamarck, Edwards and Haime, Ann. Sci. Nat., sér. 3, vol. 13, p. 68.
1850. *Oculina diffusa* Lamarck, Duchassaing, Animaux Radiaires des Antilles, p. 15.
1857. *Oculina diffusa* Lamarck, Edwards and Haime, Histoire naturelle des Coralliaires, vol. 2, p. 107.
1859. *Oculina diffusa* Lamarck, Dana, Synopsis Rept. Zoophytes U.S. Exploring Exped., p. 67.
1861. *Oculina diffusa* Lamarck, Duchassaing and Michelotti, R. Accad. Sci. Torino, Mem., ser. 2, vol. 19, p. 338.
1866. *Oculina diffusa* Lamarck, Duchassaing and Michelotti, R. Accad. Sci. Torino, Mem., ser. 2, vol. 23, p. 162.
1870. *Oculina diffusa* Lamarck, Duchassaing, Revue des Zoophytes et des Spongiaires des Antilles, p. 25.
1871. *Oculina diffusa* Lamarck, Pourtalès, Mus. Comp. Zool., Mem., vol. 2, No. 4, pp. 23, 65.
1877c. *Oculina diffusa* Lamarck, Arango y Molina, R. Acad. Cienc. Méd., Fís. y Nat. Habana, An., vol. 14, p. 274.
1879. *Oculina diffusa* Lamarck, Dana, Corals and Coral Islands, ed. 2, p. 384.
1880. *Oculina diffusa* Lamarck, Pourtalès, *in* Agassiz, Mus. Comp. Zool., Mem., vol. 7, No. 1, pl. 3, figs. 10-12.
1881a. *Oculina diffusa* Lamarck, Studer, Naturforsch. Gesell. Bern, Mitth., Abhandl. 1880, p. 10, text-fig. 3.
1886. *Oculina diffusa* Lamarck, Quelch, Voyage H.M.S. Challenger, Rept. Sci. Results, Zoology, vol. 16, pt. 46, pp. 10, 11, 47, 49.
1888. *Oculina diffusa* Lamarck, Ortmann, Zool. Jahrb., Syst., vol. 3, p. 162.
1888b. *Oculina diffusa* Lamarck, Heilprin, Acad. Nat. Sci. Philadelphia, Proc., vol. 40, p. 304.
1899. *Oculina diffusa* Lamarck, Duerden, Inst. Jamaica, Jour., vol. 2, No. 6, p. 621.
1900a. *Oculina diffusa* Lamarck, Vaughan, U.S. Geol. Sur., Mon. 39, pp. 49, 116, 117, 212, pl. 2, fig. 5.
1901b. *Oculina diffusa* Lamarck, Verrill, Connecticut Acad. Arts Sci., Trans., vol. 11, pt. 1, art. 3, p. 175.
1902a. *Oculina diffusa* Lamarck ? var. Vaughan, U.S. Fish Comm., Bull., vol. 20 for 1900, pt. 2, pp. 291. 294, pl. 1, figs. 5-5a. [*Fide* Verrill, 1901b, p. 175.]
1902d. *Oculina diffusa* Lamarck, Duerden, Nat. Acad. Sci. Washington, Mem., vol. 8, pp. 585-588, pl. 22, fig. 149.
1903. *Oculina diffusa* Lamarck, Verrill, Connecticut Acad. Arts Sci., Trans., vol. 11, pt. 2, art. 10, p. 848.
1911b. *Oculina diffusa* Lamarck, Toula, K.-K. Geol. Reichsanst., Jahrb., vol. 61, p. 489.
1913. *Oculina diffusa* Lamarck, Mayer, Carnegie Inst. Washington, Yearbook No. 11, p. 126.
1914b. *Oculina diffusa* Lamarck, Mayer, Carnegie Inst. Washington, Publ. No. 183, Papers Tortugas Lab., vol. 6, No. 1, p. 19.
1915b. *Oculina diffusa* Lamarck, Vaughan, Carnegie Inst. Washington, Yearbook No. 13, pp. 224, 225.

1915d. *Oculina diffusa* Lamarck, Vaughan, Washington Acad. Sci., Jour., vol 5, No. 17, p. 596.
1916a. *Oculina diffusa* Lamarck, Vaughan, Carnegie Inst. Washington, Yearbook No. 14, p. 227.
1918b. *Oculina diffusa* Lamarck, Vaughan, Carnegie Inst. Washington, Publ No. 231, Papers Dept. Marine Biol., vol. 9, p. 326.
1919a. *Oculina diffusa* Lamarck, Vaughan, U.S. Nat. Mus., Bull. 103, No. 9, p. 352.
1929. *Oculina diffusa* Lamarck, Felix, Fossilium Catalogus. I: Animalia, par 44, pp. 596-597.
1930a. *Oculina diffusa* Lamarck, Yonge, Great Barrier Reef Exped. 1928-29, Sci. Repts., vol. 1, No. 2, p. 17.
1932a. *Oculina diffusa* Lamarck, Wells, Carnegie Inst. Washington, Yearbook No. 31, p. 291.
1943. *Oculina diffusa* Lamarck, Smith, Florida Acad. Sci., Proc., vol. 6, No. 1, pp. 44, 46.
1943. *Oculina diffusa* Lamarck, Vaughan and Wells, Geol. Soc. Amer., Spec. Paper, No. 44, pp. 180, 181, 325, pl. 33, fig. 2.
1944. *Oculina diffusa* Lamarck, Wells, Jour. Paleont., vol. 18, No. 5, p. 446.
1948. *Oculina diffusa* Lamarck, Smith, Atlantic Reef Corals, pp. 62, 66, 91, pl. 28.
1954. *Oculina diffusa* Lamarck, Smith, U.S. Fish and Wildlife Serv., Fish. Bull., vol. 55, No. 89, p. 293.
1954. *Oculina diffusa* Lamarck, Fontaine, Inst. Jamaica, Ann. Rept. 1953-1954, p. 25.
1956a. *Oculina (Oculina) diffusa* Lamarck, Wells, Treatise on Invertebrate Paleontology, Pt. F, Coelenterata, p. F140, fig. 308, 4.
1956. *Oculina diffusa* Lamarck, Menzel, Oceanogr. Inst. Florida State Univ., Contrib. No. 61, p. 3.
1958b. *Oculina diffusa* Lamarck, Squires, Amer. Mus. Nat. Hist., Bull., vol. 115, art. 4, pp. 229, 232, 238, 256-257, pl. 38, fig. 4.
1958a. *Oculina diffusa* Lamarck, Zans, Geol. Sur. Dept. Jamaica, W.I., Bull. No. 3, p. 32.
1959a. *Oculina diffusa* Lamarck, Goreau, Biol. Bull., vol. 116, No. 1, pp. 59, 64, 66, 67.
1959b. *Oculina diffusa* Lamarck, Goreau, Ecology, vol. 40, No. 1, pp. 70, 75, 81, 85.
1959. *Oculina diffusa* Lamarck, Zans, Geonotes, vol. 2, No. 1, pp. 29, 35.
1960b. *Oculina diffusa* Lamarck, Lewis, Canadian Jour. Zool., vol. 38, No. 6, p. 1135.
1961a. *Oculina diffusa* Lamarck, Goreau, Endeavour, vol. 20, fig. 5.
1961. *Oculina diffusa* Lamarck, Duarte Bello, Acuario Nac. [Cuba], Ser. Educac. No. 2, pp. 9, 60-61, figs. 49, 50.
1962. *Oculina diffusa* Lamarck, Stoddart, Atoll Research Bull., No. 87, pp. 19, 20.
1963. *Oculina diffusa* Lamarck, Almy and Carrión-Torres, Caribbean Jour. Sci., vol. 3, Nos. 2-3, pp. 143, 156, 162, pl. 16a.
1963. *Oculina diffusa* Lamarck, Jones, Bull. Marine Sci. Gulf and Caribbean, vol. 13, No. 2, p. 284.
1964. *Oculina diffusa* Lamarck, Roos, Studies of the Fauna of Curaçao and other Caribbean Islands, vol. 20, No. 81, p. 48.
1964. *Oculina diffusa* Lamarck, Rivero, Geos, No. 11, pp. 112, 113.
1965. *Oculina diffusa* Lamarck, Neumann, Bull. Marine Sci., vol. 15, No. 4, p. 1004.
1967. *Oculina diffusa* Lamarck, Mesolella, Science, vol. 156, No. 3775, p. 639.

The corrallum is a small somewhat irregular cylindrical branch with a subcircular cross section. The surface of the corallum is worn and smoothish, but in some places the original fine granulation has been preserved. The calices are small, more or less circular, rather distant from one another, somewhat elevated, and thickened at the rounded margin. The markings on the calices have been mostly obliterated but just off one of them the coenosteum is both costate and granulate, the costae low and faint, the granulations consisting of low pointed processes. There are about 24 septa arranged in three cycles, those of the first two cycles subequal and reaching the columella, the ones of the third cycle the smallest and extending part way to the columella. All of the septa are a little exsert, and all of them are minutely beaded on the summit and sides. The pali before the larger septa are weathered, and the columella is seemingly somewhat papilliform.

Measurements. — Specimen D577a: corallum fragment, length 12 mm, maximum diameter about 5 mm; average diameters of calice 2.0 $\times$ 2.2 mm measured between the inner margins; distance between calices 2.5 mm to 4 mm.

Locality. — Eastern edge of Playa Grande village at W-30. Abisinia Formation (Pleistocene). One specimen.

Remarks. — Though the only specimen is badly weathered, the characters that can be discerned are much like those of *Oculina diffusa* Lamarck, a Mio-Pliocene to Recent species of the Western Atlantic and circum-Caribbean region.

Range and distribution. — Mio-Pliocene (Cubagua Island, Venezuela) to Recent. Pleistocene localities, in addition to the present one from the Abisinia Formation of Venezuela, are Bimini in the Bahamas, Mount Hope in the Panama Canal Zone, and on Barbados. The living *O. diffusa* has been reported from Bermuda, the Bahamas, Florida (off Miami, in the Tortugas to 15 fathoms, and St. George's Sound), Mexico (off Vera Cruz), British Honduras (Pedro Bank), Panama, Cuba, Jamaica, Puerto Rico (10-16 fathoms), St. Thomas, Martinique, and probably at Puerto La Cruz, Venezuela.

Oculina sp. cf. **O. valenciennesi** Edwards and Haime Pl. 6, figs. 1, 2

1850. *Oculina Valenciennesi* Edwards and Haime, Ann. Sci. Nat., sér. 3, vol. 13, p. 69.

1957. *? Oculina Banksi* Edwards and Haime, Historie naturelle des Coralliaires, vol. 2, p. 107. [*Fide* Verrill, 1901b, p. 176.]
1857. *Oculina Valenciennesi* Edwards and Haime, Edwards and Haime, Histoire naturelle des Coralliaires, vol. 2, p. 108.
1866. *? Oculina bermudiana* Duchassaing and Michelotti, R. Accad. Sci. Torino, Mem., ser. 2, vol. 23, p. 162. pl. 9, figs. 1, 2. [*Fide* Verrill, 1901b, p. 176.]
1886. *Oculina valenciennesi* Milne-Edwards and Haime, Quelch, Voyage of H.M.S. Challenger, Rept. Sci. Results, Zoology, vol. 16, pt. 46, pp. 11, 50.
1886. *Oculina bermudensis* Duchassaing and Michelotti, Quelch, Voyage of H.M.S. Challenger, Rept. Sci. Results, Zoology, vol. 16, pt. 46, pp. 9, 10, 51-52. [*Fide* Verrill, 1901b, 176.]
1901b. *Oculina Valenciennesi* Edwards and Haime, Verrill, Connecticut Acad. Arts Sci., Trans., vol. 11, pt. 1, art. 3, p. 176, pl. 32, fig. 5.
1944. *Oculina valenciennesi* Milne-Edwards and Haime, Wells, Jour. Paleont., vol. 18, No. 5, p. 446.
1948. *Oculina valenciennesi* Edwards and Haime, Smith, Atlantic Reef Corals, pp. 62, 67, 91-92.
1954. *Oculina valenciennesi* Edwards and Haime, Fontaine, Inst. Jamaica, Ann. Rept. 1953-1954, p. 25.
1954. *Oculina valenciennesi* Edwards and Haime, Smith, U.S. Fish Wildlife Serv., Fish. Bull., vol. 55, No. 89, p. 293.
1959. *Oculina valenciennesi* Milne Edwards and Haime, Zans, Geonotes, vol. 2, No. 1, pp. 29, 35.
1959b. *Oculina valenciennesi* Edwards and Haime, Goreau, Ecology, vol. 40, No. 1, pp. 70, 75, 85.
1961. *Oculina valenciennesi* Edwards and Haime, Duarte Bello, Acuario Nac. [Cuba], Ser. Educac. No. 2, pp. 9, 62.
1964. *Oculina valenciennesi* Edwards and Haime, Roos, Studies of the Fauna of Curaçao and other Caribbean Islands, vol. 20, No. 81, p. 48.

The corallum is a thin flattish fragment encrusted on a thin plate of fibrous aragonite. Judging from its appearance the fragment is part of the basal frond of the corallum from which the branches arise. The calices are relatively small, suboval in outline, unequally distant (1 mm to 3 mm) from one another, and separated by well-defined valleys. Through weathering the calices have been worn down and are now shallow and low but elevated asymmetrically, with a maximum height of 1.7 mm, and with the slope on one side longer and less steep than on the other. The slopes are slightly convex or straight or a little concave in profile and everywhere are steep to nearly perpendicular. The margin of the calices is thin and sharp and unlike the rounded margin on the calices of the *O. diffusa* —*O. valenciennesi* complex. However, the sharp rim of the Venezuelan fossil may have been produced by the wearing down of the upper part of the calice to its present form. There are 32 to perhaps 42 septa depending on the size of the calice, the septa moderately thin except at the margin, the summits descending gently toward the columella. The summit of the septa is dentate, with as many as 15 short blunt denticles on the longest septum 2.4 mm in length. The primary and secondary septa are nearly the same length and converge at the columella where they may be curved. The tertiary septa are short and straight, dentate at the summit, and acutely narrowed at the end. The sides of the septa are closely granulated, some of the granulations blunt but others pointed. The pali, which are present before the primary and secondary septa, cannot be differentiated from them. The columella is located off center within the calice, and although its structure can not be clearly discerned it seems to be papilliform. The external wall of the calices and much of the coenosteum are marked by prominent costae which are low, relatively broad, a little convex, and separated by narrow shallow grooves. Each costa, or in some places a pair of costae, joins the septum at the margin of the calice and continues down the slope into the valley floor where the costae abut against, or are curved and become confluent with, the costae of neighboring calices. The costae are minutely beaded as is the coenosteum in local areas not traversed by the costae.

Measurements. — Specimen 1571a: corallum length 14 mm, width 13 mm, thickness 2.2 mm; average diameter of calices 3.5 mm × 3.0 mm; maximum elevation of calice 1.7 mm; longest septum 2.4 mm; thickness of aragonite substrate 1.6 mm.

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

Comparisons. — If the thin and sharp calicular margin of the Venezuelan specimen has been caused by the weathering down of the calice, and if the margin normally is a rounded one, the identity with *Oculina valenciennesi* Edwards and Haime is suggested. I have compared the base of *O. diffusa* Lamarck with that of *O. valenciennesi* on a number of specimens from different localities in the Recent collection of the U. S. National Museum and have observed that the calices of *O. diffusa* bear about 24 septa and those of *O. valenciennesi* an average of 32 septa (within a range of 28 to 42). Thus in the number of septa the Venezuelan form is closer to *O. valenciennesi* than to *O. diffusa*. On both of the last two species, however, the calices are farther apart, more circular, and more regularly elevated than on the Venezuelan specimen, and the columella centrally placed rather than excentric. Whether these differences are due to individual variation rather than to inherent genetic character remains to be determined.

The sole Venezuelan fragment also resembles the sole fragment of *Oculina gatunensis* Toula (1911b, p. 489, pl. XXX (1), fig. 1) from the middle-upper Miocene Gatun Formation of the Panama Canal Zone. Toula's description and illustration are inadequate for definitive comparison but so far as can be determined *O. gatunensis* has circular calices, a rounded calicular margin, about 24 septa, and a costate coenosteum. According to Toula the Gatun specimen was compared with the Recent *O. diffusa* from Bermuda by Marenzeller who was of the opinion that the Canal Zone fragment was thicker and flatter and that the septa were less exsert than on *O. diffusa*.

The following Recent species of *Oculina* have been named by various authors as occurring in the circum-Caribbean region: *O. arbuscula* Agassiz, *O. banksi* Edwards and Haime, *O. bermudiana* Duchassaing and Michelotti, *O. coronalis* Quelch, *O. diffusa* Lamarck, *O. implicata* Agassiz, *O. oculata* Dana, *O. pallens* Ehrenberg, *O. petiveri* Edwards and Haime, *O. recta* Quelch, *O. robusta* Pourtalès, *O. speciosa* Edwards and Haime, *O. valenciennesi* Edwards and Haime, *O. varicosa* Lesueur, *O. varicosa conigera* Verrill, and *O. virginea* (Linnaeus). A number of these have been synonymized with *O. diffusa* Lamarck, *O. valenciennesi* Edwards and Haime, or *O. varicosa* Lesueur, and Wells (1944, p. 446) has stated "At least 9 other 'species' of *Oculina* have been named from Western Atlantic and West Indian areas, most of these probably being merely ecologic variants of *O. diffusa*."

Range and distribution. — Should the identity of the Venezuelan fossil eventually be determined as *Oculina valenciennesi* Edwards and Haime, the present report will be the first concerning its occurrence in the Pliocene. Heretofore *O. valenciennesi* has been known only as a Recent form living in Bermuda (Harrington Sound 1-8 fathoms), the Bahamas, Cuba, Jamaica, and Venezuela (Puerto La Cruz).

Phyllangia americana Edwards and Haime Pl. 10, fig. 3; Pl. 11, fig. 1

1849. *Phyllangia americana* Edwards and Haime, Ann. Sci. Nat., sér. 3, vol. 12, p. 182.
1857. *Phyllangia americana* Edwards and Haime, Edwards and Haime, Histoire naturelle des Coralliaires, p. 616.

1859. *Syndepas Gouldii* Lyman, Boston Soc. Nat. Hist., Proc., vol. 6, p. 274. [*Fide* Pourtalès, 1871, p. 30.]
1861. *Phyllangia americana* Milne-Edwards and Haime, Duchassaing and Michelotti, R. Accad. Sci. Torino, Mem., ser. 2, vol. 19, p. 356.
1861. *Stellangia reptans* ? Duchassaing and Michelotti, R. Accad. Sci. Torino, Mem., ser. 2, vol. 19, p. 80, pl. 10, figs. 1-2. [*Fide* Pourtalès, 1871, p. 30.]
1866. *Phyllangia americana* Milne Edwards and Haime, Duchassaing and Michelotti. R. Accad. Sci. Torino, Mem., ser. 2, vol. 23, p. 186.
1866. *Stellangia reptans* Duchassaing and Michelotti, Duchassaing and Michelotti, R. Accad. Sci. Torino, Mem., ser. 2, vol. 23, p. 186.
1870. *Phyllangia americana* Edwards and Haime, Duchassaing, Revue des Zoophytes et des Spongiaires des Antilles, p. 31.
1871. *Phyllangia americana* Milne-Edwards and Haime, Pourtalès, Mus. Comp. Zool., Mem., vol. 2, No. 4, p. 30.
1901c. *Phyllangia americana* Edwards and Haime, Verrill, Connecticut Acad. Arts Sci., Trans., vol. 11, pt. 1, art. 4, p. 194.
1902a. *Phyllangia americana* Milne-Edwards and Haime, Vaughan, U.S. Fish Comm., Bull., vol. 20 for 1900, pt. 2, p. 289.
1902d. *Phyllangia americana* Milne Edwards and Haime, Duerden, Nat. Acad. Sci. Washington, Mem., vol. 8, pp. 555-558, pl. 5, fig. 46.
1904. *Phyllangia americana* Milne Edwards and Haime, Greely *in* Branner, Mus. Comp. Zool., Bull., vol. 44, p. 266.
1904b. *Phyllangia americana* Edwards and Haime, Duerden, Carnegie Inst. Washington, Publ. No. 20, p. 85.
1906b. *Phyllangia americana* Edwards and Haime, Vaughan, U.S. Nat. Mus., Proc., vol. 30, No. 1477, p. 848.
1919a. *Phyllangia americana* Edwards and Haime, Vaughan, U.S. Nat. Mus., Bull. 103, No. 9, p. 409.
1927b. *Phyllangia americana* Milne Edwards and Haime, van der Horst, Bijdr. Dierk. Amsterdam. vol. 25, p. 159.
1943. *Phyllangia americana* Milne Edwards and Haime, Vaughan and Wells, Geol. Soc. Amer., Spec. Papers, No. 44, p. 178.
1947. *Phyllangia americana* Edwards and Haime, Wells, Bull. Amer. Paleont., vol. 31, No. 123, p. 169, pl. 11, fig. 6.
1954. *Phyllangia americana* Edwards and Haime, Fontaine, Inst. Jamaica, Ann. Rept. 1953-1954, p. 25.
1956a. *Phyllangia americana* Milne-Edwards and Haime, Wells, Treatise on Invertebrate Paleontology, Pt. F, Coelenterata, p. F409, fig. 307, 5.
1956. *Phyllangia americana* Milne-Edwards and Haime, Menzel, Oceanogr. Inst. Florida State Univ., Contrib., No. 61, p. 3.
1959. *Phyllangia americana* Milne Edwards and Haime, Zans, Geonotes, vol. 2, No. 1, pp. 29, 35.
1963. *Phyllangia americana* Milne-Edwards and Haime, Almy and Carrión-Torres, Caribbean Jour. Sci., vol. 3, Nos. 2, 3, pp. 143, 156, pl. 15b.
1964. *Phyllangia americana* Edwards and Haime, Roos, Studies on the Fauna of Curaçao and other Caribbean Islands, vol. 20, No. 81, p. 48.

The following description pertains to a clump of corallites whose calices have been worn down nearly to their base.

The corallum is encrusting and imbedded, forming a clump of low, subplocoid corallites, their free portions subcylindrical, a little divergent, and somewhat raised. The calices are relatively large, moderately deep, more or less oval in outline, and faintly costate.

The margins of the calices are irregularly distant, some nearly touching, others more removed. The walls are thin at the calicular edge. The walls, as well as the surface of the coenosteum, where unweathered are both costate and finely granulate, the costae slightly crested, each costa joining a septum at the margin of the calice. Within the largest calice there are about 32 septa in three cycles. The septa of the first two cycles are exsert, rather sturdy, about the same in length, and extend to the columella; the septa of the third cycle are short, depressed, and thin. The summit of most of the larger septa is dentate, with about 20 short denticles in a septum 4.3 mm in length. Both sides of the septa are granulose, the denticles short, stubby and pointed, with a number of them perforated at the projecting end. The columella is feeble and trabecular.

Measurements. — Specimen S688a: length of colony 29 mm, width 20 mm, maximum thickness 4.5 mm; diameters of largest calice 10.33 mm, width 6.4 mm; height of corallite above coenosteum 1.5-2.0 mm; longest septum 4.3 mm; maximum distance between margins of calices 2.0 mm; maximum depth of calice 3.5 mm.

Locality. — Near *Lithothamnium* reef at W-23, north flank of Punta Gorda anticline. Playa Grande Formation (Maiquetía Member). One specimen imbedded in the oyster *Ostrea (Alectryonia) caboblanquensis* Weisbord (1964, pp. 190-192, pl. 25, figs. 1-6). Lower Pliocene.

Remarks. — The description and illustration of this specimen pertain to a cluster of corallites whose calices have been so worn down below the original calicular margin that the fourth cycle of septa can no longer be seen. The maximum development of the septa and the full expression of other characters occur in the upper part of the calice. Thus the calices of unweathered Recent specimens of *P. americana* bear as many of 50 to 62 septa whereas there are only 32 or so near the bottom of the calice on the Venezuelan fossil. Also the first cycle septa of the complete *P. americana* are by far the most prominent of all of the septa, and although this particular character can be spotted at once on the living form it is not so apparent on the Venezuelan fossil specimen. Nevertheless, when Dr. Wells examined the specimen, he unhesitatingly identified it as *Phyllangia americana* Edwards and Haime.

Range and distribution. — Other than its occurrence in the lower Pliocene of Venezuela (this report), *Phyllangia americana* is recorded only as a Recent species. The localities are the Bahamas (off Elbow Key 315 fathoms); west Florida (St. George's Sound); Jamaica; Martinique; St. Thomas; and Brazil (Bahía, São Sebastião, Caravellas). The living *P. americana* lives in relatively shallow water, despite its having been found at a depth of 315 fathoms off Elbow Key. According to Pourtalès (1871, p. 30) who identified *P. americana* from off Elbow Key "Dead specimens, rather worn, were dredged up with quite a number of other dead corals at this place, shoal-water and deep-water species being mixed together. The locality is very near the edge of the Salt Key Bank, at the foot of a very steep submarine slope, and washed by the edge of the Gulf Stream."

Paracyathus defilippii Duchassaing and Michelotti Pl. 10, figs. 1,2

1861. *Paracyathus De-Filippii* Duchassaing and Michelotti, R. Accad. Sci. Torino, Mem., ser. 2, vol. 19, p. 336, pl. 9, figs. 2, 3.
1866. *Paracyathus De-Filippii* Duchassaing and Michelotti, R. Accad. Sci. Torino, Mem., ser. 2, vol. 23, p. 159.
1868. *Paracyathus confertus* Pourtalès, Mus. Comp. Zool., Bull., vol. 1, No. 7, p. 134. [*Fide* Pourtalès, 1874, p. 38.]
1870. *Paracyathus De-Filippii* Duchassaing and Michelotti, Duchassaing, Revue des Zoophytes et des Spongiaires des Antilles, p. 25.
1871. *Paracyathus confertus* Pourtalès, Mus. Comp. Zool., Mem., vol. 2, No. 4, p. 11, pl. 6, figs. 11-13.
1873d. *Paracyathus confertus* Pourtalès and *Paracyathus de filippi* Duchassaing and Michelotti, Duncan, Zool. Soc. London, Trans., vol. 8, pt. 5, pt. 320.
1873. *Paracyathus agassizi* Duncan, Zool. Soc London, Trans., vol. 8, pt. 5, p. 319, pl. 43, figs. 5-8. [*Fide* Squires, 1959b, p. 12.]
1874. *Paracyathus De Filippii* Duchassaing and Michelotti, Pourtalès, Mus. Comp. Zool., Mem., vol. 4, No. 8, pt. 1, p. 38.
1877b. *Paracyathus confertus* Pourtalès, Studer, K. Preuss. Akad. Wiss. Berlin, Monatsber., p. 628.
1877c. *Paracyathus De-Filippii* Duchassaing and Michelotti, Arango y Molina, R. Acad. Cienc. Méd., Fís. y Nat. Habana, An., vol. 14, p. 273.
1878. *Paracyathus De Filippii* Duchassaing and Michelotti, Pourtalès, Mus. Comp. Zool., Bull., vol. 5, No. 9, pp. 200, 201.
1880. *Paracyathus laxus* Pourtalès, Mus. Comp. Zool., Bull., vol. 6, No. 4, pp. 104-105, pl. 1, figs. 9-11. [*Fide* Squires, 1959b, p. 12.]
1880. *Paracyathus DeFilippii* Duchassaing and Michelotti, Pourtalès, Mus. Comp. Zool., Bull., vol. 6, No. 4, pp. 96, 105.
1880a. *Paracyathus de filippii* Duchassaing and Michelotti, Moseley, Voyage of H.M.S. Challenger, Rept. Sci. Results, Zoology, vol. 2, pt. 7, p. 144.
1888. *Paracyathus confertus* Pourtalès, Agassiz, Mus. Comp. Zool., vol. 15, pp. 149, 150, fig. 466.
1895. *Paracyathus confertus* Pourtalès, Jourdan, Résultats des Campagnes Scientiques du Prince de Monaco, No. 8, p. 15.
1902a. *Paracyathus de filippii* Duchassaing and Michelotti, Vaughan, U.S. Fish Comm., Bull., vol. 20 for 1900, pt. 2, p. 292, pl. 1, figs. 1, 1a.

1920. *Paracyathus de Filippii* Duchassaing and Michelotti, Gravier, Rèsultats des Campagnes Scientifiques du Prince de Monaco, No. 55, pp. 98-99, pl. 3, fig. 43.
1958b. *Paracyathus* cf. *P. confertus* Pourtalès, Squires, Amer. Mus. Nat. Hist., Bull., vol. 115, art. 4, pp. 232, 258.
1959b. *Paracyathus defilippi* Duchassaing and Michelotti, Squires, Amer. Mus. Novitates, No. 1965, pp. 12-15.
1960c. *Paracyathus* cf. *defilippi* Duchassaing and Michelotti, Lewis, Barbados Mus. Nat. Hist. Soc., Jour., vol. 28, No. 1, p. 12.

The corallite is solitary, attached at the base, relatively short, subtympanoidal or subcylindrical in shape, and costulate from calicular margin to base. The base is a little broader than the middle of the stem which is slightly contracted, but at the calice the corallite is again expanded to nearly the same diameter as the base. Just below the calicular margin and to one side of the corallite there is a secondarily thickened and nodulous area of regrowth. The costae are low but pronounced, subequal in size, a little wider than, to about as wide as, their interspaces, and, where not worn, narrowed somewhat at the crest. The costae of the outer wall are minutely granulated, the tubercles imperforate and disposed in two columns, each column close to but slightly off the crest of the costa. Below the outermost layer of the corallite the tubercles on the costae are perforate. Each costa joins each septum at the margin of the calice. The calice is regularly oval, the width nine-tenths the length. Within the calice of the only specimen collected there are 42 septa in four cycles, the first three cycles complete, the fourth nearly so. The septa of the first cycle are moderately exsert, those of the later cycles successively less exsert. All of the septa are thicker at the margin of the calice than farther in where they become attenuate. The primary septa are thicker and wider than those of later cycles. The upper edges of the septa are well rounded at the calicular margin, but then descend nearly vertically before the pali. The pali are robust, irregularly granular or compound above, and occur before all of the larger septa in crowded circlets where they become confused with the papillae of the columella. Along the summit edge and on the side the septa are granulose, the individual tubercles short, strong, pointed and imperforate. There are at least three rows of granulations on the faces of the larger septa and about seven denticles along the summit of a septum 1.4 mm in length. The columella is well developed and papillose.

Measurements. — Specimen S574a: height of corallite 5.5 mm; diameter of corallite at base 4.6 mm; diameters of calice 4.3 × 3.3 mm; depth of calice to top of pali 0.86 mm.

Locality. — North flank of Punta Gorda anticline at W-23. Playa Grande Formation (Maiquetía Member). One specimen.

Remarks. — Making allowances for its small size and squatty rather than elongate-conical shape, the Venezuelan fossil otherwise is identical with Recent specimens of *Paracyathus defilippii* I have seen in the U. S. National Museum. Compared with other fossil species, the Venezuelan form is close to *Paracyathus vaughani* Gane from the upper Miocene of Virginia and North Carolina. (See Gane 1900, p. 185, pl. 15, figs. 4-6, and Vaughan 1904a, p. 438, pl. 122, figs. 1-3).

Range and distribution. — Other than the present report of its occurrence in the Pliocene of Venezuela, *Paracyathus defilippii* Duchassaing and Michelotti (and its congeners *P. confertus* Pourtalès, *P. agassizi* Duncan, and *P. laxus* Pourtalès) is known only in the Recent. In Western Atlantic-Caribbean waters the species occurs in the Bahamas (Bimini); off Habana, Cuba (36-805 fathoms); in Puerto Rico (Mayaguez 8.5 fathoms and Boca Prieta 30 fathoms); off Sta Cruz, St. Kitts, Montserrat, Dominica, Grenada, Bequia, and St. Thomas in the Antilles (56 to 458 fathoms), and along the west coast of Barbados. In the Eastern Atlantic the species is reported southwest of Cape St. Vincent, Portugal (91 meters to 248 fathoms) and from the Azores in 145 to 454 meters. Moseley reported *P. defilippii* from the Arafura Sea between Australia and New Guinea at a depth of 49 fathoms.

BIBLIOGRAPHY

Abe, Noboru

1937a. *Post-larval development of the coral Fungia actiniformis var. palawensis Döderlein.* Palao Trop. Biol. Sta., Studies, vol. 1, No. 1, pp. 73-93, figs. 1-10.

1937b. *Ecological survey of Iwayama Bay, Palao.* Palao Trop. Biol. Sta., Studies, No. 2, pp. 217-324, figs. 1-41, 25 tables.

1938. *Feeding behaviour and the nematocyst of Fungia and 15 other species of corals.* Palao Trop. Biol. Sta., Studies, vol. 1, No. 3, pp. 469-521, 31 figs.

1939a. *Ecological studies on Rhizopsammia minuta var. mutsuensis Yabe and Eguchi.* Jubilee Publ. Prof. H. Yabe, 60th Birthday. vol. 1, pp. 175-187, 6 figs.

1939b. *On the expansion and contraction of the polyp of a reef coral Caulastraea furcata Dana.* Palao Trop. Biol. Sta., Studies, vol. 1, No. 4, pp. 651-669, figs. 1-5.
1939c. *Migration and righting reaction of the coral Fungia actiniformis var. palawensis Döderlein.* Palao Trop. Biol. Sta., Studies, vol. 1, No. 4, pp. 671-694, figs. 1-9.
1940. *Growth of Fungia actiniformis var. palawensis Döderlein and its environmental conditions.* Palao Trop. Biol. Sta., Studies, vol. 2, No. 1, pp. 105-145, 11 figs.

Abe, N., Eguchi M., and Hiro, F.
1937. *Preliminary study of the coral reef of Iwayama Bay, Palao.* Palao Trop. Biol. Sta., Studies, vol. 1, No. 1, pp. 17-35, pls. 1, 2, chart.

Abel, E. F.
1959. *Zur Kenntnis der mariner Höhlenfauna unter besonder Berücksichtigung der Anthozoen.* Staz. Zool. Napoli, Pubbl., vol. 30, Suppl., pp. 1-94, pls. 1-4, text-figs.
1962a. *Anthozoen im Aquarium.* Neptun, vol. 2, No. 1, pp. 324-326, 3 figs.
1962b. *Edelkorallen.* Neptun, vol. 2, No. 3, pp. 65-66.

Abel, Othenio
1928. *Parasitische Balanen auf Stockcorallen aus dem Mediterranen Miozänmeer.* Palaeobiologica, vol. 1, pp. 13-38, 3 pls. 5 text-figs.

Abich, Hermann
1859. *Ueber das Steinsalz und seine geologische Stellung im russischen Armenien.* Acad. Imp. Sci. St. Petersbourg, Mém., sér. 6, vol. 7, pp. 59-151, 10 pls.

Abrard, René
1925. *Le Lutétien du bassin de Paris. Essai de monographie stratigraphique.* Angers, 388 pp., 4 pls. 32 text-figs., 4 maps.
1963. *Géologie et hydrogéologie des departements de l'Aube et de l'Yonne.* Mus. Nat. Hist. nat. Paris, Mém., n. s., vol. 12C, No. 1, pp. 1-54.

d'Achiardi, Antonio
1867-68. *Corallari fossili del terreno nummulitico dell'Alpi Vente. Parte I.* Soc. Ital. Sci. Nat. Milano, Mem., vol. 2, No. 4, 54 pp., 5 pls. *Parte II,* vol. 4, No. 1, 31 pp. 5 pls.
1868. *Studio comparativo fra i coralli dei terreni terziarii del Piemonte e dell'Alpi Venete.* Univ. Pisa, Ann., vol. 10, No. 2, pp. 73-144, pls. 1, 2.
1875. *Coralli eocenici del Friuli.* Soc. Toscana Sci. Nat. Pisa, Atti, Proc. Verb., vol. 2, pp. 239-242.

Acloque, Alexandre
1899. *Faune de France.* Paris, vol. 3, pp. 486-588.

Agassiz, Alexander
1880. *Report on the Florida reefs. Accompanied by illustrations of Florida corals, from drawings by A. Sonrel, Burkhardt, A. Agassiz and Roetter. With an explanation of plates by L. F. de Pourtalès.* Mus. Comp. Zool., Mem., vol. 7, No. 1, pls. 1-23.
1883. *The Tortugas and Florida reefs.* Amer. Acad. Arts Sci., Mem., vol. 11, pp. 107-133, pls. 1-12.
1888. *Three cruises of the Blake.* Mus. Comp. Zool., Bull., vols. 14-15, xxii + 314 + 220 pp., 545 figs., maps.
1889. *The coral reefs of the Hawaiian Islands.* Mus. Comp. Zool., Bull., vol. 17, No. 3, pp. 121-170, 13 figs.
1890. *On the rate of growth of corals.* Mus. Comp. Zool., Bull., vol. 20, No. 2, pp. 61-64, 4 pls.
1892. *Report on the dredging operations off the west coast of Central*

America, to the west coast of Mexico, and in the Gulf of California. Mus. Comp. Zool., Bull., vol. 23, pp. 1-89, 22 pls.

1894. *A reconnaissance of the Bahamas and of the elevated reefs of Cuba, in the steam yacht "Wild Duck", January to April 1893.* Mus. Comp. Zool., Bull., vol. 26. pp. 1-203, 47 pls.

1895. *A visit to the Bermudas in March 1894.* Mus. Comp. Zool., Bull., vol. 26, pp. 209-281, 30 pls.

1896a. *A visit to the Great Barrier Reef of Australia.* Amer. Jour. Sci., ser. 4, vol. 2 (152), No. 9, art. 32, pp. 240-244.

1896b. *The Florida elevated reef.* Mus. Comp. Zool., Bull., vol. 28, pp. 29-51, pls. 1-17.

1898a. *A visit to the Great Barrier Reef of Australia in the steamer "Corydon".* Mus. Comp. Zool., Bull., vol. 28, pp. 95-148, 42 pls.

1898b. *The island and coral reefs of the Fiji group.* Amer. Jour. Sci., ser. 4, vol. 5, (155), No. 26, art. 16, pp. 113-123.

1898c. *The Tertiary elevated limestone reefs of Fiji.* Amer. Jour. Sci., ser. 4, vol. 6 (156), No. 32, art. 15, pp. 165-167.

1899. *The islands and coral reefs of Fiji.* Mus. Comp. Zool., Bull., vol. 33, 167 pp., 120 pls.

1900. *Explorations of the "Albatross" in the Pacific.* Amer. Jour. Sci., ser. 4, vol. 9 (159), No. 49, art. 5, pp. 33-43; No. 50, art. 9, pp. 109-116; No. 51, art. 19, pp. 193-198; No. 53, art. 37, pp. 369-374.

1903a. *Reports on the scientific results of the expedition to the tropical Pacific, in charge of A. Agassiz; by the U. S. Fish Commission steamer "Albatross" from August, 1899 to March, 1900. IV. Coral reefs of the tropical Pacific.* Mus. Comp. Zool., Mem., vol. 28, 410 pp., 138 pls.

1903b. *The coral reefs of the Maldives.* Mus. Comp. Zool., Mem., vol. 29, 168 pp., 62 pls.

1903c. *On the formation of barrier reefs and of the different types of atolls.* Roy. Soc. London, Proc., vol. 71, pp. 412-414.

1906. *Reports on the scientific results of the expedition to the tropical Pacific, in charge of Alexander Agassiz, by the U. S. Fish Commission steamer "Albatross" from October, 1904 to March, 1905. General report of the expedition.* Mus. Comp. Zool., Mem., vol. 33, pp. i-xiii, 1-75, 96 pls., 8 text-figs.

Agassiz, Alexander, and Agassiz, Elizabeth Cabot Carey

1865. *Seaside studies in Natural History. Marine animals of Massachusetts Bay. Radiates.* Boston, ed. 2, 155 pp., figs.

Agassiz, Alexander, and Pourtalès, Louis François de

1874. *Zoological results of the Hassler Expedition. I. Echini, crinoids, and corals.* Mus. Comp. Zool., Mem., vol. 4, pp. 1-49, 10 pls., 15 text-figs.

1876. *Recent corals from Tilibiche, Peru.* Mus. Comp. Zool., Bull., vol. 3, pp. 287-290, 1 pl.

Agassiz, Louis

1850. *On the structure of coral animals.* Amer. Assoc. Adv. Sci., Proc., vol. 2, pp. 68-77.

1852. *Extracts from the report of Professor Agassiz to the Superintendent of the Coast Survey, on the examination of the Florida reefs, and coast.* U. S. Coast Sur., Rept. for 1851, pt. 1, pp. 146-160.

1858. *The animals of Millepora are hydroid acalephs and not polyps.* Amer. Jour. Sci., ser. 2, vol. 26 (76), pp. 140-141.

1869. *Report upon deep-sea dredgings in the Gulfstream during the third cruise of the U.S. steamer "Bibb" addressed to Professor Pierce.* Mus. Comp. Zool., Bull., vol. 13, pp. 363-386.

1880. *Report on the Florida reefs.* Mus. Comp. Zool., Mem.. vol. 7, No. 1, pp. 1-61, pls. 1-23.

Agassiz, Louis, and Fewkes, J. W.

1889. *The anatomy of Astrangia danae. Six lithographs from drawings by A. Sourel. Natural history illustrations prepared under the direction of Louis Agassiz, 1849. Explanation of plates by Walter Fewkes.* Smithsonian Inst., 20 pp., 6 pls.

Ahlburg, Johannes

1913. *Versuch einer geologischen Darstellung der Insel Celebes.* Geol. u. Palaeont. Abhandl. Jena, vol. 16, No. 1, pp. 1-172, 8 pls., text-figs., 3 geol. maps.

Alcock, Alfred William

1891. *Note on results of last season's deep-sea dredging. Natural history notes from H.M.S. "Investigator", Commander R. F. Hoskyn, R.N., commanding. No. 21.* Ann. Mag. Nat. Hist., ser. 6, vol. 7, pp. 4-8; vol. 8, pp. 449-451, fig. 15.

1893a. *Some newly-recorded corals from the India seas.* Asiatic Soc. Bengal, Jour., vol. 62, pp. 138-149, 3 pls. 2 charts.

1893b. *On some Actiniaria of the Indian seas.* Asiatic Soc. Bengal, Jour., vol. 62, pp. 151-153.

1894a. *An account of the deep-sea collections made during the season of 1892-1893.* Asiatic Soc. Bengal, Jour., vol. 62, pp. 169-177, pls. 8, 9.

1894b. *On some new and rare corals from the deep waters of India.* Asiatic Soc. Bengal, Jour., vol. 63, pp. 186-188.

1898. *An account of the deep-sea Madreporaria collected by the Royal Indian Marine Survey ship "Investigator."* Calcutta, 29 pp., 3 pls.

1902a. *Report on the deep-sea Madreporaria of the Siboga Expedition.* Siboga-Exped., vol. 10, Mon. 16a, pp. 1-51, pls. 1-5.

1902b. *A Naturalist in Indian Seas.* London, xxiv + 328 pp., 98 figs.

Aleem, Anwar Abdel

1957. *Succession of marine fouling organisms on test panels immersed in deep water at La Jolla, California.* Hydrobiologia, vol. 11, No. 1, pp. 40-58, figs. 1-5.

Alexander, W. B.

1932. *The natural history of the Firth of Tay.* Perthshire Soc. Nat. Sci., Trans., vol. 9, No. 2, pp. 35-42.

Allan, Edgar Johnson

1899. *On the fauna and bottom-deposits near the Thirty-Fathom Line from the Eddystone Grounds to Start Point.* Marine Biol. Assoc. Plymouth, Jour., vol. 5, pp. 365-542, charts, tables. [Coelenterata pp. 443-460.]

Allen, E. J., and Todd, R. A.

1900. *The fauna of Salcombe Estuary.* Marine Biol. Assoc. Plymouth, Jour., vol. 6, pp. 151-214. [Coelenterata pp. 185-187.]

1901. *The fauna of the Exe Estuary.* Marine Biol. Assoc. Plymouth, Jour., vol. 6. [Coelenterata p. 317.]

Allen, F. E.

1950. *Investigations on underwater fouling. III. Note on the fouling organisms attached to naval mines in north Queensland waters.* Australian Jour. Marine Freshwater Res., vol. 1, No. 1, pp. 106-109, pl. 1.

Allen, F. E., and Wood, E. J.

1950. *Investigations on underwater fouling. II. The biology of fouling in Australia. Results of a year's research.* Australian Jour. Marine Freshwater Res., vol. 1, No. 1, pp. 92-105, pls. 1-3, text-figs.

Allen, J. R. L., and Wells, J. W.
1962. *Holocene coral banks and subsidence in the Niger Delta.* Jour. Geol., vol. 70, No. 4, pp. 381-397, pls. 1-4, text-figs. 1-6.
Alloiteau, James
1935. *Sur la nécessité de l'étude de sections pour la détermination des polypiers du Crétacé.* Acad. Sci. Paris, C. R., vol. 201, No. 3, pp. 232-234.
1936a. *Polypiers fossiles de Madagascar. I. Formes du Crétacé de la province d'Analalava.* Géol. Serv. Mines Tananarive, Ann., No. 6, pp. 41-53, pl. 6.
1936b. *Sur la présence, dans le calcaire à Spatangus de la Haute-Marne, de Plesiosmilia villersensis Koby et de deux espèces nouvelles se rapportant ux genres Pleurosmilia et Plesiosmilia.* Soc. Géol. France, Bull., sér. 5, vol. 6, pp. 507-510, pl. 36.
1936c. *Sur la présence, dans le Turonien d'Uchaux de Pachygyra Krameri Oppenh.* Soc. Géol. France, C. R., No. 17, pp. 1935-1936.
1937. *Sur la présence, dans le Turonien d'Uchaux, de Diplocteniuin ferrum equinum Reuss.* Soc. Géol. France, C. R., Nos. 7-8, pp. 85-87.
1939a. *Polypiers récoltés par M. P. Sénesse dans le Santonien de la Jouane, Cne. de Sougraigne (Aude).* Soc. Géol. France, Bull., sér. 5, vol. 9, pp. 3-22, pl. 1.
1939b. *Deux espéces nouvelles de polypiers d'Anthozoaires de l'Anatolie septentrionale.* Bull. Scient. Bourg., vol. 9, pp. 5-11, 1 pl.
1941. *Révision de la collection H. Michelin. Polypiers d'Anthozoaires fossiles. I. Crétacé.* Mus. Nat. Hist. nat. Paris, Mém., n. s., vol. 16, No. 1, pp. 1-110, pls. 1-31.
1947. *Polypiers du Gargasien aragonais.* Escuela Peritos Agric. y Especialidades Agropec. y Serv. Tec. Agric., An., vol. 6, pp. 187-243, pls. 1-3.
1948. *Polypiers des couches albiennes à grandes Trigonie de Padern (Aude).* Soc. Géol. France, Bull., sér. 5, vol. 18, pp. 699-738, pls. 26, 27.
1949a. *Sur la structure du g. Trochosmilia et sa position systématique.* Acad. Sci. Paris, C. R., vol. 228, pp. 1148-1150.
1949b. *Les coraux d'Éocène de Bojnice-les-Bains près de Prievdza dans les Karpathes slovaques.* Práce Statneho Geol. Ustavu Bratislava, vol. 24, pp. 1-30, pls. 1-8, text-figs.
1950. *Types et échantillons de polypiers de l'ancienne collection Defrance.* Mus. Nat. Hist. nat. Paris, Mém., n. s., sér. C, vol. 1, No. 2, pp. 105-148, pls. 1-7.
1952a. *Généralités sur les Coelentères; Hydrozoaires, Schyphozoaires; Alcyonaires; Madreporaires; Madreporaires post-Paleozoīques. In* Piveteau, J., *Traité de Paléontologie,* vol. 1, pp. 376-418, 539-684, pls. 1-10, text-figs. 1-130.
1952b. *Note sur des polypiers du Sénégal.* Direct. Mines A. O. F., Bull., No. 14, pp. 9-18, 1 pl.
1952c. *Sur le g. Diplocteniuin Goldf. dans le Crétacé supérieur français.* Soc. Géol. France, Bull., sér. 6, vol. 2, pp. 537-573, pls. 19, 20.
1953. *Sur cinq genres nouveaux de Madréporaires post-paleozoīques.* Soc. Géol. France, Bull., sér. 6, vol. 3, pp. 873-887, pls. 28, 29.
1954a. *Le genre Actinastrea d'Orb. 1849 dans le Crétacé supérieur français.* Ann. Hébert et Haug, vol. 8, pp. 1-104, pls. 1-10.
1954b. *Du genre Phyllosmilia de Fromentel dans le Crétacé supérieur français.* Centre Et. Docum. Paléont., Ann., No. 8, 30 pp., 1 pl.
1957. *Contribution à la systématique des Madréporaires fossiles.* Centre Nat. Rech. Scient. Paris, vol. 1 (text), pp. 1-462, text-figs. 1-5; vol. 2 (illustrations) figs. 1-286, pls. 1-20.

1958. *Monographie des Madréporaires fossiles de Madagascar.* Ann. Géol. Madagascar, vol. 25, pp. i-viii, 1-218, pls. 1-38, text-figs. 1-37.
1959. *Introduction à la séance spécialisée sur les millieux récifaux.* Soc. Géol. France, Bull., sér. 7, vol. 1, pp. 335-336.
1960a. *Recherches sur le développement du squellete chez les Madréporaires.* Soc. Géol. France, Bull., sér. 7, vol. 1, No. 7, pp. 678-686, figs. 1-3.
1960b. *Nouveaux polypiers du Crétacique d'Espagne.* Escuela Técnica Perit. Agric. Agropec. Serv. Técn. Agric. Barcelona, An., vol. 14, pp. 77-108, pls. 1-2, text-figs. 1-4.
1960c. *Sur le genre Clausastrea.* Ann. Paléont., vol. 46, pp. 1-46, pls. 1-5, text-figs. 1-16.
1964. [*Type corals revised.*] Paleontologia Universalis, n. s., 1956-1959, Nos. 59-88, 90-101, 103-121, 131-143, 150-153.

Alloiteau, J., and Tissier, J.
1958. *Les Madréporaires du Montien des Petites Pyrénées. Comparaison avec ceux du Montien de Mons.* Soc. Hist. Nat. Toulouse, Bull., vol. 93, Nos. 1-2, pp. 241-293, pls. 1-4, text-figs. 1-17.

Alm, G.
1916. *Faunistische und biologische Untersuchungen im See Hjalmaren (Mittelschweden).* Ark. f. Zool., vol. 10, No. 3, pp. 1-47.

Almola, A., Rios, J. M., and Garrido, J.
1943. *Sobre una curiosa asociación fósil de un coralario de una orthophragmina.* Soc. Española Hist. Nat., Bol., vol. 41, pp. 223-225, pl. 10.

Almodovar, L. R.
1962. *Notes on the algae of coral reefs, off La Parguera, Puerto Rico.* Florida Acad. Sci., Quart. Jour., vol. 25, No. 4, pp. 275-286, fig. 1.

Almy, Charles C., Jr., and Carrión-Torres, Carlos
1963. *Shallow-water stony corals of Puerto Rico.* Caribbean Jour. Sci., vol. 3, Nos. 2-3, pp. 133-162, pls. 1-21, text-figs. 1, 2.

Altinli, I. Enver
1954a. *The geology of southeastern Sürt.* Fac. Sci. Univ. Istanbul, Rev., vol. B19, No. 1, pp. 1-31, pls. 1-3 [Oligocene coral.]
1954b. *The geology of southern Hakkâri.* Fac. Sci. Univ. Istanbul, Rev., vol. B19, No. 1, pp. 33-65, pls. 1-3.
1963. *Erzurum. Explanation of the text of the Geologic Map of Turkey.* [Turkish with English translation.] Ankara, vol. 1, pp. i-vi, 1-54, i-iv, 55-131.
1964. *Van. Explanation of the text of the Geologic Map of Turkey.* [Turkish with English translation.] Ankara, pp. 1-90.

Alvariño, A.
1957a. *Estudio del zooplancton del Metiterraneo Occidental.* Inst. Español Oceanogr., Bol., vol. 81, pp. 1-26, figs. 1-9.
1957b. *Zooplancton del Atlántico Ibérico.* Inst. Español Oceanogr., Bol., vol. 82, pp. 1-51, figs. 1-7.

Alzamora, Massuti, M.
1948. *Estudio de diez y seis muestras de plancton de Golfo de Nãpoles.* Inst. Biol. Aplic. Barcelona, Publ., vol. 5. pp. 85-94.

Ancellin, J.
1957. *Observations sur la faune et les fonds de pêche de quelques secteurs de la Manche et des mars nordiques.* Inst. Pêches Marit., Rev. Trav., vol. 21, No. 4, pp. 449-484.

Anderson, Charles A.
1950. *1940 E. W. Scripps cruise to the Gulf of California. Part I. Geology of islands and neighboring land areas.* Geol. Soc. Amer., Mem. 43, pp. i-vii, 1-53, pls. 1-3, text-figs. 1-19.

Anderson, H. J.
1962. *Paläontologische Bemerkungen zur Stratigraphie des Oligo-Miocän in der niederrheinischen Bucht.* Fortschr. Geol. Rheinld.-Westf., vol. 6, pp. 1-18, figs. 1-3. [Coral p. 9.]
Andrews, Charles William
1900a. *A monograph of Christmas Island (Indian Ocean): Physical features and geology.* British Mus. (Nat. Hist.), xiii + 337 pp., 22 pls., 1 map, text-figs.
1900b. *Notes on the limestones and general geology of the Fiji Islands, with special reference to the Lau group. Based upon surveys made for Alexander Agassiz, with a preface by T. W. Edgworth David.* Mus. Comp. Zool., Bull., vol. 38, pp. 1-50, 40 pls.
Angelis d'Ossat, Gioacchino de
1892-93. *Introduzione allo studio degli Antozoi fossili.* Riv. Italiana Sci. Nat. e Boll. Naturalista, Collettore, Allevatore, Coltivatore Siena, vol. 12 (1892), pp. 129-132, 141, 142; vol. 13 (1893), pp. 6-9, 25-28, 34-38, 60-64, 77-82.
1893. *I Zoantari fossili dei dintorno di Roma.* Soc. Geol. Italiana, Boll., vol. 12, pp. 1-25.
1894. *I corallari dei terreni Terziari dell'Italia settentrionale. Collezione Michelotti. Museo Geologico della R. Università di Roma.* R. Accad. Lincei Roma, Mem., Cl. Sci. Fis., Mat., Nat., vol. 1, pp. 164-280, pls. 1-3.
1895a. *Studio paleozoologico. I. Corallarii fossili dei terreni Terziari, collezione del Gabinete di Storia Nat., R. Instituto Tecnico di Udine. Appendice. Intorno ad una Hydrocorallina fossile.* Riv. Italiana Sci. Nat. Siena, vol. 15, pp. 20-22, 33-35, 34-46, 57-62, 81-86.
1895b. *Descripción de los Antozoos fósiles Pleiocénicos de Cataluña.* Barcelona, 26 pp., 1 pl., 19 text-figs.
1895c. *Antozoos y Briozoos de los depósitos Pliocénicos de Cataluña y contribución a la fauna Paleozóica de dicha region.* R. Acad. Sci. y Artes Barcelona, Mem., vol. 3, No. 3, 47 pp.
1899. *Los primeros Antozoos y Briozoos Miocénicos recogidos en Cataluña.* R. Acad. Sci. y Artes Barcelona, Mem., vol. 3, No. 4, 31 pp.
1903a. *Zoantari del Terziario della Patagonia.* Palaeontogr. Italica, vol. 9, pp. 19-34, pl. 10.
1903b. *Zoantari Miocenici dell'Hérault (Francia meridionale).* Soc. Geol. Italiana, Boll., vol. 22, pp. 115-119, 4 figs.
1905a. *Sul concetto di individuo nei Zoantari fossili.* Soc. Geol. Italiana, Boll., vol. 24, pp. 147-157, 1 fig.
1905b. *Coralli del Cretacio inferiore della Catalogna.* Palaeontogr. Italica, vol. 11, pp. 169-251, pls. 14-17.
1905c. *I coralli del calcare de Venassino (Isola di Capri).* Acad. Sci. Napoli, Atti, ser. 2, vol. 12, 45 pp., 2 pls.
1905d. *Fauna coralina del piso aptense de Cataluña.* Real Acad. Cienc. Barcelona, Mem., pt. 3, vol. 5, No. 5, pp. 67-73.
1907. *Altri Zoantari del Terziario della Patagonia.* Mus. Nac. Buenos Aires, An., vol. 16, pp. 93-102, pl. 1.
Angelis d'Ossat, Gioacchino de, and Neviani, Antonio
1897. *Corallarii e Briozoi Neogenici di Sardegna.* Soc. Geol. Italiana. Boll., vol. 15, pp. 571-598.
Anić, D.
1952. *Oberoligozäne kohlenführende Ablagerungen der Südhänge des Ivančica Gebirges in Kroatien.* [Serbian with German summary.] Geol. Vjesn Yougosl., Nos. 2-4, pp. 7-62, 11 pls.

Anichini, C.
1960. *Variazioni qualitative e quantitative dello zooplancton nelle parte orientale del Golfo di Cagliari dal luglio 1956 al dicembre 1957.* Comm. Internat. Mer Médit., Rapp., vol. 15, No. 2, pp. 317-325, 4 figs.

Annandale, [Thomas] Nelson
1924. *Cirripedes associated with Indian corals of the families Astraeidae and Fungidae.* Indian Mus. Calcutta, Mem., vol. 8, pp. 61-68, 1 pl.

Annoscia, E.
1963. *Antozoi e Briozoi nelle argille Calabriane di Venosa.* Geol. Romana, vol. 2, pp. 215-278, pls. 1-19, text figs. 1-13, [Corals pp. 221-223.]

Anselmi, R.
1923. *Sulla distribuzione stagionale dei principali gruppi zoologici presenti nei plancton superficiale del Mare di Quarto dei Mille.* Soc. Ligustica Sci. Lett. Pavia, Atti, vol. 2, pp. 64-74.

Antipa, Gregor
1941. *Marea Neagra. I. Oceanografia, Bionomia si Biologia generala a Marii Negre.* Fond. Acad. Romana Bucaresti, Pub., vol. 10, No. 55, p. 1-313, figs., maps. [Coelenterata p. 217.]

Appellöf, Adolf
1900. *Studien über Actinen-Entwicklung.* Bergens Mus. Aarbog, No. 1, pp. 1-99, 4 pls. 13 text-figs.

Arai, J.
1957. *Preliminary remarks on some Miocene corals from the Kami-yokoze Formation, Chichibu Basin, Saitama Prefecture, Japan.* Geol. Soc. Japan, Jour., vol. 63, p. 746.

Arango y Molina, Rafael
1877c. *Radiados de la Isla de Cuba. Pólipos Calcáreos.* R. Acad. Cienc. Médicas, Físicas y Naturales de la Habana, An., vol. 14, pp. 272-284.

d'Archiac, Etienne Jules Adolphe Desmier de St. Simon
1846. *Description des fossiles recueillis par M. Thorent dans les couches à Nummulites des environs de Bayonne.* Soc. Géol. France, Mém., sér. 2, vol. 2, pp. 189-217, pl. 5.
1850. *Description des fossiles du groupe nummulitique aux environs de Bayonne et Dax.* Soc. Géol. France, Mém., sér. 2, vol. 3, pp. 397-456, pls. 8-13.
1853. *Description des animaux fossiles nummultiques de l'Inde.* Paris, 375 pp., 36 pls.

Arkell, William Joscelyn
1928. *Aspects of the ecology of certain fossil coral reefs.* Jour. Ecol., vol. 16, pp. 134-149, 3 pls., 2 text-figs.
1933. *The Jurassic System in Great Britain. Chap. 18. The distribution of corals.* Oxford, pp 557-562, fig. 92.
1935. *On the nature, origin, and climatic significance of the coral reefs in the vicinity of Oxford.* Geol. Soc. London, Quart. Jour., vol. 91, pt. 1, pp. 77-110, pl. 6.

Arnaud, H.
1877. *Mémoire sur le terrain Crétacé du Sud-Ouest de la France.* Soc Géol. France, Mém., sér. 2, vol. 10, No. 4, 110 pp., pls 21-28.

Arnesen, Emily
1898. *Beiträge zur Anatomie und Histologie von Ulocyathus arcticus Caryophyllia smithii, Dendrophyllia ramea und Cladocora caespitosa.* Beitr Anat. Histol., Arch., Math-Naturv. Kl., vol. 20, pp 1-28, pls. 1, 2.

Ashworth, J. H., and Annandale, N.

1904. *Observations on some aged specimens of Sagartia troglodytes, and on the duration of life in coelenterates.* Roy. Soc. Edinburgh, Proc., vol. 25, pp. 295-308.

Atanacković, M.

1955. *Das marine Paläogen auf den Nordabhangen von Skopska Crna Gora (Becken von Gornja Norava-Südserbien).* [Serbian with German summary.] Radova Geol. Inst. Beograd, Zborn, vol. 8, pp. 113-133, pls. 1-5, text-figs. 1-6.

Atoda, Kenji

1947. *The larva and post-larval development of some reef-building corals. I. Pocillopora damicornis caespitosa (Dana).* Tôhoku Imp. Univ., Sci. Rept., ser. 4 (Biology), vol. 18, pp. 24-47, 6 figs. *II. Stylophora pistillata,* pp. 48-64, 1 pl., 1 text-fig.

1951a. *The larva and post-larval development of some reef-building corals. III. Acropora brüggemanni (Brock).* Jour. Morph., vol. 89, No. 1, pp. 1-15, pl. 1, text-figs 1-9. *IV. Galaxea aspera Quelch,* pp. 17-35, pls. 1-3, text-figs. 1-3.

1951b. *The larva and post-larval development of some reef-building corals. V. Seriatopora hystrix Dana.* Tôhoku Imp. Univ., Sci. Rept., ser. 4 (Biology), vol. 19, No. 1, pp. 33-39, 6 figs.

1951c. *Asexual reproduction in some younger reef corals of Seriatoporidae.* Tôhoku Imp. Univ., Sci. Rept., ser. 4 (Biology), vol. 19, No. 2, pp. 178-186, pl. 2, 1 text-fig.

1953. *The larva and post-larval development of the reef-building coral.* Tôhoku Imp. Univ., Sci. Rept., ser. 4 (Biology), vol. 20, No. 1, pp. 105-121, text-figs.

1954. *Investigation of the fauna in Tashiro Island, Ojika-gun, Miyagi Prefecture.* [Japanese with English summary.] Saito Ho-on-Kai Mus., Res. Bull., No. 23, pp. 16-18.

Audouin, Victor, and Savigny, Jules-Cesar

1826, 1828. *Description de l'Égypte, ou recueil des observations des recherches qui ont été faites en Égypt pendant l'expédition de l'Armée Française, publie par les ordres de sa Majesté l'Empereur Napoléon le Grand. Histoire Naturelle. Tome premier. Explication sommaire des planches de Polypes de l'Égypt et de la Syrie.* Paris, vol. 1, pt. 4, pp. 225-236, pls. 1-6.

Aurivillius, Carl Vilhelm Samuel

1898. *Vergleichende thiergeographische Untersuchungen über die Plankton-Fauna des Skageraks in den Jahren 1893-1897.* K. Svenska Vetensk.-Akad., Handl., vol. 30, No. 3, 426 pp., text-figs.

1899a. *Om hafsevertebraternas utvecklingstider och periodiciteten i larvformernas uppträdande vid Sveriges Vestkust.* K. Svenska Vetensk.-Akad. Handl., Bihang, vol. 24, No. 4, 91 pp.

1899b. *Animalisches Plankton aus dem Meere zwischen Jan Mayen, Spitzbergen, K. Karls Land und der Nordküste Norwegens.* K. Svenska Vetensk.-Akad., Handl., vol. 32, No. 6, 71 pp.

Avias, Jacques

1960. *Les récifs coralliens de la Nouvelle-Calédonie et quelques-uns de leurs problèmes.* Soc. Geol. France, Bull., sér. 7, vol. 1, No. 4 (1959), pp. 424-430, pls. 26, 27.

Azzaroli, A.

1958. *L'Oligocene e il Miocene della Somalia. Stratigrafia, tettonica, paleontologia (macro-foraminiferi, coralli, molluschi).* Palaeontogr. Italica, vol. 52, pp. 1-143, pls. 1-36, text-figs. 1-34. [Corals pp. 82-105.]

Bacci, G.
1946. *Ricerche sulle zoocenosi bentoniche del Golfo di Napoli.* Staz. Zool. Napoli, Pubbl., vol. 20, No. 2, pp. 158-178, figs.

Bainbridge, V.
1960. *The plankton of inshore waters off Freetown, Sierra Leone.* Fish. Publ. London, No. 13, pp. 1-48, figs. 1-22.

Baker, C. L.
1933. *Formation of Indo-Pacific coral reefs and atolls.* Pan-Amer. Geol., vol. 60, pp. 15-24.

Baker, H. A.
1925. *A coral reef in the New Hebrides.* Zool. Soc. London, Proc., pt. 3, pp. 1007-1019, text-figs. 1-8.

Baker, Henry
1743. *An attempt towards a natural history of the Polype.* London, 218 pp., 1 pl.

Bal, D. V., and Pradhan, L. B.
1952. *Records of zooplankton in Bombay waters during 1944-47.* Univ. Bombay, Jour., n. s., vol. 20B, No. 5, pp. 75-80.

Balavoine, Pierre
1956. *Le gisement fossilifère de Saint-Gervais (Seine-et-Oise).* Mus. Nat. Hist. nat. Paris, Bull., sér. 2, vol. 28, No. 4, pp. 419-427.

Ball, J.
1916. *The geography and geology of west-central Sinai.* Geol. Sur. Dept. Egypt, Rept., pp. i-ix, 1-219, pls. 1-24 [Corals p. 121].

Banner, A. H., and Randall, J. E.
1952. *Preliminary report on marine biology study of Onotoa Atoll, Gilbert Islands. Part I.* Atoll Res. Bull., No. 13, pp. 1-42.

Bannwarth
1914. *Biologische Riff-Untersuchungen im Golf von Suez.* Senckenb. Naturforsch. Gesell., Abh., vol. 36, No. 1, pp. 41-50, chart.

Barnard, K. H.
1954. *South African Shore-Life.* Capetown, pp. 1-135, pls. 1-25.

Barr, R. W.
1962. *The geology of the Toco District, Trinidad, West Indies, Pt. 1.* Overseas Geol. Min. Resources, vol. 8, No. 4, pp. 379-415, pls. 1-2, text-figs. 1-5, geol. map. [Coral list by J. W. Wells p. 394.]

Barrett, J. H., and Yonge, C. M.
1958. *Collins pocket guide to the sea shore.* London, pp. 1-272, 40 pls., text-figs. [Coelenterata pp. 45-46.]

Barrois, Charles
1886. *Sur le calcaire à polypiers de Cabrières. Hérault.* Soc. Géol. du Nord (Lille), Ann., vol. 13, pp. 74-101.

Bartholomew, R. W.
1960a. *Geology of Savusavu Bay West, Vanua Levu.* Geol. Sur. Dept. Suva, Fiji, Bull., vol. 5, iv + 28 pp., pls. 1-12. [Corals by J. W. Wells, p. 9.]
1960b. *Geology of the Nandi area, western Viti Levu.* Geol. Sur. Dept. Suva, Fiji, Bull., vol. 7, iv + 27 pp., pls. 1-14, map. [Corals by J. W. Wells p. 12.]

Bassett-Smith, Percy William
1889a. *Coral reefs.* Nature, vol. 40, No. 1027, p. 223.
1889b. *Bathymetric conditions as to growing corals and other species of the Tizard and Macclesfield Banks in the China Seas.* Amer. Jour. Sci., ser. 3, vol. 38, p. 169.

1890. *Report on the corals from the Tizard and Macclesfield Banks, China Sea.* Ann. Mag. Nat. Hist., ser. 6, vol. 6, pp. 353-374, 443-458, 3 pls.
1893. *China Sea. Report on the results of dredging obtained on the Macclesfield Bank, by H.M.S. "Penguin", commander W. W. Moore, April 1892.* Hydrogr. Dept., Admiralty, 16 pp., 1 chart.
1894. *China Sea. Report on the restults of dredging obtained on the Macclesfield Bank, by H.M.S. "Rambler" . . . April 1888, and H.M.S. "Penguin" . . . April 1892, and H.M.S. "Egeria" . . . April 1893.* Hydrogr. Dept., Admiralty, 42 pp., 2 pls., text-figs., chart.
1899. *On the formation of coral-reefs on the N. W. coast of Australia.* Zool. Soc. London, Proc., pp. 157-159.

Bassindale, R.
1938. *The intertidal fauna of the Mersey Estuary.* Marine Biol. Assoc. U. K., Plymouth, Jour., vol. 23, No. 1, pp. 83-98, pl. 3.
1941. *The invertebrate fauna of the southern shores of the Bristol Channel and Severn Estuary.* Bristol Nat. Soc., Proc., ser. 4, vol. 9, pp. 143-201. [Coelenterata pp. 146-155.]
1945. *Studies on the biology of the Bristol Channel. XVI. The fauna of Skomer Island. A preliminary sketch.* Bristol Nat. Soc., Proc., ser. 4, vol. 27, No. 2, pp. 109-120.
1961. *On the marine fauna of Ghana.* Zool. Soc. London, Proc., vol. 137, No. 4, pp. 481-510, 5 figs.

Baster, Job
1757. *Observations de corallinis iisque insidentibus polypis aliusque animaliculis marinis.* Roy. Soc. London, Philos. Trans., pp. 258-280, 4 pls.

Bataller, Calatayud, José Ramon
1950. *La paleontología en el Instituto Geológico.* Inst. Geol. España, Libro Jubilar (1849-1949), vol. 1, pp. 173-235. [Corals pp. 189-193.]
1955. *Enumeración de las especies nuevas del Eocénico de España.* Escuela Perit. Agric. Barcelona, An.. vol. 13, pp. 3-50. [Anthozoa pp. 18-20.]
1959. *Paleontología del Garumiense.* Inst. Mallada, Estudios Geol., vol. 15, pp. 4-44. [Corals pp. 41-43.]

Battistini, René
1959. *Observations sur les récifs coralliens du Sud-Ouest de Madagascar.* Soc. Géol. France, Bull., sér. 7, vol. 1, No. 4, pp. 341-346, figs. 1, 2.

Beauchamp, Paul Marais de
1923. *Études de bionomie intercotidale. Les îles de Ré at d'Yeu.* Arch. Zool., vol. 61, pp. 455-520, pls. 17-24.
1929. *Sur un madréporaire observé à Saint-Gervan.* Mus. Nat. Hist. nat. Paris, Bull., vol. 50, pp. 107-110.

Beaumont, Walter Ibbotson
1900. *The fauna and flora of Valencia Harbour on the west coast of Ireland. VII. The results of dredging and shore-collecting.* Roy. Irish Acad. Dublin, Proc., ser. 3, vol. 5. [Coelenterata pp. 766-769.]

Beauvais, Louise
1964. *Étude stratigraphique et paléontologique des formations à Madréporaires du Jurassic supérieur du Jura et de l'Est du bassin de Paris.* Soc. Géol. France, Mém., n. s., vol. 43, No. 1 (Mém. 100), pp. 1-287, pls. 1-38, text-figs. 1-54.
1966a. *Revision de quelques Madréporaires du Dogger d'Angeleterre de la collection Milne Edwards.* Soc. Géol. France, Bull., sér. 7, vol. 7 (1965). pp. 871-875, pls. 36, 37.

1966b. *Revision des Madréporaires du Dogger de la collection Koby.* Eclogae Geol. Helvetiae, vol. 59, No. 2, pp. 989-1024, pls. 1-15.

Beauvais, Marcel

1965. *Revision des Madréporaires de forme cyclotitoïde des couches de Gosau de la collection E. Quenstedt.* Soc. Géol. France, Bull., sér. 7, vol. 6, No. 4, pp. 535-544, pls. 15, 16, text-figs. 1A-1B.

Beche, H. T. de la

1828. *Notes on the habits of a Caryophyllia from Tot Bay, Devon.* Zool. Jour. London, vol. 3, p. 481.

Becker, Evald

1875. *Die Korallen der Nattheimer Schichter.* Paleontographica, vol. 21, pp. 121-162, pls. 36-39.

Becker, Evald, and Milachewitch, Constantin

1875. *Die Korallen der Nattheimer Schichter.* Palaeontographica, vol. 21, pp. 165-204, pls. 40-45.

Becker, George F.

1901. *Report on the geology of the Philippine Islands.* U. S. Geol. Sur., 21st Ann. Rept., Part III, pp. 493-614, pls. 67-68 (charts).

Bedot, Maurice

1907. *Madréporaires d'Amboine.* Rev. Suisse Zool. Genève. vol. 15, pp. 143-292, pls. 5-50. [Voyage de MM. M. Bedot et C. Pictet dans l'Archipel Malais.]

Beechey, Frederick William

1831. *Narrative of a voyage to the Pacific and Beerings' Strait . . . performed in H.M.S. Blossom . . . in . . . 1825-28.* London, 2 vols. [in 1], xxi + 742 pp., 14 pls., 3 maps.

Behre, Elinor H.

1950. *Annotated list of the fauna of the Grand Isle region 1928-1946.* Marine Lab. Louisiana State Univ., Occas. Papers, No. 6, pp. 1-66. [Coelenterata pp. 6-8.]

Belanski, Charles Herbert

1928. *Descriptions of some typical fossils of the shellrock stage.* Amer. Midland Nat., vol. 11, pp. 171-177, 1 pl.

Bell, A[lfred]

1888. *British upper Tertiary corals.* Geol. Mag., decade 3, vol. 5, pp. 28, 29.

1921. *Notes on the later Tertiary Invertebrata.* Yorkshire Philos. Soc., Ann. Rept., 21 pp., 2 pls.

Bell, Francis Jeffrey

1895. *On the variations observed in large masses of Turbinaria.* Roy. Microsc. Soc. London, Jour., pp. 148, 149, pls. 2, 3.

Bellini, R.

1905. *Le varie facies del Miocene Medio nelle Colline di Torino.* Soc. Geol. Italiana, Boll., vol. 25, pp. 607-653.

Bemmelen, Reinout Willem

1936-37. *Oostelijk Midden Java.* Mijnw. Nederland. Ind., Jb., Nos. 65-66, pp. 20-33.

1949. *The Geology of Indonesia.* The Hague, 2 vols. + portfolio; vol. 1, pp. 1-xxiii, 1-732, figs. 1-377, tables 1-124; vol. 2, pp. i-vii, 1-265, figs. 1-52, tables 1-56; portfolio, pls. 1-41.

Bénard, F.

1960. *La faunule associée au Lithophyllum incrustans Phil., des cuvettes de la région de Roscoff.* Cahiers Biol. Marine, vol. 1, No. 1, pp. 89-102, 2 text-figs.

Beneden, Edouard Joseph Marie van

1866. *Recherches sur la faune littorale de Belgique. Polypes.* Brussels, pp. 1-207, pls. 1-18, text-figs.

1897. *Die Anthozoen der Plankton-Expedition. In* Hensen, V.A.C., *Ergebnisse der in dem Atlantischen Ozean von Mitte Juli bis Anfang November 1889 ausgefuhrten Plankton-Expedition der Humboldt-Stiftung.* Vol. 2, No. Ke, 222 pp., 16 pls., 59 text-figs., maps.

Benham, W. B.

1906. *On a new species of Sarcophyllum from New Zealand.* Zool. Anzeig., vol. 31, pp. 66, 67.

Bennigsen, ———

1900. *Bericht des kaiserlichen Gouverneurs v. Bennigsen über seine Reise zum Zwecke der Uebernahme des Inselgebietes der Karolinen, Palau und Marianen in Deutschland besitz.* Deutsch. Kolonialblatt Berlin, vol. 11, pp. 100 *et seq.*

1901a. *Ueber eine Reise nach den deutschen und englischen Salomons Inseln.* Deutsch. Kolonialblatt Berlin, vol. 12, pp. 113 *et seq.*

1901b. *Reise des Gouverneurs v. Bennigsen nach den Karolinen und Palau Inseln.* Deutsch. Kolonialblatt Berlin, vol. 12, pp. 447 *et seq.*

Berg, ———

1903. *Bericht des Vizegouverneurs Berg über einem Besuch der Trukinseln.* Deutsch. Kolonialblatt Berlin, vol. 14, pp. 364 *et seq.*

Bergmann, Warner, and Lester, David

1940. *Coral-reefs and the formation of petroleum.* Science, vol. 92, pp. 452, 453.

Berkey, Charles P.

1915. *Geological reconnaissance of Porto Rico.* New York Acad Sci., Ann., vol. 26, pp. 1-70, pls. 1-3, text-figs. 1-20.

Bermúdez, Pedro J.

1960, 1961. *Contribución al estudio de las Globigerinidea de la región Caribe-Antillana. (Paleoceno-Reciente).* Bol. Geol. (Venezuela), Publ. Especial No. 3 (1960), Tercer Congreso Geológico Venezolano, Tomo 3, pp. 1119-1393. Also Editorial Sucre, Caracas, pp. 1119-1393 (1961).

1966. *Consideraciones sobre los sedimentos del Mioceno Medio al Reciente de las costas central y oriental de Venezuela. Primera parte.* Bol. Geol. (Venezuela), vol. 7, No. 14, pp. 333-411, correlation chart, 4 tables.

Bermúdez, Pedro, J., and Fuenmayor, Angel, N.

1962. *Notas sobre los foraminíferos del Grupo Cabo Blanco.* Asoc. Venezolana Geol., Min. y Petroleo, Bol. Informativo, vol. 5, No. 1, pp. 3-16, fig. 1 (geol. map).

1966. *Consideraciones sobre los sedimentos del Mioceno Media al Reciente de las costas central y oriental de Venezuela. Segunda parte. Los foraminíferos bentónicos.* Bol Geol. (Venezuela), vol. 7, No. 14, pp. 412-611, pls. 1-4.

Bernard, Henry M.

1895a. *Notes on the madreporarian genus Astraeopora as represented by the specimens in the British Museum (Natural History).* Ann. Mag. Nat. Hist., ser. 6, vol. 16, pp. 273-281, 1 pl.

1895b. *Notes, morphological and systematic, on the madreporarian genus Turbinaria.* Ann. Mag. Nat. Hist., ser. 6, vol. 16, pp. 499-521, pls. 19, 20.

1896a. *Catalogue of the madreporarian corals in the British Museum (Natural Hitsory). Volume II. The genus Turbinaria. The genus Astraeopora.* British Mus. (Nat. Hist.), vol. 2, No. 4, pp. i-iv, 1-106, pls. 1-33.

1896b. *On the affinities of the madreporarian genus Alveopora with the Paleozoic Favositidae, together with a brief sketch of some of the evolutionary stages of the madreporarian skeleton.* Linnean Soc. London, Jour., Zoology, vol. 26, pp. 495-516, pl. 33.

1897a. *Catalogue of the madreporarian corals in the British Museum (Natural History). Volume III. The genus Montipora. The genus Anacropora.* British Mus. (Nat. Hist.), vol. 3, pp. i-vii, 1-192, pls. 1-34.

1897b. *Notes, morphological and systematic, on the madreporarian subfamily Montiporinae (Montipora and Anacropora) with an account of the phylogeny of the Madreporidae.* Ann. Mag. Nat. Hist., ser. 6, vol. 20, pp. 117-135, pl. 2.

1899a. *Recent Poritidae, and the position of the family in the madreporarian system.* Linnean Soc. London, Jour., Zoology, vol. 27, pp. 127-149, 2 figs.

1899b. *On the structure of Porites, with preliminary notes on the soft parts.* Linnean Soc. London, Jour., Zoology, vol. 27, pp. 487-503, pl. 35, text-fig.

1900. *On the Madreporaria collected by Mr. C. W. Andrews at Christmas Island.* Zool. Soc. London, Proc., pp. 119-127.

1901a. *On the unit of classification for systematic biology.* Cambridge Philos. Soc., Proc., vol. 11, pp. 268-280.

1901b. *Nomenclatur und Entwickelungslehre.* Int. Zool. Congr. Berlin, pp. 891-896.

1902. *The species problem in corals.* Nature, vol. 65, pp. 560.

1903. *Catalogue of the madreporarian corals in the British Museum (Natural History). Volume IV. The family Poritidae. 1.—The genus Goniopora.* British Mus. (Nat. Hist.), vol. 4, pp. i-viii, 1-206, pls. 1-14.

1904. *The prototheca of the Madreporaria, with special reference to the genera Calostylis Lindstr. and Moseleya Quelch.* Ann. Mag. Nat. Hist., ser. 7, vol. 13, pp. 1-33, pl. 1.

1905. *Catalogue of the madreporarian corals in the British Museum (Natural History). Volume V. The family Poritidae. 2. The genus Porites. Part 1. Porites of the Indo-Pacific region.* British Mus. (Nat. Hist.), vol. 5, pp. i-vi, 1-303, pls. 1-35.

1906. *Catalogue of the madreporarian corals in the British Museum (Natural History). Volume VI. The family Poritidae. 2.-The genus Porites. 2.-Porites of the Atlantic and West Indies, with the European fossil forms. The genus Goniopora, a supplement to Vol. IV.* British Mus. (Nat. Hist.), vol. 6, pp. i-vi, 1-173, pls. 1-17.

Berry, Willard

1929. *Shorter contributions to the paleontology of the Eocene of northwestern Peru. I. Solitary corals.* Washington Acad. Sci., Jour., vol. 19, pp. 236, 237, figs. 1-4.

Bertin, L.

1949. *Animaux-plantes (Eponges et Coelentérés).* La Vie des Animaux, vol. 1, pp. 37-66, pls., text-figs.

Bertram, G. C. L.

1937. *Some aspects of the breakdown of corals at Ghardaqa, Red Sea.* Zool. Soc. London, Proc. 1936, pp. 1011-1026, pl. 1, text-figs. 1-4.

Bertrand, H.

1938. *Les bassins à flot du port de Saint-Malo-Saint-Servan.* Lab. Maritime Dinard, Bull., vol. 18, pp. 14-24.

Bianconi, Giovanni Giuseppe

1871. *Specimina zoologica Mosambicana: fasc. 17.* Accad. Sci. Inst. Bologna, Mem., vol. 9, pp. 199-222.

Bieda, F.

1951. *Regionalna geologia Polski Karpaty. 7. Mlodszy trzeciorzed Karpati Przedgórza.* Polsk. Tow. Geol., vol. 1, No. 6, pp. 156-180, pls. 15, 16, text-figs.

Blackburn, M.

1937a. *Notes on Australian Hydrozoa, with descriptions of two new species.* Roy. Soc. Victoria, Proc., n. s., vol. 1, No. 1, pp. 170-181, text-figs.

1937b. *Hydrozoa. The Sir Joseph Banks Islands. Reports of the expedition of the McCoy Society for field investigation and research.* Roy. Soc. Victoria, Proc., n. s., vol. 1, No. 2, pp. 312-328, text-figs.

1937c. *Lady Julia Percy Island. Coelenterata.* Roy. Soc. Victoria, Proc., n. s., vol. 1, (49), No. 2, pp. 364-371, 2 text-figs.

Blainville, H. M. Ducrotay de

1823-30. *Zoophytes. Dictionnaire des Sciences naturelles.* Vol. 29 (1823); vol. 35 (1825); vol. 43 (1826); vol. 60 (1830).

1834-37. *Manuel d'Actinologie ou de Zoophytologie.* Paris, 2 vols., pp. i-viii, 1-694, 103 pls.

Blake, Sidney Fay

1953. *The Pleistocene fauna of Wailes Bluff and Langleys Bluff, Maryland.* Smithsonian Misc. Collec,. vol. 121, No. 12, pp. 1-32, pl. 1, text-fig. 1.

Blanc, J.-J.

1959. *Campagne de la "Calypso" dans le Golfe de Gênes (1957). I. Recherches sur les oases du Golfe de Gênes (région de Portofino).* Inst. Océanogr. Paris, Ann., n. s., vol. 37, No. 4, pp. 273-287, figs. 1-7.

Blanckenhorn, Max Ludwig Paul

1890. *Das Eocän in Syrien mit besonderer Berücksichtigung Nord-Syrien.* Deutsch. Geol. Gesell., Zeitschr., vol. 42, pp. 318-360, pls. 17-19.

Blumenthal, Moritz M.

1958. *Der Vulcan Ararat und die Berge seiner Sedimentumrandung.* Fac. Sci. Univ. Instanbul, Rev., vol. 23B, Nos. 3-4, pp. 177-327, 11 pls., 2 maps.

Blunt, J. S.

1960. *Oceanography, Hydrology. Introductory studies: hydrology and plankton, Mawson, June 1956-February 1957.* ANARE Rept., vol. 3B, pp. 1-135, figs. 1-45. [Coelenterates p. 43.]

Boccone, Paolo

1671. *Recherches et observations curieuses sur la nature du corail blanc et rouge de Dioscoride.* Paris, pp. 1-328, illus.

Böhnke, K.

1939. *Kleine Beobachtungen an Meerestieren (IV).* Aquar. Terrarienk. Braunschweig, Wschr., vol. 36, pp. 307-310, text-figs.

Bölsche, Wilhelm

1866. *Die Korallen des norddeutschen Jura-und Kreide-Gebirges.* Deutsch. Geol. Gesell., Zeitschr., vol. 18, pp. 439-486, pls. 7-9.

Boettger, Leopold Oskar

1890. *Geschichtliche Darstellung unsere Kenntnisse und Meinungen von den Korallenbauten.* Zeitschr. f. Naturwiss. Halle, vol. 63, pp. 241-304.

Boettger, Oskar

1898. *Zur Kenntniss der Fauna der mittelmiocänen Schichten von Kostej im Barrat. [Deltocyathus italicus Michelotti].* Siebenbergischen Verein Naturwiss., Verhandl. u. Mitth., vol. 46, p. 57.

Bolli, Hans, and Bermúdez, Pedro J.
1965. *Zonation based on planktonic Foraminifera of Middle Miocene to Pliocene warm-water sediments.* Asoc. Venezolana Geol., Min. y Petroleo, Bol. Informativo, vol. 8, No. 5, pp. 119-152.

Bolten, T. E.
1960. *Catalogue of type invertebrate fossils of the Geological Survey of Canada. I.* Geol. Sur. Canada, pp. 1-215. [Coelenterates pp. 20-67.]

Boni, A.
1937. *Studi comparativi fra il Neogene del bacino de Vienna e quello del bacino piemontese-Ligure.* Soc. Geol. Italiana, Boll., vol. 56, No. 1, p. 115.

Bonney, Thomas George
1889. *The structure and distribution of coral reefs.* Nature, vol. 40, No. 1021, p. 77; No. 1027, p. 222.
1890. *Coral reefs: fossil and Recent.* Nature, vol. 43, pp. 53, 148.

Bontschev, St.
1897. *Das Tertiärbecken von Haskovo (Bulgarien).* K.-K. Geol. Richsanst. Wien, Jahrb., vol. 46, pp. 309-384. [Coelenterata pp. 359-368.]

Boone, Lee
1928. *Coelenterata from tropical East American seas.* Bull. Bingham Oceanogr. Collec. New York, vol. 1, No. 5, pp. 1-8, 3 pls.
1933. *Scientific results of the cruises of the yachts "Eagle" and "Ara", 1921-1928, William K. Vanderbilt, commanding. Coelenterata, Echinodermata, Mollusca.* Vanderbilt Marine Mus., Bull., vol. 4, 217 pp., 133 pls.
1938. *The marine Algae, Coelenterata, Annelida, Polychaeta, Echinodermata, Crustacea, and Mollusca of the world cruises of the yachts "Ara", 1928-1929, and "Alva", 1931-1932, "Alva" Mediterranean cruise, 1933, and "Alva" South American cruise, 1935, William Vanderbilt, commanding.* Vanderbilt Marine Mus., Bull., vol. 7, pp. 29-76, pls. 4-25.

Borcea, I.
1927. *Données sommaires sur le faune de la mer Noire (littoral de Roumanie).* Univ. Jassy, Ann. Sci., vol. 14, pp. 545-547.
1931. *Nouvelles contributions à l'étude de la faune benthonique dans la mer Noire, près du littoral Roumain.* Univ. Jassy, Ann. Sci., vol. 16, Nos. 3-4, pp. 655-766.
1934. *Liste des animaux marins récoltées jusqu'à présent dans la region de la station d'Agigéa (mer Noire).* Univ. Jassy, Ann. Sci., vol. 19, pp. 402-407.

Boschma, Hilbrand
1914. *Stylasteridae.* Danish Ingolf. Exped., vol. 5, No. 5, 25 pp., 5 pls.
1922. *On budding and coalescence of buds in Fungia fungites and F. actiniformis.* K. Akad. Wetensch. Amsterdam, Versl., vol. 30, No. 6, pp. 331-343, figs.
1923a. *Knospung und verwandte Erscheinung bei Fungia fungites und F. actiniformis.* Treubia, Batavia, vol. 3, pp. 149-179, pls. 7-19.
1923b. *On the food of the Madreporaria.* K. Akad. Wetensch. Amsterdam., Versl., vol. 32, pp. 13-23.
1923c. *Experimental budding in Fungia fungites.* K. Akad. Wetensch. Amsterdam, Versl., vol. 32, No. 1, pp. 85-94, pl. 2.
1923d. *Über die Bildung der jungen Kolonien von Goniopora stokesi durch ungeschlechtiche Fortpflanzung.* Zool. Anzeig., vol. 57, pp. 284-286, fig.

1923e. *The Madreporaria of the Siboga Expedition. Part IV. Fungia patella.* Siboga-Exped., vol. 10, Mon. 16d, pp. 128-148, pls. 9, 10.
1924a. *On two different growth forms of Merulina laxa Dana.* R. Mus. Nat. Hist. Leiden, Meded., Zoologie, vol. 8, pp. 36-38, pl. 1.
1924b. *Regeneration und Knospung bei koloniebildenden Fungiden.* Nederlands. Dierk. Vereen., Tijdschr., ser. 2, vol. 19, pp. 56-60.
1924c. *On the food of Madreporaria.* K. Nederland. Acad. Wiss. Amsterdam, Proc., vol. 27, pp. 13-23.
1925a. *Madreporaria. I. Fungidae. Papers from Dr. Mortensen's Pacific Expedition 1914-1916, and the Danish Expedition to the Kei Islands, 1922 . . .* Dansk Naturhist. Foren., Vidensk. Medd., vol. 79, pp. 185-259, pls. 5-11.
1925b *The nature of the association between Anthozoa and Zooxanthellae.* Nat. Acad. Sci., Proc., vol. 11, pp. 65-67.
1925c. *Studies on anthozoan polyps.* Carnegie Inst. Washington, Yearbook No. 24, pp. 223-224.
1925c. *On the feeding reactions and digestion in the coral polyp, Astrangia danae, with notes on its symbiosis with Zooxanthellae.* Biol. Bull., vol. 49, pp. 407-460, fig. 1.
1925d. *On the symbiosis of certain Bermuda coelenterates and Zooxanthellae.* Amer. Acad. Arts and Sci., Proc., vol. 60, No. 9, pp. 451-460, text-figs. a, b.
1926. *On the food of reef corals.* K. Akad. Wetensch. Amsterdam, Versl., vol. 35, pt. 2, No. 7, pp. 713-718.
1928. *An unusual manner of budding in Echinopora lamellosa (Esper).* Dansk Naturhist. Foren., Vidensk. Medd., vol. 85, pp 1-6, pl. 1.
1929a. *On the food of reef corals and some other coelenterates.* Internatl. Congress Zool. Budapest, vol. 10, pp. 920-923.
1929b. *The Fungidae (Anthozoa) collected by Mr. Cyril Crossland at Tahiti and neighbouring islands.* Zool. Soc. London, Proc., pp. 43-47, pl. 1.
1929c. *On the postlarval development of the coral Meandra areolata (L.).* Carnegie Inst. Washington, Publ. No. 391, Papers Tortugas Lab,. vol. 26, pp. 129-147, 9 figs.
1930. *The occurence of stalked buds in the coral Echinopora lamellosa (Esper).* Treubia, Buitenzorg, vol. 12, pp. 129-132, pls. 1-5.
1934. *On the septal arrangement in fungid corals.* Fifth Pacific Sci. Congress, Proc., vol. B8, No. 24, pp. 4199-4206, 7 figs.
1935. *Einige stylasteriden (Hydrokorallen) der ochotskischen und japanischen See.* Explor. Mers U.R.S.S. Inst. Hydrol. Leningrad, vol. 22.
1936. *Sur la croissance de quelques coraux des récifs de l'Ile d'Edam (Baie de Batavia).* Mus. Roy. Hist. nat. Belgique, Mém., sér. 2, vol. 3, pp 101-115
1942 *Investigations on Stylasteridae (Hydrocorals).* Norske Vidensk.-Akad. Oslo, Mat.-Naturv. Kl., Skr., No. 3, pp. 3-113, pls. 1-6, text-figs.
1948a. *The species problem in Millepora.* R. Mus. Nat. Hist. Leiden, Zool. Verhandel., No. 1, 115 pp., 15 pls., 13 text-figs.
1948b. *Specific characters in Millepora.* K. Nederland. Akad. Wetensch. Amsterdam, Proc., vol. 51, No. 7, pp. 818-823.
1948c. *Het soortproblem bij Millepora.* K. Nederland. Akad. Wetensch. Amsterdam, Versl., Afd. Natuurk., vol. 57, No. 4, pp. 26-27.
1949a. *The ampullae of Millepora.* K. Nederland. Akad. Wetensch. Amsterdam, Proc., vol. 52, No. 1, pp. 1-14, pls. 1-5, text-figs. 1-4.

1949b. *Notes on specimens of the genus Millepora in the collection of the British Museum.* Zool. Soc. London, Proc., vol. 119, pp. 661-672, pls. 1, 2.

1950a. *Further notes on the ampullae of Millepora.* R. Mus. Nat. Hist. Leiden, Zool. Meded., vol. 31, No. 5, pp. 49-61, pls. 1-6, text-figs. 1-3.

1950b. *Notes on the coral reefs near Suva in the Fiji Islands.* K. Nederland. Akad. Wetensch. Amsterdam, Proc., vol. 53, No. 2, pp. 294-298, pls. 1-3, Text-figs.

1950c. *Stylasteridae (Hydrocorals) from southern seas.* Discovery Repts., vol. 26, pp. 33-46, pls. 2-4, text-figs.

1951a. *Deling bij Tubastrea.* K. Nederland. Akad. Wetensch. Amsterdam, Versl., vol. 60, No. 5, pp. 44-46, text-fig.

1951b. *Notes on Stylasterina (Hydrocorallia).* K. Nederland. Akad. Wetensch. Amsterdam, Proc., ser. C, vol. 54, No. 15, pp. 451-458, figs. 1, 2.

1951c. *Notes on Hydrocoralla.* R. Mus. Nat. Hist. Leiden, Zool. Verhandel., No. 13, pp. 1-49, pls. 1, 2, 6 text-figs.

1951d. *On a specimen of Distichopora brasseyae Wright (Hydrocorallia, Styalsterina).* R. Mus. Nat. Hist. Leiden, Zool. Verhandel., No. 13, pp. 459-463, text-fig.

1951e. *The coral Montipora monasteriata (Forsk.) in the Fiji Islands.* R. Mus. Nat. Hist. Leiden, Zool. Meded., vol. 31, No. 9, pp. 89-94, pls. 8, 9.

1951f. *Some nomenclatorial corrections to "Investigations on Stylasteridae (Hydrocorals) 1942.* R. Mus. Nat. Hist. Leiden, Zool. Meded., vol. 31, No. 12.

1952a. *Het septale systeem von Notophyllia.* K. Nederland. Akad. Wetensch. Amsterdam, Versl., vol. 61, No. 4, pp. 47, 48, fig. 1.

1952b. *Madreporarian corals of the genus Notophyllia.* K. Nederland. Akad. Wetensch. Amsterdam, Proc., ser. C, vol. 55, No. 3, pp. 238-247, 1 pl., text-figs.

1953a. *Over enkele noorsche koralen.* K. Nederland. Akad. Wetensch. Amsterdam, Versl., vol. 62, No. 4, pp. 32-35.

1953b. *Notes on specimens of Stylaster mooraboolensis (Hall) in the collection of the Manchester Museum.* K. Nederland. Akad. Wetensch. Amsterdam, Proc., ser. B, vol. 56, No. 4, pp. 355-363, 1 pls., text-figs.

1953c. *Linnaeus's description of the stylasterine coral Errina aspera. I, II.* K. Nederland. Akad. Wetensch. Amsterdam, Proc., ser. C, vol. 56, No. 3, pp. 301-316, text-figs.

1953d. *The Stylasterina of the Pacific.* R. Mus. Nat. Hist. Leiden, Zool. Meded., vol. 32, No. 16, pp. 165-184.

1953e. *On specimens of the coral genus Tubastraea, with notes on phenomena of fission.* Studies on the Fauna of Curaçao and other Caribbean Islands, vol. 4, No. 18, pp. 109-120, pls. 9-12.

1954a. *Die Familie Axoporidae.* K. Nederland. Akad. Wetensch. Amsterdam, Versl., vol. 63, No. 1, pp. 99-103, figs. 1, 2.

1954b. *On some specimens of the coral Montipora verrucosa (Lamarck) from the Hawaiian Islands, formerly described as separate species.* K. Nederland. Akad. Wetensch., Proc., ser. C, vol. 57, No. 2, pp. 151-158, 1 pl.

1954c. *Stylasterina in the collection of the Amsterdam Museum. I. Errina aspera (L.).* K. Nederland. Akad. Wetensch., Proc., ser. C, vol. 57, No. 2, pp. 143-150, pls. 1-3.

1955a. *The type specimen of Stylaster gemmascens (Esper 1794).* K. Nederland. Akad. Wetensch. Amsterdam, Proc., ser. C, vol. 58, pp. 23-31, pls. 1, 2, text-figs. 1-4.

1955b. *The specific characters of the coral Stylaster roseus.* Deep-sea Research, vol. 3, Suppl., pp. 134-138, text-figs. 1, 2.
1956a. *Stylasterina in the collection of the Paris Museum. I. Distichopora gracilis Dana.* K. Nederland. Akad. Wetensch. Amsterdam, Proc., ser. C, vol. 59, No. 2, pp. 137-143, pls. 1-4, text-figs. 1, 2.
1956b. *The stylasterine coral Allopora incompleta Tenison-Woods.* K. Nederland. Akad. Wetensch. Amsterdam, Proc., ser. C, vol. 59, No. 2, p. 144-153, pls. 1-3, text-figs. 1, 2.
1956c. *Notes on the stylasterine coral Allopora nobilis Kent.* K. Nederland. Akad. Wetensch. Amsterdam, Proc., ser. C, vol. 59, No. 2, pp. 154-165, pls. 1-3, text-figs. 1-4.
1956d. *Stylasterina in the collection of the Paris Museum. II. Errina amoena nov. spec.* K. Nederland. Akad. Wetensch. Amsterdam, Proc., ser. C, vol. 59, No. 3, pp. 281-289, pls. 1-3, text-figs. 1-3.
1956e. *List of the described species of the order of Stylasterina.* R. Mus. Nat. Hist. Leiden, Zool. Verhandel., No. 33, pp. 1-72.
1956f. *Milleporina and Stylasterina. In* Moore, R. C., *Treatise on Invertebrate Paleontology.* Lawrence, Univ. Kansas Press, pt. F, Coelenterata, pp. F90-F106, text-figs. 75-85.
1957. *Stylasterina in the collection of the Paris Museum. III. Stylaster flabelliformis (Lamarck).* R. Mus. Nat. Hist. Leiden, Zool. Meded., vol. 35, No. 19, pp. 261-282, pls. 10-13, text-figs. 1-9.
1959a. *Revision of the Indo-Pacific species of the genus Distichopora.* Bijdr. Dierk., vol. 29, pp. 121-171, pls. 1-16, text-figs. 1-5.
1959b. *The species problem in corals.* Internatl. Congr. Zool., Proc., vol. 15, 1958, pp. 246-248.
1960a. *Opmerkingen over een Zuidafrikaanse Stylasteridae.* Gewone Vergad. Akad. Amsterdam, Versl., vol. 69, No. 4, pp. 54, 55.
1960b. *Notes on the stylasterine coral Allopora profunda Moseley.* K. Nederland, Akad. Wetensch. Amsterdam, Proc., ser. C, vol. 63, No. 3, pp. 400-407, pl. 1, text-fig. 1.
1960c. *Gyropora africana, a new stylasterine coral.* K. Nederland. Akad. Wetensch. Amsterdam, Proc., ser. C, vol. 63, No. 3, pp. 423-434, pls. 1, 2, text-fig. 1.
1960d. *The stylasterine coral Allopora bithalamus (Broch).* K. Nederland. Akad. Wetensch. Amsterdam, Proc., ser. C, vol. 63, No. 4, pp. 435-446, pls. 2, 3, text-figs. 1-4.
1960e. *The styalsterine coral Allopora stellulata (Stewart).* R. Mus. Nat. Hist. Leiden, Zool. Meded., vol. 37, No. 4, pp. 49-60, pls. 3-6, text-figs. 1-4.
1961a. *Résultats scientifiques des campagnes de la "Calypso". XVII. Campagne 1956 dans le golfe Guinée et aux îles Principe, São Tomé et Annobon (suite). 12. Stylasterina.* Inst. Océanogr. Paris, Ann., n. s., vol. 39, No. 5, pp. 193-225, pls. 3-6, text-figs. 1-4.
1961b. *Notes on Millepora braziliensis Verrill.* K. Nederland. Akad. Wetensch. Amsterdam, Proc., ser. C, vol. 64, No. 3, pp. 292-296, pls. 1, 2.
1961c. *Acropora Oken, 1815 (Anthozoa, Madreporaria); proposed validation under the plenary powers. Z. N. (s) 1036.* Bull. Zool. Nomencl., vol. 18, No. 5, pp. 334, 335.
1962a. *Notes on the stylasterine coral Allopora miniata.* K. Nederland. Akad. Wetensch. Amsterdam, Proc., ser. C, vol. 65, No. 3, pp. 195-204, text-figs. 1, 2.
1962b. *Notes on Stylaster lonchitis Broch.* K. Nederland. Akad. Wetensch. Amsterdam, Proc., ser. C, vol. 65, No. 4, pp. 287-293, pls. 1, 2, text-figs 1, 2.

1962c. *On milleporine corals from Brazil.* K. Nederland. Akad. Wetensch. Amsterdam, Proc., ser. C, vol. 65, No. 4, pp. 302-312, pls. 1-8, text-fig. 1.

1963a. *On the stylasterine genus Errina, with the description of a new species.* K. Nederland. Akad. Wetensch. Amsterdam, Proc., ser. C, vol. 66, No. 4, pp. 331-344, pl. 1, text-fig. 1.

1963b. *Errina (Lepidopora) diffusa, a new stylasterine coral from South Africa.* K. Nederland. Akad. Wetensch. Amsterdam, Proc., ser. C, vol. 66, No. 5, pp. 391-396, pl. 1, text-figs. 1-3.

1963c. *The stylasterine coral Errina dabneyi.* K. Nederland. Akad. Wetensch. Amsterdam, Proc., ser. C, vol. 66, No. 5, pp. 397-405, pl. 1, text-figs. 1-4.

1963d. *The generic name Axopora.* K. Nederland. Akad. Wetensch. Amsterdam, Proc., vol. 66B, pp. 107-117, figs. 1-2.

1963e. *Notes on the species of the genus Axopora.* K. Nederland. Akad. Wetensch. Amsterdam, Proc., vol. 66B, No. 3, pp. 118-129, pls. 1-8.

1964a. *Errina (Lepidopora) decipiens, a new stylasterine coral from the West Indies.* K. Nederland. Akad. Wetensch. Amsterdam, Proc., ser. C, vol. 67, No. 2, pp. 55-63, pl. 1, text-figs. 1-4.

1964b. *On Stylasterina of the genus Stenohelia.* K. Nederland. Akad. Wetensch. Amsterdam, Proc., ser. C, vol. 67, No. 2, pp. 64-73, pls. 1, 2, text-figs. 1, 2.

1964c. *Further notes on the stylasterine coral Stenohelia concinna.* K. Nederland. Akad. Wetensch. Amsterdam, Proc., ser. C, vol. 67, No. 2, pp. 74-77, pls. 1, 2, text-fig. 1.

1964d. *Further notes on the stylasterine corals Stenohelia challengeri and Stenohelia maderensis.* K. Nederland. Akad. Wetensch. Amsterdam, Proc., ser. C, vol. 67, No. 2, pp. 78-84, pls. 1, 2, text-fig. 1.

1964e. *The stylasterine coral Allopora divergens.* K. Nederland. Akad. Wetensch. Amsterdam, Proc., ser. C, vol. 67, No. 3, pp. 109-118, pls. 1, 2, text-figs. 1-3.

1964f. *On variation in Stylaster sanguineus.* K. Nederland. Akad. Wetensch. Amsterdam, Proc., ser. C, vol. 67, No. 4, pp. 184-194, pls. 1, 2, text-figs. 1, 2.

1964g. *Notes on the ampullae of two colonies of Millepora.* K. Nederland. Akad. Wetensch. Amsterdam. Proc., ser. C, vol. 67, No. 4, pp. 195-200, pls. 1, 2, text-figs. 1-4.

1964h. *Notes on the stylasterine coral Errina macrogastra.* K. Nederland. Akad. Wetensch. Amsterdam, Proc., ser. C, vol. 67, No. 5, pp. 281-286, pl. 1, text-figs. 1, 2.

1964i. *Notes on the stylasterine coral Errina labiata.* K. Nederland. Akad. Wetensch. Amsterdam, Proc., ser. C, vol. 67, No. 5, pp. 287-300, pls. 1, 2, text-figs. 1-4.

1965a. *On stylasterine corals of the genus Errina from the island Mauritius.* K. Nederland. Akad. Wetensch. Amsterdam, Proc., ser. C, vol. 68, No. 1, pp. 1-7, pls. 1, 2, text-figs. 1, 2.

1965b. *On the supposed differences between Errina antarctica (Gray) and Errina moseleyi (Ridley).* K. Nederland. Akad. Wetensch. Amsterdam, Proc., ser. C, vol. 68, No. 1, pp. 8-18, pls. 1, 2, text-figs. 1-5.

1965c. *Errina carnea, a new stylasterine coral from the Antarctic.* K. Nederland. Akad. Wetensch. Amsterdam, Proc., ser. C, vol. 68, No. 1, pp. 9-24, pl. 1, text-fig. 1.

1965d. *Further notes on Stylaster roseus (Pallas). I.* K. Nederland. Akad. Wetensch. Amsterdam, Proc., ser. C, vol. 68, No. 4, pp. 227-240, pls. 3-7, text-fig. 1. *II,* pp. 241-250, text-figs. 2-4.

1966a. *Notes on the stylasterine coral Allopora subviolacea Kent.* K. Nederland. Akad. Wetensch. Amsterdam, Proc., ser. C, vol. 69, No. 3, pp. 267-272, pl. 1, text-figs. 1, 2.

1966b. *On a new species of Millepora from Mauritius, with notes on the specific characters of Millepora exaesa.* K. Nederland. Akad. Wetensch. Amsterdam, Proc., ser. C, vol. 69, No. 4, pp. 409-419, pls. 1, 2, text-fig. 1.

Boschma, H., and Verwey, J.

1930. *The occurrence of stalked buds in the coral Echinopora lamellosa (Esper).* Treubia, Batavia, vol. 12, pp. 129-132, pls. 1-5.

Boshoff, P. H.

1968. *Development and constitution of the coral reefs. In* McNae, W., and Kalk, M., *A Natural History of Inhaca Island, Moçambique.* Johannesburg, pp. 49-56, 2 figs.

Bossanyi, J.

1957. *A preliminary survey of the small natant fauna in the vicinity of the sea floor off Blyth, Northumberland.* Jour. Anim. Ecol., vol. 26, No. 2, pp. 353-368.

Boteler, Thomas

1835. *Narrative of a voyage of Discovery to Africa and Arabia, performed in His Majesty's ships Leven and Baracouta, from 1821 to 1826, under the command of Capt. F. W. Owen, R.N.* London, 2 vols.

Boule, Marcellin, and Cottreau, Jean

1907-1936. *Types du prodrome de paléontologie stratigraphique universelle de d'Orbigny.* Ann. Paléont., vol. 2 (1907) pp. 34-35 (170-171), pl. 10 (24), figs. 18-24; vol. 5 (1910), pp. 111-116 (83-88); vol. 6 (1911), pp. 117-119 (65-67), pl. 22, figs. 11-19, pl. 23, figs. 3-16, pl. 24, figs. 1-6; vol. 8 (1913), pp. 175, 176 (103, 104), pl. 32, figs. 1-21, pl. 33, figs. 1-9; vol. 12 (1928), pp. 177-180 (149-152); vol. 17 (1928), pp. 75-78 (59-62), pl. 49, figs. 26-30, pl. 50, figs. 1-7; vol. 20 (1931), pp. 143-172 (11-40), 173-181 (165-173), pl. 59, figs. 9-20, pl. 60, figs. 1-11, pl. 61, figs. 1-14, pl. 62, figs. 1-16, pl. 63, figs. 1-13, pl. 64, figs. 1-4; vol. 23 (1935), pp. 29-36 (73-80); vol. 24 (1936), pp. 37-43 (33-39), pl. 73, figs. 20-26; pl. 74, figs. 1-17, pl. 75, figs. 1-16.

Bourgeat, [François] Emilien

1888. *Recherches sur les formations coralligènes du Jura Méridional.* Paris, 187 pp., 16 figs.

Bourguet, Louis

1842. *Traité des Pétrifications.* [*With some letters from P. Cartier.*] Paris, 2 pts. in 1 vol., 60 pls.

Bourne, Gilbert Charles

1887a. *The anatomy of the madreporarian coral Fungia.* Quart. Jour. Microsc. Sci. London, vol. 27, pp. 293-324, pls. 23-25.

1887b. *On the anatomy of Mussa and Euphyllia, and the morphology of the madreporarian skeleton.* Quart. Jour. Microsc. Sci. London, vol. 28, pp. 21-52, pls. 3, 4.

1888a. *Coral formations.* Nature, vol. 37, pp. 414, 415; vol. 38, p. 5.

1888b. *The atoll of Diego Garcia and the coral formations of the Indian Ocean.* Roy. Soc. London, Proc., vol. 43, pp. 440-461, pl. 4.

1890. *Report of a cruise on H.M.S. "Research" off the south-west coast of Ireland.* Marine Biol. Assoc. U. K. Plymouth, Jour., n. s., vol. 1, p. 318 (Anthozoa).

1893. *On the post-embryonic development of Fungia.* Roy. Dublin Soc., Sci. Trans., ser. 2, vol. 5, pp. 205-238, pls. 22-25.

1895. *On the structure and affinities of Heliopora caerulea, Pallas. With some observatians on the structure of Xenia and Heteroxenia.* Roy. Soc. London, Philos. Trans., vol. 186, pp. 445-483, 4 pls.
1897. *Review of Ogilvie's microscopic and systematic study of madreporarian types of corals.* Nat. Sci., vol. 11, pp. 124-128.
1899. *Studies on the structure and formation of the calcareous skeleton of the Anthozoa.* Quart. Jour. Microsc. Sci. London, vol. 41, pt. 4, No. 164. pp. 499-547, pls. 40-43.
1900. *Anthozoa. In* Lankester, Edwin Ray, *Treatise on Zoology,* Part II, Chapter 6, pp. 1-84, figs. 1-37.
1903. *Some new and rare corals from Funafuti.* Linnean Soc. London, Jour., Zoology, vol. 29, pp. 26-37, 2 pls.
1905. *Report on the solitary corals collected by Dr. Herdman at Ceylon 1902.* Roy. Soc. Rept. Pearl Oyster Fishing in Ceylon, vol. 4, pp. 187-242, 4 pls.
1911. *Anthozoa.* Encyclopedia Britannica, vol. 2, pp. 97-104, 19 figs.

Bouvier, Eugène Louis
1895. *Le commensalisme chez certains polypes madréporaries.* Ann. Sci. Nat. Paris, sér. 7, vol. 20, pp. 1-32, pl. 1, text-figs. 1-3.

Braams, W. G., and Geelen, H. F. M.
1953. *The preference of some nudibranchs for certain coelenterates.* Arch. Nederland. Zool., vol. 10, No. 3, pp. 241-264.

Bradford, Willard
1966. *The Harvey Bassler collection of Peruvian fossils.* Lehigh Univ., Bethlehem, Pa., 104 pp., figs.

Brady, George Stewardson
1900. *An afternoon's dredging off Cullercoats.* Nat. Hist. Soc. Northumberland, Durham, and Newcastle-upon-Tyne, Nat. Hist. Trans.. vol. 13, pp. 442-444.
1903. *Report on dredging and other marine research off the north-east coast of England in 1901.* Nat. Hist. Soc. Northumberland, Durham, and Newcastle-upon-Tyne, Nat. Hist. Trans., vol. 14, pp. 87-101.

Brandt, Karl
1898. *Die Fauna der Ostsee, insbesondere die der Kider Bucht.* Deutsch. Zool. Gesell., Verhandl., vol. 7, pp. 10-34.

Branner, John Casper
1904. *The stone reefs of Brazil, their geological and geographical relations, with a chapter on the coral reefs.* Mus. Comp. Zool., Bull., vol. 44, Geol. ser. vol. 7, 285 pp., 104 text-figs., 99 pls.

Brattström, H.
1952. *Biologiska och faunistiska notiser från Öresund. 3. Från 1948 års undersökninger i Öresund och Kattegatt.* Fauna o. Flora, No. 4, pp. 161-166.

van Breem, J.
1905. *Plankton von Noord-en Zuiderzee.* Nederland. Dierk. Vereen., Tijdschr., ser. 2, vol. 9, pp. 145-325.

Brinkmann, A., Jr.
1941. *Noen evertebrater fra Barentshaven og Denmarkstredt.* Bergens Mus., Aarb., No. 2, pp. 1-16, text-figs.

Broch, Hjalmar
1907. *Invertébrés du fond. In* Duc d'Orleans, *Crosière océanographique accomplie à bord de la "Belgica" dans la Mer de Grönland, 1905. Résultats scientifiques.* Pp. 567 + 2, 12 pls. 68 maps and charts, text-figs. [*Coelentèrés,* pp. 531-533, 557-558.]

1910. *Die Hydroiden der arktischen Meere.* Fauna Arctica, vol. 5, No. 1, pp. 127-148, 3 pls.
1914a. *Beiträge zur Kenntnis der Meeresfauna Westafrikas. Lief. I. Hydrozoa benthonica.* Hamburg, pp. 19-50, 1 pl., 12 text-figs.
1914b. *Stylasteridae.* Danish Ingolf Exped., vol. 5, No. 5, 27 pp., 5 pls., 6 text-figs.
1918. *Coelenterates in the publications of J. E. Gunnerus, a contribution to the history of Norwegian zoology.* K. Norske Vidensk. Selsk. Trondhjem, Skr., 1917, No. 4, pp. 1-17, 1 pl., 4 text-figs.
1922. *Riffkorallen im Nordmeer einst und jetzt.* Naturwiss., Jahrg. 10, pp. 804-806, 1 fig.
1927. *Untersuchungen über die marine Bodenfauna bei Lindesnes im Juni 1926.* Zool. Mus. Oslo, Med., vol. 10, p. 32.
1928. *Hydrozoen. In,* Dahl, F., *Tierwelt Deutschlands.* Jena, vol. 4, pp 95-159, figs.
1932. *Über einige geographisch interesante Fundstellen von Alcyonarien und Hydrokorallen im nördlichen Stillen Ozean.* Explor. Mers d'URSS. No. 17, Inst. Hydrologique Leningrad, pp. 81-86, 2 figs.
1933. *Zur Kenntnis der adriatischen Hydroidenfauna von Split.* Norske Vidensk.-Akad. Oslo, Skr., No. 1, pp. 3-115, 1 chart, 46 figs.
1935a. *Einige Stylasteriden (Hydrokorallen) der ochotskischen und japanischen See.* Explor. Mers d'URSS, No. 22, Inst. Hydrologique Leningrad, pp. 58-60, 2 figs.
1935b. *Beobachtungen an einigen adriatischen Seichwasser-Anthozoen von Split.* Biol. Generalis, vol. 11, pp. 1-14, 2 figs.
1936a. *Untersuchungen an Stylasteriden (Hydrokorallen). Teil I.* Norske Vidensk.-Akad. Oslo, Skr., Mat.-Naturvid. Kl., No. 8, pp. 1-103, 13 pls. 32 text-figs.
1936b. *Spongia, Coelenterata, and Actinaria.* Norwegian North Polar Exped. "Maud", Sci. Results, vol. 5, No. 18, pp. 3-5.
1942. *Investigations on Stylasteridae.* Norske Vidensk.-Akad. Oslo, Mat.-Naturvid. Kl., No. 3, pp. 3-113, pls. 1-6, 38 text-figs.
1947. *Stylasteridae (hydrocorals) of the John Murray Expedition to the Indian Ocean.* John Murray Exped. 1933-34, Sci. Rept., vol. 8, No. 2, pp. 305-316, pl. 1, text-figs. 1-4.
1948a. *Antarctic hydroids.* Norwegian Antarctic Exped. 1927-28, Rept. Sci. Results, No 28, pp. 1-23, figs.
1948b. *Maneter.* Fauna Oslo, vol. 1, pp. 65-75, text-figs.
1950. *Stylasteridae (hydrocorals) from southern seas.* Discovery Repts., vol. 26, pp. 33-46, pls. 2-6, text-figs. 1-12.
1951. *Some nomenclatorial corrections to "Investigations on Stylasteridae (hydrocorals)", 1942.* R. Mus. Nat. Hist. Leiden, Zool. Meded., vol. 31, No. 12, pp. 125-127.
1956. *The Folden Fiord. Coelenterata. II. Corals.* Tromsø Mus., Skr, vol. 1, No. 12, pp. 7, 8.

Broderip, William John

1828. *Note. Description of Caryophyllia smithii n. sp.* Zool. Jour., vol. 3, pp. 485, 486, pl. 13, figs. 1-6.

Brody, Samuel

1945. *Bioenergetics and growth.* New York, xii + 1023 pp., illustr., diagr., tables.

Broekhuysen, G. J., and Taylor, H.

1959. *The ecology of South African estuaries. Part X. Kosi Bay Estuary system.* South African Mus., Ann., vol. 44, No. 7, pp. 279-296, pls. 5, 6, text-fig. 1.

Bromel, Magnus von

1717. *Mineralogia et Lithographica Svecana, das ist Abhandlung in dem*

Königreich schedbefindlichen Mineralien und Steinen ins Teutsche übersetzt, mit einem Vorbericht von dem vorkurzer Zeit in Schweden entblössten Gold-Ertz begleitet, etc. Stockholm and Leipzig, xxvi + 148 pp., figs.

Brook, George

1889. *Report on the Antipatharia collected by H.M.S. Challenger during the years 1873-76.* Voyage H.M.S. Challenger, Rept. Sci. Results, Zoology, vol. 32, pt. 80, pp. i-iii, 1-222, pls. 1-15.

1891. *Description of new species of Madrepora in the collection of the British Museum.* Ann. Mag. Nat. Hist., ser. 6, vol. 8, No. 48, art. 54, pp. 458-471.

1892. *Preliminary description of (40) new species of Madrepora in the collection of the British Museum.* Ann. Mag. Nat. Hist., ser. 6, vol. 10, No. 60, art. 56, pp. 451-465.

1893a. *On the affinities of the genus Madrepora.* Linnean Soc. London, Jour., Zoology, vol. 24, pp. 353-360.

1893b. *Catalogue of the madreporarian corals in the British Museum (Natural History). Volume 1. The genus Madrepora.* British Mus. (Nat. Hist.), vol. 1, pp. i-xi, 1-212, pls. 1-35.

Brosius, M., and Gramann, F.

1957. *Eine Oligozänbohrung im südlichen Habichtswald bei Kassel.* Hess. Landesamt. Bodenforsch., Notizbl., vol. 85, pp. 206-217, figs. 1, 2.

Browand, F.

1957. *Coral reef battleground.* Sea Frontiers, vol. 3, No. 4, pp. 238-250, 9 figs.

Brown, Amos P.

1913. *Notes on the geology of the Island of Antigua.* Acad. Nat. Sci. Philadelphia, Proc., vol. 65, pp. 584-616, pls. 17-20. [Corals listed pp. 593, 599.]

Brown, Amos P., and Pilsbry, Henry A.

1913. *Two collections of Pleistocene fossils from the Isthmus of Panama.* Acad. Nat. Sci. Philadelphia, Proc., vol. 65, pp. 493-500, 3 figs.

Brown, Thomas Clachar

1915. *The development of the mesenteries in the zooids of the Anthozoa and its bearing upon the systematic position of the Rugosa.* Amer. Jour. Sci., ser. 4, vol. 39 (189), No. 233, art. 35, pp. 535-542, figs. 1-11.

Browne, Edward Thomas

1900. *The fauna and flora of Valencia Harbour on the west coast of Ireland. I. The pelagic fauna (1895-98).* Roy. Irish Acad. Dublin, Proc., ser. 3, vol. 5, pp. 667-693, pl. 19. [Coelenterata, pp. 677, 685.]

Browne, E. T., and Vallentin, R.

1904. *On the marine fauna of the Isles of Sicily. I. The pelagic fauna. II. The shore fauna.* Inst. Cornwall, Jour., vol. 16, No. 1, pp. 120-132.

Browne, Patrick

1789. *The civil and natural history of Jamaica . . .* London, 2d ed, 4 indexes + viii + 503 pp., 49 pls.

Bruce, J. R.

1934. *Faunistic notes.* Marine Biol. Sta. Port Erin, Rept., vol. 47, pp. 26, 27.

1939. *Faunistic notes and records.* Marine Biol. Sta. Port Erin, Rept., vol. 52, pp. 11-17.

1948. *Additions to the faunal records, 1941-46.* Marine Biol. Sta. Port Erin, Rept. 1945-47, pp. 39-58. [Coelenterata pp. 44-46.]

Brueggemann, Friedrich

1877a. *Neue Korallen aus dem rothen Meere und von Mauritius.* Naturwiss. Verein Bremen, Abhandl., vol. 5, pp. 395-400, pls. 7, 8.

1877b. *Notes on stony corals in the collection of the British Museum. 1. Description of two new species of Turbinariidae. 2. Remarks on the species of Seriatopora. 3. A revision of the Recent solitary Mussaceae.* Ann. Mag. Nat. Hist., ser. 4, vol. 19, pp. 415-421; vol. 20, pp. 300-313.

1877c. *Kampf um's Dasein unter der Korallen.* Kosmos, vol. 1, pp. 161-162.

1878a. *A. Ueber einige Steinkorallen aus Singapore. B. Zur Nomenclatur der Trachyphyllien.* Naturwiss. Verein Bremen, Abhandl., vol. 5, pp. 539-549, 550.

1878b. *Fossile recente Korallen.* Kosmos, vol. 1, p. 394.

1878c. *Ueber einige Steinkorallen von Singapore.* Naturwiss. Verein Bremen, Abhandl., vol. 5, pp. 539-549.

1879a. *Corals. Zoology of Rodriguez.* Roy. Soc. London, Philos. Trans., vol. 168, pp. 569-579.

1879b. *Ueber die Korallen der Insel Ponapé.* Mus. Godeffroy, Jour., vol. 14, pp. 201-212.

Brunel, P.

1963. *Inventaire taxonomique des invertébrés marins du golfe Saint-Laurent.* Sta. Biol. Mar. Grande-Rivière, Rapp. 1962, pp. 81-89.

Brunelli, G.

1941. *Note sul plancton della Laguna Veneta.* Arch. Oceanogr. Limnol. Roma, vol. 1, No. 1, pp. 31-57. [Coelenterates pp. 55, 56.]

Brunn, J. H.

1956. *Contribution à l'étude géologique du Pinde septentrional et d'une partie de la Macédoine occidentale.* Ann. Géol. Hellen., ser. 1, vol. 7, pp. 1-358, pls. 1-20, text-figs. 1-76, map.

Bryan, E. H., Jr.

1951. *Coral atoll bibliography.* Atoll Research Bull., No. 2, p. 14.

1953. *Check list of atolls.* Atoll Research Bull., No. 19, pp. 1-38.

Bryan, W. H., and Hill, Dorothy

1941. *Spherulitic crystallization as a mechanism of skeletal growth in the hexacorals.* Roy. Soc. Queensland, Proc., vol. 52, pt. 2, pp. 78-91.

Bsharah, Lewis

1957. *Plankton of the Florida current. V. Environmental conditions, standing crop, seasonal and diurnal changes at a station forty miles east of Miami.* Bull. Marine Sci. Gulf and Caribbean, vol. 7, No. 3, pp. 201-251, figs. 1-45.

Buchanan, J. B.

1954. *The zoogeographical significance of the Madreporaria collected in the Gold Coast.* Rev. Zool. Botan. Afr., vol. 49, Nos. 1, 2, pp. 84-88.

1955. *The Pennatulacea of the Gold Coast.* Rev. Zool. Botan. Afr., vol. 51, Nos. 1, 2, pp. 388-390.

1958. *The bottom fauna communities across the continental shelf off Acra, Ghana (Gold Coast).* Zool. Soc. London, Proc., vol. 130, No. 1, pp. 1-56, pl. 1, text-figs. 1-10.

Buchanan, John Young

1886. *On oceanic shoals discovered in the S.S. Dacia in October 1883.* Roy. Soc. Edinburgh, Proc., vol. 13, pp. 428-443.

1888. *The exploration of the Gulf of Guinea.* Scottish Geogr. Mag., vol. 4, pp. 177-200, 233-251.

Buettner, David Sigismundus Augustus
1714 *D. S. Buttners Coralliographia Subterranea, seu dissertatio de coraliis fossilibus, in specie, de lapido corneo, Horn-oder gemeinem Feuer-Stein.* Lipsiae, 68 pp., 5 pls.

Buisonje, P. H. de
1964 *Marine terraces and subaeric sediments on the Netherlands Leeward Islands, Curaçao, Aruba and Bonaire, as indication of Quaternary changes in sea level and climate.* K. Nederland. Akad. Wetensch., Proc., ser B, vol. 67, No. 1, pp. 60-79, figs. 1, 2.

Bull, H. O.
1939. *The Anthozoa of the Cullercoats District.* Dove Marine Lab. Cullercoats, Rept., ser. 3, vol. 6, pp. 29-38.

Bullivant, J. S.
1959. *Photographs of the bottom fauna in the Ross Sea.* New Zealand Jour. Sci., vol. 2, No. 4, pp. 489-497, figs. 1-10.

Burdon-Jones, C., and Tambs-Lyche, H.
1960. *Observations on the fauna of the North Brattholman stone-coral reef near Bergen.* Univ. Bergen, Aarb., Math.-Nat. ser., No. 4, pp. 1-24.

Burgers, J. M.
1944. *Over de Poliepen van Oorkwal.* Levende Nat. Amsterdam, vol. 48, Nos. 11, 12, pp. 129-133, 141-45, text-figs.

Bürgl, Hans
1961. *Contribución a la estratigrafia y litogenesis de la Isla de San Andres.* Inst Geol. Nac. Colombiana, Bol. Geol., vol. 7, Nos. 1-3 (for 1959), pp. 5-25, figs.

Butsch, R. S.
1939. *The reef builders of Barbados.* Barbados Mus. and Nat. Hist. Soc., Jour., vol. 6, No. 3, pp. 129-138, pls. 1, 2.

Cabioch, L.
1961. *Etude de la répartition des peuplements benthiques au large de Roscoff.* Cahiers Biol. Marine, vol. 2, No. 1, pp. 1-40, figs. 1, 2, chart.

Cailleux, A.
1951. *Recifs coralliens et paléoclimats.* Soc. Biogéogr., C. R., No. 293, pp. 21-23.

Canavari, Mario
1897. *La fauna degli strati con Aspidoceras acanthicum di Monte Serra presso Camerino. Pt. I (Anthozoa, etc.).* Palaeontogr. Italica, vol. 2, pp. 25-52, pls. 4-9, text-figs. 1-14.

Canestrini, Giovanni
1883. *Il Corallo.* Roma, 170 pp., map.

Canestrelli, Giuseppe
1907. *Revisione della fauna Oligocenica di Laverda nel Vicentino.* R. Accad. Lincei Roma, Rend., vol. 16, No. 2, pp. 525-528.
1908. *Revisione della fauna Oligocenica di Laverda nel Vicentino.* Soc. Ligustica Sci. Nat. Geogr. Genova, Atti, vol. 19, pp. 27-29, 97-152, 2 pls.

Capeder, G.
1904. *Sulla Paronipora penicillata, nuovo genere di corallario fossile, appartenente alla famiglia delle Favositidi.* Rev. Italiana Paleont., vol. 10, No. 1, pp. 58-61, pls. 2, 3.

Carez, Léon
1904-1909. *La géologie des Pyrénées françaises.* Mém. Carte Géol. Detaill. France, Nos. 1-6, 3900 pp., 26 pls., 13 maps.

Caria, I. C.
1963. *La fauna Miocenica della zona di Funtanazza compressa tra le*

Marine di Montevecchio Arbus in Sardegna. Ist. Geol. Paleont. Univ. Cagliari, Pubbl., vol. 2, No. 10, pp. 1-74, pls. 1-11. [Corals pp. 13-18.]

Carlgren, Oskar

1905. *Ueber die Bedeutung der Flimmerbewewegung für den Nahrungstransport bei den Actinarien und Madreporiarien.* Biol. Zentralbl. Leipzig, vol. 25, p. 308-322.

1903-1908. *Anthozoa.* H. G. Bronn's Klassen und Ordnungen des Tier-Reichs, Bd. 2, Abt. 2, Liefg. 1, pp. 1-48; Liefg. 2-3, pp. 49-112; Liefg. 4-6, pp. 113-176.

1925. *Zur Kenntnis der Hexacorallen.* Zool. Anzeig., vol. 65, pp. 87-99.

1927. *Noch einige Bemerkungen über Pax' "Hexacorallien" im Handbuch der Zoologie.* Zool. Anzeig., vol. 69, pp. 288-294.

1939. *Actinaria, Zoantharia, and Madreporaria.* Zool. Iceland, vol. 2, No. 8, pp. 1-20, figs.

1940. *A contribution to the knowledge of the structure and distribution of the cnidae in the Anthozoa.* Univ. Lund., Acta, n. F., vol. 36, No. 3, pp. 1-62, figs.

1945. *Further contributions to the knowledge of the cnidom in the Anthozoa, especially in the Actinaria.* Univ. Lund., Acta, n. F., Avd. 2, vol. 41, No. 9, pp. 1-24.

Carpenter, F. W.

1910. *Feeding reactions of the rose coral (Isophyllia).* Amer. Acad. Arts Sci., Proc., vol. 46, pp. 147-162, 1 pl., 2 text-figs.

Carr, David, and Thorpe, John

1961. *From the Cam to the Cays. The Story of the Cambridge Expedition to British Honduras.* London, xii +2 + 190 pp., pls., map.

Carruthers, Robert George

1906. *The primary septal plan of the Rugosa.* Ann. Mag. Nat. Hist., ser. 7, vol. 18, pp. 356-363, pl. 9.

Carter, Henry John

1878a. *On new species of Hydractinidae, recent and fossil, and on the identity in structure of Millepora alcicornis with Stromatopora.* Ann. Mag. Nat. Hist., ser. 5, vol. 1, pp. 298-311, pl. 17.

1878b. *Large fossil hydrozoic coralla from the Chalk.* Ann. Mag. Nat Hist., ser. 5, vol. 1, pp. 412-419.

1878c. *On the probable nature of the animal which produced the Stromatoporidae traced through Hydractinia, Millepora alcicornis, and Caunopora to Stromatopora.* Ann. Mag. Nat. Hist., ser. 5, vol. 2, pp. 304-324.

Carus, Julius Victor

1884. *Prodomus Faunae Mediterraneae . . . Pars I.* Stuttgart, 2 vols. [Coelenterata pp. 1-84.]

Cary, Lewis Robinson

1912. *Report upon investigations carried on at the Tortugas Laboratory during 1911.* Carnegie Inst. Washington, Yearbook for 1911, No. 10, pp. 142-156, pls. 4-6.

1914. *Observations upon the growth rate and oecology of gorgonians.* Carnegie Inst. Washington, Publ. No. 182, Papers Tortugas Lab., vol. 5, No. 6, pp. 79-90, pls. 1, 2, tables 1-4.

1915. *The Alcyonaria as a factor in reef limestone formation.* Nat. Acad. Sci., Proc., vol. 1, pp. 285-289.

1917. *The part played by Alcyonaria in the formation of some Pacific coral reefs.* Nat. Acad. Sci., Proc., vol. 3, pp. 545-548.

1918. *The Gorgonaceae as a factor in the formation of a coral reef.* Carnegie Inst. Washington, Publ. No. 213, pp. 341-362, pls. 100-105.

1931. *Studies on the coral reefs of Tutuila, American Samoa, with special* *reference to the alcyonarians.* Carnegie Inst. Washington, Publ. No. 413, Papers Tortugas Lab., vol. 27, pp. 53-98, pls. 1-7, text-figs. 1-14.

Caspers, H.

1941. *Der tierische Befall am Holz der Helgoländer Seebrücke.* Zool. Anzeig., vol. 136, pp. 1-8, text-figs.

1951. *Quantitative Untersuchungen über die Bodentierwelt des Schwarzen Meeres im bulgarischen Küstenbereich.* Arch. Hydrobiol., vol. 45, pp. 1-192, pls. 1-7, text-figs., tables.

1952. *Der tierische Bewuchs an Helgoländer Seetonnen.* Helgoländ. Wiss. Meeresuntersuch., vol. 4, No. 2, pp. 138-160, text-figs.

Caster, Kenneth E.

1938. *Macroscopic fauna of the Quimbriz (Eocene) formation on the Luculo River, Angola. Anthozoa.* Comm. Serv. Geol. Portugal, vol. 20, pp. 84-85, pl. 8.

Casto de Elera, R. P. F.

1896. *Catálago sistemático de todo la fauna de Filipinas. Coelentéreos.* Manila, vol. 3, pp. 838-840.

Catala, R.

1950. *Contribution à l'étude écologique des îlots coralliens du Pacific Sud. Premiers éléments d'écologie terrestre et marine des îlots voisins au littoral de la Nouvelle Calédonie.* Bull. Biol. France et Belgique Paris, vol. 84, No. 3, pp. 234-315, pls. 1, 2, 11 text-figs.

1955. *Iles basses coralliennes et organismes marins du Pacifique.* Soc. Zool. France, Bull., vol. 80, No. 4, pp. 225-227.

Catullo, Tommaso Antonio

1852. *Cenni sopra il terreno di sedimento superiore delle Provincie Venet e descrizione di alcuni polipaj fossilli ch'esse racchiude.* R. Ist. Veneto Sci., Mem., vol. 4, pp. 1-44, pls. 1-4.

1856. *Dei terreno di sedimento superiore delle Venezie e dei fossili Bryonzoari, Antozoari, e Spongiari.* Padua, pp. i-viii, 1-88, pls. 1-19.

Cavelier, C., and Pomerol, C.

1963. *Le Bartonien de Ronquerolles (Seine-et-Oise).* Soc. Géol. France, Bull., sér. 7, vol. 4, No. 2 (for 1962), pp. 170-181, figs. 1-3. [Corals p. 172.]

Cavelier de Cavenille

1875. *La pêche du corail sur les côtes de l'Algérie.* Nancy, 71 pp.

Caziot, Eugène

1921. *Espèces rares de la faune marine de la rade de Villefranche-sur-mer (A.-M.).* Soc. Zool. France, vol. 46, pp. 114-116.

Cecchini, C.

1917. *Gli Alcionari e Madreporari raccolti nel Mediterraneo dall R. N. "Washington" (1881-1883).* Arch. Zool. Napoli, vol. 9, pp. 123-157, 1 pl., text-figs.

Cerruti, A.

1941. *Osservazioni ed esperimenti sulle cause di distruzione delle larvae d'ostrica nel Mar Piccolo e nel Mar Grandi di Taranto.* Arch. Oceanogr. Limnol. Roma, vol. 1, No. 3, pp. 165-188. [Coelenterates pp. 184-186.]

Cerutus, Benedictus

1622. *Musaeum F. Calceolarii, jun . . . a B. Ceruto . . . incaeptum et ab A. Chiocco . . . luculenter descriptum & perfectum, &c . . .* Veronae, [46] 746 pp., frontisp., 36 text-figs.

Chabouis, L., and Chabouis, F.

1954. *Petite Histoire naturelle des Établissemets Français de l'Oceanie, Saint-Amand-Montrond.* Paris, vol. 2, pp. 1-137, figs [Coelenterates pp. 127-131.]

Chacko, P. I.

1950. *Marine plankton from waters around the Krusadai Island.* Indian Acad. Sci., Proc., vol. 31B, No. 3, pp. 162-174, figs.

Chamberlin, Rollin T.

1924. *The geological interpretation of the coral reefs of Tutuila, American Samoa.* Carnegie Inst. Washington, Publ. No. 340, Papers Dept. Marine Biol., vol. 19, pp. 145-178, pls. 1-7, text-figs. 1-5.

Chambeyron, L.

1875. *Note relative à la Nouvelle Calédonie.* Soc. Geogr. Paris, Bull., vol. 9, pp. 566-586.

1876. *Le grand récif au nord de la Nouvelle Calédonie.* Soc. Geogr. Paris, Bull., vol. 12, pp. 633-644.

Chamisso de Boncourt, Louis Charles Adelaide

1819. *De Animalibus quibusdam e classe Vermium Linneana, in circumnavigatione Terrae, auspicante Comite N. Romanzoff, Duce Ottone de Kotzebue, annuis 1815-1818 peracta, observatis . . .* Acad. Leopold.-Carolin., Nova Acta, vol. 10 (1821), pp. 243-373, pls. 24-33.

1821. *Ueber die Korallen-Inseln. In* Kotzebue, O. von, *Entdeckung Reise in der Süd-See,* vol. 3, pp. 187-189.

Chantérac, Ch. de

1875. *Étude sur la formation des iles et récifs madréporiques.* Rev. Marit. et Colon. Paris, vol. 44, pp. 626-637.

Chapman, Frederick

1916. *Cainozoic geology of the Mallee and other Victorian bores.* Geol. Sur. Victoria, Rec., vol. 3, No. 4, pp. 327-430, pls. 63-78.

1920. *Notes on a collection of Tertiary fossils from Ooldea and Watson, South Australia.* Roy. Soc. Victoria, Proc., vol. 32, No. 2, pp. 225-245, 2 pls.

1921. *New or little-known Victorian fossils in the National Museum.* Roy. Soc. Victoria, Proc., vol. 33, pp. 212-225, 3 pls.

1925. *A fossil coral.* Victoria Natural., vol. 42, pp. 128-129.

1931. *A report on samples obtained by boring into Michaelmas reef, about 23 miles N.E. of Cairns, Queensland.* Great Barrier Reef Comm. Brisbane, Rept., vol. 3, p. 32.

Chapman, Frederick, and Crespin, Irene

1928. *The Sorrento bore, Morningside Peninsula, with a description of new or little-known fossils.* Geol. Sur. Victoria, Rec., vol. 5, No. 1, pp. 89-90, 144, 175, 1 pl.

Chapman, G.

1955. *Aspects of the fauna and flora of the Azores. VI. The density of animal life in the coralline alga zone.* Ann. Mag. Nat. Hist., ser. 12, vol. 8, art. 95, pp. 801-805.

Chapuis, Félicien, and Dewalque, G. J. G.

1854. *Mémoire en réponse à la question suivante: Faire la description des fossiles des terrains Secondaires de la Province de Louxenbourg . . .* Acad. Roy. Sci., Lettres et Beaux Arts Belgique, Mém. Couronnes, vol. 25, 325 pp., 38 pls.

Chaput, G.

1955. *Contribution à l'étude de la faune pliocène de la Péninsula de Cnide (Turquie).* Bull. Sci. Bourgoyne, vol. 15, pp. 39-51.

Chauvin, A.

1916. *Le développement des récifs coralliens.* Rev. Gén. Sci. Paris, vol. 27, pp. 338-340.

Chavan, A., and Cailleux, A.

1957. *Détermination pratique des fossiles.* Paris, Masson & Cie, pp. 1-385, figs. 1-2995, [Coelenterates pp. 175-187.]

Checchia-Rispoli, G.

1916. *Sui terreni Terziari Inferiori del versante settentrionale delle Madonie.* Mem. Descr. Carta Geol. Italia, vol. 6, No. 2, pp. 3-209, 9 pls.

Chevalier, Jean-Pierre

1954a. *Contribution a la révision des polypiers du genre Heliastraea.* Ann. Hébert et Haug, vol. 8, pp. 105-188, 8 pls., 41 text-figs.

1954b. *Sur quelques espèces d'Anthozoaires du Nummultique des environs de Blaye (Gironde).* Soc. Géol. France, Bull., sér. 6, vol. 4, Nos. 1-3, pp. 61-66, pl. 5b.

1955a. *Polypiers. In* Bruno, J. H., Chevalier, J.-P., and Marie, P., *Quelquesformes nouvelles de Polypiers et de Foraminifères de l'Oligocène et du Miocène du NW de la Grèce.* Soc. Géol. France, Bull., sér. 6, vol. 5, Nos. 1-3, pp. 195-202, pls. 8-10.

1955b. *Les polypiers Anthozoaires du Stampien de Gaas (Landes.)* Soc. Hist. Nat. Toulouse, Bull., vol. 90, Nos. 3, 4, pp. 375-410, pls. 1-3, text-figs. 1-13.

1956. *Le récif Miocène du Languedoc.* Soc. Géol. France, Bull., sér. 6, vol. 6, Nos. 1-3, pp. 127-134, text-figs. 1, 2.

1958. *Aperçu sur les formations coralliennes du Miocène française.* 83e Congr. Soc. Sav., Sect. Sci., pp. 111-121.

1959a. *Quelques considérations sur la vie récifal au Miocène dans le bassin Méditerranéen.* Soc. Géol. France, Bull., sér. 7, vol. 1, No. 4, pp. 369-374, text-figs. 1, 2.

1959b. *Contribution à l'étude du developpement du plan Pourtalès chez les Eupsamidae (Madréporaires): cas de Balanophyllia italica Mich.* Soc. Géol. France, Bull., sér. 7, vol. 1, No. 4, pp. 691-695.

1961. *Recherches sur les Madréporaires et les formations récifales Miocenès de la Méditerranée occidentale.* Soc. Géol. France, Mém. Paléont., vol. 93, pp. 1-562, pls. 1-26, text-figs. 1-199.

1962a. *Les Madréporaires Miocènes du Maroc.* Serv. Géol. Maroc, Notes et Mém., No. 173, pp. 17-74, pls. 1-4.

1962b. *Les Madréporaires du Pliocène d'Orosei (Nuoro, Sardaigne).* Soc. Géol. France, Bull., sér. 7, vol. 3, No. 3, pp. 266-270, pl. 4a, text-fig. 1.

1963a. *Les Madréporaires de l'Aquitanien inférieur de Peyrére, près de Peyrehorade (Landes).* Assoc. Avancem. Sci., C. R., vol. 80 (for 1961), p. 90.

1963b. *Les Madréporaires de l'Aquitanien inférieur de Peyrère de Peyrehorade (Landes).* Assoc. Rég. Étude Recherches Sci. Reims, Ann., vol. 1, No. 2, pp. 47-60, pls. 1, 2, text-figs. 1-7.

1964a. *Compte rendu des missions effectuées dans le Pacifique en 1960 et 1962. (Mission d'études des récifs coralliens de Nouvelle Caledonie.)* Cahiers Pacif., No. 6, pp. 171-175.

1964b. *Kenntniss der Korallen Miocäns von Westfalen und der Niederlande.* Fortschr. Geol. Rheinald.-Westf., vol. 14, pp. 1-30, pls. 1, 2, text-figs. 1-13.

1964-65. *Contribution à l'étude des Madréporaires Neogènes du Portugal et des Açores.* Port. Serv. Geol., Comunic., vol. 48, pp. 109-139, figs.

Chevalier, Jean-Pierre, and Demarcq, G.

1964. *Les Madréporaires Miocènes de la vallée du Rhône.* Lab. Geol. Fac. Sci. Lyon, Trav., n. s., No. 11, pp. 7-48, pls. 1, 2, text-figs. 1-5, map.

Chopin, A.

1895. *A visit to Cumbrae: a list of Coelenterata found.* Manchester Microsc. Soc., Trans. 1894, p. 53.

Choubert, G.
1962. *Les Madréporaires Miocènes du Maroc. Introduction stratigraphique.* Serv. Géol. Maroc, Mém., No. 173, pp. 7-15, 1 fig.
Chubb, Lawrence John
1925. *The St. George Scientific Expedition.* Geol. Mag., vol. 62, pp. 369-373.
1927a. *The geology of the Austral or Tubuai Islands (Southern Pacific).* Geol. Soc. London, Quart. Jour., vol. 83, pp. 291-316, pl. 23, text-figs. 1-7.
1927b. *On the geology of Maiao (Society Islands).* Geol. Soc. London, Quart. Jour., vol. 83, pp. 342-345, fig. 1.
1927c. *Mangaia and Rurutu—a comparison between two Pacific islands.* Geol. Mag., vol. 64, No. 761, pp. 518-522.
1933. *Geology of Galapagos, Cocos and Easter Islands.* Bernice P. Bishop Mus., Bull., No. 110, 65 pp., 9 text-figs., 5 pls.
Chumley, James
1918. *The fauna of the Clyde Sea area . . . 1918.* Glasgow, pp. 1-200 + vi, chart.
Chun, Carl
1888a. *Die pelagische Thierwelt in grössern Meerestiefen und Beziehungen zu Oberflächenfauna.* Biblioteca Zoologica Leipzig, No. 1, 66 pp., 5 pls.
1888b. *Bericht über eine nach den canarischen Inseln im Winter 1887-1888 ausgeführte Reise.* K. Preuss. Akad. Wiss. Berlin, Sitzungsber., pp. 1141-1173.
1889. *Bericht über eine nach den canarischen Inseln im Winter 1887-1888 ausgeführte Reise.* K. Preuss. Akad. Wiss. Berlin, Sitzungsber., pp. 524-526, 1 pl.
1889. *Coelenterata (Hohlthiere). In* Bronn, H. G., *Klassen und Ordnungen das Tierreichs.* Vol. 2, No. 2, pp. 1-538, pls. 1-33, text-figs. 1-95.
Clark, Bruce, L., and Arnold, Ralph
1924. *Fauna of the Sooke Formation, Vancouver Island with description of a new coral by T. Wayland Vaughan.* Univ. California Publ., Bull. Dept. Geol. Sci., vol. 14, No. 5, pp. 123-234, pls. 15-42.
Clark, B. L., and Woodford, A. O.
1927. *The geology and paleontology of the type section of the Meganos Formation (Lower Middle Eocene) of California.* Univ. California Publ., Bull. Dept. Geol. Sci., vol. 17, No. 2, pp. 63-142, pls. 14-22, map.
Clarke, F. W., and Wheeler, W. C.
1922. *The inorganic constituents of marine invertebrates.* U.S. Geol. Sur., Prof. Paper 124, pp. 6-9.
Clerc, Modeste
1907. *Les polypiers de Gilley.* Soc. Sci. Nat. Neuchatel, Bull., vol. 33 (1905), pp. 158-167, chart.
Cleve, Peter Theodor
1871. *On the geology of the north-eastern India islands.* K. Svenska Vetensk.-Akad., Handl., vol. 9, No. 12, 48 pp., 2 pls. text-figs.
1882. *Outline of the geology of the West India islands.* New York Acad. Sci., Ann., vol. 2, pp. 185-192.
1901. *The seasonal distribution of Atlantic plankton organisms.* Goteborgs Kongl. Vetenskaps och Vitterhets Samhälles Handl., Ny Tidsföld, vol. 3, 368 pp. [Coelenterata pp. 93-98.]
Cloud, Preston E., Jr.
1952a. *Facies relationships of organic reefs.* Amer. Assoc. Petrol. Geol., Bull., vol. 36, No. 11, pp. 2125-2149, figs. 1-4.

1952b. *Preliminary report on the geology and marine environments of Onotoa Atoll, Gilbert Islands.* Atoll Research Bull., No. 12, pp. 1-73, 8 figs., 5 tables.

1954. *Superficial aspects of modern organic reefs.* Sci. Monthly, vol. 79, pp. 195-208, figs. 1-7.

1955. *Bahama Banks west of Andros Island.* Geol. Soc. Amer., Bull., vol. 66, No. 12, pt. 2, p. 1542.

1957. *Nature and origin of atolls.* Eighth Pacific Sci. Congress, Proc., vol. 3A, pp. 1009-1024, figs. 1-6.

Clusius, Carolus (Charles de l'Ecluse)

1605. *Exoticorum libri decem: Quibus Animalium, Plantarum, Aromatum, aliorumque peregrinorum fructuum historiae discribuntur . . .* Leyden, pp. 10 + 378 + 5, figs.

1611. *Curae posteriores, seu plurimarum non ante recognitarum . . . stirpium peregrinorumque aliquot Animalium novae descriptiones.* Leyden, viii + 134 + 39 pp., figs.

Cognetti, G., and Santarelli, M.

1960. *Ricerche sulla zoocenosi bentoniche de Golfo di Napoli. II. La cosidetta secca di San Giovanni a Teduccio.* Boll. Pesca Pisic. Idrobiol. Ann. 35, n. s., vol. 14, No. 1 (1959), pp. 10-20, figs. 1, 2.

Colacicchi, Roberto

1963. *Geologia del territorio di Pachino (Sicilia Meridionale).* Geol. Romana, vol. 2, pp. 343-404, pls. 1-5, text-figs. 1-27.

Collignon, M.

1960. *Calcaires à polypiers récifs et atolls du Sud de Madagascar.* Soc. Géol. France, Bull., sér. 7, vol. 1, No. 4 (1959), pp. 403-408, figs. 1, 2.

Collignon, M., and Cottreau, Jean

1927. *Fossiles du Miocène marin de Madagascar.* Ann. Paléont., vol. 16, pp. 8-10, pl. 1.

Collins, J. H.

1895. *Illustrations of Cornish fossils.* Geol. Soc. Cornwall, Trans., vol. 11, pp. 553-559, 1 pl.

Colliver, F. S.

1937. *Fossil localities in and about Melbourne. Part IV. Altona brown coal mine.* Victoria Natural. Melbourne, vol. 54, No. 5, pp. 80-81.

Colom, G.

1957. *Biogeografia de la Baleares.* Palma de Mallorca, pp. 1-568, figs. 1-119 [Miocene corals p. 79.]

Comaschi, Caria

1960. *Macrofauna e estratigrafia de Miocene della zona di Cagliari.* Soc. Geol. Italiana, Boll., vol. 78, (1959), No. 1, pp. 3-36, pls. 1-8, map.

Combes, P.

1903. *Coralliaires de Madagascar.* Le Cosmos Paris, sér. 2, vol. 49, pp. 678-680, 4 figs.

Conant, Franklin Story

1899. *Notes on zoological collecting in Jamaica, W. I.* Johns Hopkins Univ. Circ., vol. 19, pp. 23-25.

Condorelli-Francaviglia, Mario

1899. *Invertebrati raccolti dalla R. Nave "Scill" nell'Adriatico e nel Jonio.* Soc. Romana Studi Zool., Boll., vol. 8, pp. 25-49.

Cooke, C. Wythe

1953. *Pleistocene corals at Lake Worth, Florida.* Science, vol. 117, No. 3042, p. 440.

Cooper, H. Stonehewer

1882. *The Coral Lands of the Pacific: their peoples and their products.* London, xxiv + 398 pp., 1 pl.

Coppinger, Richard William
1883. *Cruise of the "Alert". Four years in Patagonian, Polynesian, and Mascarene waters (1878-82)* . . . London, xiii + 256 pp., 16 pls.

Cori, C. J., and Steuer, A.
1901. *Beobachtungen über das Plankton des Triester Golfes in den Jahren 1899 und 1900.* Zool. Anzeig., pp. 111-116, table. [Coelenterata pp. 114-116.]

Coryell, H. N., and Ohlsen, Violet
1929. *Fossil corals of Porto Rico, with descriptions also of a few Recent species.* New York Acad. Sci., Scientific Survey of Porto Rico and the Virgin Islands, vol. 3, pt. 3, pp. 167-236, pls. 26-44.

Cottreau, Jean
1935, 1937. *Types du Prodrome de Paléontologie Stratigraphique Universelle de d'Orbigny.* Ann. Paléont., vol. 24 (1935), pp. 35-42, pls. 73-75; vol. 26 (1937), pp. 53-84, pls. 76-81.

Coues, Elliott, and Yarrow, H. C.
1878. *Notes on the natural history of Fort Macon, N.C., and vicinity. (No. 5).* Acad. Nat. Sci. Philadelphia, Proc., vol. 30, pp. 297-315. [Polypi or Anthozoa, pp. 310-312.]

Couffon, Olivier
1905. *Étude critique sur les faluns du Haguineau.* Soc. Études Scient. Angers., Bull., vol. 33, pp. 35-85. [Coelenterates p. 40.]
1905. *Étude critique sur les Faluns de Chalonnes.* Soc. d'Études Scient. Angers, Bull., vol. 34, pp. 163-165.

Coulon, L.
1931. *Les Coelentérés actuels et fossiles du Musée d'Elbeuf.* Soc. Sci. Nat. Elbeuf, Bull., vol. 49, pp. 46-72, 3 pls.

Couthouy, Joseph P.
1844. *Remarks upon coral formations in the Pacific, with suggestions as to the cause of their absence in the same parallels of latitude, on the coast of South America.* Boston Soc. Nat. Hist., Jour., vol. 4, pp. 66-105, 137-162, 8 figs.

Coutière, Henry
1898. *Note sur les récifs madréporiques observés a Djibouti.* Mus. Nat. Hist. nat. Paris, Bull., vol. 4, pp. 38-41, 87-90, 155-157, 1 text-fig.; pp. 238-240, 274-276.

Cowles, R. P.
1930. *A biological study of the offshore waters of Chesapeake Bay.* U.S. Bur. Fish., Bull., vol. 46 (1931), pp. 277-381, 16 figs.

Coy, E. C.
1922. [*Plankton investigations.*] *Coelenterata (1922).* Dove Marine Lab. Cullercoats, Rept., vol. 13, pp. 50-56.

Crespin, Irene
1960. *Catalogue of type and figured specimens in the Commonwealth Palaeontological Collection, Canberra.* Australian Bur. Min. Res. Geol. Geophys., Rept., vol. 54, pp. 1-92. [Coelenterata pp. 44-51.]

Crisp, D. J., and Fischer-Piette, E.
1959. *Répartition des principales espèces intercotidales de la côte Atlantique française en 1954-1955.* Inst. Océanogr. Paris, Ann., vol. 36, No. 2, pp. 275-387, figs. 1-22.

Crosby, William Otis
1883. *On the elevated coral reefs of Cuba.* Boston Soc. Nat. Hist., Proc., vol. 22, p. 124-128.

Crossland, Cyril
1902. *The coral reefs of Zanzibar.* Cambridge Philos. Soc., Proc., vol. 11, pp. 493-503, pl. 6.

1904a. *The coral reefs of Pemba Island and of the East African mainland.* Cambridge Philos. Soc., Proc., vol. 12, pp. 36-43, 2 charts.
1904b. *The coral formations of Zanzibar and East Africa.* British Assoc. Adv. Sci., Rept. 1903, pp. 685-687.
1905. *The oecology and deposits of the Cape Verde marine fauna.* Zool. Soc. London, Proc., pt. 2, pp. 170-186, figs. 21-26.
1907a. *Reports on the marine biology of Sudanese Red Sea. — I. Introduction by W. A. Herdman. II. Narrative of the expedition. III. Note on the formation of the shore cliff near Alexandria. IV. The recent history of the coral reefs of the mid-West shores of Red Sea.* Linnean Soc. London, Jour., Zoology, vol. 31, pp. 1-30, text-figs. 1, 2, pls. 1-4.
1907b. *Physical descriptions of Khor Donganad, Red Sea.* Linnean Soc. London, Jour., Zoology, vol. 31, pp. 265-286, pls. 28-34, text-figs. 1-3.
1913. *Desert and Water gardens of the Red Sea.* London and New York, Cambridge Univ. Press, xv + 158 pp., 40 pls., maps.
1927a. *Barrier reefs as a sign of a subsiding coast line.* Nature, vol. 120, p. 11.
1927b. *The expedition to the South Pacific of the S.Y. "St. George". Marine ecology and coral formations in the Panama region, the Galapagos and Marquesas Islands, and the Atoll of Napuka.* Roy. Soc. Edinburgh, Trans., vol. 55, pp. 531-554, pl. 55, text-figs. 1-11.
1927c. *Recession of the Tahitian coral reefs.* Nature, vol. 119, p. 597.
1927d. *Exploring the coral reefs of Tahiti.* Discovery, vol. 8, p. 212.
1927e. *Barrier reefs of Tahiti and Moorea.* Nature, vol. 120, pp. 618-619.
1928a. *The coral reefs of Tahiti, Moorea, and Rorotonga.* Linnean Soc. London, Jour., Zoology, vol. 36, pp. 577-618, 5 pls., 14 text-figs.
1928b. *Notes on the ecology of the reef-builders of Tahiti.* Zool. Soc. London, Proc., pp. 717-735, pls. 1-5, text-fig. 1.
1929. *Recession and age of the Tahitian coral reefs.* Nature, vol. 124, p. 576.
1931a. *The coral reefs of Tahiti compared with the Great Barrier reefs.* Geogr. Jour. London, vol. 77, p. 395.
1931b. *The reduced building-power and other variations in the astrean corals of Tahiti, with a note on Herpolitha limax and Fungia spp.* Zool. Soc. London, Proc., pp. 351-392, pls. 1-22, text-figs. 1-13.
1935. *Coral faunas of the Red Sea and Tahiti.* Zool. Soc. London, Proc., pp. 499-504, pls. 1-3.
1938. *The coral reefs at Ghardaqa, Red Sea.* Zool. Soc. London, Proc., vol. 108A, pp. 512-523, charts.
1939a. *Further notes on the Tahitian barrier reef and lagoons.* Linnean Soc. London, Jour., Zoology, vol. 40, No. 273, pp. 459-474, pls. 12, 13, chart.
1939b. *Reports on the preliminary expedition for the exploration of the Red Sea in the R.R.S. "Mabahith". Chapter III. Some coral formations.* Marine Biol. Sta. Ghardaqa (Red Sea), Publ., vol. 1, pp. 21-34, pl. 2, text-figs.
1941. *On Forskål's collection of corals in the Zoological Museum of Copenhagen.* Zool. Mus. Hauniensis København, Spolia, vol. 1, pp. 5-63, pls. 1, 2.
1948. *Reef corals of the South Africa coast.* Natal Mus. Pietermaritzburg, Ann., vol. 2, pp. 169-205, pls. 5-14.
1952. *Madreporaria, Hydrocorallinae, Helipora and Tubipora.* British Mus. (Nat. Hist.), Sci. Repts. Great Barrier Reef Exped. 1928-29, vol. 6, No. 3, pp. 85-257, pls. 1-56, text-figs. 1A-C.

Cunha, A. X. da
1950. *Nova contribuição para o estudo dos hidropólipos das costas de Portugal.* Mus. Bocage, Arch., No. 21, pp. 121-144, figs.
Curtis, M. L. K.
1956. *Type and figured specimens from the Tortworth Inlier, Gloucestershire.* Bristol Nat. Soc., Proc., vol. 29, No. 2, pp. 147-154.
Cutress, C. C.
1955. *An interpretation of the structure and distribution of cnidae in Anthozoa.* Syst. Zool., vol. 4, No. 3, pp. 120-137, figs. 1-10.
Cuvier, Georges Léopold Crétien Frédéric Dagobert
1817, 1829, 1836-49. *La Règne Animal, distribué d'après son organisation, pour servir de base à l'histoire naturelle des animaux et d'introduction à la anatomie comparée.* Paris, 4 vols. (1817); 2d ed., 5 vols. (1829); 3d ed., 17 vols. (1836-49).
Dahl, Friedrich
1897a. *Ueber den Bismark-Archipel in naturwissenschaftlicher Beiziehung.* Gesell. Naturf. Freunde Berlin, Sitzungsber., pp. 123-131.
1897b. *Ueber den Bismark-Archipel.* Deutsch. Zool. Gesell., Verhandl., pp. 204-210.
1898. *Frage der Bildung der Coralleninseln.* Zool. Jahrb., Syst., vol. 11, pp. 141-150, 2 figs.
1899. *Ueber Korallenriff-Theorien.* Gesell. Naturf. Freunde Berlin, Sitzungsber., pp. 211-220.
Dainelli, G.
1904a. *Contributo allo studio dell'Eocene medio dei dintorni di Ostroviza in Dalmazia.* R. Accad. Lincei Roma, Atti, ser. 5, vol. 13, No. 5, pp. 277-282.
1904b. *La fauna eocenica di Bribir in Dalmazia.* Palaeontogr. Italica, vol. 10, pp. 141-273, pls. 15-17.
1915. *L'Eocene Friulano.* Florence, pp. 204-344, pls. 27-41.
Dakin, William John
1953. *Great Barrier Reef and some mention of other Australian coral reefs.* Melbourne, pp. xi + 13-176, illustr.
Dakin, W. J., Bennett, I., and Pope, E.
1948. *A study of certain aspects of the ecology of the intertidal zone of the New South Wales coast.* Australian Jour. Sci. Res. Melbourne, vol. B1, No. 3, pp. 176-230, pls. 1-9, text-figs.
Dakin, W. J. [Assisted by Bennett, I., and Pope E.]
1953. *Australian seashores. A guide for the beach-lover, the naturalist, the shore fisherman, and the student.* London, i-xii, 1-372 pp., frontisp., pls. 1-99. [Coelenterates pp. 120-139, pls. 21-26.]
Dall, William Healy
1884. *On some Hydrocorallinae from Alaska and California.* Biol. Soc. Washington, Proc., vol. 2, pp. 111-115. Also Ann. Mag. Nat. Hist., ser. 5, vol. 13, pp. 467-471.
Dalla-Torre, Karl Wilhelm von
1889. *Die Fauna von Helgoland.* Zool. Jahrb., vol. 4, Suppl. 2, 99 pp.
Dalton, Leonard V.
1908. *Notes on the geology of Burmah.* Geol. Soc. London, Quart. Jour., vol. 64, pp. 604-644, pls. 54-57.
Daly, Reginald Aldworth
1910. *Pleistocene glaciation and the coral reef problem.* Amer. Jour. Sci., vol. 30, No. 179, art. 32, pp. 29-308.
1915. *The glacial-control theory of coral reefs.* Amer. Acad. Arts and Sci., Proc., vol. 51, No. 4, pp. 155-251, figs. 1-48.
1916a. *Problems of the Pacific Islands.* Amer. Jour. Sci., vol. 41, No. 242, art. 7, pp. 153-186, figs. 1-38, pl. 3.

1916b. *A new test of the subsidence theory of coral reefs.* Nat. Acad. Sci. Washington, Proc., vol. 2, pp. 664.
1917. *Origin of the living coral reefs.* Scientia, Bologna, vol. 22, pp. 188-199; suppl. pp. 60-74.
1919. *The coral reef zone during and after the glacial period.* Amer. Jour. Sci., vol. 48, No. 284, art. 10, pp. 136-159.
1920a. *The geology of American Samoa.* Carnegie Inst. Washington, Yearbook No. 18, pp. 192-195.
1920b. *A recent world-wide sinking of ocean level.* Geol. Mag., vol. 57, pp. 247-261.
1920c. *A general sinking of sea-level in Recent time.* Nat. Acad. Sci. Washington, Proc., vol. 6, pp. 246-250.
1922. *The geology of Ascension and St. Helena Islands.* Geol. Mag., vol. 59, pp. 146-156.
1924. *The geology of American Samoa.* Carnegie Inst., Washington, Publ. No. 340, Papers Dept. Marine Biol., vol. 19, pp. 93-143, pls. A-B, 1-9, text-fig. 1.
1925. *The geology of Ascension Island.* Amer. Acad. Arts and Sci., Proc., vol. 60, No. 1, 80 pp., 21 pls., 8 text-figs.
1927. *Geology of Saint Helena Island.* Amer. Acad. Arts and Sci., Proc., vol. 62, No. 2, pp. 31-92, pls. 1-25.
1929. *Swinging sea-level of the ice age.* Geol. Soc. Amer., Bull., vol. 40, pp. 721-734.
1934, 1963. *The changing world of the Ice Age.* Yale Univ. Press, xix + 271 pp., figs. 1-149.
1948. *Coral reefs — a review.* Amer. Jour. Sci., vol. 246, No. 4, pp. 193-207.

Dammerman, K. W.
1922. *The fauna of Krakatau, Verlaten Island and Sebesby.* Treubia, vol. 3, pp. 61-112, figs.
1948. *The fauna of Krakatau 1883-1933.* K. Nederland. Akad. Wetensch. Amsterdam. Verhandl., ser. 2, vol. 44, pp. 1-594, pls. 1-11, text-figs. [Coelenterates pp. 524, 563.]

Damon, W. E.
1882. *Coral in aquarium.* Amer. Monthly Microsc. Jour., vol. 3, p. 221.

Dana, James Dwight
1846-49. *Zoophytes. United States Exploring Expedition during the years 1838-1839-1840-1841-1842 under the command of Charles Wilkes.* Philadelphia, vol. 7, vi + 740 pp., 61 pls. 45 text-figs.
1846. *Structure and classification of zoophytes.* Philadelphia, 132 pp., figs.
1853. *On coral reefs and islands.* New York, 143 pp., figs., 2 maps.
1859. *Synopsis of the author's report on the zoophytes of the U.S. Exploring Expedition.* New Haven, vi + 172 pp.
1872, 1879, 1890. *Corals and coral islands.* New York, 1st ed. (1872), 398 pp.; 2d ed. (1879), 406 pp.; 3d ed. (1890), 440 pp., 16 pls.
1874. *Notes on the new edition of Darwin's work on the structure and distribution of coral reefs.* Amer. Jour. Sci., ser. 3, vol. 8, pp. 312-318.
1885. *Origin of coral reefs.* Amer. Jour. Sci., vol. 30, pp. 89-105, 169-191, map.

Darby, David G., and Hoyt, J. H.
1964. *An upper Miocene fauna dredged from tidal channels of coastal Georgia.* Jour. Paleont., vol. 38, No. 1, pp. 67-73, pls. 17, 18, text-figs. 1, 2. [Anthozoa p. 70.]

Darwin, Charles

1837. *On certain areas of elevation and subsidence in the Pacific and Indian Oceans, as deduced from the study of coral formations.* Geol. Soc. London, Proc., vol. 2, pp. 552-554.

1842, 1874, 1889. *The structure and distribution of coral reefs.* London, 1st ed. (1842); 2d ed. (1874); 3d ed. (1889), Ward, Lock and Co., xx + 154 pp., 3 pls., text-figs.

David, Caroline Martha (Mrs. T. W. Edgeworth David)

1899. *Funafuti; or, three months on a coral island: an unscientific account of a scientific expedition.* London, pp. i-xiii, 1-318, pls., map.

David, Tannat William Edgeworth

1904. *The atoll of Funafuti. Sect. 4. Narrative of the second and third expedition.* Roy. Soc. London, Coral Reef Committee Rept., xiv + 428 pp., 8 pls., text-figs., 18 maps.

1927. *Note on a bore in the Great Barrier Reef of Australia.* Geol. Soc. London, Quart. Jour., vol. 83, p. vii.

David, T. W. E., Halligan, G. H. and Finckh, A. E.

1904. *The atoll of Funafuti. Sect. 7. Report on dredging at Funafuti.* Roy. Soc. London, Coral Reef Committee, Rept., xiv + 428 pp., 8 pls., 18 maps, text-figs. [Pp. 151-159.]

David, T. W. E., and Sweet, G.

1904. *The atoll of Funafuti. Sect. 5. The geology of Funafuti.* Roy. Soc. London, Coral Reef Committee, Rept., xiv + 428 pp., 8 pls., 18 maps, text-figs. [pp. 61-124].

Davidaschvili, L. S.

1937. *On the ecology of animals of the Middle Miocene reefs of Ukranian S.S.R.* Prob. Paleont., Moscow Univ. Lab. Paleont., Publ., vols. 2, 3; pp. 537-563. [Russian, with English summary.]

Davidoff, C.

1907. *Sur la question du mésoderme chez les Coelenterés.* Zool. Anzeig., vol. 31, pp. 119-124.

Davies, Arthur Morley

1962. *An Introduction to Palaeontology (3d ed.) revised and partly rewritten by C. J. Stubblefield.* London, Murby, i-ix + 322 pp., 1 pl., text-figs. 1-120.

Davies, L. M.

1937. *The Eocene beds of the Punjab Salt Range.* Palaeont. Indica, vol. 24, No. 1, pp. 64-65.

Davis, A. G.

1952. *The Brockenhurst Beds at Victoria Tilery, Brockenhurst, Hampshire.* Geol. Assoc. London, Proc., vol. 63, No. 3, pp. 215-219.

Davis, William Morris

1913. *Dana's confirmation of Darwin's theory of coral reefs.* Amer. Jour. Sci., ser. 4, vol. 35(185), No. 206, art. 18, pp. 173-188, fig. 1.

1915. *The origin of coral reefs.* Nat. Acad. Sci. Washington, Proc., vol. 1, pp. 146-152.

1916a. *Extinguished and resurgent coral reefs.* Nat. Acad. Sci. Washington, Proc., vol. 2, pp. 466-471, figs. 1-3.

1916b. *The origin of certain Fiji atolls.* Nat. Acad. Sci. Washington, Proc., vol. 2, pp. 471-475, figs. 1, 2.

1917. *The Great Barrier Reef of Australia.* Amer. Jour. Sci., ser. 4, vol. 44 (194), No. 263, art. 28, pp. 339-350, figs. 1-5.

1918a. *Les falaises et les récifs coralliens de Tahiti.* Ann. de Geogr. Paris, vol. 27, pp. 241.

1918b. *The fringing reefs of the Philippine Islands.* Nat. Acad. Sci., Washington, Proc., vol. 4, pp. 197-204.

1918c. *Coral reefs and submarine banks.* Jour. Geol., vol. 26, pp. 198-223, figs. 1-4, pp. 289-309, 385-411.
1918d. *Subsidence of reef-encircled islands.* Geol. Soc. Amer., Bull., vol. 29, pp. 489-574, figs. 1-17.
1918e. *The reef-encircled islands of the Pacific.* Jour. Geogr. Lancaster, vol. 17, pp. 1, 58, 102.
1919a. *The geological aspects of the coral-reef problem.* Sci. Progress London, vol. 13, pp. 420-444, 3 figs.
1919b. *The significant features of reef-bordered coasts.* New Zealand Inst. Wellington, Trans. Proc., vol. 51, p. 6.
1919c. *Koraalriffen en bodembewegingen. Coral reefs and crustal movements.* Nat. Tijdschr. Batavia, vol. 79, pp. 27-45, text-figs.
1920a. *The small islands of almost atolls.* Nature, vol. 105, p. 292.
1920b. *The islands and coral reefs of Fiji.* Geogr. Jour. London, vol. 55, pp. 34-45, 200-220, 377-388, figs.
1921. *The coral reefs of Tutuila, Samoa.* Science, vol. 53, pp. 559-565.
1922a. *The barrier reef of Tagula, New Guinea.* Assoc. Amer. Geogr. Albany, Ann., vol. 12, pp. 97-151, 1 pl., 23 text-figs.
1922b. *Coral reefs of the Louisiade Archipelago.* Nat. Acad. Sci. Washington, Proc., vol. 8, pp. 7-13.
1923a. *Drowned coral reefs south of Japan.* Nat. Acad. Sci. Washington, Proc., vol. 9, pp. 58-62.
1923b. *The marginal belts of the coral seas.* Nat. Acad. Sci. Washington, Proc., vol. 9, pp. 292-296.
1923c. *The depth of the coral reef lagoons.* Nat. Acad. Sci. Washington, Proc., vol. 9, pp. 296-301.
1923d. *The marginal belts of the coral seas.* Amer. Jour. Sci., ser. 5, vol. 6 (206), No. 33, art. 16, pp. 181-195.
1924a. *Notes on coral reefs.* Second Pan-Pacific Sci. Congress Australia, Proc., vol. 2, pp. 1161- 1163.
1924b. *A tilted-up, beveled-off atoll.* Science, vol. 60, pp. 51-56, 2 figs.
1924c. *The formation of the Lesser Antilles.* Nat. Acad. Sci. Washington, Proc., vol. 10, No. 6, pp. 205-211.
1925a. *The Steward Bank in the China Sea.* Science, vol. 62, p. 401.
1925b. *Les côtes et les récifs coralliens de la Nouvelle-Calédonie.* Ann. de Geogr. Paris, vol. 34, pp. 244, 332, 423, 521.
1926a. *The Lesser Antilles.* New York, Amer. Geogr. Soc., 5 + 207 pp., maps, 16 pls., text-figs.
1926b. *Subsidence rate of reef-encircled islands.* Nat. Acad. Sci. Washington, Proc., vol. 12, No. 2, pp. 99-105, figs. 1, 2.
1928a. *The Coral Reef Problem.* Amer. Geogr. Soc. New York, Spec. Publ. No. 9, 596 pp., 227 figs.
1928b. *The Formation of coral reefs.* Sci. Monthly, vol. 27, No. 4, pp. 289-300, 6 figs.

Dawson, John William

1878. *Stromatopora as distinguished from Millepora.* Ann. Mag. Nat. Hist., ser. 5, vol. 2, pp. 28-30.

Dawydoff, C.

1937a. *Quelques observations sur le développement embryonnaire des Madréporaires.* Acad. Sci. Paris, C. R., vol. 204, No. 5, pp. 378-380.
1937b. *La prétendue métamérisation des larves des Hexacoralliaires.* Acad. Sci. Paris, C. R., vol. 204, No. 7, pp. 519-521.
1937c. *Observations sur la faune pélagique des eaux indochinoises de la mer de Chine méridionale. Note préliminaire.* Soc. Zool. France, Bull., vol. 61, pp. 461-464.

1955. *Contribution à l'étude des invertébrés de l'Indochine*. Bull. Biol., Suppl. No. 37, pp. 1-158, 2 maps. [Coelenterates pp. 52-78.]

Day, J. H., Millard, N. A. H., and Broekhuysen, G. J.

1954. *The ecology of South African estuaries. Part IV. The St. Lucia system*. Roy. Soc. South Africa, Trans., vol. 34, No. 1, pp. 129-179, pls. 3, 4, text-fig.

Day, J. H., Millard, N. A. H., and Harrison, A. D.

1952. *The ecology of South African estuaries. Part III. Knysna: a clear open estuary*. Roy. Soc. South Africa, Trans., vol. 33, No. 3, pp. 367-413, pl. 31, text-figs.

Deboutteville, C. D., and Bougis, P.

1951. *Recherches sur le trottoir d'Algues calcaires effectuées à Banyuls pendant le stage d'eté 1950*. Vie et Mileu, vol. 2, pp. 161-181, pls. 1, 2, text-figs.

Decary, R.

1946. *Animaux de Madagascar*. Mus. Colon. Marseille, Ann., sér. 6, vol. 4, pp. 197-222.

Deevey, G. B.

1952a. *A survey of the zooplankton of Block Island Sound, 1943-1946*. Bull. Bingham Oceanogr. Collec., vol. 13, No. 3, pp. 65-119, figs.

1952b. *Quantity and composition of the zooplankton of Block Island Sound, 1949*. Bull. Bingham Oceanogr. Collec., vol. 13, No. 3, pp. 120-164, text-fig.

1960. *The zooplankton of the surface waters of the Delaware Bay region*. Bull. Bingham Oceanogr. Collec., vol. 17, No. 2, pp. 1-53, text-figs. 1-19.

DeFrance, Marin Jacques Louis

1826. *Polypiers*. Dictionnaire des Sciences Naturelles, vol. 42, pp. 377-398.

Dehée, R.

1929. *Description de la faune d'Etraeungt*. Soc. Géol. France, Mém., vol. 5, pt. 2, No. 11, (Coelenterata) pp. 43-48, 2 pls.

De la Beche, Henry Thomas

1828. *Notes of the habits of a Caryophyllia from Tor Bay, Devon*. Zool. Jour. London, vol. 3, pp. 481-485, pl. 13, figs. 1-6.

Delage, Marie Yves, and Herouard, Edgard

1901. *Traité de Zoologie Concrète. Vol. 2, pt. 2, Les Coelentérés*. Paris 848 pp., 72 pls., 1102 text-figs.

Delap, M., and Delap, C.

1905. *Notes on the plankton of Valencia Harbour*. Fish. Ireland, Ann. Rept. 1902-1903, pt. 2, Appendix 4, pp. 3-20.

1906. *Notes on the plankton of Valencia Harbour*. Fish. Ireland, Sci. Investig., No. 7, pp. 3-26, pls. 1, 2.

Delap, M. J.

1924. *Further notes on the plankton of Valentia Harbour 1906-1923*. Irish Natural. Dublin, vol. 33, pp. 1-6.

Delepine, G.

1930a. *La faune du Calcaire de Regnéville*. Soc. Linn. Normandie Caen, Mém., vol. 8, No. 1, pp. 5-8, 1 pl.

1930b. *Contribution à l'étude de la faune du Calcaire de Sablé*. Soc. Linn. Normandie Caen, vol. 8, No. 1, pp. 25-40, 1 pl.

Delheid, E.

1899a. *Quelques mots su les Coelentérés des argiles Rupeliennes*. Soc. Roy. Malac. Belgique, Ann., vol. 31, pp. xxx-xxxii.

1899b. *La faune Rupelien Supérieur. Un dernier mot sur le polypier géant de ce terrain*. Soc. Roy. Malac. Belgique, Ann., vol. 31, pp. lxxii-lxxvi, pl. 1.

Dembinska-Rózkowska, M.

1932. *Korale mioceńskie Polski. Polnische Miozänkorallen.* Pol. Tow. Geol. Kraków, Rocz., vol. 8, No. 1, pp. 97-171, 6 pls.

Demel, K.

1933. *Liste des invertébrés et de poissons des eaux polonaises de la Baltique.* Mus. Zool. Polon., Fragmenta Faun., vol. 2, pp. 121-136.

Denizot, Georges

1962-63. *Atlas de fossiles. I. Fossiles primaires et triassiques (1963). II. Fossiles jurassiques et cretaciques (1962). III. Fossiles tertiaires et quaternaires (1963).* Paris, N. Boubée et Cie.

Dennant, John

1898. *Corals. In* Tate, R., *Fauna of the Older Tertiary of Australia.* Roy. Soc. New South Wales, Jour., vol. 31, pp. 412-416, pl. 20.

1899-1904. *Descriptions of new species of corals from the Australian Tertiaries.* Roy. Soc. South Australia, Trans., vol. 23 (1899), pp. 112-122, pls. 2, 3; pp. 281-287, pls. 9-10; vol. 25 (1901), pp. 48-53, pl. 2; vol. 26 (1902), pp. 1-6, 255-264, pls. 1, 5, 6; vol. 27 (1903), pp. 208-215, pls. 1, 2; vol. 28 (1904), pp. 52-76, pls. 22-25.

1904a. *Recent corals from the South Australian and Victorian coasts.* Roy. Soc. South Australia, Trans., vol. 8, pp. 1-11, pls. 1, 2.

1904b. *Report on fossiliferous ironstone conglomerate from Cape Patton.* Geol. Sur. Victoria, Rec., vol. 1, No. 1, p. 36 (Anthozoa).

1904c. *Catalogues of the described species of fossils (except Bryozoa and Foraminifera) in the Cainozoic fauna of Victoria, South Australia and Tasmania.* Geol. Sur. Victoria, Rec., vol. 1, No. 2, pp. 89-147.

1906. *Madreporaria from the Australian and New Zealand coasts.* Roy. Soc. South Australia, Trans., vol. 30, pp. 151-165, pls. 5, 6.

Deraniyagala, P. E. P.

1956. *Some fossils from the Miocene amphitheatre at Minihagalkanda, Ceylon.* Spolia Zeylanica, vol. 28, No. 1, pp. 1-5, pls. 1-3.

1961. *The amphitheatres of Minihagal Kanda, their possible origin, and some of the fossils and stone artifacts collected from them.* Spolia Zeylanica, vol. 29, No. 2, pp. 149-161, pls. 1-8, text-figs. 1-4. [Corals p. 153.]

Deriugin, K. M.

1915. *La faune du Golfe de Kola et les conditions de son existence.* [In Russian.] Acad. Sci. Petrograd, Mem., ser. 8, vol. 34, No. 1, ix + 929 pp., 14 pls.

1924. *Das Barents-Meer längs dem Kola-Meridian (33° 30′ östl. L.)* Internat. Rev. Hydrobiol., vol. 12, pp. 145-174.

Deshayes, Gérard Paul

1831. *Description de coquilles caractéristiques des terrains.* Paris, vii + 264 pp., 14 pls.

Deshayes, Gérard Paul, and Edwards, Henri Milne

1836. *Histoire des Polypes. In* Lamarck, Hist. Nat. Anim. sans Vert., ed. 2, 684 pp.

Desio, A.

1926. *Il Guira nel Dodecaneso.* Giorn. Geol. Bologna, ser. 2, vol. 1, pp. 49-63, 1 pl.

Deslongchamps, E. E. [and Lamaroux, J. V. E., and Bory de St. Vincent]

1824-27. *Histoire naturelle des Zoophytes ou animaux rayonnees.* Encyclopédie Méthodique. Pt. 1, pp. 1-376 (1824); pt. 2, pp. 377-819 (1827).

Destombes, J., Jeanette, A., and de Lapparent, A. F.

1958. *Sur un conglomérat miocène à ossements de Crocodile à l'E de Fédala (Meseta cotière marocaine).* Soc. Géol. France, C. R., Nos. 11, 12, pp. 276-277.

Deunff, J.

1960. *Formations récifales et hystrichosphères.* Soc. Géol. France, Bull., sér. 7, vol. 1, No. 4 (1959), pp. 409-410.

Devanny, John

1951. *Travels in North Queensland.* London, pp. 1-251, 23 pls., maps.

Dew, B., and Wood, E. J. F.

1955. *Observations on periodicity in marine invertebrates.* Australian Jour. Marine and Freshwater Res., vol. 6, No. 3, pp. 469-478, figs. 1-8.

Dewalque, Georges Jean Gustave

1899. *Les fossiles du Boldenberg et les fossiles boldériens.* Soc. Géol. Belgique, Ann., vol. 25, pp. 117-122.

Dexter, R. W.

1955. *Fouling organisms attached to the American lobster in Connecticut waters.* Ecology, vol. 36, No. 1, pp. 159-160.

Dieni, I., and Omenetto, P.

1960. *Studi di una macrofauna del Pliocene inferiore di Orosei (Sardegna).* Riv. Italiana Paleont., vol. 66, No. 4, pp. 605-618, pl. 17, text-figs. 1, 2. [Corals pp. 611-612.]

Dietrich, W. O.

1918. *Zur Kenntnis der persischen Miocäns (Korallen).* Centralbl. Min. Stuttgart, pp. 98-104.

Dieuzeide, R., and Roland, J.

1957. *Opérations de draguages et de chalutages effectuées au large des côtes Algériennes au cours des années 1954 et 1955.* Sta. Aquic. Pêche Castiglione, Bull., n. s., vol. 8 (1956), pp. 9-27, 2 charts. [Coelenterates p. 13.]

Dittmer, E.

1959. *Jungtertiäre Ablagerungen im westlichen Schleswig-Holstein.* Meyniana, vol. 8, pp. 1-21, figs. 1, 2. [Corals p. 7.]

Dixon, Frederick

1850. *The geology and fossils of the Tertiary and Cretaceous formations of Sussex.* London, pp. i-xvi, 1-422, i-xvi, 45 pls., text-figs.

Dixon, George Yates, and Dixon, Andrew Francis

1891. *Report on the marine invertebrate fauna near Dublin.* Roy. Irish Acad., Proc., vol. 2, No. 1, pp. 19-33.

Doederlein, Ludwig

1881. *Die Liu-kiu Inseln, Amami-Oshima.* Deutsch. Gesell, f. Natur-und Volkerk. Ostasiens, Mitt., vol. 24, pp. 103-117, 140-156.

1901. *Die Korallen-Gattung Fungia. I. Stammesgeschichte der Fungien-Arten. II. Kennzeichen der neuen Arten von Fungia. III. Die ungeschlechtliche Fortpflanzung bei Fungien.* Zool. Anzeig., vol. 24, pp. 351-360.

1902. *Die Korallen-Gattung Fungia.* Senckenb. Naturforsch. Gesell., Abhandl., vol. 27, pt. 1, iii + 162 pp., 25 pls.

1913. *Die Steinkorallen aus dem Golf von Neapel.* Zool. Sta. Neapel, Mitt., vol. 21, pp. 105-152, pls. 7-9.

Dolgopolskaia, M. A.

1940. *Das Zooplankton des Schwarzen Meeres in der Nähe von Karadag.* [Russian, with German summary.] Sta. Biol. Karadagh, Trav., vol. 6, pp. 57-111, figs.

Dollfus, Gustave F.

1891. *Revue de paléontologie 1889. Coelenterata.* Univ. Paris, Ann. Géol. vol. 6, pp. 999-207.

1904. *Faune malacologique du Miocène supérieur de Rennes (Étage Redonien, Gite d'Apigné, Ile-et-Vilaine).* Assoc. Française Avanc. Sci., C. R., vol. 32, pp. 656-663.

1906a. *Faune malacologique du Miocène supérieur de Gourbesville (Manche), Étage Redonien.* Assoc. Française Avanc. Sci., C. R., vol. 34 (1905), pp. 358-371.
1906b. *Contribution à l'étude des Hydrozoaires fossiles.* Soc. Géol. France, Bull., sér. 4, vol. 6, pp. 121-128, pl. 4, text-figs. 1-3.
1908. *Sur quelques polypiers fossilles des Indes Néerlandaises.* Jaarb. Mijnw. Ned. Ind. Batavia, vol. 37, pp. 676-686, pls. 1-3.
1915. *Paléontologie du Voyage à l'Ile Célèbes de M. E. C. "Abendanon".* Leiden, pp. 1-57, 4 pls.
1917. *Paléontologie du Voyage à l'Ile Célèbes de M. E. C. "Abendanon". In* Abendanon, M.E.C., *Geologische en geographische doorkruisingen van Midden-Celebes.* Leiden, vol. 3, pp. 95-1016, 4 pls.
1924. *Contribution à la faune des invertébrés du banc de Rockall.* Inst. Océanogr. Monaco, Bull., No. 438, 28 pp.
1929. *Un polypier de Biron.* Soc. Géol. France, Bull., vol. 29, Nos. 6, 7, pp. 383-385, 1 pl., 1 text-fig.
1936. *Polypiers (Hexacoralliaires et Hydrocoralliaires) récoltés à la Guadeloupe par la mission cryptogramique du Muséum en 1936.* Mus. Nat. Hist. nat. Paris, Bull., sér. 2, vol. 8, No. 6, pp. 514-516.

Donovan, Edward
1823-1827. *The Naturalist's Repository, or miscellany of exotic natural history, exhibiting . . . specimens of foreign birds, insects, shells, etc.* London, 5 vols.

Dons, Carl
1933a. *Zoologiske Notiser. XV. Om Nord-Norges Korallsumfund.* K. Norske Vidensk. Selsk. Trondhjem, Forh., vol. 5, pp. 13-15.
1933b. *Zoolisker Notiser. XVII. Om Beitstadfjordens korallrev.* K. Norske Vidensk. Selsk. Trondhjem, Forh., vol. 5, pp. 143-146, 2 figs.
1934. *Über die nördlichsten Korallenriffe der Welt.* K. Norske Vidnsk. Selsk. Trondhjem, Forh., vol. 6, pp. 206-209, 2 figs.
1936. *Die Verbreitung von Steinkorallen in west Finnmark.* K. Norske Vidensk. Selsk. Trondhjem, Forh., vol. 8, pp. 57-60.
1939. *Über die Verbreitung der nordischen Stylasteriden.* K. Norske Vidensk. Selsk. Trondhjem, Forh., vol. 11 (1938), pp. 196-198, figs.
1944. *Norges Korallrev.* K. Norske Vidensk. Selsk. Trondhjem, Forh., vol. 16, pp. 37-82, 15 figs.
1945. *Norges Strandfauna. XXXII. Hexakorallen.* K. Norske Vidensk. Selsk. Trondhjem, Forh., vol. 18, No. 3, pp. 17-20, figs.

Doty, M. S.
1954. *Floristic and ecological notes on Raroia [Tuamotus].* Atoll Research Bull., No. 33, pp. 1-41.

Doty, M. S., and Morrison, J. P. E.
1954. *Inter-relationships of the organisms on Raroia Atoll aside from man.* Atoll Research Bull., No. 35, pp. 1-61, 9 figs.

Doucieux, L.
1905. *Fossiles nummulitiques de l'Aude et du Hérault. Madreporaria.* Univ. Lyons, Ann., vol. 17, pp. 112-113.

Drach, P.
1956. *Premières recherches en scaphandre autonome sur les récifs de coraux (Archipel des Far-San, Mer Rouge).* 14th Internat. Congr. Zool. 1953, pp. 459-460.

Drasche von Wartinberg, Richard
1878. *Die Insel Réunion (Bourbon) im indischen Ocean. Eine geologisch-petrographische Studie mit einem Anhange über die Insel Mauritius.* Wien. pp. i-vii, 1-85, 16 pls., text-figs., 2 maps.

Droop, M. R.

1963. *Algae and invertebrates in symbiosis.* Soc. Gen. Microbiol., Symposium 13, pp. 172-199, figs. 1-3.

Dryden, Lincoln

1944. *Surface features of coral reefs.* Beach Erosion Board, Corps of Engineers, U.S. Army, Engineering Notes, No. 18, 62 pp., 44 figs.

Duarte Bello, Pedro Pablo

1961. *Corales de los arrecifes Cubanos.* Acuario Nac. Marianao [Cuba], Ser. Educacional No. 2, pp. 1-85, figs. 1-4, 1-74.

DuBar, Jules R., and Beardsley, Donald W.

1861. *Paleoecology of the Choctawhatchee deposits (Late Miocene) at Alum Bluff, Florida.* Southeastern Geol., vol. 2, No. 3, pp. 155-189, figs. 1, 2.

DuBar, Jules R., and Chaplin, James R.

1963. *Paleoecology of the Pimlico Formation (Late Pleistocene); Nixonville Quadrangle, Horry County, South Carolina.* Southeastern Geol., vol. 4, No. 3, pp. 127-159. [Coelenterata, table 3, p. 152.]

DuBar, Jules R., and Howard, James F.

1963. *Paleoecology of the type Waccamaw (Pliocene ?) outcrops; South Carolina.* Southeastern Geol., vol. 5, No. 1, pp. 27-68, figs. 1-3.

Duchassaing de Fonbressin, Placide

1847. *Essai sur la constitution géologique de la partie basse de la Guadeloupe, dite la Grande-Terre.* Soc. Géol. France, Bull., sér. 2, vol. 4, pp. 1093-1100.

1850. *Animaux Radiaires des Antilles.* Paris, 33 pp., 2 pls.

1855. *Observations sur les formations modernes de l'île de la Guadeloupe.* Soc. Géol. France, Bull., sér. 2, vol. 12, pp. 753-759.

1870. *Revue des Zoophytes et des Spongiaires des Antilles.* Paris, 52 pp., 2 pls.

Duchassaing de Fonbressin, Placide, and Michelotti, Jean [Giovanni]

1861. *Mémoire sur les coralliaires des Antilles.* R. Accad. Sci. Torino, Mem., ser. 2, vol. 19, pp. 279-365, pls. 1-10.

1864. *Spongiaires de la Mer Caraïbe.* Hollandsche Maatschappij Wetensch. Haarlem, Natuurkundige Verhandel., ser. 2, vol. 21, No. 2, 124 pp., 25 pls.

1866. *Supplément au Mémoire sur les coralliaires des Antilles.* R. Accad. Sci. Torino, Mem., ser. 2, vol. 23, pp. 97-206, pls. 1-11.

Duerden, James Edwin

1899. *Zoophyte collecting in Bluefields Bay.* Inst. Jamaica, Jour., vol. 2, No. 6, pp. 619-624.

1900. *Order of appearance of the mesenteries and septa in the Madreporaria.* Johns Hopkins Univ. Circ., vol. 19, No. 146, pp. 47-53, 12 figs.

1902a. *Aggregated colonies in madreporarian corals.* Amer. Natural., vol. 36, pp. 461-471, figs. 1-3.

1902b. *The significance of budding and fission.* Ann. Mag. Nat. Hist., ser. 7, vol. 10, pp. 382-393, figs. 1-4.

1902c. *Increase of mesenteries in Madrepora beyond the protocnemic stage.* Johns Hopkins Univ. Circ., vol. 21, pp. 59-66, figs. 1-13.

1902d. *West Indian madreporarian polyps.* Nat. Acad. Sci. Washington, Mem., vol. 8, pp. 399-599, pls., 1-25, text-figs. 1-18c.

1902e. *Relationship of the Rugosa (Tetracoralla) to the living Zoantheae. Notes from the Biological Laboratory.* Johns Hopkins Univ. Circ., vol. 21, No. 155, pp. 19-24, figs. 1-12.

1902f. *Review of Vaughan's work on "Some fossil corals from the elevated reefs of Curaçao, Aruba, and Bonaire."* Science, vol. 15, pp. 143-145.

1902g. *Primary hexamerism in the Rugosa (Tetracoralla).* Science, vol. 15, p. 577.
1903a. *Recent and fossil corals.* Science, vol. 18, p. 817.
1903b. *Boring algae as agents in the disintegration of corals.* Amer. Mus. Nat. Hist., Bull., vol. 16, pp. 323-332, pl. 32.
1903c. *Importance of boring algae in the distintegration of corals.* Nature, vol. 67, p. 88.
1903d. *Fissiparous gemmation.* Ann. Mag. Nat. Hist., ser. 7, vol. 11, pp. 141-155.
1903e. *Septal sequence in the coral Siderastraea.* Science, vol. 18, p. 614.
1903f. *Morphology and development of recent and fossil corals.* Science, vol. 18, p. 614.
1903g. *A method of studying the septal sequence in Paleozoic corals.* Elisha Mitchell Sci. Soc., Jour., vol. 19, pp. 32-33.
1904a. *Recent results on the morpohology and development of coral polyps.* Smithsonian Misc. Coll., vol. 47, pp. 93-111.
1904b. *The coral Siderastraea radians and its postlarval development.* Carnegie Inst. Washington, Publ. No. 20, 130 pp., 11 pls.
1904c. *Septal sequence.* Biol. Bull., vol. 7, pp. 79-104, 9 figs.
1904d. *Some results on the morphology and development of Recent and fossil corals.* British Assoc. Adv. Sci., Rept. 1903, pp. 684-685.
1904e. *The development and relationships of the Rugosa (Tetracoralla).* Science, vol. 19, p. 217.
1905. *The morphology of the Madreporaria. VI. The fossula in rugose corals.* Marine Biol. Lab. Woods Hole, Bull., vol. 9, pp. 27-53.
1906a. *The primary septa in rugose corals.* Science, n. s., vol. 24, pp. 246-247.
1906b. *Continuation of investigations on the morphology and development of recent and fossil corals and physiology of the Zoantharia.* Carnegie Inst. Washington, Yearbook No. 4, pp. 277-278.
1906c. *The role of mucus in corals.* Quart. Jour. Microsc. Sci., vol. 49, pp. 591-614.
1906d. *The morphology of the Madreporaria. VII. Intrapolypal tentacles.* Ann. Mag. Nat. Hist., ser. 7, vol. 17, pp. 466-474, 5 figs.
1906e. *The morphology of the Madreporaria. VIII. The primary septa of the Rugosa.* Ann. Mag. Nat. Hist., ser. 7, vol. 18, pp. 226-242, 21 figs.

Duerden, J. E., and Ayres, S. A.
1905. *The nerve-layer in the coral Coenopsammia.* Michigan Acad. Sci., Rept., vol. 7, pp. 75-77.

Dumble, Edwin Theodore
1918. *Geology of the northern end of the Tampico Embayment area.* California Acad. Sci., Proc., ser. 4, vol. 8, pp. 113-156, map.

Dunbar, Carl Owen
1954. *A new technique for making sections of invertebrate fossils.* Jour. Paleont., vol. 28, No. 1, p. 112.

Duncan, Peter Martin
1863a. *On the fossil corals of the West Indian islands.—Part I.* Geol. Soc. London, Quart. Jour., vol. 19, pp. 406-458, pls. 13-16.
1863b. *Note on the fossil corals accompanying the Testacea from Jamaica.* Geol. Soc. London, Quart. Jour., vol. 19, pp. 513-514.
1864a. *On the fossil corals of the West Indian islands.—Part II.* Geol. Soc. London, Quart. Jour., vol. 20, pp. 20-44, pls. 2-5.
1864b. *On the fossil corals of the West Indian islands.—Part III.* Geol. Soc. London, Quart. Jour., vol. 20, pp. 358-374.
1864d. *A description of and remarks upon some fossil corals from Sinde.* Ann. Mag. Nat. Hist. ser. 3, vol. 13, pp.. 295-307, pls. 18, 19.

1864c. *A description of some fossil corals and echinoderms from the South Australian Tertiaries.* Ann. Mag. Nat. Hist., ser. 3, vol. 14, pp. 161-168, pls. 5, 6.
1864e. *On the correlation of the Miocene beds of the West Indian islands; and on the synchronism of the chert formation of Antigua with the lowest limestone of Malta.* Geol. Mag., vol. 1, pp. 97-102.
1864f. *Note on a new coral from Mount Séla in the island of Java.* Geol. Soc. London, Quart. Jour., vol. 20, pp. 72-73, pl. 7, figs. 9a-9d.
1865a. *On the corals of the Maltese Miocene.* Ann. Mag. Nat. Hist., ser. 3, vol. 15, pp. 273-276, 1 pl.
1865b. *A description of some fossil corals from the South Australian Tertiaries.* Ann. Mag. Nat. Hist., ser. 3, vol. 16, pp. 182-187, pl. 8.
1865c. *Note on the fossil corals from Muddy and Violet Creeks, South Australia.* Geol. Soc. London, Quart. Jour., vol. 21, p. 394, 395.
1866. *Note on the Madreporaria from the "Sutton Stone."* Geol. Soc. London, Quart. Jour., vol. 22, pp. 89-93.
1866-1876. *Monography of the British Fossil Corals. Second series. Being a supplement to the "Monograph of the British Fossil Corals" by MM. Milne-Edwards and J. Haime.* Palaeontogr. Soc. London. *Pt. I (1866), Introduction and corals from the Tertiary formations,* pp. i-iii, 1-66, pls. 1-10. *Pt. II, No. 1 (1869), Corals from the White Chalk, the Upper Greensand, and the Red Chalk of Hunstanton,* pp. 1-26, pls. 1-9. *Pt. II. No. 2 (1870), Corals from the Upper Greensand of Haldon, from the Gault, and the Lower Greensand,* pp. 27-46, pls. 10-15. *Pt. III (1873), Corals from the Oolitic strata,* pp. 1-24, pls. 1-7; Index, pp. 1-6; General index, pp. 1-12. *Pt. IV. No. 1 (1876), Corals from the zone of A. planorbis and A. angulatus in the Liassic formation,* pp. i-ii, 1-43, pls. 1-11. *Pt. IV, No. 2 (1868), Corals from the zone of A. angulatus (cont'd) (and other zones of the Lias),* pp. 45-73, pls. 12-17.
1867a. *On the Madreporaria of the Infra-Lias of South Wales.* Geol. Soc. London, Quart. Jour., vol. 23, pp. 12-28.
1867b. *On Cyclophyllum, a new genus of the Cyanthophyllidae, with remarks on the genus Aulophyllum.* Geol. Soc. London, Quart. Jour., vol. 23, pp. 327-330, pl. 13.
1867c. *On the genera Heterophyllia, Battersbyia, Palaeocyclus, and Asterosmilia; the anatomy of their species, and their position in the classification of the sclerodermic Zoantharia.* Roy. Soc. London, Philos. Trans., vol. 157, pp. 643-656, 2 pls.
1868a. *On the genus Clisiophyllum.* British Assoc. Adv. Sci., Rept., vol. 38, pp. 61-63.
1868b. *Cyclophyllum fungites, Flem.* Geol. Mag., vol. 5, p. 197.
1868c. *On Heterophyllia.* Geol. Mag., vol. 5, p. 584.
1868d. *On the fossil corals (Madreporaria) of the West Indian islands. Part IV. Conclusion.* Geol. Soc. London, Quart. Jour., vol. 24, pp. 9-33, pls. 1, 2.
1868-71. *Reports on the British fossil corals.* British Assoc. Adv. Sci., Rept., vol. 38 (1868), pp. 75-113; vol. 39 (1869), pp. 150-170; vol. 41 (1871), pp. 116-137.
1869-70. *Corals and their polypes.* Student and Int. Obs., vol. 3 (1869), pp. 81-91; pt. 2, pp. 241-250, 1 pl.; vol. 4 (1870), pp. 95-107, 445-456, 1 pl.
1870a. *On the Madreporaria dredged up in the expedition of H.M.S. "Porcupine."* Roy. Soc. London, Proc., vol. 18, pp. 289-301.
1870b. *The physical geography of Western Europe during the Mesozoic and Cainozoic periods elucidated by their coral faunas.* Geol. Soc. London, Quart. Jour., vol. 26, pp. 51-70.

1870c. *On the fossil corals (Madreporaria) of the Australian Tertiary deposits.* Geol. Soc. London, Quart. Jour., vol. 26, pp. 284-318, pls. 19-21.
1871a. *On the structure and affinities of Guynia annulata, Dunc., with remarks upon the persistence of Palaeozoic types of Madreporaria.* Roy. Soc. London, Philos. Trans., vol. 162, pp. 29-40.
1871b. *On a new species of coral from the Red Crag of Waldringfield: Solenastraea Prestwichi.* Geol. Soc. London, Quart. Jour., vol. 27, pp. 369-371.
1871c. *On the persistence of Caryophyllia cylindrica Reuss. sp., a Cretaceous coral in the coral fauna of the deep sea.* Geol. Soc. London, Quart. Jour., vol. 27, pp. 434-439.
1872a. *Third report on the British fossil corals.* British Assoc. Adv. Sci., Rept., vol. 41, pp. 116-137.
1872a. *On Trochocyathus anglicus, a new species of Madreporaria from the Crag.* Geol. Soc. London, Quart. Jour., vol. 28, pp. 447-449, pl. 28.
1873a. *On the genus Palaeocoryne, Duncan & Jenkins, and its affinities.* Geol. Soc. London, Quart. Jour., vol. 29, pp. 412-417, pl. 14.
1873b. *On Caryophyllia Bredai, Milne-Edwards & Jules Haime, from the Red Crag of Woodbridge.* Geol. Soc. London, Quart. Jour., vol. 29, pp. 503-504, figs. 1-3.
1873c. *On the older Tertiary formations of the West Indian islands.* Geol. Soc. London, Quart. Jour., vol. 29, pp. 548-565, pls. 19-22.
1873d. *A description of the Madreporaria dredged up during the expeditions of H.M.S. "Porcupine" in 1869 and 1870.* Zool. Soc. London, Trans., vol. 8, pt. 5, pp. 303-344, pls. 39-49.
1875a. *On some fossil Alcyonaria from the Australian Tertiary deposits.* Geol. Soc. London, Quart. Jour., vol. 31, pp. 673-674, pl. 38a.
1875b. *On some fossil Alcyonaria from the Tertiary deposits of New Zealand.* Geol. Soc. London, Quart. Jour., vol. 31, pp. 675, 676, pls. 38b.
1875c. *On some fossil corals from the Tasmanian Tertiary deposits.* Geol. Soc. London, Quart. Jour., vol. 31, pp. 677, 678, pl. 38c.
1876a. *On some unicellular Algae, parasitic within Silurian and Tertiary corals, with a notice of their presence in Calceola sandalina and other fossils.* Geol. Soc. London, Quart. Jour., vol. 32, pp. 205-211, pl. 15.
1876b. *On some fossil reef-building corals from the Tertiary deposits of Tasmania.* Geol. Soc. London, Quart. Jour., vol. 32, pp. 341-351, pl. 22.
1876c. *Notices of some deep-sea and littoral corals from the Atlantic Ocean, Caribbean, Indian, New Zealand, Persian Gulf, and Japanese &c. seas.* Zool. Soc. London, Proc., pp. 428-442 pls. 38-41.
1877a. *On some thallophytes parasitic within recent Madreporaria.* Roy. Soc. London, Proc., vol. 25, pp. 17, 18, 238-257, pls. 5-7.
1877b. *Report on corals.* In *Biology of the "Valorous" cruise.* Roy. Soc. London, Proc., vol. 25, p. 223.
1877c. *On the rapidity of growth and variability of some Madreporaria on an Atlantic cable, with remarks upon the rate of accumulation of foraminiferal deposits.* Ann. Mag. Nat. Hist., ser. 4, vol. 20, pp. 361-365. Also, Roy. Soc. London, Proc., vol. 26 (1878), pp. 133-137.
1878. *A description of the Madreporaria dredged up during the expeditions of H.M.S. "Porcupine," in 1869 and 1870. Pt. II.* Zool. Soc. London, Trans., vol. 10, pp. 235-249, pls. 43-45.

1879. *On the Upper Greensand coral fauna of Haldon, Devonshire.* Geol. Soc. London, Quart. Jour., vol. 35, pp. 89-97, pl. 8.
1880. *Sind fossil corals and Alcyonaria. Tertiary and Upper Cretaceous fauna of western India.* Palaeont. Indica, vol. 1, pt. 2, pp. 1-110, 28 pls.
1881a. *On Asterosmilia Reedi, a new species of coral from the Oligocene of Brockenhurst, Hants.* British Assoc. Adv. Sci., Rept., pp. 618-619.
1881b. *On the coralliferous series of Sind, and its connexion with the last upheaval of the Himalayas.* Geol. Soc. London, Quart. Jour., vol. 37, pp. 190-209.
1882a. *On some Recent corals from Madeira.* Zool. Soc. London, Proc., pp. 213-221, pl. 8.
1882b. *Sind fossil corals and Alcyonaria.* N. Jahrb. Min., Geol. u. Palaeont., pt. 1, pp. 310-313.
1883a. *On the madreporarian genus Phymastraea of Milne-Edwards and Jules Haime, with a description of a new species.* Zool. Soc. London, Proc., pp. 406-412, 2 figs.
1883b. *Remarks on an essay by Prof. G. Lindström, entitled "Contributions to the actinology of the Atlantic Ocean," and a reply to some of his criticisms.* Ann. Mag. Nat. Hist., ser. 5, vol. 12, pp. 361-369.
1884a. *On Streptalasma Roemeri, a new coral from the Wenlock Shale.* Geol. Soc. London, Quart. Jour., vol. 40, pp. 167-173, pl. 7.
1884b. *On Cyathophyllum Fletcheri, Ed. & H., sp., from the Wenlock Shale, with remarks on the group to which it belongs.* Geol. Soc. London, Quart. Jour., vol. 40, pp. 174-177.
1884c. *On the internal structures and classificatory position of Micrabacia coronula Goldfuss, sp.* Geol. Soc. London, Quart. Jour., vol. 40, pp. 561-566, figs. 1-3.
1884d. *Observations on the madreporarian family — the Fungidae, with especial reference to the hard structures.* Linnean Soc. London, Jour., Zoology, vol. 17, pp. 137-162, pls. 5, 6.
1884e. *On the structure of the hard parts of the Fungidae. — Part II. Lophoserinae.* Linnean Soc. London, Jour., Zoology, vol. 17, pp. 302-319, pl. 13.
1884f. *On the replacement of a true theca or wall by epitheca in some serial coralla, and on the importance of the structure in the growth of incrusting corals.* Linnean Soc. London, Jour., Zoology, vol. 17, pp. 361-366.
1884g. *On a new genus of Recent Fungida, family Funginae, Ed. & H., allied to the genus Micrabacia, Ed. & H.* Linnean Soc. London, Jour., Zoology, vol. 17, pp. 417-419, pl. 20.
1884h. *On the relation of the pali of corals to the tentacles.* Ann. Mag. Nat. Hist., ser. 5, vol. 13, pp. 466-467.
1884i. *On the hard structures of some species of Madrepora.* Ann. Mag. Nat. Hist., ser. 5, vol. 14, pp. 188-198.
1884j. [*Palaeocyclus Fletcheri.*] *Reply to Professor Lindström.* Geol. Mag., decade 3, vol. 1, pp. 239-240.
1884k. *Deep-sea corals.* Nature, vol. 30, p. 464.
1885. *A revision of the families and genera of the sclerodermic Zoantharia, Ed. & H., or Madreporaria (M. rugosa excepted).— Chapters I-VI.* Linnean Soc. London, Jour., Zoology, vol. 18, p. 1-204,
1886a. *On the Astrocoeniae of the Sutton stone and other deposits of the Infra-Lias of South Wales.* Geol. Soc. London, Quart. Jour., vol. 42, pp. 101-112, pl. 8.

1886b. *On the structure and classificatory position of some Madreporaria from the Secondary strata of England and south Wales.* Geol. Soc. London, Quart. Jour., vol. 42, pp. 113-142.
1886c. *An answer to "Observations on some imperfectly known Madreporaria from the Cretaceous formation of England, by R. F. Tomes, Esq., F.G.S."* Geol. Mag., decade 3, vol. 3, pp. 52-55.
1886d. *On a new species of Axosmilia (A. elongata) from the pea grit of the Inferior Oolite of England.* Geol. Mag., decade 3, vol. 3, pp. 340-342.
1887. *On a new genus of Madreporaria (Glyphastraea), with remarks on the morphology of Glyphastraea Forbesi, Ed. & H., from the Tertiaries of Maryland, U.S.* Geol. Soc. London, Quart. Jour., vol. 43, pp. 24-32, pl. 3.
1888. *On Glyphastraea sexradiata, Lonsdale, sp.* Ann. Mag. Nat. Hist., ser. 6, vol. 1, p. 160.
1889a. *On the Madreporaria of the Mergui Archipelago, collected for the Trustees of the Indian Museum, Calcutta, by Dr. John Anderson, F.R.S., Superintendent of the Museum.* Linnean Soc. London, Jour., Zoology, vol. 21, pp. 1-25, pl. 1.
1889b. *On the Cretaceous species of Podoseris, Dunc.* Ann. Mag. Nat. Hist., ser. 6, vol. 4, pp. 24-36, 1 pl.
1890. *Notes on the zoology of Fernando Noronha. Madreporaria.* Linnean Soc. London, Jour., Zoology, vol. 20, pp. 569-570.

Duncan, Peter Martin, and Nelson, R. G.
1876. *On the actinozoan nature of Millepora alcicornis, Dana and Linn. (pars.)* Ann. Mag. Nat. Hist., ser. 5, vol. 17, pp. 354-359; vol. 18, p. 78.
1880. *On some points in the histology of certain species of Corallinaceae.* Linnean Soc. London, Trans., Botany, vol. 1, pp. 197-209.

Duncan, Peter Martin, and Thomson, James
1867. *On Cyclocyathus, a new genus of the Cyathophyllidea, with remarks on the genus Aulophyllum.* Philos. Mag., vol. 34, p. 398.

Duncan, Peter Martin, and Wall, G. P.
1865. *A notice of the geology of Jamaica, especially with reference to the District of Clarendon; with descriptions of the Cretaceous, Eocene, and Miocene corals of the islands.* Geol. Soc. London, Quart. Jour., vol. 21, pp. 1-14, pls. 1, 2, text-figs. 1-5.

Durham, J. Wyatt
1940. *Eocene and Oligocene coral faunas of Washington.* Geol. Soc. Amer., Bull., vol. 51, No. 12, p. 1983.
1941a. *A new coral from the Pliocene of California.* Jour. Paleont., vol. 15, No. 3, pp. 278, 279, text-figs. 1, 2.
1941b. *Ecology of corals and molluscs in the Gulf of California.* Rept. Subcommittee Ecol. Marine Organisms Nat. Research Council, Div. Geol. Geogr., p. 42.
1942a. [*Recent corals of the Gulf of California and the north Pacific coast of the U.S.A.*] Rept. Committee Marine Ecol. Related Palaeont., Nat. Research Council, Div. Geol. Geogr., pp. 14-15, 1 table.
1942b. *Reef corals from the California Middle Eocene.* California Acad. Sci., Proc., ser. 4, vol. 23, No. 34, pp. 503-510, pl. 44.
1942c. *Eocene and Oligocene coral fauna of Washington.* Jour. Paleont., vol. 16, No. 1, pp. 84-104, pls. 15-17, text-fig. 1.
1943. *Pacific Coast Cretaceous and Tertiary corals.* Jour. Paleont., vol. 17, No. 2, pp. 196-202, pl. 32, 2 text-figs.
1946. *Eocene faunas from the Department of Bolivar, Colombia. Part II. Corals.* Geol. Soc. Amer., Mem., vol. 16, pp. 77, 78, pls. 25-27.

1947a. *Growth stages of some simple corals.* Geol. Soc. Amer., Bull., vol. 58, No. 12, pt. 2, p. 1261.

1947b. *Corals from the Gulf of California and the north Pacific Coast of America.* Geol. Soc. Amer., Mem. 20, pp. 1-63, 2 figs. 14 pls., 5 tables.

1949. *Ontogenetic stages of some simple corals.* Univ. California Publ. Geol., vol. 28, No. 6, pp. 137-172, pls. 4, 5, text-figs. 1-17.

1950a. *1940 E. W. Scripps Cruise to the Gulf of California. Part. II. Megascopic paleontology and marine stratigraphy.* Geol. Soc. Amer., Mem. 43, viii + 216 pp., tables 1-10, pls. 1-48.

1950b. *Cenozoic marine climate of the Pacific coast.* Geol. Soc. Amer., Bull., vol. 61, pt. 3, No. 11, pp. 1243-1264, text-figs. 1-3.

1952. *Early Tertiary marine faunas and continental drift.* Amer. Jour. Sci., vol. 250, No. 5, pp. 321-343, 1 fig.

1962a. *Scientific results of the Galápagos-Expedition 1953-54 of the International Institute for Submarine Research, Vaduz (Liechtenstein), leader Dr. Hans Hass. Corals from the Galápagos and Cocos Islands.* California Acad. Sci., Proc., ser. 4, vol. 32, No. 2, pp. 41-56, text-figs. 1-9.

1962b. *The late Mesozoic of central California.* California Div. Mines Geol., Bull., vol. 181, pp. 31-38, pl. 1.

Durham, J. Wyatt, and Allison, Edwin C.

1960. *Symposium: The biogeography of Baja California and adjacent areas. Part I. Geologic history. The geologic history of Baja California and its marine faunas.* Syst. Zool., vol. 9, No. 2. pp. 47-91, text-figs. 1-7, tables 1-9.

Durham, J. Wyatt, and Barnard, J. Laurens

1952. *Stony corals of the Eastern Pacific collected by Velero III and Velero IV.* Allan Hancock Pacific Exped., vol. 16, No. 1, pp. 1-110, pls. 1-16.

Dutertre, A. P.

1930. *Étude de quelques polypiers du Viséen du Boulonnais.* Soc. Géol. Nord Lille, Ann., vol. 54, pp. 108-130, 1 pl.

Eales, Nellie Barbara

1961. *The littoral fauna of the British Isles. A handbook for collectors.* Cambridge Univ. Press, 3d ed., xvi + 306 pp., pls 1-24. [Coelenterata pp. 27-48.]

Ealey, E. H. M., and Chitteborough, R. G.

1956. *Plankton, hydrology and marine fouling at Heard Island.* Australian Nat. Antarctic Exped., Interim Rept., No. 15, pp. 1-81, text-figs. 1-20.

Eames, Frank Evelyn

1950. *On the ages of certain Upper Tertiary beds of Peninsular India and Ceylon.* Geol. Mag., vol. 87, No. 4, pp. 233-252.

1952. *A contribution to the study of the Eocene in western Pakistan and western India: D. Discussion of the faunas of certain standard sections, and their bearing on the classification and correlation of the Eocene in western Pakistan and western India.* Geol. Soc. London, Quart. Jour., vol. 107, Pt. 2, No. 426, pp. 173-200, figs.

Easton, William Heyden

1942. *An improved technique for photographing peel sections of corals.* Jour. Paleont., vol. 16, No. 2, pp. 261-263, text-figs.

1960. *Invertebrate Paleontology.* New York, Harper Bros., pp. 1-107, figs. [Coelenterates pp. 123-213.]

Edmondson, Charles Howard

1927. *Some factors in the growth of Hawaiian shallow water corals.* Bernice P. Bishop Mus., Spec. Publ., No. 12, p. 19.

1928. *The ecology of an Hawaiian coral reef.* Bernice P. Bishop Mus., Bull., No. 45, pp. 1-64, figs. 1-6, 25 tables.
1929. *Growth of Hawaiian corals.* Bernice P. Bishop Mus., Bull., No. 58, pp. 1-38, 5 pls., 4 text-figs.
1933. *Reef and shore fauna of Hawaii.* Bernice P. Bishop Mus., Spec. Publ., No. 22, 295 pp., 163 figs.
1940. *The relation of the marine fauna of Hawaii to that of other sections of the Pacific area.* Sixth Pacific Sci. Congress, Proc., vol. 3, pp. 593-598.
1946. *Behavior of coral planulae under altered saline and thermal conditions.* Bernice P. Bishop Mus., Occas. Pap., vol. 18, pp. 283-304, 7 figs.

Edwards, Alphonse Milne

1861. *Observations sur l'existence de divers mollusques et zoophytes à de tres grandes profondeurs dans la Mer Méditerranée.* Ann. Sci. Nat. Paris, sér. 4, vol. 15, pp. 149-157.
1882a. *Rapport préliminaire sur l'expédition du Talisman dans l'Océan Atlantique.* Acad. Sci. Paris, C. R., vol. 97, pp. 1389-1395.
1882b. *A summary report upon a zoological exploration made in the Mediterranean and Atlantic on board the "Travailleur."* Ann. Mag. Nat. Hist., ser. 5, vol. 4, p. 39.

Edwards, Henri Milne

1836-49. *Les Zoophytes. In* Cuvier, G., La Règne Animal. Third ed., vol. 10, Paris, 160 pp., 100 pls.
1838a. *Sur les polypes du corail.* Soc. Philom. Paris., Extr. Proc. Verb., pp. 118, 119.
1838b. *Observations sur la nature et le mode de croissance des polypiers.* Ann. Sci. Nat. Paris, sér. 2, vol. 10, pp. 321-334, 380.
1841. *Faits relatifs à l'organisation de zoophytes et des mollusques.* Soc. Philom. Paris, Extr. Proc. Verb., pp. 1-2.

Edwards, Henri Milne, and Haime, Jules

1848-51. *Recherches sur les polypiers. Premier mémoire. Observations sur la structure et le developpement des polypiers en general.* Ann. Sci. Nat. Paris, sér. 3, vol. 9(1848), p. 37-89, pls. 4-6. *Deuxième mémoire. Monographie des turbinolides,* vol. 9(1848), pp. 211-344, pls. 7-10. *Troisième mémoir. Monographie des eupsammidae,* vol. 10 (1948), pp. 65-114, pl. 1. *Quatrième mémoire. Monographie des astréides,* vol. 10 (1848), pp. 209-320, pls. 5-9. *Monographie des astréides (1). Tribu II. Astrèens (Astreinae),* vol. 11 (1849), pp. 233-312. *Monographie des astréides (1). Suite. Quatrième section. Astréens agglomerés. Astréens aggregatae,* vol. 12 (1849), pp. 95-197. *Cinquième mèmoire. Monographie des oculinides,* vol. 13 (1850), pp. 63-110, pls. 3-4. *Sixième mémoire. Monographie des fongides,* vol. 15 (1850), pp. 73-144. *Septième mémoire. Monographie des poritides,* vol. 16 (1851), pp. 21-70.
1850-54. *A monograph of the British fossil corals. Pt. 1. Introduction. Corals from the Tertiary and Cretaceous formations.* Palaeontographical Soc. London, pp. i-lxxxv, 1-71, pls. 1-11 (1850). *Pt. 2. Corals from the oolitic formations,* pp. 72-145, (1851). *Pt. 3. Corals from the Permian formation and the Mountain limestone,* pp. 146-210, pls. 31-46 (1852). *Pt. 4. Corals from the Devonian formation,* pp. 211-244, pls. 47-57 (1853). *Pt. 4 Corals from the Silurian formation,* pp. 245-299, pls. 58-72 (1854).
1848a. *Observations sur les polypiers de la familie des astréides.* Acad. Sci. Paris, C. R., vol. 27, pp. 466-469.
1848b. *Notes sur la classification de la deuxième tribu de la famille des astréides.* Acad. Sci. Paris, C. R., vol. 27, pp. 490-497.

1848c. *Recherches sur les polypiers. Monographie des eupsammides (Extrait).* Acad. Sci. Paris, C. R., vol. 27, pp. 538-541.
1849a. *Mémoire sur les polypiers appartenant à la famille des oculinides, au groupe intermédiare des pseudastréides et à la famille des fongides.* Acad. Sci. Paris, C. R., vol. 29, pp. 67-73.
1849b. *Mémoire sur les polypiers appartenant aux groupes naturels des zoanthaires perforés et des zoanthaires tabulés.* Acad. Sci. Paris, C. R., vol. 29, pp. 257-263.
1851. *Monographie des polypiers fossiles des terrains Paléozoïques.* Mus. Nat. Hist. nat. Paris, Arch., vol. 5, 502 pp., 20 pls.
1857-60. *Histoire Naturelle des Coralliaires ou Polypes proprement dits.* Paris, vol. 1 (1857), viii + 326 pp.; vol. 2 (1857), 633 pp.; vol. 3 (1860), 560 pp.; atlas, 31 pls.

Effinger, William Lloyd
1938. *The Gries Ranch fauna (Oligocene) of western Washington.* Jour. Paleont., vol. 12, No. 4, pp. 355-390, 3 pls., 3 text-figs. [Corals p. 388, pl. 47.]

Eguchi, Motoki
1934. *A so-called "deep-sea" coral family Eupsammidae.* [In Japanese.] Geol. Soc. Japan, Jour., vol. 41, No. 489.
1935. *The corals and coral reefs in the Palao Islands of the South Sea Islands.* Tohoku Imp. Univ. Sendai, Sci. Rept. Geol. Paleont., vol. 16.
1936a. *Three new genera of corals from the lower Cretaceous of Japan.* Imp. Acad. Japan, Proc., vol. 12, No. 3, pp. 70-72, 4 figs.
1936b. *Coral fauna of the Tokyo Bay and its environs.* [In Japanese.] Shokubutu Dobutu [Botany and Zoology], vol. 4, No. 2, pp. 402-409, 2 figs.
1938a. *On the reef-building coral of Aoshima, Prov. Hyuga, and Madreporaria of the Miyagi-ken.* [In Japanese.] Shokubutu Dobutu, vol. 6, No. 12, pp. 2013-2022, figs.
1938b. *A systematic study of the reef-building corals of the Palao Islands.* Palao Trop. Biol. Sta. Tokyo, Studies, vol. 3, pp. 325-390.
1938c. *On some deep-water corals.* [In Japanese.] Manchurian Biol. Soc., Bull., vol. 1, No. 3.
1941a. *Stylasterinae from Japanese seas.* [Japanese with English abstract.] Jubilee Publ. Commem. Prof. H. Yabe, vol. 2 (1940-1941), pp. 1171-1194, figs.
1941b. *On some simple corals from Mindoro Island, Philippines.* [Japanese with English summary.] Geol. Soc. Japan, Jour., vol. 48, No. 575, pp. 414-417.
1941c. *On two species of simple corals from Kagosima-ken, Kyûsû.* [Japanese with English summary.] Geol. Soc. Japan, Jour., vol. 48, No. 575, pp. 418-420.
1942. *Recent and fossil corals of the family Oculinidae from Japan.* Geol. Soc. Japan, Jour., vol. 49, No. 583, pp. 135-142, 1 pl.
1944. *Notes on Flabellum from the Moniwa shell beds of Kanagase-Mura in Miyagi-ken.* Geol. Soc. Japan, Jour., vol. 51, No. 607, pp. 132-134.
1948. *Fossil Helioporidae from Japan and the South Sea Islands.* Jour. Paleont., vol. 22, No. 3, pp. 362-364, pl. 60.
1964. *A study of Stylasterina from the Antarctic Sea.* JARE Sci. Rept., Biology, No. 20E, pp. 1-10, pls. 1, 2, text-fig. 1.

Ehrenberg, Christian Gottfried
1834. *Die Corallenthiere des rothen Meeres physiologisch Untersucht und systematisch Verzeichnet. Beiträge zur physiologischen Kennt-*

niss der Corallenthiere im allgemeinen, und besonders des rothen Meeres, nebst einem Versuche zur physiologischen Systematik derselben. K. Akad. Wiss. Berlin, Phys. Abhandl. 1832, pp. 225-380. *Über die Natur und Bildung der Coralleninseln und Corallenbänken in Rothen Meeres.* Pp. 381-432.

1841-44. *On the nature and formation of the coral islands and coral banks in the Red Sea.* [Translated into English by C. Menge.] Roy. Asiatic Soc. Great Britain and Ireland, Bombay Branch, Jour., vol. 1, pp. 73-83 (1841); 129-136 (1842); 322-341 (1843); 390-402 (1844).

Ehrenberg, Kurt

1960. *Paläozoologie.* Vienna, Springer-Verlag, pp. 1-408, figs. 1-175. [Coelenterata pp. 38-50.]

Eichler, W.

1952. *Die Tierwelt der Gewächshäuser.* Leipzig, pp. i-iv, 1-93, figs.

Ekman, Sven

1934. *Indo-Westpazifik und Atlantic-Ostpazifik, eine tier-geographische Studie.* Zoogeographica Jena, vol. 2, pp. 320-374, 11 figs.

1953. *Zoogeography of the sea.* London, xiv + 417 pp., 121 figs.

Ellenberger, F.

1958. *Étude géologique du pays de Vanoise.* Mém. Carte Géol Déaillé France, pp. 1-561, pls. 1-42, text-figs. 1-111. [Corals pp. 254, 273, 288-289, 303.]

Ellis, John

1755. *An essay towards a natural history of the corallines, and other marine productions of the like kind, commonly found on the coasts of Great Britain and Ireland.* London, xvii + 103 pp., 39 pls.

1756. *Essai sur l'histoire naturelle des Corallines et autres productions marines du même genre qu'on trouve communement sur les côtes de la Grande-Bretagne et d'Irlande; au quel on à joint une description d'un grand polype de mer, pris auprès du Pole Arctique, par des pêcheurs de baleine, pendant l'eté de 1753.* La Haye, pp. i-xvi, 1-125, pls. 1-38.

1767. *Versuch einer Natur-Geschichte der corall-Arten und anderer dergleichen Cörper, welche gemeiniglich an den Küsten von Gross Britannien und Irland gefunden weden. Aus dem Englischen und Französischen übersetzt, und mit Anmerkungen, auch einem Anhange fünf hiether gehöriger Abhadlungen der Herren Schlosser, Baster und Ellis, begleitet von D. J. G. Krüniz.* Nürnberg, xxii + 168 pp., 47 pls.

Ellis, John, and Solander, Daniel Carl

1786. *The natural history of many curious and uncommon zoophytes, collected from various parts of the globe by the late John Ellis, Esq., F. R. S., Reg. Upsala Soc., etc. Systematically arranged and described by the late Daniel Solander, M. D., F. R. S., etc.* London, xii + 208 pp., 63 pls.

Emerson, William K.

1958. *Results of the Puritan-American Museum of Natural History Expedition to Western Mexico. I. General account.* Amer. Mus. Novitates, No. 1894, pp. 1-25, 9 figs.

Emery, Kenneth O.

1948. *Submarine geology of Bikini atoll.* Geol. Soc. Amer., Bull., vol. 59, No. 9, pp. 855-860, pls. 1-5.

1956. *Marine geology of Johnston Island and its surrounding shallows, Central Pacific Ocean.* Geol. Soc. Amer., Bull., vol. 67, No. 11, pp. 1505-1520, 5 pls., 7 text-figs.

Emery, K. O., Tracey, J. I., and Ladd, H. S.

1950. *Submarine geology and hydrography in the northern Marshalls.* 18th Sess. Internat. Geol. Congr. (Great Britain) 1948, Rept., No. 18, pp. 22-27, figs.

1954. *Geology of Bikini and nearbly atolls. Part I. Geology.* U. S. Geol. Sur., Prof. Paper 260-A, pp. 1-265, pls. 1-73, text-figs. 1-83, 11 charts.

Endean, R., Kenny, R., and Stephenson, W.

1956. *The ecology and distribution of intertidal organisms on the rocky shores of the Queensland mainland.* Australian Jour. Marine Freshwater Res., vol. 7, No. 1, pp. 88-146, pls. 1-7, text-figs. 1-13.

Enders, M.

1932. *Calcit und Aragonit im Skelett der Anthozoen.* Arch. Naturgesch., n. F., vol. 1, pp. 646-653.

Engel, B. A.

1962. *Geology of the Bulahdelah-Port Stephens District, N. S. W.* Roy. Soc. New South Wales, Jour., vol. 95, No. 6, pp. 197-215, text-figs. 1-3, map.

Engelbrecht, L. N. J., Coertze, F. J., and Snyman, A. A.

1962. *Die Geologie van die Gebied tussen Port Elizabeth en Alexandria, Kaapprovinsie.* South Africa Dept. Mines, Geol. Sur. Rept. 50th Anniv., pp. 1-54, pls. 1-8, text-figs. 1-3.

England, Helen M.

1926. *Development of gonophores of the Stylasteridae.* Zool. Soc. London, Proc., pp. 265-283, figs. 1-23.

Eppert, Herbert C., Jr.

1966. *Stratigraphy of the Upper Miocene deposits in Sarasota County, Florida.* Tulane Studies Geol., vol. 4, No. 2, pp. 49-61, figs. 1, 2.

Eremija, M.

1959. *Paläontologische Neuigkeiten aus Neogenschichten südlich von der Stadt Glina (Croatien).* [Serbian with German summary.] Ann. Géol. Pén. Balkan, vol. 26, pp. 185-194, pls. 1-4.

Erentöz, E.

1956. *Stratigraphie des bassins néogènes de Turquie, plus spécialement d'Anatolie merididionale et comparaisons avec le domain Méditerranéen dans son ensemble.* Inst. Études Rec. Min. Turquie, Publ., vol. 63, pp. 1-54, pls. 1-4, text-figs., maps.

Eschscholtz, Johann Friedrich von

1825. *Bericht über die zoologische Ausbeute während der Reise von Kronstadt bis St. Peter und St. Paul.* Isis, pt. 6, pp. 734-747, pl. 5.

Esper, Johann Cristoph

1788-1830. *Die Pflanzenthiere in Abbildungen nach der Natur mit Farben erleuchtet nebst Beschreibungen.* Nürnberg, 3 vols. text, 2 vols. 428 pls.; vol. 1, pts. 1-2, pp. 1-96 (1788); pts. 3-4, pp. 97-192 (1789); pts. 5-6, pp. 193-320 (1790); vol. 2, pts. 7, 8, pp. 1-96 (1791); pts. 9-10, pp. 97-180 (1792); pt. 11, pp. 181-220 (1793); pt. 12, pp. 221-304 (1799); vol. 3, pt. 13, pp. 1-24 (1805); pts. 14-15, pp. 25-144 (18??); pt. 16, pp. 145-284 (1829); pt. 17-conclusion (1830).

1794-1806. *Fortsetzungen der Pflanzenthiere.* Nürnberg, 2 vols.; vol. 1, pts. 1-2 (1794); pts. 3-4, pp. 65-116 (1795); pts. 5-6, pp. 117-168 (1796); pts. 7-8, pp. 169-230 (1797); vol. 2, pt. 9, pp. 1-24 (1798); pt. 10, pp. 25-48 (1806).

Etheridge, Robert, Jr.

1889. *The general zoology of Lord Howe Island.* Australian Mus. Sydney, Mem., vol. 2, pp. 1-42.

1891. *The operculate Madreporaria Rugosa of New South Wales.* Australian Mus. Sydney, Rec., vol. 1, No. 10, pp. 201-205, 1 pl.

1901. *Corals from the coral limestone of Lion Creek, Stanwell, near Rockhampton.* Geol. Sur. Queensland, Bull., vol. 12, pp. 5-32, pls. 1, 2.

Euzet, L., and Fujol, M.

1963. *La faune associée à Mercerieila enigmatica Fauvel (Annélide Serpulidae) dans quelques stations des environs de Séte.* Comm. Internat. Mer Médit., Rapp., vol. 17, No. 3, pp. 833-842, text-figs. 1, 2.

Ewetz, C. E.

1932. *Fossilrester i Visingsöformationen.* Geol. Fören. Stockholm, Forh., vol. 54, No. 3, pp. 310-314, figs.

Fabiani, Ramiro

1910. *Paleontologia del Colli Berici.* Soc. Italiana Sci. XL, Mem., ser. 3, vol. 15, pp. 45-250, pls. 1-6.

1915. *Monografia sui terreni terziari del Veneto. II. Paleogene del Veneto.* Ist Geol. Padova, Mem., vol. 3, pp. 1-336, pls. 1-9.

Fabricius, Frank

1964. *Aktive Lage-und Ortsveränderung bei der Koloniekoralle Manicina areolata und ihre paläoökologische Bedeutung.* Senckenbergiana Lethea, vol. 45, Nos. 1-4, pp. 299-323, pls. 28-30, text-figs. 1-6.

Fage, Louis

1937. *Sur l'association d'un annélide polychete Lumbriconereis flabellicola n. sp. et d'un madrépore Flabellum ravonium* T. *et H.* Internat. Congr. Zool. Lisboa, vol. 12, pp. 941-945, 2 figs.

Fagetti, E., and Fisher, W.

1964. *Resultados cuantitativas del zooplancton frente a la costa Chilena por la Expedición "Marchile I."* Montemar, vol. 11, pp. 137-193, figs. 1-10.

Fairbridge, Rhodes Whitmore

1948. *Notes on the geomorphology of the Pelsart Group of Houtman's Abrolhos Islands.* Roy. Soc. West Australia, Jour., vol. 33 (1946-47), pp. 1-43, pls. 1-3, text-figs.

1950a. *Recent and Pleistocene coral reefs of Australia.* Jour. Geol., vol. 58, No. 4, pp. 330-401, pls. 1-8, text-figs. 1, 2.

1950b. *Landslide patterns on oceanic volcanoes and atolls.* Geogr. Jour., vol. 115, pp. 84-88, 2 pls., 3 text-figs.

Fairbridge, R. W., and Gill, E. D.

1947. *The study of eustatic changes of sea level.* Australian Jour. Sci., vol. 10, No. 3, pp. 63-67.

Fairbridge, R. W., and Teichert, C.

1947. *The rampart system at Low Isles, 1928-45.* Rept. Great Barrier Reef Committee, vol. 6, pt. 1, pp. 1-16.

1948. *The Low Isles of the Great Barrier Reef: a new analysis.* Geogr. Jour. London, vol. 111, Nos. 1-3, pp. 2384-2427.

Farmer, Wesley M.

1964. *One hundred common marine animals of San Diego.* San Diego Soc. Nat. Hist., Occas. Pap., No. 14, pp. 1-47, figs.

Farran, George P.

1915. *Results of a biological survey of Blacksod Bay, County Mayo.* Sci. Investig. Fish. Ireland Dublin, 1914, pp. 1-72, 1 pl.

Faure, M.-L.

1950a. *Note préliminaire sur le zooplancton de la zone côtière du Maroc.* Soc. Sci. Nat. Maroc, Bull., vol. 28, pp. 197-201, fig.

1950b. *Note préliminaire sur le zooplancton de la zone côtière du Maroc (année 1947).* Rapp. Cons. Explor. Mer, vol. 126, pp. 44-51, 8 figs.

Faurot, Lionel

1886. *Voyage au golfe de Tadjoura (Obock-Tadjourah-Goubbet Kharab).* Rev. de l'Afrique Français, 6 pls.

1888a. *Rapport à M. le Ministre de l'Instruction Publique sur une mission dans la mer Rouge et dans le golfe d'Aden.* Arch. Zool. Expér. et Génér., sér. 2, vol. 6, pp. 117-134, 2 figs.

1888b. *Sur les sédiments quaternaires de l'île de Kamaraue (mer Rouge) et du golfe de Tadjourah.* Soc. Géol. France, Bull., sér. 3, vol. 16, pp. 528-546, pls. 9, 10, text-figs. 1-13.

1894. *Description de Galaxea anthophyllites, nouvelle espèce de polype de la mer Rouge.* Soc. Zool. France, Bull., vol. 19, pp. 114-116, fig.

1895. *Études sur l'anatomie, l'histologie et le developpement des Actinies.* Arch. Zool. Expér. et Génér., sér. 3, vol. 3, pp. 43-262, pls. 1-12, text-figs. 1-29.

1909a. *Relations entre le mode de développement des Tetracorallia et celui des Hexacorallia.* Acad. Sci. Paris, C. R., vol. 148, pp. 583-584.

1909b. *Affinités des Tetracoralliaires et des Hexacoralliaires.* Ann. Paléont., vol. 4, pp. 69-108, figs. 1-21.

Faustino, L. A.

1927. *Recent Madreporaria of the Philippine Islands.* Bur. Sci. Manila, Mon., vol. 22, pp. 1-310, pls. 1-100.

1930. *Living coral reefs of the Philippine Islands.* Fourth Pacific Sci. Congr. Batavia, Proc., vol. 3, pp. 203-204.

1931a. *Two new madreporarian corals from California.* Philippine Jour. Sci., vol. 44, No. 3, pp. 285-287, 1 pl.

1931b. *Coral reefs of the Philippine Islands.* Philippine Jour. Sci., vol. 44, No. 3, pp. 291-308, 3 pls., 3 text-figs.

1932. *Notes on the Philippine black corals.* Philippine Jour. Sci., vol. 49, No. 2, pp. 197-199, 5 pls.

Felix, Johannes Paul

1884. *Korallen aus ägyptischen Tertiärbildungen.* Deutsch. Geol. Gesell., Zeitschr., vol. 36, pp. 415-453, pls. 3-5.

1885. *Kritische Studien ueber die Tertiäre Korallenfauna des Vicentins nebst Beschreibung einiger neuen Arten.* Deutsch. Geol. Gesell., Zeitschr., vol. 37, pp. 379-421, pls. 17-19.

1891. *Versteinerungen aus der mexicanischen Jura und Kreide-Formation. Anthozoa.* Palaeontogr., vol. 37, pp. 140-162, 4 pls.

1898. *Beiträge zur Kenntniss der Astrocoeninae.* Deutsch. Geol. Gesell., Zeitschr., vol. 50, pp. 247-256, pl. 11.

1900a. *Ueber die Gruppe der Montlivaltiaceae.* Naturforsch. Gesell. Leipzig, Sitzungsber., vol. 26-27, pp. 20-24.

1900b. *Ueber zwei neue Korallengattungen aus den ostalpinen Kreideschichten.* Naturforsch. Gesell. Leipzig, Sitzungsber., vol. 26-27, pp. 37-40.

1903a. *Korallen aus ägyptischen Miocänbildungen.* Deutsch. Geol. Gesell., Zeitschr., vol. 55, pp. 1-22, pl. 1.

1903b. *Korallen aus portugiesischen Senon.* Deutsch. Geol. Gesell., Zeitschr., vol. 55, p. 45-55, pl. 3.

1904. *Studien über tertiäre und quartäre Korallen und Riffkalke aus Ägypten und der Sinaihalbinsel.* Deutsch. Geol. Gesell., Zeitschr., vol. 56, No. 2, pp. 168-206, pl. 10, 6 text-figs.

1905. *Ueber einige fossile Korallen aus Colombien.* K. Bayerischen Akad. Wiss., Sitzungsber., Math.-Phys. Cl., vol. 35, pp. 85-93.

1909. *Ueber eine untertertiäre Korallenfauna aus der Gegend von Barcelona.* Palaeontogr., vol. 56, pp. 113-135, pl. 12.

1910. *Ueber einige Korallen aus dem persischen Miocän.* Naturforsch. Gesell. Leipzig, Sitzungsber., vol. 36, pp. 1-10, pl. 1.
1912. *Ueber eine pliocäne Korallenfauna aus holländisch Neu-Guinea.* K. Sachs. Gesell. Wiss. Leipzig, Ber., Math-Phys. Kl., vol. 64, pp. 429-445.
1913. *Die fossilen Anthozoen aus der Umgegend von Trinil.* Palaeontogr., vol. 60, pp. 311-365, pls. 24-27.
1914. *Fossilium Catalogus. I. Animalia. Pars 5. Anthozoa palaeocretacea.* Berlin, pp. 1-84. *Pars 6. Anthozoa cenomanica,* pp. 85-143. *Pars 7. Anthozoa neocretacea,* pp. 144-273.
1915-1920. *Jungtertiäre und quartäre Anthozoen von Timor und Obi. In* Wanner, J., *Paläontologie von Timor.* Lf. 2, pp. 1-43, 2 pls. (1915); Lf. 8, pp. 1-40, 1 pl. (1920).
1916. *Ueber Hydnophyllia und einige andere Korallen aus dem vicentischen Tertiär.* Naturforsch. Gesell. Leipsig, Sitzungsber, vol 43, pp. 1-30, pl. 1.
1921. *Fossile Anthozoen von Borneo. In* Wanner, J., *Paläontologie von Timor.* Vol. 9, pp. 1-64, pls. 141-144, 2 text-figs.
1925a. *Studien über fossile Korallen. I. Ueber die Gattung Phyllocaenia.* Zentralbl. Min. Geol., Abt. B, No. 2, pp. 363-368.
1925b. *Fossilium Catalogus. I. Animalia. Pars 28. Anthozoa eocaenica et oligocaenica.* Berlin, pp. 1-296.
1926. *Studien über fossile Korallen.* Glasnik Priordosl. Druzt. Zagreb, vols. 38-39, pp. 231-246, figs.
1927. *Fossilium Catalogus. I. Animalia. Pars 35. Anthozoa miocaenica.* Berlin, pp. 297-488.
1927b. *Ueber die Gattung Phyllocaenia. II.* Naturforsch. Gesell. Leipzig, Sitzungsber., vol. 55, pp. 1-7.
1929. *Fossilium Catalogus. I. Animalia. Pars 44. Anthozoa pliocaenica et pleistocaenica.* Berlin, pp. 489-666.

Ferguson, Frederick F., and Jones, E. Ruffin
1949. *A survey of the shoreline fauna of the Norfolk Peninsula.* Amer. Midland Natural., vol. 41, No. 2, pp. 436-446.

Ferrer Hernández, Francisco
1932. *Arrecifes de coral y atollos.* Soc. Española Hist. Nat., Reseña Cient., vol. 7, Nos. 3, 4, pp. 178-192.

Ferrounière, G.
1922. *Le calcaire de la Grange près Chalonnes (Maine-et-Loire).* Soc. Sci. Nat. Nantes, Bull., sér. 4, vol. 2, pp. 1-37, 2 pls.

Festa, A.
1951. *Ulteriori notizie sulla fauna pliocenica del Genovesato.* Mus. Storia Nat. Genova, Ann., vol. 64, pp. 85-100.

Feugueur, Léon
1963. *L'Ypresièn du Basin de Paris. Essai de monographie stratigraphique.* Serv. Carte Géol. Detaille France, Mém., pp. 1-568, pls. 1-8, text-figs. 1-107, [Corals p. 473.]

Fewkes, Jesse Walter
1883. *Annelid messmates with a coral.* Amer. Natural., vol. 17, pp. 595-597.
1888. *On the origin of the present form of the Bermudas.* Boston Soc. Nat. Hist., Jour., vol. 23, pp. 518-522.
1889a. *The anatomy of Astrangia danae.* Smithsonian Inst. Washington, 22 pp., 6 pls.
1889a. *New Invertebrata from the Coast of California.* Boston, 50 pp., 8 pls.

Field, Louise Randall
1949. *Sea anemones and corals of Beaufort, North Carolina.* Duke Univ. Marine Sta., Bull., No. 5, pp. 1-39, pls. 1-10.
Fielden, Henry Wemyss
1893. *Transportation of coral by the Gulf Stream.* The Zoologist, ser. 3, vol. 17, pp. 352-353.
Filatova, Z. A., and Barsanova, N. G.
1964. *The communities of bottom fauna of the western part of the Bering Sea.* [Russian with English summary.] Inst. Okeanol. Moskva, Trud., vol. 69, pp. 6-97, figs. 1-5.
Filatova, Z. A., and Levenstein, R. J.
1961. *Quantitative distribution of the deep-sea bottom fauna in the northeastern Pacific.* [Russian with English summary.] Inst. Okeanol., Trud., vol. 45, pp. 190-213, figs. 1-10.
Filhol, Henri
1885. *La Vie au Fond des Mers. Les explorations sous-marines et les voyages au "Travailleur" et du "Talisman."* Paris, 300 pp., 8 pls., 96 text-figs.
Filice, Francis P.
1858. *Invertebrates from the estuarine portion of San Francisco Bay, and some factors influencing their distribution.* Wasmann Jour. Biol., vol. 16, No. 2, pp. 159-211, 3 figs.
Filliozat, Marius
1910. *Types nouveaux de polypiers éocènes.* Soc. Géol. France, Bull., sér. 4, vol. 10, p. 801.
1911. *Revision des polypiers des faluns de Touraine.* Feuille Jeunes Nat., sér. 5, vol. 41, pp. 169-175, 185-190, pls. 1-3.
1914a. *Sur le genre Circophyllia M. E. and H. 1848.* Soc. Géol. France, C. R., pp. 96-97.
1914b. *Polypiers éocènes de la Loire-Inferieure.* Soc. Sci. Nat. Nantes, Bull., vol. 4, pp. 67-80, pls. 1, 2.
1956a. [*Two type Eocene corals revised.*] Paleontologia Universalis, Nos. 264-265.
1956b. *Paracyathus desnoyersii, H. Milne-Edwards and J. Haime 1848.* Paleontologia Universalis, No. 265.
Filliozat, M., and Chevalier, J.-P.
1956. *Turbinolia caryophyllus Lamarck, 1816.* Paleontologia Universalis, No. 278.
Finckh, Alfred E.
1904. *The atoll of Funafuti: biology of the reef-forming organisms at Funafuti Atoll.* Roy. Soc. London, Rept. Coral Reef Comm. (6), pp. 125-150, 1 fig.
Fischer, Paul Henri
1876. *Anthozoaires du département de la Gironde et des côtes du Sud-Ouest de la France.* Soc. Linn. Bordeaux, Actes, vol. 30, 12 pp.
Fischer-Piette, E.
1932a. *Répartition des principales espèces fixées sur les rochers battus des côtes et des îles de la Manche, de Lannon à Fécamp.* Inst. Océanogr. Paris, Ann., vol. 12, No. 4, pp. 105-213, charts 1-17.
1932b. *Quelques nouveaux gisements d'espèces intéressantes.* Lab. Mus. Hist. nat. St. Servan, Bull., vol. 10, pp. 23-25.
1932c. *Faune et flore de Saint-Servan en 1932.* Lab. Mus. Hist. nat. St. Servan., Bull., vol. 10, pp. 25-31.
1955. *Répartitition, le long des côtes septentrionele de l'Espagne, des principales espéces peuplant des roches intertidaux.* Inst. Océanogr. Paris, Ann., n. s., vol. 31, No. 2, pp. 37-124, figs. 1-5.

1963. *La distribution des principaux organismes intercotidaux Nord-Ibériques en 1954-55.* Inst. Océanogr. Paris, Ann., vol. 40, No. 3, pp. 165-311, figs. 1-8. [Coelenterates pp. 241-243.]

Fischer von Waldheim, Gotthelf

1806-1807. *Muséum Demidoff (mis en odre systématique et décrit par G. Fischer). Ou catalogue des curiosities de la nature et de l'art, données a l'Université Imperiale de Moscou par . . . P. de Demidoff.* Moscow, vol. 1 (1806), Catalogue . . . de la Bibliothèque, lxxiii + 275 pp.; vol. 2 (1806), Minéraux et Pétrifications, xvii + 300 pp., 6 pls.; vol. 3 (1807), Végétaux et Animaux, ix + 330 pp., 6 pls.

Fisher, Walter Kenrick

1931. *Californian hydrocorals.* Ann. Mag. Nat. Hist., ser. 10, vol. 7, pp. 391-399, pls. 15-17.

1938. *Hydrocorals of the North Pacific Ocean.* U. S. Nat. Mus., Proc., vol. 84, No. 3024, pp. 493-554, pls. 34-76.

Fitzroy, Robert, King, Philip P., and Darwin, Charles

1839. *Narrative of the surveying voyages of His Majesty's Ships Adventure and Beagle, between . . . 1826 and 1836, describing their examination of the southern shores of South America, and the Beagle's circumnavigation of the Globe.* London, 3 vols.

Fize, A., and Serène, R.

1957. *Les Hapalocarcinidés du Viet-Nam.* Mus. Nat. Hist. nat. Paris, Arch., sér. 7, vol. 5, xii + 202 pp., pls. 1-18, text-figs. 1-43. [Corals as hosts pp. 152-179.]

Flamand, G. B. M.

1911. *Recherches géologiques et géographiques sur "le Haut Pays de l'Oranie" et sur le "Sahara" (Algérie et territoires du Sud, et paléontologie algerienne.)* Lyon, 1001 pp., 16 pls., 22 maps.

Fleming, John

1818. *Contributions to the British fauna.* Wernerian Hist. Soc. Edinburgh, Mem., ser. 2, vol. 1, pp. 238-260, pls. 17, 18.

1827, 1842. *History of the British Animals.* London, ed. 2, xxiii + 565 pp.

Fletcher, H. O.

1956. *An ancient reef-building coral.* Australian Mus. Mag., vol. 12, No. 3, pp. 96-98, figs. 1, 2.

Flinders, Matthew

1814. *A Voyage to Terra Australis; undertaken for the purpose of completing the discovery of that vast country, and prosecuted in the years 1801, 1802 and 1803.* London, 2 vols. and Atlas of 12 pls. and 16 maps.

Florei, N.

1961. *Nouvelles données sur la faune Miocène de Zorlantul-Mare (Banat).* [Romanian with Russian and French summaries.] Studii Cerc. Geol., vol. 6, No. 4, pp. 667-698, pls. 1-10.

Flügel, Erik

1961. *Gattungsliste der fossilen Hydrozoen.* N. Jahrb. Geol. Paläont., Abh., vol. 113, pt. 1, pp. 68-94.

1964. *Über die Beziehungen zwischen Stylophyllopsis Frech, Oppelismilia Duncan und Malukkia Jaworski (Scleractinia, Trias-Lias).* N. Jahrb. Geol. Paläont., Monatsh., Jahrg. 1964, pp. 336-348, figs. 1-4.

Folk, Robert L., and Robles, Rogelio

1964. *Carbonate sands of Isla Perez, Alacran Reef complex, Yucatan.* Jour. Geol., vol. 72, No. 3, pp. 255-292, pls. 1-4, text figs. 1-19.

Folkeson, F.

1919. *Results of Dr. E. Mjöberg's Swedish Scientific Expedition to*

Australia 1910-1913. XVII. Madreporaria. K. Svensk. Vetensk.-Akad., Handl., vol. 59, No. 1, pp. 1-23, pl. 1.

Fontaine, A. R.

1954. *Notes on the marine invertebrate collections. Corals.* Inst. Jamaica, Ann. Rept. 1953, 1954, pp. 24-27.

Foord, Arthur Humphreys

1884. *On three new species of Monticuliporoid corals.* Mus. Nat. Hist., Ann., ser. 5, vol. 13, pp. 338-342, pl. 12, text-fig. 1.

Forbes, Edward, and Austen, Robert Godwin

1859. *The Natural History of European Seas.* London, 306 pp., chart.

Forbes, Henry Ogg

1885. *A Naturalist's Wanderings in the Eastern Archipelago; a narrative of travel and exploration from 1878 to 1883.* New York, xiv + 536 pp., figs., maps.

Forbes, Litton

1875. *Two Years in Fiji.* London, xii + 340 pp.

Forest, Jacques

1955. *Beautés du Fond des Mers.* Paris, 100 pp., figs. [Coelenterates pp. 73-84.]

1958. *Campagne de la "Calypso" dans le Golfe de Guinée et aux îles Principe, São Tomé, Annoban (1956).* Inst. Océanogr. Paris, Ann., vol. 37, pp. 1-36, pls. 1-3.

Forskal, Pehr

1776. *Icones rerum naturalium quam in itinere orientali depingi curavit Petrus Forskål, post mortem auctorio ad regis mandatum aeri incisas edidit Carsten Niebuhr.* Hauniae, 15 pp., 43 pls.

Forsstrand, Carl

1891. *Metoder för preparering och konservering af hafsdur samt nogra biologiska iakttagelser från Bermudas Korallfauna.* Biol. Fören. Stockholm, Forh., vol. 2, No. 8, pp. 108-111.

Fosberg, Francis Raymond

1951a. *Economic development of coral islands.* Atoll Res. Bull., vol. 1, No. 1, pp. 3-5.

1951b. *Ecological research on coral atolls.* Atoll Res. Bull., vol. 1, No. 1, pp. 3-5.

1951c. *Flora and vegetation of coral atolls.* Atoll Res. Bull., vol. 1, No. 1, pp. 13, 14.

1951d. *Literature on coral atolls.* Atoll Res. Bull., vol. 1, No. 1, p. 23-25.

1951e. *Land ecology and coral atolls.* Atoll Res. Bull., vol. 1, No. 2, pp. 7-11.

1957a. *Description and occurrence of atoll phosphate rock in Micronesia.* Amer. Jour. Sci., vol. 255, pp. 584-592.

1957b. *Some geological processes at work on coral atolls.* New York Acad. Sci., Trans., ser. 2, vol. 19, No. 5, pp. 411-422.

Fowell, R. R.

1947. *Zoology notes.* Swansea Sci. Field Nat. Soc., Proc., vol. 2, Nos. 8-9, pp. 262-263.

Fowler, George Herbert

1885-90. *The anatomy of the Madreporaria. Part 1.* Quart. Jour. Microsc. Sci. London, vol. 25 (1885), pp. 577-597, pls. 40-42; *Part 2,* vol. 27 (1886), pp. 1-16, pl. 1; *Part 3,* vol. 28, (1887), pp. 1-19, pls. 1, 2; *Part 4,* vol. 28 (1888), pp. 415-430, pls. 32, 33; *Part 5,* vol. 30 (1890), pp. 405-422, pl. 28.

1887. *On some new types of madreporarian structure.* British Assoc. Adv. Sci., Rept., pp. 759-760.

1912. *Science of the Sea, an elementary Handbook of Practical Oceanography.* London, Challenger Soc., xviii + 452 pp., 8 maps, figs.

Fox, H.

1904. *Geological notes. II. Supplementary notes on the distribution of fossils on the north coast of Cornwall south of the Camel.* Geol. Soc. Cornwall, Trans., vol. 12, No. 9, pp. 753-759. [Coelenterata p. 755.]

Foye, Wilbur Garland

1917a. *The geology of the Fiji Islands.* Nat. Acad. Sci. Washington, Proc., vol. 3, pp. 305-310.

1917b. *The geology of the Lau Islands.* Amer. Jour. Sci., ser. 4, vol. 43 (193), No. 257, art. 31, pp. 343-350, figs. 1, 2.

1918. *Geological observations in Fiji.* Amer. Acad. Arts and Sci., Proc., vol. 54, No. 1, pp. 1-145, figs. 1-40.

Franc, A.

1951. *The zooplancton de la région de Dinard-Saint-Malo.* Lab. Marit. Dinard, Bull., No. 34, pp. 25-40.

Frebold, H.

1950. *Geologie des Barentsschelfes.* Deutsch. Akad. Wiss. Berlin, Abhandl., Kl. Math. Allgem. Naturwiss., No. 5, pp. 1-151, figs., maps.

Frederick, G. C.

1893. *Geological notes on certain islands in the New Hebrides.* Geol. Soc. London, Quart. Jour., vol. 49, pp. 227-229.

Fredj, Gaston

1964. *Contributions à l'étude bionomique de la Méditerranée ocicdentale (Côte du Var et des Alpes maritimes—côte occidentale de Corse). Fascicule 2. La région de Saint-Tropez (région A1).* Inst. Océanogr. Monaco, Bull., No. 1311 A, pp. 1-55. [Coelentérés pp. 49, 50.]

Friederichsen, Max

1901. *Die Karolinen.* Geogr. Gesell. Hamburg, Mitt., vol. 17, pp. 1-27.

Friederici, Georg

1911. *Ein Beitrag zur Kenntnis der Tuamotu-Inseln.* Verein f. Erdkunde Leipzig, Mitt., p. 97-176, pls., chart.

Friederici, Georg, and Sapper, Karl Theodor

1910. *Buka.* Deutsch. Schutzgeb. Berlin, Mitt. Forsch. Geleh., vol. 23, pp. 193-206.

Friedlander, Immanuel

1910. *Beiträge zur Geologie der Samoainseln.* Bayer. Akad. Wiss., Abhandl., Math.-Phys. Kl., vol. 24, pp. 507-541, 5 pls., 2 maps.

Fritsch, Karl Wilhelm Georg von

1878. *Fossile korallen der Nummulitenschichten von Borneo.* Palaeontographica, Suppl. 3, pp 92-138, pls. 14-19.

Fritsch, Karl von, and Reiss, Wilhelm

1868. *Geologische Beschreibung der Insel Tenerife.* Winterhur, xviii + 494 pp.

Fritz ———

1901. *Bericht ueber die Insel Rota (Marianen).* Deutsch. Schutzgeb. Berlin, Mitt. Forsch. Geleh., vol. 14, p. 194 *et seq.*

1902. *Reise nach den nördlichen Marianen.* Deutsch. Schutzgeb. Berlin, Mitt. Forsch. Geleh., vol. 15, p. 96 *et seq.*

Fromentel, Louis Edouard Gourdan de

1856. *Note sur les polypiers fossiles de l'étage portlandien de la Haute-Saône.* Soc. Géol. France, Bull., sér. 2, vol. 12, pp. 851-864.

1857. *Description des polypiers fossiles de l'étage néocomien.* Soc. Sci. Yonne, Bull., pp. 1-78, pls. 1-10.

1861. *Introduction à l'étude des polypiers fossiles.* Soc. Emul. du Doubs Besançon, Mém., 357 pp.

1862a. *Monographie des polypiers jurassiques supérieurs. 1re Partie. Étage portlandien.* Soc. Linn. Normandie, Mém., vol. 12, 56 pp., 7 pls.

1862b. *Paléontologie stratigraphique de l'Infra-Lias du département de la Côte-d'Or.* Soc. Géol. France, Mém., sér. 2, vol. 7, pp. 92-94, pls. 7, 8.

1862-87. *In* d'Orbigny. *Paléontologie française. Terrains crétacés. Zoophytes.* Paris, vol. 8, pp. 1-48, pls. 1-12; pp. 48-96, pls. 13-24; pp. 97-144, pls. 25-36 (1862); pp. 145-192, pls. 37-48; pp. 193-240, pls. 49-60; pp. 241-288, pls. 61-72 (1863); pp. 289-336, pls. 73-86 (1867); pp. 337-384, pls. 85-96 (1870); pp. 385-432, pls. 97-108 (1873); pp. 433-480, pls. 109-120 (1877); pp. 481-512, pls. 121-132 (1879); pp. 513-528, pls. 133-144 (1883); pp. 529-560, pls. 145-156 (1884); pp. 561-576, pls. 157-168; pp. 577-608, pls. 169-180 (1886); pp. 609-624, pls. 181-192 (1888).

Fryer, J. C. F.

1910-12. *The structure and formation of Aldabra and neighbouring islands with notes on their flora and fauna. The Percy Sladen Trust Expedition to the Indian Ocean in 1905, under the leadership of Mr. J. Stanley Gardiner. Volume III, No. XIX.* Linnean Soc. London, Trans., Zoology, ser. 2, sect. B, vol. 14, pt. 3, pp. 398-442, pls. 22-29, text-figs. 1-3.

Fucini, Alberto

1895. *Fauna dei calcari bianchi ceroidi con Phylloceras cylindricum Sow., sp. del Monte Pisano.* Soc. Toscana Sci. Nat. Pisa, Atti, vol. 14, pp. 125-351.

Furnestin, M.-L.

1960. *Zooplancton du golfe du Lion et de la côte orientale de Corse.* Inst. Pêches Marit., Rev. Trav., vol. 24, No. 2, pp. 153-252, figs. 1-66.

Furon, R., and Kouriatchy, N.

1948. *La faune éocène du Togo.* Mus. Nat. Hist. nat. Paris, Mém., n. s., vol. 27, No. 4, pp. 95-114, pls. 8, 9. [Corals p. 97.]

Furuhashi, K.

1953. *On the vertical distribution of animal plankton in the Sea of Japan off San'in district in summer of 1952.* Seto Marine Biol. Lab., Publ., vol. 3, No. 1, pp. 61-74, figs.

Gabb, William M.

1875. *Notes on West Indian fossils.* Geol. Mag., decade 2, vol. 2, pp. 544-545.

Gabb, William M., and Horn, George H.

1860a. *Description of new Cretaceous corals from New Jersey.* Acad. Nat. Sci. Philadelphia, Proc., vol. 12, pp. 366-367.

1860b. *Descriptions of new species of American Tertiary and Cretaceous fossils.* Acad. Nat. Sci. Philadelphia, Jour., ser. 2, vol. 4, pp. 375-404.

1862. *Monograph of the fossil Polyzoa of the Secondary and Tertiary formations of North America.* Acad. Nat. Sci. Philadelphia, Jour., ser. 2, vol. 5, pp. 111-178, pls. 19-21.

Gadeau de Kerville, Henri

1898. *Recherches sur les faunes marine et maritime de la Normandie. 2e. voyage. Région de Grandcamp-les-Bains (Calvados) et Iles Saint-Marcouf (Manche), Juillet-Septembre, 1894.* Soc. Amis Sci. Nat. Rouen, Bull., vol. 33, pp. 309-387. [Hydroides, Coralliaires, pp. 333-334.]

1900. *Recherches sur les faunes marine et maritime de la Normandie. 3e voyage.* Soc. Amis Sci. Nat. Rouen, Bull., vol. 36, pp. 145-224. [Coelenterata pp. 176-177.]

Galtsoff, Paul S.

1933. *Pearl and Hermes Reef, Hawaii. Hydrological and biological observations.* Bernice P. Bishop Mus., Bull., vol. 107, pp. 3-49, pls. 1-5, text-figs. 1-9.

1954. *Gulf of Mexico: its origin, waters, and marine life.* U.S. Fish and Wildlife Serv., Fishery Bull., vol. 55, No. 89, xiv + 604 pp., figs. 1-74.

Galvani, D.

1845. *Illustrazione delle conchiglie fossili marine rinvenute in un banco calcare madreporitico in S. Filippo inferiore presso Messina.* Nuovi Ann. Sci. Nat., vol. 3, pp. 129-145, 185-205.

Gamulin, T.

1948. *Contribution a la connaissance du zooplancton de la zone insulaire de la Dalmatie moyenne.* [Yugoslavian with French and Russian sumaries.] Acta Adriatica, vol. 3, No. 7, pp. 1-38.

Ganapati, P. M., Lakshmana, M. V., and Nagabhushanam, R.

1958. *Biology of fouling in the Visakhapatnam Harbour.* Andhra Univ., Mem. Oceanogr., vol. 2, pp. 193-209, pl. 1, text-figs. 1, 2. [Coelenterates pp. 199-200.]

Gane, Henry Stewart

1895. *A contribution to the Neocene corals of the United States.* Johns Hopkins Univ., Circular, vol. 15, No. 121, pp. 8-10.

1900. *Some Neocene corals of the United States.* U.S. Nat. Mus., Proc., vol. 22, No. 1193, pp. 179-198, pl. 15.

Gaono, M. R. de

1944. *Contribución al esclarecimiento de un coralario y de una "Orthophragmina."* Soc. Española Hist. Nat., Bol., vol. 42, pp. 417-420, pls. 36, 37.

Gardiner, John Stanley

1889. *Origin of coral islands.* Nature, vol. 39, No. 1010, pp. 435, 436.

1897. *On some collections of corals of the family Pocilloporidae from the southwest Pacific Ocean.* Zool. Soc. London, Proc., pp. 941-953, pls. 56, 57.

1898a. *On the perforate corals collected by the author in the South Pacific.* Zool. Soc. London, Proc., pp. 257-276, pls. 23, 24.

1898b. *On the fungid corals collected by the author in the South Pacific.* Zool. Soc. London, Proc., pp. 525-539, pls. 43-45.

1898c. *On the tubinolid and oculinoid corals collected by the author in the South Pacific.* Zool. Soc. London, Proc., pp. 994-1000, pl. 62.

1898d. *The coral reefs of Funafuti, Rotuma and Fiji, together with some notes on the structure and formation of coral reefs in general.* Philos. Soc. Cambridge, Proc., vol. 9, pp. 417-503, figs. 1-8.

1898e. *The geology of Rotuma.* Geol. Soc. London, Quart. Jour., vol. 54, pp. 1-11, figs. 1-4, map.

1898f. *The building of atolls.* Fourth Interntl. Congr. Zool. Cambridge, Proc., vol. 4, pp. 118-123, pl. 1.

1899a. *On the astraeid corals collected by the author in the South Pacific.* Zool. Soc. London, Proc., pp. 734-764, pls. 46-49.

1899b. *On the solitary corals collected by Dr. A. Willey. In* Willey, Arthur, *Zoological results based on material from New Britain, New Guinea, Loyalty Islands and elsewhere during . . . 1895, 1896 and 1897.* Vol. 2, pp. 161-170, pls. 19, 20.

1899c. *On the post-embryonic development of Cycloseris. In* Willey, Arthur, *Zoological results . . . .* Vol. 2, pp. 171-180, pls. 19, 20.

1899d. *On the anatomy of a supposed new species of Coenopsammia from Lifu. In* Willey, Arthur, *Zoological results* . . . . Vol. 4, pp. 257-380, pl. 35.
1901a. *On the rate of growth of some corals from Fiji.* Philos. Soc. Cambridge, Proc., vol. 11, pp. 214-219.
1901b. *Coral reefs of the Indian region.* British Assoc. Adv. Sci., Rept., pp. 363, 400.
1901c. *The coral islands of the Maldives.* British Assoc. Adv. Sci., Rept., p. 683.
1901d. *I. Introduction, narrative and route of the expedition. II. The Maldive and Laccadive groups with notes on other coral formations in the Indian Ocean.* The Fauna and Geography of the Maldive and Laccadive Archipelagoes, Cambridge, pp. 1-50, text figs.
1902a. *On the unit of classification for systematic biology. A reply to Mr. Bernard.* Philos. Soc. Cambridge, Proc., vol. 11, pp. 423-427.
1902b. *Some notes on variation and protandry in Flabellum rubrum, and senescence in the same and other corals.* Philos. Soc. Cambridge, Proc., vol. 11, pp. 463-471.
1902c. *The Maldive and Laccadive groups, with notes on other coral formations in the Indian Ocean (continued).* Fauna and Geography of the Maldive and Laccadive Archipelagoes, vol. 1, No. 2, pp. 146-183, text-figs. 1-33, pls. 8-12.
1902d. *South African corals of the genus Flabellum, with an account of their anatomy and development.* Marine Investig. South Africa, vol. 2, No. 6, pp. 117-154, pls. 1-4.
1902e. *The formation of the Maldives.* Geogr. Jour. London, vol. 19, pp. 277-301, sketch-maps, pl.
1903a. *The Maldive and Laccadive groups, with notes on other coral formations in the Indian Ocean (continued).* Fauna and Geography of the Maldive and Laccadive Archipelagoes, vol. 1, pp. 146-183, pls. 8-12, text-figs. 25-33; pp. 314-346, pls. 16-17, text-figs. 74, 75; pp. 376-423, pls. 19-21, text-figs. 90-109.
1903b. *Lagoon deposits. I. General account. II. Report on certain deposits, by Sir John Murray.* Fauna and Geography of the Maldive and Laccadive Archipelagoes, vol. 2, No. 1, pp. 581-588, pl. 34.
1903c. *The origin of coral reefs as shown by the Maldives.* Amer. Jour. Sci., vol. 16, pp. 203-213, 1 fig.
1903d. *Formation of the Maldives.* Geogr. Jour. London, vol. 19, pp. 277-296, 12 figs.
1904a. *Coral reefs of the Indian region.* British Assoc. Adv. Sci., Rept., pp. 305-308.
1904b. *The formation of coral reefs.* Nature, vol. 69, pp. 371-373, 4 figs.
1904c. *Corals.* Science, vol. 20, pp. 765-766.
1904d. *Madreporaria. Part I. Introduction with notes on variation. Part II. Astraeidae.* Fauna and Geography of the Maldive and Laccadive Archipelagoes, vol. 2, pp. 755-790, pls. 59-64.
1904e. *The turbinolid corals of South Africa, with notes on their anatomy and variation.* Marine Investig. South Africa, vol. 3, pp. i-iv, 95-129, pls. 1-3.
1905a. *Madreporaria. Part III. Fungida. Part IV. Turbinolidae. Fauna and Geography of the Maldive and Laccadive Archipelagoes.* Vol. 2, Suppl. 1, pp. 933-957, pls. 89-93.
1905b. *The Chagos Archipelago.* Nature vol. 72, pp. 571, 572, chart.
1906a. *The Percy Sladen expedition in H.M.S. Sealark.* Nature, vol. 73, pp. 43, 184, 294-296, charts, pl.
1906b. *The Indian Ocean.* Geogr. Jour. London, vol. 28, pp. 313-353, 454-471, maps, pl.

1907. *The Seychelles Archipelago.* Geogr. Jour. London, vol. 29, pp. 148-168, map, fig.

1909. *Reports of the Percy Sladen Trust Expedition to the Indian Ocean in 1905, under the leadership of Mr. J. Stanley Gardiner, M.A. 15. The madreporarian corals. I. The family Fungidae, with a revision of the genera and species and an account of their geographical distribution.* Linnean Soc. London, Trans., Zoology, ser. 2, vol. 12, pp. 257-290, pls. 33-39.

1928. *Tropical shores; coral reefs and islands. In* Fowler and Allen, *Science of the Sea.* Oxford, 2d ed., pp. 93-149, 15 figs.

1929a. *Coelenterata. IV. Madreporaria (b). Turbinolididae and Eupsammidae.* British Antarctic (Terra Nova) Exped. 1910, Nat. Hist. Rept., Zoology, vol. 5, No. 4, pp. 121-130, 1 pl.

1929b. *Corals of the genus Flabellum from the Indian Ocean.* Indian Mus. Calcutta, Rec., vol. 31, pp. 301-310, pl. 13.

1930a. *Studies in coral reefs.* Mus. Comp. Zool., Bull., vol. 71, pp. 1-16.

1930b. *Commensal algae and coral reefs.* Nature, vol. 126, No. 3184, p. 724.

1931a. *Coral Reefs and Atolls.* London, xiii + 181 pp., 15 pls. 4 charts, 32 text-figs.

1931b. *Photosynthesis and solution in formation of coral reefs.* Linnean Soc. London, Proc., pp. 65-69. Also, Nature, vol. 127, No. 3214, pp. 857-858.

1932. *The Great Barrier Reef and the formation of coral reefs.* Nature, vol. 129, No. 3264, pp. 748-749.

1936. *The reefs of the western Indian Ocean. I. Chagos Archipelago II. Marcarene region.* Linnean Soc. London, Trans., Zoology, ser. 2, vol. 19, pp. 393-436, pl. 25, text-figs. 1-10.

1939a. *Madreporararian corals, with an account of variation in Caryophyllia.* Discovery Repts., vol. 18, pp. 323-338, pls. 20, 21.

1939b. *The ecology of solitary corals.* British Mus., John Murray Exped. 1933-34, Sci. Rept., vol. 6, No. 5, pp. 243-250, pls. 1, 2.

Gardiner, J. Stanley, and Waugh, Peggy

1938. *The flabellid and turbinolid corals.* British Mus., John Murray Exped. 1933-34, Sci. Rept., vol. 5, No. 7, pp. 167-202, pls. 1-7, text-figs. 1-6.

1939. *Madreporaria excluding Flabellidae and Turbinolidae.* British Mus., John Murray Exped. 1933-34, Sci. Rept., vol. 6, No. 5, pp. 225-242, pls. 1, 2, text-figs. 1-3.

Garstang, Walter

1895. *Faunistic notes at Plymouth.* Marine Boal. Assoc. Plymouth, Jour., vol. 3, pp. 210-235.

Gautier, Y. V., and Picard, J.

1957. *Bionomie du banc du Magaud (Est des Iles d'Hyères).* Stat. Marit. Endoume, Rec. Trav., vol. 21, No. 1, pp. 28-40, figs. 1, 2.

Géczy, Barnabás

1954. *Cyclolites (Anth.) telnumanyok oder Studien über Cycloliten (Anth.).* Geologica Hungarica. Fasciculi Geologici Hungariae. Ser. Palaeont., No. 24, pp. 1-180, pls. 1-10.

1958. *A Hexocoralliák torzsfeslödéséröl.* Foldlt. Kozl., vol. 88, pp. 464-466.

1959. *Sur les Diploctenium (Anth.) de Sümeg.* Acta Geol. Hungar., vol. 6, Nos. 1-2, pp. 195-208 pls. 1-4, text-figs. 1-6.

George, A. C.

1953. *The marine plankton of the coastal waters of Calicut, with observations on the hydrological conditions.* Zool. Soc. India, Jour., vol. 5, pp. 76-107, figs.

Gerlach, S.

1960. *Ueber das tropische Korallenriff als Lebensraum.* Deutsch. Zool. Gesell., Verhandl. 1959, pp. 356-363, figs. 1-4.

Germain, L.

1937. *Les récifs de coraux.* Sciences Paris, vol. 8, pp. 25-29.

Gerth, Heinrich

1908. *Beitrag zur Phylogenie der Tubocorallier.* Zeitschr. f. Induktive Abstammungs u. Vererbungslehre, vol. 1, No. 1, pp. 11-68.

1921. *Anthozoa. In* Martin, K., *Die Fossilen von Java.* Samml. Geol. Reichsmus. Leiden, vol. 1, pp. 387-445, pls. 55-57.

1923. *Die Anthozoenfauna des Jungtertiärs von Borneo. Beiträge zur Geologie Ost-Asiens und Australiens.* Samml. Geol. Reichsmus. Leiden, ser. 1, vol. 10, pp. 37-136, 9 pls.

1925a. *Jungtertiäre Korallen von Nias, Java, und Borneo, nebst einer Uebersicht über die aus dem Känozoikum des indischen Archipel bekannten Arten.* Leidsche Geol. Meded., vol. 1, No. 1, pp. 22-82, pls. 5-7.

1925b. *Die Bedeuting der tertiären Riffkorallenfaune des Malayischen Arhipels für die Entwicklung der lebenden Riff-Fauna im indopazifischen und atlantischen Gebiet.* Geol. Mijnb. Gen. Nederland. Kolon., Verh., Geol. Ser., vol. 8, pp. 173-196.

1930. *The evolution of reef corals during the Cenozoic period.* 4th Pacific Sci. Congr. Batavia-Bandoung, Proc., vol. 2A, pp. 333-350.

1931a. *Anthozoa Caenozoica.* Leidsche Geol. Meded., vol. 5, pp. 129-151.

1931b. *Palaeontologie von Niederlandisch Ost-Indien. Coelenterata.* Leidsche Geol. Meded., vol. 5, pp. 387-445.

1933. *Neue Beiträge zur Kenntnis der Korallenfauna des Tertiärs von Java. I. Die Korallen des Eocäns und des älteren Neogen.* Dienst Mijnb. Nederland.-Ind., Wetensch. Meded., vol. 25, pp. 1-45, 5 pls.

1952. *Die von Sipunculiden bewohnten lebenden an jungtertiären Korallen und der wurmförmige Körper von Pleurodictyum.* Paläont. Zeitschr., vol. 25, Nos. 3-4, pp. 119-126, pl. 6, text-fig.

Geyer, O. F.

1954. *Die oberjurassische Korallenfauna von Würtenberg.* Palaeontographica, vol. 104, Abt. A, Nos. 4-6, pp. 121-220, pls. 9-16.

Giattini, G. B.

1902. *Fossili del Loveen nel Montenegro.* Riv. Italiana Paleont., vol. 8, pp. 62-66, pls. 5, 6.

Gideon, P. W., Menon, P. K. B., Rao, S. R. V., and Jose, K. V.

1957. *On the marine fauna of Gulf of Kutch: a preliminary survey.* Bombay Nat. Hist. Soc., Jour., vol. 54, No. 3, pp. 690-706, 1 pl., text-figs. 1-5. [Coelenterates pp. 693, 694.]

Giebel, Cristoph Gottfried Andreas

1861. *Neue ostindische Turbinaria.* Gesell. Naturwiss. Berlin, Zeitschr., vol. 18, pp. 134-135.

1879. *Ueber Zoopilus echinatus Dana (?).* Gesell. Naturwiss. Berlin, Zeitschr., vol. 52, pp. 322-324.

Gifford, E. W.

1951. *Archeological excavations in Fiji.* Anthrop. Rec. Chicago, vol. 13, No. 3, pp. i-v, 189-228, pls. 1-18, figs., maps. [Coral list p. 218.]

Gigout, M.

1951. *Études géologiques sur la Méséta marocaine occidentale (Arrière-pays de Casablanca, Mazagran et Safi).* Géol. Serv. Maroc, Notes et Mém., vol. 86, pp. 1-508, pls. 1-18, text-figs., tables.

Gillet, Keith, and McNeill, Frank
1962. *The Great Barrier Reef and Adjacent Isles.* Coral Press Pty. Ltd., Sydney, rev. ed., xiii + 209 pp., pls. 1-168, figs. 1-3, charts 1-6.
Gilson, Gustave
1900. *Exploration de la mer sur les côtes de la Belgique en 1899.* Mus. Hist. nat. Belgique, Mém., vol. 1, pp. 1-81, 3 pls., 10 text-figs. [Coelenterata p. 34.]
Gimbrede, Louis de A.
1962. *The Hurricane Lentil: source of many Claiborne fossils.* Jour. Paleont., vol. 36, No. 5, pp. 1116-1120.
Ginsburg, Robert N.
1956. *Environmental relationship of grain size and constituent particles in some South Florida carbonate sediments.* Amer. Assoc. Petrol. Geol., Bull., vol. 40, No. 10, pp. 2384-2427, figs. 1-10.
Ginsburg, Robert N., and Lowenstam, H. A.
1958. *The influence of marine bottom communities on the depositional environment.* Jour. Geol., vol. 66, pp. 310-318.
Giorgi, Cosimo de
1903. *La serie geologica dei terreni nella peninsola Salentina.* Pontif. Accad. Nuovi Lincei, Mem., vol. 20, pp. 155-218.
Glibert, M.
1930. *Note sur les Madréporaires du Bruxellien (Eocène moyen) de Nil-Saint-Vincent et de Neder Ocherzeel.* Mus. Hist. nat. Belgique, Bull., sér. 6, vol. 20, 14 pp., 5 figs.
Gmelin, Johann Friedrich
1791. *Caroli a Linné Systema Naturae.* Leipzig, ed. 13, vol. 1, pt. 6, pp. 3021-3910.
Gočev, P.
1935. *Beitrag zur Kenntniss der Korallen des Tortons von Pleven (Nord Bulgarien).* Bulgar. Geol. Gesell., Zeitschr., vol. 7, pp. 1-7, pl. 1.
Goebeler, E.
1891. *Die Unstehung der Korallen-Inseln.* Ausland, vol. 64, No. 44, pp. 875-880; No. 45, pp. 895-900; No. 46, pp. 908-911.
Goedbloed, A. F.
1962a. *The dactylozooids of Allopora blattea and Stylaster roseus.* K. Akad. Wetensch. Amsterdam, Proc., ser. C, vol. 65, No. 5, pp. 438-446, figs. 1-7.
1962b. *On the structure and the development of the gonophores of Allopora blattea and Stylaster roseus.* K. Akad. Wetensch. Amsterdam, Proc., ser. C, vol. 65, No. 5, pp. 522-531, figs. 1-26.
Godhar, H. A. F.
1963. *Light and tropical marine invertebrates.* Inst. Océanogr. Monaco, Bull., Spec. No. 1d, pp. 91-104.
Gohar, H. A. F., and Soliman, G. N.
1963a. *On three mytilid species boring in living corals.* Marine Biol. Sta. Al-Ghardaqa, Publ., vol. 12, pp. 65-98, pls. 1,2, text-figs. 1-17.
1963b. *On the biology of three coralliophilids boring in living corals.* Marine Biol. Sta. Al-Ghardaqa, Publ., vol. 12, pp. 99-126, pl. 1, text-figs. 1-26.
1963c. *On two mytilids boring in dead coral.* Marine Biol. Sta. Al-Ghardaqa, Publ., vol. 12, pp. 205-218, pl. 1, text-figs. 1-26.
Goldfuss, Georg August
1826-29. *Petrefacta Germaniae.* Düsseldorf, vol. 1, No. 1, pp. 1-70, pls. 1-24 (1826); No. 2, pp. 71-168, pls. 25-51 (1829).
González de Juana, Carlos
1951. *Introducción al estudio de la geología de Venezuela.* Bol. Geol. [Venezuela], vol. 1, No. 1, pp. 119-139, figs. 1-10

Goodchild, J. G.
1903. *Observations on the bathymetrical distribution of reef-building corals.* Roy. Phys. Soc. Edinburgh, Proc., vol. 15, pp. 66-69.

Gordon, M. M. Ogilvie
1907. *Note on the formation of the skeleton in the Madreporaria.* Quart. Jour. Microsc. Sci. London, vol. 51, pp. 473-482.

Gordon, Maria
1906. *The lime forming layer of the madreporarian polyp.* Quart. Jour. Microsc. Sci. London, vol. 49, pp. 203-211.

Gordon, William Anthony
1960. *The age of the middle Tertiary rocks of northwestern Puerto Rico.* Second Caribbean Geol. Conference Mayaguez, Trans., pp. 87-90

Goreau, Thomas F.
1953. *Phosphomonoesterases in reef-building corals.* Nat. Acad. Sci. Washington, Proc., vol. 39, No. 12, pp. 1291-1295, figs.
1959a. *The physiology of skeleton formation in corals. I. A method for measuring the rate of calcium deposition by corals under different conditions.* Biol. Bull. Woods Hole, vol. 116, No. 1, pp. 59-75, figs. 1-5.
1959b. *The ecology of Jamaican coral reefs. I. Species composition and zonation.* Ecology, vol. 40, No. 1, pp. 67-90, figs. 1-21.
1959c. *Calcification and growth in reef-forming corals.* Internat. Congr. Zool., Proc., vol. 15 (1958), pp. 248-249.
1959d. *Buttressed reefs in Jamaica, British West Indies.* Internat. Congr. Zool., Proc., vol. 15, p. 250.
1961a. *Problems of growth and calcium deposition in reef corals.* Endeavour, vol. 20, No. 77, pp. 32-39, figs. 1-10.
1961b. *On the relation of calcification to primary productivity in reef building organisms*, pp. 269-285. *In* Lenhoff, H. M., and Loomis, W. F., *The Biology of Hydra and of some other Coelenterata.* Univ. Miami Press, Coral Gables, pp. i-xv, 1-467, 39 pls., text-figs.
1963a. *Boring sponges as controlling factors in the formation and maintenance of coral reefs.* Amer. Assoc. Advancem. Sci., Publ., vol. 75, pp. 25-54, figs.
1963b. *Calcium carbonate deposition by coralline algae ad corals in relation to their roles as reef-builders.* New York Acad. Sci., Ann., vol. 109, No. 1, pp. 127-167, figs. 1-9.
1964a. *Mass expulsion of Zooxanthellae from Jamaican reef communities after hurricane Flora.* Science, vol. 145, No. 3630, pp. 383-386, figs. 1, 2, fig. on cover.
1964b. *On the predation of coral by the spiny starfish Acanthaster planci (L.) in the southern Red Sea.* Israel Fish. Res. Sta., Bull., vol. 35, pp. 23-26, fig. 1.

Goreau, Thomas F., and Bowen, V. T.
1955. *Calcium uptake by a coral.* Science, vol. 122, No. 3181, pp. 1188-1189.

Goreau, Thomas F., and Goreau, Nora I.
1959. *The physiology of skeleton formation in corals. II. Calcium deposition by hermatypic corals under various conditions in the reef.* Biol. Bull. Woods Hole, vol. 117, No. 2, pp. 239-250, figs. 1-3, tables 1-4.
1960a. *The physiology of skeleton formation in corals. III. Calcification rate as a function of colony weight and total nitrogen content in the reef coral Manicina areolata (Linnaeus).* Biol. Bull. Woods Hole, vol. 118, No. 3, pp. 419-429, figs. 1-3.

1960b. *The physiology of skeleton formation in corals. IV. On isotopic equilibrium exchanges of calcium between corallum and environment in living and dead reef-building corals.* Biol. Bull. Woods Hole, vol. 119, No. 3, pp. 416-427, figs. 1, 2, tables 1-3.

1960c. *Distribution of labelled carbon in reef building corals with and without Zoö xanthellae.* Science, vol. 131, No. 3401, pp. 668-669.

Goreau, T. F., and Hartman, W. D.

1963. *Boring sponges as controlling factors in the formation and maintenance of coral reefs.* Amer. Assoc. Advancem. Sci., Publ., vol. 75, pp. 25-54, figs. 1-16.

Gosse, Philip Henry

1851. *A Naturalist's Sojourn in Jamaica.* London, pp. 307-314.

1853. *A Naturalist's Rambles on the Devonshire Coast.* London, 448 pp., 28 pls.

1858. *On Phyllangia, a new living British madrepore.* Ann. Mag. Nat. Hist., ser. 3, vol. 2, pp. 349-351.

1859. *On Sphenotrochus wrightii, a new Irish madrepore.* Nat. Hist. Rev., vol. 6, pp. 161-163, pl. 17.

1860. *Actinologia Britannica. A history of the British sea anemones.* London, 362 pp., 12 pls.

Gotto, R. V.

1951. *Some plankton records from Strangford Lough, Co. Down.* Irish Natural. Dublin, Jour., vol. 10, pp. 162-164.

Gough, Lewis Henry

1904a. *Plankton collected at Irish light stations, 1904.* Fish. Ireland, Sci. Investig., vol 6, pp. 12-53.

1904b. *Report on the plankton of the English Channel in 1903.* North Sea Fish. Investig. Comm., Rept. 2 (S. area), pp. 325-377.

Grabau, A. W., and Shimer, H. W.

1909-1910. *North American Index Fossils.* New York, vol. 1 (1909), viii + 853 pp.; vol. 2 (1910), xv + 909 pp.

Graeffe, Eduard

1866. *Notizen ueber die Fauna der Viti-Inseln.* Zool.-Botan. Gesell. Wien, Verhandl., vol. 16, pp. 585-596.

1884. *Uebersicht der Seethierfauna des Golfes von Trieste. III. Coelenteraten.* Zool. Inst. Wien, Arb., vol. 5, pp. 333-363

Graff, Ludwig von

1884 *Zur Kenntniss der physiologischen Function des Chlorophylls im Tierreich.* Zool. Anzeig., vol. 7, pp. 520-527.

Granger, A.

1896. *Histoire Naturelle de France. Coelentérés.* Paris, pt. 17.

Gravely, Frederic Henry

1909. *Note on coelenterates at Port Erin, July 1908.* Biol. Soc. Liverpool, Proc. Trans., vol. 23, pp. 56-57.

1927. *The littoral fauna of Krusadai Island in the Gulf of Manaar. Hydrozoa, Anthozoa, Scleractiniae.* Madras Govt. Mus., Bull., vol. 1, pp. 7-20, 25-30, 41-51, pls.

1941. *Shells and other animal remains found on the Madras beach. I. Groups other than snails, etc. (Mollusca Gastropoda).* Madras Govt. Mus., Bull., n. s., Nat. Hist. sect., vol. 5, pp. 1-112, figs. [Coelenterates pp. 6-18.]

Gravier, Charles

1902. *Sur les collections d'invertébrés rapportées de la Guyane Française par M. F. Geay.* Mus. Nat. Hist. nat. Paris, Bull., vol. 7, p. 226.

1906a. *Sur les formations coralliennes de l'île San Thomé (Golfe de Guinée).* Acad. Sci. Paris, C. R., vol. 143, pp. 929-931.

1906b. *Sur les formations coralliennes de l'île San Thomé (Golfe de Guinée).* Mus. Nat. Hist. nat. Paris, Bull., vol. 12, pp. 543-547.
1907. *Note sur quelques coraux des récifs du Golfe de Tadjourah.* Mus. Nat. Hist. nat. Paris, Bull., vol. 13, pp. 339-343.
1908a. *Sur un cas de greffe naturelle chez un Madréporaire.* Soc. Biol. Paris, C. R., vol. 64, pp. 859-861.
1908b. *Sur la biologie des Madréporaires du genre Siderastrea Blainville.* Soc. Biol. Paris, C. R., vol. 64, pp. 1081-1082.
1908c. *Sur quelques traits de la biologie des récifs coralliaires.* Soc. Philom. Paris, Bull., sér. 9, vol. 10, pp. 144-162. Also, Rev. Sci. Paris, sér. 5, vol. 10, pp. 385-393.
1909a. *Sur les Madreporaires des îles San-Thomé et du Prince (Golfe de Guinée).* Acad. Sci. Paris, C. R., vol. 148, pp. 1549-1551.
1909b. *Sur un noveau Porites de San Thomé (Golfe de Guinée).* Mus. Nat. Hist. nat. Paris, Bull., vol. 15, pp. 363-365.
1909c. *Sur l'habitat et de polymorphisme de Siderastrea radians (Pallas).* Mus. Nat. Hist. nat. Paris, Bull., vol. 15, pp. 365-368.
1909d. *Madréporaires des iles San Thomé et du Prince (Golfe de Guinée).* Inst. Oceéanogr. Paris, Ann., vol. 1 (1910), No. 2, pp. 1-28, pls. 1-9.
1910. *Sur le rôle des algues calcaires dans les récifs coralliennes.* Assoc. Française Avancem. Sci., C. R., vol. 38, pp. 702, 703.
1910a. *Sur le mode de croissance marginale des colonies de Siderastrea radians (Pallas).* Assoc. Française Avancem. Sci., C. R., vol. 38, pp. 704-705.
1910b. *Sur les Madréporaires de l'Afrique Occidentale.* Assoc. Française Avancem. Sci., C. R., vol. 38, pp. 705-708.
1910c. *Sur les récifs coralliens de la baie de Tadjourah (Golfe d'Aden) et leurs Madréporaires.* Acad. Sci. Paris, C. R., vol. 151, pp. 650-652.
1910d. *Sur la durée de la vie chez les Madréporaires.* Acad. Sci. Paris, C. R., vol. 151, pp. 772-774.
1910e. *Sur la lutte pour l'existence des récifs coralliens.* Acad. Sci. Paris, C. R., vol. 151, pp. 955, 956.
1910f. *Sur le Porites bernardi Gravier.* Mus. Nat. Hist. nat. Paris, Bull., vol. 16, pp. 98-99.
1910g. *Sur quelques formes nouvelles de Madréporaires de la baie de Tadjourah.* Mus. Nat. Hist. nat. Paris, Bull., vol. 16, pp. 273-276.
1910h. *Sur les Madréporaires de la baie Tadjourah (Golfe d'Aden).* Mus Nat. Hist. nat. Paris, Bull., vol. 16, pp. 324-327.
1910i. *Sur le role de Algues calcaires dans les récifs coralliens.* Assoc. Française Advancem. Sci., C. R. (1909), vol. 38, pp. 702-703.
1910j. *Sur quelques particularités biologiques des récifs madréporiques de la baie de Tadjourah.* Assoc. Française Avancem. Sci., C. R., vol. 39, pp. 167-169.
1911a. *Sur quelques animaux parasites ou commensaux de Madréporaires du genre Galaxea Oken.* Acad. Sci. Paris, C. R., vol. 152, pp. 210-212.
1911b. *Les récifs de coraux et les Madréporaires de la baie de Tadjourah (Golfe d'Aden).* Inst. Océanogr. Paris, Ann., vol. 2, pp. 1-96, pls. 1-12, text-figs. 1-6.
1912a. *La vie des coraux.* Biologica Paris, vol. 2, pp. 33-44.
1912b. *Sur les récifs coralliens de la baie de Tadjourah (Golfe d'Aden).* Internat. Zool. Kongr. Jena, Verhandl., vol. 8 (1910), pp. 682-688.
1914a. *Sur un espèce nouvelle de Madréporaire. Deuxième expédition Antarctique Française.* Mus. Nat. Hist. nat. Paris, Bull., pp. 236-238.

1914b. *Madréporaires.* Deuxième Exped. Antarctique Française, 1908-1910, 133 pp., 10 pls.
1915a. *Note préliminaire sur les Madréporaires recueillis au cours des croisières de la "Princess-Alice" et de "l'Hirondelle" de 1893-1913 inclusivement.* Inst. Océanogr. Monaco, Bull., No. 304, 22 pp., figs. 1-11.
1915b. *Sur un phénomène de multiplication par scissiparité longitudinale chez un Madréporaire.* Acad. Sci. Paris, C. R., vol. 160, pp. 103-105. *Sur quelques traits de la biologie des coraux des grandes profondeurs sous-marines,* pp. 380-382.
1916. *Sur les Madréporaires recueillis par S. A. S. Le Prince de Monaco dans les grands profondeurs de l'Atlantique septentrional.* Acad. Sci. Paris, C. R., vol. 162, pp. 268-270.
1920. *Madréporaires provenant des campagnes des yachts Princess-Alice et Hirondellle II (1893-1913). Résultats des Campagnes Scientifiques du Prince de Monaco.* Monaco, No. 55, pp. 1-123, pls. 1-16.

Gray, John Edward
1835. *Characters of two new genera of corals (Errina and Anthophora).* Zool. Soc. London, Proc., pp. 85, 86.
1847. *An outline of an arrangement of stony corals.* Ann. Mag. Nat. Hist., ser. 1, vol. 19, pp. 120-128.
1849. *Descriptions of some new corals, including a new British coral discovered by W. MacAndrews, Esq. F. R. S., etc.* Zool. Soc. London, Proc., pp. 74-77, pl. 2.
1857 *Synopsis of the families and genera of axiferous zoophytes or barked corals.* Zool. Soc. London, Proc., pp. 278-294, pl. 9.
1859. *On the arrangement of zoophytes with pinnated tentacles.* Ann. Mag. Nat. Hist., ser. 3, vol. 4, pp. 439-444.
1870. *Catalogue of Lithophytes or Stony Corals in the Collection of the British Museum.* London, British Mus. (Nat. Hist.), iv + 51 pp., 14 figs.
1872a. *Thouarella antarctica, from the Falkland Islands.* Ann. Mag. Nat. Hist., ser. 4, vol. 9, p. 482.
1872. *Notes on corals from the South and Antarctic Seas.* Zool. Soc. London, Proc., pp. 744-747, pls. 62-64.

Greeff, Richard
1882. *Ueber die Corallenfischerei an de Küste der capverdischen Insel S. Thiago.* Zool. Anzeig., vol. 4, p. 490-491.
1883. *Sur les pêcheries de corail sur la côte de l'île Cap Vert San Jago.* Arch. Zool. Expér. et Génér., ser. 2, vol. 1, p. xxxii.
1886. *Ueber westafrikanische Stylasteriden.* Gesell, Beförd, Gesammt. Naturwissensch. Marburg, Sitzungsber., 11 pp.

Greeley, Arthur W.
1904. *Notes on the corals collected on the northeast coast of Brazil. In* Branner, J. C., *The stone reefs of Brazil.* Mus. Comp. Zool., Bull., vol. 44, pp. 268-275.

Greene, Joseph Reay
1858. *Observations on the distribution of Actinoida, with a list of Irish species recorded.* Natur. Hist. Rev., vol. 5, pp. 35-37.

de Gregorio, Aitonio
1882-84. *Contribuzione ai coralli Giuresi di Sicilia.* Nat. Sicil., vol. 1 (1882), pp. 182-184; vol. 2 (1883), pp. 73-77, 121-126; vol. 3 (1884), pp. 189-192, 243-246, 257-261.
1882a. *Sul Titonio dell'Aquilega e il coralliano delle Madonie. Memoria paleontologica.* Nat. Sicil., vol. 1, pp. 18-24.
1882b. *Fossili dintorni de Fachino.* Palermo, 22 pp., 6 pls.

1890. *Monographie de la faune éocénique de l'Alabama.* Ann. Géol. Paléont., vols. 7-8, 316 pp., 46 pls.
1892. *Intorno a taluni Coelenterati Mediterranei viventi.* Naturalista Siciliano, vol. 12, No. 3, pp. 74-75.
1894a. *Monographie des fossiles éocéniques (Étage Parisien) de Monte Postale.* Ann. Géol. Paléont., vol. 14, 55 pp., 9 pls.
1894b. *Nota su taluni coralli del Terziario Inferiore di Sicilia della formazione delle argile scagliose.* Nat. Sicil. (Gior. Sci. Nat. Palermo), vol. 13, pp. 75, 102-105, pl. 2.
1895. *Coralli Giuresi di Sicilia. Parte quarta.* Nat. Sicil. (Gior. Sci. Nat. Palermo), vol. 14, pp. 123-125.

Gregory, John Walter

1892. *The exploration of coral reefs by borings.* Nat. Sci., vol. 1, No. 1, pp. 50-52.
1895. *Contributions to the paleontology and physical geology of the West Indies.* Geol. Soc. London, Quart. Jour., vol. 51, pp. 255-312, pl. 11, text-figs. 1, 2.
1898a. *A collection of Egyptian fossil Madreporaria.* Geol. Mag., decade 4, vol. 5, No. 6, pp. 241-251, pls. 8, 9.
1898b. *Millestroma, n. g., a Cretaceous milleporid coral from Egypt.* Geol. Mag., decade 4, vol. 5, No. 8, pp. 337-342, 2 pls.
1899a. *New species of Cladophyllia, Prionastrea, and Stylina.* Ann. Mag. Nat. Hist., ser. 7, vol. 4, pp. 457-461, figs.
1899b. *Fossil corals [of Lake Urmi].* Linnean Soc. London, Jour., Zoology, vol. 27, pp. 424-430, pl. 28.
1900a. *On the West Indian species of Madrepora.* Ann. Mag. Nat. Hist., ser. 7, vol. 6, No. 31, art. 3, pp. 20-31.
1900b. *The geology and fossil corals and echinoids of Somaliland.* Geol. Soc. London, Quart. Jour., vol. 56, pp. 26-45, pls. 1, 2.
1900c. *The corals. Jurassic fauna of Cutch.* Palaeont. Indica, ser. 9, vol. 2, pt. 2, pp. 1-195, 26 pls., 4 text-figs.
1900d. *The fossil corals of Christmas Island. In* Andrews, *A Monograph of Christmas Island.* Pp. 205-225, pl. 19.
1900e. *Polytremacis and the ancestry of the Helioporidae.* Roy. Soc. London, Proc., vol. 66, pp. 19, 291-305, pl. 2.
1906. *On a collection of fossil corals from eastern Egypt, Abu Roash and Sinai.* Geol. Mag., decade, 5, vol. 3, pp. 52-58, 110-118, pls. 6, 7.
1921. *Fossil corals from British East Africa. The Rift Valleys and Geology of East Africa.* Pp. 479, 20 pls.
1925. *Fossil corals, in On the collection of fossils and rocks from Somaliland made by Messrs. Wyllie and Smellie.* Glasgow Univ., Geol. Dept. Hunterian Mus., Mon., vol. 1, pt. 4, pp. 22-45, pls. 4-8.
1927. *Some Lower Cretaceous corals from eastern Venezuela.* Geol. Mag. vol. 64, No. 760, pp. 440-444, pl. 13.
1929. *Dendroseries, n. g., and other fossil corals from Trinidad.* Geol. Mag., vol. 66, No. 776, pp. 65-68, pl. 8.
1930a. *The fossil fauna of the Samana Range and some neighbouring areas. Pt. 7. The Lower Eocene corals.* Palaeont. Indica, vol. 15, No. 7, pp. 81-128, 2 pls., 1 fig.
1930b. *The fossil corals of Kenya Colony, collected by Miss McKinnon Wood.* Glasgow Univ., Geol. Dept. Hunterian Mus., Mon., vol. 4, pp. 185-209, 4 pls.
1938. *Second collection of fossil corals from the Kenya coastlands, made by Miss McKinnon Wood.* Glasgow Univ., Geol. Dept. Hunterian Mus., Mon., vol. 5, pp. 90-97, pl. 9, text-fig.

Gregory, J. W., and Trench, J. B.
1916. *Eocene corals from Fly River, Central New Guinea.* Geol. Mag., decade 6, vol. 3, pp. 481-488; 529-536, pls. 19-22.

Gressitt, J. L.
1952. *Description of Kayrangel Atoll, Palau Islands.* Atoll Res. Bull., No. 14, pp. 1-6, 2 charts.

Gressly, A[manz]
1838-41. *Observations géologiques sur les Jura Soleurois.* Schweizer Naturforsch. Gesell., N. Denkschr., vol. 2 (1838), pp. 1-112, pls. 1-5; vol. 4 (1840), pp. 113-245, pls. 6-12; vol. 5, (1841), pp. 246-349, pls. 13, 14.

Grewingk, Constantin Caspar Andreas
1848. *Beitrag zur Kenntniss der geognostischen. Beschaffenheit Californiens.* Russ. K. Min. Gesell. St. Petersburg, Verhandl. 1847, pp. 142-162.

Griffin, L. E.
1913. *The Philippine Marine Biological Station at Port Galera, Mindoro, P. I.* Internat. Rev. Hydrobiol., vol. 6, pp. 325-334.

Grigg, James A.
1888. *Undersogelser over dyrelivet i de vestlandske fjorde. I. Master.* Bergens Mus., Aarsber. 1887, 13 pp. [Coelenterata pp. 12-13.]

Grigg, Richard W.
1965. *Ecological studies of black coral in Hawaii.* Pacific Sci., vol. 19, No. 2, pp. 244-260, figs. 1-11.

Gripp, Karl
1922. *Die Fauna der Oligozänablagerungen am Rande des Kara-Dag nördlich von Öskiib.* Hamburg Univ., Abhandl. Gebiet Ausl., vol. 7, pp. 42-61, pl. 2.
1958a. *Erdgeschichtliche Aussagen der Korallen des nieder-rheinischen Oberoligozäns und Mittel-miozäns.* Fortschr. Geol. Rhein. Westfalen, vols. 1-2, pp. 239-253, pls. 1, 2, text-figs. 1-3.
1958b. *Écologie de quelques Madréporaires de la Méditerranée.* Vie et Millieu, vol. 9, No. 4, pp. 379-411, pls. 1-3.

Grubić, D.
1958. *Prilog stratigrafskom poznavanju visnjickih plavih glina.* Serv. Géol. Serb., Bull., vol. 15, pp. 111-120.

Gruvel, Jean Abel
1923. *Quelques gisements de coraux sur la côte occidentale du Maroc.* Acad. Sci. Paris, C. R., vol. 176, p. 1637.
1927. *Le Port d'Agadir et la région du sous considérées au point de vue de la pêche industrielle.* Faune Colonies Françaises Paris, vol. 1, vii + 28 pp., 6 pls., 7 text-figs., 1 chart.
1931. *Les états de Syrie richesses marines et fluviales exploitation actuelle-avenir. Partie générale et économique.* Faune Colonies Françaises Paris, vol. 3, pp. 1-387, 28 pls.

de Gruyter, J. G.
1944. *Koralen van het Nederlandsche Tertiar.* Leidsche Geol. Meded., vol. 14A, No. 1, pp. 10-39, pls. 1, 2, text-figs.

Guaitani, F.
1944. *Revisione della fauna dei lembi pliocenici delle Prealpi Lombarde.* Riv. Italiana Paleont. Pavia, vol. 50, No. 2, pp. 1-29.

Gualtieri, Niccolo
1742. *Index testarum conchyliorum quae adservantur in Museo N. Gualteri . . . et methodice distributae exhibentur tabulis CX.* Florentiae, 23 pp., 110 pls.

Gudger, E. W.
1941. *Coelenterates as enemies of fishes. IV. Sea anemones and corals as fish eaters.* New England Natural., vol. 10, pp. 1-8, figs.
Guérin-Méneville, Felix Edouard
1829-44. *Iconographie du Règne Animal de G. Cuvier, ou représentation d'après Nature de l'une des espèces les plus remarquables, et souvent non encore figurees, de chaque genre d'animaux. Avec un text.* Paris, 3 vols., 50 Nos.
Guettard, Jean Etienne
1770. *Mémoires sur diferentes parties des sciences et des arts.* Paris, vol. 2, pp. 278-473; vol. 3, pp. 404-536, pls. 1-68.
Guilcher, André
1953. *Problemes et méthodes de l'étude géomorphologique des récifs coralliens.* Soc. Sci. Nancy, Bull., n. s., vol. 12, No. 4, pp. 144-153.
1956. *Étude géomorphique des récifs coralliens du Nord-Ouest de Madagascar.* Inst. Océanogr. Paris, Ann., n. s., vol. 33, No. 2, pp. 65-136, pls. 1-8, text-figs. 1-23.
1959. *Les récifs coralliens à petits lagons multiples de la baie Ramanetaka (côte nord-ouest de Madagascar).* Soc. Géol. France, Bull., sér. 7, vol. 1, No. 4, pp. 337-340, figs. 1-4.
Guiler, Eric R.
1949. *The intertidal ecology of Tasmania.* Roy. Soc. Tasmania, Papers, pp. 135-201, pls. 1-2, text-figs. 1-32.
1951. *The intertidal ecology of Pipe Clay Lagoon.* Roy. Soc. Tasmania, Papers (1950), pp. 29-52, pls. 1, 2, text-figs. 1-8.
1952. *The nature of intertidal zonation in Tasmania.* Roy. Soc. Tasmania, Papers, vol. 86, pp. 31-61.
Gunneris, Johann Ernst
1768. *Om nogle Norske Corallen.* K. Norske Vidensk. Selsk., Skr., vol. 4, p. 38, fig.
Gunter, Gordon
1950. *Seasonal population changes and distributions as related to salinity, of certain invertebrates of the Texas coast, including the commercial shrimp.* Inst. Marine Sci. Univ. Texas, Publ., vol. 1, No. 2, pp. 7-51, figs. 1-8, tables 1-18.
Gunter, Gordon, and Hall, Gordon E.
1963. *Biological investigations of the St. Lucie Estuary (Florida) in connection with Lake Okeechobee discharges through the St. Lucie Canal.* Gulf. Res. Rept., vol. 1, No. 5, pp. 189-307, pls. 1-16, text-figs. 1-4. [Coelenterates p. 289.]
Gunther, Siegmund
1911. *Die Korallenbauten als objekt wissenschaftlicher Forschung in der Zeit vor Darwin.* Akad. Wiss. Munchen, Math-Phys. Kl., Sitzungsber., vol. 40 (1910), No. 4, 42 pp.
Guppy, Henry Brougham
1884a. *The origin of coral reefs.* Nature, vol. 29, pp. 214, 215.
1884b. *Die Enstehung der Korallenriffe.* Kosmos, vol. 1, pp. 211-220.
1884c. *Coral soundings in the Solomon Islands.* Ann. Mag. Nat. Hist., ser. 5, vol. 13, pp. 460-466, 3 figs.
1886. *Notes on the character and mode of formation of the coral reefs of the Solomon Islands.* Roy. Soc. Edinburgh, Proc., vol. 13, pp. 857-904, figs.
1887. *The Solomon Islands: their geology, general features, and suitability for colonization.* London, vii + 152 pp., 2 pls. maps.
1888a. *Coral formations.* Nature, vol. 37, pp. 462, 604.
1888b. *A criticism of the theory of subsidence as explaining the origin of coral reefs.* Scottish Geogr. Mag., vol. 4, pp. 124-137, chart.

1889a. *Coral reefs.* Nature, vol. 40, No. 1020, pp. 53-54; No. 1022, p. 102; No. 1025, pp. 173-174; No. 1027, p. 222.
1889b. *The Cocos-Keeling Islands.* Scottish Geogr. Mag., vol. 5, pp. 281-297, 457-474, 569-588, 5 figs., 1 map.
1890. *The coral reefs of the Java Sea and its vicinity.* Nature, vol. 41, No. 1057, p. 300.

Guppy, R. J. Lechmere
1899. *Note on the discovery of corals in the harbour of Port of Spain.* Victoria Inst., Trinidad, Proc., vol. 3, pp. 168-169.

Gürich, G.
1933. *Die Kuibis-Fossilen der Nama-Formation von Südwestafrika. Nachtrage und Zusätze.* Palaeont. Zeitschr. Berlin, vol. 15, Nos. 2-3, pp. 137-154, figs.

Hada, Yoshine
1932. *A note of the earlier stage of colony formation with the coral Pocillopora caespitosa Dana.* Tôhoku Univ., Sci. Rept. (Contrib. Marine Biol. Sta. Ashamushi, Amori-ken No. 89), ser. 4, vol. 7, No. 3, pp. 425-431.

Haddon, Alfred Cort
1887a. *Preliminary report on the fauna of Dublin Bay.* Roy. Irish Acad., Proc., vol. 4 (1886), pp. 523-531. [Coelenterata pp. 524-528.]
1887b. *First report on the marine fauna of the south-west of Ireland.* Roy. Irish Acad., Proc., vol. 4, pp. 599-638. [Coelenterata pp. 615-618.]
1892. *The newly hatched larva of Euphyllia.* Roy. Soc. Sci. Dublin, Proc., vol. 7, pp. 127-136.

Hadzi, J.
1928. *Knidariji bučate i Slatke vode.* Jugosl. Akad. Znan. Manj. Zagreb, Rad., vol. 234, pp. 246-278, 8 figs.
1929. *Einige allgemein wichtige Resultate meiner Untersuchungen über Coelenterata (s. ampl.).* Internat. Congr. Zool. Budapest, vol. 10, pp. 927-931.

Haeberle, Fred R.
1952. *Coral reefs of the Loyalty Islands.* Amer. Jour. Sci., vol. 250, No. 9, pp. 656-666, figs. 1-4.

Haeckel, Ernst Heinrich Philipp
1866. *Generelle Morphologie der Organismen. Allgemeine Grundzüge der organischen Formen-Wissenschaft, mechanisch begründet durch die von C. Darwin reformirte Descendez-Theorie.* Berlin, 1036 pp., illust.
1876. *Arabische Korallen. Ein Ausflag nach den Korallenbänken des rothen Meeres und ein Blick in das Leben der Korallenthiere.* Berlin, 48 pp., 7 pls., text-figs.
1884. *Neue Gestraeden der Tiefsee mit Caement-Skelet.* Medicin-Naturwiss. Gesell. Jena, Sitzungsber., vol. 17, pp. 84-89.
1896. *Systematische Phylogenie. Entwurf eines naturlichen Systems der Organismen auf Grund ihrer Stammgeschichte. Vol. II. Systematische Phylogenie der wirbellosen Tiere.* Berlin, xviii + 720 pp.

Hagmeir, A.
1951. *Die Nahrung der Meerestiere.* Handbuch Seefisch. Nordeurop., vol. 1, No. 5B, pp. 87-242, pls. 12-21, text-figs. [Coelenterata pp. 91-100.]

Haime, Jules
1850-52. *In* Bellardi, *Catalogue raisonné des fossiles nummulitiques du Comté de Nice.* Soc. Géol. France, Bull., sér. 2, vol. 7, pp. 678, 679; Soc. Géol. France, Mém. sér. 2, vol. 4, pp. 279-290, pl. 22.
1954. *In* d'Archiac, *Coupe géologique des environs des Bains des Rennes (Aude), suivie de la description de quelques fossiles de cette*

localité. Soc. Géol. France, Bull., sér. 2, vol. 11, pp. 185-230, 206-208, pl. 4.

Hall, Thomas Sergeant

1893. *On two new Tertiary stylasterids.* Roy. Soc. Victoria, Proc., vol. 5, pp. 117-122, 1 pl.

1898. *Stylasteridae from the Victorian Tertiaries.* Roy. Soc. Victoria, Proc., vol. 10, pp. 75-179.

1902. *New or little known fossils from the Tertiaries of Victoria.* Roy. Soc. Victoria, Proc., vol. 15, pt. 1, pp. 80-85, pl. 11.

Hamilton, Edwin L.

1956. *Sunken islands of the mid-Pacific mountains.* Geol. Soc. Amer., Mem. 64, pp. i-x, 1-97, pls. 1-13, text-figs. 1-12, tables 1-5. [Coelenterates pp. 57-63, pls. 6, 7.]

Hand, C.

1959. *On the origin and phylogeny of the coelenterates.* Syst. Zool., vol. 8, No. 4, pp. 191-202.

Hanna, G. Dallas

1926. *Expedition to the Revillagigedo Islands, Mexico, in 1925. Part I. General account.* California Acad. Sci., Proc., ser. 4, No. 1, 113 pp., 10 pls.

Hanna, Marcus A.

1927. *An Eocene invertebrate fauna from the La Jolla Quadrangle, California.* Univ. California Publ. Geol. Sci., vol. 16, No. 8, pp. 247-298, pls. 24-57.

Hanzawa, Shoshiro

1931. *Notes on the raised coral reefs and their equivalent deposits in Taiwan (Formosa) and adjacent islets.* Rec. Oceanogr. Works Japan, vol. 3, No. 2, pp. 37-52, pls. 1-10, text-figs. 1-3.

Hanzawa, S., Asano, K., and Takai, F.

1961. *Catalogue of type specimens of fossils in Japan.* Palaeont. Soc. Japan, 25th Anniv. Vol., vi + 422 pp. [Coelenterata pp. 94-119.]

Hardenberg, J. D. F.

1938. *Marine biological fishery problems in the tropics.* Arch. Néerl. Zool., vol. 3, pp. 65-73, figs. 1-3.

Hargitt, Charles W.

1914. *The Anthozoa of the Woods Hole region.* U.S. Bur. Fish., Bull., vol. 32, pp. 225-254, pls. 41-44, text-figs. 1-5.

Harker, P.

1960. *Corals, brachiopods, and molluscs of Grinnell Peninsula.* Geol. Sur. Canada, Mem., vol. 309, pp. 38-89, pls. 11-25.

Harrison, Ruth M.

1910. *Marine fauna from the Kerimba Peninsula, Portuguese East Africa collected by Jas. J. Simpson, M.A., B.Sc., and R. N. Rudmose-Brown, B.Sc., University of Aberdeen: Madreporaria.* Zool. Soc. London, Proc., pp. 913-917.

1911. *Some Madreporaria from the Persian Gulf. With a note on the memoir and some further notes on Pyrophyllia inflata by Sydney J. Hickson, M.A., D.Sc., F.R.S.* Zool. Soc. London, Proc, pp. 1018-1044, pls. 57, 58, text-figs 216-221

Harrison, Ruth M., and Poole, Margaret

1909a. *Marine fauna from the Mergui Archipelago, lower Burmah, collected by Jas. J. Simpson and R. N. Rudmose-Brown. Madreporaria.* Zool. Soc. London, Proc., pp. 897-912, pls. 85, 86.

1909b. *Marine fauna from the Kerimba Archipelago, Portuguese East Africa, collected by Jas. J. Simpson and R. N. Rudmose-Brown.* Zool. Soc. London, Proc., pp. 913-917.

Hartlaub, Clemens

1896-97. *Die Coelenteraten Helgolands.* Wiss. Meeresuntersuch. Deutsch. Meere Kiel, vol. 1, pp. 161-206; vol. 2, pp. 449-536 (1897).

Hartman, Olga

1955. *Quantitative survey of the benthos of San Pedro Basin, Southern California. Part I. Preliminary results.* Allan Hancock Pacific Exped., vol. 19, No. 1, pp. 1-150, 9 pls.

1960. *Systematic account of some marine invertebrate animals from the deep basins off Southern California.* Allan Hancock Pacific Exped., vol. 22, No. 2, pp. 69-215. [Coelenterates pp. 76-77.]

Hartman, Olga, and Bernard, S. L.

1960. *The benthic fauna of deep basins off Southern California: continued studies in the seaward and deeper basins.* Allan Hancock Pacific Exped., vol. 22, No. 2, pp. 217-297, chart. [Coelenterate list p. 283.]

Hartman, Olga, and Emery, Kenneth O.

1956. *Bathypelagic coelenterates.* Limnol. and Oceanogr., vol. 1, No. 4, pp. 304-312, pls. 1-4, text-figs. 1-3.

Hartmeyer, Robert

1909. *Die westindischen Korallenriffe und ihr Tierleben.* Meereskunde Berlin, Jahrg. 3, No. 2, pp. 1-40, pls. 1, 2, text-figs. 1-9.

den Hartog, J. C.

1961a. *Die faunistiche Gliederung im südwest-niederländischen Deltagebiet.* Internat. Rev. Hydrobiol., vol. 46, No. 3, pp. 407-418, figs. 1-5.

1961b. *Einige aantikeningen over Actinia equina (L.) de Gewone zeeanemoon.* Levende Nat., vol. 64, No. 12, pp. 280-285, figs. 1, 2.

Hartt, Charles Frederick

1870. *Geology and physical geology of Brazil.* Boston, 620 pp., illustr., maps. [Corals pp. 187-214.]

Hartung, Georg

1860. *Die Azoren in ihrer äusseren Erscheinung und nach ihrer geognostischen Natur. Mit Reschreibung der fossilen Reste, von Prof. H. G. Bronn.* Leipzig, viii + 350 pp., 19 pls., map.

1864. *Geologische Beschreibung der Inseln Madeira und Porto Santo. Mit dem systematischen Verzeichnisse der fossilen Reste dieser Inseln un der Azoren von Karl Meyer.* Lipzig, x + 298 pp., 16 pls., map.

Hashimoto, Wataru

1939. *Stratigraphy of the Philippines.* [Japanese with English summary.] Jubilee Publ. Comm. 60th Birthday Prof. H. Yabe, vol. 1, pp. 381-426.

Haskell, D. C.

1942. *The United States Exploring Expedition, 1838-42, and its publications, 1844-1874.* New York State Libr., N.Y., i-xii, 1-188 pp., frontisp., 4 pls.

Hassan, M. Y.

1953. *Tertiary faunas from Kap Brewster, East Greenland.* Medd. Grønland, vol. 111, No. 5, pp. 1-42, pls. A-E, text-fig. [Coral p. 14.]

Hatae, Nobuhiro

1960. *The geology and the geological structure of Amakusa-shino-shina, Kumanoto Prefecture.* [In Japanese with English resume.] Kagoshima Univ., Sci. Rept., No. 9, pp. 61-107, text-figs. 1-5, 7-45, map.

Hatai, Kotora, and Hayasaka, Shozo

1955. *Significance of the Pleistocene marine fauna of the Jizodo Forma-*

tion, Chiba Prefecture. Tokyo Kijiku Daigaku, Sci. Rept., vol. 4C, No. 26, pp. 1-6.

Hatai, S.

1940. *Results of coral studies at the Palao Tropical Biological Station.* Sixth Pacific Sci. Congr. San Francisco, Proc., vol. 3, pp. 599-603.

Hawelka, V.

1930. *Geologische Reiseskizzen aus der Hercegovina, Südostbosnien und dem angrenbenden Teile der Crna Gora (Montenegros).* Glas. Zem. Mus. Bosn. Herc., vol. 42, pp. 1-55, figs.

Hawks, Francis Lister

1856. *Narrative of the Perry Expedition of an American squadron to the China Seas and Japan . . . in . . . 1852-54, under the command of Commodore M. C. Perry . . . compiled . . . by F L. Hawks.* Washington, 3 vols., vii + 624 pp., 76 pls., 9 maps, text-figs.

Hayasaka, Ichiro

1931a. *On the reef building corals in the Bay of Suo, Taihoku Prefecture, Taiwan.* [In Japanese.] Taiwan Tigaku Kizi, vol. 2, Nos. 5-8, pp. 65-67.

1931b. *Fossil occurrences of some commensal solitary corals in Taiwan. A preliminary note.* [Japanese with English summary.] Taiwan Tigaku Kizi, vol. 2, Nos. 5-8, pp. 67-70.

1932a. *A supplementary note to the occurrence of Heteropsammia and Heterocyathus in Taiwan.* Taiwan Tigaku Kizi, vol. 3, No. 1, p. 7. [Japanese.]

1932b. *An astraciform coral from central Japan.* Geol. Mag., vol. 69, No. 6, pp. 273-275, 2 figs.

Hayasi, Kazumasa

1937. *On the detection of calcium in the calicoblasts of some reef corals.* Palao Trop. Biol. Sta., Studies, vol. 2, pp. 169-176, pls. 1-3, text-figs. 1-6.

Hayes, C. W., Vaughan, T. W., and Spencer, A. C.

1901. *Report on geological reconnaissance of Cuba. In* Cuba. Civil Report of Leonard Wood, military governor of Cuba, Jan. 1-Dec. 31, 1901. Havana [1903], 123 pp., 35 pls., 10 maps.

Heape, Walter

1888. *Preliminary report upon the fauna and flora of Plymouth Sound.* Marine Biol. Assoc. Plymouth, Jour., vol. 2, pp. 153-193. [Coelenterata pp. 165-167.]

Hedgpeth, Joel Walker

1953. *An introduction to the zoogeography of the northwestern Gulf of Mexico with reference to the invertebrate fauna.* Inst. Marine Sci. Univ. Texas, Publ., vol. 3, No. 1, pp. 107-224, figs.

1957. *Treatise on marine ecology and paleoecology. Vol. 1. Ecology.* Geol. Soc. Amer., Mem. 67, pp. 1-1296, pls., text-figs., tables.

1964. *Introduction to seashore life of the San Francisco Bay region.* California Nat. Hist. Guides, vol. 9, pp. 1-136, pls. 1-8, text-figs. [Coelenterata pp. 48-56.]

Hedley, Charles

1896. *General account of the Atoll of Funafuti.* Australian Mus. Sydney, Mem., vol. 3, pp. 1-71.

1898. *The broadening of atoll-islets.* Nat. Sci. London, vol. 12, p. 174.

1924. *The Great Barrier Reef of Australia.* Nat. Hist., vol. 24, pp. 62-69, figs.

1925a. *The natural destruction of a coral reef.* Roy. Geogr. Soc. Australasia, Trans., vol. 1, pp. 35-40, 1 pl., 1 text-fig.

1925b. *The surface temperature of Moreton Bay.* Roy. Geogr. Soc. Australasia, Trans., vol. 1, pp. 149-150.

1925c. *Coral shingle as a beach formation.* Roy. Geogr. Soc. Australasia, Trans., vol. 1, p. 66.

1926a. *Recent studies in the Great Barrier Reef of Queensland.* Amer. Jour. Sci., ser. 5, vol. 11 (211), No. 63, pp. 187-193.

1926b. *The biology of North-West Islet, Capricorn Group. G. Corals.* Austral. Zool., vol. 24, pp. 249-250.

Hedley, Charles, and Taylor, T. Griffith

1908. *Coral reefs of the Great Barrier, Queensland: a study of their structure, life-distribution, and relation to mainland physiography.* Australian Assoc. Adv. Sci., vol. 11, pp. 397-413, 3 pls., 6 text-figs.

Hegedus, G.

1962. *Coralliaires Oligocènes de la Hongrie.* [Hungarian with French and Russian summaries.] Ungar. Geol. Anst., Jahresber. 1959, pp. 231-261, pls. 1-3.

Heicke, A.

1904. *Ein Beitrag zur Kenntniss der Weichteile der Madreporarier.* Arch. f. Naturgesch. Berlin, vol. 1, pp. 253-296, pl. 12.

von Heider, Arthur

1881. *Die Gattung Cladocora Ehrenberg.* K. Akad. Wiss. Wien, Sitzungsber., vol. 84, pp. 634-667, pls. 1-4.

1886. *Korallenstudien.* Zeitschr. Wiss. Zool., vol. 44, pp. 507-535, pls 30, 31.

1891. *Korallenstudien. II. Madracis pharensis Heller.* Zeitschr. Wiss. Zool., vol. 51, pp. 315-322, pl. 34.

Heilprin, Angelo

1888a. *The Animal Life on our Sea-shore. With special reference to the New Jersey coast and the southern shore of Long Island.* Philadelphia, 130 pp., 8 pls.

1888b. *Contribution to the natural history of the Bermuda Islands.* Acad. Nat. Sci. Philadelphia, Proc., vol. 40, pp. 302-328, pls. 14-16. [Coelenterata pp. 303-309.]

1889. *The Bermuda Islands: A contribution to the physical history and zoology of the Somers Archipelago, with an examination of the structure of coral reefs.* Acad. Nat. Sci. Philadelphia, 230 pp., 17 pls.

1890. *The corals and coral reefs of the western waters of the Gulf of Mexico.* Acad. Nat. Sci. Philadelphia, Proc., vol. 42, pp. 303-316, pls. 6, 7 (charts).

1891. *Rate of coral growth [Porites astraeoides].* Acad. Nat. Sci. Philadelphia, Proc., vol. 43, p. 75.

Hela, I., Moore, H. B., and Owre, H.

1953. *Seasonal changes in the surface water masses and in their plankton in the Bermuda area.* Bull. Marine Sci. Gulf and Caribbean, vol. 3, No. 3, pp. 157-167, figs. 1-10.

Heller, Camil

1868. *Die Zoophyten und Echinodermen des Adriatischen Meeres.* Zool.-Botan. Verhandl. Wien., vol. 18, pp. 1-88, pls. 1-3.

Hennig, B.

1937. *Korallenpilze.* Natur u. Volk, vol. 67, No. 10, pp. 499-502, figs. 1-4.

Henriques da Silva, G.

1958a. *La faune Miocène de l'Ile du Prince.* 20th Internat. Geol. Congr. 1956, sect. 7, Paleont., Taxon. y Evol., pp. 153-172. [Coelenterates p. 154.]

1958b. *Contribution à la connaissance de la faune fossile de l'Ile de Porto Santo.* 20th Internat. Geol. Congr. 1956, Sect. 7, Paleont., Taxon. y Evol., pp. 361-363. [Coelenterates p. 362.]

Hensen, Victor Andreas Christian

1887. *Ueber die Bestimmung des Plankton's oder des im Meer treibenden Materials an Pflanzen und Thieren.* Komm. Untersuch. Deutschen Meere, Ber., pp. 1-109, 6 pls.; Anhang, 19 pp., 8 tables.

Henson, F. R. S.

1950. *Cretaceous and Tertiary reef formations and associated sediments in Middle East.* Amer. Assoc. Petrol. Geol., Bull., vol. 34, No. 2, pp. 215-238, figs. 1-14.

Herdman, William Abbott

1891. *Biological results of the "Argo" cruise.* Liverpool Biol. Soc., Proc., vol. 5, pp. 198-200 [Coelenterata].

1893. *Notes on the collections made during the cruise of the S. Y. "Argo" up the west coast of Norway in July, 1891.* Liverpool Biol. Soc., Proc., vol. 6, p. 89 [Coelenterata].

1895. *Marine zoology of the Irish Sea.* Liverpool Biol. Soc., Proc., vol. 9, p. 41.

1901. *Dredging operations.* Liverpool Biol. Soc., Trans., vol. 15, pp. 24-30 [Coelenterata].

1902a. *Fifteenth annual report on the Liverpool Marine Biology Committee and their biological station at Port Erin.* Liverpool Biol. Soc., Proc., vol. 16, pp. 27-66.

1902b. *Guide to the Port Erin Aquarium.* Liverpool Biol. Soc., Proc., vol. 16, pp. 72-78 [Coelenterata], 4 figs.

1919. *The Marine Biological Station at Port Erin, being the thirty-second annual report of the Liverpool Marine Biological Committee.* Liverpool Biol. Soc., Proc. Trans., vol. 33, pp. 25-62.

Herman, William Abbot, Scott, Andrew, and Johnstone, James

1913. *Report on the investigations carried on during 1912, in connection with the Lancashire Sea-Fisheries Laboratory, at the University of Liverpool, and the Sea-Fish Hatchery at Piel, near Barrow.* Liverpool Biol. Soc., Proc. Trans., vol. 27, pp. 177-494.

Herrick, Francis Hobart

1889. *Walks under the sea by a coral strand.* Amer. Natural., vol. 23, No. 275, pp. 941-956

Hertlein, Leo G.

1957. *Pliocene and Pleistocene fossils from the southern portion of the Gulf of California.* Southern California Acad. Sci., Bull., vol. 56, pt. 2, pp. 57-75, pl. 13.

1963. *Contribution to the biogeography of Cocos Island, including a bibliography.* California Acad. Sci., Proc., ser. 4, vol. 32, No. 8, pp. 219-289, figs. 1-4. [Coelenterata pp. 230-232.]

Hertlein, L. G., and Grant, U. S., IV

1960. *The geology and paleontology of the marine Pliocene of San Diego, California.* San Diego Soc. Nat. Hist., Mem., vol. 2, No. 2A, pp. 71-133, pls. 19-26. [Corals pp. 77-84.]

Hertlein, L. G., and Emerson, W. K.

1956. *Marine Pliocene invertebrates from near Puerto Penasco, Sonora, Mexico.* San Diego Soc. Nat. Hist., Trans., vol. 12, No. 8, pp. 154-176, pl. 12.

1957. *Additional notes on the invertebrate fauna of Clipperton Island.* Amer. Mus. Novitates, No. 1859, pp. 1-9, fig. 1.

Hesse, R., Allee, W. L., and Schmidt, K. P.

1937. *Ecological Animal Geography.* New York and London, xiv + 597 pp., 133 figs.

Hiatt, R. W.

1951. *Marine ecology.* Atoll Research Bull., No. 2, pp. 5-6

1957. *Factors influencing the distribution of corals on the reefs of Arno Atoll, Marshall Islands.* Eighth Pacific Sci. Congr., Proc., vol. 3A, pp. 929-970, figs. 1-12.

Hickson, Sydney John

1883a. *On the ciliated groove (siphonoglyphe) in the stomadaeum of the Alcyonarians.* Roy. Soc. London, Philos. Trans., vol. 174, No. 3, pp. 693-705, pls. 50, 51.

1883b. *The structure and relations of Tubipora.* Quart. Jour. Microsc Sci., vol. 23, pp. 556-577, pls. 39, 40.

1886. *Preliminary notes on certain zoological observations made at Talisee Island, North Celebes.* Roy. Soc. London, Proc., vol. 40, pp. 322-325.

1887. *On the sexual cells and the early stages in the development of Millepora plicata.* Roy. Soc. London, Proc., vol. 43, pp. 245-247.

1888a. *On the sexual cells and early stages in the development of Millepora plicata.* Roy. Soc. London, Philos. Trans., vol. 179B, pp. 193-204, pls. 38, 39.

1888b. *Theories of coral reefs and atolls. An address delivered before Section D of the British Association at Bath 1888.* Oxford, 16 pp.

1889a. *Over voortplantingsorganen van de Milleporiden.* Nederland. Dierk. Vereen., Tijdschr., vol. 2, No. 3, pp. 36-37.

1889b. *A Naturalist in North Celebes.* London, 357 pp., 35 figs. 2 maps.

1890a. *The affinities of Heliopora caerulea.* Nature, vol. 42, p. 370.

1890b. *On the maturation of the ovum and the early stages in the development of Allopora.* Quart. Jour. Microsc. Sci., vol. 30, No. 4, pp. 519-598, 1 pl., 2 text-figs.

1890c. *On the meaning of the ampullae in Millepora murrayi.* British Assoc. Adv. Sci., Rept., pp. 863-864.

1890d. *On the male gonangia of Allopora and Distichopora.* British Assoc. Adv. Sci., Rept., p. 864.

1890e. *Preliminary report on a collection of Alcyonaria and Zoantharia from Port Phillip.* Roy. Soc. Victoria, Proc., pp. 136-140.

1891a. *The medusae of Millepora murrayi and the gonophores of Allopora and Distichopora.* Microsc. Soc. London, Quart. Jour., vol. 32, No. 3, pp. 375-407, 2 pls.

1891b. *The medusae of Millepora and their relations to the medusiform gonophores of the Hydromedusae.* Cambridge Philos. Soc., Proc., vol. 7, pp. 147-148.

1891c. *Animal life on a coral reef.* Nature, vol. 44, No. 1126, pp. 90-91.

1892a. *Preliminary notes of observations on the anatomy and habits of Alcyonaria.* Cambridge Philos. Soc., Proc., vol. 7, No. 6, pp. 305-308.

1892b. *Notes on a small collection of Hydrocorallinae.* Roy. Dublin Soc. Sci., Proc., vol. 7, pp. 496-510, 3 pls.

1892c. *Note on the female gonophores of Errina labiata.* Zool. Anzeig., vol. 15, No. 394, pp. 237-238.

1897. *On the ampullae in some specimens of Millepora in the Manchester Museum.* Manchester Lit. Philos. Soc., Mem. Proc., vol. 41, No. 2, 4 pp.

1898a. *On the species of the genus Millepora: a preliminary communication.* Zool. Soc. London, Proc., pp. 246-257.

1898b. *Notes on the collection of specimens of the genus Millepora obtained by Mr. Stanley Gardiner at Funafuti and Rotuna.* Zool. Soc. London, Proc., pp. 828-833.

1898c. *Did Millepora occur in Tertiary times?* Zool. Anzeig., vol. 21 pp. 70-71.

1898d. *Crab-gall on Millepora.* Liverpool Mus., Bull., vol. 1, pp. 81-82, 1 fig.
1899a. *Report on the specimens of the genus Millepora collected by Dr. Willey. In* Willey, Arthur, *Zoological results based on material from New Britain, New Guinea, Loyalty Islands and elsewhere, collected during . . . 1895, 1896, and 1897.* Pt. 2, Pp. 121-132, pls. 12-16.
1899b. *The medusae of Millepora.* Roy. Soc. London, Proc., vol. 66, pp. 3-10, figs. 1-10.
1900. *The Alcyonaria and Hydrocorallinae of the Cape of Good Hope.* Marine Investig. South Africa, vol. 1, No. 5, pp. 67-96, 6 pls.
1901a. *Classification of Hydrozoa. In* Delage, Y., and Hérouard, E., *Traité de Zoologie Concrète. Les Coelentérés.* Paris, vol. 2, pt. 2, 153 pp.
1901b. *Alcyonium.* Liverpool Biol. Soc., Trans., vol. 15, pp. 92-113, 3 pls.
1903. *The Alcyonaria and Hydrocorallinae of the Cape of Good Hope.* Cape of Good Hope, Dept. Agric., Marine Invest. South Africa, vol. 1, 67 pp.
1905a. *The Alcyonaria of the Maldives. Part III.* Fauna and Geography of the Maldive and Laccadive Archipelagoes, vol. 2, No. 4, pp. 808-826, pl. 67.
1905b. *The Alcyonaria of the Cape of Good Hope. Part III.* Marine Investig. South Africa, vol. 3, pp. 211-239, 3 pls.
1905c. *On a new species of Corallium from Timor.* K. Akad. Wetensch., Verslag en Meded., Afd. Natuurk. [Roy. Acad. Sci. Amsterdam, Proc.], vol. 8, pp. 268-271.
1905d. *Precious corals.* Microsc. Soc. Manchester, Trans., pp. 29-38.
1905e. *Remarkable Coelenterata from the west coast of Ireland.* Nature, vol. 73, No. 1879, p. 5.
1906a. *Notes on the maturation of Alcyonium digitatum.* Quart. Jour. Microsc. Sci., vol. 49, pp. 493-505.
1906b. *Coelenterata and Ctenophora.* The Cambridge Natural History, vol. 1, pp. 243-424, figs. 124-184.
1907a. *Coelenterata. I. Alcyonacea.* Nat. Antarctic Exped. 1901-1904, Nat. Hist., vol. 3 (Zoology and Botany), pp. 1-15, 2 pls.
1907b. *Die Alcyoniden der Siboga-Expedition. I. Coralliidae.* Siboga-Exped., Livr. 35, Mon. 13c, pp. 1-7, 1 pl.
1907c. *Note on Caligorgia flabellum from Port Philip, Melbourne.* Roy. Soc. Victoria, Proc., vol. 19, p. 46.
1907d. *The Alcyonaria, Antipatharia and Madreporaria collected by the "Huxley" from the north side of the Bay of Biscay in August 1906.* Marine Biol. Assoc. Plymouth, Jour., vol. 8, pp. 6-14.
1907e. *The differentiation of species of Coelenterata in the shallow-water seas.* Microsc. Soc. Manchester, Trans. 1906, pp. 25-36.
1910. *On a new octoradiate coral, Pyrophyllia inflata (new genus and species).* Manchester Lit. Philos. Soc., Mem. Proc., vol. 54, pp. 1-7, 4 figs.
1911a. *On Ceratopora, the type of a new family of Alcyonaria.* Roy. Soc. London, Proc., vol. 84, pp. 195-200, pl. 6.
1911b. *On a specimen of Osteocella septentrionalis (Gray).* Manchester Lit. Philos. Soc., Mem. Proc., vol. 55, pp. 1-15.
1912a. *Change in the name of a genus of Alcyonaria.* Zool. Anzeig., vol. 40, p. 351.
1912b. *On the hydrocoralline genus Errina.* Zool. Soc. London, Proc., pp. 876-896, pls. 94-96.
1912c. *Notes on some Stylasterina in the Muséum d'Histoire Naturelle de Paris.* Mus. Nat. Hist. nat. Paris, Bull., pp. 461-466, 1 pl.

1915. *Some Alcyonaria and a Stylaster from the west coast of North America.* Zool. Soc. London, Proc., pp. 541-557, pl. 1, text-figs. 1-5.
1916. *The Pennatulacea of the Siboga Expedition, with a general survey of the order.* Siboga-Exped., Livr. 77, Mon. 14, pp. i-x, 1-265, pls. 1-10, map.
1921. *On some Alcyonaria in the Cambridge Museum.* Cambridge Philos. Soc., Proc., vol. 20, pp. 366-373, text-figs.
1922a. *On two sea-pens from West Australia. The Percy Sladen Trust Expedition to the Abrolhos Islands (Indian Ocean).* Linnean Soc. London, Jour., Zoology, vol. 35, pp. 21-23.
1922b. *On two specimens of Endopachys from the Persian Gulf.* K. Zool. Genootsch., Natura Artis Magistra Amsterdam, vol. 22, pp. 155-160, text-figs.
1922c. *Black coral.* Nature, vol. 110, pp. 217-218.
1924. *An introduction to the study of recent corals.* Univ. Manchester, Publ. No. 163, pp. i-xvi, 1-257, 110 figs.
1928. *Papers from Dr. Th. Mortensen's Pacific Expedition 1914-1916. XLVII. The Gorgonacea of Panama Bay together with a description of one species from the Galapagos Islands and one from Trinidad.* Dansk Naturhist. Foren. København, Vidensk. Meddel., vol. 85, pp. 325-422, pls. 4-6, text-figs. 1-37.
1930a. *Some alcyonarians from the Eastern Pacific Ocean.* Zool. Soc. London, Proc., pp. 209-227, 3 pls. 4 text-figs.
1930b. *On the classification of the Alcyonaria.* Zool. Soc. London, Proc., pp. 229-252, 2 figs.
1931. *The alcyonarian family Xeniidae, with a revision of the genera and species.* Great Barrier Reef Exped. 1928-29, Sci. Rept., vol. 4, No. 5, pp. 137-179, 2 pls., 5 text-figs.
1932. *Gorgonacea.* Great Barrier Reef Exped. 1928-29, Sci. Rept., vol. 4, No. 13, pp. 459-511, figs. 1-20.
1937a. *The family Melitodidae.* Zool. Soc. London, Trans., vol. 23, pp. 74-212, pl. 14, text figs.
1937b. *The Pennatulacea.* John Murray Exped. 1933-34, Sci. Rept., vol. 4, No. 5, pp. 109-130, 2 figs.
1938. *An alcyonarian from the Eocene of Mississippi.* Washington Acad. Sci., Jour., vol. 28, No. 2, pp. 49-51, text-figs.
1940a. *The Gorgonacea with notes on two species of Pennatulacea.* John Murray Exped. 1933-34, Sci. Rept., vol. 6, pp. 267-317, pl. 1, text-figs.
1940b. *The species of the genus Acabaria in the Red Sea.* Marine Biol. Sta. Ghardaqa (Red Sea), Publ., vol. 2, pp. 3-22, pls. 1, 2, text-figs.

Hickson, Sydney J., and England, Helen Mary
1905. *The Stylasterina of the Siboga Expedition.* Siboga-Exped., vol. 5, Livr. 19, Mon. 8, 26 pp., 3 pls.
1909. *The Stylasterina of the Indian Ocean.* Linnean Soc. London, Trans., ser. 2, vol. 12, Zoology, pp. 345-354, pl. 44.

Hickson, Sydney J., and Hiles, I. L.
1900. *The Stolonifera and Alcyonacea collected by Dr. Willey in New Britain. In* Willey, A., *Zoological results based on material from New Britain . . . and elsewhere . . . collected during . . . 1895, 1896, and 1897, pt. 4.* Pp. 493-508, pls. 50, 51.

Hill, Dorothy
1935. *British terminology for Rugose corals.* Geol. Mag., vol. 72, No. 857, art. 11, pp. 481-519, text-figs. 1-21.
1956. *Rugosa. In* Moore, R. C., *Treatise on Invertebrate Paleontology.* Lawrence, Univ. Kansas Press, *pt. F, Coelenterata,* pp. F233-F324

text-figs. 165-219; *Heterocorallia*, pp. F324-F327, text-figures 220, 221; *Zoantharia Incertae Sedis*, p. F477.
1960. *Possible intermediates between Alcyonaria. Tabulata, Tabulata and Rugosa, and Rugosa and Hexacoralla.* Twenty-first Internat. Geol. Congr., Rept., vol. 22, pp. 51-58.

Hill, Dorothy, and Edwards, A. B.
1941. *Note on a collection of fossils from Queenstown, Tasmania.* Roy. Soc. Victoria, New South Wales, Proc., n. s., vol. 53, No. 1, pp. 222-230, pl. 7.

Hill, D., and Jull, R. K.
1965. *Note on Campophyllum flexuosum (Goldfuss).* Geol. Mag., vol. 102, No. 3, pp. 206-212, pl. 7.

Hill, Dorothy, and Stumm, Erwin C.
1956. *Tabulata. In* Moore, R. C., *Treatise on Invertebrate Paleontology.* Lawrence, Univ. Kansas Press. *pt. F, Coelenterata,* pp. F444-F476, text-figs. 340-357.

Hill, Dorothy, and Wells, John W.
1956. *Cnidaria-general features. In* Moore, R. C., *Treatise on Invertebrate Paleontology.* Lawrence, Univ. Kansas Press, *pt. F, Coelenterata,* pp. F5-F9, text-figs. 2-5; *Hydrozoa-general features,* p. F67; *Hydroida and Spongiomorphida,* pp. F81-F89, text-figs. 65-74.

Hill, Robert Thomas
1894. *Notes on the Tertiary and later history of the island of Cuba.* Amer. Jour. Sci., ser. 3, vol. 48 (148), No. 285, art. 28, pp. 196-212.
1895 *Notes on the geology of Cuba based upon a reconnaissance made for Alexander Agassiz.* Mus. Comp. Zool., Bull., vol. 16, pp. 243-288, 9 pls.
1898a. *Cuba and Porto Rico, with the other islands of the West Indies; their topography, climate, flora, products, industries, cities, people, political conditions, etc.* New York, xxvii + 429 pp., pls., maps.
1899. *The geology and physical geography of Jamaica.* Mus. Comp. Zool., Bull., vol. 34, pp. 1-226.

Hill, William
1891. *On the minute structure of some coral limestones from Barbados.* Geol. Soc. London, Quart. Jour., vol. 47, pp. 243-250.

Hilly, J.
1963. *Étude géologique du massif de l'Edough et du Cap de Fer (Est Constantinois).* Serv. Carte Géol. Alger, Bull., n. s., vol. 19 (1962), pp. 1-408, pls. 1-25, text-figs 1-109.

Hilton, W. A.
1916. *Notes on coelenterates and echinoderms from Laguna Beach.* Jour. Entom. Zool. Claremont, California, vol. 8, pp. 88-93.
1961. *A skeleton of stony coral from the Great Barrier Reef, Australia.* Science, vol. 133, No. 3479, fig. on cover.

Hinde, George Jennings
1888. *On the history and characters of the genus Septastraea d'Orbigny (1849), and the identity of its type species with that of Glyphastraea, Duncan (1887).* Geol. Soc. London, Quart. Jour., vol. 44, pp. 200-227, pl. 9.
1890. *Notes on the palaeontology of Western Australia. II. Corals and Polyzoa.* Geol. Mag., decade 3, vol. 7, pp. 194-204, 2 pls. [Corals pp. 194-199.]
1905. *Report on materials from the borings at Funafuti Atoll. Corals. Atoll of Funafuti.* Roy. Soc. Rept. 1904, pp. 186-361.

Hirata, K.

1956. *Ecological studies on the Recent and raised coral reefs in Yoron Island.* Kagoshima Univ., Sci. Rept., No. 5, pp. 97-118, pls. 1-5, text-figs. 1-3.

1958. *Ecological studies on the Recent and raised coral reefs in Yoron Island. II.* Kagoshima Univ., Sci. Rept., No. 7, pp. 69-84, pls. 1-10, text-figs. 1-3.

Hiro, Fugio

1938. *Studies on the animals inhabiting reef corals. II. Cirripeds of the genera Creusia and Pyrgoma.* Palao Trop. Biol. Sta., Studies, vol. 1, No. 3, pp. 391-416, 1 pl., 13 text-figs.

Hobson, A. D.

1949. *Marine fauna.* Scientific Survey of Northeast England, 1949, pp. 42-45.

Hoffmeister, John Edward

1925. *Some corals from American Samoa and the Fiji Islands.* Carnegie Inst. Washington, Publ. No. 343, Papers Dept. Marine Biol., vol. 22, pp. i-iv, 1-90, pls. A, 1-23.

1926. *The species problem in corals.* Amer. Jour. Sci., ser. 5, vol. 12 (212), No. 68, pp. 151-156.

1929. *Some reef corals from Tahiti.* Washington Acad. Sci., Jour., vol. 19, pp. 357-365, 2 pls.

1932. *Geology of Eua, Tonga.* Bernice P. Bishop Mus. Honolulu, Bull., vol. 96, 93 pp., 22 pls., 5 text-figs., 5 tables.

1933. *Report on deep-sea corals, obtained by F. I. S. "Endeavour" on the coasts of New South Wales, Victoria, South Australia, and Tasmania.* Australian Dept. Trade and Customs. Fisheries. Biol. Res. Fishing Experiments F. I. S. "Endeavour" 1909-14, Rept., vol. 6, No. 1, pp. 1-16, pls. 1-4, text-figs.

1934. *Fossil corals from Viti Levu, Fiji.* Bernice P. Bishop Mus. Honolulu, Bull., vol. 119, pp. 154-157.

1940. *James Dwight Dana's studies of volcanoes and of coral islands.* Amer. Philos. Soc., Trans., vol. 82, No. 5, pp. 721-732.

Hoffmeister, John Edward, and Multer, H. Gray

1964. *Growth-rate estimates of a Pleistocene coral reef of Florida.* Geol. Soc. Amer., Bull., vol. 75, No. 4, pp. 353-358, pls. 1, 2, text-fig. 1.

Hoffmeister, John Edward, and Ladd, Harry S.

1935. *The foundation of atolls: A discussion.* Jour. Geol., vol. 43, No. 6, pp. 653-665.

1945. *Geology of Lau, Fiji.* Bernice P. Bishop Mus. Honolulu, Bull., No. 181, 399 pp., 62 pls., 40 text-figs., sketch maps.

Holsworth, Edmund William Hunt

1862a. *Descriptions of two new species of corals belonging to the genus Flabellum.* Zool. Soc. London, Proc., pp. 198-199, pl. 28.

1862b. *On the occurrence of Caryophyllia clavus on the coasts of Britain, with some remarks of the circumstances affecting the distribution of corals around the British Islands.* Zool. Soc. London, Proc., pp. 199-202.

Holme, N. A.

1950. *The bottom fauna of Great West Bay.* Marine Biol. Assoc. Plymouth, Jour., vol. 29, No. 1, pp. 163-183, tables, 1-10.

1961. *The bottom fauna of the English Channel.* Marine Biol. Assoc. Plymouth, Jour., vol. 41, No. 2, pp. 397-461, 15 figs.

Holwill, F. J. W.

1963. *A note on the mode of attachment and growth of the coral Metriophyllum gracile Schlüter.* Geol. Mag., vol. 100, No. 6, pp. 503-506 pl. 33, text-figs. 1, 2.

1964. *The coral genus Metriophyllum Edwards and Haime.* Paleontology, vol. 7, No. 1, pp. 108-123, pls. 16-19, text-figs. 1-6.

Horn, George H.

1860. *Descriptions of new corals in the museum of the Academy.* Acad. Nat. Sci. Philadelphia, Proc., vol. 12, p. 435.

Horne, John

1881. *A Year in Fiji, or an inquiry into the botanical, agricultural, and economical resources of the colony.* London, iv + 297 pp., map.

van der Horst, C. J.

1919. *A new species of Fungia.* R. Mus. Nat. Hist. Leiden, Zool. Meded. vol. 5, No. 2, pp. 65-66, pl. 1.

1921. *The Madreporaria of the Siboga Expedition. II. Madreporaria Fungida.* Siboga-Exped., vol. 10, Livr. 90, Mon. 16b, pp. 52-98, pl. 1-6.

1922a. *The Madreporaria of the Siboga Expedition. III. Eupsammidae.* Siboga-Exped., vol. 10, Mon. 16c, pp. 99-127, pls. 7, 8, text-figs. 1-6.

1822b. *The Percy Sladen Expedition to the Indian Ocean in 1905. Vol. 7. IX. Madreporaria: Agariciidae.* Linnean Soc. London, Trans., Zoology, vol. 18, pp. 417-429, pls. 31, 32.

1923. *On the arrangement of the septa in eupsammid corals.* Bijdr. Dierk. Amsterdam, vol. 22, Fest-Nr., pp. 107-111.

1926. *The Percy Sladen Trust Expedition to the Indian Ocean in 1905 under the leadership of Mr. J. Stanley Gardiner, M. A. Vol. 8. XI. Madreporaria: Eupsammidae.* Linnean Soc. London, Trans., Zoology, vol. 19, pt. 1, No. 2, pp. 43-53, pls. 2, 3.

1927a. *Eupsammid corals from South Africa.* Union South Africa Fish. and Marine Biol. Sur. Rept. for 1925, vol. 5, No. 9, (2), pp. 1-7, pls. 1, 2, 4 text-figs.

1927b. *Bijdragen tot de Kennis der Fauna van Curaçao. Madreporaria.* Bijdr. Dierk. Amsterdam, vol. 25, pp. 159-161.

1931. *Some solitary corals from the Indian Ocean.* Indian Mus. Calcutta, Rec., vol. 33, pp. 3-12, pls. 1, 2.

1933. *Balanophyllia annae, a new species of coral from the Cape seas.* Ann. Mag. Nat. Hist., ser. 10, vol. 12, pp. 156-158, pl. 7, 1 text-fig.

1938. *Balanophyllias from the Cape of Good Hope.* Ann. Mag. Nat. Hist., ser. 11, vol. 2, pp. 139-145, pls. 5, 6, text-figs.

Hoskins, Cortez W.

1964. *Molluscan biofacies in calcareous sediments, Gulf of Batabanó, Cuba.* Amer. Assoc. Petrol. Geol., vol. 48, No. 10, pp. 1680-1704, pls. 1, 2, text-figs. 1-24, tables 1, 2.

Hosoi, Keizo

1938-47. *Contribution to the biochemistry of the coral. I. On the occurrence of glycogen and its content in the polyp of Fungia actiniformis var. palawensis Doederlein.* Palao Tropical Biol. Sta., Studies, No. 3 (1938), pp. 447-453. *II. On the occurrence of sugar and its content in the polyp of Fungia actiniformis var. palawensis Doederlein,* pp. 453-455. *III. Copper content of Fungia actiniformis var. palawensis Doederlein,* pp. 457-458. *IV. Iodine in the polyp of Fungia actiniformis var. palawensis Doederlein,* vol. 2, No. 1 (1940), pp. 49, 50. *V. Distribution of nitrogen in the protein of the polyp of Fungia actiniformis var. palawensis Doederlein,* pp. 51-56. *VI. Calcium and carbonate in the skeleton of Fungia actiniformis var. palawensis Doederlein,* pp. 57-59. *VII. On the fungiasterol, a new sterol of the polyp of Fungia actiniformis var. palawensis Doederlein,* 1942, p. 469. *VIII. On the contents of cystine and amino acids in the polyp of Fungia actiniformis var. palawensis Doederlein,* 1942, p. 683. *IX. Inorganic composition of the skeleton* *of the coral, Fungia actiniformis var. palawensis Döderlein.* Tôhoku Univ., Sci. Rept., ser. 4, vol. 18 (1947), No. 1, pp. 85-87. *X. A note on the comparative physiology of the coral, Fungia actiniformis var. palawensis Döderlein*, pp. 88-98.

Houttuyn, Martin

1761-85. *Natuurlyke Historie, of uitvoerige Beschryving der Dieren, Planten en Mineraalen, volgens Samenstel van den Heer Linnaeus.* Amsterdam, vol. 1, 18 pts., viii + 614 pp., pls. 126-138 (1761-73).

Hovey, Edmund Otis

1902. *Martinique and St. Vincent: a preliminary report upon the eruption of 1902.* Amer. Mus. Nat. Hist., Bull., vol. 16, pp. 333-372, 19 pls.

Hovey, S.

1839a. *Geology of St. Croix.* Amer. Jour. Sci., vol. 35, No. 1, art. 3, pp. 64-74.

1839b. *Geology of Antigua.* Amer. Jour. Sci., vol. 35, No. 1, art. 4, pp. 75-85.

Howchin, Walter

1909 *Notes on the discovery of a large mass of living corals in Gulf St. Vincent, with bibliographical references to the Recent corals of South Australia.* Roy. Soc. South Australia, Proc., vol. 33, pp. 242-252, pl. 16.

Howe, Herbert J.

1960. *Turbinolia rosetta, a new coral species from the Paleocene of Alabama.* Jour. Paleont., vol. 34, No. 5, pp. 1020-1022, text-figs. 1, 2.

Howe, Marshall Avery

1912. *The building of coral reefs.* Science, vol. 35, No. 909, pp. 837-842.

Hoyle, William Evans

1888. *Report on the biological investigations carried on into waters to the west of Lewis in July and August, 1887.* Fishery Board Scotland, Ann. Rept., vol. 6, pt. 3, pp. 215-222, pl. 15.

Hudson, R. G. S., Eames, F. E., and Wilkins, G. L.

1957. *The fauna of some Recent marine deposits near Basrah, Iraq.* Geol. Mag., vol. 94, No. 5, pp. 393-401, fig. 1.

Humphrey[s], George

1797. *Museum Calonnianum. Specifications of the various articles which compose the . . . Museum of Natural History collected by M. de Calonne in France . . .* London, pt. 1, viii + 84 pp.

Hunt, E. B.

1863. *On the origin, growth, substructure and chronology of the Florida Reef.* Amer. Jour. Sci., ser. 2, vol. 35 (85), No. 104, art. 22, pp. 197-210.

Hunt, J. A.

1947. *Report on general survey of British Somaliland 1946.* War Office, London, pp. 1-12, maps, tables.

Hure, Jure

1955. *Distribution annuelle verticale du zooplancton sur une station de l'Adriatique Méridionale.* Acta Adriatica, vol. 7, No. 7, pp. 1-72, figs. 1-76.

1961. *Migration journalière et distribution saisonnière verticale du zooplancton dans la région profonde de l'Adriatique.* [Serbian with French resumé.] Acta Adriatica, vol. 9, No. 6, pp. 1-59, figs. 1-64.

Hutton, F. W.

1904. *Index Faunae Zelandiae.* London, 372 pp.

Hyatt, Alpheus
1879. *Common hydroids, corals, and echinoderms.* Boston Soc. Nat. Hist., Guides for Sci. Teaching, No. 5, 32 pp., figs.

Hyman, Libbie Henrietta
1940. *The Invertebrates. Protozoa through Ctenophora.* New York, McGraw Hill, xii + 726 pp., 221 figs.
1956. *Morphology of living coelenterates. In* Moore, R. C., *Treatise on Invertebrate Paleontology. Pt. F, Coelenterata.* Lawrence, Univ. Kansas Press, pp. F10-F20, text-figs. 6-9.

Ibbotson, P.
1960. *Geology of the Suva area, Viti Levu.* Geol. Sur. Dept. Suva Fiji, Bull., vol. 4, vii + 47 pp., pls. 1-7, map. [Corals p. 29.]

Ijima, Isao
1902. *Studies on the Hexactinellidae. Contribution II.* College Sci. Imp. Univ. Tokyo, Jour., vol. 15, pp. 1-299, pls. 1-14.

Il'ina, T. G.
1963. *Novyye dannyye o proiskhozh-denii shestiluchevykh korallov. (Some new data on the origin of hexacorals).* Akad. Nauk S.S.S.R., Doklady, Earth Sci. Sect., vol. 148, No. 1, pp. 156-158, figs. 1, 2; pp. 194-196, figs. 1, 2.

Imbrie, John, and Newell, Norman
1964. *Approaches to paleoecology.* New York, pp. i-viii, 1-432, figs.

Imperato, Ferrante
1699. *Delll'Historia Naturale . . . libri XXVIII, nella quale ordinatamente si tratta della diversa condition di Minere e Pietre. Con alcune historie di Piante & Animali; sin hora non date in luce.* Venice, xxiv + 791 pp., 1 pl., text-figs.

Irvine, Robert
1898. *Coral formations.* Nature, vol. 37, pp. 461-462, 509, 605; vol. 38, p. 54.

Issel, Raffaele
1922. *Nuove indagini sul plancton nelle acque di Rovigno.* Com. Talassogr. Ital., Mem., vol. 102, 37 pp., 4 tables.
1925. *Ricerche sulle variazioni del plancton nelle acque di Rovigno e di Quarto* (1922-1923). Com. Talassogr. Ital., Mem., vol. 115, 41 pp., 8 tables.

Ivanovsky, A. B.
1966. *Position of rugose corals in the system of coral polyps.* Acad. Sci. U.S.S.R., Doklady, Earth Sci. Sect., vol. 166, Nos. 1-6, pp. 180-182.

Ivanovsky, A. B., and Lavrova, L. Y.
1960-61. *Discoveries of remains of hexacorals in the Cretaceous and Paleogene deposits of the West Siberian Plain.* [In Russian and English.] Acad Sci. U.S.S.R., C.R., Earth Sci. Sect., vol. 130, No. 2, pp. 428-429, figs. 1, 2. English translation, Nos. 1-6, pp. 182-183, figs. 1, 2.

Jacquette, R.
1962. *Études des fonds de Maërl de Méditerranée.* Sta. Marit. Endoume, Rec. Trav., Bull. 26, No. 41, pp. 141-235, 11 figs.

Jakovlev, N.
1913. *Quelques résultats des études les plus récentes des récifs corallens de l'Océan Indien et de la Mer Rouge.* [In Russian with resumé in French.] Com. Geol. St. Petersburg, Bull., vol. 32, p. 251-274, pls. 10, 11.

Janensch, Werner
1904. *Über Heterocoenia provincialis Mich. sp., eine Hexakoralle vom Habitus der Tubipora.* Deutsche Geol. Gesell., Zeitschr., vol. 55, No. 4, pp. 486-493, pl. 25.

Jaworski, Erich
1931. *Coelenterata Cnidaria.* Bibliographica Palaeontogica für die Jahre 1914-26, vol. 1, pp. 83-105.
1938. *Untersuchungen über Rassenbildung bei Anthozoen.* Thalassia, vol. 3, No. 1, pp. 3-57, figs.

Jeffords, Russell M.
1947. *Septal arrangement in some porpitid corals.* Geol. Soc. Amer., Bull., vol. 58, No. 12, pt. 2, p. 1198 (abstract).

Jespersen, P.
1927. *Dr. Thorild Wulff's plankton collections in waters west of Greenland.* Meded. Grønland, vol. 64, pp. 108-110.

Joliet, C.
1951. *Contributions à l'étude du peuplement de l'Yzeron du Grand-Moulin à Francheville. II. La faune de l'Yzeron.* Soc. Linn. Lyon, Bull., vol. 20, pp. 104-111, fig.

Jones, Frederick Wood
1907. *On the growth-forms and supposed species in corals.* Zool. Soc. London, Proc., pt. 2, pp 518-556, pls. 27-29, text-figs. 141-161.
1908. *The rate of growth of the reef-building corals.* Zool. Anzeig., vol. 33, pp. 716-717.
1909. *The coral island question.* Zool. Soc. London, Proc., pp. 671-679.
1910a. *Corals and Atolls; their history, description, theories of their origin both before and since that of Darwin, the influence of winds, tides and ocean currents on their formation and transformation, their present condition, products, flora and fauna.* London, xxiii + 392 pp., 27 pls., map.
1910b. *The building of atolls.* Zool. Anzeig., vol. 35, pp. 399-404.
1910c. *The Cocos-Keeling Atoll.* Nature, vol. 84, pp 528, 529; vol. 85, pp. 41, 139.

Jones, John A.
1963. *Ecological studies of the southeastern Florida patch reefs. Part I. Diurnal and seasonal changes in the environment.* Bull. Marine Sci. Gulf and Caribbean, vol. 13, No. 2, pp. 282-307, figs. 1-6.

Jones, John Matthew
1859. *The Naturalist in Bermuda; a sketch of the geology, zoology and botany of that remarkable group of islands; together with meteorological observations.* London, xii + 200 pp., map.
1869. *Contributions to the natural history of the Bermudas. Coralliaria.* Nova Scotia Inst., Proc. and Trans., vol. 2, pt. 2, pp. 7-16.

Jones, N. S.
1939. *Some recent additions to the off-shore fauna of Port Erin.* Marine Biol. Sta. Port Erin, Rept., vol. 52, pp. 18-32.

Jones, O. A.
1933. *A revision of the Australian species of the coral genera Spongophyllum E. & H. and Endophyllum E. & H., with a note on Aphrophyllum Smith.* Roy. Soc. Queensland, Proc., vol. 44, pp. 50-63, 2 pls.
1936. *The controlling effect of environment upon the corallum in Favosites; with a revision of some massive species on this basis.* Ann. Mag. Nat. Hist., ser. 10, vol. 17, No. 97, pp. 1-24, pls. 1-3.
1937. *The Australian massive species of the coral genus Favosites.* Australian Mus. Sydney, Rec., vol. 20, No. 2, pp. 79-102, pls. 11-16.
1944. *Tabulata and Heliolitidae from the Wellington district, N. S. W.* Roy. Soc. New South Wales, Jour., vol. 77, pt. 2, pp. 33-38, 1 pl.

Jones, O. A., and Hill, Dorothy
1940. *The Heliolitidae of Australia, with a discussion of the morphology*

and systematic position of the family. Roy. Soc. Queensland, Proc., vol. 51, No. 12, pp. 183-215, pls. 6-11.

Jones, S.

1961. *Government of India Central Marine Fisheries Research Station, Marine Fisheries Mandapan Camp, South India. Annual report of the Chief Research Officer for the year ending 31st March 1960.* Indian Jour. Fish., vol. 7, No. 2, pp. 496-552.

Jordan, Eric Knight

1936. *The Pleistocene fauna of Magdalena Bay, Lower California.* Dept. Geol. Stanford Univ., Contrib., vol. 1, No. 4, pp. 107-173, pls. 17-19.

Jordan, Eric Knight, and Hertlein, Leo George

1926. *Expedition to the Revillagigedo Islands, Mexico, in 1925. Part 7. Contribution to the geology and paleontology of the Tertiary of Cedros Island and adjacent parts of Lower California.* California Acad. Sci., Proc., ser. 4, vol. 15, No. 14, pp. 409-464, pls. 27-34, text-fig. 1.

Joubin, Louis [Marie Adolphe Olivier Edouard]

1912. *Carte des bancs et récifs de coraux.* Inst. Océanogr. Paris, Ann., vol. 4, No. 2, pp. 1-7, charts 1-5.

1922a. *Les coraux de mer profonde nuisables aux chalutiers.* Office Sci. et Tech. Pêches Marit., Notes et Mém., No. 18, 16 pp., map.

1922b. *Distribution géographique de quelques coraux abyssaux dans les mers occidentales européennes.* Acad. Sci. Paris, C. R., vol. 175, pp. 930-933, map.

1923. *Les coraux des mers profondes du plateau continental atlantique.* Rapp. et Proc. Verb. Explor. Mer. Copenhagen, vol. 21, pp. 43-46, 1 pl.

1927-29. *Microcyathus neapolitanus. Coenocyathus mouchezi. Lophelia prolifera. Amphelia oculata. Cladopsammia rolandi. Leptosammia pruvoti. Caryophyllia arcuata, cyathus. Desmophyllum fasciculatum, crista-galli.* Faune Flore Méditer. Paris.

1928. *Note sur un coralliaire du genre Desmophyllum.* Mus. Nat. Hist. nat. Paris, Bull., vol. 34, pp. 212-218, 6 figs.

1930. *Note sur un coralliaire nouveau, Hoplangia pallaryi, de la Méditerranée.* Mus. Nat. Hist. nat. Paris, Bull., vol. 36, pp. 412-417, 4 figs.

1934. *Sur un coralliaire rare de la Baie de Castiglione (Cladocora patriarca Pourtalès).* Sta. Aguicult. Alger, Bull. Trav., No. 1, pp. 35-42, 1 pl.

1938. *Cours d'Océanographie Biologique. XI. Les Anthozoaires.* Soc. Océanogr. Paris, No. 97, pp. 1688-1694.

Jourdan, Etienne

1880. *Recherches zoologiques et histologiques sur les Zoanthaires du Golfe de Marseille.* Ann. Sci. Nat. Paris, sér. 6, vol. 10, pp. 1-154, pls. 1-17.

1895. *Résultats des campagnes scientifiques accomplies sur son yacht par Albert ler, Prince Souverain de Monaco. Zoanthaires provenant des campagnes du Yacht "l'Hirondelle" (Golfe de Gascogne, Açores, Terre-Neuve).* Monaco, No. 8, 36 pp., 2 pls.

Jovanic, D., and Dolic, D.

1958. *O fosilonosnium lokalnostina Srednjeg i gornjeg miocena u Siroj okolini Arandelovca.* Serv. Géol. Serb., Bull., vol. 16, pp. 87-96, pls. 1-5, text-fig. 1.

Judd, John Wesley

1895. *The scientific results of the "Challenger" Expedition. Coral reefs.* Nat. Sci., vol. 7, pp. 18-20.

Jukes, Joseph Beete

1847. *Narrative of the Surveying Voyage of H.M.S. "Fly," commanded by Captain F. P. Blackwood, R.N., in Torres Strait, New Guinea, and other islands of the Eastern Archipelago, during the years 1842-1846; together with an excursion into the interior of the eastern part of Java.* London, 2 vols.

Jukes-Browne, A. J., and Harrison, J. B.

1891. *The geology of Barbados. I. The coral rocks of Barbados and other West Indian islands.* Geol. Soc. London, Quart. Jour., vol. 47, pp. 197-243, figs. 1-9.

1892. *On the geology of Barbados. II. The oceanic deposits.* Geol. Soc. London, Quart. Jour., vol. 48, pp. 170-226, figs. 1-9, 1-4, geol. map.

Julien, Alexis Anastay

1867. *On the geology of the Key of Sombrero, W. I.* Lyceum Nat. Hist. New York, Ann., vol. 8, pp. 251-278.

Jungersen, Hektor F. E.

1905. *Some results from the Ingolf expeditions.* K. Danske Vidensk. Selsk. Forh., Oversigt, No. 2, pp. 127-135.

1916. *Alcyonarian and madreporarian corals in the Museum of Bergen, collected by the "Fram" Expedition 1898-1902 and by the "Michael Sars" 1900-1906.* Bergens Mus. Aarbok 1915-1916, Naturv. Raek., ser. 2, No. 6, pp. 4-44.

1917. *Alcyonaria, Antipatharia og Madreporaria. A conspectus of the Alcyonaria, Antipatharia and Madreporaria of Greenland.* Medd. Grønland, vol. 23, pp. 1153-1212.

Jussen, E.

1890. *Ueber pliocäne Korallen von der Insel Rhodus.* K. Akad. Wiss. Wien, Sitzungsber., vol. 99, pp. 1-11, pl. 1.

Jussieu, Bernard de

1742. *Examen de quelques productions marines qui ont été mises au nombre des plantes, et qui sont l'ouvrage d'une sorte d'insecte de mer.* Acad. Sci. Paris, Mém., pp. 290-302, 392-409.

Kalk, Margaret

1959. *A general ecological survey of some shores in northern Moçambique.* Rev. Biol. Lisboa, vol. 2, No. 1, pp. 1-24, pls. 1-4. [Coelenterates p. 17.]

Kato, M., Nakamura K., Hirai, E., and Kakinuma, Y.

1962. *Interspecific relation in the colony formation among some hydrozoan species.* Marine Biol. Sta. Asamushi, Bull., vol. 11, No. 1, pp. 31-36, pls. 4-6, text-figs. 1-5.

Kawaguti, Siro

1937. *On the physiology of reef corals. I. On the oxygen exchanges of reef corals.* Palao Tropical Biol. Sta. Tokyo, Studies, No. 2, pp. 187-198, 4 figs. *II. The effect of light on colour and form of reef corals,* pp. 199-208, 4 figs. *III. Regeneration and phototropism in reef corals,* pp. 209-216, pls. 6-7, 4 text-figs.

1940a. *An abundance of reef-coral planulae in plankton.* Zool. Mag. Tokyo, vol. 52, No. 1, p. 31.

1940-42. *Materials for the study of reef-building corals. I.* [In Japanese.] Kagaku Nanyo, vol. 2 (1940), pp. 159-169, 2 figs., 7 tables. *II,* vol. 3, (1941), pp. 171-176, 2 figs., 1 table. *III,* vol. 5, pp. 95-106, 10 figs., 1 table.

1943a. *Corals of Formosa.* [In Japanese.] Nat. Hist. Soc. Formosa, Trans., vol. 33, No. 240, pp. 257-267, figs.

1943b. *Zooxanthellae and corals.* [In Japanese.] Nat. Hist. Soc. Formosa, Trans., vol. 33, No. 251, pp. 285-299, figs.

1943c. *Effect of fresh water on respiration of reef corals.* [In Japanese.] Nat. Hist. Soc. Taiwan, Jour., vol. 33, pp. 259-261.
1943d. *Breakdown of reef-coral skeletons by sponges.* [In Japanese.] Nat. Hist. Soc. Taiwan, Jour., vol. 33, p. 261-262, 2 figs.
1943e. *Growth forms of reef corals in relation to water currents.* [In Japanese.] Nat. Hist. Soc. Taiwan, Jour., vol. 33, pp. 263-267.
1943f. *A supplement to studies on phototaxis and rejuvenescence of reef corals.* [In Japanese.] Nat. Hist. Soc. Taiwan, Jour., vol. 33, pp. 285-297, 3 figs, 1 table.
1943g. *Zoological study of reef-building corals; oceanography and limnology of the Pacific Ocean.* [In Japanese.] Nat. Hist. Soc. Taiwan, Jour., vol. 33, pp. 489 *et seq.*
1944. *On the physiology of reef corals. VI. Study on the pigments.* Palao Tropical Biol. Sta. Tokyo, Studies, vol. 2, No. 4, pp. 671-673, pls. 1, 2, text-figs. *VII. Zooxanthella of the reef corals is Gymnodium sp. Dinoflagellate: its culture in vitro,* pp. 675-671, figs. *VIII. Zooxanthellae as a factor of positive phototropism in those animals containing them,* pp. 681-682.
1953a. *Ammonium metabolism of the reef corals.* Okayama Univ., Biol. Jour., vol. 1, p. 171, 4 figs.
1953b. *Coral fauna of the island of Botel Tobago, Formosa, with a list of corals from the Formosan waters.* Okayama Univ., Biol. Jour., vol. 1, No. 3, pp. 185-197, pls. 1-4, text-fig. 1.
?. *Reef-building corals in Taiwan.* [In Japanese.] Taiwan no Kagaku, vol. 2, pp. 1-6, 2 pls.

Kawaguti, Siro, and Sakumoto, D.
1948. *The effects of light on the calcium deposition of corals.* Oceanogr. Inst. Taiwan, Bull., vol. 4, pp. 65 *et seq.*
1954. *Pigment of skeleton of a reef coral, Oulastrea crispata.* Okayama Univ., Biol. Jour., vol. 1, No. 4, pp. 265-270, figs. 1-5.

Kawahara, Tatuo
1962. *Studies on the marine fouling communities. I. Development of a fouling community.* Fac. Fish. Univ. Mie, Rept., vol. 4, No. 2, pp. 27-42, pls. 1,2, text-figs. 1-6.

Kawakami, I.
1941. *Asexual reproduction in some reef corals.* Palao Tropical Biol. Sta., Studies, vol. 2, pp. 147 *et seq.*

Keferstein, Wilhelm Moritz
1859. *Die Korallen der norddeutschen Tertiärgebilde.* Deutsch. Geol. Gesell., Zeitschr., vol. 11, pp. 354-383, pls. 14, 15.

Keller, Conrad
1888. *Die Wanderung der marinen Thierwelt im Suezcanal.* Zool. Anzeig., vol. 11, pp. 359-364, 389-395.

Kemna, A.
1908. *Morphologie des Coelentérés.* Soc. Roy. Malac. Bruxelles, Ann., vol. 43, pp. 229-337.
1910. *Morphologie des Coelentérés.* Soc. Roy. Malac. Bruxelles, Ann., vol. 44, pp. 143-204.

Kent, William Saville
1870a. *Observations on the Madreporaria, or stony corals (Stenohelia).* Ann. Mag. Nat. Hist., ser. 4, vol. 5, pp. 120-123.
1870b. *On an existing coral, closely allied to the Palaeozoic genus Favosites; with remarks on the affinites of the Tabulata.* Ann. Mag. Nat. Hist., ser. 4, vol. 6, pp. 384-387.
1870c. *Observations on the Madreporaria or stony corals taken in the late expedition of the yacht "Norma" off the coasts of Spain and Portugal.* Ann. Mag. Nat. Hist., ser. 4, vol. 6, pp. 459-461.

1871. *On some new and little-known species of Madreporaria, or stony corals, in the British Museum collection.* Zool. Soc. London, Proc., pp. 275-286, pls. 23-25.
1890. *The zoological affinities of Heliopora coerulea.* Nature, vol. 42 pp. 340, 341.
1891. *Notes on new and little-known Australian Madreporaceae.* Australian Mus. Sydney, Rec., vol. 1, No. 6, pp. 123-124, pls. 15-17.
1893. *The Great Barrier Reef of Australia; its products and potentialities.* London, xvii + 387 pp., pls. 1-64, figs., maps.
1897. *The Naturalist in Western Australia.* London, xv + 302 pp., 59 pls., figs.

Kerneis, A.
1960. *Contribution à l'étude faunistique et écologique des herbiers de Posidonies de Banyuls.* Vie et Milieu, vol. 11, No. 2, pp. 145-187, text-figs. 1-14.

Kerr, John Graham
1910. *List of specimens of corals described by Ellis, and now in the University collection.* Glasgow Natural., vol. 2, p. 111.

Kessel, E.
1938. *Schneckenschalen, Krebse und Polypen.* Natur u. Volk, vol. 68, No. 9, pp. 428-431, figs.

Kiaer, J.
1933. *The ecoral fauna of the Kaltstad Limestone in Meddalen.* Norske Vidensk.-Akad. Oslo, Skr., No. 4 (1932), pp. 103-113, 6 pls. 2 text-figs.

King, L.
1953. *A Miocene marine fauna from Zululand.* Geol. Soc. South Africa, Trans. Proc., vol. 56, pp. 59-91, pls. 8-12, text-figs. [Corals p. 66.]

King, O.
1878. *Muskelepithelien bei Anthozoen. Vorlaüfige Mittheilung.* Morph. Jahrb., vol. 4, p. 327.

Kingsley, John Sterling
1901. *Preliminary catalogue of the marine Invertebrata of Casco Bay, Maine.* Portland Soc. Nat. Hist., Proc., vol. 2, No. 5, pp. 159-183.

Kinkelin, F.
1903. *Die Originale der paläontologischen Sammlung im Senckenbergischen Museum und die auf dieselben bezugliche Literatur.* Senckenberg. Naturforsch. Gesell. Frankfurt-am-Main, Bericht, pp. 1-88. [Coelenterata pp. 52-53.]

Kinsman, D. J. J.
1964. *Reef coral tolerance of high temperature and salinities.* Nature, vol. 202, No. 4939, pp. 1280-1282, fig. 1.

Kirkpatrick, Randolph
1887. *Description of a new genus of Sylasteridae.* Ann. Mag. Nat. Hist., ser. 5, vol. 19, pp. 212-214.
1902. *Hydrozoa. Guide to the Coral Gallery (British Museum Natural History).* London, 73 pp., figs. Review in Ann. Mag. Nat. Hist., ser. 7, vol. 11, p. 132, 1903.

Kishinouye, Kamakichi
1904. *Notes on the natural history of corals.* Imp. Fish. Bur. Tokyo, Jour., vol. 14, No. 1, 32 pp., 9 pls.

Kissling, Don L.
1965. *Coral distribution on a shoal in Spanish Harbor, Florida Keys.* Bull. Marine Sci., vol. 15, No. 3, pp. 599-611.

Kitahara, T.
1904. *On the coral fishery of Japan.* Imp. Fish. Bur. Tokyo, Jour., vol. 13, No. 3, 14 pp., pls. 1-5.

Kitson, Albert Ernest
1904. *Report on the bryozoan limestone at Flinders.* Geol. Sur. Victoria, Rec., vol. 1, No. 1, pp. 49-51. [Anthozoa listed.]

Klaer, Hans
1904. *Notes on dredgings in the Drobaksund, Norway.* Nyt. Mag. Naturvid., vol. 42, No. 1, pp. 61-89.

Klausewitz, W.
1958. *Die Atoll-Riffe der Malediven* Natur u. Volk, vol. 88, No. 11, pp. 380-390, figs. 1-10.

Kleinpell, R. M., and Weaver, D. W.
1963. *Oligocene biostratigraphy of the Santa Barbara Embayment, California. Catalogue and register.* Univ. California, Publ. Dept. Geol., vol. 43, pp. 165-209.

von Klipstein, August
1843-83. *Mittheilungen aus dem Gebiete der Geologie und Paleontologie. Beiträge zur geologischen Kenntniss der oestlichen Alpen.* Giessen, 2 vols., 311 pp., 20 pls.
1880. *Die Tertiärablagerungen von Waldvöckelheim und ihre Polyparienfauna.* K. - K. Geol. Reichsanst. Wien, Jahrb. 1879, pp. 61-68.

Kloss, Cecil Boden
1903. *In the Andamans and Nicobars; the narrative of a cruise in the schooner "Terrapin," with notices of the islands, their fauna, ethnology, etc.* London, xvi + 373 pp., pls., maps.

Klunzinger, Carl Benjamin
1870. *Ein zoologische Excursion auf ein Koralriff des rothen Meeres.* Zool.-Botan. Gesell. Wien, Verhandl., vol. 20, pp. 389-394.
1872. *Zoologische Excursion auf ein Korallenriff des rothen Meeres bei Kosser.* Gesell. f. Erdk. Berlin, Zeitschr., vol. 7, pp. 20-56.
1877-79. *Die Korallenthiere des Rothen Meeres.* Berlin, 3 vols. *I. Die Alcyonarien und Malakodermen,* vol. 1 (1877), 98 pp., 8 pls. *II. Die Steinkorallen: Die Madreporaraceen und Oculinaceen,* vol. 2, (1879), 88 pp., 10 pls. *III. Die Astraeaceen und Fungiaceen,* vol. 3 (1879), 100 pp., 10 pls.
1878. *Bilder aus Oberägyptien, der Wüste und dem Rothen Meeres.* Stuttgart, xii + 400 pp., figs.
1880. *Das Wachsthum der Korallen, insbesondere ihre Vermehrung durch Ablager und über Wachsthumstörungen.* Schles. Gesell., Jahresh., vol. 36, pp. 62-71.

Knight-Jones, E. W., and Jones, W. C.
1956. *The fauna of rocks at various depths off Bardsey.* Bardsey Observ., Rept. 1958, pp. 23-30.

Knorr, Georg Wolfgang
1760-73. *Les délices des yeux et de l'esprit, ou collection générale des differentes espèces de coquillages que la mer renferme.* Nürnberg, 3 vols., 6 pts.
1766-67. *Deliciae Naturae; oder auserlesenes Natüralien-Cabinet, welches aus den drey Reichen der Natur zeiget was von curiosen. Liebhabern aufbehalten und gesammlet zu werden verdienet. Ehemals herausgegeben von Georg Wolfgang Knorr . . . fortgesetzt von dessen Erben beschreiben von Philip Ludinge Statius Müller . . . und das Franzöische Übersetzt von Matthäus Verdier de la Blaquière,* etc. Nürnberg, 2 vols., pp. [13], viii, 132, xx, 144, 91 pls.

Knose, G. A.
1957. *General account of the Chatham Islands 1954 Expedition.* New Zealand Dept. Sci. and Industr. Res., Bull. 122, 37 pp., 24 figs.

Knox, G. H.

1951. *A rock bottom fauna from 80 fathoms off Banks Peninsula.* Canterbury Mus., Rec., vol. 6, pp. 41-51.

Koby, Frédéric Louis

1881-87. *Monographie des polypiers jurassiques de la Suisse.* Soc. Paléont. Suisse, Mém., pt. 1, vol. 7 (1881), pp. 1-60, pls. 1-12; pt. 2, vol. 8 (1882), pp. 61-108, pls. 13-30; pt. 3, vol. 10 (1884), pp. 109-148, pls. 31-42; pt. 4, vol. 11 (1885), pp. 149-212, pls. 43-63; pt. 5, vol. 12 (1886), pp. 213-304, pls. 64-84; pt. 6, vol. 7 (1887), pp. 305-352, pls. 90-99.

1896-98. *Monographie des Polypiers Crétacés de la Suisse.* Schweiz. Palaeont. Gesell., Abhandl., vol. 22 (1896), No. 2, pp. 1-28, 8 pls.; vol. 23 (1896-1897), No. 2, pp. 29-62, 8 pls; vol. 24 (1897), No. 2, pp. 63-100, 6 pls.

1905a. *Description de la faune jurassique du Portugal. Polypiers du Jurassique supérieur.* Commission Serv. Géol. Portugal, 167 pp., 30 pls.

1905b. *Sur les Polypiers jurassiques des environs de Saint-Vallier-de-Thiey (Var.).* Soc. Géol. France, Bull., sér. 4, vol. 11, pp. 647-863, 6 pls.

1906. *Polypiers bathoniens de Saint-Gaultier.* Soc. Paléont. Suisse, Mém., vol. 33, 61 pp., 4 pls.

von Koch, Gottlieb

1877. *Mittheilungen über Coelenterata. Anatomie von Stylophora digitata Pallas.* Jenaische Zeitschr. f. Medicin u. Naturwiss., vol. 11, pp. 375-381, pl. 22.

1879. *Bemerkungen über das Skelet der Korallen.* Morph. Jahrb., vol. 5, pp. 316-323.

1880. *Notizen über Korallen.* Morph. Jahrb., vol. 6, pp. 355-361, pl. 16.

1882a. *Ueber die Entwicklung des Kalkskelettes von Astroides calycularis und dessen morphologische Bedeutung.* Zool. Stat. Neapel, Mitt., vol. 3, pp. 284-292, pls. 20, 21.

1882b. *Mittheilungen über das Kalkskelet der Madreporarien.* Morph. Jahrb., vol. 8, pp. 85-96, pl. 3.

1882c. *Die morphologisch Bedeutung des Korallenskelets.* Biol. Centralbl., vol. 2, p. 583.

1882d. *Mittheilungen über die Structur von Pholidophyllum loveni E. & H., und Cyathophyllum sp? aus Konieprus.* Palaeontographica, vol. 28, pp. 213-223.

1886a. *Ueber das Verhältniss von Skelet und Weichtheilen bei den Madreporaren.* Morph. Jahrb., vol. 12, pp. 154-162, pl. 9.

1886b. *Ueber die von Herrn Prof. Dr. Greeff in Golf von Guinea gesammelten Anthozoen.* Bonn, 34 pp., 5 pls.

1888. *Ueber Flabellum.* Morph. Jahrb., vol. 14, pp. 329-344, pl. 13.

1889a. *Ueber Caryophyllia rugosa.* Morph. Jahrb., vol. 15, No. 1, pp. 10-20, 13 figs.

1889b. *Kleinere Mittheilungen über Anthozoen.* Morph. Jahrb., vol. 15, No. 4, pp. 646-649, 1 fig.

1889c. *Ueber das Skelett der Steinkorallen.* Tugebl. Versamml. Deutscher Naturforscher u. Aertzte, vol. 62, p. 265.

1890. *Kleinere Mittheilungen über Anthozoen.* Morph. Jahrb., vol. 16, pt. 1, No. 2, pp. 396-400, 2 figs. *Septalknospung bei recenten Madreporien.* pp. 534-536, 4 figs. *Echte und unechte Synapticula und Theca von Fungia,* pp. 686-689, 3 figs.

1891. *Das Verhältniss zwischen den Septen des Mutterthieres zu denen der Knospen bei Blastotrochus.* Morph. Jahrb., vol. 17, pp. 332-336.

1892. *Kleinere Mittheilungen über Anthozoen. 7. Ueber Kolonien von Bebryce mallis, Phil., welche Cornulariden ähnlich sind.* Morph. Jahrb., vol. 18, pp. 373-376. *8. Aggregierte Kolonien von Balanophyllia verrucaria Aut,* pp. 376-382, 11 figs. *9. Beobachtung des Wachsens von Clavularia ochracea,* pp. 605-608, 1 fig.

1893. *Die ungeschlechtiche Vermehrung von Madrepora.* Naturhist. Gesell. Nürnberg, Verhandl., 18 pp., 1 pl.

1896a. *Zwischenknospung bei recenten Korallen. Knospung von Favia cavernosa Forsk.* Morph. Jahrb., vol. 24, pp. 167-171, 171-177, figs.

1896b. *Das Skelett der Steinkorallen, eine morphologische Studie.* Festschr. C. Gegenbaur, Leipzig, vol. 2, pp. 249-276, 1 pl., text-figs. 1-23.

1897. *Entwicklung von Caryophyllia clavus.* Zool. Stat. Neapel., Mitt., vol. 12, pp. 755-772, pl. 34, 21 text-figs.

Kochansky, V.

1944. *Fauna marinskog miocena juznog pobočja Medvednice (Zagrebačke gore).* [Serbian with German summary.] Hrvats. Drzav. Geol. Zavod. Muz. Zagreb, Vjets., vols. 2, 3, pp. 171-280, pls. 11-15.

Koehler, René

1886. *Littoral fauna of the Anglo-Norman Islands.* Ann. Mag. Nat. Hist., ser. 5, vol. 18, pp. 362, etc. Translated from: *Contribution à l'etude de la faune littoral des îles anglo-normandes (Jersey, Guernesey, Herm et Sark).* Ann. Sci. Nat. Paris (Zool.), vol. 20, art. 4, 62 pp., pl. 1.

Koelsch, A.

1962. *Korallentiere, kurz vorgestelt.* Neptun, vol. 2, No. 4, pp. 96-97, 1 fig.

Kofoid, Charles Atwood

1904. *Biological survey of the waters of southern California at San Diego.* Science, vol. 19, pp. 505-508.

Kölliker, Rudolph Albert von

1865. *Icones Histiologicae; oder Atlas der vergleichenden Gewebelehre. 2. Abteilung der feinere Bau der hoheren Thiere. I. Die Bindesubstanz der Coelenteraten.* Leipzig, pp. i-vi, 1-181, pls. 1-19.

Kolosváry, Gabor

1945. *Beiträge zur Kenntnis der adriatischen Coelenteraten auf Grund der Sammlung des Ung. Nat. Museum.* Riv. Biol. Firenze, vol. 37, pp. 139-142, fig.

1949a. *Les coraux (Madreporaria) de la collection du Musée National Hongrois.* Soc. Linn. Lyon, Bull., vol. 18, No. 1, pp. 13-16.

1949b. *The Eocene corals of the Hungarian transdanubian province.* [Hungarian with English summary.] Földtani Közlöny (Hungarian Geol. Soc.), Bull., vol. 79, Nos. 5-8, pp. 141-242, pls. 1-22, text-figs.

1951. *Ueber die mit Korallen in Synökose lebenden Balaniden.* [Russian with German summary.] Acta Biol. Budapest, vol. 2, Nos. 1-3, pp. 291-297.

1954a. *Adatok a magyarorszagi Jura-Idöszaki Korallok ismeretéhey.* [Hungarian with Russian and German summaries.] Földtani Közlöny, Bull., vol. 84, No. 3, pp. 235-243, pls. 33-41.

1954b. *On the known fossil hydrozoa of Hungary* Hist.-Nat. Mus. Nat. Hung., Ann., vol. 5, pp. 27-38, figs.

1954c. *Les coralliaires du Cretacé de la Hongrie.* [Hungarian with French resumé.] Földtani Intezet, Evk. (Ung. Geol. Anst., Jahrb.), vol. 42, No. 2, pp. 64-131, pls. 1-16.

1956a. *Eocene corals from the Bükk Mountains in Hungary.* [Hungarian with Russian summary.] Földtani Közlöny, Bull., vol. 86, No. 1, pp. 67-85, pls. 19, 20.

1956b. *Ueber phylogenetische Regression im Korallen-organismus.* Acta Biol. Szeged., n. s., vol. 2, Nos. 1-4, pp. 199-204, figs. 1-21.

1957a, *Cnidarien.* [In] Beretzk, P., Csongor, G., Horváth, A., Kárpáty, A., Kolosváry, G., Szabados, M., and Székely, M., *Das Leben der Tisza. I. Ueber die Tierwelt der Tisza und ihrer Inundationsgebiete.* Acta Biol. Szeged., n. s., vol. 3, Nos. 1-2, pp. 81-108. [Cnidaria p. 87.]

1957b. *Ueber die fossilen Madreporarien in dem System der Lebenserscheinungen.* Acta Biol. Szeged., n. s., vol. 3, Nos. 1-2, pp. 123-126.

1957c. *Mitteilung über die Aufarbeitung eines neueren Anteils des ungarischen Madreporarien-Materials der geologischen Anstalt* Acta Biol. Szeged., n. s., vol. 3, Nos. 3-4, pp. 329-314, figs. 1-10.

1957d. *A study of the fossil Madreporaria of Hungary in the system of life phenomena.* Acad. Sci. Hung., Acta Biol., Suppl. No. 1, pp. 34-35.

1958. *Ueber die fossilen Madreporarien der Mittelgebirge im Mittel-Donau-Becken.* 20th Internat. Geol. Congr. 1956, vol. 7, Paleont. Taxon. Evol., pp. 325-333.

1960a. *Classification phylogénétiques de Anthozoaires et des Cirripèdes.* Soc. Hist. Nat. Toulouse. Bull., vol. 95, Nos. 1, 2, pp. 195-196.

1960b. *A Móra Ferenc Muzeum madreporariái.* Móra Ference Muz. Évkon. 1958-59, Évi Kötet, pp. 223-226.

1960c. *The phylogenetic classification of the madreporarian corals.* Jour. Paleont., vol. 34, No. 5, pp. 1051-1053, fig. 1.

1961a. *Ergänzende Daten zur Kenntnis der Madreporarien und Balaniden der Adria.* Acta Biol. Szeged., n. s., vol. 7, Nos. 3-4, pp. 143-147.

1961b. *Quelques Madréporaires fossiles intéressants nouveux en Hongrie.* [Hungarian with French and Russian summaries.] Ung. Geol. Anst., Jahresber. 1957, 58, pp. 497-503, pl. 1, text-fig. 1.

1962. *Enumération des Madréporaires de l'Adriatique.* Soc. Linn. Lyon, Bull. Mens., vol. 31, No. 3, pp. 69-70.

1963. *Madreporarien und Balaniden aus rezenten Mittelmeersedimenten.* Internat. Rev. Gesamt. Hydrobiol., vol. 48, No. 1, p. 175.

1964a. *Contribution à la connaissance de la faune des coralliaires Mes-et Cénozoïque de la Transylvanie.* [Magyar with French and Russian summaries.] Mag. Allami Földt., Ev. Jel. 1961, No. 2, pp. 211-258, pls. 1-10

1964b. *New data on the fossil coral fauna of Hungary.* Jour. Paleont., vol. 38, No. 5, p. 1005.

Kopek, G.

1952. *Les coraux miocènes de la Slovaquie du Sud.* [Serbian with summaries in French, Hungarian, and Rusian.] Geol. Sborn. Slovensk. Akad., vol. 3, Nos. 1, 2, pp. 69-87, pls. 12-16.

1954. *Les coralliaires miocènes de la Hongrie Septentrionale.* [Hungarian with French and Russian summaries.] Földtani Intezet, Evk. (Ung. Geol. Anst., Jahrb.), vol. 42, No. 1, pp 1-63, pls 1-11, text-figs

Kornicker, L. S., Bonet, F., Cann, R., and Hoskin, C. M.

1959. *Alacran Reef, Campeche Bank, Mexico.* Inst. Mar'ne Sci. Univ. Texas, Publ., vol. 6, pp. 1-22, text-figs. 1-20. [Coelenterates pp. 18-19.]

Kornicker, Louis S., and Boyd, Donald W.

1962. *Shallow-water geology and environments of Alacran Reef complex,* *Campeche Bank, Mexico.* Amer. Assoc. Petrol. Geol., Bull., vol. 46, No. 5, pp. 640-673, figs. 1-34, tables 1-4.

Kornicker, Louis S., and Squires, Donald F.

1962. *Floating corals: a possible source of erroneous distribution data.* Limnol. and Oceanogr., vol. 7, No. 4. pp. 447-452, fig. 1.

Korotneff, Aleksej

1887. *Zwei neue Coelenteraten.* Zeitschr. Wiss. Zool., vol. 45, pp. 468-490, 1 pl., 4 text-figs.

Kossmat, Franz

1893. *Ueber einige Kreideversteinerungen von Gabun.* K. Akad. Wiss. Wien, Sitzungsber., vol. 102, pp. 575-589, 2 pls.

1907. *Geologié (und Palaeozoologie) der Insel Sokótra, Sémha, und 'Abd el Kûri.* K. Akad. Wiss. Wien, Denkschr., vol. 71, pp. 1-62, 5 pls., text-figs. 1-13.

Kowalewski, K.

1930. *Stratigraphie du Miocène des environs de Korytnica en comparaison avec le Tertiaire des autres territoires du Massif de Ste.-Croix.* [In Polish.] Serv. Géol. Pologne, Bull., vol. 6, (corals), pp. 67-70.

Krämer, Augustin Friedrich

1897. *Ueber den Bau der Korallenriffe und die Plankton Vertheilung an den Samoanischen Küsten nebst vergleichenden Bemerkungen.* Kiel and Leipzig, xi + 174 pp., map, figs.

1902-1903. *Die Samoa-Inseln. Entwurf einer Monographie mit besonderer Berücksichtigung Deutsch-Samoa.* Stuttgart, vol. 1, pp. i-xii, 361-509; vol. 2, pp. i-x, 1-445, 13 pls.

1906a. *Hawaii, Ostmikronesien und Samoa. Meine zweite Südseereise (1897-1899) zum Studium der Atolle und ihrer Bewohner.* Stuttgart, xv + 585 pp., 20 pls.

1906b. *Curaçao, nebst einigen Bemerkungen über eine westindische Reise (1899-1900).* Globus, vol. 90, pp. 293-299.

1908. *Studienreise nach den Zentral und Westkarolinen.* Deutsch. Schutzgeb. Berlin, Mitt. Forsch Geleh., vol. 21, p. 169.

1927. *Die Enstehung und Besiedlung der Koralleninseln.* Stuttgart, 53 pp., illustr., tables diagrs.

Kramp, P. L.

1933a. *The Scoresby Sound Committee's 2nd East Greenland Expedition in 1932 to King Christian IX's Land. Coelenterata, Ctenophora, and Chaetognatha.* Medd. Grønland, vol. 104, No. 11, 20 pp., 10 figs.

1933b. *Occasional notes on Coelenterata. II.* Vidensk. Medd. Naturhist. Foren. Kjøbenhavn, vol. 94, pp. 237-247, 1 fig.

Kranz, W.

1914-15. *Das Tertiär zwischen Castelgomberto, Montecchio Magiore, Creazzo und Monteviale im Vicentin.* N. Jahrb. Min., Beilage Bd. 38, pp. 273-324, pl. 6. 5 text-figs.; No. 2 (1915), pp. 19-50, pl. 1, 2 text-figs.

Krejci, K.

1923. *Norddeutsche Miocänkorallen.* Centralbl. Min. Stuttgart, pp. 602-606.

1926. *Norddeutsche Miocänkorallen.* Preuss. Geol. Landes., Jahrb., vol. 46, pp. 457-503, pl. 7.

Krempf, Armand

1905a. *On the modification of the tentacular apparatus in certain species of Madrepora.* Ann. Mag. Nat. Hist., ser. 7, vol. 15, pp. 595-597.

1905b. *Liste des Hexanthides du Golfe de Tadjourah par M. Ch. Gravier.* Mus. Nat. Hist. nat. Paris, Bull., No. 3, pp. 191-196.

1907. *Sur la formation du Squelette des Hexacoralliaires à polypier.* Acad. Sci. Paris, C. R., vol. 144, pp. 157-159.

1919a. *Sur un stade primitif, essentiel, non encore reconnu dans le développement des Anthozoaires* Acad. Sci. Paris, C. R., vol. 169, pp. 39-42.

1919b. *Développement des ébauches musculaires chez la larvae d'un Anthozoaire (Pocillopora caespitosa Dana) au stade primitif de la symétrie tétradiaire.* Acad. Sci. Paris, C. R., vol. 169, pp. 929-932.

1920a. *Sur les principales modalités du développement et des relations de l'orthosepte et de stérigmatosepte dans l'ensemble du groupe des Anthozoaires.* Acad. Sci. Paris, C. R., vol. 170, pp. 136-139.

1920b. *Sur la métamérisation oroaborale de la larve de deux Hexacoralliaires (Seriatopora subulata et Pocillopora caespitosa).* Acad. Sci. Paris, C. R., vol. 170, pp. 826-828.

1927. *La forme des récifs coralliens et le régime des vents alternants.* Serv. Océanogr. des Pêches de l'Indochine Saigon, Trav., vol. 2, pp. 1-33, pls. 1-6, text-figs. 1-4.

1929. *About the shape of the coral reefs and the system of alternating winds.* Fourth Pan Pacific Sci. Congr., Proc., vol. 2, p. 427.

1931. *La forme des récifs coralliens et le régime des vents alternants.* Inst. Océanogr. Indochine, Notes, vol. 16, pp. 19-22. [Resumé of the 1927 paper.]

1934. *Inscription marégraphique des cycles de rétrogradation des noeuds de la lune par certains coraux constructeurs de récifs.* Acad. Sci. Paris, C. R., vol. 198, pp. 1708-1710, fig.

1935. *Enregistrement du cycle marégraphique de 18 ans 2/3 par le polypier en voie de croissance de quelques coralliaires.* Ann. Sci. Nat. Paris, sér. 10, vol. 18, pp. 135-143, 3 figs.

Kruizinga, P.

1961. *Een interessante steen.* Ver. Publ. Nederland. Geol., n. s., vol. 10, pp. 266-267, figs. 1, 2.

Krumbeck, L.

1906. *Beiträge zur Geologie und Paläontologie von Tripolis.* Palaeontographica, vol. 53, pp. 51-136, pls. 7-9.

Krumpholz, F.

1916. *Miozäne Korallen aus Bosnien.* Naturforsch. Verein Brünn, Verhandl., vol. 54, pp. 26-50, 1 fig.

Kuenen, Ph. H.

1933. *Geology of coral reefs.* Snellius-Exped. 1929-1930, vol. 5, pt. 2, pp. 1-25, pls. 1-11, text-figs. 1-106.

Kühn, Othmar

1914-16. *Coelenterata. In* Bronn, H. G., *Klassen und Ordnungen des Tier-Reichs.* Leipzig, vol. 2, pt. 2, Nos. 22-36, pp. 371-538, 11 pls., text-figs.

1924. *Studien über die Poritidae der Kreideformation.* Österreich. Mittelsch., Zeitschr., vol. 1, pp. 237-244, pl. 1.

1925a. *Variationsuntersuchungen an rezenten Korallen und ihre Anwendung auf die fossilen.* Zool.-Botan. Gesell. Wein, Verhandl., vols. 74, 75, pp. 129-134, 1 fig.

1925b. *Das Miocäns von Eggenburg. Die Korallen.* Geol. Bundesanst. Wien, Abhandl., vol. 22, No. 3, pp. 3-20, pl. 1.

1926. *Korallen des Miocäns von Cicilien.* Geol. Bundesanst. Wien, Jahrb., vol. 76, pp. 65-80, pl. 2.

1928. *Hydrozoa. Fossilium Catalogus. I. Animalia.* Berlin pt. 36, 114 pp.

1930. *Korallen aus der Klippenhülde der Karpathen.* Státn. Geol. Ustav. Česk. Vestnik, Rep., vol. 6, 14 pp., 2 pls.

1933a. *Alcuni coralli fossili dell'Istria.* Acad. Sci. Nat. Torino, Atti, vol. 68, Nos. 7-10, pp. 402-409, 6 figs.
1933b. *Das Becken von Isfahan-Saidabad, und seine altimiocäne Korallenfauna.* Palaeontographica Stuttgart, vol. 79, Nos. 3-6, pp. 143-172, 176-221, pls. 17-19, 3 text-figs.
1934. *Ein Eocänvorkommen auf Chalkidike.* Centralb. Min. Geol. Paläont. vol. 133, pp. 125-136, 2 figs.
1936. *Die Korallen und Bryozoen des Tegels von Kreta.* Prakt. Akad. Athènes. vol. 11, No. 3, pp. 171-181, 1 pl.
1939. *Hydrozoa. In* Schindewolf, O. H., *Handbuch der Paläozoologie.* Berlin, vol. 2A, pp. A3-A68.
1946. *Das Alter der Prominaschichten und der innerozänen Gebirgsbildung.* Geol. Bundesanst. Wien, Jahrb., Nos. 1, 2, pp. 49-94. pls. 1, 2, text-figs.
1949. *Lehrbuch der Paläozoologie.* Stuttgart, v + 326 pp., figs. [Coelenterata pp. 25-50.]
1951. *Nouveau gisement d'Éocène supérieur en Macédonie.* [Serbian with French summary.] Mus. Hist. Nat. Serb., Bull., vol. A4, pp. 35-39, figs.
1954. *Korallen aus mittel-deutschen Mitteloligozän.* Hessisch. Landesant Bodenforsch., Notizbl., vol. 82, pp. 50-56, pl. 5.
1963a. *Korallen und Bryozoen dem Tyrrhenien der Strophaden.* Akad. Athens, Prakt., vol. 38, pp. 449-456, pl. 1.
1963b. *Korallensteinkerne im österreichischen Miozän.* Naturhist. Mus. Wien, Ann., vol. 66, pp. 101-112, pls. 1, 2.
1963c. *Korallen aus dem Miozän des Lavant-Tales.* Senckenberg. Leth., vol. 44, No. 2, pp. 85-106, pl. 17, text-figs. 1-4.
1965. *Korallen und Bryozoen aus der bayerischeren Molasse.* Bayerische Staatssaml. Paläont. Hist. Geol., Mitt., vol. 5, pp. 29-68, figs.

Kühn, O., and Andrusov, D.
1937. *Weitere Korallen aus der Oberkreide der Westkarpathen.* Kral. Česká Spol. Nauk., Věst., vol. 2, pp. 1-18, 1 fig.

Kühn, O., and Heritsch, F.
1936. *Geschichte von Triaskorallen vom Plabutsch bei Graz.* Naturwiss. Verein Steiermark, Mitt., No. 73, pp. 19-30, pl. 1.

Kükenthal, Willy
1896. *Ergebnisse einer zoologischen Forschungsreise in den Molkken und Borneo. Die Litoralfauna Ternates.* Senckenberg. Naturforsch. Gesel., Abhandl., vol. 22, pp. 45-52.
1901. *Leitfaden für das zoologische Praktikum.* Jena, (Coelenterata, pp. 45-75, figs. 37-63).
1904. *Ueber einige Korallentiere des rothen Meeres.* Medicinischnaturwiss. Gesell. Jena, Denkschr., Kaeckel Festschr., pp. 31-58, pls. 4, 5.

Künne, C.
1937a. *Ueber die Verbreitung der Leitformen des Grossplanktons in der südlichen Nordsee im Winter.* Deutsch. Wiss. Kom. Meeresforsch. Berlin, Ber., n. F., vol. 8, pp. 131-164, 9 text-figs.
1937b. *Ueber als "Fremdlinge" zu bezeichnende Grossplanktonen in der Ostsee.* Rapp. Cons. Explor. Mer, vol. 102, No. 2, pp. 1-7.
1952. *Untersuchungen über das Grossplantkon in der Deutschen Bucht und im Nordsylter Wattenmeer.* Helgoländ. Wiss. Meersuntersuch., vol. 4, No. 1, pp. 1-54, figs.

Kunth, A.
1869-70. *Beiträge zur Kenntniss fossiler Korallen.* Deutsche Geol. Gesell., Zeitschr., vol. 21, pp. 183-220, 647-688 (1869); vol. 22, pp. 24-25.

Kuo, L. C.
1948. *Geomorphology of the Tizard Bank and Reefs, Nan-sha Islands, China.* Acta Geol. Taiwanica, vol. 2, No. 1, pp. 45-55, pl. 1.

Küpper, H.
1941. *Bijdrage tot de stratigrafie van het Tagogapoe-Gy. Masigit gebied.* Ing. Nederland.-Ind., ser. 12, vol. 8, pp. 105-109.

Kuriyan, G. K.
1950. *The fouling organisms of pearl-oyster cages.* Bombay Nat. Hist. Soc., Jour., vol. 49, No. 1, pp. 90-92, figs.

Kutassy, A. von
1934. *Jong tertiaire koralen en mollusken uit de molasse-afzettingen in oost Celebes.* Geol.-Mijn. Genootsch. Nederland. Kolon., Verh., vol. 10, pp. 306-317, 3 pls.

Labat, Jean Baptiste
1730. *Voyage du Chevalier des Marchais en Guinée, isles voisines, et à Cayenne, fait en 1725, 1726 et 1727.* Paris, vol. 1.

Laborel, J.
1961. *Sur un cas particulier de concrétionnement animal. Concrétionnement à Cladocora cespitosa L. dans le Golfe de Talante.* Rapp. Comm. Internat. Mer Medit., vol. 16, No. 2, pp. 429-432, figs. 1-3.

Lacaze-Duthiers, Felix Joseph Henri de
1864. *Histoire Naturelle du Corail; organization, reproduction, pêche en Algérie, industrie et commerce. Avec 20 planches dessinées d'après nature et coloriés.* Paris, 346 pp.
1872. *Développement des Coralliaires. Premier mémoire. Actiniaires sans polypier.* Arch. Zool. Exper. et Génér., vol. 1, pp. 289-396, pls. 11-16, text-figs. 1-16.
1873a. *Développement des Coralliaires. Deuxième mémoire. Actiniaires à polypiers.* Arch. Zool. Expér. et Génér., vol. 2, pp. 269-348, pls. 12-15, text-figs. 1-5.
1873b. *Développement des polypes et de leur polypier.* Acad. Sci. Paris, C. R., vol. 77, pp. 1201-1207.
1877. *Observations sur la déglutition et la vitalité des Caryophyllies de Smith et Balanophyllie royale.* Arch. Zool. Expér. et Génér., vol. 6, pp. 377-384
1894a. *Faune du Golfe du Lion. Évolution du polypier du Flabellum anthophyllum.* Arch. Zool. Expér. et Génér., ser. 3, vol. 2, pp. 445-484, pl. 18.
1894b. *Sur le Flabellum anthophyllum du Golfe du Lion.* Acad. Sci. Paris, C. R., vol. 118, pp. 1013-1019.
1896. *Sur les Coralliaires du Golfe du Lion.* Acad. Sci. Paris, C. R., vol. 122, pp. 435-441.
1897. *Faune du Golfe du Lion. Coralliaires. Zoanthaires. Sclérodermés. Deuxième mémoire.* Arch. Zool. Expér. et Génér., sér. 3, vol. 5, pp. 1-249, pls. 1-12, text-figs. 1-9.
1899. *Les Caryophyllies de Port-Vendres.* Arch. Zool. Expér. et Génér., sêr. 3, vol. 7, pp. 529-562, pl. 15.

Lacrois de Marlès, J.
1845. *Histoire Descriptive et pittoresque de Saint-Domingue (Haïti).* Tours, 288 pp.

Lacroix, G., and Bergeron, J.
1963. *Liste preliminaire des invertébrés du banc de Bradelle, 1962.* Sta. Biol. Mar. Grande-Rivière, Rapp. 1962, pp. 59-67, figs. 1, 2.

Lacvivier, Charles Sixte [Croisiers de]
1884. *Études géologiques sur le département de l'Ariège et en particulier sur le terran Crétace.* Fac. Sci. Paris, These, 304 pp., 5 pls. 63 text-figs.

Ladd, Harry S.

1934. *Geology of Vitilevu, Fiji.* Bernice P. Bishop Mus., Bull., vol. 119, 263 pp., 44 pls., 11 text-figs., sketch map.

1950a. *Recent reefs.* Amer. Assoc. Petrol. Geol., Bull., vol. 34, No. 2, pp. 203-214, figs. 1-8

1950b. *Drilling on Bikini Atoll, Marshall Islands.* 18th Sess. Internat. Geol. Congr. (Great Britain), 1948, Rept., No. 8, pp. 38-43, figs.

1957. *Treatise on marine ecology and paleoecology. Volume 2.* Geol. Soc. Amer., Mem. 67, pp. 1-1077, figs. maps, tables, pls.

1961. *Reef building.* Science, vol. 134, No. 3481, pp. 703-715, figs. 1-11.

Ladd, H. S., Ingerson, E., Townsend, R.C., Russel, M., and Stephenson, H. K.

1953. *Drilling on Eniwetok Atoll, Marshall Islands.* Amer. Assoc. Petrol. Geol., Bull., vol. 37, No. 10, pp. 2257-2280, pls. 1-2, text-figs. 1-5.

Ladd, H. S., and Tracey, J. L.

1948. *Drilling on Bikini Atoll, Marshall Islands.* Science, vol. 107, No. 2768, pp. 51-55, figs.

1949. *The problem of coral reefs.* Sci. Monthly, vol. 69, No. 5, pp. 297-305, figs.

Ladd, H. S., Tracey, J. I., Wells, J. W., and Emery, K. O.

1950. *Organic growth and sedimentation on an atoll.* Jour. Geol., vol. 58, No. 4, pp. 410-425, pls. 1-7, figs. 1, 2.

Lafon, M., Durchon, M., and Saudray, Y.

1955. *Recherches sur les cycles saisonniers du plankton.* Inst. Océanogr. Paris, Ann., n. s., vol. 31, No. 3, pp. 125-230, chart, graphs, tables. [Coelenterates pp. 194, 195.]

Lamarck, Jean Batiste Pierre Antoine de Monte de

1801. *Système des animaux sans vertèbres, ou tableau général des classes, des ordres et des genres de ces animaux.* Paris, 432 pp.

1815. *Sur les polypiers corticifères.* Mus. Nat. Hist. nat. Paris, Mém., vol. 1, pp. 401-416, 467-476 *Suite des polypiers corticifères,* vol. 2, pp. 76-84, 157-164, 227-240.

1816. *Histoire naturelle des animaux sans vertèbres.* Paris, vol. 2, iv + 568 pp.

1821. *Exposition méthodique des genres de l'ordre des Polypiers, avec leur description et celles des principale espèces, figurées dans 84 planches; les 63 premières appartenant à l'Histoire naturelle des Zoophytes d'Ellis et Solander.* Paris, viii + 115 pp., 84 pls.

1836. *Histoire naturelle des animaux sans vetèbres. Histoire des Polypes.* Paris and London, ed. 2, vol. 2, 683 pp. *(Revue et augmentée de notes présentant . . . par MM. G. P. Deshayes et H. Milne Edwards).*

Lambe, Lawrence M.

1906. *Notes on the fossil corals collected by Mr. A. P. Low, at Beechy Island, Southampton Island, and Cape Chidley in 1904.* Cruise of the Neptune, pp. 322-328.

Lameere, Auguste

1924. *Notes de zoogénie. VI. Affinités des Tétracoralliaires.* Soc. Roy. Zool. Malac. Bruxelles, Ann., vol. 54, pp. 29-32.

1928. *Précis de zoologie. Les Métazoaires (caractères fondamentaux des Spongiaires, les Coelentérés.* Inst. Zool. Torley-Rousseau Bruxelles, Rec., vol. 2, Suppl., pp. 281-384.

1939. *Evolution des Coelentérés.* Sta. Zool. Wimereux, Trav., vol. 13, pp. 399-406.

Lamouroux, Jean Vincent Felix

1812. *Sur la classification des Polypiers coralligènes non enterement pierreux.* Soc. Philom., Nouv. Bull. Sci., vol. 3, pp. 181-188.

1816. *Historie des Polypiers coralligènes flexibles, vulgairement nommés Zoophytes.* Caen, lxxxiv + 560 pp., 19 pls.

1821. *Exposition méthodique des genres, de l'ordre des Polypiers, avec leur description et celles des principales espèces, figurées dans 84 planches; les 63 premières appartenant à l'Histoire nateurelle des Zoophytes d'Ellis et Solander.* Paris, viii + 115 pp., 84 pls., 1 table.

1824. *Histoire naturelle des Zoophytes ou animaux rayonés.* Encyclopédie Méthodique, vol. 2, pp. i-viii, 1-819, pls. 482-487.

Lang, William Dickson

1909. *Growth studies in the British species of the coral genus Parasmilia.* Zool. Soc. London, Proc., pp. 285-307, figs.

1917. *Homoeomorphy in fossil corals.* Geol. Assoc. London, Proc., vol. 28, pp. 85-94.

1950. *Report on Dorset natural history for 1949 (except birds and Lepidoptera).* Dorset Nat. Hist. Archaeol. Soc., Proc., vol. 71, pp. 133-137.

1952. *Report on Dorset natural history for 1951 (except birds and Lepidoptera).* Dorset Nat. Hist. Field Club, Proc. for 1951, pp. 171-177.

Lang, W. D., and Smith, S.

1937. *On the coral genus Fungites.* Ann. Mag. Nat. Hist., ser. 10, vol. 19, pp. 617-619.

Langenbeck R.

1908. *Korallenriffe und Koralleninseln.* Geogr. Anzeig. Gotha, vol. 9, pp. 97-101, 125-128.

Lapparent, Albert F. de

1938. *Études géologiques dans les régions provençales et alpines entre le Var et la Durance.* Bull. Serv. Carte Géol. France, Bull., vol. 40, 302 pp. (139, 175 corals), 11 pls., 53 text-figs., maps.

Latham, Mary H.

1929. *Jurassic and Kainozoic corals from Somaliland.* Roy. Soc. Edinburgh, Trans., vol. 56, pp. 273-289, pls. 1-2, text-figs. 1-4.

Latham, V. A.

1915. *Mounting zoophytes and Polyzoa.* Amer. Microsc. Soc., Trans., vol. 34, pp. 55, 56.

Laube, Gustav Carl

1865. *Die Fauna der Schichten von St.-Cassian. 1 Abt.* Akad. Wiss. Wien, Denkschr., vol. 24, pp. 223-266.

de Laubenfels, M. W.

1955. *Are coelenterates degenerate or primitive?* Syst. Zool., vol. 4, No. 1, pp. 43-45.

Laubier, Lucien

1966. *Le coralligène des Albires. Monographie biocenotique.* Inst. Océanogr. Paris, Ann., vol. 43, pp. 137-316, pls. 1-6, text-figs. 1-12, 2 maps. [Coelentérés pp. 205-209.]

Le Barbier, Camille

1908. *Les pêches maritimes dans la province de Tulear.* Bull. Economique Madagascar, vol. 8, pp. 30-47.

Lebour, Marie V.

1917. *The microplankton of Plymouth Sound from the region beyond the breakwater.* Marine Biol. Assoc. Plymouth, Jour., vol. 11, pp. 133-182.

Lecompte, Marius

1937. *Some observations on the coral reef area of Tortugas.* Carnegie Inst. Washington, Yearbook No. 36, pp. 96-97.

Leconte, Joseph

1875. *Rate of growth of corals.* Quart. Jour. Sci., ser. 3, vol. 10, pp. 34-36.

1880. *Coral reefs and islands.* Nature, vol. 22, p. 558.

Le Danois, Édouard

1921. *Cartes de pêche.* Paris, Office Scient. et Techn. Pêches Maritimes, pp. 1-3.

1948. *Les Profondeurs de la Mer.* Paris. 303 pp., 8 pls., 56 text-figs.

1953. *La Vie étrange des Rivages Marins.* Paris, 192 pp., 96 pls., text-figs.

Lee, Samuel Phillips

1854. *Cruise of the United States Brig "Dolphin."* 33d Congress. 1st Sess., Senate Exec. Doc. No. 59, Washington, D. C., vii + 331 + 2 pp., 15 charts.

Lefevre, S., Leloup, E., and Van Meel, L.

1956. *Observations biologiques dans le Port d'Ostende.* Inst. Sci. Nat. Belgique, Mém., vol. 133, pp. 1-157, pls. 1-3. [Coelenterates pp. 57-59, 80.]

Legaré, J. E. Henri

1961. *Estudios preliminares del zooplancton en la region de Cariaco.* Inst. Oceanogr. Cumaná, Bol., vol. 1, No. 1, pp. 191-218, figs. 1, 2, tables 1-9. [Coelenterata p. 204.]

Léger, Louis

1928. *Signalement de stations nouvelles d'espèces intéressantes ou rares ou encore inconnues en France* Lab. Hydrobiol. Univ. Grenoble. Trav., vol. 19, pp. 139-141. [Coelentérés.]

Leghissa, S., and Mazzi, S.

1959. *Contributo ad una migliore conoscenza sulla struttura e composizione delle mesodermide negli Antozoi.* Riv. Biol. Perugia, vol. 51, No. 3, pp. 293-325, figs. 1-11.

Lejeune, Maria J.

1935a. *Premiers assais d'étude radiographique du squelette chez les Hexacoralliaires actuels.* Acad. Roy. Belgique, Bull., sér. 5, vol. 21, pp. 328-331, figs.

1935b. *Contribution à l'étude biologique des Hexacoralliaires fossiles. Montlivaultia.* Ann. Paléont., vol. 24, Nos. 3-4, 37 pp., pls. 1-7, 9 text-figs.

Leloup, Eugène

1947. *Les Coelentérés de la faune Belge. Leur bibliographie et leur distribution.* Mus. Nat. Hist. nat. Paris, Mém., vol. 107, pp. 1-73, figs.

1952. *Faune de Belgique. Coelentérés.* Bruxelles, pp. 1-283, figs. 1-160.

Leloup, E., and Konietzko, B.

1956. *Recherches biologiques sur les eaux saumâtres du Bas-Escaut.* Inst. Sci. Nat. Belgique, Mém., vol. 132, pp. 1-100, pls. 1-5, text-figs. 1-26.

Lendenfeld, Robert von

1888a. *Der Character der australischen Cölenteratenfauna.* Biol. Centralbl., vol. 7, pp. 641-646.

1888b. *Notes on Australian coelenterates.* British Assoc. Adv. Sci., Rept., vol. 56, pp. 709-710.

1889a. *Neuere Untersuchungen über Anthozoen.* Biol. Centralbl., vol. 9, No. 2, pp. 54-56.

1889b. *Darwin's Corallenriffe.* Biol. Centralbl., vol. 9, No. 18, pp. 564-567.

1890a. *Die Koralleninseln der Sinai-halbinsel.* Biol Centralbl., vol. 10, pp. 200-205.

1890b. *Neuere Arbeiten über Anthozoen.* Biol. Centralbl., vol. 9, No. 24, pp. 755-759.

1890c. *Neuere Arbeiten über Hydromedusen und Anthozoen.* Biol. Centralbl., vol. 10, No. 23, pp. 711-721; No. 24, pp. 744-754.

1890d. *Coral reefs: fossil and Recent.* Nature, vol. 42, pp. 29-31, 100, 148.

Lenox-Conyngham, G.

1925. *The Great Barrier Reef.* Geogr. Jour. London, vol. 65, pp. 314-323, figs.

Lesson, René Primevère

1832-35. *Illustrations de Zoologie.* Paris, 60 pls.

1834. *Zoophytes. In* Belanger, *Voyage aux Indes-Orientales par le Nord de l'Europe, les provinces du Caucase, la Géorgie, l'Armenie et la Perse, suivi de détails topographiques, statistique et autres sur le Pégou, les Isles de Java, de Maurice et de Bourbon, sur le Cap-de-bonne-Espérance et Sainte-Hélène, pendant . . . 1825-29.* Paris, Zoolgie, xxxix + 535 pp., 40 pls.

1839. *Voyage autour du monde . . . sur . . . La Coquille pendant . . . 1822-25.* Paris, Zoologie, 2 vols., Atlas 157 pls.

Lesueur, Charles Alexandre

1817. *Observations on several species of the genus Actinia; illustrated by figures.* Acad. Nat. Sci. Philadelphia, Jour., vol. 1, pp. 149-154, 169-189, pl. 8.

1821. *Description de plusieurs animaux appartenants aux polypiers lamellifères de M. le Chev. Lamarck.* Mus. Nat. Hist. nat. Paris, Mém., vol. 6, pp. 271-298, pls. 15-17.

Le Sueur, R. F.

1961. *Marine zoological report for 1960.* Soc. Jersiaise, Ann. and Bull., vol. 18, No. 1, pp. 42-45. [Coelenterates p. 45.]

1962. *Marine zoology report for 1961.* Soc. Jersiaise, Bull., vol. 18, No. 2, pp. 165-168. [Coelenterates p. 168.]

Leuckhart, Friedrich Sigismund

1841. *Observations zoologicas de zoophytis coralliis, speciatim et genere Fungia, et descriptionem nonnullarum hujus generis specierum, etc.* Freiburg, 60 + 2 pp., 4 pls.

Levinsen, Georg Marius Reinold

1893. *Annulata, Hydroidae, Anthozoa, Porifera. Hauchs Expedition. Det Videnskabelige Udbyette af Kanonbaden "Hauchs" togter i de Danske indenfor Skagen i Aarene 1883-86.* Vidensk. Meddel. Naturhist. Foren. Kjøbenhavn, vol. 5, pp. 307-464.

Lewis, John B.

1960a. *The fauna of rocky shore of Barbados, West Indies.* Canadian Jour. Zool., vol. 38, No. 2, pp. 391-435, figs. 1-20.

1960b. *The coral reefs and coral communities of Barbados, W. I.* Canadian Jour. Zool., vol. 38, No. 6, pp. 1133-1145, pls. 1-7, text-fig. 1.

1960c. *Scleractinia of Barbados.* Barbados Mus. and Nat. Hist. Soc., Jour., vol. 28, No. 1, pp. 11-12.

Lewis, John R.

1953. *The ecology of rocky shores around Anglesey.* Zool. Soc. London, Proc., vol. 123, No. 3, pp. 481-549, pls. 1-4, text-figs. 1-15, tables 1, 2.

Leymerie, Alexandre
1846. *Mémoire sur le terrain à Nummulites des Corbières et de la Montagne Noire.* Soc. Géol. France, Mém., sér. 2, vol. 1, pp. 338-373, pls. 13-17.
1881. *Description géologique et paléontologique des Pyrénées et de la Haute-Garonne.* Toulouse, 1010 pp., 51 pls., geol. map.

Lhomme, Gaston
1904. *Coquilles fossiles trouvées en 1903 dans les sables de Saint-Gobain (Yprésien).* Feuille des Jeunes Naturalistes, sér. 4, vol. 34, pp. 103-106.

Lhuyd, Edward
1699. *Lithophylacii Britannici Ichnographia, sive Lapidum aliorumque Fossilium Britannicarum singulari figura insignium . . . distributio classica . . . Additis rariorum aliquot figuris . . . de quibusdam circa marina fossilia & stirpes minerales praesertim notandis, . . .* London, xvi + 145 + 5 pp., 17 pls.

Light, Sol Felty
1954. *Intertidal invertebrates of the central California coast.* Univ. California Press, Berkeley, 2nd ed. (Revised by Smith, R. I., Pitelka, F. A., Abbott, D. P., and Weesner. F. M.), pp. i-xiv, 1-446, text-figs. 1-138.

Lilly, S. J., Sloane, J. F., Bassindale, R., Ebling, F. J., and Kitching, J. A.
1953. *The ecology of the Lough Ine rapids with special reference to water currents. IV. The sedentary fauna of sublittoral boulders.* Jour. Anim. Ecol., vol. 22, pp. 87-122, 25 figs.

Lindström, Gustaf
1876. *On the affinities of the Anthozoa Tabulata.* Ann. Mag. Nat. Hist., ser. 4, vol. 18, pp. 1-17.
1877. *Contributions to the actinology of the Atlantic Ocean.* K. Svenska Vetensk.-Akad. Stockholm, Handl., n. F., vol. 14, No. 6, pp. 1-26, 3 pls.
1899. *Remarks on the Heliotidae.* K. Svenska Vetensk.-Akad., Handl., vol. 32, No. 1, 140 pp., 12 pls.
1900. *On Thecocyathus nathorsti, a Neocomian coral from King Charles Land.* K. Svenska Vetensk.-Akad., Forhandl., pp. 2-12, figs.

Link, Heinrich Friedrich
1807. *Beschreibung der Naturalien-Sammlungen der Universität zu Rostock.* Rostock, pt. 3, pp. 161-169.

Linke, O.
1951. *Neue Beobachtungen über Sandkorallen-Riffe in der Nordsee.* Natur u. Volk, vol. 81, pp. 77-84, figs.

Linnaeus, Carl
1758. *Systema Naturae per regna tria naturae, secundum Classes, Ordines, Genera, Species, cum characteribus, differentiis, synonymis, locis. Tomus I. Regnum Animale.* Holmiae, Editio Decima, Reformata, 824 pp.
1766-67. *Systema Naturae . . .* Holmiae, Editio Duodecima, Reformata, pt. 1, pp. 1-532 (1766); pt. 2, pp. 533-1327 (1767).

Liouville, J.
1924. *Sur les coraux nuisibles aux chalutiers du Maroc.* Acad. Sci. Paris, C. R., vol. 179, pp. 193-195.

Lipparini, T.
1928. *Sabbie ad Antozoi del Pliocene superiore di Ancognano Bolognese.* Giorn. Geol. Bologna, ser. 2, vol. 3, pp. 134-140, 1 pl.

Lisson, Carlos Israel
1942. *Edad de los fósiles Peruanos y distribución de sus depósitos en la República, con un mapa paleontológico del Peru.* Lima, 3d ed., 320 pp.

Lister, Joseph Jackson
1891. *Notes on the geology of the Tonga Islands.* Geol. Soc. London, Quart. Jour., vol. 47, pp. 590-617, 7 maps, figs.
1889. *Some points in the natural history of Fungia.* Quart. Jour. Microsc. Sci., vol. 29, pp. 359-363, 2 figs.

Lloyd, E. Russel
1933. *Coral reefs and atolls.* Amer. Assoc. Petrol. Geol., Bull., vol. 17, No. 1, pp. 85-87.

Llueca, Frederico Gómez
1931. *Noticia sobre el hallazgo del "Aspidiscus cristatus" Lamarck en el cenomanense.* Inst. Geol. Min. España, Bol., vol. 52, pp. 345-348, 1 pl.

L'Obel, Matthias de
1576. *Plantarum seu Stirpium Historia* . . . Antwerp, 2 vols., (pp. 650-651).
1591. *Icones Stirpium seu Plantarum* . . . Antwerp, 2 vols., (pls. 251-253).

Lo Bianco, Salvatore
1888. *Notizie biologiche riguardanti specialmente il periodo di maturita sessuale degli animali del Golfo di Napoli.* Zool. Stat. Neapel, Mitth., vol. 8 (1888), pp. 385-440. [Coelenterata pp. 363-393]; vol. 13 (1899), pp. 448-573. [Coelenterata pp. 457-469.]
1899. *The methods employed at the Naples Zoological Station for the preservation of marine animals.* U.S. Nat. Mus., Bull., No. 39, 42 pp.

Locard, Arnould
1877. *Description de la faune des terrains tertiaires moyens de la Corse.* Soc. Agric. Hist. nat. Lyon, Ann., sér. 4, vol. 9, ix + 374 pp., 17 pls.

Loel, Wayne, and Corey, William Henry
1932. *The Vaqueros Formation, lower Miocene of California. I. Paleontology.* Univ. California, Publ. Geol., vol. 22, No. 3, pp. 31-410, pls. 4-65, 2 maps.

Lörenthey, E.
1926. *Beiträge zur Entwicklung des Eozäns und seiner Fauna in Nordalbanien.* Kgl. Ungar. Geol. Anstalt, Mitt. Jahrb., vol. 25, pp. 11-13, pls.

Logan, B. W.
1961. *Coral-reef and bank communities of the Campeche Shelf, Yucatan, Mexico.* [Abstract.] Geol. Soc. Amer., Program Ann. Meeting 1961, p. 94A.

Lonsdale, William
1845. *Account of twenty-six species of Polyparia obtained from the Eocene Tertiary of North America.* Geol. Soc. London, Quart. Jour., vol. 1, pp. 509-533, text-figs.
1850. *Notes on the corals [and Polyzoa]. In* Dixon, Frederick, *The geology and fossils of the Tertiary and Cretaceous formations of Sussex.* London, Pp. xvi + 422 + xvi, 45 pls.

Loppens, K.
1904. *Bryozoaires et Cnidozoaires nouveaux pour la faune Belge trouvés par la plupart pendant l'année 1903.* Soc. Zool. Belgique, Bull., vol. 39, pp. 45-47.

Lorenc, Ladislav
1951. *Eocenni fauna z Heršpic u Slavkova.* Geol. Úst. Praha, Sbar., Paléont., vol. 17, pp. 269-351, pls. 19-26. [Corals pp. 273-274.]
Lütken, Christian
1873. *En art fra nutiden af den miocene koralslaegt Cladangia, C. exusta (Stp.)* Vidensk. Medd. Naturhist. Foren. Kjobenhavn, pp. 65-68, pls. 2A.
1874. *Description du Cladangia exusta (Stp.), espèce moderne d'un genre de coraux connu jusqu'ici seulement fossile (Miocene).* Arch. Zool. Expér. et Génér., vol. 3, pp. xxix-xxx.
Luther, W., and Fiedler, K.
1961. *Die Unterwasserfauna der Mittelmeerkusten. Ein Taschenbuch für Biologen und Naturfreunde.* Hamburg and Berlin, pp. 1-253, pls. 1-46, text-figs. 1-28. [Coelenterata pp. 203-222.]
Lyman, Theodore
1859a. *On a new species of coral (Astrea decactis).* Boston Soc. Nat. Hist., Proc., vol. 6, pp. 260-263.
1859b. *On a new genus and species of coral, Syndepas Gouldii.* Boston Soc. Nat. Hist., Proc., vol. 6, pp. 274-278.
1859c. *On a new species of coral (Oculina glomerata).* Boston Soc. Nat. Hist., Proc., vol. 6, pp. 287-289.
Ma, Ting Ying H.
1933. *On the seasonal change of growth in some Paleozoic corals.* Imp. Acad. Japan Tokyo, Proc., vol. 9, No. 8, pp. 407-408, 1 pl.
1934a. *On the seasonal change of growth in a reef coral, Favia speciosa (Dana), and the water-temperature of the Japanese seas during the latest geological times.* Imp. Acad. Japan Tokyo, Proc., vol. 10, pp. 353-356, figs. 1-9.
1934b. *On the growth rate of reef corals and the seawater temperature in the Japanese islands during the latest geological times.* Tôhoku Univ., Sci. Rept., vol. 16, No. 3, pp. 165-189, 4 pls., 8 text-figs.
1936. *On the Devonian equator located by the growth rate of tetracorals.* Geol. Soc. Japan, Jour., vol. 43, No. 512, pp. 343-346, pl. 19.
1937a. *On the growth rate of reef corals and its relation to sea water temperature.* Palaeont. Sinica, vol. B16, No. 1, pp. 1-226, pls. 1-100, tables 1-105. Also, Nat. Inst. Zool. Bot. Acad. Sinica, Mem., Zoology, vol. 1, 226 pp., 100 pls.
1937b. *Data on the time required for the building of coral reefs.* Geol. Soc. China, Peking, Bull., vol. 17, No. 1, pp. 135-136.
1937c. *On the Ordovician climate of the northern hemisphere deduced from the growth rate of tabulate corals.* Geol. Soc. Japan, Jour., vol. 44, No. 529, pp. 931-938.
1938. *On the water temperature of the Western Pacific during early and late Pleistocene as deduced from the growth rate of fossil corals.* Geol. Soc. China Peking, Bull., vol. 18, Nos. 3-4, pp. 349-418, 62 graphs.
1951. *Research on the past climate and continental drift. IV. The equator and relative positions of the continents during the Cretaceous period as deduced from the distribution and growth values of reef corals.* Taipei, 25 pp., 2 figs.
1952. *Research on the past climate and continental drift. V. The shiftings in pole positions with diastrophisms since the end of the Cretaceous, and the accompanying drift of continents.* Taipei, 176 pp., 22 pls., 7 figs., 1 chart.
1958. *The relation of growth rate of reef corals to surface temperature of sea water as basis for study of causes of diastrophisms in-*

stigating evolution of life. Research on the Past Climate and Continental Drift, vol. 14, pp. 1-60, pls. 1-24, text-figs. 1-7.
1959a. *Effect of water temperature on growth rate of reef corals* Oceanogr. Sinica, Spec. vol. 1, i-iv + 116 pp., pls. A, 1-320, text-figs. 1-7b.
1959b. *The relation of growth rate of reef corals to surface sea water temperature as a basis for the study of causes of diastrophism initiating evolution.* Internat. Congr. Zool., Proc. 1958, pp. 986 987.
1960a. *Continental drift and polar wandering.* Research on the Past Climate and Continental Drift, vol. 15, pp. 1-24, pls. 1-8, text-figs 1-10.
1960b. *History of the Pacific, Atlantic and Indian Ocean basins as deduced from growth values of reef corals.* Geol. Soc. China Peking, Proc., vol. 3, pp. 67-81, figs. 1-4.
1960c. *A comparison of palaeomagnetic latitudes and palaeographical latitudes deduced from growth values of reef corals.* Oceanogr. Sinica, vol. 6, No. 2, pp. 1-5, figs. 1-7. [Reprinted from Geol. Soc. China, Mem., No. 1, 1962.]
1962. *A recomparison of palaeomagnetic latitudes and palaeogeographical latitudes deduced from growth values of reef corals.* Oceanogr. Sinica, vol. 7, pp. 75-93, figs. 1a-7b. [Reprinted from Geol. Soc. China, Mem., No. 1, 1962.]

Ma, T. Y., Hayasaka, I., and Kawaguti, S.
1946. *Observations on the coral reefs of Penghu Islands, Taiwan.* Oceanogr. Inst. Taiwan, Bull., vol. 1, p. 1.

MacBride, D.
1944. *Corals.* Nat. Hist. Soc. Jamaica, Nat. Hist. Notes, vol. 2, No. 17, pp. 87-88.

MacDonald, Donald Francis
1919. *The sedimentary formation of the Panama Canal Zone, with special reference to the stratigraphic relations of the fossiliferous beds.* U.S. Nat. Mus., Bull. 103, No. 10, pp. i-iv, 525-545, pls. 153-154 (maps).

MacDonald, John Denis
1862. *Observations on some Australian and Feejeean Heterocyathi, and their parasitical Sipunculus.* Nat. Hist. Rev., vol. 2, pp. 78-82, 5 figs.

MacGillivray, J.
1852. *Narrative of a Voyage of H.M.S. "Rattlesnake" . . . during . . . 1846-1850. Including discoveries and surveys in New Guinea. the Louisade Archipelago, etc.* London, 2 vols.

MacGinitie, George E.
1955. *Distribution and ecology of the marine invertebrates of Point Barrow, Alaska.* Smithsonian Misc. Collection, vol. 128, No. 9, pp. 1-201, pls. 1-8, text-figs. 1-12. [Coelenterates pp. 116-123.]

MacGinitie, George E., and MacGinitie, Nettie
1949. *Natural History of Marine Animals.* New York, pp. i-xii, 1-473, 1 pl., text-figs. 1-282. [Coelenterates pp. 117-143.]

Machado, A.
1942. *Notas de zoologia.* Brotéria Cienc. Nat. Lisboa, vol. 11, No. 3, pp. 97-105.

Mack, G.
1950. *Corals and the Great Barrier Reef.* Queensland Mus. Brisbane, 12 pp., figs.

Mackintosh, N. A.
1934. *Distribution of Antarctic macroplankton.* Discovery Repts., vol. 9, pp. 69-160, 49 figs.
MacLure, William
1817. *Observations on the geology of the West India islands from Barbadoes to Santa Cruz, inclusive.* Acad. Nat. Sci. Philadelphia, Jour., vol. 1., pt. 1, pp. 139-149.
Macmillan, N. F.
1951. *The natural history of Lough Foyle, North Ireland. The marine fauna. Pt. I. (Coelenterata, Mollusca, Bryozoa, Echinodermata).* Roy. Irish Acad., Proc., vol. 54B, No. 5, pp. 73-84.
MacMunn, Charles Alexander
1902. *On the pigments of certain corals.* Fauna and Geography of the Maldive and Laccadive Archipelagoes, vol. 1, pp. 184-190.
Macnae, William, and Kalk, Margaret
1958. *A natural history of Inhaca Island, Moçambique.* Johannesburg, Witwatersrand Univ. Press, pp. i-v, 1-163, pls. 1-11, text-figs. 1-30.
1962. *The fauna and flora of sand flats at Inhaca Island, Moçambique.* Jour. Anim. Ecol., vol. 31, No. 1, pp. 93-128, figs. 1-5.
MacNeil, Francis Stearns
1954a. *Organic reefs and banks and associated detrital sediments.* Amer. Jour. Sci., vol. 252, No. 7, pp. 385-401.
1954b. *The shape of atolls: an inheritance from subaerial erosion forms.* Amer. Jour. Sci., vol. 252, No. 7, pp. 402-407, pls. 1-8.
Maillieux, Eugène
1933. *Terrains Roches et Fossils de la Belgique.* Bruxelles, 212 pp., 252 figs.
Makiiima, J.
1926. *Heteropsammia, Stephanoseris. and Heterocyathus as commensal corals.* Geol. Soc. Japan Tokyo, Jour., vol. 33, p. 1. [In Japanese.]
Malaroda, R.
1947. *Segnalazione di nuove impronte delle arenarie del Flysch eocenico dell conca di Trieste.* Mus. Storia Nat. Trieste, Atti, vol. 16, No. 5, pp. 57-64, pls. 1, 2.
1951. *Il Lattarfiano del Monteccio di Costozza (Colla Berici). Parte prima: I macrofossili.* Mus. Storia Nat. Verona, Mem., vol. 2 (for 1949-50), pp. 147-210, pls. 1-7.
Mallada, Lucas
1884-92. *Sinopsis de las especies fósiles que se han encontrado en España.* Com. Mapa Geol. España, Biol., vol. 11 (1884), pp. 147-150, 209-358; vol. 12 (1885), pp. 649-370; vol. 13 (1886), pls.; vol. 14 (1887), pp. i-xix, 1-171; vol. 15 (1888), pls.; vol. 16 (1890), pp. 61-63; vol. 17 (1891), pls.; vol. 18 (1892), pp. 1-253.
Maluquer y Nicolau, Joaquim
1916. *Treballs oceanogràfics en la costa del Empurda.* Junta Cienc. Nat. Barcelona, pp. 221-261.
Mankowski, W.
1959. *Macroplankton investigations of the southern Baltic in the period 1952-1955.* [Polish with Russian and English summaries.] Prace Morsk. Inst. Ryback. Gydn., vol. 10A, pp. 69-129, charts.
Mann, F. G.
1948. *Biología de la Antártica Suramericana.* Santiago de Chile, vol. 2, pp. 1-364, pls. 1-46, text-figs., maps.
Mansfield, Wendell C.
1926. *Fossils from quarries near Suva, Viti Levu, Fiji Islands, and from Valvao, Tonga Islands, with annotated bibliography of the geology*

of the Fiji Islands. Carnegie Inst. Washington, Publ., No. 344, Papers Dept. Marine Biol., vol. 23, pp. 85-104, pls. 1-7.

Mantell, Gideon Algernon

1850. *On the geology of New Zealand.* Geol. Soc. London, Quart. Jour., vol. 6, pp. 331-343, pls. 28, 29. [Corals p. 331.]

Manten, A. A.

1960. *De groeivormen van Koralen als milieu-indicatoren. Grondboor en hamer.* Nederland Geol. Vereen, vol. 5, pp. 145-165, figs.; vol. 6, p. 203.

Manton, S. M.

1932. *On the growth of the adult colony of Pocillopora bulbosa.* British Museum (Nat. Hist.) Great Barrier Reef Exped. 1928-29, Sci. Rept., vol. 3, No. 6, pp. 157-166, pl. 1, text-figs. 1-4.

Manton, S. M., and Stephenson, T. A.

1935. *Ecological surveys of coral reefs.* British Mus. (Nat. Hist.) Great Barrier Reef Exped. 1928-29, Sci. Rept., vol. 3, No. 10, pp. 273-312, 16 pls. 2 text-figs.

Marec, E. J.

1928. *Essai sur l'industrie du corail, la mise en valeur et d'exploitation des bancs coralligènes Algériens.* Soc. Océanogr. Paris, Bull., vol. 8, pp. 744-751, 758-767, 777-781, 785-790.

Marenzeller, Emil von

1887. *Ueber das Wachstum der Gattung Flabellum, Lesson.* Zool. Jahrb., vol. 3, No. 1, pp. 25-50.

1888. *Ueber einige japanische Turbinoliiden.* K.-K. Naturhist. Hofmus. Wien, Ann., vol. 3, pp. 15-22.

1895. *Tiefsee- und Riffkorallen des rothen Meeres.* Expedition en S. E. Schiff "Pola" in das Rote Meer, Zool. Ergebn., vols. 24-25.

1896. *Deutsche Benennungen für Poriferen, Coelenteraten, Echinodermen und Wurmer.* K.-K. Zool.-Botan. Gesell. Wien, Verhandl., vol. 40, pp. 177-184.

1901. *Ostafrikanische Steinkorallen.* Naturhist. Mus. Hamburg, Mitt., vol. 18, pp. 117-134, 1 pl.

1903. *Madreporaria und Hydrocorallia. Expédition Antarctique Belge.* Résultats du Voyage du J. Y. Belgica en 1897-1899 sus le commandement de A. de Gerlache de Gomery, vol. 7, 7 pp., 1 pl.

1904a. *Reports on the dredging operations of the west coast of Central America to the Galapagos, to the west coast of Mexico, and in the Gulf of California, in charge of Alexander Agassiz, carried on by the U. S. Fish Commission Steamer "Albatross", during 1891, Lieut. Comm. Z. L. Tanner, U.S.N. commanding. XXXIII. Stein-und Hydro-Korallen. XXXIV. Lagisca ittitans sp. nov., ein symbiont von Hydrokorallen.* Mus. Comp. Zool., Bull., vol. 43, Nos. 2-3, pp. 75-94, 4 pls.

1904b. *Steinkorallen.* Wissensch. Ergebn. Deutsch. Tiefsee-Exped. Valdivia 1898-99, vol. 7, No. 3, pp. 261-318, pls. 14-18.

1906. *Ergebnisse der Expeditionen S. M. Schiff "Pola" in das Rote Meer 1895-1896-1897-1898 betreffen. I. Ueber den septennachwuchs der Eupsamminen E. & H. II. Tiefseekorallen.* Akad. Wiss. Wien, Anzeig., pp. 54-56; 85, 86.

1907a. *Ostafrikanische Steinkorallen. (Beiheft 2).* Naturhist. Mus. Hamburg. Mitt., vol. 18, pp. 117-134, 1 pl.

1907b. *Expeditionen S. M. Schiff "Pola" in das Rote Meer, nördliche und südliche Hälfte 1895/96-1897/98. Zoologische Ergebnisee XXIV. Ueber der Septennachwuchs der Eupsammiden E. und H.* Akad. Wiss. Wein, Denkschr., vol. 80, pp. 1-12, 7 figs. *Zoologische*

Ergebnisee XXV. Tiefseekorallen, pp. 12-26, 2 pls. *Zoologische Ergebnisse XXVI. Riffkorallen*, pp. 27-97, 29 pls.

Marinelli, Olinko

1902. *Descrizione geologica dei dintorni di Tarcento in Friuli.* Inst. Sci. Fis. Nat. Firenze, Pubbl., No. 43, vii + 238 pp., 5 pls., 2 maps.

Marini, M.

1942. *Revisione della fauna neocretacica della Libia: Coralli.* Mus. Libico Storia Nat., Ann., vol. 3 (1941), pp. 75-82, pls. 4-5. Also, Ist. Geol. Paleont., Geogr. Fis. Univ. Milano, Pubbl., ser. P, vol. 30, pp. 75-82, pls. 4, 5.

Marion, Antoine Fortuné

1883. *Esquisse d'une topographie zoologique du Golfe de Marseille.* Mus. Hist. nat. Marseille, Ann., Zool., vol. 1, No. 1, 108 pp., map.

1898. *Notes sur la faune des Dardanelles et du Bosphore.* Mus. Hist. nat. Marseille, Ann., sér. 2, vol. 1, pp. 163-182.

1906. *Étude des Coelentérés atlantiques recueillis par la Commisson des Dragages de l'aviso "Le Travailleur" durant les campagnes 1880-1881.* Expéd. Scient. Travailleur et du Talisman, Paris, pp. 103-151, pls. 11-17.

Markow, Michel

1908. *Mitteilungen über das Plancton des schwarzen Meeres in der Nähe von Sebastopol.* Zool. Anzeig., vol. 33, pp. 663-666.

Markowski, S.

1962. *Faunistic and ecological investigations in Cavendish Dock, Barrow-in-Furness.* Jour. Anim. Ecol., vol. 31, No. 1, pp. 43-51, figs. 1, 2.

Marshall, Norman Bertram

1954. *Aspects of Deep-Sea Biology.* London, 380 pp., illustr.

Marshall, Patrick

1911. *Coral reefs of the Cook and Society Islands.* Australian Assoc. Adv. Sci., Rept., vol. 13, p. 140.

1913. *Notes on the geology of Moorea and Rurutu Islands.* New Zealand Inst. Wellington, Trans. and Proc., vol. 46, pp. 281-283.

1914. *The geology of Tahiti.* New Zealand Inst. Wellington, Trans. and Proc., vol. 47, p. 361.

1927. *Geology of Mangaia.* Bernice P. Bishop Mus. Honolulu, Bull., No. 36, 48 pp., 2 pls., text-figs. map.

1929. *Mangaia and Rurutu — a comparison between the two Pacific Islands.* Geol. Mag., vol. 66, No. 783, pp. 385-390, figs.

1930. *Geology of Rarotonga and Atiu.* Bernice P. Bishop Mus. Honolulu, Bull., No. 72.

1931. *Coral reefs — rough-water and calm-water types.* Great Barrier Reef Comm. Brisbane, Rept., vol. 3, pp. 64-72, 2 figs.

Marshall, Sheina M.

1925. *A survey of Clyde plankton.* Roy. Soc. Edinburgh, Proc., vol. 45, pp. 117-141.

1932. *Notes on oxygen production in coral planulae.* British Mus. (Nat. Hist.) Great Barrier Reef Exped. 1928-29, Sci. Rept., vol. 1, No. 9, pp. 253-258, 2 figs., 2 tables.

Marshall, Sheina M., and Orr, A. P.

1931. *Sedimentation on Low Isles Reef and its relation to coral growth.* British Mus. (Nat. Hist.) Great Barrier Reef Exped. 1928-29, Sci. Rept., vol. 1, No. 5, pp. 93-133, 3 pls., 7 text-figs.

Marshall, Sheina M., and Stephenson, T. A.

1933. *The breeding of reef animals. Part I. The corals.* British Mus. (Nat. Hist.) Great Barrier Reef Exped. 1928-29, Sci. Rept., vol. 3, No. 8, pp. 219-245, 1 pl., 6 text-figs., 3 tables.

Marshall, William Adolph Ludwig

1888. *Die Tiefsee und ihr Leben.* London, 343 pp., 4 pls., 114 text-figs.

Marsigli [Marsilli], Luigi Ferdinando

1725. *Histoire Physique de la Mer.* Amsterdam, xi + 173 pp., 50 pls., 2 maps.

Martelli, A.

1902. *I fossili dei terreni eocenici di Spalato.* Palaeontogr. Italica, vol. 8, pp. 43-97.

von Martens, Eduard Carl

1887. *Eine recente Koralle aus Japan.* Gesell. Naturforsch. Freunde Berlin, Sitzungsber., No. 2, pp. 14-15.

Martin, Jules

1860. *Paléontologie stratigraphique de l'Infra-Lias du départment de la Côte-d'Or.* Soc. Géol. France, Mém., sér. 2, vol. 7, pp. 1-101, pls. 1-8.

Martin, [Johann] Karl [Ludwig]

1879-80. *Die Tertiärschichten auf Java.* Leiden, ix + 164 + 51 + 6 + vi pp., 28 pls., 1 geol. map. [Corallia pp. 132-164, pls. 24-26.]

1890. *Die Kei-Inseln und ihr Verhaltniss zur Australisch-Asiatischen-Grenzlinie, zugleich ein Beitrag zur Geologie von Timor und Celebes.* Kon. Nederland. Aardrijksk. Genootsch. Amsterdam, Tijdschr., vol. 7, pp. 241.

1894. *Reisen in den Molukken, in Ambon, den Uliassern, Seran (Ceram) und Buru.* Leiden, xviii + 404 pp., pls., map.

1896. *Zur Frage nach der Enstehung des Oost un West-indischen Archipels.* Hettner's Geogr. Zeitschr. Leipsiz, vol. 2, p. 361.

1897, 1902. *Reisen in den Molukken . . . Geologischer Theil.* Leiden, ix + 296 pp., 15 pls., 6 maps.

1901. *Concerning Tertiary fossils in the Philippines.* U.S. Geol. Sur., Ann. Rept., vol. 21, No. 3, pp. 129-139.

1911. *Bemerkungen über sogenanten Korallenkalk oder Karang.* Zentralb. f. Min., Geol. u. Paleont. Stuttgart, pp. 282-285.

1917. *Bemerkungen über sogenannant Oligocäne und andere Versteinerungen von Celebes.* Geol. Reichsmus. Leiden, Samml., vol. 2, No. 7, pp. 299-307.

Martin, O. R., and Crehuet, R. F.

1948. *Apuntes para el estudio bionomico de la Bahia de Santander.* Asoc. Española Progr. Cienc., An., vol. 13, No. 1, pp. 89-129. [Coelenterates p. 113.] Also, Inst. Español Oceanogr. Madrid, Bol., vol. 1, pp. 1-41, chart.

Massy, Anne L.

1912. *Report of a survey of trawling grounds on the coasts of Counties Down, Louth, Neath, and Dublin. Pt. 3. Invertebrate fauna. Coelenterata.* Fisheries Ireland, Sci. Investig. 1911, No. 1.

Matthai, George

1914. *A revision of the Recent colonial Astreidae possessing distinct corallites.* Linnean Soc. London, Trans., Zoology, vol. 17, pp. 1-140, pls. 1-38.

1918a. *Is the madreporarian skeleton an extra protoplasmic secretion of the polyp?* Cambridge Philos. Soc., Proc., vol. 19, pp. 160-163.

1918b. *On reactions to stimuli in corals.* Cambridge Philos. Soc., Proc., vol. 19, pp. 164-166.

1919. *Coelenterata. II. Madreporaria. a. On Favia conferta Verrill, with notes on other Atlantic species of Favia.* British Mus. (Nat. Hist.) British Antarctic "Terra Nova" Exped. 1910, Rept., Zoology, vol. 5, No. 2, pp. 69-96, pls. 1-4, text-figs. 1-2.

1920. *Is the madreporarian skeleton an extra-protoplasmic secretion?* Cambridge Philos. Soc., Proc., vol. 19, pp. 160-163.
1923a. *Histology of the soft parts of astreid corals.* Quart. Jour. Microsc. Sci. London, vol. 67, pp. 101-122, pls. 7, 8.
1923b. *Madréporaires de Nouvelle-Calédonie.* Bull. Biol. France Belgique, vol. 57, pp. 70-88, pls. 1, 2.
1924a. *On a species of sub-fossil solitary coral from the Chilka Lake.* Indian Mus. Calcutta, Mem., vol. 5, pp. 999-1003, fig.
1924b. *Report on the madreporarian corals in the collection of the Indian Museum, Calcutta.* Indian Mus. Calcutta, Mem., vol. 8, pp. 1-59, pls. 1-11.
1926a. *Colony-formation in astreid corals.* Roy. Soc. London, Philos. Trans., vol. 214B, pp. 313-356, pls. 24-26, text-figs. 1-27.
1926b. *Colony-formation in Isophyllia, Symphillia, Mussa, Manicina, and Merulina.* Roy. Soc. London, Philos. Trans., vol. 214B, pp. 356-367, pls. 27, 28.
1928. *A monograph of the Recent meandroid Astraeidae.* Catalogue of the Madreporarian Corals in the British Museum (Natural History), vol. 7, pp. 1-288, pls. 1-72, text-figs. 1-35.
1940. *On the mode of growth of the skeleton in astreid corals.* Ann. Mag. Nat. Hist., ser. 11, vol. 5, No. 26, pp. 184-192, fig.
1948a. *On the mode of growth of the skeleton in fungid corals.* Roy. Soc. London, Philos. Trans., vol. 233B, No. 597, pp. 177-195, pls. 3, 4, text-fig.
1948b. *Skeletal variation in two large coralla from Tahiti, one of Pavona varians (Verrill) and another of Psammocora haimiana Milne Edwards and Haime.* Roy. Soc. London, Philos. Trans., vol. 233B, No. 597, pp. 197-199, pls. 15, 16.
1948c. *Colony-formation in fungid corals. I. Pavona, Echinophyllia, Leptoseris and Psammocora.* Roy. Soc. London, Philos. Trans., vol. 233B, No. 598. pp. 201-231, figs. 1-13.

Matthews, William H.
1960. *Texas fossils: An amateur collector's handbook.* Univ. Texas Bur. Econ. Geol., Guidebook, vol. 2, pp. 1-123, pls. 1-49, text-figs. 1-26. [Coelenterata pp. 49-50.]

Mauny, Raymond
1949. *Que faut-il appeler "pierres" d'Aigris?* Inst. Français d'Afrique Noir, Notes, No. 42, pp. 33-36.

Maurin, C.
1961. *Répartition des crevettes profondes sur les côtes sud du bassin occidental de la Méditerranée et dans la region Atlantique ibéro-marocaine.* Rapp. Comm. Internat. Mer Médit., vol. 16, No. 2, pp. 529-532.

Maurin, C., and Meglio, S. di
1961. *Campagne du navire océanographique "President-Théodore-Tissier" dans le secteur Atlantique ibéro-marocaine et sur les côtes sud de la Méditerranée occidentale. Commentaires sur les fonds prospectés et sur les cartes établies.* Rapp. Comm. Internat. Mer Médit., vol. 16, No. 2, pp. 269-273.

Mavor, J. W.
1909. *Bilateral symmetry in the development of the primary septa of a living coral.* Science, n. s., vol. 29, No. 748, p. 712.
1916. *On the development of the coral Agaricia fragilis Dana.* Amer. Acad. Arts and Sci., Proc., vol. 51, pp. 483-511, pls 1-6, text-figs. 1-5.

Mawatari, S., and Kobayashi, S.

1954. *Seasonal settlement of animal fouling organisms in Ago Bay, middle part of Japan. I. II.* Res. Inst. Nat. Resources Tokyo, Misc. Rept., No. 35, pp. 37-47, figs. 1-13; No. 36, pp. 1-8, pls. 1, 2, text-figs. 14-19.

Mawson, Douglas

1905. *The geology of the New Hebrides.* Linnean Soc. New South Wales, Jour. pt. 3, pp. 400-484.

May, Walther

1902. *Die neueren Forschungen über die Bildung der Korallenriffe.* Zool. Centralbl., vol. 9, pp. 229-245.

Mayer [Mayor], Alfred Goldsborough

1903a. *The Tortugas as a biological station.* Science, vol. 17, p. 246.

1903b. *The Bahamas versus Tortugas as a station for research in marine biology.* Science, vol. 18, pp. 369-371.

1913. *Department of Marine Biology.* Carnegie Inst. Washington, Yearbook for 1912, No. 11, pp. 118-129.

1914a. *An expedition to the coral reefs of Torres Straits.* Popular Sci. Month., vol. 85, pp. 209-231, figs.

1914b. *The effects of temperature upon tropical marine animals.* Carnegie Inst. Washington, Publ. No. 183, Papers Tortugas Lab., vol. 6, No. 1, pp. 1-24.

1915. *Ecology of the Murray Island coral reef.* Nat. Acad. Sci. Washington, Proc., vol. 1, pp. 211-214.

1916a. *Sub-marine solution of limestone in relation to the Murray-Agassiz theory of coral atolls.* Nat. Acad. Sci. Washington, Proc., vol. 2, pp. 28.

1916b. *The solution of limestone in sea-water.* Carnegie Inst. Washington, Yearbook No. 14, pp. 210-212.

1916c. *The lower temperatures at which reef-corals lose their ability to capture food.* Carnegie Inst. Washington, Yearbook No. 14, p. 212.

1917a. *Coral reefs of Tutuila, with reference to the Murray-Agassiz solution theory.* Nat. Acad. Sci. Washington, Proc., vol. 3, pp. 522-526.

1917b. *Ecology of the Murray Island coral reef.* Carnegie Inst. Washington, Publ. No. 213, Papers Dept. Marine Biol., vol. 9, pp. 1-48, pls. 1-19, text-figs. 1-9, tables 1-12.

1918a. *Toxic effects due to high temperature.* Carnegie Inst. Washington, Publ. No. 252, Papers Tortugas Lab., vol. 12, No. 7, pp. 173-178.

1918b. *The growth-rate of Samoan coral reefs.* Nat. Acad. Sci. Washington, Proc., vol. 4, pp. 390-393.

1919. *The growth-rate of Pacific coral reefs.* Zool. Soc., Bull., vol. 22, No. 6, pp. 137-149, fig.

1920. *The reefs of Tutuila, Samoa, in their relation to coral reef theories.* Amer. Philos. Soc., Proc., vol. 59, pp. 225-236, figs.

1921. *Rose Atoll, American Samoa.* Amer. Philos. Soc., Proc., vol. 60, pp. 62-70.

1924a. *Structure and ecology of Samoan reefs.* Carnegie Inst. Washington, Publ. No. 340, Papers Dept. Marine Biol., vol. 19, pp. 1-25, pls. 3-8, text-figs. 1-3.

1924b. *Causes which produce stable conditions in the depths of the floors of Pacific fringing reef-flats.* Carnegie Inst. Washington, Publ. No. 340, pp. 27-36, pls. 9-10, text-fig. 1, table.

1924c. *Growth-rate of Samoan corals.* Carnegie Inst. Washington, Publ. No. 340, Papers Dept. Marine Biol., vol. 19, pp. 51-72, pls. 1-26, tables 1-8.

1924d. *Rose Atoll, American Samoa.* Carnegie Inst. Washington, Publ. No. 340, Papers Dept. Marine Biol., vol. 19, pp. 73-92, pls. 27, 28.

Mayer, Paul

1887. *Ueber "Stielneubildung" bei Tubularia.* Zool. Anzeig., vol. 10, p. 365.

Mayer, P., and Heider, A. von

1896. *Coelenterata.* Zool. Jahresber. 1895, 18 pp.

Mazzarelli, G.

1929. *Note sul corallo (Corallium rubrum L.).* Arch. Zool. Torino, vol. 13, pp. 403-467, 1 pl., 1 text-fig.

McCoy, Frederick

1848. *On some new Mesozoic Radiata.* Ann. Mag. Nat. Hist., ser. 2, vol. 2, pp. 397-420.

1849. *On some new genera and species of Paleozoic corals and Foraminifera.* Ann. Mag. Nat. Hist., ser. 2, vol. 3, pp. 1-20, 119-136.

M'Intosh, William Carmichael

1901. *The coloration of marine animals.* Ann. Mag. Nat. Hist., ser. 7, vol. 7, pp. 221-240. [Coelenterata pp. 224-225.]

1926. *Additions to the marine fauna of St. Andrews since 1874.* Ann. Mag. Nat. Hist., ser. 9, vol. 18, pp. 248-261, figs.

McIntyre, A. D.

1958. *The ecology of Scottish inshore fishing grounds. The bottom fauna of east coast grounds.* Marine Res., No. 1, pp. 1-24, figs. 1-3.

McLean, James H.

1962. *Sublittoral ecology of kelp beds of the open coast area near Carmel, California.* Biol. Bull. Woods Hole, vol. 122, No. 1, pp. 95-114, figs. 1, 2.

McMillan, N. F.

1961. *The coral Lophohelia prolifera Pallas in North Ireland.* Irish Natural., Jour., vol. 13, No. 12, p. 277.

McMurrich, James Playfair

1889. *The Actiniaria of the Bahama Islands, W.I.* Jour. Morph., vol. 3, No. 1, pp. 1-80, pls. 1-4.

1903. *Review of Duerden's memoir on "West Indian madreporarian polyps."* Science, vol. 18, pp. 80-81.

1905. *A revision of the Duchassaing and Michelotti actinian types in the Museum of Natural History, Turin.* Mus. Zool. ed Anat. Comp. R. Univ. Torino, Boll., vol. 20, No. 494, pp. 1-23.

McNeill, Frank A.

1933. *Coral and the Great Barrier Reef.* Australian Mus. Sydney, Mag., vol. 5, No. 4, pp. 113-117, 4 figs.

1934. *The mighty polyp.* Australian Mus. Sydney, Mag., vol. 5, No. 5, pp. 170-172, 2 figs.

1947. *Coral-built land.* Australian Mus. Sydney, Mag., vol. 9, No. 6, pp. 190-193, 3 figs.

1951. *Wealth in coral gravels.* Australian Mus. Sydney, Mag., vol. 10, No. 6, pp. 190-192, fig.

1955. *Coral paradise of One Tree Island.* Australian Mus. Sydney, Mag., vol. 11, No. 12, pp. 404-408, 5 figs.

Meléndez Meléndez, Bermudo

1947. *Tratado de Paleontologia. I. Invertebrados. 1. Animales Inferiores.* Madrid, pp. i-xxiii, 1-511, pls. 1-9, text-figs., tables. [Coelenterates pp. 205-263.]

1952. *Sobre la paleobiología y bioestratigrafía de los tetracoralarios hulleros.* Inst. Mallada, Estud. Geol., vol. 8, No. 16, pp. 379-384, fig. 1.

Menard, H. W., Allison, E. C., and Durham, J. W.

1962. *A drowned Miocene terrace in the Hawaiian Islands.* Science, vol. 138, No. 3543, pp. 896-897.

Meneghini, Giuseppe

1856. *Paléontologie de l'Ile de Sardaigne, ou description des fossiles recueillis dans dans cette contrée par le Général A. de la Marmora.* Turin, viii + 584 pp., 8 pls.

Menzel, R. Winston

1956. *Annotated check-list of the marine fauna and flora of the St. George's Sound-Apalachee Bay Region, Florida Gulf Coast.* Oceanogr. Inst. Florida State Univ., Contr., No. 61, pp. 1-78, chart.

Merezhkovskii, Konstantin Serghyeevich

1880. *Sur la structure de quelques coralliaires.* Acad. Sci. Paris, C. R., vol. 90, pp. 1086-1088.

Merriam, Charles Warren

1933. *Study of modern coral-reefs in relation to problems of palaeontology.* Carnegie Inst. Washington, Yearbook No. 32, pp. 276-277.

Merriam, C. W., and Turner, F. E.

1937. *The Capay middle Eocene of northern California.* Univ. California, Publ. Geol., vol. 24, No. 6, pp. 91-113, pls. 5, 6.

Mertens, R.

1941. *Eine neue Koralennatter aus Mexico.* Senckenbergiana, vol. 23, Nos. 4-6, pp. 216-217, 1 fig.

Mesolella, Kenneth J.

1967. *Zonation of uplifted coral reefs on Barbados, West Indies.* Science, vol. 156, No. 3775, pp. 638-640, figs. 1-3.

Metschnikoff, Elias

1870. *Ueber die Entwickelung einiger Coelenteraten.* Acad. St.-Pétersbourg, Bull., Cl. Phys.-Math., vol. 15, pp. 95-100.

Meyer, Georg

1882. *Rugose Korallen aus ost-und westpreussische Diluvialgeschiebe.* K. Physikal.-Oekonom. Gesell. Königsberg, Schr., vol. 22, pp. 97-111, 1 pl.

Michelin, Jean Louis Hardouin

1840-47. *Iconographie zoophytologique. Description par localités et terrains des polypiers fossiles de France, et pays environnants.* Paris, pp. 1-16, pls. 1-4 (1840); pp. 17-148, pls. 5-42 (1841-43); pp. 149-178, pls. 43-46 (1844); pp. 179-220, pls. 47-53 (1845); pp. 221-306, pls. 54-73 (1846); pp. 307-348, pls. 74-79 (1847).

1842a. *Description d'une nouvelle espèce de Zoophye du genre flabelline (Flabellum Less.).* Rév. Zool., vol. 5, p. 119.

1842b. *Description d'une nouvelle espèce de Zoophyte du genre fongie.* Rév. Zool., vol. 5, p. 316.

1850. *Description d'une nouvelle espèce de caryophyllie.* Rév. Zool., sér. 2, vol. 2, pp. 238-239, 1 pl.

Michelotti, Giovanni

1838. *Specimen Zoophytologiae Diluvianae.* Turni, iv + 227 + 9 pp., 7 pls.

1847. *Description des fossiles des terrains miocènes de l'Italie septentrionale. Précis de la faune miocène de la Haute-Italie.* Natuurk. Holland. Maatsch. Wetensch. Haarlem, Verh., ser. 2, vol. 3, pp. 1-408, 17 pls.

1861. *Études sur le Miocène Inférieur de l'Italie Septentrionale.* Natuurk. Holland. Maatsch. Wetensch. Haarlem, Verh., ser. 2, vol. 15, No. 2, 183 pp., 16 pls.

Milachewitch, Constantin

1876. *Die Korallen der Nattheimer Schichten.* Palaeontographica, vol. 31, pp. 205-244, pls. 46-51.

Mill, Hugh Robert

1895. *Studies of a growing atoll.* Nature, vol. 51, pp. 203-204.

Millard, N. A. H., and Harrison, A. D.

1954. *The ecology of South African estuaries. Part V. Richard's Bay.* Roy. Soc. South Africa, Trans., vol. 34, No. 1, pp. 157-179, pls. 5, 6, 6 text-figs.

Milne-Edwards, Henri see **Edwards, Henri Milne**

Miner, Roy Waldo

1924. *Hunting coral in the Bahamas.* Nat. Hist. New York, vol. 24, No. 5, pp. 595-600, 9 pls.

1925. *The reef builders of the tropic seas.* Nat. Hist. New York, vol. 25, No. 3, pp. 251-260.

1934. *Coral castle builders of tropic seas.* Nat. Geogr. Mag., vol. 65, No. 6, pp. 703-728, 16 figs.

1938. *Fragile creatures of the deep.* Nat. Hist. New York. vol. 42, No. 4, pp. 241-255, figs.

Mirigliano, Giuseppe

1949. *Pliocene tra Licurati, S. Iconico e Porto degl'Infreschi (Salerno).* Soc. Nat. Napoli, Boll., vol. 57 (1948), pp 60-71.

Mistakidis, M. N.

1951. *Quantitative studies of the bottom fauna of Essex oyster grounds.* Fish. Investig., ser. 2, vol. 17, No. 6, pp. 1-47, figs., tables.

Mitzopoulos, M. K.

1940. *Ueber des Alter und die Fauna des Neogens in Elis (Peloponnes).* Prak. Akad. Athens, vol. 15, pp. 429-436, pls. 1-3. [Corals p. 432.]

Moebius, Karl August

1880. *Beiträge zur Meeresfauna der Insel Mauritius und der Seychellen.* Berlin, vi + 352 pp., 22 pls., 1 map.

Moenke, M.

1953. *Les coralliaires des argiles du Tortonien de Beçzyn.* [Polish with French and Russian summaries.] Acta Geol. Polon., vol. 3, No. 2, pp. 239-276, figs. 1-18, 2 tables.

Mohler, Willi A.

1943. *Palaeontology and stratigraphy of the Tertiary of SE Borneo.* Geol. Dienst. Bandung, Arch., 24/cx.

Molengraaff, Gustaaf Adolpf Frederik

1886. *De Geologie van het Eiland St. Eustatius. Eene bijdrage tot de kennis der Nederlandsche Kolonien.* Leiden, 64 pp., 111 pls.

1916. *Het problem der Koraaleilanden en isostasie.* K. Akad. Wetensch. Amsterdam, Verl., vol. 25, p. 215.

1917. *The coral reef problem and isostasy.* K. Akad. Wetensch. Amsterdam, Proc, vol. 19, p. 610.

1921. *Modern deep-sea research in the East Indian Archipelago.* Geogr. Jour. London, vol. 57, pp. 95-118, 9 figs.

1929. *The coral reefs of the East Indian Archipelago, their distribution and mode of development.* Fourth Pan Pacific Sci. Congress Batavia, Proc., vol. 2 (A and B), p. 55; p. 989.

Molengraaff, G. A. F., and Weber, M.

1919. *Het verband tuschen den plistoceenen ijstijd en het onstaan der Soenda-zee.* K. Akad. Wetensch. Amsterdam, Verl., vol. 28, p. 497.

Molinier, R., and Picard, J.

1953. *Notes biologiques à propos d'un voyage d'étude sur les côtes de Sicile.* Inst. Océanogr. Paris, Ann., n. s., vol. 28, No. 4, pp. 163-187, pls. 1-4, text-fig.

Monod, Théodore

1950. *Coraux Ouest-Africains.* Notes Africaines Dakar, No. 46, p. 60.

1954. *Sur deux Madréporaires Ouest-africains.* Mus. Congo-Belge, Ann., n. s., Zool., vol. 1, pp. 222-230, 1 pl., text-figs.

Monsour, E.

1942. *Fossil corals of the genus Turbinolia from the Gulf Coast.* Rept. Comm. Marine Ecol. Related Palaeont. Nat. Res. Council Div. Geol. Geogr. Washington, p. 56 [Abstract.]

Montanaro, Eugenia

1929a. *Coralli Tortoniani di Monteginnio (Modena).* Soc. Geol. Italiana, Boll., vol. 48, pp. 107-137, pl. 3.

1929b. *I coralli fossili e le condizione d'ambiente dei depositi Miocenici di Montegibbio e Montebaranzone.* Gior. Geol. Bologna, ser. 2, vol. 4, pp. 50-74, tables.

1931a. *Coralli Pliocenici dell'Emilia.* Palaeontogr. Italica, vol. 31, pp. 63-91, pl. 4, 2 text-figs.

1931b. *Coralli dello "Schlier" di Pantano (Reggio Emilia).* Soc. Geol. Italiana, Boll., vol. 50, No. 2, pp. 193-212, pl. 10.

1931c. *Di un corallario di "typo antico" nello "Schlier" di Pantano (Reggio Emilia).* Soc. Nat. Mat. Modena, Atti, vol. 62, pp. 97-100.

1933. *Faune attinologiche Plio-Pleistoceniche dell'Africa Orientale.* Palaeontogr. Italica, vol. 33, pp. 141-209, pls. 18-22.

1934. *A proposito di un interessante tipo di cupsanimede.* Soc. Geol. Italiana, Boll., vol. 52, No. 2, pp. 361-366, pl. 17.

1937a. *Sull'eta di certi calcari madeporici della fossa Eritrea.* Terzo Congr. Stud. Col. Firenze, Atti, pp. 186-192.

1937b. *Celenterati, Echinodermi e Brachiopodi del Cretaceo medio-superiore della Zululand.* Palaeontogr. Italiana, vol. 37, pp. 193-210, pl. 9.

1937c. *Faunetta nuova a coralli del Cenomaniano "a facies Africana" di Caltavuturo (Palermo).* Soc. Geol. Italiana, Boll., vol. 56, pp. 425-440, pls. 13, 14.

Montanaro-Gallitelli, Eugenia

1939a. *Ritrovamento del gen. Pachyseris (P. imperialis n. sp.) nelle terrazze Pleistoceniche del Mar Rosso.* Riv. Ital. Paleont. Pavia, vol. 45, Nos. 3-4, pp. 51-55, pl. 4.

1939b. *Ricerche sull'eta di alcuni depositi insulari e marginali del Mar Rosso (Isole Daalac, Peninsola di Buri, dintorni di Massaua fino al Sahel).* Palaeontogr. Italica, n. s., vol. 9 (39), pp. 215-258, pls. 15-17, 1 text-fig.

1942. *Nuovo reperto a confermo della miocenicità di un deposito costiero al Nord di Massaua.* R. Accad. Italiana Roma, Rend., ser. 7, vol. 3, pp. 387-391.

Montanaro-Gallitelli, E., and Tacoli, M. L.

1951. *Le sabbie fossilifere di Žabčice (Brno.).* Accad. Modena, Atti, ser. 5, vol. 9, pp. 129-199, pls. 1-3, text-figs.

Monticelli, Francesco Saverio

1898. *Adelotacta zoologica.* Zool. Stat. Neapel, Mitth., vol. 12, pp. 432-462, pls. 19-20.

Monty, Cl.

1964. *Recherches paléoécologiques dans le V2a de la région "Huy-Moha."* Soc. Géol. Belg., Ann., vol. 86 (1962-1963), pp. B407-B432, pls. 1, 2, text-figs. 1-3, tables 1, 2.

Moore, Donald R.

1958. *Notes on Blanquilla Reef, the most northerly coral formation in the western Gulf of Mexico.* Inst. Marine Sci. Univ. Texas, Publ., vol. 5, pp. 151-155.

1962. *Occurrence and distribution of Nemopsis bachei Agassiz (Hydrozoa) in the northern Gulf of Mexico.* Bull. Marine Sci. Gulf and Caribbean, vol. 12, No. 3, pp. 399-402.

Moore, D. R., and Bullis, H. R., Jr.

1960. *A deep-water coral reef in the Gulf of Mexico.* Bull. Marine Sci. Gulf and Caribbean, vol. 10, No. 1, pp. 125-128, figs. 1, 2.

Moore, Hilary B.

1933. *New faunistic records for the Manx region.* Marine Biol. Sta. Port Erin, Rept., vol. 46, pp. 30-34.

1934. *New faunistic records for the Manx region.* Marine Biol. Sta. Port Erin, Rept., vol. 47, pp. 27-28.

1937. *Marine fauna of the Isle of Man.* Liverpool Biol. Soc., Proc., vol. 50, pp. 38-57.

1939a. *The colonization of a new rocky shore at Plymouth.* Jour. Anim. Ecol., vol. 8, No. 1, pp. 29-38.

1939b. *The role of temperature in hydranth formation in Tubularia.* Biol. Bull. Woods Hole, vol. 76, pp. 104-107.

1958. *Marine ecology.* New York, i-xi, 1-493 pp., figs. 2-1 to 12-1.

Moore, H. B., and Sproston, N. G.

1940. *Further observations on the colonization of a new rocky shore at Plymouth.* Jour. Anim. Ecol., vol. 9, pp. 319-327.

Moore, Raymond C. (Editor)

1956. *Treatise on Invertebrate Paleontology. Part F. Coelenterata.* Lawrence, Univ. Kansas Press, pp. i-xx, F1-F498, figs. 1-358.

Moore, William Usborne

1889. *Coral reefs.* Nature, vol. 40, No. 1026, pp. 203-204; No. 1029, p. 271.

1897. *Formation of coral reefs.* Nature, vol. 55, p. 463.

Moore, W. U., and Bassett-Smith, P. W.

1889. *Bathymetric conditions as to growing corals and other species of the Tizard and Macclesfield Banks in the China Seas.* Amer. Jour., Sci., ser. 3, vol. 38 (138), No. 224, p. 169.

1890. *China Sea. Reports on the results of an examination, by the officers of H.M.S. "Rambler," of the slopes and zoological condition of Tizard and Macclesfield Banks, 1888.* Hydrogr. Dept. Admiralty, 19 pp., 4 sections, figs.

Moorhouse, F. W.

1936. *The cyclone of 1934 and its effect on Low Isles, with special observations on Porites.* Great Barrier Reef Comm. Brisbane, Rept., vol. 4, pt. 2, No. 5, pp. 37-44, pls. 8-11.

Moreau, L.

1918. *Les récifs coralliens.* Rev. Scientifique, vol. 56, pp. 548-557, map.

Moreau de Jonnès, Alexandre

1822. *Histoire physique des Antilles françaises; savoir: la Martinique et les îles de la Guadeloupe.* Paris, 560 pp.

Morellet, Lucien, and Morellet, Jean

1948. *Le Bartonien du Bassin de Paris.* Mém. Carte Géol. Détail. France 1948, pp. 1-437, map. [Coelenterates pp. 20-22.]

Moresby, John

1876. *New Guinea and Polynesia. Discoveries and surveys in New Guinea and the d'Entrecasteaux Islands, A Cruise in Polynesia, and visits to the pearl-shelling stations in Torres Straits of H.M.S. "Basilisk."* London, xviii + 327 pp., 4 pls., 3 maps.

Morey, Frank

1909. *Coelenterata.* A Guide to the Natural History of the Isle of Wight, pp. 215-219.

Morgan, John

1904. *The structure and growth of corals.* E. Kent Soc., Rept., ser. 2, vol. 1, pp. 7-14, 4 pls.

Morgan, Thomas Hunt

1889. *Notice of Dr. H. V. Wilson's paper on the development of Manicina areolata.* Johns Hopkins Univ., Circ., vol. 8, No. 70, pp. 39-40.

1904. *An attempt to analyze the phenomena of polarity in Tubularia.* Jour. Exper. Zool. Baltimore, vol. 1, pp. 587-591.

1906. *Hydranth formation and polarity in Tubularia.* Jour. Exper. Zool. Baltimore, vol. 3, pp. 501-505.

Morgan, T. H., and Stevens, N. M.

1904. *Experiments on polarity in Tubularia.* Jour. Exper. Zool. Baltimore, vol. 1, pp. 559-585, 5 figs., 20 tables.

Mori, Kei

1964. *Some solitary corals from off Aomari Prefecture, Japan.* Paleont. Soc. Japan, Trans. Proc., n. s., vol. 56, pp. 309-316, pl. 46, text-figs. 1, 2.

Möriche, Wilhelm

1896. *Versteinerungen der Tertiärformation von Chile.* N. Jahrb. f. Min., Geol. u. Palaeont., vol. 10, pp. 589-590, pl. 12, figs. 6, 7. [*Oculina ramondi.*]

Morris, Charles

1888. *Theories of the formation of coral islands.* Acad. Nat. Sci. Philadelphia, Proc., vol. 40, pp. 419-420.

Morrison, J. P. E.

1951. *Atoll research in zoology, land and marine.* Atoll Res. Bull., No. 1, pp. 16, 17.

Mortensen, Theodor

1918. *Papers fom Dr. Th. Mortensen's Pacific Expedition 1914-1916. I. Observations on protective adaptations and habits, mainly in marine animals. 7. Coelenterates.* Dansk. Naturhist. Foren. København, Vidensk. Medd., vol. 69, pp. 82, 83.

1923. *The Danish Expedition to the Kei Islands 1922.* Dansk Naturhist. Foren. Kjøbenhavn, Vidensk. Medd., vol. 76, pp. 55-99, 3 pls.

Morton, Samuel George

1834. *Synopsis of the organic remains of the Cretaceous group of the United States . . . To which is added an Appendix containing a tabular view of the Tertiary fossils hitherto discovered in North America.* Philadelphia, 88 + 8 pp., 19 pls.

Moseley, Henry Nottidge

1876a. *On the structure and relations of the alcyonarian Heliopora caerulea, with some account of the anatomy of a species of Sarcophyton; notes on the structure of the species of the genera of Millepora, Pocillopora, and Stylaster; and remarks on the affinities of certain Palaezoic corals.* Roy. Soc. London, Philos. Trans., vol. 166, pt. 1, pp. 91-129, 2 pls.

1876b. *On the structure of a species of Millepora occurring at Tahiti.* Roy. Soc. London, Proc., vol. 24, pp. 448-450.

1876c. *Preliminary report to Professor Wyville Thomson, F.R.S., Director of the Civilian Scientific Staff, on the true corals dredged by H.M.S. "Challenger" in deep water, between the dates Dec. 30th, 1870, and August 31st, 1875.* Roy. Soc. London, Proc., vol. 24, pp. 544-569.

1876d. *Preliminary note on the structure of the Stylasteridae, a group of stony corals, which, like the Milleporidae are hydroids and not anthozoans.* Roy. Soc. London, Proc., vol. 25, pp. 93-101.
1877. *On the structure of a species of Millepora occurring at Tahiti, Society Islands.* Roy. Soc. London, Philos. Trans., vol. 167, pp. 117-135, pls. 2, 3.
1878a. *On the hydroid stony corals.* Zool. Anzeig., vol. 1, pp. 336-338.
1878b. *On the structure of the Stylasteridae, a family of the hydroid stony corals.* Roy. Soc. London, Philos. Trans., vol. 169B, pp. 425-503, pls. 33-44.
1879. *On the structure of the Stylasteridae, a family of hydroid stony corals.* Nature, vol. 20, pp. 339-341.
1880a. *On Koch's researches on the corals.* Zool. Soc. London, Proc., p. 24.
1880b. *Description of a new species of coral, Desmophyllum lamprotichum.* Zool. Soc. London, Proc., pp. 41-42, 2 figs.
1881. *Report on certain hydroid, alcyonarian, and madreporarian corals procured during the voyage of H.M.S. Challenger in the years 1873-76.* Voyage H.M.S. Challenger, Rept. Sci. Results, Zoology, vol. 2, pt. 7, pp. 1-248, pls. 1-14, 1-16, 22 text-figs.
1882a. *Precious coral.* Nature, vol. 25, pp. 510-511.
1882b. *Notes on the structure of Seriatopora, Pocillopora, Corallium, and Tubipora.* Quart. Jour. Microsc. Sci. London, vol. 22, pp. 391-398.
1887. *On new forms of Actinaria dredged in the deep sea; with a description of certain pelagic surface-swimming species.* Linnean Soc. London, Trans., ser. 2, vol. 1, pp. 295-305, pl. 45.
1892. *Notes by a Naturalist. An account of observations made during the voyage of H.M.S. Challenger round the world in the years 1872-1876, new and revised.* London, xvi + 599 pp., 2 pls., text-figs., chart.

Moss, Frederick J.
1889. *Through atolls and islands in the Great South Sea.* London, xv + 317 pp., pls., map.

Motoda, Sigeru
1939. *Submarine illumination, silt content, and quantity of food plankton of reef corals in Iwayama Bay, Palao.* Palao Trop. Biol. Sta. Tokyo, Studies, vol. 1, No. 4, pp. 637-649, 2 text-figs., tables 1-6.
1940a. *A study of growth rate in the massive reef coral Goniastraea aspera Verrill.* Palao Trop. Biol. Sta. Tokyo, Studies, vol. 2, No. 1, pp. 1-6, fig.
1940b. *Comparison of the conditions of water in bay, lagoon, and open sea in Palao.* Palao Trop. Biol. Sta. Tokyo, Studies, vol. 2, No. 1, p. 41-48, 2 figs., tables.
1940c. *The environment and the life of massive reef coral, Goniastraea aspera Verrill.* Palao Trop. Biol. Sta. Tokyo, Studies, vol. 2, No. 1, pp. 61-104, figs. 1-9.

Muckenhuber, L.
1964. *Miozän-Korallen des Wiener Beckens.* Österreich. Akad. Wiss., Math.-Naturwiss. Kl., Sitzungesber., vol. 173, Nos. 5-7, pp. 301-308, pl. 1.

Muellerried, Frederick Karl Gustav
1933-34. *Estudios paleontológicos y estratigráficos en la región de Tehuacan, Puebla.* Inst. Biol. Univ. Mexico, An., vol. 4 (1933), pp. 34-46, 79-93, 309-330; vol. 5 (1934), pp. 55-80, 39 figs.

Müllegger, S.
1951. *Korallen.* Aquar. Terrar. Zeitschr. Stuttgart, vol. 4, pp. 238-240, 321-323, figs.

Müller, F. von
1884. *A record of Localities of some New South Wales zoophytes.* Linnean Soc. New South Wales, Proc., vol. 9, p. 534.

Müller, Otto Frederik
1776. *Zoologiae Danicae prodromus seu Animalium Daniae et Norvegiae indigenarum characteres, nomina, et synonyma imprimus popularium.* Havniae, xxxii + 282 pp.

Müller, Philipp Ludwig Statius
1775. *Von den Corallen. In* Ritters *Carl von Linné . . . vollstandiges Natursystem nach der zwölften lateinischer Ausgabe und nach Anleitung des holländischen Erklärung ausgefertiget von P.L.S. Müller.* Nürnberg, vol. 6, pt. 2, 960 pp., pls. 20-37.

Mulder, J. F.
1897. *The Eocene deposits of Corio Bay.* Geelong Nat., vol. 6, pp. 12-17.
1904. *Fossils from Campbell's Point.* Geelong Nat., ser. 2, vol. 1, pp. 37-38.

Muller, Siemon Wm., and Campbell, Alison
1954. *The relative number of living and fossil species of animals.* Syst. Zool., vol. 3, No. 4, pp. 169-170.

Mumford, E. Philpot
1940. *The present status of studies of faunal distribution with reference to oceanic islands.* Sixth Pac. Sci. Congr., Proc., vol. 4, pp. 241-248.

Munier-Chalmas, Ernest, Charles, Philippe August
1892. *Observations inédits sur le développement suivant la symétrie bilaterale des septa chez les Turbinolidae éocènes. In* Bernard, Felix, *Elements de Paléontologie.* Paris, p. 154.
1903. *Notice sur les travaux scientifiques de M. Munier-Chalmas.* Lille, 119 pp. [Corals, pp. 28-30.]

Murray, John
1880a. *On the structure and origin of coral reefs and islands.* Roy. Soc. Edinburgh, Proc., vol. 10, pp. 505-518.
1880b. *The structure and origin of coral reefs and islands.* Nature, vol. 20, pp. 23, 351.
1887-89. *Structure, origin and distribution of coral reefs and islands.* Roy. Inst. Great Britain, Proc., vol. 12, pp. 251-262.
1888. *"Coral formations."* Nature, vol. 37, pp. 414, 438.
1889. *Structure, origin, and distribuiion of coral reefs and islands.* Nature, vol. 39, No. 1009, pp. 424-428; vol. 40, No. 1027, p. 222; No. 1030, p. 294.
1898. *On the deep and shallow-water marine fauna of the Kerguelen region of the Great Southern Ocean.* Roy. Soc. Edinburgh, Trans., vol. 38, pp. 343-500.

Murray, J., and Irvine, R.
1890. *Coral reefs and other carbonate of lime formations in modern seas.* Nature, vol. 42, No. 1076, pp. 162-166.
1889-90. *On coral reefs and other carbonate of lime formations in modern seas.* Roy. Soc. Edinburgh, Proc., vol. 17, pp. 79-109.

Muscatine, L.
1961. *Symbiosis in marine and freshwater coelenterates. In* Lenhoff, H. M., and Loomis, W. F., *The Biology of Hydra and some other Coelenterates.* Univ. Miami Press, pp. 255-268.

Nair, N. B.
1962. *Ecology of marine fouling and wood-boring organisms of western Norway.* Sarsia, vol. 8, pp. 1-88, pls. 1-9, text-figs. 1-7.

Nakai, Z. and others
1957. *A preliminary report on the biological survey in the "Kuroshio"*

area, south of Honshu, June-July, 1955. Rec. Oceanogr. Works Japan 1957, pp. 159-196, figs. 1-46.

Namias, Isacco

1892a. *Coralli fossili del Museo Geologica della R. Università di Modena.* Soc. Nat. Mat. Modena, Atti, ser. 3, vol. 10, anno 25, pp. 93-108.

1892b. *I coralli fossili del Museo Geologico della R. Università di Modena.* Soc. Nat. Mat. Modena, Atti, ser. 3, vol. 10, anno 25, pp. 309-328, 3 pls.

Nardo, Giovanni Domenico

1845. *Distribuzione naturale in ordini, famglie e generi della classe de zoofitari.* Nuovi Annali delle Scienze Naturali, vol. 3, pp. 104-109.

Naumov, D. V.

1960. *Hydroids and Hydromedusae of the marine, brackish, and fresh-water basins of the U. S. S. R.* [In Russian.] Zool. Inst. Akad. Nauk, vol. 70, pp. 1-626, pls. 1-30, text-figs. 1-463.

Naumow, D. W., and Thiel, M. E.

1962. *Bestimmungstabellen der Polypen und Medusae der russichen Gewässer.* Hamburg. Zool. Mus. u. Inst., Mitt., vol. 60, pp. 285-324.

Navarro, F. de F., and Massuti, M.

1940. *Composición y ciclo anual del plancton superficial de la Bahia de Palma de Mallorca.* Inst. Español Oceanogr. Madrid, Notas, ser. 2, vol. 97, pp. 1-62, 2 figs.

Naylor, E.

1959. *The fauna of a warm dock.* Internat. Congr. Zool., Proc., vol. 15 (1958), pp. 259-262.

Nelli, Bindo

1903. *Fossili miocenici del Macigno di Porretta.* Soc. Geol. Italiana, Boll., vol. 22, pp. 181-252.

Nemenzo, F.

1955a. *Systematic studies on Philippine shallow water scleractinians. I. Suborder Fungiida.* Bull. Nat. Applied Sci., vol. 15, No. 1, pp. 3-84, pls. 1-14.

1955b. *On the scleractinian fauna of Peurto Galera Bay, Oriental Mindoro, and Laguimanoc Bay, Quezon.* Bull. Nat. Applied Sci., vol. 15, Nos. 2-4, pp. 131-137, 2 maps.

1959. *Systematic studies on Philippine shallow water scleractinians. II. Suborder Flavida.* Bull. Nat. Applied Sci., vol. 16, Nos. 1-4, pp. 1-4, 73-135, pls. 1-24.

1960a. *Systematic studies on Philippine shallow water scleractinians. III. Suborder Caryophyllida.* Bull. Nat. Applied Sci., vol. 17, Nos. 3-4, pp. 207-214, pls. 1, 2.

1960b. *Systematic studies on Philippine shallow water scleractinians. IV. Suborder Dendrophylliida.* Bull. Nat. Applied Sci., vol. 18, No. 1, pp. 1-21, pls. 1-10.

Nelson, R. G., and Duncan, P. M.

1876. *On the actinozoan nature of Millepora alcicornis, Dana and Linn. (pars).* Ann. Mag. Nat. Hist., ser. 4, vol. 17, pp. 354-359; vol. 18, p. 78.

Nelson, Richard J.

1837. *On the geology of the Bermudas.* Geol. Soc. London, Trans., vol. 5, pp. 103-124.

1853. *On the geology of the Bahamas, and on coral-formations generally.* Geol. Soc. London, Quart. Jour., vol. 9, pp. 200-214, figs. 1-4.

Nesis, K. N.

1962. *Soviet investigations of benthos in Newfoundland-Labrador fish-*

ing area. [Russian with English summary.] Soviet Fisheries Investig. NW Atlantic-Polar Research Inst. Moscow, pp. 219-225, figs. 1, 2.

Nesteroff, Vladimir

1954. *Sur l'origine organo-detritique des craies coralliennes de la Mer Rouge.* Acad. Sci. Paris, C. R., vol. 238, No. 6, pp. 709-711.

Nesterhoff, W. D.

1955. *Les récifs coralliens du banc Farsan Nord (Mer Rouge). Résultats scientifiques des campagnes de la "Calypso".* Inst. Océanogr. Paris, Ann., n. s., vol. 30, pp. 1-53, pls. 1-21, text-figs. 1-11.

Neumann, A. Conrad

1965. *Processes of recent carbonate sedimentation in Harrington Sound.* Bull. Marine Sci., vol. 15, No. 4, pp. 987-1035, figs. 1-13. [Corals p. 1004.]

Neumayr, Melchior

1889. *Calostylis und die perforaten Hexacorallier.* N. Jahr. f. Min., Geol. u. Palaeont., vol. 2, pp. 44-53.

Neumayer, Melchoir, and Naumann, Edmund

1890 *Zur Geologie und Paläontologie Japans.* K. Akad. Wiss. Wien, Math.-Naturw. Cl., Denkschr., vol. 57, pp. 1-41, pls. 1-5.

Neveu-Lemaire, Maurice

1904. *Mission scientifique de MM. G. de Créqui-Monfort et E. Sénéchal de la Grange dans l'Amérique du Sud.* Soc. Zool. France, Bull., vol. 29, No. 4, pp. 82-89. [Coelenterata p. 89.]

Neviani, Antonio

1896. *Corallarii e Briozoi Neogenici di Sandegna.* Soc. Geol. Italiana, Boll., vol. 15, No. 4, pp. 571-598, figs. 1-4.

1934. *Cimeli zoologici Marsiliani.* Accad. Nuovi Lincei, Atti. vol. 87, No. 6, pp. 360-373, 1 fig.

1935. *Il corallo rosso fossile saggio bibliografico-storico.* Soc. Geol. Italiana Boll., vol. 54, No. 1, pp. 51-66.

Newbigin, Marion Isabel

1898. *Colour in Nature; a study in biology.* London, xii + 344 pp., figs.

Newell, G. E.

1954. *The marine fauna of Whitstable.* Ann. Mag. Nat. Hist., ser. 12, vol. 7, No. 77, pp. 321-350. [Anthozoa p. 331.]

Newell, Norman D.

1951a. *Shoal water geology and environment.* Amer. Mus. Nat. Hist., Bull., vol. 97, pp. 1-29.

1951b. *Organic reefs and submarine dunes of oolite sand around Tongue of the Ocean, Bahamas.* Geol. Soc. Amer., Bull., vol. 62, p. 1466.

1952. *Periodicity in invertebrate evolution.* Jour. Paleont., vol. 26, No. 3, pp. 371-385, figs. 1-10.

1954a. *Expedition to Raroia, Tuamotus.* Atoll. Res. Bull., No. 31, pp. 1-12, 4 pls.

1954b. *Reefs and sedimentary processes of Raroia.* Atoll Res. Bull., No. 36, pp. 1-35, 4 figs., table.

1955. *Bahamian platforms. In* Poldervaart, Arie, *The Crust of the Earth.* Geol. Soc. Amer., Spec. Paper 62, pp. 303-316, pls. 1, 2, text-figs. 1-4.

1956. *Geological reconnaissance of Raroia (Kon Tiki) Atoll, Tuamotu Archipelago.* Amer. Mus. Nat. Hist., Bull., vol. 109, No. 3, pp. 311-372, pls 22-49, text-figs. 1-15, tables 1-12

1958. *American coral seas.* New York Acad. Sci., Trans., ser. 2, vol. 21, No. 2, pp. 125-127.

1959a. *Questions of the coral reefs.* Natural History, vol. 68, No. 3, pp. 118-131, 19 figs.

1959b. *The coral reefs. Part II. Biology of the corals.* Natural History, vol. 68, No. 4, pp. 226-235, 13 figs.
1959c. *American coral seas.* Internat. Congr. Zool., Proc., vol. 15 (1958), pp. 251-252.

Newell, Norman D., and Imbrie, John
1955. *Biological reconnaissance in the Bimini area, Great Bahamas Bank.* New York Acad. Sci., Trans., ser. 2, vol. 18, No. 1, pp. 3-14, figs. 1-4 (charts).

Newell, N. D., Imbrie, J., Purdy, E. G., and Thurber, D. L.
1959. *Organism communities and bottom facies, Great Bahama Bank.* Amer. Mus. Nat. Hist., Bull., vol. 117, art. 4, pp. 179-228, pls. 58-69, text-figs. 1-17.

Newell, Norman D., and Rigby, J. Keith
1957. *Geological studies on the Great Bahama Bank.* Soc. Econ. Paleont. Mineral., Spec. Publ. No. 5, pp. 15-72, text-figs. 1-22, pls. 1-22. [Corals identified by John W. Wells.]

Newell, N. D., Rigby, J. K., Whiteman. A. J., and Bradley, J. S.
1951. *Shoal-water geology and environments of eastern Andros Islands, Bahamas.* Amer. Mus. Nat. Hist., Bull., vol. 97, art. 1, pp. 1-29, pls. 1-8, 5 text-figs.

Newton, Richard Bullen
1905. *The Tertiary fossils of Somaliland, as represented in the British Museum.* Geol. Soc. London, Quart. Jour., vol. 61, pt. 1, pp. 155-157.

Nicholson, Henry Alleyne
1875. *On the mode of growth and increase amongst the corals of the Palaeozoic period.* Roy. Soc. Edinburgh, Trans., vol. 27, pp. 237-250.
1878. *On the minute structure of the corals of the genera Heliophyllum and Crepidophyllum.* Ann. Mag. Nat. Hist., ser. 5, vol. 1, pp. 44-54.
1880. *On the classification and affinities of the "tabulate corals".* Roy. Phys. Soc. Edinburgh, Proc., vol. 5, pp. 88-104.
1883. *Contributions to micro-palaeontology. On Stenopora howsii Nich., with notes on Monticulipora tumida, Phil., and remarks on Tubulipora urii, Young.* Ann. Mag. Nat. Hist., ser. 5, vol. 12, pp. 285-297, pl. 10, 3 text-figs.
1888a. *On the structure and affinities of the genus Parkeria.* Ann. Mag. Nat. Hist., ser. 6, vol. 1, pp. 1-12, pl. 3, text-fig.
1888b. *On certain anomalous organisms which are concerned in the formation of some Palaeozoic limestones.* Geol. Mag., decade 3, vol. 5, pp. 15-24, figs.
1888c. *On the detection of mural pores in thin sections of the Favositidae.* Geol. Mag., decade 3, vol. 5, pp. 104-110, fig.
1888d. *On the structure of Cleistopora (Michelinia) geometrica, Edwards & Haime.* Geol. Mag., decade 3, vol. 5, pp. 150-152, fig.

Nicolas, Charles
1909. *L'Archipel des "Loyaute."* In *Le Tour du Monde: à travers le Monde.* Paris, vol. 15, pp. 313, 325.

Nicosia, M. L.
1955. *Coralli, Brachiopodi, Molluschi e Pesci. In* Lipparini, T., Malatesta, A., Nicosia, M. L., and Valdinucci, A., *Contributi alla conosanza delle faune neogeniche e quarternarie della Sicilia. V. Pliocene e Quaternario del Capo Milazzo in Sicilia.* Serv. Geol. Ital., Boll., vol. 77, Nos. 4, 5, pp. 579-604, figs. 1-13.

Niejahr ————
1876. *Aus den Reiseberichten der Brigg "Hermann Friedrich."* Ann. Hydrogr. u. Marit. Meteorol. Berlin, vol. 4, p. 243.

Nielsen, K. Brünnich
1917. *Heliopora incrustans nov. sp. With a survey of the Octocorallia in the deposits of the Danian in Denmark.* Medd. Geol. København, vol. 5. No. 8, pp. 1-13.
1918. *Slaegten "Moltkia" og andre Octocoraller i Sveriges Kridttidsaflejringer.* Geol. Fören. Stockholm, För., vol. 40, No. 4, pp. 461-468, pl. 8.
1919. *En hydrocorallen fra Faxe og bemaerkninger om Danien'ets geologiske stellung.* Danmarks Geol. Undersøg., ser. 4, vol. 1, No. 10, 66 pp., 2 pls.
1922. *Zoantharia from Senone and Paleocene deposits in Denmark.* K. Danske Vidensk. Selsk., Skr., ser. 8, vol. 5, pp. 201-233, pls. 1-4.
1925. *Nogle nye Octocoraller fra Danienet.* Dansk. Geol. Foren., Medd., vol. 6, No. 28, 6 pp., 3 figs.

Niermeyer, J. F.
1911-12. *Barriereriffen en atollen in de Oost-Indiese Archipel.* K. Nederland. Aardrijkst. Genootsch. Amsterdam, vol. 28 (1911), p. 877; vol. 29 (1912), pp. 64, 225, 623.

Niino, Hiroshi
1950. *On the bottom deposits on the banks at the mouth of Wakasa Bay and on the adjacent continental shelf.* Tokyo Univ. Fish. Jour., vol. 37, No. 1, pp. 1-274, pls. 1-3, text-figs. 1-39, tables.

Nikolaev, I. I., and Kriers, N. K.
1961. *Quantitative estimation of plankton in the Central Baltic and the Gulf of Riga in 1959.* Ann. Biol. Copenhagen, vol. 16 (1959), pp. 84-86, 3 figs.

Nishiwada, Kyugaku
1895. *On some organic remains from the Tertiary limestone near Sagara, Totomi.* College Sci. Imp. Univ. Japan, Jour., vol. 7, pp. 233-243, 1 pl.

Nobre, Augusto
1904. *Subsidios para o estudo da fauna marinha do norte de Portugal.* Ann. Sci. Nat. Porto, vol. 8, pp. 37-94, 153-160. [Coelenterata pp. 38-51, 154.]
1931. *Contribuções para o estudo dos Coelenterados de Portugal.* Porto, 82 pp., 21 pls.
1937. *Fauna marinha de Portugal.* Mus. Zool. Univ. Coimbra, Mem., ser. 1, vol. 99, pp. 24-29 (Coelenterata).
1938. *Fauna marinha de Portugal.* Mus. Zool. Univ. Coimbra, Mem., ser. 1, vol. 108, pp. 47-48 (Coelenterata).

Noetling, Friedrich Wilhelm
1895. *On some marine fossils from the Miocene of upper Burma.* Geol. Sur. India, Mem., vol. 27, pp. 1-45. [Coelenterata pp. 6-7, pl. 1.]
1898. *Fauna of the Upper Cretaceous (Maëstrichtian) beds of the Mari Hills. Coelenterata.* Palaeont. Indica, ser. 16, *Fauna of Baluchistan,* vol. 1, pt. 3, pp. 9-11, pl. 1.
1900. *The Miocene of Burma.* K. Akad. Wetensch. Amsterdam, Verhand., sect. 2, vol. 7, No. 2, 130 pp., 1 map.
1901. *The fauna of the Miocene beds of Burma.* Palaeont. Indica, n. s., vol. 1, No. 3, pp. 1-378, pls. 1-25. [Coelenterata pp. 101-103.]

Nomland, Jorgen O.
1916. *Corals from the Cretaceous and Tertiary of California and Oregon.* Univ. California Publ., Bull. Dept. Geol., vol. 9, No. 5, pp. 59-76, pls. 3-6.

1917. *New fossil corals from the Pacific coast.* Univ. California Publ., Bull. Dept. Geol., vol. 10, No. 13, pp. 185-190, pl. 5.

Nomura, S., and Hatai, K. M.

1936. *A note concerning data on the bathymetric range of certain marine animals and remarks on the geology of the Neogene formations in northeast Honsyû, Japan and their depth of sedimentation as indicated by the fossil fauna.* Saitô Hô-on Kwai Mus. Sendai, Res. Bull., vol. 10, pp. 231-234.

1939. *On some fossils from the Akita Prefecture, northeast Honsyû, Japan.* Japanese Jour. Geol. Geogr., vol. 16, Nos. 1-2, pp. 39-64, figs.

1946. *The marine fauna of Kyûroku-sima and its vicinity, northeast Honsyû, Japan.* Saitô Hô-on Kwai Mus. Sendai, Res. Bull., vol. 19, pp. 57-115, 2 pls.

Nordgaard, Ole

1912. *Et Gammett Lophelia — Rev i Trondhjemsfjorden.* Kgl. Norske Vidensk. Selsk. Kjøbenhavn, Skr., 8 pp.

1921. *Bidrag til Faunaens Historie i Trondhjems-fjorden. II.* Kgl. Norsk. Vidensk. Selsk., Skr. 1920, No. 5, 18 pp.

1930. *Faunistic notes on marine evertebrates. VI. On the distribution of some madreporarian corals in northern Norway.* Kgl. Norsk. Vidensk. Selsk. Trondhjem, Forhand., vol. 2, No. 28, pp. 102-105, 2 figs.

Norman, Alfred Merle [Rev. Canon]

1867. *Preliminary report on the Crustacea, Molluscoidea, Echinodermata, and Coelenterata, procured by the Shetland Dredging Committee in 1867.* British Assoc. Adv. Sci., Rept. 37th Meeting, p. 437-441.

1893. *A month on the Trondhjem Fjord.* Ann. Mag. Nat. Hist., ser. 6, vol. 12, No. 71, art. 53, pp. 341-367, 441-452. [Coelenterata p. 349.]

Noszky Jenö

1938. *Intrakalyzinale Zwillingsbildung an der Lithophyllia striato-punctata nov. sp. aus Mittel-miocen von Kostej in Ungarn.* [Hungarian with German summary.] Földtani Közlöny, vol. 68, Nos. 7-9, pp. 214-217, 1 fig.

Nugent, L. E., Jr.

1946. *Coral reefs in the Gilbert, Marshall, and Caroline Islands.* Geol. Soc. Amer., Bull., vol. 57, pp. 735-780, pls. 1,2, text-figs. 1-15.

Nugent, Nicholas

1821. *A sketch of the geology of the Island of Antigua.* Geol. Soc. London, Trans., vol. 5, pp. 459-475.

Nutting, Charles Cleveland

1895. *Narrative and preliminary report of Bahama Expedition.* State Univ. Iowa, Lab. Nat. Hist. Bull., vol. 3, Nos. 1-2, pp. i-vi, 1-251, pls., text-figs.

1919. *Barbados-Antiqua Expedition. Narrative and preliminary report of a zoological expedition from the University of Iowa to the Lesser Antilles under the auspices of the graduate college.* Univ. Iowa Studies Nat. Hist., vol. 8, No. 3, 274 pp., 50 pls.

1924. *Fiji-New Zealand Expedition. Narrative and preliminary report of a scientific expedition from the University of Iowa to the South Seas.* Univ. Iowa Studies Nat. Hist., vol. 10, No. 5, 369 pp., 58 pls.

Nyst, Pierre Henri

1843. *Description des coquilles et des polypiers fossiles des terrains tertiaires de la Belgique.* Cour. Acad. Roy. Sci. Belgique, Mém., vol. 17, pp. 1-696, pls. 1-15.

Odum, Eugene P., and Odum, Howard T.
1957. *Zonation of corals on Japtan Reef, Eniwetak Atoll.* Atoll Res. Bull., No. 52, pp. 1-5, fig. 1.

Odum, Howard T., and Odum, Eugene P.
1955. *Trophic structure and productivity of a windward coral reef community on Eniwetok Atoll.* Ecol. Monogr., vol. 25, No. 3, pp. 291-320, figs. 1-12, 17 tables.
1956. *Corals as producers, herbivores, carnivores, and possibly decomposers.* Ecology, vol. 37, No. 2, p. 385.

Ogilvie, Maria Matilda
1894. *Coral in the Dolomites.* Geol. Mag., ser. 4, vol. 1, pp. 1-10, 49-60, pls. 2-3, text-fig.
1896a. *Microscopic and systematic study of madreporarian types of corals.* Roy. Soc. London, Philos. Trans., vol. 187B, No. 3, pp. 83-345, figs. 1-75.
1896b. *Recent work on the madreporarian skeleton.* Nature, vol. 55, pp. 126, 127.
1897. *Die Korallen der Strambergerschichten. Palaeontologische Studien über die Grenzschichten der Jura—und Kreide—Formation im Gebiete der Karpathen, Alpen und Apenninen.* Palaeontographica, Suppl., vol. 2, sect. 7, pp. 73-282, 12 pls.
1898. *The classification of the Madreporaria.* Nature, vol. 55, pp. 280-284, 9 figs.
1907. *Note on the formation of the skeletons in the Madreporaria.* Quart. Jour. Microsc. Sci. London, vol. 51, No. 203, pp. 473-482.

Okada, Yô K.
1927. *Études sur la régénération chez les coelentérés.* Arch. Zool. Expér. et Génér., vol. 66, pp. 497-551, figs. 1-27.

Oken, Lorenz
1815. *Lehrbuch der Naturgeschichte.* Jena, Theil 3, Zool., Abt. I, Fleischlose Thiere, xxxviii + 850 + xviii pp. [Corals pp. 57-74.]

Okulitch, Vladimir J.
1936. *On the genera Heliolites, Tetradium, and Chaetetes.* Amer. Jour. Sci., ser. 5, vol. 32 (232), No. 191, pp. 361-379, fig. 1.

Olearius, Adam
1674. *Gottorffische Kunst-Kammer worinnen allerhand ungemeine Sachen, so theils die Natur, theils künstliche Hände hervorgebracht und bereitet . . .* Schlesswig, x + 80 pp., 36 pls.

de Oliveira, L. P. H.
1950a. *Relatorio sobre as excursões cientificas feitas a bordo do Navio Hydrográfico "Rio Branco," sob a orientação do Professor Pierre Drach, da Sorbonne.* Inst. Oswaldo Cruz, Mem., vol. 47, pp. 87-96, chart.
1950b. *Levantamento biogeográfica de Baí de Guanabara.* Inst. Oswaldo Cruz, Mem., vol. 48, pp. 363-391, 4 pls., text-figs., chart.
1951. *Nota prévia sôbre a fauna e flora marinha bentonica da Ilha da Trindade.* Inst. Oswaldo Cruz, Mem., vol. 49, pp. 443-456, figs.

Oppenheim, Paul
1896a. *Die Eocänfauna des Monte Postale bei Bolca im Veronesischen.* Palaeontographica, vol. 43, pp. 125-221, pls. 9-3. [Coelenterata pp. 136-144.]
1896b. *Das Altertertiär der Colli Berici in Venetien, die Stellung der Schichten von Priabona, und die oligocäne Transgression im alpinen Europa.* Deutsch. Geol. Gesell., Zeitschr., vol. 48, pp. 27-152, pls. 2-5. [Coelenterata pp. 39-41, pl. 5.]
1899. *Palaeontologisches Miscellaneën. II. (1) Ueber "Trochocyathus sinuosa Brogniart" und verwandte Formen. (2) Ueber einige Kor-*

allen des venetienischen Tertiärs. (3) Ueber einige Tabulaten-ähnliche Korallen des Mesozoicum. Deutsch. Geol. Gesell., Zeitschr., vol. 51, pp. 207-242, pls. 9-13, 5 text-figs.
1900-1907. *Die Priabonenschichten und ihre Fauna.* Palaeontographica, vol. 47, pp. 1-348, pls. 1-21. [Coelenterata pp. 48-77.]
1901. *Ueber einige altertertiäre Faunen der Österreichisch-Ungarischen Monarchie.* Beitr. Paläont. u. Geol. Österreich.-Ungarns u. Orient, vol. 13, pp. 141-227, pls. 9-19.
1906. *Neue Beiträge zur Geologie und Palaeontologie der Balkanhalbinsel.* Deutsch. Geol. Gesell., Zeitschr., vol. 58, pp. 109-180, pl. 8.
1909. *Ueber eine Eocänfaunula von Ostbosnien und einige Eocänfossilien der Herzegowina.* K.-K. Geol. Reichsanst. Wien, Jahrb., vol. 58, pp. 311-344, pls. 11-15.
1911. *Weitere Notizen zur altertertiären Korellenfauna von Barcelona.* Deutsch. Geol. Gesell., Zeitschr., vol. 63, pp. 329-356, figs.
1912. *Neue Beiträge zur Eocänfauna Bosniens.* Beitr. Paläont. u. Geol. Österreich.-Ungarns u. Orient., vol. 25, pp. 87-149.
1913. *Ueber Porites polystyla Reuss und die Gattung Actinacis d'Orbigny.* Deutsch. Geol. Gesell., Zeitschr., vol. 65, pp. 159-180, pl. 3.
1914a. *Die Eocänfauna von Besca Nuova auf der Insel Veglia.* K.-K. Geol. Reichsanst. Wien, Verh., Nos. 7-8, pp. 189-202.
1941b. *Fauna und Alter des Konglomerats von Zdunek bei Kremsier.* K.-K. Geol. Reichsanst. Wien, Jahrb., vol. 63, pp. 695-710, pl. 26.
1914c. *Altertertiäre Korallen vom Nordrand der Madonie in Sizilien.* Centralbl. Min. Stuttgart, pp. 687-703, fig.
1915. *Die eocäne Invertebratenfauna des Kalksteins in Togo.* Beitr. Geol. Erforsch. Deutschen Schutzgebiete, vol. 12, pp. 1-126, 5 pls.
1917. *Ueber Balanophyllia porteni n. sp. aus dem Quartär der Strophaden, und Stephanophyllia schweinfürthi n. sp. aus der obersten Kreide von Ober-Ägypten* N. Jahrb. f. Min., Geol. u. Palaont., pp. 1-8, pl. 1.
1918. *Ueber eine Madrepora (M. meyni n. sp.) aus dem nord-deutschen Diluvium.* Deutsch. Geol. Gesell., Zeitschr., vol. 69B, pp. 184-190.
1919. *Ueber einige Korallen aus dem Eocän von Kosavin (Kroatien).* Centralbl. Min. Stuttgart, pp. 312-314.
1921. *Ueber Hydractinien aus dem mittelmiocänen Tuffen von San Giovani Ilarione in Venetien.* Deutsch. Geol. Gesell., Zeitschr., vol. 72, pp. 145-160, 1 pl., text-figs.
1922. *Ueber eine Eocänfauna der Polje von Lukovac bei Nevesinje in der Herzegovina.* Berlin, 100 pp., 4 pls.
1927. *Neue Beiträge zur Kenntniss des Neogens in Syrien und Palästina.* Geol. Palaeont. Abhandl. Jena, vol. 15, pp. 326-335, 1 pl.
1930. *Die Anthozoen der Gosauschichten in den Ostalpen.* Berlin, 604 pp., 48 pls.

Orbigny, Alcide Charles Victor Dessalines d'
1849. *Note sur des polypiers fossiles.* Paris, 12 pp.
1850. *Catalogue des espèces fossiles de Mollusques, Bryozoaires, de Polypiers et d'Amorphozoaires de l'étage Néocomien.* Rev. et Mag. Zool., vol. 2, pp. 170-181.
1849-52. *Prôdrome de Paléontologie Stratigraphique Universelle des Animaux Mollusques et Rayonnés, faisant suite au cours élémentaire de Paléontologie* . . . Paris, 3 vols.

Ortmann, Arnold Edward
1887. *Die systematische Stellung einiger fossilen Korallengatungen und Versuch einer phylogenetischen Ableitung der einzeln Gruppen der lebenden Steinkorallen.* N. Jahrb. f. Min., Geol. u. Palaeont., vol. 2, pp. 183-205, 1 pl.

1888. *Studien ueber Systematik und geographisch Verbreitung der Steinkorallen.* Zool. Jahrb., vol. 3, pp. 143-188, pl. 6.

1889a. *Ueber bilaterale Anordnung der Septen von Cylicia tenella Dana, und die Bedeutung der Bilateralität bei Steinkorallen.* Zool. Anzeig., vol. 12, pp. 643-646.

1889b. *Beobachtungen an Steinkorallen von der Südküste Ceylons.* Zool. Jahrb., vol. 4, No. 4, pp. 493-590, pls. 11-18.

1889-90. *Bericht über die Leistungen in der Naturgeschichte der Anthozoen in den Jahren 1883, 1884, 1885, 1886, und 1887.* Arch. f. Naturgesch., vol. 53, pp. 219-246 (1889); vol. 54, pp. 149-165.

1890. *Die Morphologie des Skeletts des Steinkorallen in Beziehung zur Koloniebildung.* Zeitschr. f. Wissensch. Zool. Leipzig, vol. 50, pt. 2, pp. 278-316, pl. 11.

1892a. *Ueber Korallriffe an der ostafrikanischen Küste.* Zool. Anzeig., vol. 15, No. 381, pp. 18-20.

1892b. *Die Korallriffe von Dar-es-Salaam und Umgegend.* Zool. Jahrb., Syst., vol. 6, pp. 631-670, chart (pl. 29).

1892c. *Bericht über die wissenschaftlichen Leistungen in der Naturgeschichte der Anthozoen während des Jahres 1888.* Arch. f. Naturgesch., vol. 55, pt. 2, No. 3, pp. 167-179.

Orton, J. H.

1920. *Sea temperature, breeding and distribution in marine animals.* Marine Biol. Assoc. U.K. Plymouth, Jour., n s., vol. 12, pp. 339-366, fig. 1.

Osasco, Elodia

1895. *Di alcuni corallari pliocenici del Piemonte della Liguria.* R. Accad. Sci. Torino, Atti, vol. 31, pp. 179-192 (225-238), pl. 31.

1897. *Di alcuni corallari miocenici del Piemonte.* R. Accad. Sci. Torino, Atti, vol. 32, pp. 640-653, pl. 32.

1898. *Di alcuni corallari oligocenici del Piemonte e della Liguria.* R. Accad. Sci. Torino, Atti, vol. 33, pp. 104-114, 1 pl.

1902. *Contribuzione allo studio dei coralli cenozoici del Veneto.* Palaeontogr. Italica, vol. 8, pp. 99-120, pls. 8, 9.

Osberger, R.

1954a. *Jungtertiäre Korallen von Java. Teil 1.* N. Jahrb. f. Geol. u. Palaeont., Abhandl., vol. 100, No. 1, pp. 119-158, pls. 9-11, text-figs. 1, 2.

1954b. *Notes on Plio-Pleistocene corals of Timor.* Madj. Ilmu Al. Unt. Indones. (Indonesian Jour. Nat. Sci.), vol. 110, Nos. 1-3, pp. 80-82.

1954c. *Research in fossil corals from Java.* Indonesian Jour. Nat. Sci., vol. 110, Nos. 4-6, pp. 201-207, pls. 1, 2.

1955a. *Jungtertiäre Korallen von Java. Teil 2.* N. Jahrb. f. Geol. u. Palaeont., Abhandl., vol. 101, No. 1, pp. 39-74, pls. 3-6, text-figs. 1-3.

1955b. *Beschreibung einiger tertiärer Korallen von Java.* N. Jahrb. f. Geol. u. Palaeont., Monatshefte, Jahrg. 1955, No. 6, pp. 252-256, figs. 1-3b.

1956a. *Korallen als Hilfs-Mittel der Tertiär — und Quartar Stratigraphie Indonesiens.* Djaw. Geol. Bandung, Publ. Keilm., No. 32, pp. 1-82, table.

1956. *The use of corals in the stratigraphy of the Tertiary of Indonesia.* XX Congr. Geol. Internac. Mexico, Resumen Trab., p. 236.

von der Osten, Erimar

1957. *A fauna from the lower Cretaceous Barranquin formation of Venezuela.* Jour. Paleont., vol. 31, No. 3, pp. 571-590, pls. 63-65. [Corals pp. 574-577.]

1958. *Astrocoenia barranquiniana, a new name for Astrocoenia minima von der Osten.* Jour. Paleont., vol. 32, No. 1, p. 247.

Ostenfeld, Carl Emil Hansen

1916. *Catalogue des espèces, de plantes et d'animaux observées dans le plankton recuelli pendant les expeditions depuis le mois de Juillet 1908 jusqu'au mois de Decembre 1911.* Publ. Circ. Copenhague, vol. 70, pp. 1-87.

1931. *Concluding remarks on the plankton collected on the quarterly cruises in the years 1902 to 1908.* Bull. Trim. Cons. Explor. Mer Copenhague, pp. 601-672.

Otter, G. W.

1937. *Rock-destroying organisms in relation to coral reefs.* British Mus. (Nat. Hist.) Great Barrier Reef Exped., Sci. Rept., vol. 1, pp. 323-352, pls. 1-6, text-figs. 1-5.

Ozaki, Hiroshi

1958. *Stratigraphical and paleontological studies on the Neogene and Pleistocene formations of the Tyôsi District.* Mus. Tokyo, Bull. Nat. Sci., vol. 4, No. 1, pp. 1-182, pls. 1-24. [Corals p. 169.]

Pace, S.

1901a. *On the corallum of Turbinaria.* Linnean Soc. London, Jour., Zoology, vol. 28, pp. 358-365, 14 text-figs.

1901b. *On the supposed re-discovery of "Moseleya" in Torres Straits.* Ann. Mag. Nat. Hist., ser. 7, vol. 7, pp. 385-387.

Pachitz, M.

1953. *Les polypiers du Crétacé supérieur en Serbie. I. Les polypiers indépendants.* Inst. Géol. Acad. Serb. Sci., Rec. Trav., vol. 33, No. 5, pp. 95-110, pls. 1-8

Packard, Alpheus Spring, Jr.

1873. *Occurrence of a deep-sea Floridan coral (Deltocyathus agassizi Pourtalès) near Cape Cod.* Amer. Natural., vol. 7, pp. 744-745.

Paeckelmann, Werner

1939. *Ergebnisse einer Reise nach der Insel Chios.* Deutsch. Geol. Gesell., Zeitschr., vol. 91, No. 5, pp. 341-376, pls. 9, 10, text-figs.

Pallas, Peter Simon

1766. *Elenchus Zoophytorum sistens generum adumbrationes generaliores et specierum cognitarum succinctas descriptiones cum selectis auctorum synonymis.* Hagae-Comitum, i-xvi + 28 + 451 pp.

1768. *Lyst der Plant-Dieren. . . in het Latyn beeschreeven. . . Vertaald, en met aanmerkingen en afbeeldingen voorzien door P. Boddaert.* Utrecht, pp. 50 + 654, 14 pls.

1787. *Charakteristik der Thierpflanzen . . . Aus dem lateinischen Übersetzt, und mit Anmerkungen versehen, von C. F. Wilkens . . . und nach seinen Tode herausgegeben von J. F. W. Herbst.* Nürnberg, 2 vols., 344 and 265 pp., 26 pls.

Palmans, M.

1960. *Pour la première fois, des Madrépores-coraux sont transportés vivants, du fond du Pacifique dans un aquarium Européen, en l'occurrence l'aquarium du Zoo d'Anvers.* Zoo, Antwerp, vol. 25, No. 3, pp. 74-79, 8 figs.

Palminha, F.

1955. *"Conquilha" (Donax trunculus L.), Algas e Celenterados em comunidae biológica.* Naturália, vol. 5, No. 1, pp. 15-21, figs. 1-4.

Palmer, Dorothy Bryant Kemper

1923. *A fauna from the middle Eocene shales near Vacaville, California.* Univ. California, Publ. Geol. Sci., vol. 14, pp. 289-318, pls. 52-57.

Palmer, Robert Hastings
1928. *Fossil and Recent corals and coral reefs of western Mexico.* Amer. Philos. Soc., Proc., vol. 68, pp. 21-31, 3 pls.

Papp, A.
1952. *Zur Kenntnis des Jungteriärs in der Umgebung von Krems a. d. Donau (N.-Ö).* Geol. Bundesanst. Wien, Verhandl., Jahrg. 1952. No. 3, pp. 122-126.

Paradice, W. E. J.
1925. *The pinnacle or mushroom-shaped coral growths in connection with the reefs of the outer barrier* [*Great Barrier Reef*]. Roy. Geogr. Soc. Australasia, Trans., vol. 1, pp. 52-58, 3 pls., text-figs., chart. Also, Great Barrier Reef Comm. Brisbane, Rept., vol. 1, pp. 52-60, pls. 6-7, text-figs. 1-4, 8 sections.

Parenzan, P.
1957. *Formazioni coralligene Mediterranee e loro biologia.* Boll. Zool., vol. 24, No. 2, pp. 287-312, figs. 1-4.
1959. *Biocenologia bentonica: il fondo ad Ascidie.* Thalassia Jonica, vol. 2, pp. 15-45, figs. 1-4.
1960. *Aspetti biocenotici dei fondi ad alghe litoproduttrici del Mediterraneo.* Rapp. Com. Internat. Mer Medit., vol. 15, No. 2, pp. 87-107.

Parfitt, Edward
1883. *On the temperature and coral fauna of the Greensand Sea.* Devonshire Assoc. Adv. Sci., Rept. Trans., p. 416.

Paris, J.
1954. *Contribution à la connaissance de la "Zone Nord des Cannolots."* Vie et Milieu, vol. 5, No. 4, pp. 469-512, figs. 1-9. [Coelenterates pp. 499-501.]

Park, James
1905. *Marine Tertiaries of Otago and Canterbury, with special reference to the relations existing between Pareora and Oamaru Series.* New Zealand Inst., Trans., vol. 37, pp. 489-552.
1910. *The Geology of New Zealand.* Melbourne and London, 488 pp., 27 pls., 145 text-figs.
1917. *On a new species of coral from the lower Oamaruian tuffs, near Debora, Oamaru.* New Zealand Inst., Trans., vol. 49, p. 396, pl. 27.

Parker, D. H.
1964. *Paleocene fossils from Sokoto Province, north-western Nigeria.* Geol. Sur. Nigeria, Rec., vol. 7, pp. 23-36, pls. 7-9. [Coral p. 34.]

Parker, Robert H.
1959. *Macro-invertebrate assemblages of Central Texas coastal bays and Laguna Madre.* Amer. Assoc. Petrol. Geol., Bull., vol. 43, No. 9, pp. 2100-2166, pls. 1-6, text-figs. 1-32.
1960. *Ecology and distributional patterns of marine macro-invertebrates, northern Gulf of Mexico. In* Shepard, F. P., and others, *Recent sediments, northwest Gulf of Mexico.* Amer. Assoc. Petrol. Geol., pp. 302-337, pls. 1-6, text-figs. 1-17.
1964. *Zoogeography and ecology of macro-invertebrates of Gulf of California and continental slope of western Mexico.* Amer. Assoc. Petrol. Geol., Mem., vol. 3, pp. 331-376, pls. 1-10, text-figs. 1-21.

Parker, Robert H., and Curray, Joseph R.
1956. *Fauna and bathymetry of banks on continental shelf, northwest Gulf of Mexico.* Amer. Assoc. Petrol. Geol., Bull., vol. 40, No. 10, pp. 2428-2439, 1 pl., 6 text-figs.

Parkinson, James

1822. *Outlines of Oryctology. An introduction to the study of fossil organic remains, especially those found in the British strata.* London, vii + 346 pp., 10 pls.

Parona, Carlo Fabrizio

1899. *Osservazioni sulla fauna e sull'età del calcare di scogliera presso Colle Pagliare nell'Abruzzo Aquilano.* R. Accad. Sci. Torino, Atti, vol. 34, pp. 250-259 (378-387).

Parsons, James

1753. *A letter from James Parsons, M.D., F.R.S., to the Rev. Mr. Birch, Sec. R.S., concerning the formation of corals, corallines, etc.* Roy. Soc. London, Philos. Trans., vol. 47, pp. 505-513.

Pascoe, Edwin H.

1964. *A Manual of the Geology of India and Burma.* Govt. India Press, vol. 3, pp. i-xxiv, 1345-2130, 19 pls.

Pascoe, E. H., and Cotter, G. de P.

1908. *On a new species of Dendrophyllia from the Upper Miocene of Burmah.* Geol. Sur. India, Rec., vol. 36, pp. 147, 148, pl. 21.

Patil, A. M.

1951. *Study of the marine fauna of the Karwar coast and neighboring islands.* Bombay Nat. Hist. Soc., Jour., vol. 50, pp. 128-139, chart.

Pattison, Samuel Rowles

1888. *On the pedigree of the coral reefs of England.* Victoria Inst. London, Jour. of Trans., vol. 21, pp. 196-210.

Paul, M. D.

1942. *Studies on the growth and breeding of certain sedentary organisms in the Madras Harbour.* Indian Acad. Sci., Proc., vol. 15B, pp. 1-42, pl. 1, text-figs.

Pavlovec, R.

1959. *The Upper Eocene fauna from the surroundings of Drniš in Dalmatia.* [Serbian with English summary.] Slov. Akad. Znan. Umetn., Razpr., vol. 5, pp. 349-416, pls. 1-2, text-figs. 1-9.

Pawsey, E. L., and Davis, F. M.

1924. *Report on exploratory voyages to Lousy Bank and adjacent areas.* Fish. Investig. Great Britain, ser. 2, vol. 7, No. 2, p. 14.

Pax, Ferdinand

1910. *Die Steinkorallen der Deutschen Südpolar-Expedition 1901-1903.* Deutsche Südpolar-Exped. 1901-1903, vol. 12, No. 1, pp. 63-76, 2 pls.

1915. *Hexacorallien de Murmanküste.* [In Russian with resumé in German.] Lab. Zool. Petrograd, Trav., vol. 4, pp. 165-180, 1 pl.

1924a. *Anthozoen des Leidner Museums.* Zool. Meded. Leiden, vol. 8, pp. 1-17, figs.

1924b. *Hexacoralla. In* Kükenthal, W., *Handbuch der Zoologie,* vol. 1, pp. 770-901, figs.

1925. *Beitrag zur Anthozoen-fauna von Palästina.* Zool. Anzeig., vol. 64, pp. 193-196, 2 figs.

1927a. *Anthozoa. In* Dahl, F., *Tierwelt Deutschlands und der angrenzenden Meeresteile nach ihren Merkmalen und nach ihrer Lebensweise.* Jena, Teil 4, pp. 189-240, figs.

1927b. *Die Achsenskelette der Anthozoen im Röntgenbilde.* Zeitschr. f. Morph. Ökol. Berlin, vol. 9, pp. 710-718.

1932a. *Die Antipatharien und Madreporarien des arktischen Gebietes.* Fauna Arctica, vol. 6, pp. 267-280, 8 figs.

1932b. *Beitrag zur Kenntnis der japanischen Dörnchenkorallen.* Zool. Jahrb., Syst., vol. 63, pp. 407-450, 19 figs.

1933. *Zoogene Bau-und Schottermaterialen rezenten Ursprungs.* Zool. Mus. Berlin, Mitt., vol. 19, pp. 333-376.
1934a. *Anthozoa. (Teil 1: Allgemeines, Ceriantharia, Antipatharia, Zoantharia, Madreporaria).* Die Tierwelt der Nord und Ostsee, Teil 3a, pp. 1-80, 53 figs.
1934b. *Die Untersuchung von Korallenskeletten im infraroten Licht.* Zool. Anzeig., vol. 106, pp. 15-17, 1 fig.
1938a. *Neogene Bau-und Schottermaterialen rezenten Ursprungs. In* Pax, F. and Arndt, W., *Die Rohstaffe des Tierreichs,* vol. 1, pp. 2056-2058, 1 fig.
1938b. *Dünger aus wirbellosen Tieren. Coelenteraten. In* Pax, F. and Arndt, W., *Die Rohstoffe des Tierreichs,* vol. 1, pp. 2083-2084, figs.
1940. *Anthoza oder Korallentiere.* Bronn's Klassen und Ordnungen des Tierreichs, Bd. 2, Abt. 2, Buch 3, Lfg. 7, pp. 177-336, text-figs. 1-118.
1953. *Korallenfischerei in der Adria.* Natur u. Volk, vol. 83, No. 9, pp. 304-310, figs.
1954a. *Die Abstammung der Cölenteraten nach der Theorie von Jovan Hadzi.* Naturwiss. Rundschau, vol. 7, pp. 288-290.
1954b. *Jadranski Koralji u akvariju.* [*Adriatic corals in the aquarium.*] Piroda, vol. 41, No. 9, pp. 342-346, figs.
1954c. *Die Korallentiere der Adria.* Aquar. Terrar. Zeitschr., vol. 7, pp. 10-13, 32-34, 60-62, 120-123, 142-147, 172-176, 202-205, 229-231, 315-317, figs.
1955. *Ein neuer Gattungsname für eine adriatische Steinkoralle.* Bull. Sci. Yugoslav., vol. 2, No. 3, p. 75.
1957. *La conoscenza degli Antozoi adriatici fino alla fin del seclo XVIII.* Soc. Adriat. Sci. Nat., Boll., vol. 48, pp. 50-61, figs. 1-5.

Pax, Ferdinand, and Arndt, W.
1928. *Seemoos Akori Korallen.* Rohstoffe des Tierreichs Berlin, vol. 12, B, C, D, pp. 9-107, 52 figs.

Pax, Ferdinand, and Müller, Ingeborg
1953. *Die Anthozoenfauna von der Bucht von Kaštela bei Split.* Acta Adriatica, vol. 5, No. 1, pp. 1-35, figs.
1955a. *Gli Antozoi del Golfo di Trieste. I. Lo stato attuale della ricerca e il materiali di indagine esistente.* Mus. Civ. Storia Nat. Trieste, Atti, vol. 20, No. 2 (6), pp. 49-102, pls. 5, 6, text-figs. 1-16.
1955b. *Die Korallentiere der Adria.* Aquar. Terrar. Zeitschr., vol. 8, pp. 10-12, 39-40, 67-69, figs. 20-27.
1956. *Gli Antozoi del Museo Civico di Storia Naturale di Trieste. III. Madreporaria dell'Adriatico.* Mus. Civ. Storia Nat. Trieste, Atti, vol. 20, No. 5, pp. 163-169, pls. 18, 19.
1962. *Die Anthozoenfauna der Adria.* Fauna et Flora Adriatica, vol. 3, pp. 1-343, figs. 1-214.

Peacock, A. D.
1924. *Plankton investigations. Coelenterata.* Dove Marine Lab. Cullercoats, Rept., n. s., vol. 13, pp. 57-60.

Pearse, Arthur Sperry
1951. *Animals of the Black Rocks. In* Pearse, A. S., and Williams, G., *The biota of the reefs off the Carolinas.* Elisha Mitchell Sci. Soc., Jour., vol. 67, No. 1, pp. 133-161, figs., tables.

Peck, Joseph H., Jr., and McFarland, Herdis B.
1954. *Whitfield collection of types in the University of California.* Jour. Paleont., vol. 28, No. 3, pp. 297-309, pl. 29.

Pedersen, T. B.
1922. *Rastritesskiferen på Bornholm.* Dansk. Geol. Foren., Medd., vol. 6, No. 11, 29 pp., 7 figs.

Pelletier, M.
1950. *Définition du genre Isastraea Milne Edwards et Haime 1851 d'après la structure du génotype: Astrea helianthoides Goldfuss 1826.* Soc. Géol. France, C. R., Nos. 9-10, pp. 160-162, 2 figs.
Penck, [Friedrich Carl] Albrecht
1896. *Das grosse australische Wallriff.* Naturwiss. Vereins Wien, Schr., vol. 36, pp. 325-347.
Penecke, Karl Alphons
1898. *Marine Tertiär-Fossilien Nordgrieschenlands.* K. Akad. Wiss. Wien, Denkschr., vol. 64, pp. 41-66. [Anthozoen, p. 51, pls. 2, figs. 7, 8.]
Percival, E.
1929. *A report on the fauna of the estuaries of the River Tamar and the River Lynher.* Marine Biol. Assoc. Plymouth, Journ., vol. 16. pp. 88, 96-97.
Pérès, J. M.
1958. *Images de quelques communatés benthiques marines de la Méditerranée.* Soc. Zool. France, Bull., vol. 83, No. 4, pp. 358-366.
Pérès, J. M., and Picard, J.
1951. *Notes sur les fonds coralligènes de la région de Marseille.* Arch. Zool. Expér. et Génér., vol. 88, Notes et Rev., pp. 24-38.
1963. *Aperçu sommaire sur les peuplements marins benthiques entourant l'Ile de Port-Cros.* Terre et la Vie, vol. 110, No. 4, pp. 436-448.
Perkins, Bobby Frank
1951. *An annotated bibliography of North American upper Cretaceous corals 1785-1950.* Fondren Sci. Ser. Dallas, Texas, No. 3, pp. 1-45, 1 pl.
Perkins, E. J., and Williams, B. R. H.
1963. *A preliminary list of the marine fauna and flora of the Solway Firth, with some notes on the distribution of Elminius modestus Darwin.* Dumfr. Gall. Nat. Hist. Soc., Trans., ser. 3, vol. 40, pp. 75-88, figs. 1-2. [Coelenterates pp. 77-78.]
Perrier, [Jean Octave] Edmond
1887. *Les coralliaires et les îles madréporiques.* Assoc. Française Avancem. Sci., C. R., pp. 80-105.
Perrier, Rémy
1936. *La Faune de la France.* Paris, vol. 1A, pp. 8-64, 118, 229 figs.
Petersen, C. G. J.
1915. *On the animal communities of the sea bottom in the Skagerak, the Christiania Fjord, and the Danish waters.* Danish Biol. Sta. Copenhagen, Rept., vol. 23, pp. 3-28.
Peyssonel, J. A. de
1753. *An account of a manuscript treatise, presented to the Royal Society, entitled Traité du corail, contenant les nouvelles découverts, qu'on a fait sur la corail, les pores, les madrépores, scharras, litophitons, éponges, et autres corps et productions, que la mer fournit, pour servir à l'histoire naturelle de la mer . . .* Roy. Soc. London, Philos. Trans., vol. 47 (for 1751-1752), pp. 445-469.
Pfeffer, Georg [Johann]
1889. *Zur Fauna von Südgeorgien.* Hamburg. Wiss. Anstalt, Jahrb., vol. 6, pt. 2, Coelenterata, pp. 37-55. Also, Hamburg. Mus., Mitt., vol. 6, No. 5, 19 pp.
Philippi, Rudolph Amandus
1840a. *Zoologische Bemerkungen. VII. Desmophyllum stellaria Ehr.* Arch. f. Naturgesch., vol. 6, No. 1, pp. 193, 194.
1840b. *Zoological Notices. Oculina ramea Ehrenberg.* Ann. Mag. Hist. Nat., vol. 4, No. 22, pp. 93, 94.

1841. *Ecmesus und Phyllodes, zwei neue Genera fossilen Korallen.* N. Jahr. f. Min., Jahrg. 1841, pp. 662-668, pl. 11b.
1842. *Zoologische Beobachtungen. VI. Verzeichniss der im Mittelmeer von mir beobachten Arten Cyathina Ehrenberg.* Arch. f. Naturgesch., vol. 8, No. 1, pp. 40-45.
1866. *Kurze Beschreibung einiger chilenischen Zoophyten.* Arch. f. Naturgesch., vol. 32, pp. 118-120.
1887. *Die Tertiären und Quartären Versteinerungen Chiles.* Leipzig, 226 pp., 58 pls.

Phillips, John
1836. *Illustrations of the Geology of Yorkshire. Part II. The Mountain Limestone District.* London, xx + 253 pp., 24 pls.

Picard, J.
1952. *Notes sur deux espèces de Madréporaires communes à la Manche et à la Méditerranée.* Lab. Marit. Dinard, Bull., No. 36, pp. 5-7.

Pieper, Friedrich Wilhelm
1884. *Ergänzungen zu "Heller's Zoophyton etc. des adriatischen Meeres."* Zool. Anzeig., vol. 7, pp. 148-152, 164-169, 185-188, 216-221.

Pijpers, P. J.
1933. *Geology and paleontology of Bonaire.* Geogr. Geol. Meded. Utrecht, vol. 8, pp. 75-103, 2 pls., 147 text-figs.

Plate, L.
1916. *Übersicht über biologische Studien auf Ceylon.* Jenaische Zeitschr., vol. 54, pp. 1-42, pls. 1-9, 4 text-figs.

Plaziat, J. C.
1964. *Résultats stratigraphiques d'une étude du "Sparnacien" des Corbières.* Bur. Rech. Géol. Min., Mém., vol. 28, pp. 395-400.

Plessis, Y.
1961. *Écologie de l'estran rocheux du Calvados. Étude des biocénoses et recherches expérimentales.* Inst. Océanogr. Paris, Ann., vol. 38, No. 3, pp. 233-323, figs. 1-8.
1963. *Réalisation d'habitats sableux en milieu expérimental.* Inst. Océanogr. Monaco, Bull., Num. Spéc. 1D, pp. 61-70, figs. 1-2.

Poche, Franz
1915. *Über das System der Anthozoa und einige allgemeine Fragen der zoologischen Systematik.* Zool. Anzeig., vol. 46, pp. 61-16, 33-43.

Počta, Filip
1886. *Notiz über eine neue Korallengattung aus dem böhmischen Cenoman.* K.-K. Geol. Reichsanst. Wien, Verhandl., pp. 119-120.
1887. *Die Anthozoen der böhmischen Kreideformation.* K. Böhmisch. Gesell. Wiss., Abhandl., vol. 7, 60 pp., 2 pls.

Pollock, James Barkley
1928. *Fringing and fossil coral reefs of Oahu.* Bernice P. Bishop Mus. Honolulu, Bull., vol. 55, pp. 1-56, 5 pls.

Ponomareva, L. A.
1961. *The zooplankton from the Aniva Bay (Sea of Okhotsk).* [Russian with English summary.] Inst. Okeanol. Moskva, Trud., vol. 51, pp. 103-111, figs. 1, 2.

Pontoppidan, Erik Ludvigsen
1755. *The Natural History of Norway. Translated from the Danish original.* Copenhagen, 291 pp., 28 pls., map.

Ponzi, Giuseppe
1876. *I fossili del Monte Vaticano. Zoofiti.* R. Accad. Lincei Roma, Atti, ser. 2, vol. 3, No. 2, pp. 925-959, pls. 1-3.

Popovici, Z., and Angelescu, V.
1954. *La economía del mar y sus relaciones con la alimentación de la*

humanidad. Ext. Cult. Mus. Argentina, Publ., Cienc. Nat., No. 8, 2 vols. [Coelenterates, vol. 1, pp. 560-562.]

Potts, F. A.

1925. *The life of the [Great Barrier] reef.* Geogr. Jour. London, vol. 65, pp. 323-329.

Pourtalès, Louis François de

1967, 68. *Contributions to the fauna of the Gulf Stream at great depths.* Mus. Comp. Zool., Bull., vol. 1, Nos. 6-7, pp. 103-120 (1867); pp. 121-142 (1868).

1871. *Illustrated catalogue of the Museum of Comparative Zoology at Harvard College. IV. Deep sea corals.* Mus. Comp. Zool., Mem., vol. 2, pp. 1-93, pls. 1-8.

1874. *Zoological results of the Hassler Expedition. I. Echini, crinoids, and corals.* Mus. Comp. Zool., Mem., vol. 4, Illustrated Catalogue No. 8, pt. 1, *Deep Sea Corals.* Pp. 33-50, pls. 6-9.

1875a. *Corals at the Galapagos Islands.* Amer. Jour. Sci., ser. 3, vol. 10 (110), No. 58, art. 38, pp. 282-283.

1875b. *List of fossil corals collected by W. M. Gabb, Esq., Santo Domingo.* Geol. Mag., decade 2, vol. 2, pp. 544-545.

1878. *Report on the dredging operations of the U.S. Coast Survey steamer "Blake." Corals.* Mus. Comp. Zool., Bull., vol. 5, No. 9, pp. 197-212, pl. 1.

1880. *Reports on the results of dredging in the Caribbean Sea, 1878-79, by United States Coast Survey steamer "Blake," Commander J. R. Bartlett, U.S.N. VI. Report on the corals and Antipatharia.* Mus. Comp. Zool., Bull., vol. 6, No. 4, pp. 95-120, pls. 1-3.

Powell, Arthur William Baden

1947. *Native Animals of New Zealand.* Auckland, (Coelenterates) pp. 4-9, figs.

1949. *Native Animals of New Zealand.* Auckland Mus., Handbook Zool., pp. 1-96, figs. 1-411.

Praeger, Robert Lloyd

1950. *Natural History of Ireland, a sketch of its flora and fauna.* London, 350 pp., maps.

Pratje, Otto

1924. *Korallenbänke in tiefen und kühlen Wasser.* Centralbl. f. Min. Geol., Paläont., pp. 410-415, fig.

Pratt, Edith M.

1900. *Anatomy of Neohelia porcellana (Moseley). In* Willey, Arthur, *Zoological results based on material from New Britain, New Guinea, Loyalty Islands, and elsewhere collected during . . .1895, 1896 and 1897.* Cambridge, pp. 591-602, 2 pls.

Pratz, Eduard

1882. *Ueber die verwandtschaftlichen Beziehungen einiger Korallengattungen mit hauptsächlicher Berücksichtigung ihrer Septalstruktur.* Palaeontographica, vol. 29, No. 2, pp. 81-124, 1 pl.

1883. *Eocäne Korallen aus der libyschen Wüste und Ägypten.* Palaeontographica, vol. 30, No. 2, pp. 219-237, pl. 35.

Préfontaine, G.

1933. *Additions à la liste des espèces animales de l'estuaire du Saint-Laurent.* Roy. Soc. Canada, Trans., ser. 3, sect. 5, vol. 27, pp. 253-258.

Préfontaine, G., and Brunel, P.

1962. *Liste d'invertébrés marins recuellies dans l'estuaire du Saint-Laurent de 1929 a 1934.* Natural. Canad., vol. 89, Nos. 8-9, pp. 237-263, fig. 1. [Coelenterates pp. 245-246.]

Prenant, Marcel

1927. *Notes éthologiques sur la faune marine sessile des environs de Roscoff. II. Spongiaires, Tuniciers, Anthozoaires.* Sta. Biol. Roscoff, Trav., No. 6, pp. 10-11.

Prever, Pietro Lodovico

1909. *Anthozoo della fauna cenomaniana dei calcari i Scolliera. La fauna coralligena del Cretaceo dei Monti d'Ocre nell Abruzzo Aquilano de Parona.* Carta Geol. Italia, Mem., vol. 5, No. 1, pp. 51-147, pls. 1-15.

1921, 22. *I coralli oligocenici di Sassello nell'Appennino Ligure. I. Corallari a calici confluenti.* Palaeontogr. Italica, vol. 27 (1921), pp. 53-100, pls. 7-15; vol. 28 (1922), pp. 1-40, pls. 1-7.

Pringsheim, E. G.

1955. *Die "gelben Zellen" der Koralle Cladocora.* Staz. Zool. Napoli, Pubbl., vol. 17, pp. 5-9, figs. 1-6.

Prochäzka, Vladimir Josef

1888. *Studien an den mährischen Miocaenkorallen.* K. Böhmischen Gesell. Wiss. Prague, Sitzungsber. 1887, pp. 300-328, pls. 1-4.

1893a. *Ein Beitrag zur Kenntniss der miocänen Anthozoen des Wiener Beckens.* České Akad. César. Frantz Jos. Prague, sect. 2, vol. 2, No. 7, p. 32.

1893b. *Bericht ueber die Stratigraphie und faunistische Verhältnisse des westlicher Miocängebietes von Mähren.* K. Böhmischen Gesell. Wiss. Prague, Sitzungsber. 1892, pp. 326-368.

Prowazek, Stanislaus von

1913. *Die Deutschen Marianen, ihre Natur und Geschichte.* Leipzig, iv + 125 pp., 51 figs.

Pruvot, Georges Florentin

1895. *Coup d'oeil sur la distribution générale des invertébrés dans la région de Banyuls (Golfe du Lion).* Arch. Zool. Expér. et Génér., sér. 3, vol. 23, pp. 629-658, chart.

1897. *Essai sur les fonds et la faune de la Manche Occidentale (Côtes de Bretagne) comparés à ceux du Golfe du Lion.* Arch. Zool. Expér. et Génér., sér. 3, vol. 25, pp. 511-664, pls. 21-26. [Coelenterata tables 20-22, pp. 657-660.]

Purchon, R. D.

1948. *Studies on the biology of the Bristol Channel. XVII. The littoral and sublittoral fauna of the northern shores, near Cardiff.* Bristol Nat. Soc., Proc., vol. 27, No. 4, pp. 285-310.

1956. *A list of corls collected in the vicinity of Singapore.* Linnean Soc. New South Wales, Proc., vol. 81, No. 2, pp. 157-158.

Purdy, Edward G.

1963a. *Recent calcium carbonate facies of the Great Bahama Bank. 1. Petrography and reaction groups. 2. Sedimentary facies.* Jour. Geol., vol. 71, No. 4, pp. 334-355, pls. 1-5, text-figs. 1-5; pp. 472-497, pl. 1, text-figs. 1-4.

Purves, J. C.

1884-85. *Esquisse géologique de l'île d'Antigoa.* Mus. Roy. Hist. nat. Belgique, Bull., vol. 3, pp. 273-318, pl. 14.

Pyefinch, K. A., and Downing, F. S.

1949. *Notes on the general biology of Tubularia larynx Ellis and Solander.* Marine Biol. Assoc. Plymouth, Jour., vol. 28, No. 1, pp. 21-43, figs.

Quaas, A.

1902. *Die Fauna der Overwegischichten und der Blätterthone in der lybischen Wüste.* Palaeontographica, vol. 30, No. 2, pp. 153-336, pls. 20-33.

Quayle, Ernest H.

1932. *Fossil corals of the genus Turbinolia from the Eocene of California.* San Diego Soc. Nat. Hist., Trans., vol. 7, No. 10, pp. 91-109, pl. 6, 12 text-figs.

Quelch, John Joseph

1884a. *On new Stylasteridae, with remarks on some recently described forms.* Ann. Mag. Nat. Hist., ser. 5, vol. 13, pp. 111-117.

1884b. *On some Stylasteridae.* Ann. Mag. Nat. Hist., ser. 5, vol. 13, pp. 267-269.

1884c. *Preliminary notice of new genera and species of "Challenger" reef corals.* Ann. Mag. Nat. Hist., ser. 5, vol. 13, pp. 292-297.

1884d. *The Milleporidae.* Nature, vol. 30, p. 539.

1886. *Report on the reef corals collected by H.M.S. Challenger during the years 1873-76.* Voyage H.M.S. Challenger, Rept. Sci. Results, Zoology, vol. 16, pt. 46, pp. 1-203, pls. 1-12.

Quenstedt, Friedrich August von

1852-85. *Handbuch der Petrefactenkunde.* Leipzig, ed. 1 (1852), iv + 796 pp., 62 pls.; ed. 2 (1867), 982 pp., 86 pls.; ed. 3 (1882-1881), 1239 pp., 100 pls.

1879-1881. *Petrefactenkunde Deutschlands. Bd. VI (1). Korallen.* Leipzig, pp. 497-624 (1879); pp. 625-752 (1880); pp. 753-912 (1880); pp. 913-1093, 42 pls. (1881).

Quin, John T.

1907. *The Building of an Island, being a sketch of the geologic structure of the Danish West Indian island of St. Croix, or Santa Cruz.* Christiansted, viii + 106 pp., 5 pls., map, diagrs.

Quoy, Jean René Constant, and Gaimard, Joseph Paul

1824. *Zoologie. Voyage autour du monde . . . sur . . . l'Uranie et la Physicienne . . . 1817-20.* Paris, vol. 2, pp. i-iv, 1-712, pls. 1-96.

1833. *Zoophytes. Voyage de découvertes de l'Astrolabe.* Paris, vol. 4, 390 pp., 26 pls.

Quyada, B.

1911. *Catálogo de la colección de los Celenterados del Museo Nacional.* Mus. Nat. Chile, Bol., vol. 3, pp. 165-182.

Raasch, G. O. (Editor)

1961. *1st international symposium on Arctic geology. I. Geology of the Arctic.* Univ. Toronto Press, xv + 732 pp., figs.

Raffy, Anne

1953. *Résistance de quelques Actinaires intercotidaux à l'émersion et à la dessalure.* Soc. Zool. France, Bull., vol. 77, pp. 484-487.

Ralph, P. M.

1948. *Some New Zealand corals.* New Zealand Sci. Rev. Wellington, vol. 6, No. 6, pp. 107-110, figs.

Ralph, P. M., and Hurley, D. E.

1952. *The settling and growth of wharf-pile fauna in Port Nicholson, Wellington, New Zealand.* Victoria Univ. New Zealand, Zool. Publ. No. 19, pp. 1-22, figs.

Ralph, P. M., and Squires, D. F.

1962. *The extant scleractinian corals of New Zealand.* Victoria Univ. New Zealand, Publ. No. 29, pp. 1-19, pls. 1-8.

Ramirez, Ricardo

1956. *Paleontología Dominicana. Descripción de las formaciones geológicas Baitoa, Cercado, Gurabo y Arcilla Mao, y lista de los moluscos y corales fósiles procedentes de ellas, que integran la colección preparada para ser exhibada en la Feria de La Paz y Confraternidad del Mundo Libre.* Univ. Santo Domingo, Sección Geol. Paleont., 26 pp., 8 pls.

Ranson, Gilbert

1950. *Géonémie, écologie et répartition géographique des coraux constructeurs de récifs. Coraux et climats.* Soc. Biogéogr. Paris, C. R., vol. 27, No. 235, pp. 77-88.

1952. *Note sur la cause probable de l'absence de récifs coralliens aux îles Marquises et de l'activité réduite des coraux récifaux à Tahti, aux Tuamotu, aux Hawaii, etc.* Soc. Biogéogr. Paris, C. R., vol. 29, No. 248, pp. 3-11.

1955. *Observations sur les îles coralliens de l'Archipel des Tuamotu.* Soc. Zool. France, Bull., vol. 80, pp. 272-274.

1961. *Biologie des coraux.* Cahiers Pacif., No. 3, pp. 75-94.

1964. *Biologie des coraux. III. Rapports des coraux avec leur milieu.* Cahiers Pacif., No. 6, pp. 51-69.

Ranson, Gilbert, and Paretias, Jacqueline

1958. *Coraux et récifs coralliens (Bibliographie).* Inst. Océanogr. Monaco, Bull., No. 1121, pp. 1-80.

Ranson, Gilbert, and Serene, R.

1961. *New knowledge of the marine invertebrate fauna of Viet Nam.* 9th Pacific Sci. Congr., Proc., vol. 10, pp. 40-42.

Rathbun, Richard

1879. *Brazilian corals and coral reefs.* Amer. Natural., vol. 13, No. 9, pp. 539-551, fig.

1888. *Catalogue of the species belonging to the genus Madrepora contained in the United States National Museum.* U. S. Nat. Mus., Proc., vol. 10, pp. 10-19.

1888b. *Annotated catalogue of the species of Porites and Synaraea in the United States National Museum, with a description of a new species of Porites.* U. S. Nat. Mus., Proc., vol. 10, pp. 354-366, pls. 15-19.

Raymond, Percy Edward

1921. *The history of corals and the "limeless" oceans.* Amer. Jour. Sci., ser. 5, vol. 2 (102), No. 12, art. 28, pp. 343-347, figs. 1-3.

Razzauti, A.

1933. *Nomi volgari di pesci e di altri animali del Mare di Livorno.* Boll. Pesca Roma, vol. 9, pp. 113-120.

Reade, Thomas Mellard

1888. *Coral formations.* Nature, vol. 37, pp. 488, 535.

Réaumur, René Anton Ferchault de

1732. *Observations sur la formation du corail et des autres productions appelées plantes pierreuses.* Acad. Sci. Paris, Mém. 1727, pp. 378-396.

Redfield, A. C., and others

1952. *Marine fouling and its prevention.* U. S. Naval Inst. Annapolis, pp. i-x, 1-388, frontisp., figs.

Reed, Frederick Richard Cowper

1902. *Woodwardian Museum notes: Salter's undescribed species. VIII.* Geol. Mag., vol. 9, pp. 256-259, pl. 16; pp. 337-342, pl. 18.

1939. *A Miocene limestone from Cyprus.* Geol. Mag., vol. 76, pp. 310-311.

van Rees, Jacob

1884. *Coelenteraten van de Oosterschelde. Coelentérés de l'Escaut de l'Est.* Nederland. Dierk. Vereen., Tijdschr., Suppl. D, vol. 1, pp. 570-591.

Rees, W. J.

1962. *The distribution of the coral Caryophylla smithii and the barnacle Pyrgoma anglicum in British waters.* British Mus. (Nat. Hist.), Bull., Zoology, vol. 8, No. 9, pp. 401-418, pl. 12, text-figs. 1-3.

1963. *Tubularia crocea L. Agassiz in British waters.* Nature, vol. 197, No. 4873, p. 1223.

Rehberg, Hermann

1892. *Neue und wenig bekannte Korallen.* Naturwiss. Verein Abhandl., vol. 12, No. 1, pp. 1-50, pls. 1-4.

Rein, Johannes Justus

1881. *Die Bermuda-Inseln und ihre Korallenriffe, nebst einem Nachtrage gegen die Darwin'sche Senkungstheorie.* Deutsche Geographentages, Verhandl, vol. 1, pp. 29-46.

Reis, Otto M.

1889. *Korallen der Reiterschichten.* Geognostichten Jahreshefte, vol. 2, pp. 91-162, pls. 1-4.

Renouf, L. P. W.

1939. *Faunistic notes from the south coast of County Cork, Eire.* Ann. Mag. Nat. Hist., ser. 11, vol. 4, pp. 520-525.

Renz, Carl

1931. *Zur Kenntniss der Gattung Aspidiscus Koenig.* Schweiz. Palaeont. Gesell., Abhandl., vol. 51, No. 3, pp. 1-5, pl. 1.

Renz, H. H.

1942. *Stratigraphy of northern South America, Trinidad, and Barbados.* 8th Amer. Sci. Congr., Proc., vol. 4, pp. 514-571, strat. table.

Reuss, August Emanuel von

1845. *Die Versteinerungen der böhmische Kreideformation.* Stuttgart, 148 pp., 51 pls.

1847. *Die fossilen Polyparien des Wiener Tertiärbeckens.* Naturwiss. Abhandl. W. Haidinger, vol. 2, pp. 1-109, pls. 1-12.

1854. *Beiträge zur Characteristik der Kreideschichten in dem Ostalpen besonders im Gosauthale und am Wolfgangsee.* K. Akad. Wiss. Wien, Math.-Naturwiss. Cl., Denkschr., vol. 7, pp. 1-157, pls. 1-31.

1856. *Beiträge zur Characteristik der Tertiärschichten der nördlischen und mitteren Deutschlands.* Akad. Wiss. Wien, Sitzungsb., vol. 18, pp. 197-272, pls. 1-12.

1859. *Ueber einige Anthozoen aus den Tertiärschichten des Mainzer Beckens.* Akad. Wiss. Wien, Sitzungsb., vol. 35, pp. 479-488, pls. 1, 2.

1860. *Die marinen Tertiärschichten Böhmens und ihre Versteinerungen.* Akad. Wiss. Wien, Sitzungsb., vol. 39, pp. 207-285, pls. 1-8.

1864a. *Die fossilen Foraminifera, Anthozoen, und Bryozoen von Oberburg in Steiermark.* K. Akad. Wiss, Wien, Math.-Naturwiss. Cl., Denkschr., vol. 23, pp. 1-36, pls. 1-10.

1864b. *Ueber Anthozoen und Bryozoen des Mainzer Tertiärbeckens.* Akad. Wiss. Wien, Sitzungsb., vol. 50, pp. 197-210, pls. 1-3.

1864c. *Zur Fauna der deutschen Oberoligocäns. II. Anthozoen.* Akad. Wiss. Wien, Sitzungsb., vol. 50, pp. 614-690, pls. 6-15.

1866a. *Ueber fossilen Korallen von der Insel Java.* Reise Österreich. Fregatte "Novara" um die Erde, Geol. Theil, vol. 2, pp. 165-195, pls. 1-3.

1866b. *Foraminifera, Anthozoen, und Bryozoen des deutschen Septarienthones.* K. Akad. Wiss. Wien, Math.-Naturwiss. Cl. Denkschr., vol. 25, pp. 117-214, 11 pls.

1867. *Die fossile Fauna der Steinsalzablagerungen von Wieliczka in Galizien.* Akad. Wiss. Wien, Sitzungsb., vol. 55, pp. 1-168, 8 pls.

1868-72. *Paläontologischen Studien ueber die älter Tertiärschichten der Alpen. I. Die fossilen Anthozoen der Schichten von Castelgomberto.* K. Akad. Wiss. Wien, Math.-Naturwiss. Cl., Denkschr., vol. 28 (1868), pp. 129-148, pls. 1-16; *II. Die fossilen Anthozoen und Bryozoen der Schichtengruppe von Crosara,* vol. 29 (1869), pp. 215-298, pls. 17-36; *III. Die fossilen Anthozoen der Schichtengruppe von S. Giovanni Ilarione und von Ronca,* vol. 32 (1872), pp. 1-60, pls. 37-56.

1870. *Oberoligocäne Korallen aus Ungarn.* Akad. Wiss. Wien, Sitzungsb., vol. 61, pp. 37-56, pls. 1-5.

1871. *Die fossilen Korallen des österreichisch-ungarnischen Miocäns.* K. Akad. Wiss. Wien, Math.-Naturwiss. Cl., Denkschr., vol. 31, pp. 97-270, pls. 1-21.

Reyeros, Navarro, M. M.

1963. *Corales del Cretácico inferior de San Juan Raya, Estado de Puebla.* Paleont. Mexicana, vol. 17, pp. i-iii, 1-21, pls. 1-5, text-figs. 1, 2.

Reynolds, M. A.

1953. *The Cainozoic succession of Maslin and Aldinga Bays, South Australia.* Roy. Soc. South Australia, Trans., vol. 76, pp. 114-140, figs., map.

Rice, William North

1878. *On the animal of Millepora alcicornis.* Amer. Jour. Sci., ser. 3, vol. 16 (116), No. 91, art. 16, pp. 180-182, figs. 1-20.

Richard, J., and Neuville, H.

1937. *Sur l'histoire naturelle de l'ile d'Alboran. Résultats des Campagnes Scientifiques de Prince de Monaco.* Monaco, No. 96, pp. 167-177, pl. 1.

Richards, H. C.

1938. *Some problems of the Great Barrier Reef.* Roy. Soc. New South Wales, Jour., vol. 71, No. 1, pp. 68-85.

Richards, H. C., and Hedley, C.

1925. *A geological reconnaissance in North Queensland.* Roy. Geogr. Soc. Australasia, Trans., vol. 1, pp. 1-28, 2 pls.

Richards, H. C., and Hill, D.

1942. *Great Barrier Reef bores, 1926 and 1927. Descriptions, analyses, and interpretations.* Great Barrier Reef Comm. Brisbane, Rept., vol. 5, pp. 1-122, pls. 1-10, text-figs.

Richards, Horace Gardiner

1933. *A new species of Hydrocorallinae from the Pleistocene of New Jersey.* Washington Acad. Sci., Jour., vol. 23, No. 4, pp. 211-212, 1 fig.

1938. *Some problems of the Great Barrier Reef.* Roy. Soc. New South Wales, Proc., vol. 71, pp. 68-85.

1948. *Tertiary invertebrate fossils from newly discovered localities in North and South Carolina.* Notulae Naturae, No. 207, pp. 1-11, pls. 1-4.

1966. *Notes on five marine Pleistocene localities in northeastern North Carolina.* Southeastern Geol., vol. 7, No. 3, pp. 135-139. [Coelenterata p. 138.]

Richards, Horace Gardiner, and Harbison, Anne

1942. *Miocene invertebrate fauna of New Jersey.* Acad. Nat. Sci. Philadelphia, Proc., vol. 94, pp. 167-250, pls. 7-22.

Richards, H. G., and Shapiro, E.

1963. *An invertebrate macrofauna from the Upper Cretaceous of Delaware.* Delaware Geol. Sur., Rept. Investig., vol. 7, pp. 1-38, pls. 1-4, text-figs. 1-3.

Richey, W. C.

1956. *Five Polyps.* Pennsylvania Acad. Sci., Proc., vol. 30, pp. 211-217, figs. 1, 2.

Richmond, E. A.

1962. *The fauna and flora of Horn Island, Mississippi.* Gulf Research Rept., vol. 1, No. 2, pp. 1-106, figs. 1-27.

Richter, R.

1953. *Vorzeitliche Korallen entschleiern deutsche Gebirge.* Natur u. Volk, vol. 83, No. 4, pp. 109-115, figs.

1955. *Die ältesten Fossilien Süd-Afrikas.* Senckbergiana Lethaea, vol. 36, Nos. 3, 4, pp. 243-289, pls. 1-7, text-figs. 1, 2.

Ricketts, Edward F., Calvin, Jack, and Hedgpeth, Joel

1948. *Between Pacific Tides.* Stanford Univ. Press, pp. i-xiii, 1-518, frontisp., pls. 1-46, text-figs. 1-135, maps. (Phylum Coelenterata, pp. 413-420.)

Ridley, Stuart Oliver

1881. *Account of the zoological collections made during the survey of H.M.S. "Alert" in the Straits of Magellan and on the coast of Patagonia. X. Coelenterata.* Zool. Soc. London, Proc., pp. 101-107, pl. 6.

1882. *On the arrangement of the Coralliidae, with descriptions of new and rare species.* Zool. Soc. London, Proc., pp. 221-233, pl. 9.

1883a. *On the coral fauna of Ceylon, with descriptions of new species.* Ann. Mag. Nat. Hist., ser. 5, vol. 11, pp. 250-262.

1883b. *Notes on the zoophytes and sponges obtained by Mr. F. Day off the east coast of Scotland.* Linnean Soc. London, Jour., Zoology, vol. 17, p. 105.

1884a. *On some structures liable to variation in the subfamily Astrangiacea (Madreporaria).* Linnean Soc. London, Jour., Zoology, vol. 17, pp. 395-399, pl. 16.

1884b. *On the classificatory value of growth and budding in the Madreporidae, and on a new genus illustrating this point.* Ann. Mag. Nat. Hist., ser. 5, vol. 13, pp. 284-319, pl. 11.

Ridley, Stuart Oliver, and Quelch. John Joseph

1885. *List of corals collected in Keeling Islands. In* Forbes, Henry Ogg, *A Naturalist's wandering in the Eastern Archipelao,* New York, pp. 44-47.

Riedl, Rupert

1963. *Fauna and Flora der Adria.* Hamburg and Berlin, pp. 1-640, pls. 1-8, text-figs. [Cnidaria (Nesseltiere) pp. 123-173.]

Riesenberg, Felix

1940. *The Pacific Ocean.* New York, London, 322 pp., figs. maps.

Rigby, J. Keith, and McIntire, William G.

1966. *The Isla de Lobos and associated reefs, Veracruz, Mexico.* Brigham Young Univ., Geol. Studies, vol. 13, pp. 1-46, pls. 1-8, text-figs. 1-9.

Riggio, Giuseppe

1893. *Alcuni osservazioni sulla nota del Marchese A. de Gregorio intorno a tabini Celenterati Mediterranei viventi.* Natural. Siciliano, vol. 12, pp. 96-98.

Riley, G. A.

1938. *Plankton studies. I. A preliminary investigation of the plankton of the Tortugas region.* Jour. Marine Res., vol. 1, pp. 335-352, figs. 101-104.

Ringuelet, R. A.

1964. *Los tipos morfológicos o biotopos en las comunidades marinas de la zona litoral.* Segundo Congreso Lat.-Amer. Zool., An., vol. 1, pp. 23-26.

Rink, Henrik Johannes
1847. *Die Nikobarischen Inseln. Eine geographische Skizze mit speciellet Berücksichtigung der Geognosie.* Copenhagen, viii + 188 pp., 1 pl. text-figs., geol. map.

Rios, José Maria, and Almela, Antonio
1944. *Un chaetetido del Eoceno Español.* Inst. Geol. y Min., Notas y Comunic., No. 12, pp. 19-37, 4 pls., 1 text-fig.

Risbec, J.
1931. *Quelques remarques sur l'alllure des récifs frangeants en Nouvelle-Calédonie.* Inst. Océanogr. Indochine, vol. 16, pp. 23-32, 7 figs.

Rispoli, G. Checchia
1915. *A proposito di una nota del Dott. P. Oppenheim dal titulo "Alttertiäre Korallen vom Nordrand der Madonie in Sizilien."* Riv. Ital. Paleont. Parma, vol. 21, pp. 34-40.

Risso, Antoine
1826. *Histoire naturelle des principaux productions de l'Europe méridionale.* Paris, vol. 5, pp. 352-361, figs. 48-62.

Ritchie, J.
1912. *Two rare corals and Polyzoa from Rockall.* Scottish Naturalist Edinburgh, p. 281.

Ritter, William E.
1903. *Preliminary report on the marine biological survey work carried on by the Zoological Department of the University of Californa at San Diego.* Science, vol. 18, pp. 360-366. [Coelenterata by H. B. Torrey.]

Rivero, Frances Charlton de
1962. *Paleontologia, paleoecologia y ecologia marina.* Geos, No. 7, pp. 5-101, figs. 1-23.
1964. *Ecologia, paleoecologia y distribucion estratigráfica de los arrécifes organicos.* Geos, No. 11, pp. 41-122, figs. 1-6, tables 1, 2.

Robertson, J. A.
1932. *A cursory survey of Bear Island trawling ground.* Rapp. Cons. Explor. Mer. Copenhague, vol. 81, pp. 115-139.

Robinson, W. I.
1917. *The relationship of the Tetracoralla to the Hexacoralla.* Connecticut Acad. Arts and Sci., Trans., vol. 21, pp. 145-200, figs. 1-7.
1923. *The ancestry of the Hexacoralla.* Amer. Jour. Sci., ser. 5, vol. 6 (206), No. 35, art. 33, pp. 424-426.

Rodriguez, Gilberto
1959. *The marine communities of Margarita Island, Venezuela.* Bull. Marine Sci. Gulf and Caribbean, vol. 9, No. 3, pp. 237-280, figs. 1-26.
1963. *The intertidal estuarine communites of Lake Maracaibo.* Bull. Marine Sci. Gulf and Caribbean, vol. 13, No. 2, pp. 197-218, figs. 1-6.

Roebuck, William Denison
1895. *Bibliography of Coelenterata 1884-92.* Naturalist, pp. 151-158.

Roemer, Friedrich Adolf
1836. *Die Versteinerungen des norddeutschen Oolithen-Gebirges.* Hannover, 218 pp., 16 pls.
1839. *Versteinerungen des norddeutschen Oolith-Gebirges. Ein Nachtrag.* Hannover, p. i-iv, 1-59, 5 pls.
1863. *Die Polyparien des norddeutschen Tertiär.-Gebirges.* Palaeontographica, vol. 9, pp. 199-245, pls. 35-39.
1888. *Ueber eine durch die Häufigkeit hippuritenartiger Chamiden ausgezeichnete Fauna der oberturonen Kreide von Texas.* Palaeont. Abhandl., vol. 4, pp. 281-296, 3 pls.

Roger, J.
1943. *Les polypiers du gisement Pliocène ancien de Dar bel Hamri (Maroc).* Mus. Nat. Hit. nat. Paris, Bull., sér. 2, vol. 15, No. 6, pp. 477-481, 2 figs.
1944. *Essai d'interprétation d'une forme curieuse de Flabellum du Pliocène ancien de Dar bel Hamri (Maroc).* Mus. Nat. Hist. nat. Paris, Bull., sér. 2, vol. 16, No. 4, pp. 245-254, 2 pls., 5 text-figs.

Romanini, M. G.
1949. *Sulla presenza di un fattore diffusore nei Celenterati.* Soc. Ital. Milano, Atti, vol. 88, Nos. 1-2, pp. 65-68.

Roos, P. J.
1964. *The distribution of reef corals in Curaçao.* Studies on the fauna of Curaçao and other Caribbean Islands, vol. 20, No. 81, pp. 1-57, pls. 1-13, text-figs. 1-16. [Natuurwetenschappelijke Studiekring voor Suriname en de Nederlandse Antillen, No. 38.]

Ross, Jame G.
1888. *Coral formations.* Nature, vol. 37, pp. 462, 584-585.

Rossi, Lucia
1950. *Celenterati del Golfo di Rapallo (Riviera Ligure).* Ist. Mus. Zool. Torino, Boll., vol. 2, No. 4, pp. 193-235, figs.
1951. *Moderne acquisizione sulla fisiologia dei coralli.* Natura Milano, vol. 42, Nos. 1-2, pp. 1-10.
1954. *Spedizione subacquea Italiana nel Mar Rosso. Richerche zoologiche. V. Madreporarii, Stoloniferi e Milleporini.* Riv. Biol. Colon., vol. 14, pp 23-72, pls. 1-10.
1955. *Sulla presenza in Mar Rosso di Goniastrea benhami Vaugh.* Doriana, vol. 2, No. 63, pp. 1-4, 2 figs.
1957a. *Revisione critica dei Madreporarii del Mar Ligure.* Doriana, vol. 2, No. 76, pp. 1-9, pls. 1-4.
1957b. *Variabilità e differenziazione nei Madrepararii del gen. Fungia.* Ist. Mus. Zool. Torino, Boll., vol. 5 (1955-56), pp. 45-51.
1957c. *Osservazioni ecologiche su alcuni Antozoi del Golfo di Genova.* Boll. Zoll., vol. 23, No. 2 (1956), pp. 237-246, figs. 1, 2.
1958a. *Madreporarii raccolti dalla N.R.P. "Faial" durante la campagna 1957 presso le coste del Portogallo. (Nota preliminare).* Doriana, vol. 2, No. 86, pp. 1-9.
1958b. *Contributo alla studio della fauna di profundità vivente presso la Riviera Ligure di Levante.* Doriana, vol. 2, No. 92, pp. 1-13, figs. 1, 2.
1960a. *Catalogo dei tipi di Madreporarii esistenti nel Museo Zoologico di Torino.* Ist. Mus. Zool. Univ. Torino, Boll., vol. 6, No. 1 (1958-60), pp. 81-89, pl. 1.
1960b. *Madréporaires.* Résultats Scient. Campagne N. R. P. "Faial" eaux côtières Portugal, No. 3, pp. 1-13, pls. 1-3.
1961. *Résultats scientifiques des Campagnes de la "Calypso." XV. Études sur le seuil Siculo-Tunisien. 6. Madréporaires.* Inst. Océanogr. Paris, Ann., n. s., vol. 39, No. 5, pp. 33-48.
1962. *Morfologia e riproduzione vegetativa di un Madreporario nuovo per il Mediterraneo.* Boll. Zool., vol. 28, No. 2 (1961), pp. 261-272, pls. 1. 2, text-figs. 1-4.

Rothpletz, [Friedrich] August, and Simonelli, Vittorio
1890. *Die marinen Ablagerungen auf Gran Canaria.* Deutsch. Geol. Gessel., Zeitschr., vol. 42, pp. 677-736, pls. 35, 36.

Roule, Louis
1896. *Coelentérés. In* Koehler, R., *Résultats scientifiques de la campagne du "Caudan" dans le Golfe de Gascoyne—Aout-Septembre 1895.* Univ. Lyon, Ann., vol. 26, pp. 299-323.

1900. *Notice sur les Anthozoaires des côtes de la Corse.* Soc. Zool. France, Bull., vol. 25, pp. 120-125, 2 figs.

1903. *Coral.* Smithsonian Inst., Rept. for 1902, pp. 609-612, pls. 1, 2.

Rousseau, Louis

1854. *Description des Mollusques, Coquilles et Zoophytes.* Voyage au Pôle Sud et dans l'Océanie sur les corvettes l'Astrolabe et la Zélée, exécute . . . pendant . . . 1837-1840 sous le commandement de M. J. Dumont d'Urville . . . , Zoologie, vol. 5, pp. i-viii, 1-132.

Roux, Jean

1910. *Deux archipels voisins de la Nouvelle-Guinée. Récit d'une expédition scientifique aux îles Aroe et Kei.* Le Globe, Genève, vol. 49, pp. 1-38.

Rózkowska, Maria D.

1932. *Korale miocénskie Polski.* Rocznika Polskiejo Tow. Geol. 3 Roku (Pol. Geol. Gessel.), vol. 8, pp. 1-75 pls. 2-7.

1955. *Some corals from the Crania tuberculata zone in the vicinity of Sochaczew near Warsaw.* [In Polish.] Acta Geol. Polon., vol. 5, No. 2, Palaeontology, pp. 241-272, pls. 1, 2, text-figs. 1-4.

Rukas, Justin M., and Gootch, D. David

1939. *Exposures of Vicksburg Oligocene fauna in western Louisiana.* Amer. Assoc. Petrol. Geol., Bull., vol. 23, No. 2, pp. 246-250.

Rumpf [Rumphius] Georg Eberhard

1750. *Het Amboinische Kruid-Boek . . . Herbarium Amboinense, plurimas conplectens Arbores, Frutices, Herbas, Plantas Terrestres & Aquaticas, quae in Amboina, et adjacentibus referiuntur insulis . . . descriptas . . . Quod & insuper exhibet varia Insectorum Animaliumquae genera . . . figuris depicta . . .* Amstelaed, vol. 6, 250 pp, 90 pls.

Runcorn, S. K.

1966. *Corals as paleontological clocks.* Sci. Amer., vol. 215, No. 4, pp. 26-33, 11 figs.

Russell, Frederick Stratten

1927. *The vertical distribution of plankton in the sea.* Biol. Rev., vol. 2, pp. 213-262, figs. 1-8.

Russell, R. S. (editor)

1957. *Coelenterata.* Marine Biol. Assoc. Plymouth, Plymouth Marine Fauna, ed. 3, pp. 37-69.

Russell, Frederick Stratten, and Yonge, C. M.

1928. *The Seas; our knowledge of life in the sea and how it is gained.* London, xiii + 329 pp., 127 pls., maps, charts.

Rutten, Louis Martin Robert

1938. *Bibliography of West Indian geology.* Geograaph. Geol. Meded. Utrecht, Physiogr.-Geol. Reeks No. 16, pp. i-vii, 1-103.

1940a. *New data on the smaller islands north of Venezuela.* K. Nederland. Akad. Wetensch., Proc., Sect. Sci., vol. 43, No. 7, pp. 820-827.

1940b. *On the geology of Margarita, Cubagua and Coche (Venezuela).* K. Nederland. Akad. Wetensch., Proc., Sect. Sci., vol. 43, No. 7, pp. 828-841.

Rutten, M. G.

1936. *Geology of the northern part of the Province of Santa Clara (Las Villas), Cuba.* Geograaph. Geol. Meded. Utrecht, Physiogr.-Geol. Reeks No. 11, 60 pp., 1 pl., 5 maps, sections.

Ryder, T. A.

1927a. *The structure and development of Holocystis E. and H.* Geol. Mag., vol. 64, pp. 119-122, 9 figs.

1927b. *The structure and development of Sphenotrochus crispus, and notes on aporose morphology.* Geol. Mag., vol. 64, pp. 376-381, 2 figs.

Sabaris, L. S.
1934. *Fauna corallina del Eocene Catalan.* Real Soc. Española Hist. Nat., Bol., vol. 33, No. 10, pp. 433-456.

Sacco, Federico
1889, 90. *Catalogo paleontologico del bacino Terziario del Piemonte.* Soc. Geol. Italiana Roma, Boll., vol. 8 (1899), pp. 281-356; vol. 9 (1890), pp. 185-340.
1906. *La questione Eo-Miocenica dell'Appenino.* Soc. Geol. Italiana Roma, Boll., vol. 25, pp. 65-127.

Saggini, F.
1962. *Stratigrafia e facies di due lembi trasgressivi pliocenici presso Casaglia (Bassa Valle della Cècina).* Soc. Toscana Sci. Nat., Atti, vol. 69A, No. 2, pp. 310-326, figs. 1-4, photos 1-4.

Sahni, M. R., and Sastry, M. V. A.
1958. *Lower Miocene (Gaj) fauna from Travancore-Cochin, South India.* Palaeont. Soc. India, Jour., vol. 3, pp. 219-233, pl. 41.

Sainte-Claire Deville, Charles Joseph
1948-59. *Voyage Géologique aux Antilles et aux Iles de Téneriffe et de Fogo.* Paris, vols. 1, 2, pp. 1-40.

Saisho, T.
1956. *On the distribution of plankton collected along the meridian 130°E.* Fac. Fish. Kagoshima Univ., Mem., vol. 5, pp. 109-114, text-fig.

Sakakura, Katuhiko
1934. *Pleistocene Pyrgoma from Tiba Prefecture.* Geol. Soc. Japan Tokyo, Jour., vol. 41, pp. 575-581, 4 figs.
1935. *Fossil Heterocyathus from Tiba Prefecture.* Geol. Soc. Japan Tokyo, Jour., vol. 42, No. 409, pp. 182-191, pl. 5.

Salée, Achille
1914. *Sur Cyathophyllum lacazei.* Soc. Acad. Boulogne-sur-mer, Bull., vol. 10, p. 368.

Salomon, Wilhelm Hermann
1896. *Geologische und palaeontologische Studien über die Marmolata (Anthozoa).* Palaontographica, vol. 42, pp. 133-137, pl. 1, figs. 28-51.

Salter, K. E. W.
1954. *Notes on the Scleractinia or stony corals (Coelenterata) of Heron Island, Queensland. I. A list of common species.* Linnean Soc. New South Wales, Proc., vol. 79, Nos. 3-4, pp. 90-94.

Salter, K. E. W., and Besley, M. A.
1950. *Coral genera of Heron Island (Barrier Reef).* Linnean Soc. New South Wales, Proc., vol. 75, Nos. 5-6, pp. xxv, xxvi.

Salvat, B.
1964. *Prospections faunistiques en Nouvelle-Calédonie dans le cadre de la Mision de Études des Récifs Coralliens.* Cahiers Pacif., No. 6, pp. 77-119, 1 pl., 1 text-fig., 5 maps.

Salvatori, W.
1956. *I coralli ed i forameniferi del Miocene inferiore di M. Curlo (Vaghera).* Riv. Italiana Paleont. Strat., vol. 62, No. 2, pp. 125-132, pl. 12.

Sánchez, J. A.
1960. *Una campaña biológica a bordo del "Cruz del Sur" por aguas de Baleares.* Real Soc. Española Hist. Nat., Bol., secc. Biol., vol. 57 (1959), pp. 151-168, figs. 1-3, chart. [Coelenterates pp. 158-159.]

Sánchez y Sánchez, Manuel
1917. *Detalles nuevas sobre estructura de los celenterados.* Real Soc. Española Hist. Nat., Bol., vol. 17, pp. 217-221.

Sanderson, A. R.

1930. *The coelenterate plankton of the Northumbrian coast during the year 1924.* Marine Biol. Assoc. Plymouth, Jour., vol. 17, pp. 219-232, 1 fig.

Sanford, Wendell G.

1939. *A review of the families of tetracorals.* Amer. Jour. Sci., vol. 237, No. 5, pp. 295-323, figs. 1A1-10C2; No. 6, pp. 401-423, figs. 11A-16C2.

Sangiorgi, Domenico

1896. *Il Tortoniano dell'alta valle dell'Idice.* Riv. Italiana Paleont. Parma, vol. 2, pp. 173-198.

1918. *Fossili tortoniani dell'alta valle dell'Idice.* Riv. Italiana Paleont. Parma, vol. 23, pp. 11-25.

Santini, D.

1961. *Note sur les peuplements sciaphiles de l'étage infralittoral rocheaux de la région de Bonifacio.* Sta. Marine Endoume, Rec. Trav., vol. 23, Bull. 37, pp. 61-90, figs. 1, 2. [Coelenterates p. 67.]

Santo Pintos, J. dos

1953. *Contribuçao para o estudo do zooplancton marinho da Guiné Portuguesa.* Bol. Cult. Guiné Portug., vol. 8, No. 29, pp. 1-16, pls. 1-8.

Sara, M.

1957. *Problemi di speciazione negli animali marini.* Arch. Zool. Ital. Napoli, vol. 42, pp. 237-379, figs. 1-21.

1962. *Specie ed ambiente negli animal marini del benthos fisso.* Boll. Zool., vol. 28, No. 2 (1961), pp. 97-123.

Sardeson, Frederick W.

1896. *Ueber die Beziehungen der fossilen Tabulaten zu den Alcyonarien.* N. Jahrb. Min., Geol. u. Paläont., vol. 10, pp. 249-362, 42 figs.

Sargent, Marston C., and Austin, Thomas S.

1949. *Organic productivity of an atoll.* Amer. Geophys. Union, Trans., vol. 30, No. 2, pp. 245-249, figs. 1, 2.

1954. *Biologic economy of coral reefs. Bikini and nearby atolls, Marshall Islands.* U.S. Geol. Sur., Prof. Paper 260E, pp. 293-300, fig. 100, 5 tables.

Sars, Michael

1856. *Fauna Littoralis Norvegiae.* Bergen, 101 pp., 12 pls.

1865. *Om de i Norge forekommende fossile dyrelevninger fra Quartaerperioden.* Univ. Program første halvaar 1864, Christiania, 134 pp., 4 pls.

1869. *Remarks on the distribution of animal life in the depths of the sea.* Ann. Mag. Nat. Hist., ser. 4, vol. 3, pp. 423-441.

1872. *In* Sars, Georg Ossian, *On some remarkable forms of animal life from the great deeps off the Norwegian coast.* Univ. Christiana, Prog. Rept. 1st half 1869, viii + 62 pp., 6 pls.

Savigny, Marie Jules César Lelorgne de

1808 [1826]. *Description de l'Égypte, ou recueil des observations et des recherches qui ont été faites en Égypte pendant l'expédition de l'armée française, publié par les ordres de sa Majesté l'Empereur Napoléon le Grand. Tome Premier. Explication sommaire des planches de polypes de l'Égypte et de la Syrie. Madrépores.* Paris, vol. 1, pp. 233-235; vol. 2, pls. 3, 5.

Sawano, Eishiro

1932. *Progress of researches on the biology of corals carried on in the South Sea Islands, Yuppu and Palau.* Rec. Oceanogr. Works Japan, vol. 4, No. 2, pp. 249-250.

Sayar, C. A.
1957. *Geological study of the region between the Golden Horn (Halic) and the Lake Küçükçekmece, near Istanbul, Turkey.* Tech. Univ. Istanbul, Bull., vol. 10, No. 2, pp. 1-18, figs., map.

Scacchi, Arcangelo
1835. *Notizie intorno alle conchiglie ed a'zoofiti fossili, che si trovano nelle viccinanze di Gravina in Puglia.* Napoli, 3 pts., illustr.

Scalia, Salvatore
1906. *I fossili postpliocenici di Salustro, presso Motta S. Anastasia.* Accad. Sci. Nat. Catania, Gioenia, Atti, ser. 4, vol. 19, No. 17, pp. 1-12.

Scatizzi, I.
1935. *La pesca del corallo.* Boll. Pesca Pisicult. Idrobiol. Roma, vol. 11, pp. 706-726, figs.

Schäfer, Wilhelm
1962. *Aktuo-Paläontologie nach Studien in der Nordsee.* Senckenb.-Buch Frankfurt, No. 41, pp. 1-666, pls. 1-36, text-figs. 1-277. [Coelenterata pp. 206-207.]

Schaffer, Franz Xaver
1902. *Beiträge zur Kenntnis der Miocänbeckens von Cicilien.* K.-K. Geol. Reichsanst. Wien, Jahrb., vol. 52, pp. 1-38.

Schafhaeutl, Karl Emil von
1863. *Sud Bayerns Lethea Geognostica. Der Kressenberg und die südlich von ihm gelegenen Hochalpen geognostisch in ihren Petrefacten.* Leipzig, xvi + 487 pp., 98 pls., text-figs., map.
1877. *Ueber eine neue Koralle, im Diceratitenkalk von Kellheim.* N. Jahrb. f. Min., pp. 622-626.

Scheer, Georg
1960. *Der Lebensraum der Riffkorallen.* Naturwiss. Verein Darmstadt, Bericht 1959-60, pp. 29-44, figs. 1-44.
1962a. *Geheimnisvolle Riff-Korallen.* Neptun, vol. 2, pp. 5-7, figs.
1962b. *Korallenriffe.* Neptun, vol. 2, pp. 90-93, figs. 1-9.
1962c. *Beitrag zur Geschichte der "Corall-Arten und anderer dergleichen Mer-Coerper."* Neptun, vol. 2, No. 6, pp. 168-169.

Scheffer, Victor Blanchard
1959. *Invertebrates and fishes collected in the Aleutians, 1936-38.* North Amer. Fauna, No. 61, pp. 365-406, figs. 1-26. [Coelenterates pp. 370-371.]

Schenck, Hubert Gregory
1922. *Physiography and geology of Samar Island, Philippine Islands.* Philippine Jour. Sci., vol. 20, pp. 231-271.

Schindewolf, Otto Heinrich
1930a. *Über den Septalapparat der Korallen.* Geol. Landanst. Berlin, Sitzungsb., vol. 5, pp. 226-230.
1930b. *Aus der Stammesgeschichte der Korallen.* Gesell. Naturf. Freunde Berlin, Sitzungsb., Nos. 4-7, pp. 118-132, 23 figs.
1930c. *Über die Symmetrie-Verhältnisse der Steinkorallen.* Palaeont. Zeitschr. Berlin, vol. 12, pp. 214-263, 60 figs.
1931. *On the genotype and septal development of the coral genus Petraia Münster.* Geol. Soc. London, Quart. Jour., vol. 87, No. 4, pp. 630-649, pl. 3, 18 text-figs.
1932. *Ueber Polyparform und Septalapparat der Tetrakorallen.* Centralbl. f. Min., Geol. u. Palaeont., vol. 9, pp. 464-478, 8 figs.
1942. *Zur Kenntness der Polycoelien und Plerophyllen. Eine Studie über den Bau der "Tetrakorallen" und ihre Beziehungen zu den Madreporarien.* Reichsamt. f. Bodenf., Abhandl., vol. 204, 324 pp. 36 pls., 155 text-figs.

1959. *Würmer und Korallen als Synöken. Zur Kenntnis der Systeme Aspidosiphon/Heteropsammia und Hicites/Pleurodictyum.* Akad. Wiss. Mainz, Abhandl., Mat.-Nat. Kl., No. 6 (1958), pp. 1-328, pls. 1-14, text-figs. 1-13.
1960. *Über Lebensgemeinschaften von Würmen und Korallen.* Natur u. Volk, vol. 90, No. 1, pp. 1-10, figs. 1-16.

Schlosser, Max
1928. *Ueber Tertiär und obere Kreide aus Portugesisch-Ost Africa.* Bayern Akad. Wiss., Abhandl., vol. 32, pp. 1-25, 3 pls.

Schnierer, I.
1963. *Die Wunder des Grossen Barrier-Riffs.* Kosmos, vol. 59, No. 5, pp. 209-216, 8 figs.

Schnorf, Alice
1961. *Les Milleporidiidae des marnes Valanginiennes d'Arzier.* Eclogae Geol. Helvetiae, vol. 53, No. 2 (1960), pp. 716-28, pls. 1-3; text-figs. 1-13.

Schubert, Richard Johann
1905a. *Zur Stratigraphie des istrich-norddalmatinischen Mitteleocän.* K.-K. Geol. Reichsanst., Jahrb., vol. 55, pt. 1, pp. 153-188.
1905b. *Zone 30, Kol. XIII. Spezialkarte der Österr.-Ungar. Monarchie im Mass-stabe.* K.-K. Geol. Reichsanst. 1905, 25 pp.

Schürmann, M.
1958. *Die oberoligozänen Invertebraten von Süchteln (Niedersheim).* Fortschr. Geol. Rhein. Westfalen, vols. 1, 2, pp. 255-258.

Schuster-Dieterichs, Ortud
1956. *Auf enier Korallen-Insel des karibischen Meeres.* Natur. u. Volk, vol. 86, No. 11, pp. 376-380, figs. 1-3.

Schwarz, Ernest H. L.
1904. *The formation of coral reefs.* Nature, vol. 69, p. 581.

Schwarzbach, M.
1949. *Fossile Korallenriffe und Wegeners Drift-hypothese.* Naturwiss. Berlin, vol. 36, No. 8, pp. 225-233.

Schweigger, August Friedrich
1819. *Beobachtungen auf naturhistorischen Reisen . . . Anatomisch-physiologische Untersuchung über Corallen; nebst ein Anhange, Bemerkungen über die Bernstein enthaltend.* Berlin, xii + 127 pp., 8 pls., 12 tables.
1820. *Handbuch der Naturgeschichte der Skelettlosen Ungegliederten Thiere.* Leipzig, xvi + 776 pp.

Scilla, Agostino
1670. *La vana speculazione disingannata dal senso. Lettera responsiva circa i corpi marini, che petreficati si trovano in varii luoghi terrestri.* Napoli, 168 pp., 28 pls.

Sclater, William Lutley
1886. *On a new madreporarian coral of the genus Stephanotrochus from the British seas, with notes on its anatomy.* Zool. Soc. London, Proc., pp. 128-136, pls. 12-14.

Scott, K. M. F., Harrison, A. D., and Macnae, W.
1952. *The ecology of South African estuaries. Part II. The Klein River Estuary, Hermanus, Cape.* Roy. Soc. South Africa, Trans., vol. 33, No. 3, pp. 283-331, pls. 25, 26, text-figs.

Seale, Alvin
1911. *The fishery resources of the Philippine Islands. Part 4. Miscellaneous marine products. Precious corals (Alcyonaria), etc.* Philippine Jour. Sci., Gen. Biol., Eth., Anthrop., vol. 6, pp. 283-320, pls. 1-12.

Searle, A. G.
1956. *An illustrated key to Malayan hard corals.* Malay Nat. Jour., vol. 2, Nos. 1-2, pp. 1-28, pls. 1-42, text-figs. 1-3, frontisp.

Seba, Albertus
1934-65. *Locupletissimi rerum naturalium thesauri accurata descriptio, et iconibus artificiosissimus expressio, per universam physices historium* . . . Amstelaedami, 4 vols. [Coelenterates in vol. 3, 1758.]

Segerstrale, S. G.
1951. *The recent increase in salinity off the coasts of Finland and its influence upon the fauna.* Cons. Int. Explor. Mer., Jour., vol. 17, pp. 103-110, figs., table.

Seguenza, Giuseppe
1863-64. *Disquisizioni paleontologiche intorno ai corallarii fossil delle rocce terziarie del distrito di Messina.* R. Acad. Sci. Torino, Mem., ser. 2, vol. 21, pp. 399-560, pls. 1-15.
1880. *Le formazione terziarie nella provincia di Reggio (Calabria).* R. Accad. Lincei Roma, Atti, ser. 3, vol. 6, pp. 1-446, 17 pls., map.

Seler, E.
1884. *Ueber die Bildung der Koralenriffe.* Biol. Centralbl., vol. 4, pp. 477-480.

Seismograph Service Corporation
1950. *Bibliography of organic reefs, bioherms, and biostromes. (Compiled as a service to the oil industry.)* Tulsa.

Semon, Richard Wolfgang
1896. *Im Australischen Busch und an den Küsten des Korallenmeeres. Reiserlebnisse und Beobachtungen eines Naturforschers in Australien, Neu-Guinea und den Molukken.* Leipzig, xvi + 569 pp., 35 pls., text-figs., 4 maps.

Semper, Carl Gottfried
1862. *Reise durch die nördlichen Provinzen der Insel Luzon.* Zeitschr. f. Alg. Erdkunde Berlin, vol. 13, pp. 81-96.
1863. *Reisebericht (Palau-Inseln.)* Zeitschr. f. Wiss. Zool. Leipzig, vol. 13, pp. 558-570.
1868. *Ueber die Enstehung der Corallenriffe.* Phys.-Medicin. Gesell. Würzburg, Verhandl., vol. 1, No. 3, pp. vi-viii.
1869. *Die Philippinen und ihre Bewohner.* Würzburg, viii + 143 pp., 2 maps.
1872. *Ueber Generationswechsel bei Steinkorallen, und über das M. Edwards'sche Wachsthumsgesetz der Polypen (zugleich ein Beitrag zur Fauna der Philippinen).* Zeitschr. f. Wiss. Zool. Leipzig, vol. 22, pp. 235-280, pls. 16-21.
1873. *Die Palau-Inseln im Stillen Ocean.* Leipzig, viii + 372 pp., map.
1883. *Animal Life as affected by the Natural Conditions of Existence.* London, 3d ed., xvi + 472 pp., figs.

Senfft, Arno
1896. *Die Insel Nauru.* Mitt. Forsch. Geleh. Deutschen Schutzgebieten Berlin, vol. 9, p. 101.
1901. *Ueber einen Besuch des Uluti-Atolls (West-Karolinen).* Deutsches Kolonialbl. Berlin, vol. 12, p. 824.
1902, 1905. *Ueber einem Besuch des Palau Inseln.* Deutsches Kolonialbl. Berlin, vol. 13 (1902), p. 13; vol. 16 (1905), p. 40.
1904. *Bericht ueber den Besucheiniger Inselgruppen der West-Karolinen.* Mitt. Forsch. Geleh. Deutschen Schutzgebieten Berlin, vol. 17, p. 192.
1905. *Die Karolineninseln Oleai und Lamutrik.* Petermann's Mitt. Gotha, vol. 51, p. 53.

Sestini, N. Fantini
1960. *La fauna oligocenica dei dintorni di Ovada (Alessandria).* Riv. Italiana Paleont. e Strat., vol. 66, No. 3, pp. 403-434, pls. 36-39. [Corals pp. 411-322.]

Setchell, William Albert
1926. *Nullipore versus coral in reef formation.* Amer. Philos. Soc., Proc., vol. 65, pp. 136-140.
1928a. *A botanical view of coral reefs, especailly of those of the Indo-Pacific region.* Third Pan Pacific Sci. Congr. Tokyo, Proc., vol. 2, p. 1837.
1928b. *Coral reefs as zonational plant formations.* Science, vol. 68, pp. 119-121.
1930. *Nullipore reef control and its significance.* Fourth Pan-Pacific Congr. Batavia-Bandoeng, vol. 3, pp. 265-286.

Seurat, Léon Gaston
1930. *Coelentérés.* Exploration Zoologique de Algérie. 1830-1930, pp. 613-622.
1934. *La faune et le peuplement de la Polynésie Française.* Soc. Biogéogr., Mém., vol. 4, pp. 41-74.

Sewell, Robert Beresford Seymour
1922. *A survey season in the Nicobar Islands.* Bombay Nat. Hist. Soc., Jour., vol. 28, pp. 970-989, 4 pls.
1928. *A survey of recent changes of sea level based largely on a study of coral growths in Indian and Pacific seas.* Int. Rev. Hydrobiol., vol. 20, pp. 89-102.
1929. *A study of recent changes of sea-level based largely on a study of coral-growths in Indian and Pacific seas.* Internat. Congr. Zool. Budapest, vol. 10, pp. 1483-1485.
1932. *The coral coasts of India* Geogr. Jour. London, vol. 79, No. 6, pp. 449-465, 4 pls., chart.
1934. *A study of the fauna of the Salt Lakes, Calcutta.* Indian Mus. Calcutta, Rec., vol. 36, pp. 45-121, 12 figs.
1935. *Geographic and oceanographic research in Indian waters. Part VIII. Studies on coral and coral formations in Indian waters.* Asiatic Soc. Bengal, Mem., vol. 9, pp. 461-539, pls. 11-15, text-figs.
1936. *An account of Addu Atoll. An account of Hornsburgh or Goifurfehendu Atoll.* British Mus. (Nat. Hist.) John Murray Exped. 1933-34, Sci Rept., vol. 1, No. 3, pp. 63-93, 8 pls. 1 text-fig.; No. 5, pp. 109-125, 6 pls., 1 text-fig.

Sharma, R. E.
1961. *Malayan coral reefs.* Malayan Nat. Jour., 21st Anniv. Spec. Issue, pp. 224-229.

Sharp, Eric W.
1910. *Some notes on the marine zoology of Alderney.* Soc. Nat. Sci. Guernsey, Trans., pp. 92-96.

Sherloc, R. I.
1905. *The Foraminifera and other organisms in the raised reefs of Fiji.* Mus. Comp. Zool., Bull., vol. 38, pp. 347 *et seq.*

Shikama, Tokio
1952. *A Handbook of Illustrated Fossils from Japanese and their Adjacent Territories.* [In Japanese.] Kyoto, pp. 1-376, 1-57, text-figs.
1964. *Index Fossils of Japan.* [In Japanese.] Kyoto, pp. i-viii, 1-287, pls. 1-80, text-figs. [Coelenterata pls. 13-20.]

Shinn, Eugene

1963. *Spur and groove formation on the Florida Reef tract.* Jour. Sed. Petrol., vol. 33, No. 2, pp. 291-303, figs. 1-12.

1966. *Coral growth-rate, an environmental indicator.* Jour. Paleont., vol. 40, No. 2, pp. 233-240, pl. 27, text-figs. 1-6.

Shipley, Arthur Everett

1901. *The abysmal fauna of the Antarctic region.* Antarctic Manual 1901, chapter 18, pp. 241-275. [Coelenterata pp. 248-251.]

Shor, G. G., Jr.

1964. *Thickness of coral at Midway Atoll.* Nature, vol. 201, No. 4925, pp. 1207, 1208.

Shrock, Robert R., and Twenhofel, William H.

1953. *Phylum Coelenterata. Principles of Invertebrate Paleontology.* New York, Toronto & London, 2d. ed., pp. 98-182, figs.

Siemiradzki, Józef

1919. *Katalog systematyczny zbiorón paleontologicznich Museum im. Dzieduszyck ich we Lwowie.* Rozpr. i Widom Muz. Dzildusz Lwowie, vol. 3, pp. 22-36.

1927. *Sur les coralliaries du Crétacé supérieure de Pologne.* Kosmos, vol. 51, pp. 313-324, 1 pl.

Silva, G. H. da

1956a. *O Miocénico da Ilha do Principe.* Conf. Int. Afr. Ocid., Sess. 6, vol. 2, pp. 231-269, pls. 1-7.

1956b. *La faune Miocène de l'Ile du Prince.* Mus. Min. Geol. Univ. Coimbra, Mem., vol. 42, pp. 29-53, pls. 1-7 [Corals p. 30.]

1959. *Fósseis do Miocénico marinho da Ilha de Porto-Santo.* Mus. Min. Geol. Univ. Coimbra, Mem., vol. 48, pp. 1-22, pls. 1-10. [Corals pp. 7-8.]

Simkiss, K.

1964. *Possible effects of Zooxanthellae on coral growth.* Experimentia, vol. 20, p. 180.

Simonelli, Vittorio

1895. *Gli Antozoi Pliocenici del ponticello di Savena presso Bologna.* Palaeontographia Italica, vol. 1, pp. 149-168, pl. 8, text-figs. 1-3.

1896a. *Antozoi Neogenici del Museo Parmense.* Palaeontographia Italica, vol. 2, pp. 185-211, pl. 23, figs. 1-9.

1896b. *Fossili Tortoniani di Castelnova ne'Monti.* Riv. Italiana Paleont., vol. 2, pp. 256-258.

Simony, Oskar

1890. *Reise nach der westlichen Gruppe der canarischen Inseln.* K.-K. Geogr. Gesell. Wien, Mitt., vol. 33, pp. 145-176, 209-231.

1892. *Die canarischen Inseln, insbesonder Lanzarote und die Isletas.* Verein Verbr. Natur. Kenntnis Wien, Vorträge, vol. 32, No. 11.

Singleton, F. A.

1941. *The Tertiary geology of Australia.* Roy. Soc. Victoria, Proc., n. s., vol. 1, pp. 1-125, pls. 1-3, text-figs., maps.

Sismonda, Eugenio, and Michelotti, Giovanni

1871. *Matériaux pour servir a la paléontologie du terrain tertiaire de Piemont.* R. Accad. Sci. Torino, Mem., ser. 2, vol. 25, pp. 257-362, pls. 1-10.

Skerman, T. M.

1959. *Marine fouling at the Port of Auckland.* New Zealand Jour. Sci., vol. 2, No. 1, pp. 57-94, figs. 1-10.

1960. *Ship-fouling in New Zealand waters: a survey of marine fouling organisms from vessels of the coastal and overseas trades.* New Zealand Jour. Sci., vol. 3, No. 4, pp. 620-648, figs. 1-7.

Slack-Smith, R. J.

1960. *An investigation of coral deaths at Peel Island, Moreton Bay, in early 1956.* Univ. Queensland, Papers Zool., vol. 1, No. 7 (1959), pp. 211-222, figs. 1-3.

Sloane, Hans

1696. *Catalogus Plantarum quae in Insula Jamaica sponte proveniunt vel vulgo coluntur, cum earundum synonymis et locis natalibus; adjectis aliis quibusdam quae in Insulis Maderae, Barbados, Nieves, et Sancti Christophoroi nascuntur. Seu Prodromi Naturalis Jamaicae, pars prima.* London, v + 232 pp.

1707-1725. *A Voyage to the Islands of Madera, Barbados, Nieves, S. Cristophers and Jamaica, with the natural history of the herbs and trees, four-footed beasts, fishes, birds, insects, reptiles, etc., of the last of these Islands; to which is prefixed an introduction wherein is an account of the inhabitants, air, water, diseases, trade, etc. of that place, with some relations concerning the neighbouring continent, and islands of America. Illustrated with the figures of the things described, which have not been heretofore engraved; in large copper plates big as life.* London, 2 vols: vol. 1, 12 + cliv + 264 pp., pls. 1-156; vol. 2, xviii + 381 pp., pls. 157-274.

Sloane, J. F., Bassindale, R., Davenport, E., Ebling, F. J., and Kitching, J. A.

1961. *The ecology of Lough Ine. IV. The flora and fauna associated with undergrowth-forming algae in the rapids area.* Jour. Ecol., vol. 49, No. 2, pp. 353-368, figs. 1-9. [Coelenterates pp. 363-364.]

Sloss, Laurence L.

1950. *Rates of evolution.* Jour. Paleont., vol. 24, No. 2, pp. 131-139, figs. 1-8.

Sluiter, Carel Philip

1889. *Einiges über die Enststehung der Korallenriffe in der Javasee und Branntweinsbaai und über neue Korallenbildung bei Krakatau.* Natuurk. Tijidschr. Nederlandsche Indie, vol. 49, pp. 360-380.

Smart, J.

1942. *Bibliography of key works for the identification of the British fauna and flora.* Publ. Assoc. Study Systematics in relation to Gen. Biol. London, vol. 1, pp. 1-105. [Coelenterata pp. 17-21.]

Smidt, E. L. B.

1944. *Biological studies of the invertebrate fauna of the harbour of Copenhagen.* Vidensk. Medd. Dansk. Naturhist., Foren., vol. 107, pp. 235-316, figs.

Smith, Frederick George Walton

1943. *Littoral fauna of the Miami area. I. The Madreporaria.* Florida Acad. Sci., Proc., vol. 6, No. 1, pp. 41-48.

1948. *Atlantic Reef Corals. A handbook of the common reef and shallow-water corals of Bermuda, Florida, the West Indies, and Brazil.* Univ. Miami Press, pp. 1-112, pls. 1-41, text-figs. 1-10.

1954. *Gulf of Mexico Madreporaria. In* Galtsoff, Paul S., *Gulf of Mexico, its origin, waters, and marine life.* U. S. Fish and Wildlife Serv., Fish. Bull., vol. 55, No. 89, pp. 291-295.

Smith, Frederick George Walton, Williams, Robert H., and Davis, Charles C.

1950. *An ecological survey of the subtropical inshore waters adajent to Miami.* Ecology, vol. 31, No. 1, pp. 119-146, figs.

Smith, H. G.

1939. *The significance of the relationship between Actinians and Zooxanthellae.* Jour. Exper. Biol. London, vol. 16, No. 3, pp. 334-345, figs. 1, 2.

Smith, Warren Dupré

1906. *Preliminary geological reconnaissance of the Lobos Mountains, Batangas Province.* Philippine Jour. Sci., vol. 1, pp. 617-635, pl. 4.

1913. *Contributions to the stratigraphy and fossil invertebrate fauna of the Philippine Islands.* Philippine Jour. Sci., vol. 8, sect. A, pp. 235-300, 20 pls.

Smythe, Sarah Maria (Bland)

1864. *Ten Months in the Fiji Islands.* London, x + viii + 282 pp., 10 pls. 4 maps.

Socin, C.

1939. *Fauna dei tufi basaltici dell'Eocene del territorio di Brentonico (M. Baldo-Trentino).* Studi Trentini, vol. 20, Nos. 1-2, pp. 63-114, pls. 1, 2.

Sokolov, Nikolai Aleksyeevich

1894. *Die unteroligocäne Fauna der Glauconitsande bei der Eisenbahnbrücke von Jekaterinoslaw.* Comité Géologique, Mém., vol. 9, No. 3, vii + 138 pp., 5 pls., text-figs.

Solé Sabaris, L.

1942. *Fauna coralina del Eocena Catalán.* Real Acad. Cienc. y Artes Barcelona, Mem., vol. 26, No. 9, 183 pp., 10 pls.

Sollas, William Johnson

1898a. *Funafuti: the study of a coral atoll.* Natural Sci. London, vol. 14, pp. 17-37, 13 figs.

1898b. *Report on the coral reef at Funafuti.* Nature, vol. 55, pp. 373-377, 5 diagrs.

Sousa e Silva, E. de, and Santos-Pinto, J. dos

1949. *O plancton de Baía de S. Martinho do Porto.* Soc. Portug. Cienc. Nat., Bol., ser. 2, vol. 2, pp. 203-241, pls. 1-6, tables. [Coelenterates pp. 222-223.]

Southern, Rowland

1915. *Clare Island survey. Marine ecology.* Roy. Irish Acad. Dublin, Proc., vol. 31, Clare Island Survey, No. 67, pp. 1-110, pls. 1-3.

Southward, A. J.

1961, 62. *The distribution of some plankton animals in the English Channel and approaches. I. Samples taken with stramin nets in 1955 and 1957.* Marine Biol. Assoc. U. K. Plymouth, Jour., vol. 41 (1961), No. 1, pp. 17-35, figs. 1-6. *II. Surveys with Gulf III high-speed sampler, 1958-60,* vol. 42 (1962), No. 2, pp. 275-375, pl. 1, text-figs. 1-26.

Sowerby, Arthur de Carle

1930. *Notes on the coelenterates of the Manchurian seas.* Naturalist in Manchuria, Tientsin, vol. 5, pp. 83-85.

Sowerby, James

1831. *In* Sedgwick and Murchison, *A sketch of the structure of the eastern Alps; with sections throughout the newer formations on the northern flanks of the chain . . .* Geol. Soc. London, Trans., ser. 2, vol. 3, pp. 359-360, pl. 37.

Soyer, Robert, and Cailleux, André

1960. *Géologie de la region Parisienne.* Presses Univ. France, pp. 1-128, figs. 1-6.

Spencer, Joseph William Winthrop

1895. *Geographical evolution of Cuba.* Geol. Soc. Amer., Bull., vol. 7, pp. 67-94.

1901a. *On the geological and physical development of Antigua.* Geol. Soc. London, Quart. Jour., vol. 57, pp. 490-505, pl. 15 (map), 1 geol. section.

1901b. *On the geological and physical development of Guadeloupe.* Geol. Soc. London, Quart. Jour., vol. 57, pp. 506-519.
1901c. *On the geological and physical development of Anguilla, St. Martin, S. Bartholomew, and Sombrero.* Geol. Soc. London, Quart. Jour., vol. 57, pp. 520-533.
1901d. *On the geological and physical development of the St. Christopher Chain and Saba Banks.* Geol. Soc. London, Quart. Jour., vol. 57, pp. 534-544.
1902a. *On the geological and physical development of Dominica; with notes on Martinique, St. Lucia, St. Vincent, and the Grenadines.* Geol. Soc. London, Quart. Jour., vol. 58, pp. 341-353, pl. 10 (map), text-figs. 1, 2.
1902b. *On the geological and physical development of Barbados; with notes on Trinidad.* Geol. Soc. London, Quart. Jour., vol. 58, pp. 354-367, figs. 1, 2.

Spender, M.
1930. *Island reefs of the Queensland coast.* Geogr. Jour. London, vol. 76, pp. 273-297, 12 figs.

Spengler, Lorenz
1781. *Beskrivning over et beysinderlight coral-product, hvilket man kunde kalde snekke madrepore.* K. Danske Selsk., Skr., n. s., vol. 1, pp. 240-248.
1799. *Beskrivelse over en nye og sielden koral-art, kaldet Madrepora fimbriata.* Samml. Vidensk. Selsk., Skr., ser. 2, vol. 5, p. 607.

Sproston, N. G.
1949. *A preliminary survey of the plankton of the Chu-san region, with a review of relevant literature.* Sinensia Shanghai, vol. 20, Nos. 1-6, pp. 58-61, figs. [Coelenterata pp. 139-140.]

Squires, Donald F.
1956a. *Climatic interpretation of Cenozoic faunal migrations in New Zealand.* New York Acad. Sci., Trans., ser. 2, vol. 18, No. 5, pp. 415-426, figs. 1-5.
1956b. *A new Triassic coral from Idaho.* Amer. Mus. Novitates, No. 1797, pp. 1-27, figs. 1-53.
1957. *New species of caryophyllid corals from the Gulf Coast Tertiary.* Jour. Paleont., vol. 31, No. 5, pp. 992-996, pl. 126, figs. 6-9.
1958a. *The Cretaceus and Tertiary corals of New Zealand.* Paleont. Bull. New Zealand, vol. 29, pp. 1-107, pls. 1-16, text-figs. 1-28.
1958b. *Stony corals from the vicinity of Bimini, Bahamas, British West Indies.* Amer. Mus. Nat. Hist., Bull., vol. 115, art. 4, pp. 215-262, pls. 28-43, text-figs. 1-4.
1958c. *Some Upper Cretaceous corals from New Jersey.* Amer. Mus. Novitates, No. 1911, pp. 1-7, figs. 1-6.
1959a. *Results of the Puritan-American Museum of Natural History Expedition to Western America. 7. Corals and coral reefs in the Gulf of California.* Amer. Mus. Nat. Hist., Bull., vol. 118, art. 7, pp. 367-432, pls. 28-34, text-figs. 1-20, tables 1-7.
1959b. *Deep sea corals collected by the Lamont Geological Observatory. I. Atlantic corals.* Amer. Mus. Novitates, No. 1965, pp. 1-42, figs. 1-24.
1960a. *Additional rhizangiid corals from the Wanganui Series.* New Zealand Jour. Geol. Geophys., vol. 3, No. 1, pp. 1-7, figs. 1-6.
1960b. *The scleractinian genera Kionotrochus and Cylindrophyllia.* Dom. Mus. Wellington, Rec., vol. 3, No. 4, pp. 283-288, figs. 1-16.
1960c. *Scleractinian corals from the Norfolk Island cable.* Auckland Inst. Mus., Rec., vol. 5, Nos. 3-4, pp. 195-201, pls. 33-35.

1960d. *Wellsotrochus, a new name for Wellsia Squires 1958.* Jour. Paleont., vol. 34, No. 5, p. 1053.
1961a. *Deep sea corals collected by the Lamont Geological Observatory. II. Scotia Sea corals.* Amer. Mus. Novitates, No. 2046, pp. 1-48, figs. 1-31, tables 1-3.
1961b. *A comparative ecologic study of the coral reefs of Lord Howe Island, and the Great Barrier Reef, Australia.* Amer. Philos. Soc., Yearbook for 1960, pp. 279-281.
1962a. *The fauna of the Ross Sea. II. Scleractinian corals.* New Zealand Dept. Sci. Industr. Research, Bull., vol. 147, pp. 1-28, pls., 1-2, text-figs. 1-8, tables 1-10, frontisp.
1962b. *Additional Cretaceous and Tertiary corals from New Zealand.* Roy. Soc. New Zealand, Trans., Geology, vol. 1, No. 9, pp. 133-150, pls. 1-4.
1962c. *A scleractinian coral fauna from Cape Rodney.* New Zealand Jour. Geol. Geophys., vol. 5, No. 3, pp. 508-514.
1962d. *Corals at the mouth of the Rewa River, Viti Levu, Fiji.* Nature, vol. 195, No. 4839, pp. 361-362, fig. 1.
1962e. *Deep sea corals collected by the Lamont Geological Observatory. III. Larvae of the Argentine scleractinian coral Flabellum curvatum Moseley.* Amer. Mus. Novitates, No. 2078, pp. 1-11, figs. 1-3.
1963a. *Flabellum rubrum (Quoy and Gaimard).* New Zealand Oceanogr. Inst., Mem., vol. 20, pp. 1-43, 3 pls., text-figs. 1-8.
1963b. *Madreporas rhizángidas, fósiles y vivientes de la Argentina.* Neotropica, vol. 9, No. 28, pp. 9-16, figs. 1-11.
1963c. *Carbon-14 dating of the fossil dune sequence, Lord Howe Island.* Australian Jour. Sci., vol. 25, No. 9, pp. 412-413.
1963d. *Modern tools probe deep water. Coral banks are explored seismically.* Nat. Hist. New York, vol. 72, No. 6, pp. 22-29, 11 figs.
1964a. *Deep water corals as fish food.* Nature, vol. 203, No. 4945, pp. 663-664.
1964b. *Fossil coral thickets in Wairarapa, New Zealand.* Jour. Paleont., vol. 38, No. 5, pp. 904-915, pls. 147, 148, text-figs. 1-3, tables 1-3.
1964c. *New stony corals (Scleractinia) from northeastern New Zealand.* Auckland Inst. Mus., Rec., vol. 6, No. 1, pp. 1-9, figs.
1964d. *Biological results of the Chatham Islands 1954 Expedition. Part 6. Scleractinia.* New Zealand Oceanogr. Inst., Mem., vol. 29, pp. 1-31, pls. 1-4, text-figs. 1-8.
1964e. *The southern Ocean: a potential for coral studies.* Smithsonian Inst., Rept. 1963, pp. 447-459, pls. 1-4, text-figs. 1-4.
1964f. *Calcareous shelf-edge prominences off the Orinoco River of South America.* [Abstract.] Geol. Soc. Amer., Spec. Papers, No. 76, p. 155.
1965. *A new species of Pliobothrus, a hydrocoral from the Oligocene of New Zealand.* New Zealand Geol. Sur., Publ., vol. 3, No. 3, pp. 23-25, 2 pls.

Standard, J. C.
1963. *Geology of Lord Howe Island.* Roy. Soc. New South Wales, Jour., vol. 96, Nos. 2-6, pp. 107-121, figs. 1-16.

Stanley, Evan Richard
1924. *Coral reefs in New Guinea.* Second Pan Pacific Sci. Congr. Australia (1923), Proc., vol. 2, p. 1101.

Stanley, Steven M.
1966. *Paleocology and diagenesis of Key Largo Limestone, Florida.* Amer. Assoc. Petrol. Geol., Bull., vol. 50, No. 9, pp. 1927-1947, 1 pl., 12 text-figs., 1 table.

Stanovic, S.
1960. *The Balkan Lake Ohrid and its living world.* Monogr. Biol., vol. 9, pp. 1-357, figs. 1-101. [Coelenterates p. 173.]

Stchepinsky, V.
1938. *Contribution à l'étude du Sahélien de Tunisie.* Soc. Géol. France, Mém., Paléont., n. s., No. 37, pp. 1-121, pls. 1-8.
1943. *L'Oligocène marin de Gaziantep (Turquie méridionale).* [Turkish with French translation, pp. 236-248.] Maden Tetrik Arama Ankara, ser. 8, vol. 2, No. 30, pp. 223-248, pls. 1-4.

Stearns, Harold T.
1935. *Pleistocene shore-lines on the islands of Oahu and Maui, Hawaii.* Geol. Soc. Amer., Bull., vol. 46, pp. 1927-1956, pls. 178-180, text-figs. 1-5.
1941. *Shore benches on North Pacific islands.* Geol. Soc. Amer., Bull., vol. 52, pp. 773-780, pls. 1-3, text-figs. 1, 2.
1945a. *Decadent coral reef on Eniwetok Island, Marshall group.* Geol. Soc. Amer., Bull., vol. 56, pp. 783-788, pls. 1, 2, text-figs. 1-3.
1945b. *Eustatic shore lines in the Pacific.* Geol. Soc. Amer., Bull., vol. 56, pp. 1071-1078, pls. 1, 2.
1945c. *Late geologic history of the Pacific basin.* Amer. Jour. Sci., vol. 243, No. 11, pp. 614-626, figs. 1, 2.
1946. *An integration of coral-reef hypotheses.* Amer. Jour. Sci., vol. 244, No. 4, pp. 245-262, pls. 1, 2, text-figs. 1-6.

Stechow, Eberhard
1921. *Neue Gruppen skelettbildenden Hydrozoen und Verwandtschaftsbeziehungen rezenten und fossiler Formen.* Deutsche Zool. Gesell., Verhandl., vol. 26, pp. 29-31.
1962. *Über skelettbildende Hydrozoen.* Zool. Anzeig., vol. 169, Nos. 9, 10, pp. 416-428, figs. 1-7.

Steers, James Alfred
1929. *The Queensland coast and the Great Barrier Reef.* Geogr. Jour. London, vol. 74, No. 1, pp. 232-258, 341-370, 6 figs., 7 photos.
1933. *Evidences of recent movements of sea-level on the Queensland coast; raised beaches and the coral reef problem.* Congr. Internat. Géogr. Paris, C. R., vol. 2, No. 1, sect. 2, p. 164.
1937. *The coral islands and associated features of the Great Barrier Reef.* Geogr. Jour. London, vol. 89, pp. 1-28, 119-146, 13 pls., 1 text-fig.
1938. *Detailed notes on the islands surveyed and examined by the Geographical Expedition to the Great Barrier Reef in 1936.* Great Barrier Reef Comm. Brisbane, Rept., vol. 4, pp. 51-104.
1940a. *The coral cays of Jamaica.* Geogr. Jour. London, vol. 95, pp. 3042.
1940b. *The cays and palisadoes, Port Royal, Jamaica.* Amer. Geogr. Soc., Geogr. Rev., vol. 30, No. 2, pp. 279-296.

Steinbeck, John, and Ricketts, Edward F.
1941. *Sea of Corte.* New York, Viking Press, pp. 1-598, pls. 1-40.

Steiner, G.
1960. *Untersuchungen über den "Geschmackssinn" der Coelenteraten.* Deutsche Zool. Gesell, Verhandl. 1959, pp. 270-275, figs. 1-4.

Steinitz, W.
1929. *Die Wanderung indopazifischer Arten ins Mittelmeer seit Beginn der Quartär-periode.* Int. Rev. Hydrobiol. Leipzig, vol. 22, pp. 1-90.

Steinmann, Gustav
1903. *Nachträge zur Fauna von Stramberg. II. Milleporidium, eine Hydrocoralline aus dem Tithon von Stramberg.* Beitr. Paläont. u. Geol. Österreich.-Ungar. u. d. Orients, vol. 15, pp. 1-8, 2 pls.

Steinmann, Gustav, and Wilckens, Otto

1908. *Kreide-und Tertiärfossilen aus den Magellanländen, gesammelt von der Schwedischen Expedition 1895-1897.* Ark. f. Zool., vol. 4, No. 6, pp. 1-118, 7 pls.

Stephens, Jane

1905. *Irish Coelentera.* Roy. Irish Acad. Dublin, Proc., vol. 25B, No. 3, pp. 25-92.

1908. *Coelenterata [of Dublin district].* British Assoc. Adv. Sci., Handbook, pp. 210-213.

Stephens, Jane, and Hickson, Sydney John

1909. *Alcyonaria and madreporarian corals of the Irish coast.* Fish. Branch Dept. Agric. Techn. Ireland, Sci. Investig., vol. 5, pp. 1-28, 1 pl.

Stephenson, Lloyd W.

1916a. *North American Upper Cretaceous corals of the genus Micrabacia.* U. S. Geol. Sur., Prof. Paper 98-J, pp. 115-125, pls. 20-23.

1916b. *Coelenterata. Systematic paleontology.* Maryland Geol. Sur., Upper Cretaceous, pp. 343-345, 752-757, pls. 48, 49.

Stephenson, Thomas Alan

1929. *On methods of reproduction as specific characters.* Marine Biol. Assoc. Plymouth, Jour., vol. 16, pp. 131-172, text-figs. 1-11.

1931. *Development and the formation of colonies in Pocillopora and Porites. Part I.* British Mus. (Nat. Hist.) Great Barrier Reef Exped. 1928-29, Sci. Rept., vol. 3, No. 3, pp. 113-134, pls. 1-6, text-figs. 1-16.

1939. *The constitution of the intertidal fauna and flora of South Africa.* Linnean Soc. London, Jour., Zoology, vol. 40, pp. 487-536, pls. 14-17, text-figs.

1940. *A note on the appearance of living coral polyps.* British Mus. (Nat. Hist.) Great Barrier Reef Exped. 1928-29, Sci. Rept., vol. 1, No. 13, pp. 389-391, pls. 1-2.

1946. *Coral reefs.* Endeavour, vol. 5, No. 19, pp. 96-106, pls. 1-8.

1948. *The constitution of the intertidal fauna and flora of South Africa. Part III.* Natal Mus., Ann., vol. 11, No. 2, pp. 207-324, pls. 15, 16, text-figs.

Stephenson, T. A., and Marshall, S.

1933. *The breeding of reef animals. I. The corals.* British Mus. (Nat. Hist.) Great Barrier Reef Exped. 1928-29, Sci. Rept., vol. 3, No. 8, pp. 219-245, 1 pl.

Stephenson, T. A., and Stephenson, A.

1931. *The structure and ecology of Low Isles and other reefs.* British Mus. (Nat. Hist.) Great Barrier Reef Exped. 1928-29, Sci. Rept., vol. 3, No. 2, pp. 1-112, pls. 1-27, text-figs. 1-15.

1933. *Growth and asexual reproduction in corals.* British Mus. (Nat. Hist.) Great Barrier Reef Exped. 1928-29, Sci. Rept., vol. 3, No. 7, pp. 167-217, pls. 1-10, text-figs. 1-14.

1952. *Life between tide-marks in North America. II. Northern Florida and the Carolinas.* Jour. Ecol., vol. 40, No. 1, pp. 1-49, pls. 1-6, text-figs. 1-9.

Stephenson, T. A., Stephenson, A., Tandy, G., and Spender, M.

1931. *The structure and ecology of Low Isles and other reefs.* British Mus. (Nat Hist.) Great Barrier Reef Exped. 1928-29, Sci. Rept., vol. 3, No. 2, pp. 17-112, pls. 1-27, text-figs. 1-15.

Stephenson, W., Endean, R., and Bennett, J.

1958. *An ecological survey of the marine fauna of Low Isles, Queensland.* Australian Jour. Marine and Freshwater Res., vol. 9, No. 2, pp. 261-318, pls. 1-11, text-figs. 1, 2.

Stephenson, W., and Wells, J. W.
1956. *The corals of Low Isles, Queensland; August 1954.* Dept. Zool. Univ. Queensland, Papers, vol. 1, No. 4, pp. 1-59, pls. 1-7.

Stetson, Thomas R., Squires, Donald F., and Pratt, Richard M.
1962. *Coral banks occurring in deep water on the Blake Plateau.* Amer. Mus. Novitates, No. 2114, pp. 1-39, figs. 1-15.

Steuer, Adolf
1898. *Pelagische Thierwelt des Rothen Meeres.* K. Akad. Wiss. Wien, Math.-Naturwiss. Cl., Sitzungsber., vol. 106, pp. 411-412 (Coelenterata).
1910. *Ein Vorschlag zur Hebung der österreichischen Korallen-Fischerei.* Oest. Fischerei Zeit. Wien, vol. 7, pp. 8-10.
1911. *Die italienische Korallenfischerei. (Ergebnisse einer Sommerreise nach Neapel.)* Oest. Fischerei Zeit. Wien, vol. 8, pp. 23-26, 60-63.

Steven, D.
1938. *The shore fauna of Amerdloq Fjord, West Greenland.* Jour. Animal Ecol., vol. 7, pp. 53-70, pls. 5, 6, text-figs.

Stewart, Charles
1878. *On a new coral. Stylaster stellatus; and a note on Tubipora musica.* Roy. Microsc. Soc. London, Jour., vol. 1, pp. 41-44.

Stewart, Charles Samuel
1831. *A visit to the South Seas, in the U.S. Ship "Vincennes" during the Years 1829 and 1830; with scenes in Brazil, Peru, Manilla, the Cape of Good Hope, and St. Helena.* New York, 2 vols. Vol. 1, 357 pp.; vol. 2, 360 pp.

Stiasny, Gustav
1930. *Die Madreporaria des Naturhistorischen Reichsmuseum in Leiden. I. Die Genera Porites, Goniopora, Montipora.* Zool. Meded. Leiden, vol. 13, pp. 22-52, pls. 1-6.
1931. *Ueber einige Coelenterata von Australien.* Zool. Meded. Leiden, vol. 14, pp. 27-40, 1 fig.
1933. *The relation between form and environment in corals.* British Mus. (Nat. Hist.) Great Barrier Reef Exped. 1928-29, Sci. Rept., vol. 3, No. 7, pp. 200-207.

Stimpson, William
1855. *Descriptions of some new marine Invertebrata from the Chinese and Japanese seas.* Acad. Nat. Sci. Philadelphia, Proc., vol. 7, pp. 375-384. [Polypi pp. 375-377.]

Stoddart, David R.
1962. *Caribbean beach studies. Technical Report No. 11, Part G. Three Caribbean atolls: Turneffe Islands, Lighthouse Reef, and Glover's Reef, British Honduras.* Atoll Res. Bull., No. 87, pp. i-iii, 1-151, figs. 1-49.
1963. *Effects of hurricane Hattie on the British Honduras reefs and cays, October 30-31, 1961.* Atoll Res. Bull., No. 95, pp. i-iv, 1-142, 64 figs.

Stoliczka, Ferdinand
1868. *Die Andaman-Inseln, Assam.* K.-K. Geol. Reichsanst, Wien, Verhandl., pp. 192-193.
1873. *Cretaceous fauna of southern India. 4. The corals or Anthozoa.* Palaeontogr. Indica, vol. 4, pp. 123-190, pls. 18-28

Storm, V.
1909. *Fra Trondhjemsfjordens Koralregion.* Naturen, vol. 33, pp. 229-235, figs.

Storr, John F.
1964. *Ecology and oceanography of the coral-reef tract, Abaco Island,*

Bahamas. Geol. Soc. Amer., Special Papers, No. 79, pp. 1-94, pls. 1-8, text-figs. 1-17, tables 1-3.

Straw, S. H.

1925. *On some English species of the genus Stylophyllopsis*. Geol. Mag., vol. 62, pp. 350-363, 2 figs.

Strusz, D. L.

1960. *The geology of the parish of Mumbil, near Wellington, N.S.W.* Roy. Soc. New South Wales, Jour., vol. 93, No. 4, pp. 127-136, figs. 1, 2. [Coelenterates p. 135.]

Struve, Alfr.

1898. *Ein Beitrag zur Kenntniss des festen Gerüstes der Steinkorallen*. Russ.-Kais. Mineral. Gesell. St. Petersbourg, Verhandl., se. 2, vol. 35, pp. 43-115, pls. 2-7.

Stubbings, H. G.

1961. *Fouling and antifouling*. Research, vol. 14, No. 8, pp. 309-314, figs. 1-6.

Studer, Theophil

1877a. *Die Tongainseln*. Deutsche Geogr. Blätter Bremen, vol. 1, pp. 18 *et seq*.

1877b. *Uebersicht der Steinkorallen aus der Familie der Madreporaria aporosa, Eupsammina und Turbinaria, welche auf der Reise S.M.S. Gazelle um die Erde gesammelt wurden*. K. Preuss. Akad. Wiss. Berlin, Monatsber., pp. 625-655, pls. 1-4.

1878. *Zweite Abtheilung der Anthozoa Polyactinia welche während der Reise S.M.S. Corvette Gazelle um der Erde gesammelt wurden*. K. Preuss. Akad. Wiss. Berlin, Monatsber., pp. 124-550, pls. 1-5.

1880. *Ueber scheinbare Knospen an Herpetolitha limax*. Gesell. Naturf. Freunde Berlin, Sitzungsber., pp. 173-174.

1881a. *Ueber Knospung und theilung bei Madreporariern*. Naturforsch. Gesell. Bern, Mitt., Abhandl. 1880, pp. 3-14, 8 figs.

1881b. *Beiträge zur Fauna der Steinkorallen von Singapore*. Naturforsch. Gesell. Bern, Mitt., No. 979, pp. 15-53, 18 figs.

1882a. *La formation corallienne dans les océans au point de vue géologique*. Assoc. Soc. Suisses Géogr. Genève, Trav., vol. 2, pp. 125 *et seq*.

1882b. *Ueber einige wissenschaftliche Ergebnisse der Gazellen-Expedition*. Deutschen Geographentages Berlin, Verhandl., vol. 2, pp. 9-25.

1883. *Kalifornische Korallen*. Naturforsch. Gesell. Bern, Mitt., pp. 3-13.

1901. *Madreporarier von Samoa, den Sandwich-Inseln und Laysan. Ergebnisse einer Reise nach dem Pacific (Schauinsland 1896-97)*. Zool. Jahrb., Syst., vol. 14, pp. 388-428, pls. 23-31.

Stutchbury, Samuel

1833. *An account of the mode of growth of young corals of the genus Fungia*. Linnean Soc. London, Trans., vol. 16 (1830), pp. 493-498, pls. 32.

Suarez-Caabro, J. A.

1959. *Salinidad, temperatura y plancton de las aguas de Isla de Pinos*. Lab. Biol. Mar. Habana, Mon., vol. 7, pp. 1-30, figs. 1-7.

Sugawara Sho

1934. *Topography, geology and coral reefs of Rota Island*. Inst. Geol. Palaeont. Tôhoku Imp. Univ., Thesis, ii + 58 pp., maps [Translated by S. Ofugi into English, 1951].

Suraru, M.

1961. *Nouvelles formes de coralliaires dans le Crétacé superieur du Bassin du Barod*. [Roumanian with Russian and French summaries.] Studii Cerc. Geol. Romin., vol. 6, No. 4, pp. 653-665, pls. 1-7.

Suter, Henry

1906. *On Flabellum rugulosum.* New Zealand Inst., Trans. and Proc., vol. 38, p. 334.

Suvatti, C.

1950. *Fauna of Thailand.* Bangkok Dept. Fish., pp. i, ii, 1-1100. [Coelenterates pp. 5-9.]

Sverdrup, H. U., Johnson, M. W., and Fleming, R. H.

1942. *The Oceans.* New York, x + 1087 pp, figs. 1-265, charts 1-7.

Swedmark, Bertil

1964. *The interstitial fauna of marine sand.* Biol. Rev., vol. 39, No. 1, pp. 1-42, figs. 1-15. [Coelenterata pp. 15, 16.]

Sylvester-Bradley, Peter Colley

1958. *The description of fossil populations.* Jour. Paleont., vol. 32, No. 1, pp. 214-235, figs. 1-15, tables 1-18.

Tabb, Durbin C., and Manning, Raymond B.

1961. *A checklist of the flora and fauna of northern Florida Bay and adjacent brackish waters of the Florida mainland collected during the period July 1957 through September 1960.* Bull. Marine Sci. Gulf and Caribbean, vol. 11, No. 4, pp. 552-649, figs. 1-8.

Taege, M.

1963. *Von Quallen und Polypen.* Neptun, vol. 3, No. 9, pp. 250-252, figs. 1-4; No. 10, pp. 281-283, figs. 1-12; No. 11, pp. 316-319, figs. 13-17.

Takai, Fuyuji

1962. *Bibliography of Japanese paleontology and related sciences 1951-1960.* Palaeont. Soc. Japan, Spec. Papers, No. 9, pp. i-xiv, 1-338.

Taki, Isao, and Oyama, Katsura

1954. *Matajiro Yokoyama's "The Pliocene and later faunas from the Kwanto region in Japan.* Palaeont. Soc. Japan, Spec. Papers, No. 2, pp. 1-68, pls. 1-49.

Tambs-Lyche, A.

1959. *Zoogeographical and faunistic studies on west Norwegian marine animals.* Univ. Bergen. Naturv. R., Aarb. 1958, No. 7, pp. 1-24, figs. 1-4.

Tamura, Tadashi, and Hada, Yoshine

1932. *Growth rate of reef building corals, inhabiting in the South Sea Islands.* Tôhoku Imp. Univ., Sci. Rept., ser. 4, vol. 7, No. 3, pp. 433-455, pls. 11, 12.

Tan, Keinosuke

1939. *Geological consideration on the Taihoku Basin.* [Japanese with English abstract.] Yabe Jubilee Publ., vol. 1, pp. 371-380.

Tanaka, O., Irie, H., Iizuka, S., and Koga, F.

1961. *The fundamental investigation on the biological productivity in the north-west of Kyushu. I. The investigation on plankton.* Oceanogr. Works Japan, Rec., No. 5, pp. 1-57, figs. 1-10.

Tandy, G., and Colman, J.

1931. *Superficial structure of coral reefs; animal and plant successions on prepared substrata.* Carnegie Inst. Washington, Yearbook, No. 30, pp. 395-397.

Tate, Ralph

1878. *Notes on the correlation of the coral-bearing strata of South Australia, with a list of fossil corals in the colony.* Philos. Soc. Adelaide, Trans. and Proc. 1877,78, pp. 120-123.

1893. *Unrecorded genera of the older Tertiary fauna of Australia.* Roy. Soc. New South Wales, Jour. and Proc., vol. 27, pp. 167-197, pls. 10-13.

Tayama, Risaburo

1935a. *Table reefs, a particular type of coral reefs.* Imp. Acad. Japan Tokyo, vol. 11, No. 7, pp. 268-270, 2 figs.

1935b. *Distribution of coral reefs in the South Sea.* Imp. Acad. Japan Tokyo, vol. 11, No. 8, pp. 326-328.

1935c. *On the topography, geology and coral reef of the Palao Island.* [In Japanese.] Geol. Paleont. Inst. Tôhoku Imp. Univ., Contrib., No. 18, 67 pp., 15 pls.

1935d. *Topography, geology and coral reefs of Yap Island.* [In Japanese.] Geol. Paleont. Inst. Tôhoku Imp. Univ.. Contrib., No. 19, 43 pp., 8 pls.

1936a. *Topography, geology and coral reefs of the Aru Islands in the Netherland East Indies.* [In Japanese.] Geol. Paleont. Inst. Tôhoku Imp. Univ., Contrib., No. 20, 35 pp., map.

1936b. *Topography, geology and coral reefs of Tinian Island.* [In Japanese.] Geol. Paleont. Inst. Tôhoku Imp. Univ., Contrib., No. 21, 53 pp., 4 maps.

1936c. *Topography, geology and coral reefs of the North Mariana Islands.* [In Japanese.] Geol. Paleont. Inst. Tôhoku Imp. Univ., Contrib., No. 23, 88 pp., 10 pls.

1936d. *Topography, geology and coral reefs of Ponape of the South Sea Islands.* [In Japanese.] Geol. Paleont. Inst. Tôhoku Imp. Univ., Contrib., No. 24, 52 pp., map.

1937. *On the ridges in the western part of the South Sea under Japanese mandate and on the crustal movements of the group.* [In Japanese.] Geol. Paleont. Inst. Tôhoku Imp. Univ., Contrib., No. 28, 33 pp.

1938a. *Geomorphology, geology and coral reefs of Saipan Island.* Inst. South Seas Govt., Bull. Trop. Industry, vol. 1.

1939a. *Terraces of the South Sea Islands under the Japanese mandate.* Imp. Acad. Japan Tokyo, Proc., vol. 15, No. 5, pp. 139-141.

1939b. *Correlation of the formations in the South Sea Islands.* Geol. Soc. Japan, Jour., vol. 46, pp. 345-348.

1939d. *Topographical observations on the coral reefs in the Marshall Group.* [In Japanese.] Geol. Paleont. Inst. Tôhoku Imp. Univ., Contrib., No. 10, 57 pp.

1939e. *Insular disposition and submarine topography of the South Sea Islands.* [In Japanese.] Geol. Paleont. Inst. Tôhoku Imp. Univ., Contrib., No. 17, 22 pp.

1940b. *Geomorphology, geology and coral reefs of Truk Islands.* Yabe Jubilee Publ., vol. 2, pp. 709-723, 3 pls.

1942a. *Geomorphological and geological observations of Vogelkop Peninsula, New Guinea.* [In Japanese.] Geol. Paleont. Inst. Tôhoku Imp. Univ., Contrib., No. 37.

1942b. *Types of deposition and distribution of phosphate ores in South Sea Islands.* Inst. South Seas Govt., Bull. Trop. Industry, vol. 8.

1951. *Geology of Angaur Island.* Inst. Geol. Paleont. Tôhoku Imp. Univ., Short Papers, No. 3, pp. 91-108, figs.

1952. *Coral reefs in the South Seas.* [Japanese with English summary.] Hydrogr. Office Tokyo, Bull., vol. 11, pp. 1-292, Append. I, II (views and figs.).

Teichert, Curt

1958. *Cold-and deep-water coral banks.* Amer. Assoc. Petrol. Geol., Bull., vol. 42, No. 5, pp. 1064-1082, figs. 1-3.

Teichert, C., and Fairbridge, R. W.

1948. *Some coral reefs of the Sahul Shelf.* Geogr. Rev., vol. 38, No. 2, pp. 222-249, figs.

1950. *Photo-interpretation of coral reefs.* Photogram. Engineer., vol. 16, p. 744.

Teissier, Georges

1929. *Quelques observations éthologiques sur la faune marine des environs de Roscoff.* Lab. Mus. Hist. Nat. St. Servan, Bull., vol. 4, pp. 8, 9.

1950. *Inventaire de la faune marine de Roscoff. Cnidaires.* Sta. Biol. Roscoff, Trav., n. s., vol. 1, Suppl. 1, pp. 1-42.

Terada, Torahiko

1934. *Vertical movement of earth's crust and growth of coral reef.* Imp. Acad. Japan Tokyo, Proc. vol. 10, No. 10, pp. 643-645.

Termier, Geneviève, and Termier, Henri

1948. *Paléontologie marocaine. I. Généralités sur les invertébrés fossiles.* Serv. Mines Carte Géol. Maroc, Notes et Mém., vol. 69, 391 pp., 22 pls.

Termier, Henri, and Termier, Geneviève

1960. *Paléontologie Stratigraphique.* Paris, Masson & Cie., 515 pp., 1 pl., 3425 text-figs.

Théel, Hjalmar

1908. *Om utvecklingen af Sveriges zooliska hafstation Kristineberg och om djurlivet i angränsande haf och fjordar.* Ark. f. Zool., vol. 4, No. 5, pp. 1-136, 5 pls., 3 charts.

Thevenin, Armand

1908. *Paléontologie de Madagascar. V. Fossiles liassiques.* Ann. Paléont., vol. 3, pp. 105-143, pls. 1-4, text-figs. 1-28. [Coralliaires pp. 139-140.]

Thiebault, J.

1957. *Étude géologique du Massif de la Barousse.* Soc. Hist. Nat. Toulouse, Bull., vol. 95, Nos. 1-2, pp. 17-67, figs. 1-12, map.

Thiel, Max Egon

1928. *Madreporaria. In* Michaelsen, W., *Beiträge zur Kenntnis der Meeresfauna Westafrikas.* Hamburg, vol. 3, pt. 6, pp. 251-350, 5 pls., 4 text-figs.

1929a. *Die Darwinische Senkungtheorie der Korallenriffe und die Lehre von der Isostasie.* Deutsche Zool. Gesell., Verhandl., vol. 33, pp. 85-90.

1929b. *Ein neues Zeugnis für die Darwinische Senkungstheorie der Korallenriffe.* Naturwissenschaft. Berlin, vol. 17, pp. 681-688, 6 figs.

1929c. *Zur Frage der Ernährung der Steinkorallen und der Beduetung ihrer Zooxanthellen.* Zool. Anzeig., vol. 81, pp. 295-305.

1932. *Madreporaria. Zugleich ein Versuch einer vergleichenden Oekologie der gefunden Formen.* Mus. Roy. Hist. nat. Belgique, Mém., vol. 2, No. 12, 177 pp., 21 pls.

1933. *Ueber einige Korallen von der Philipponen nebst Bemerkungen über die Systematik der Gattung Acropora.* Mus. Roy. Hist. nat. Belgique, Bull., vol. 9, No. 36, pp. 1-37.

1940. *Ueber einen Fund einer neuen Astrangia-Art, Astrangia macrodentata, n. sp. an der Westküste von Afrika.* Rev. Zool.-Botan. Afr. Tervueren, vol. 33, pp. 195-200, figs.

1941. *Résultats scientifiques des Croisières du Navire-École Belge "Mercator, vol. 3. Madreporaria.* Mus. Roy. Hist. nat. Belgique, sér. 2, vol. 21, pp. 1-28, 3 pls.

Thomas, H. Dighton

1935a. *On Tricycloseris, Anabacia, and some new genera of Hexacoralla.* Geol. Mag., vol. 72, No. 855, pp. 424-430, pl. 18.

1935b. *Jurassic corals and hydrozoa, together with a re-description of Astrea caryophylloides Goldf.* The Mesozoic Paleontology of British Somaliland, vol. 3, pp. 23-39, pls. 2-5.

1939. *Notes on the corals from the fossiliferous tuffs of Roche Bluff. The Royal Society Expedition to Montserrat, B.W.I.* Roy. Soc. London, Philos. Trans., vol. 229B, No. 557, pp. 80-81.

1942a. *On fossils from Antigua, and the age of the Seaforth Limestone.* Geol. Mag., vol. 79, No. 1, pp. 49-61, pls. 3, 4.

1942b. *On the occurrence of Sphenotrochus (S. davisi sp. n.) in the English Auversian deposits.* Ann. Mag. Nat. Hist., ser. 11, vol. 9, pp. 61-64, figs. 1, 2.

1946. *Some American fossil Foraminifera and corals. Part 2.* Nature, vol. 158, No. 4020, pp. 719-720.

1948. *Some English Cretaceous and Eocene hexacorals.* Geol. Soc. London, Quart. Jour., vol. 103, No. 3, pp. 163-170, pls. 8, 9.

1956. *Fossil Foraminifera, Algae, and corals from the Lupar Valley (from Stage II of the Belaga Series marginal facies).* Geol. Sur. British Territor. Borneo, Ann. Rept. for 1955, pp. 97-98.

1959. [*Determination of a solitary coral fossil.*] *In* Bartholomew, R. W., *Geology of the Lautoka area, northwest Viti Levu.* Geol. Sur. Dept. Suva Fiji, Bull., vol. 2, p. 19.

Thomas, H. D., and Smith, S.

1954. *The coral genus Halysites Fischer von Waldheim.* Ann. Mag. Nat. Hist., ser. 12, vol. 7, pp. 765-774, pls. 20-22.

Thompson, A. D., and Dodson, R. G.

1960. *Geology of the Bur Mayo-Tarbaj area.* Geol. Sur. Kenya, Rept., vol. 47, pp. i-vi, 1-49, pls. 1-4, text-figs. 1-6, maps. [Corals p. 24.]

Thompson, D'Arcy Wentworth

1899. *On a supposed resemblance between the marine faunas of the Arctic and Antarctic regions.* Roy. Soc. Edinburgh, Proc., vol. 22, pp. 311-349.

Thomson, Charles Wyville

1873. *The depths of the sea.* London, xxxi + 527 pp., figs., 8 maps.

1877-78. *The voyage of the "Challenger." The Atlantic.* New York, 2 vols., vol. 1, pp. i-vix, xv-xx, 17-391, 14 pls., 106 text-figs.; vol. 2, pp. i-viii, 9-340, pls. 15-42, 62 text-figs.

Thomson, J. Allan

1908. *Fossils from Kakanui.* New Zealand Inst., Trans. Proc., vol. 40, pp. 98-103, pl. 14.

1921. *The geology of western Samoa.* New Zealand Jour. Sci. Tech. Wellington, vol. 4, p. 49.

Thomson, J. Arthur

1910. *Note on a hydrocoralline from Rockall.* Roy. Phys. Soc. Edinburgh, Proc., vol. 18, p. 61.

Thomson, J. Arthur, and Rennet, Nita

1931. *Alcyonaria, Madreporaria, and Antipatharia.* Australasian Antarctic Exped. 1911-1914, Sci. Rept., ser. C, vol. 9, No. 3, pp. 1-46, pls. 8-14.

Thomson, James

1881-82. *On a new family of rugose corals, including the genera Cyclophyllum, Aulophyllum, and on the genus Clisiophyllum.* Lit. Philos. Soc. Glasgow, Proc., vol. 13, pp. 471-551, pls. 1-7.

1888. *On a new species of Diphyllum, and on a remarkable form of the genus Lithostrotion.* Ann. Mag. Nat. Hist., ser. 6, vol. 2, pp. 317-323, 3 figs.

1893. *On the genera Calophyllum and Campophyllum.* Roy. Irish Acad. Dublin, Proc., ser. 2, vol. 5, pp. 667-758, pls. 15-21.

Thorson, Gunnar

1934. *Contributions to the animal ecology of the Scoresby Sound Fjord complex (East Greenland).* Medd. Grønland, vol. 100, No. 3, pp. 1-67, 6 pls., 3 text-figs., 20 tables.

Thurmann, Jules, and Étallon, A.

1864. *Lethea bruntrutana ou études paléontologiques et stratigraphiques sur le Jura bernois, et en particular sur les environs de Porrentruy.* Allg. Schweizerische Gesell., Neue Denkschr., vols. 18-20, 500 pp., 65 pls.

Thurston, Edgar

1890. *Notes on the pearl and shank fisheries and marine fauna of the Gulf of Manaar.* Madras Govt. Press, 116 pp., 2 photos, 2 charts, 2 diagr.

Thynne (Mrs.)

1859. *On the increase of madrepores, with notes by P. H. Gosse.* Ann. Mag. Nat. Hist., ser. 2, vol. 3, pp. 449-461, pl. 17.

Tipper, George Howlett

1911. *The geology of the Andaman Islands.* Geol. Sur. India, Mem., vol. 35, p. 195.

Tokioka, Takasi

1953. *Invertebrate fauna of the intertidal zone of the Tokara Islands. I. Introductory notes, with the outline of the shore and the fauna. II. Record of the stranded floating animals.* Seto Marine Biol. Lab., Publ., vol. 3, No. 2, pp. 123-139, pls. 4-6, text-figs. 1-6.

Tomes, Robert Tomes

1878a. *The stratigraphic position of the corals of the Lias of the Midland and western counties of England and of South Wales.* Geol. Soc. London, Quart. Jour., vol. 34, pp. 179-195, pl. 9.

1878b. *A list of the Madreporaria of Crickley Hill, Gloucestershire, with descriptions of some new species.* Geol. Mag., decade 2, vol. 5, pp. 297-305.

1882a. *Description of a new species of coral from the middle Lias of Oxfordshire.* Geol. Soc. London, Quart. Jour., vol. 38, pp. 95-96, fig. 1.

1882b. *On the Madreporaria of the Inferior Oolite of the neighbourhood of Cheltenham and Gloucester.* Geol. Soc. London, Quart. Jour., vol. 38, pp. 409-450, pl. 18.

1883a. *On the fossil Madreporaria of the Great Oolite of the counties of Gloucester and Oxford.* Geol. Soc. London, Quart. Jour., vol. 39, pp. 168-196, pl. 7.

1883b. *On some new or imperfectly known Madreporaria from the Coral Rag and Portland Stone of the counties of Wilts, Oxford, Cambridge, and York.* Geol. Soc. London, Quart. Jour., vol. 39, pp. 555-564, pl. 22.

1884. *A comparative and critical revision of the Madreporaria of the White Lias of the middle and western counties of England, and of those of the conglomerate at the base of the South Wales Lias.* Geol. Soc. London, Quart. Jour., vol. 40, pp. 353-375, pl. 19.

1885a. *Observations on some imperfectly known Madreporaria from the Cretaceous formation of England.* Geol. Mag., decade 3, vol. 2, pp. 541-553, pl. 14.

1885b. *On some new or imperfectly known Madreporaria from the Great Oolite of the counties of Oxford, Gloucester, and Somerset.* Geol. Soc. London, Quart. Jour., vol. 41, pp. 170-190, pl. 5.

1886a. *On some new or imperfectly known Madreporaria from the Inferior Oolite of Oxfordshire, Gloucestershire, and Dorsetshire.* Geol. Mag., decade 3, vol. 3, pp. 1-23, 385-398, 443-452, pl. 10.

1886b. *On the occurrence of two species of Madreporaria in the upper Lias of Gloucestershire.* Geol. Mag., decade 3, vol. 3, pp. 107-111.

1888. *Sphenotrochus.* Geol. Mag., decade 3, vol. 5, pp. 28-29.

1893a. *Observations on the affinities of the genus Astrocoenia.* Geol. Soc. London, Quart. Jour., vol. 49, pp. 569-573.

1893b. *Description of a new genus of Madreporaria from the Sutton Stone of South Wales.* Geol. Soc. London, Quart. Jour., vol. 49, pp. 574-578, 1 pl.

1899. *Observations on some British Cretaceous Madreporaria, with descriptions of two new species.* Geol. Mag., decade 4, vol. 6, pp. 298-307, pl. 13.

Toniolo, A. R.

1908. *L'Eocene dei dintorni di Rozzo in Istria.* Accad. Lincei Roma, Cl. Sci. Fis., Mat. e Nat., Rend., ser. 5, vol. 17, No. 1, pp. 815-824.

Torley, K.

1908. *Die Fauna des Schleddenhofes bei Iserlohn.* Geol. Landesanst. Berlin, Abhandl., vol. 53, pp. 1-56, 10 pls.

1933. *Über Endophyllum bowerbanki M. Edw. u. H.* Deutsch. Geol. Gesell., Zeitschr., vol. 85, No. 8, pp. 630-633, 1 pl.

Tornquist, Alexander [Johannes Heinrich]

1899. *Neue Beiträge zur Geologie und Paläontologie der Umgebung von Recoaro und Schio (im Vicentin).* Deutsch. Geol. Gesell., Zeitschr., vol. 51, pp. 341-377, pls. 18-20.

1905. *Über eine eocäne Fauna der Westküste von Madagascar.* Senckenb. Gesell., Abhandl., vol. 27, No. 3, pp. 331-333.

Tortonese, Enrico

1962. *Le collezioni di poriferi, celenterati ed echinodermi del Museo di Storia Naturale di Genova con elenchi del materiale tipico.* Doriana, vol. 3, No. 125, pp. 1-8. [Coelenterates pp. 3-5.]

1963. *The Mediterranean red coral and its associated fauna.* Sea Frontiers, vol. 9, No. 4, pp. 205-211, 5 figs.

Totton, Arthur Knyvett

1952. *Notes on some little-known corals from N.W. and S. Australia.* Ann. Mag. Nat. Hist., ser. 12, vol. 5, pp. 975-979, pls. 35, 36.

Totton, A. K., and Yonge, C. M.

1931. *Symbiotic algae of corals.* Nature, vol. 128, No. 3235, p. 760.

Toula, Franz

1911a. *Nachträge zur jungtertiären (pliocänen) Fauna von Tehuantepec.* K.-K. Geol. Reichsanst. Wien, Jahrb., vol. 61, Nos. 3-4, pp. 473-486, pl. 29, text-figs. 1, 2.

1911b. *Die jungtertiäre Fauna von Gatun am Panama Kanal.* K.-K. Geol. Reichsanst. Wien, Jahrb., vol. 61, Nos. 3-4, pp. 486-530, pls. 30, 31.

Toulmin, Lyman D.

1967. *Paleontology of a part of West Florida.* Southeastern Sect. Geol. Soc. Amer., Guidebook 1967 Ann. Meeting, 10 pp., 2 figs.

Townsend, Charles Haskins

1916. *Voyage of the "Albatross" to the Gulf of California in 1911.* Amer. Mus. Nat. Hist., Bull., vol. 35, pp. 369-476, 45 figs.

Tournefort, Joseph Pitton de

1700. *Observations sur les plantes qui naissent dans le fond de mer.* Acad. Roy. Sci., Mém. 1700, pp. 27-36, 3 pls.

Tracey, J. I., Jr.
1951. *Geological studies of coral atolls.* Atoll Res. Bull., No. 1, pp. 9, 10.

Tracey, J. I., Jr., Cloud, P. E., Jr., and Emery, K. O.
1955. *Conspicuous features of organic reefs.* Atoll. Res. Bull., No. 46, p. 1.

Tracey, J. I., Jr., Ladd, H. S., and Hoffmeister, J. E.
1948. *Reefs of Bikini, Marshall Islands.* Geol. Soc. Amer., Bull., vol. 59, pt. 2, pp. 861-878, pls. 1-11, text-figs. 1-8.

Traub, Franz
1938. *Geologische und paläontologische Bearbeitung der Kreide und des Tertiärs im ostlichen Rupertiwinkel, nordlich von Salzburg.* Palaeontographica Stuttgart, vol. 88A, Nos. 1-3, pp. 1-114, pls. 1-8, text-figs.

Trauth, F.
1911. *Die oberkretazische Korallen-Fauna von Klogsdorf in Mähren.* Mähr. Landesmus., Zeitschr., vol. 11, 104 pp., 4 pls.

Trautschold, Hermann von
1886. *Le Néocomien de Sably en Crimée.* Soc. Nat. Moscou, Nouv. Mém., vol. 15, 25 pp., 5 pls.

Traveri, J., and Veyl, C. O.
1958. *Reconocimiento geológico de la Isla Mocha, 1955.* Inst. Geol. Univ. Chile, Publ., vol. 12, pp. 157-188, pls. 1-9.

Trechmann, Charles Taylor
1930. *The Manchioneal beds of Jamaica.* Geol. Mag., vol. 67, pp. 199-218, pls. 12, 13.
1933. *The uplift of Barbados.* Geol. Mag., vol. 70, No. 823, pp. 19-47, pls. 3-4.
1934. *Tertiary and Quaternary beds of Tobago, West Indies.* Geol. Mag., vol. 71, No. 845, pp. 481-493, pls. 24-25, text-fig. 1.
1937. *The base and top of the coral rock in Barbados.* Geol. Mag., vol. 74, No. 878, pp. 337-359, pl. 12, text-figs. 1-4.
1952. *Note on a Pleistocene coral rock in Jamaica altered into material resembling bauxite or laterite.* Geol. Soc. London, Quart. Jour., vol. 107, No. 4, pp. 443-444.

Trégouboff, G.
1956. *Rapport sur les travaux concernant le plancton Méditerranéen publiés entre Novembre 1952 et Novembre 1954.* Comm. Internat. Mer Médit., Rapp., vol. 13, pp. 65-100.
1960. *Rapport sur les travaux relatifs à la planctonologie Méditerranéenne publiés entre Juillet 1956 et Juin 1958.* Comm. Internat. Mer. Médit., Rapp., vol. 15, No. 2, pp. 191-225. [Coelenterates pp. 211-213.]

Treisler, Donald K., and Lemon, James McW.
1951. *Marine Products of Commerce. Their acquisition, handling, biological aspects, and the science and technology of their preparation and preservation.* New York, 2nd ed., pp. i-xiii, 1-782, figs. 2.1-36.2, 160 tables, frontisp.

Trembley, Abraham
1744. *Mémoires pour servir à l'histoire d'un genre de polypes d'eau douce, à bras en forme de cornes.* Leide, xv + 324 pp., 13 pls.

Trites, R. W.
1960. *An oceanographical and biological reconnaissance of Kennebecasis Bay and the Saint Johns River Estuary.* Fish. Res. Bd. Canada, Jour., vol. 17, No. 3, pp. 377-408, figs. 1-16.

Tromp, S. W.
1951. *The geological history of Egypt and of the Red Sea in particular.* Geol. Soc. Turkey, Bull., vol. 3, No. 1, pp. 51-95.

Twenhofel, William Henry

1950. *Coral and other organic reefs in geologic column.* Amer. Assoc. Petrol. Geol., Bull., vol. 34, No. 2, pp. 182-202, figs. 1, 2.

Tyerman, Daniel, Bennet, George, and Montgomery, James

1831. *Journal of Voyages and Travels . . . to visit . . . various stations in the South Sea Islands, China, India, etc., between . . . 1821 and 1829* . . . London, 3 vols.

Ule, Willi

1898. *Darwin's Theorie der Korallenbauten.* Die Natur, vol. 46, pp. 619-620.

Ulrich, Edward Oscar

1904. *Hydrozoa.* Maryland Geol. Sur. Systematic paleontology, Miocene, pp. 433-438, pl. 121.

Umbgrove, Johannes Herman Frederik

1924. *Report on Pleistocene and Pliocene corals from Ceram. In* Rutten, L., and Hotz, W., *Geologic, petrographic, and paleontologic results of the exploration of the Island of Ceram, September 1917 to June 1919.* Amsterdam, ser. 2, vol. 1, Paleontology, 22 pp., 2 pls.

1925. *De Anthozoa uit het Maastrichtsche Tufkrijt.* Leidse Geol. Meded., vol. 1, pp. 83-126, pls. 8-11.

1926. *Neogene en Pleistocene Koralen von Sumatra.* Dienst Mijnb. Ned.-Indië, Wetensch Meded., vol. 4, pp. 25-56, 2 pls., map.

1928. *De Koraalriffen in de Baai van Batavia.* Dienst Mijnb. Ned.-Indië, Wetensch. Meded., vol. 7, 68 pp., 33 pls., 17 text-figs.

1928b. *Een Zaphrentis van Kota Tangah (Padangsche Bovenlanden).* Jaarb. Mijn. Ned. Oost-Indië, Verh. Geol. I, pp. 246-247, 1 pl.

1929a. *Anthozoa van N. O. Borneo.* Dienst Mijnb. Ned.-Indië, Wetensch. Meded., vol. 9, pp. 47-48, pls. 1-5.

1929b. *De Koraalriffen der Duizend-Eilanden (Java-zee).* Dienst Mijnb. Ned.-Indië, Wetensch. Meded., vol. 12, pp. 1-46, pls. 1-6.

1930a. *The influence of the monsoons on the geomorphology of coral islands.* Fourth Pan Pacific Sci. Congr., Proc., vol. 2A, pp. 49-54.

1930b. *The amount of maximal lowering of sea level in the Pleistocene.* Fourth Pan Pacific Sci. Congr., Proc., vol. 2A, p. 105.

1930c. *De Koraalriffen van den Spermonde-archipel (zuid Celebes).* Leidse Geol. Meded., vol. 3, pp. 227-260, figs. 1-3, pls. 40-43.

1930d. *The end of Sluiter's coral reef at Krakatoa.* Leidse Geol. Meded., vol. 3, pp. 261-264, figs. 1, 2.

1931a. *De Koraalriffen van Emmahaven (W. Sumatra).* Leidse Geol. Meded., vol. 4, pp. 9-24, figs. 1-10, pls. 1-4, text-figs. 1-10.

1931b. *Note on "Negroheads" (coral boulders) in the East Indian Archipelago.* K. Nederland. Akad. Wetensch. Amsterdam, Proc., vol. 34, pp. 485-487.

1938a. *Corals from an elevated marl of Taland (East Indies).* Zool. Meded. Leiden, vol. 20, pp. 263-274, figs.

1938b. *Geologic history of the East Indies.* Amer. Assoc. Petrol. Geol., Bull., vol. 22, No. 1, pp. 1-70, figs. 1-24.

1939a. *Madreporaria from the Bay of Batavia.* Zool. Meded. Leiden, vol. 22, pp. 1-64, pls. 1-184, figs., map.

1939b. *Miocene corals from Flores (East Indies).* Leidse Geol. Meded., vol. 11, pp. 62-67, 1 pl.

1939c. *De Atollen en Barrière-Riffen der Togian-Eilanden.* Leidse Geol. Meded., vol. 11, pp. 132-187, figs. 1-26.

1940. *Madreporaria from the Togian reefs (Gulf of Tomini, North Celebes).* R. Mus. Natuur. Hist., Meded. Zool., vol. 22, p. 265.

1945. *Corals from the Upper Miocene of Tjisande, Java.* K. Nederland. Akad. Wetensch. Amsterdam, Proc., vols. 46-48, pp. 340-344, 1 pl.

1946a. *Corals from a lower Pliocene patch reef in Central Java.* Jour. Paleont., vol. 20, No. 6, pp. 521-541, pls. 77-82.

1946b. *Corals from the upper Kalibeng beds (Upper Pliocene) of Java.* K. Nederland. Akad. Wetensch. Amsterdam, Proc., vol. 49, No. 1, pp. 87-93, pls. 1, 2.

1946c. *Evolution of reef corals in the East Indies since Miocene time.* Amer. Assoc. Petrol. Geol., Bull., vol. 30, No. 1, pp. 23-31, figs. 1, 2, tables 1-4.

1947a. *The Pulse of the Earth.* The Hague, pp. i-xxii, 1-358, pls. 1-8, text-figs. 1-201, tables I, II.

1947b. *Coral reefs of the East Indies.* Geol. Soc. Amer., Bull., vol. 58, pp. 729-778, pls. 1-7, text-figs. 1-24.

1950. *Corals from the Putjangan beds (Lower Pleistocene) of Java.* Jour. Paleont., vol. 24, No. 6, pp. 637-651, pls. 81-84, text-figs. 1, 2.

Umbgrove, J. H. F., and Cosijn, J.

1931. *Java's Zuidkust bij Tji Laoet Eureum.* Geol. Mijnb. Gen. Nederl. en Kolon., Verh., Geol. Serie, vol. 9, pp. 121 *et seq.*

Umbgrove, J. H. F., and Verwey, J.

1930. *The coral reefs in the Bay of Batavia.* Fourth Pan Pacific Sci. Congr., Proc., Excursion Guide A2, 30 pp., 3 pls., 8 text-figs.

Urquiza, M.

1882. *Exploración del Distrito de Coalcoman, Estado de Michoacan.* Ministerio de Fomento, An., vol. 8, pp. 195-261, figs., map.

Uschakov, P. V.

1950. *The abyssal fauna of the Okhotsk Sea.* [In Russian.] Acad. Sci. Moscou, C. R., n. s., vol. 71, No. 5, pp. 971-974.

Ussing, H.

1941. *Fra Randers Fjord og Kattegat. (Biologiske og faunistiske Bidrag).* Dansk Naturhist. Foren., Medded., vol. 104, pp. 77-86, figs.

Utinomi, Huzio

1953. *Coral-dwelling organisms as destructive agents of corals.* Seventh Pacific Sci. Congr., Proc., vol. 4, pp. 533-536.

1956a. *Coloured illustrations of sea-shore animals.* [In Japanese.] Fauna and Flora of Japan, No. 8, pp. i-xvii, 1-167, pls. 1-64, 1-12, text-figs. 1-2. [Coelenterates pp. 3-28.]

1956b. *Invertebrate fauna of the intertidal zone of the Tokara Islands. XIV. Stony corals and hydrocorals.* Seto Marine Biol. Lab., Publ., vol. 5, No. 3, pp. 339-346, pls. 31, 32. Also, Osaka Mus. Nat. Hist., Bull., No. 10, pp. 37-44, pls. 1-2.

1962. Coloured illustrations of sea-shore animals of Japan. Osaka, xvii + 168 pp., 71 pls. [Coelenterata pp. 3-28.]

Valentine, James William

1958. *Late Pleistocene megafauna of Cayucos, California, and its zoogeographic significance.* Jour. Paleont., vol. 32, No. 4, pp. 687-696, text-figs. 1, 2.

Valkanov, A.

1957. *Katalog unserer Schwarzmeerfauna.* [Summary in German.] Morsk. Biol. Sta. G. Varna Sofia, Trud., vol. 19 (1955), pp. 1-62. [Coelenterates pp. 16-18.]

Vallentin, Rupert

1896a. *Some remarks on the pelagic life occurring in and near Falmouth Harbour, with additions to the fauna of the district for 1894.* Roy. Inst. Cornwall, Jour., pp. 43-51.

1896b. *Some notes on the pelagic life occurring in the sea near Falmouth, with fauna notes of the district.* Roy. Inst. Cornwall, Jour., pp. 204-214.

1898. *Notes on the fauna of Falmouth for the years 1895-1896.* Roy. Inst. Cornwall, Jour., vol. 13, pp. 254-271.

Vanhöffen, Ernst

1890, 1892, 1896. *Jahresbericht für 1884-1887 über die Coelenteraten mit Anschluss der Spongien und Anthozoen.* Arch. f. Naturgesch., vol. 54, No. 2, pt. 3, pp. 82-148 (1890); vol. 55, No. 5, pt. 2, pp. 135-166 (1892); vol. 58, pp. 151-179 (1896).

Vannucci, M.

1949. *Hydrozoa do Brasil.* Faculdade Filos., Ciênc. e Letras Univ. São Paulo, Bol., vol. 14, pp. 219-265, pls. 1-3.

1950. *Resultados cientificos do cruzeiro do "Boependi" e do "Vega" a Ilha da Trindade. Hydrozoa.* Inst. Paulista Oceanogr., Bol., vol. 1, No. 1, pp. 81-96, pls. 1, 2.

1959. *Catalogue of Marine larvae. No. 1.* Inst. Oceanogr. Univ. São Paulo, Bol., vol. 10, pp. 1-44, figs. [Coelenterates pp. 15-16.]

Vátova, Aristocle

1928. *Compendio della flora e fauna del Mare Adriatico presso Rovigno con la distribuzione geografica delle specie bentoniche.* Comm. Talassogr. Ital., vol. 143, 614 pp., 68 pls.

1961. *La faune benthique des lagunes de Grado et de Marano.* Comm. Internat. Mer Médit., Rapp., vol. 16, No. 2, pp. 453-454.

Vaudois-Miéja, Nicole

1964. *Les espèces nummultiques tribuées au gnere Trococyathus.* Ann. Paleont., vol. 50, No. 2, pp. 111-163, pls., 15-18, text-figs. 1-19.

Vaughan, Thomas Wayland

1898. *Report on the fossil corals collected. In* Hill, Robert T., *The geological history of the Isthmus of Panama and portions of Costa Rica.* Mus. Comp. Zool., Bull., vol. 28, No. 5, Geol. Ser., vol. 3, pp. 1-285, 19 pls. (p. 275)

1899. *Some Cretaceous and Eocene corals from Jamaica. In* Hill, Robert T., *Memoir on the geology of Jamaica.* Mus. Comp. Zool., Bull., vol. 34 (Geol. ser., vol. 4), pp. 227-250, pls. 36-41.

1900a. *The Eocene and lower Oligocene coral faunas of the United States with descriptions of a few doubtfully Cretaceous species.* U.S. Geol. Sur., Mon. 39, pp. 1-263, pls. 1-24.

1900b. *A Tertiary coral reef near Bainbridge, Georgia.* Science, n. s., vol. 12, pp. 873-875.

1900c. *Trochocyathus woolmani, a new coral from the Cretaceous of New Jersey.* Acad. Nat. Sci. Philadelphia, Proc., vol. 52, pp. 436-437, figs. 1-3.

1900d. *A new fossil species of Caryophyllia from California, and a new genus and species of turbinolid coral from Japan.* U.S. Nat. Mus., Proc., vol. 22, No. 1194, pp. 199-203, pl. 16.

1901a. *Some fossil corals from the elevated reefs of Curaçao, Aruba and Bonaire.* R. Mus. Geol. Min., Samml., ser. 2, vol. 2, No. 1, pp. 1-91.

1901b. *Coelenterata.* Maryland Geol. Sur., Systematic Paleontology, Eocene, pp. 222-232, pl. 61.

1901c. *The locality of the type Prionastraea vaughani Gregory.* Ann. Mag. Nat. Hist., ser. 7, vol. 7, p. 300.

1901d. *Review of two recent papers on Bahamian corals.* Science, n. s., vol. 14, pp. 497, 498.

1902a. *The stony corals of the Porto Rican waters.* U.S. Fish Comm., Bull., vol. 20 for 1900, pt. 2, pp. 289-320, pls. 1-38.

1902b. *Some recent changes in the nomenclature of West Indian corals.* Biol. Soc. Washington, Proc., vol. 15, pp. 53-58.

1902c. *An addition to the coral fauna of the Aquia Eocene formation of Maryland.* Biol. Soc. Washington, Proc., vol. 15, pp. 205-206.

1902d. *A redescription of the coral Platytrochus speciosus.* Biol. Soc. Washington, Proc., vol. 15, pp. 207-208, figs. 1, 1a, 1b, 2, 2a.
1902e. *The earliest Tertiary coral reefs in the Antilles and the United States.* Science, n. s., vol. 15, pp. 506-507.
1903a. *Corals of the Buda Limestone.* U.S. Geol. Sur., Bull., No. 205, pp. 37-40, pls. 26, 27.
1903b. *Corrections to the nomenclature of the Eocene fossil corals of the United States.* Biol. Soc. Washington, Proc., vol. 16, p. 101.
1903c. *Coelenterata. In* Arnold, Ralph, *The Pliocene and Pleistocene fauna of San Pedro and vicinity. Part 2. Systematic Descriptions.* California Acad. Sci., Mem., vol. 3, pp. 86-90, pl. 3.
1904a. *Anthozoa.* Maryland Geol. Sur., Systematic paleontology, Miocene, pp. 438-447, pls. 122-129.
1904b. *A California Tertiary coral reef and its bearing on American Recent coral faunas.* Science, n. s., vol. 19, p. 503.
1905a. *A critical review of the literature on the simple genera of the Madreporaria Fungida, with a tentative classification.* U.S. Nat. Mus., Proc., vol. 28, No. 1401, pp. 371-424.
1905b. *Review of J. Stanley Gardiner's Madreporaria, Pts. 3 and 4, Fauna and Geography of the Maldive and Laccadive Archipelagoes.* Science, n. s., vol. 21, pp. 984-985.
1906a. *Three new Fungiae, with a description of a specimen of Fungia granulosa Klunzinger and a note on a specimen of Fungia concinna Verrill.* U.S. Nat. Mus., Proc., vol. 30, No. 1473, pp. 827-832, pls. 67-74.
1906b. *A new species of Coenocyathus from California and the Brazilian astrangid corals.* U.S. Nat. Mus., Proc., vol. 30, No. 1477, pp. 847-850, pls. 77, 78.
1906c. *Reports on the scientific results of the expedition to the eastern tropical Pacific, in charge of Alexander Agassiz, by the U. S. Fish Commission steamer "Albatross," from October, 1904, to March, 1905, Lieut. Commander L. M. Garret, U.S.N., commanding. Madreporaria.* Mus. Comp. Zool., Bull., vol. 50, pp. 59-72 + 10, pls. 1-10.
1907a. *Recent Madreporaria of the Hawaiian Islands and Laysan.* U.S. Nat. Mus., Bull. 59, pp. i-ix + 1-222, 415-427, pls. 1-96, 1 text-fig.
1907b. *Some Madreporarian corals from French Somaliland, East Africa, collected by Dr. Charles Gravier.* U.S. Nat. Mus., Proc., vol. 32, No. 1526, pp. 249-266, pls. 17-28.
1907c. *H. M. Bernard's work on the poritid corals.* Science, n. s., vol. 26, pp. 373-378.
1909. *Geology of the Florida Keys and the marine bottom deposits and Recent corals of southern Florida.* Carnegie Inst. Washington, Yearbook 1908, No. 7, pp. 131-136.
1910. *Geology of the Keys, the marine bottom deposits and Recent corals of southern Florida.* Carnegie Inst. Washington, Yearbook 1909, No. 8, pp. 140-144.
1911. *The Recent Madreporaria of southern Florida.* Carnegie Inst. Washington, Yearbook 1910, No. 9, pp. 135-144, pl. 1.
1912a. *Summary of the results obtained from a study of the Recent Madreporaria of the Hawaiian Islands and Laysan.* Seventh Internatl. Zool. Congress, Cambridge, Mass., pp. 932-943.
1912b. *The Madreporarian and marine bottom deposits of southern Florida.* Carnegie Inst. Washington, Yearbook 1911, No. 10, pp. 147-156, pls. 4-6.
1913a. *Anthozoa = Actinozoa.* In Zittel, Karl A., *Textbook of Palaeontology,* edited by Eastman, pp. 74-124, figs. 94-192.

1913b. *Studies of the geology and of the Madreporaria of the Bahamas and southern Florida.* Carnegie Inst. Washington, Yearbook 1912, No. 11, pp. 153-162.
1914a. *The reef corals of southern Florida.* Carnegie Inst. Washington, Yearbook 1913, No. 12, pp. 181-183.
1914b. *Investigations of the geology and geologic processes of the reef tracts and adjacent areas in the Bahamas and Florida.* Carnegie Inst. Washington, Yearbook 1913, No. 12, pp. 183-184.
1914c. *Building of the Marquesas and Tortugas Atolls and a sketch of the geologic history of the Florida Reef Tract.* Carnegie Inst. Washington, Publ. No. 182, Papers Dept. Marine Biol., vol. 5, pp. 55-67.
1915a. *Reef corals of the Bahamas and southern Florida.* Carnegie Inst. Washington, Yearbook 1914, No. 13, pp. 222-226.
1915b. *Geological investigations in the Bahamas and southern Florida.* Carnegie Inst. Washington, Yearbok 1914, No. 13, pp. 227-233.
1915c. *Study of the stratigraphic geology and the fossil corals and associated organisms in several of the smaller West Indian islands.* Carnegie Inst. Washington, Yearbook 1914, No. 13, pp. 358-360.
1915d. *The geologic significance of the growth-rate of the Floridian and Bahaman shoal-water corals.* Washington Acad. Sci., Jour., vol. 5, No. 17, pp. 591-600.
1916a. *On Recent Madreporaria of Florida, the Bahamas, and the West Indies, and on collections from Murray Island, Australia.* Carnegie Inst. Washington, Yearbook 1915, No. 14, pp. 220-231.
1916b. *Geologic investigation of the Florida coral reef tract.* Carnegie Inst. Washington, Yearbook 1915, No. 14, pp. 232-238.
1916c. *The results of investigations of the ecology of the Floridian and Bahaman shoal-water corals.* Nat. Acad. Sci., Proc., vol. 2, pp. 95-100.
1917a. *The reef-coral fauna of Carrizo Creek, Imperial County, California and its significance.* U.S. Geol. Sur., Prof. Paper 98-T, pp. 355-395, pls. 92-102, figs. 45, 46.
1917b. *Some corals from the Kermadec Islands.* New Zealand Inst., Trans., vol. 49, pp. 275-279, pls. 17-20.
1918a. *Some shoal-water corals from Murray Island (Australia), Cocos-Keeling Islands, and Fanning Island.* Carnegie Inst. Washington, Publ. No. 213, Papers Dept. Marine Biol., vol. 9, pp. 49-234, pls. 20-90, text-fig. 1.
1918b. *The temperature of the Florida coral-reef tract.* Carnegie Inst. Washington, Publ. No. 213, Papers Dept. Marine Biol., vol. 9, pp. 321-339, figs. 7-9.
1919a. *Fossil corals from Central America, Cuba, and Porto Rico, with an account of the American Tertiary, Pleistocene, and Recent coral reefs.* U.S. Nat. Mus., Bull. 103, No. 9, pp. i-vi, 189-524, pls. 68-152, text-figs. 4-25, tables, index pp. i-xiv.
1919b. *The biologic character and geologic correlation of the sedimentary formations of Panama in their relation to the geologic history of Central America and the West Indies.* U.S. Nat. Mus., Bull. 103, No. 11, pp. i-iv, 547-612, tables.
1919c. *Corals and the formation of coral reefs.* Smithsonian Inst., Ann. Rept. 1917, pp. 189-238, pls. 1-37, text-figs. 1-16.
1920a. *Corals from the marine Cannonball member of the Lance formation.* U.S. Geol. Sur., Prof. Paper 128-A, pp. 61-64, pl. 10.
1920b. *Study of the stratigraphic geology and of the fossil corals and associated organisms in several of the smaller West Indian islands.* Carnegie Inst. Washington, Yearbook No. 18, pp. 345-346.

1922. *Corals from the Eocene deposits of Peru. In* Bosworth, T. O., *Geology of the Tertiary and Quaternary Period in the northwest part of Peru.* London, sect. D, pp. 124-135, pls. 21-23.

1923. *Fauna of the Sooke Formation, Vancouver I. Description of a new coral.* Univ. California, Publ. Geol., vol. 14, pp. 175-176, pl. 40, figs. 1,2.

1924. *American and European Tertiary corals.* Geol. Soc. Amer., Bull., vol. 35, pp. 823-826.

1927. *A new species of Eocene coral, Archohelia clarki from California.* Univ. California Publ., Bull. Dept., Geol. Sci., vol. 17, No. 3, pp. 143-144, pl. 23.

1930. *The oceanographic point of view.* Contrib. Marine Biol., Stanford Univ. Press, pp. 40-56.

1932a. *Antillophyllia, a new coral generic name.* Washington Acad. Sci., Jour., vol. 22, pp. 506-510.

1932b. *Outstanding problems of the oceanography of the Pacific.* Sci. Mo., vol. 34, pp. 128-146.

1933a. *Report on species of corals and larger Foraminifera collected in Cuba by O. E. Meinzer.* Washington Acad. Sci., Jour., vol. 23, No. 7, pp. 352-355.

1933b. *International Committee on the Oceanography of the Pacific. Report of the Chairman. Corals and coral reefs of the Pacific.* Fifth Pan-Pacific Sci. Congress, Proc., vol. 1, pp. 343-384.

1940. *Ecology of modern marine organisms with reference to paleogeography.* Geol. Soc. Amer., Bull., vol. 51, pp. 433-468, 8 figs.

1941a. *Recent studies of the ecology of corals.* Rept. Subcomm. Ecol. Marine Organisms Nat. Research Council Div. Geol. Geogr. Washington, pp. 47-52.

1941b. *New corals: one Recent, Alaska; three Eocene, Alabama and Louisiana.* Jour. Paleont., vol. 15, No. 3, pp. 280-284, pls. 40, 41.

Vaughan, Thomas Wayland, and Hoffmeister, John Edward

1925. *New species of fossil corals from the Dominican Republic.* Mus. Comp. Zool., Bull., vol. 67, No. 8, pp. 315-326, pls. 1-4.

1926. *Miocene corals from Trinidad.* Carnegie Inst. Washington, Publ. No. 344, Papers Dept. Marine Biol., vol. 23, pp. 105-134, pls. 1-7.

Vaughan, Thomas Wayland, and Popenoe, Willis Parkison

1935. *The coral fauna of the Midway Eocene of Texas.* Univ. Texas, Bull., No. 3301, pp. 325-343, pls. 3, 4.

Vaughan, Thomas Wayland, and Wells, John West

1936. *Check list of generic names applied to the Madreporaria.* Mimeograph 36 pp.

1937. *Revision of the suborders, families, and genera of the madreporarian hexacorals.* Geol. Soc. Amer., Proc. (1936), p. 359.

1943. *Revision of the suborders, families, and genera of the Scleractinia.* Geol. Soc. Amer., Special Paper No. 44, pp. i-xv, 1-636, text-figs. 1-39, pls. 1-51.

Vaughan, Thomas Wayland, and Woodring, Wendell Phillips

1921. *Tertiary and Quaternary stratigraphic paleontology. Chap. 6. A geological reconnaissance of the Dominican Republic.* Geol. Sur. Dominican Republic, Mem., vol. 1, pp. 89-168.

Vayssière, Albert

1888. *Atlas d'anatomie comparée des invertebrés.* Paris, Fasc. 2-3, 30 pls. [Coelenterata, pls. 54-56, 58.]

1919. *Étude sur la faune marine de la côte occidentale du Golfe de Marseille (région de Carry).* Mus. Hist. nat. Marseille, Ann., vol. 17, pp. 93-110, 6 pls.

1920. *Sur la faune de la côte occidentale du Golfe de Marseille.* Acad. Sci. Paris, C. R., vol. 170, No. 16, pp. 914-916.

Vedder, J. G., and Norris, R. M.

1963. *Geology of San Nicolas Island, California.* U.S. Geol. Sur., Prof. Paper 369, pp. i-vi, 1-65, pls. 1-5, frontisp., text-figs. 1-19. [Pleistocene coral p. 48.]

Vella, Paul

1964. *Foraminifera and other fossils from late Tertiary deep-water coral thickets, Wairarapa, New Zealand.* Jour. Paleont., vol. 38, No. 5, pp. 916-928, text-figs. 1-3.

Venzo, S.

1935. *I fossili del Neogene Trentino, Veronese e Bresciano. II. Cefalopodi, Gasteropodi, Scafopodi, Echinidi e Celenterati.* Palaeontogr. Italica, vol. 35, pp. 201-255, 3 pls.

1937. *La fauna Cattiana delle Glauconie Bellunesi. Coelenterata.* Ist. Geol. Univ. Padova, Mem., vol. 13, pp. 169-181, pl. 12.

Verbeek, Rogier Diederik Marius

1883. *Topographische en geologische beschrijving van een gedeelte van Sumatra's Westkust.* Batavia, xx + 674 pp., Atlas, maps.

1899, 1900. *Over de geologie van Ambon.* K. Akad. Wetensch. Amsterdam, Verh., vol. 6, No. 7 (1899), 26 pp.; vol. 7, No. 5 (1900), 9 pp.

1900. *Geologische beschrijving van de Banda-Eilanden.* Mijnw. Ned. Oost-Indië, Jaarb., vol. 29, pp. 1-29.

1905. *Geologische beschrijving van Ambon.* Mijnw. Ned. Oost-Indië, Jaarb., vol. 34, pp. i-xxiv, 1-308, Atlas.

1908. *Mollukken-Verslag. Geologische verkenningstochten in het oostelijke gedeelte van den Nederlandsch Oost-Indischen Archipel.* Mijnw. Ned. Oost-Indië, Jaarb., vol. 37, pp. i-xlvi, 1-826, pls.

Verbeek, Rogier Diederik Marius, and Fennema, Reinder

1896. *Geologische beschrijving van Java en Madoera.* Amsterdam, 2 vols., vol. 1, pp. i-xl, 1-503; vol. 2, pp. 505-1135, 36 pls., Atlas.

Verrill, Addison Emery

1864a. *Revision of the Polypi of the eastern coast of the United States.* Boston Soc. Nat. Hist., Mem., vol. 1 (1866-1869), pp. 1-45, pl. 1.

1864b. *List of the polyps and corals sent by the Museum of Comparative Zoology to other institutions in exchange with annotations.* Mus. Comp. Zool., Bull., vol. 1, No. 3, pp. 29-60.

1865a. *On the polyps and corals of Panama, with description of new species.* Boston Soc. Nat. Hist., Proc., vol. 10, pp. 323-333.

1865. *Classification of Polyps: (Extract condensed from a synopsis of the polypi of the North Pacific Exploring Expedition under Captain Ringgold and Rodgers, U.S.N.)* Essex Inst., Commun., vol. 4, No. 9, pp. 145-152.

1866-69. *Synopsis of the polyps and corals of the North Pacific Exploring Expedition under Commodore C. Ringgold and Captain John Rodgers, U.S.N. from 1835 to 1856: collected by Wm Stimpson, naturalist to the expedition; with descriptions of some additional new species from the west coast of North America. Pt. 2, Alcyonaria.* Essex Inst., Commun., 1866, vol. 4, No. 12, pp. 181-196, pls. 5, 6; *Pt. 3, Madreporaria.* Essex Inst., Commun., 1866, vol. 5, pp. 7-50, pls. 1, 2; *Pt. 4, Actinaria.* Essex Inst., Commun., 1868, vol. 5, No. 13, pp. 315-330, pl. 3; Pt. 4 *Actinaria* (cont.). Essex Inst., Commun., 1869, vol. 6, No. 4, pp. 51-104, pls. 1, 2.

1866c. *On the polyps and corals of Panama, with descriptions of new species.* Boston Soc. Nat. Hist., Proc., vol. 10, pp. 323-333.

1867. *Notes on the Radiata in the Museum of Yale College, with descriptions of new genera and species.* Connecticut Acad. Arts and Sci., Trans., vol. 1, pt. 2, art. V, Nos. 1-3, 247-351.

1868a. *Notes on the Radiata in the Museum of Yale College, with descriptions of new genera and species. No. 4. Notice of corals and echinoderms collected by Prof. C. F. Hartt, at the Abrolhos Reefs, Province of Bahia, Brazil, 1867.* Connecticut Acad. Arts and Sci., Trans., vol. 1, pt. 2, art. V, pp. 351-371, pl. 4; *No. 5. Notice of a collection of echinoderms from La Paz, Lower California, with descriptions of a new genus.* Connecticut Acad. Arts and Sci., Trans., vol. 1, pt. 2, art. 5, pp. 371-376.

1868-1871. *Notes on the Radiata in the Museum of Yale College, with descriptions of new genera and species. No. 6. Review of corals and polyps of the west coast of America.* Connecticut Acad. Arts and Sci., Trans., vol. 1, pt. 2, art. V, pp. 377-558, pls. 5-10. *No. 7 (1871). On the geographical distribution of the polyps of the west coast of America,* pp. 558-567.

1869a. *On new and imperfectly known echinoderms and corals.* Boston Soc. Nat. Hist., Proc., vol. 12, pp. 381-396.

1869b. *Comparison of coral faunae of the Atlantic and Pacific coasts of the Isthmus of Darien.* Amer. Natural., vol. 3, pp. 499-500.

1870a. *Recent explorations of the deep-sea faunae.* Amer. Jour. Sci., No 145, ser. 2, vol. 49, pp. 129-134.

1870b. *Contributions to zoology from the Museum of Yale College. 7. Descriptions of new corals.* Amer. Jour. Sci., ser. 2, vol. 49, No. 147, art. 43, pp. 370-375, figs. 1-4.

1870c. *Contributions to zoology from the Museum of Yale College. No. 5. Descriptions of echinoderms and corals from the Gulf of California.* Amer. Jour. Sci., ser. 2, vol. 49, No. 145, art. 13, pp. 93-100.

1872a. *Brief contributions to zoology from the Museum of Yale College. No. 18. On the affinities of Palaeozoic tabulate corals with existing species.* Amer. Jour. Sci., ser. 3, vol. 3, (103), No. 15, art. 23, pp. 187-194, fig. 1.

1872b. *Brief contributions to zoology from the Museum of Yale College. No. 22. On Radiata from the coast of North Carolina.* Amer. Jour. Sci., ser. 3, vol. 3 (103), No. 18, art. 57, pp. 432-438.

1872-90. *Names of species in the author's report on Zoöphytes. In* Dana, James D., *Corals and Coral Islands.* Ed. 1 (1872), pp. 379-388; ed. 2 (1885), pp. 379-388; ed. 3 (1890), pp. 420-429.

1879a. *Preliminary check-list of the marine Invertebrata of the Atlantic coast from Cape Cod to the Gulf of St. Lawrence.* New Haven, Conn., 32 pp.

1879b. *Notice of recent additions to the marine Invertebrata of the northeastern coast of America, with descriptions of new genera and species and critical remarks on others. Part I. Annelida, Gephyraea, Nemertina, Nematoda, Polyzoa, Tunicata, Mollusca, Anthozoa, Echinodermata, Porifera.* U.S. Nat. Mus., Proc., vol. 2, pp. 165-205.

1879c. *Notice of recent additions to the marine fauna of the eastern coast of North America. No. 3.* Amer. Jour. Sci., vol. 17, pp. 239-241; *No. 5*, p. 47.

1881. *On the zoological affinities of Halysites.* Amer. Jour. Sci., ser. 3, vol. 21 (121), pp. 508-509.

1882. *Notice of a remarkable marine fauna occupying the outer banks off the southern coast of New England. Anthozoa.* Amer. Jour. Sci., ser. 3, vol. 23, pp. 222-225, 309-316; vol. 24, pp. 362-363.

1883. *Report on the Anthozoa and some additional species dredged by the "Blake" in 1877-1879, and by the U.S. Fish Commission steamer*

"Fish Hawk" in 1880-1882. Mus. Comp. Zool., Bull., vol. 11, No. 1, pp. 1-72, 8 pls.

1884a. *Notice of the remarkable marine fauna occupying the outer banks off the southern coast of New England, and of some additions to the fauna of Vineyard Sound.* U.S. Fish Comm., Rept., pt. 10 for 1882, pp. 641-669.

1884b. *Notice of the remarkable marine fauna occupying the outer banks off the southern coast of New England. No. 9. Brief contributions to zoology from the Museum of Yale College. No. 55.* Amer. Jour. Sci., ser. 3, vol. 28 (128), No. 165, art. 29, pp. 213-220.

1885a. *Notice of recent additions to the marine Invertebrata of the northeastern coast of America, with descriptions of new genera and species, and critical remarks on others. Part V. Annelida. Echinodermata, Hydroida, Tunicata.* U.S. Nat. Mus., Proc., vol. 8, pp. 423-448.

1885. *Notice of the remarkable fauna occupying the outer banks off the southern coast of New England. No. 11.* Amer. Jour. Sci., ser. 3, vol. 29, No. 170, art. 22, pp. 149-157.

1900a. *Additions to the Anthozoa and Hydrozoa of the Bermudas.* Connecticut Acad. Arts and Sci., Trans., vol. 10, art. 14, pp. 551-572, pls. 67-69, text-fig. 1.

1900b. *Notes on the geology of the Bermudas.* Amer. Jour. Sci., ser. 4, vol. 9, No. 53, art. 30, pp. 313-340, 12 figs.

1901. [*Review of the stony corals of Porto Rican waters by T. W. Vaughan,* pp. 289-320, 38 pls.] Amer. Jour. Sci., ser. 4, vol. 13, pp. 75-78.

1901a. *Additions to the fauna of the Bermudas from the Yale Expedition of 1901, with notes on other species.* Connecticut Acad. Arts and Sci., Trans., vol. 11, pt. 1, art. 2, pp. 15-62, pls. 1-9, text-figs. 1-6.

1901b. *Variations and nomenclature of Bermudian, West Indian and Brazilian reef corals, with notes on various Indo-Pacific corals.* Connecticut Acad. Arts and Sci., Trans., vol. 11, pt. 1, art. 3, pp. 63-168, text-figs. 1-5, pls. 10-35.

1901c. *Comparisons of the Bermudian, West Indian and Brazilian coral faunae.* Connecticut Acad. Arts and Sci., Trans., vol. 11, pt. 1, art. 4, pp. 169-206.

1902a. *Notes on corals of the genus Acropora Madrepora (Lam.) with new descriptions and figures of types, and of several new species.* Connecticut Acad. Arts and Sci., Trans., vol. 11, pt. 1, art. 5, pp. 207-266, pls. 36-36F.

1902-1903. *The Bermuda Islands: their scenery, climate, productions, physiography, natural history, and geology; with sketches of their early history and the changes due to man.* Connecticut Acad. Arts and Sci., Trans., vol. 11, pt. 2, art. 10, pp. i-x, 413-956, pls. 65-104, text-figs. 1-246.

1905-1906. *The Bermuda Islands. Part IV. Geology and paleontology, and Part V. An account of the coral reefs.* Connecticut Acad. Arts and Sci., Trans., vol. 12, art. 2, pp. 45-348, text-figs. 1-181, pls. 16-40.

1908a. *Some singular cases of regeneration and increase in a deep-sea coral by agamic endogenesis.* Science, vol. 27, p. 449.

1908b. *Distribution and variations in the deep-sea stony corals from off the coast of the United States.* Science, vol. 27, p. 494.

1912. *The gorgonians of the Brazilian coast.* Acad. Nat. Sci. Philadelphia, Jour., ser. 2, vol. 15, pp. 371-404, pls. 29-35, 1 text-fig.

1922. *Alcyonaria and Actinaria.* Canadian Arctic Exped. 1913-1918, Rept., vol. 8G, pp. 1-164, pls. 19-31.

1925. *A large gorgonian from Alaska*. Canadian Field Naturalist, vol. 39, p. 25.
1928. *Hawaiian shallow-water Anthozoa*. Bernice P. Bishop Mus. Honolulu, Bull., No. 49, pp. 1-30, 5 pls., 3 text-figs.

Verrill, Addison Emery, and Rathbun, Richard
1879. *List of marine Invertebrata from the New England coast, distributed by the U.S. Commission of Fish and Fisheries. Series. I.* U.S. Nat. Mus., Proc., vol. 2, pp. 227-232.

Verstappen, Herman Th.
1954. *The influence of climatic changes on the formation of coral islands.* Amer. Jour. Sci., vol. 252, No. 7, pp. 428-435, pl. 1, text-figs. 1-3.

Verstelle, J. Th.
1932. *The growth rate at various depths of coral reefs in the Dutch East Indian Archipelago.* Treubia, vol. 14, pp. 117-126, 2 pls., text-fig. 1.

Verwey, Jan
1930a. *Depth of coral reefs and penetration of light. With notes on oxygen consumption of corals.* Fourth Pacific Sci. Congr., Proc., vol. 2A, pp. 277-294, 5 charts.
1930b. *Coral reef studies. II. The depth of coral reefs in relation to their oxygen consumption and penetration of light in the water.* Treubia, vol. 13, pp. 169-198, 1 pl., 2 text-figs., 10 tables.
1931. *Coral reef studies. III. Geomorphological notes on the coral reefs of Batavia Bay.* Treubia, vol. 13, pp. 199-216, 2 pls., text-figs. 1-4.
1934. *Koraalriffen in zonlicht.* Trop. Natuur. Amsterdam, vol. 23, pp. 137-145, 9 figs.
1960a. *Annual report of the Zoological Station of the Netherlands Zoological Society for the year 1957.* Arch. Néerland. Zool., vol. 13, No. 4, pp. 540-555. [Coelenterates pp. 541-543.]
1960b. *Annual report of the Zoological Station of the Netherlands Zoological Society for the year 1958.* Arch. Néerland. Zool., vol. 13, No. 4, pp. 556-571. [Coelenterates pp. 559-561.]

Vetters, H.
1925. *Ueber kretazische Korallen und andere Fossilreste in nordalpinen Flysch.* Geol. Bundes. Wien, Jahrb., vol. 75, pp. 1-18, 1 pl.

Viala, M.
1919. *Les îles Wallis et Horn.* Soc. Neuchâteloise Geogr., vol. 28, p. 209.

Vidal, Luis mariano
1874. *Datos para el conocimiento del terreno garumnense de Cataluña.* Bol. Com. Mapa Geol. España, vol. 1, pp. 209-247, pls. 1-8.
1921. *Contribución a la paleontologia del Cretácico de Cataluña.* Acad. Cienc. Barcelona, Mem., ser. 3, vol. 17, 21 pp., 8 pls.

Viguier, Camille [Antoine François]
1888a. *Sur un nouveau type d'Anthozoaire, la Fascicularia radicans, C. Vig.* Acad. Sci. Paris, C.R., vol. 107, pp. 186-187.
1888b. *Études sur les animaux inférieurs de la baie d'Alger.* Arch. Zool. Expér. et Génér., sér. 2, vol. 6, pp. 351-373, pls. 19, 20.
1890. *Études sur les animaux inférieurs de la baie d'Alger.* Arch. Zool. Expér. et Génér., sér. 2, vol. 8, pp. 101-142, 3 pls.

Vinassa de Regny, Paolo Eugenio
1904. *Fossili ed impronte del Montenegro.* Soc. Geol. Italiana, Boll., vol. 23, pp. 307-322, pl. 9.

Vincent, Émile Gérard
1921. *Description d'un polypier nouvel des sables de Wemmel. Turbinolia gerardi.* Soc. Roy. Zool. Malacol. Bruxelles, Ann., vol. 51, pp. 55-57.

Visser, W. A., and Hermes, J. J.
1962. *Geological results of the exploration for oil in Netherlands New Guinea.* K. Nederland. Geol.-Mijnb. Genootsch., Verh., vol. 20, pp. 1-265, figs., 18 encl.

Voeltzkow, Alfred
1891. *Die Adamsbrücke und die Korallenriffe des Palkstrasse.* Peterm. Geogr. Mitth., vol. 37, Suppl. 102, 40 pp.
1904. *Bericht über eine Reise nach Ostafrika zur Untersuchung der Bildung und des Aufbaues der Riffe und Inseln des westlichen Indischen Ozeans. III. Mafia und Sansibar. IV. Die Comoren.* Gesell. f. Erdkunde Berlin, Zeitschr., pp. 274-301.
1917. *Flora und Fauna der Comoren.* Reise in Ostafrika . . . , vol. 3, No. 5, pp. 429-480.

Vogel, K.
1963. *Riff, Bioherm, Biostrom-Versuch einer Begriffsklärung.* Paläont. Zeitschr., vol. 37, Nos. 1, 2, p. 20.

Vogl, Viktor
1912. *A Vinodol Eocén márgájának faunáya.* [*The fauna of the Eocene marl of Vinodol.*] Földt. Evk. Budapest, vol. 20, pp. 67-100, pl. 4.

Vogt, H.-H.
1962. *Die Verarbeitung der Edelkoralle.* Neptun, vol. 2, No. 8, pp. 238, 239.

Voinovski-Kriger, K. G.
1954. *The development of the septal apparatus in the ontogenesis of four corals.* [In Russian.] Soc. Nat. Moscow, Bull., pp. 51-64, figs.

Vokes, Harold Ernest
1957. *Miocene fossils of Maryland.* Maryland Dept. Geol., Bull., vol. 20, vii + 85 pp., pls. 1-31. [Coelenterata p. 40.]

Volz, Wilhelm [Theodor August Hermann]
1890. *Die Korallen der Schichten von St. Cassian in Süd-Tirol.* Palaeontographica, vol. 40, Nos. 1-2.
1894. *Ueber die Korallenfauna der St.-Cassianer Schichten.* Schlesichen Gesell. Vaterländ. Cultur, Jahresber., No. 2, pp. 80-87.
1895. *Die Systematik der fossilen Korallen.* Schlesichen Gesell. Vaterländ. Cultur, Jahresber., pp. 101-107.
1896. *Die Korallen der Trias. Monographisch Bearbeitet. II. Die Korallen der Schichten von St.-Cassian in Süd-Tyrol.* Palaeontographica, vol. 43, pp. 1-124, pls. 1-12.
1903. *Ueber eine Korallenfauna aus dem Neocom der Bukowina.* Beitr. Geol. Paläont. Österreich-Ungarns Orients, vol. 15, pp. 9-30, pls. 3, 4.
1904. *Zur Geologie von Sumatra. Beobachtungen und Studien.* Geol. Paläont. Abhandl., vol. 6, No. 2. [Coelenterata pp. 100-110.]
1909-1912. *Nord-Sumatra. Bericht über eine im Auftrage der Humboldt-Stiftung der Königlich Preussischen Akademie der Wissenschaften zu Berlin in den Jahren 1904-06 ausgeführte Forschungsreise.* Berlin, 2 vols.

Voss, Gilbert L., and Voss, Nancy A.
1955. *An ecological survey of Soldier Key, Biscayne Bay, Florida.* Bull. Marine Sci. Gulf and Caribbean, vol. 5, No. 3, pp. 203-229, figs. 1-4.

Vučetić, T.
1957. *Zooplankton investigations in the sea-water lakes "Malo Jezero" and "Veliko Jezero" on the Island of Mljet (1952-1953).* Acta Adriatica, vol. 6, No. 4, pp. 1-51, figs. 1-26.

1961. *Quelques données préliminaires sur la répartition verticale du zooplancton dans la Baie Veliko Jezero de l'Ile de Mljet pendant l'été.* Comm. Internat. Mer Médit., Rapp., vol. 16, No. 2, pp. 149-151, 1 fig.

Vyalov, O. S.

1957. *Paleogene of the Kurendagh type in Turkmenia.* [In Russian.] Soc. Nat. Mascou, Bull., n. s., vol. 62, Geol. 32, No. 6, pp. 81-92, figs. 1, 2.

Waddington, H. J.

1914. *Invertebrate marine fauna of Bournemouth and district.* Bournemouth Nat. Sci. Soc., A Natural History of . . . Bournemouth, v + 400 p., 19 pls.

Wagenaar Hummelinck, P.

1940. *General information.* Studies on the fauna of Curaçao and other Caribbean Islands, vol. 1, pp. 1-57, 8 pls., 19 text-figs.

1953. *Description of new localities.* Studies on the Fauna of Curaçao and other Caribbean Islands, vol. 4, pp. 1-108, 8 pls., 26 text-figs.

Wagenen, G. van, and Wehman, H. J.

1920. *A study of the sociality in the Madreporaria.* Iowa Acad. Sci., Proc., vol. 27, pp. 241-252, 3 pls.

Wagner, Nicolas

1885. *Die Wierbellosen des Weissen Meeres. I.* Leipzig, 171 pp., 21 pls.

Wahrberg, R., and Eliason, A.

1926. *Ny lokal för Lophohelia prolifera (Pallas) vid Svensk kust.* Fauna och Flora Uppsala, p. 256.

Wainwright, S. A.

1963. *Skeletal organization in the coral Pocillopora damicornis.* Quart. Jour. Microsc. Sci., vol. 104, No. 2, pp. 169-183, 6 figs.

1964. *Studies of the mineral phase of coral skeleton.* Exper. Cell Research, vol. 54, No. 2, pp. 213-230, figs. 1-13.

Walker, H. J.

1962. *Coral and lime industry of Mauritius.* Geogr. Rev. New York, vol. 42, No. 3, pp. 325-336, figs. 1-9.

Wallace, Alfred Russel

1869. *The Malay Archipelago: the land of the Orang-utan, and the Bird of Paradise. A narrative of travel, with studies of Man and Nature.* New York, xii + 638 pp., pls., text-figs., maps.

Walther, Johannes Kuno

1888. *Die Korallenriffe der Sinaihalbinsel, geologische und biologische Beobachtungen.* K. Sächsischen Gesell. Wiss. Leipzig, Abhandl., vol. 14, No. 10, pp. 439-506, 8 pls., 34 text-figs., map.

1893-94. *Einlautung in die Geologie als historische Wissenschaft. Beobachtungen über die Bildung der Gesteine und ihrer organischen Einschlüsse.* Jena, 3 vols., xxx + viii + 1055 pp., figs. *Die Lebensweise der Meeresthiere,* vol. 2, pp. 267-295.

Walton, C. L.

1911. *Notes on various British Anthozoa.* Marine Biol. Assoc. Plymouth, Jour., vol. 9, pp. 236-242.

Wanner, R. Johann

1902. *Die Fauna der obersten weissen Kreide der libyschen Wüste.* Palaeontographica, vol. 30, pp. 91-152, pls. 13-19.

1910a. *Beiträge zur Geologie des Ostarms der Insel Celebes.* N. Jahrb. f. Min. Stuttgart, vol. 29, pp. 739-778, 1 pl.

1910b. *Beiträge zur geologischen Kenntniss der Insel Misol (Niederlandisch Ost-Indien).* K. Nederland. Aardrijksk. Genootsch. Amsterdm, Tijdschr., ser. 2, vol. 27, pp. 469-500, 5 pls. 2 text-figs.

1913a. *Geologie von West-Timor.* Geol. Rundschau Leipzig, vol. 4, pp. 136-150, 287, 288, 1 pl.
1913b. *Zur Geologie der Inseln Obimajora und Halmahera in den Molukken.* N. Jahrb. f. Min. Stuttgart, vol. 36, pp. 560-585, 1 pl.

Watts, William Whitehead
1896. *Boring a coral reef at Funafuti.* Nature, vol. 54, pp. 201-202.

Waugh, Peggy
1937. *The variation and species of Red Sea Turbinaria and Astraeopora, with a discussion of the genera.* Zool. Soc. London, Proc. 1936, pp. 913-929, pls. 1, 2, text-figs. 1-9.

Webster, Clement L.
1889. *Contributions to the knowledge of the genus Pachyphyllum.* Amer. Natural., vol. 23, pp. 621-625.

Wedekind, Rudolf
1922. *Beiträge zur Kenntnis der Mesophyllen.* Palaeont. Zeitschr. Berlin, vol. 4, pp. 48-64, pls. 1, 2.
1933. *Coelenterata.* Handwörtebuch der Naturwissenschaften Jena, vol. 2, pp. 744-788.

Weigelt, J.
1938. *Ein indo-pazifischer Fremdling im mittel-deutschen Septarienton (schwimmenden Korallenstock).* Palaeobiologica, vol. 6, pp. 412-419, pl. 25, text-figs. 1-2.

Weisbord, Norman E.
1957. *Notes on the geology of the Cabo Blanco area, Venezuela.* Bull. Amer. Paleont., vol. 38, No. 165, 25 pp., geol. map.
1962. *Late Cenozoic gastropods from northern Venezuela.* Bull. Amer. Paleont., vol. 40, No. 193, 672 pp., 48 pls., 2 text-figs.
1964. *Late Cenozoic pelecypods from northern Venezuela.* Bull. Amer. Paleont., vol. 45, No. 204, 564 pp., 59 pls., figs. 1-8.
1964. *Late Cenozoic scaphopods and serpulid polychaetes from northern Venezuela.* Bull. Amer. Paleont., vol. 47, No. 214, pp. 111-203, pls. 19-22.
1966. *Some late Cenozoic cirripeds from Venezuela and Florida.* Bull. Amer. Paleont., vol. 50, No. 225, pp. 1-145, pls. 1-12.
1966. *A new species of dasycladacean alga from the Playa Grande Formation (Pliocene) of northern Venezuela.* Tulane Studies Geol., vol. 5, No. 1, pp. 49-52, pl. 1.
1967. *Some late Cenozoic Bryozoa from Cabo Blanco, Venezuela.* Bull. Amer. Paleont., vol. 53, No. 237, 243 pp., 12 pls.

Weiss, Charles M.
1948. *The seasonal occurrence of sedimentary marine organisms in Biscayne Bay, Florida.* Ecology, vol. 29, No. 2, pp. 153-172, figs. 1-17.

Weissermel, W.
1913. *Tabulaten und Hydrozoen. Geologische und paläontologische Beiträge zur Kenntnis der Lüderitzbucher Diamantablagerungen.* Beitr. Geol. Erforsch. Deutsche Schutzgeb., vol. 5, pp. 59-111, 7 pls.
1937. *Aus der Form-und Stammesgeschichte der Korallen.* Gesell. Naturforsch. Freunde Berlin, Sitzungsber. 1936, Nos. 4-7, pp. 219-244.

Weissermel, Waldemar Siegfried Otto
1900. *Mesozoische und känozoische Korallen aus Deutsch-Ostafrika.* Deutsch-Ostafrika, vol. 7, pp. 578-595, 2 pls.

Wells, Harry W., Wells, M. J., and Gray, I. E.
1964. *The calico scallop community in North Carolina.* Bull. Marine Sci. Gulf and Caribbean, vol. 14, No. 4, pp. 561-593, figs. 1-6. [Coelenterata p. 566.]

Wells, Harry W., and Richards, Horace Gardiner

1962. *Invertebrate fauna of coquina from the Cape Hatteras region.* Jour. Paleont., vol. 36, No. 3, pp. 586-591, fig. 1.

Wells, John West

1932a. *Study of the reef corals of the Tortugas.* Carnegie Inst. Washington, Yearbook 1931, No. 31, pp. 290-292.

1932b. *Corals of the Trinity Group of the Comanchean of central Texas.* Jour. Paleont., vol. 6, pp. 225-256, pls. 30-39.

1933. *Corals of the Cretaceous of the Atlantic and Gulf coastal plains and western interior of the United States.* Bull. Amer. Paleont., vol. 18, No. 67, pp. 85-288, pls. 14-28.

1934a. *Some fossil corals from the West Indies.* U.S. Nat. Mus., Proc., vol. 83, No. 2975, pp. 71-110, pls. 1-5.

1934b. *Note on some European Upper Cretaceous corals.* Ann. Mag. Nat. Hist., ser. 10, vol. 14, pp. 385-390.

1934c. *Eocene corals. Part I: From Cuba. Part II: A new species of Madracis from Texas.* Bull. Amer. Paleont., vol. 20, No. 70B, pp. 145-164, pls. 17-19.

1934d. *A new species of stromatoporoid from the Buda Limestone of central Texas.* Jour. Paleont., vol. 8, No. 2, pp. 169-170.

1935a. *Corals from the Cretaceous and Eocene of Jamaica.* Ann. Mag. Nat. Hist., ser. 10, vol. 15, pp. 183-194, pls. 10-12.

1935b. *The genotype of Physophyllia and a living species of Astrocoenia.* Ann. Mag. Nat. Hist., ser. 10, vol. 15, pp. 339-344, pls. 13-15.

1935c. *Notes on some turbinolian corals.* Ann. Mag. Nat. Hist., ser. 10, vol. 16, pp. 529-535, pl. 18.

1936a. *The madreporarian genus Polyastra Ehrenberg.* Ann. Mag. Nat. Hist., ser. 10, vol. 18, pp. 549-552, pls. 9, 10.

1936b. *The nomenclature and type species of some genera of Recent and fossil corals.* Amer. Jour. Sci., ser. 5, vol. 31, No. 182, pp. 97-135.

1937a. *New genera of Mesozoic and Cenozoic corals.* Jour. Paleont., vol. 11, No. 1, pp. 73-77, figs. 1-6.

1937b. *Coral studies. Part I: Two new species of fossil corals. Part II: Five new genera of the Madreporaria.* Bull. Amer. Paleont., vol. 23, No. 79, pp. 237-253, pls. 35, 36, text-figs. 1, 2.

1937c. *A new genus of the madreporarian family Eupsammiidae.* Ann. Mag. Nat. Hist., ser. 10, vol. 18, pp. 564-549, pl. 8.

1937d. *Individual variation in the rugose coral species Heliophyllum halli E. & H.* Palaeontogr. Americana, vol. 2, No. 6, pp. 1-22, pl. 1.

1940. *Two new corals from the Avenal formation (Eocene) of California.* Washington Acad. Sci., Jour., vol. 30, No. 9, pp. 374-376, figs. 1-5.

1941a. *Upper Cretaceous corals from Cuba.* Bull. Amer. Paleont., vol. 26, No. 97, pp. 286-300, pls. 42, 43, map.

1941b. *Cretaceous and Eogene corals from northwestern Peru.* Bull. Amer. Paleont., vol. 26, No. 98, pp. 301-326, pls. 44-46.

1942. *Note on fossil corals from Langley Park bore, Perth.* Roy. Soc. West Australia, Jour. (1940-41), pp. 95-96.

1944. *Cretaceous, Tertiary, and Recent corals, a sponge, and an alga from Venezuela.* Jour. Paleont., vol. 18, No. 5, pp. 429-447, pls. 69-75.

1946. *Some Jurassic and Cretaceous corals from northern Mexico.* Jour. Paleont., vol. 20, No. 1, pp. 1-7, pls. 1, 2.

1947. *Coral studies. Part III: Three new Cretaceous corals from Texas and Alabama. Part IV: A new species of Phyllangia from the*

Florida Miocene. Part V. A new Coenocyathus from Florida. Bull. Amer. Paleont., vol. 31, No. 123, pp. 163-176, pls. 10, 11.
1948. *Lower Cretaceous corals from Trinidad, B. W. I.* Jour. Paleont., vol. 22, No. 5, pp. 608-616, pls. 89-91.
1950a. *Reef corals from the Cocos-Keeling Atoll.* Raffles Mus. Singapore, Bull., No. 22, pp. 29-52, pls. 9-14.
1950b. *The coral reefs of Arno Atoll, Marshall Islands.* Sci. Investig. Micronesia (Nat. Res. Council—Pacific Science Board), Rept., No. 5, pp. i-iii, 1-19, 16 charts.
1951. *The coral reefs of Arno Atoll, Marshall Islands.* Atoll Res. Bull., No. 9, pp. i-iii, 1-14, 16 charts.
1952a. *In* Cloud, P. E., *Preliminary report on geology and marine environments of Onotoa Atoll, Gilbert Islands.* Atoll Res. Bull., No. 12, pp. 55-57.
1952b. *In* Coleman, P. G., *Foraminiferal investigations in the Perth Basin, Western Australia.* Roy. Soc. West. Australia, Jour., vol. 36, p. 35.
1953a. *Geologic studies of atolls. Handbook for atoll research (second preliminary edition). Chapter 3. Geology.* Atoll Res. Bull., No. 17, pp. 14 *et seq.*
1953b. *Mesozoic invertebrate faunas of Peru. Part 3. Lower Jurassic corals from the Arequipa region.* Amer. Mus. Novitates, No. 1631, 14 pp., text-figs.
1954a. *Status of Invertebrate Paleontology, 1953. III. Coelenterata.* Mus. Comp. Zool., Bull., vol. 112, No. 3, pp. 109-124, figs. 1-6.
1954b. *Bikini and nearby atolls. Part 2. Oceanography (biologic). Recent corals of the Marshall Islands.* U.S. Geol. Sur., Prof. Paper 260-I, pp. i-vi, 385-486, pls. 94-185.
1954c. *Bikini and nearby atolls. Part 4. Paleontology. Fossil corals from Bikini Atoll.* U.S. Geol. Sur., Prof. Paper 260-P, pp. 609-617, pls. 223, 224, figs. 167, 168.
1955a. *Recent and subfossil corals of Moreton Bay, Queensland.* Dept. Geol. Univ. Queensland, Papers, n. s., vol. 4, No. 10, pp. 4-23, pls. 1-3.
1955b. *A survey of the distribution of reef coral genera in the Great Barrier Reef region.* Rept. Great Barrier Reef Committee, vol. 6, pt. 2, pp. 21-29, chart.
1956a. *Scleractinia. In* Moore, R. C., *Treatise on Invertebrate Paleontology.* Lawrence, Univ. Kansas Press, pt. F, Coelenterata, pp. F328-443, figs. 222-444.
1956b. *Preliminary list of reef corals collected at Raroia. In* Newell, N. D., *Geological reconnaissance of Raroia (Kon Tiki) Atoll, Tuamotu Archipelago.* Amer. Mus. Nat. Hist., Bull., vol. 109, No. 3, p. 356.
1957a. *Coral reefs. In* Hedgpeth, J. W., *Treatise on marine ecology and paleoecology. Volume 1. Ecology.* Geol. Soc. Amer., Mem. 57, pp. 609-631, pls. 1-9, text-figs. 1, 2.
1957b. *Annotated bibliography. Corals. In* Hedgpeth, J W., *Treatise on marine ecology and paleoecology. Volume 1. Ecology.* Geol. Soc. Amer., Mem. 57, pp. 1087-1104, text-fig. 1.
1957c. *Annotated bibliography. Corals. in* Ladd, H. S., *Treatise on marine ecology and paleoecology. Volume 2. Paleoecology.* Geol. Soc. Amer., Mem. 67, pp. 773-782.
1958a. *Scleractinian corals.* B.A.N.Z. Antarctic Research Exped. 1929-1931, Repts., ser. B (Zoology and Botany), vol. 6, pt. 11, pp. 257-275, pls. 1-2.

1958b. *Cretaceous Coelenterata of New Jersey. In* Richards, H. G., *The Cretaceous fossils of New Jersey. Part I. Porifera, Coelenterata, Annelida, Echinoidea, Brachiopoda, and Pelecypoda.* New Jersey Geol. Sur., Paleont. ser., vol. 5, pp. 33-36, pl. 3.
1959. *Notes on Indo-Pacific scleractinian corals. I. Oryzotrochus, a new genus of turbinolian coral. II. A new species of Turbinara from the Great Barrier Reef.* Pacific Sci., vol. 13, No. 3, pp. 286-290, 11 text-figs.
1960a. [*A fossil coral*]. *In* Bartholomew, R. W., *Geology of Suvasuva Bay, West Vanna Levu.* Geol. Sur. Dept. Suva Fiji, Bull., vol. 5, p. 9.
1960b. *Corals. In* Bartholomew, R. W., *Geology of the Nandi area, western Viti Levu.* Geol. Sur. Dept. Suva Fiji, Bull., vol. 7, p. 12.
1961. *Notes on Indo-Pacific scleractinian corals. III. A new reef coral from New Caledonia.* Pacific Sci., vol. 15, No. 2, pp. 189-191, text-figs. 1-5.
1962a. *Two new scleractinian corals from Australia.* Australian Mus., Rec., vol. 25, No. 11, pp. 239-241, pls. 16-18.
1962b. *Holocene coral bank and subsidence in the Niger Delta.* Jour. Geol., vol. 70, No. 4, pp. 381-389, figs. 1-7.
1962c. *Coral fauna. In* Allen, J. R. L., and Wells, J. W., *Holocene coral banks and subsidence in the Niger Delta.* Jour. Geol., vol. 70, No. 4, pp. 389-391, pls. 3-4.
1962d. [*Lower Cretaceous corals*]. *In* K. W. Barr, *The geology of the Toco District, Trinidad, West Indies. Part I.* Overseas Geol. Min. Resources, vol. 8, No. 4, p. 394.
1963a. *Coral growth and geochronometry.* Nature, vol. 197, No. 4871, pp. 948-950, figs. 1-6.
1963b. *The Recent solitary mussid scleractinian corals.* R. Mus. Nat. Hist. Leiden, Zool. Meded., vol. 39, Feestbundel H. Boschma, pp. 375-384, pls. 20-23.
1963c. *Early investigations of the Devonian System in New York, 1656-1836.* Geol. Soc. Amer., Spec. Papers, No. 74, pp. i-v, 1-74, pls. 1-11, text-figs. 1-8.
1964a. *Ahermatypic corals from Queensland.* Dept. Zool. Univ. Queensland, Papers, vol. 2, No. 6, pp. 107-121, pls. 1-3.
1964b. *Fossil corals from Eniwetok Atoll. Bikini and nearby atolls, Marshall Islands.* U.S. Geol. Sur., Prof. Paper 260-DD, pp. 1099-1111, pls. 296-300.
1966. *Notes on Indo-Pacific scleractinian corals, part 4. A second species of Stylocoeniella.* Pacific Sci., vol. 20, pp. 203-205, figs. 1-10.

Wells, John W., and Hill, Dorothy
1956. *Anthozoa. In* Moore, R. C., *Treatise on Invertebrate Paleontology.* Lawrence, Univ. Kansas Press, pt. F, Coelenterata, pp. F161-165, fig. 132; *Ceriantipatharia,* pp. F165-166, fig. 133; *Zoantharia—general features,* pp. F231-F232; *Zoanthiniaria, Corallimorpharia, and Actiniaria,* pp. F232-F233, figs. 163, 164; *Ctenophora,* p. F478, fig. 358.

Werth, Emil
1901a. *Zur Frage der Bildung der Korallenriffe.* Gesell. Naturforsch. Freunde Berlin, Sitzungsber., pp. 35-42.
1901b. *Lebende und jungfossile Korallenriffe in Ost-Afrika.* Gesell. f. Erdkunde Berlin, Zeitschr., pp. 115-144, pls. 20-22, 5 text-figs.
1901c. *Zur Kenntniss der jüngeren Ablagerungen im tropischen Ost-Afrika.* Deutsche Geol. Gesell., Zeitschr., vol. 53, pp. 287-306.

Westall, T. S.

1950. *Some aspects of growth studies in fossils. In* Zuckerman, S., *A discussion on the measurement of growth and form.* Roy. Soc. London, Proc., vol. 137B, No. 889, pp. 490-509, figs. 22-26.

Westermann, J. H., and Kiel, H.

1961. *The geology of Saba and St. Eustatius with notes on the geology of St. Kitts, Nevis and Montserrat (Lesser Antilles).* Natuurwetensch. Studiekring Suriname en Nederlandse Antillen, No. 24, pp. i-xiii, 1-175 pp., pls. 1-33, text-figs. 1-11, Append. 1-6 (colored maps).

Weyl, Richard

1966. *Geologie der Antillen. Beiträge zur regionalen Geologie der Erde.* Berlin, 410 pp., figs., maps, tables.

Wharton, William James Lloyd

1887a. *Long lost reefs.* Nature, vol. 35, pp. 347-348.

1887b. *Masamarhu Island.* Nature, vol. 36, p. 314.

1888a. *Coral formations.* Nature, vol. 37, pp. 393-395, 3 maps.

1888b. *Foundations of coral reefs.* Nature, vol. 38, pp. 568-569.

1888c. *Account of Christmas Island, Indian Ocean.* Roy. Geogr. Soc. London, Proc., vol. 10, pp. 613-624.

1890a. *Coral reefs: fossil and Recent.* Nature, vol. 42, pp. 81, 172.

1890b. *Drowned atolls.* Nature, vol. 42, p. 222.

1897. *Foundations of coral atolls.* Nature, vol. 55, pp. 390-393, sketch.

1898. *Note on Clipperton Atoll (Northern Pacific).* Geol. Soc. London, Quart. Jour., vol. 54, pp. 228-229.

Wheeler, C. B.

1963. *Oligocene and lower Miocene stratigraphy of western and northeastern Falcon Basin, Venezuela.* Amer. Assoc. Petrol. Geol., Bull., vol. 47, No. 1, pp. 35-68, figs. 1-19.

White, Charles Abiathur

1879. *Paleontological papers, No. 11. Remarks upon certain Carboniferous fossils from Colorado, Arizona, Idaho, Utah and Wyoming, and certain Cretaceous corals from Colorado, together with descriptions of new forms.* U. S. Geol. Geogr. Sur. Territories, Bull., vol. 5, pp. 209-221, figs.

1888. *On Hindesastraea, a new generic form of Cretaceous Astraeidae.* Geol. Mag., decade, 3, vol. 5, p. 363, 5 figs.

Whiteaves, Joseph Frederick

1901. *Catalogue of the marine Invertebrata of eastern Canada.* Geol. Sur. Canada, Rept., pp. 1-272. [Coelenterata pp. 18-43.]

Whitelegge, Thomas

1898. *The Alcyonaria of Funafuti. The Madreporaria of Funafuti.* Australian Mus., Mem., vol. 3, pp. 213-225, 1 pl.; pp. 305-310, 3 pls.; pp. 345-368.

1899. *The Hydrozoa, Scyphozoa, Actinozoa, and Vermes of Funafuti. The Atoll of Funafuti, Ellise group. Pt. 7.* Australian Mus., Mem., vol. 3, pp. 369-394.

Whitfield, Robert Parr

1898. *Notice of a remarkable specimen of the West Indian coral Madrepora palmata.* Amer. Mus. Nat. Hist., Bull., vol. 10, art. 19, pp. 463-464, pl. 24.

1900a. *Observations on and descriptions of Arctic fossils.* Amer. Mus. Nat. Hist., Bull., vol. 13, pp. 13-22, pls. 1, 2.

1900b. *List of fossils, types and figured specimens, used in the palaeontological work of R. P. Whitfield, showing where they are probably to be found at the present time.* New York Acad. Sci., Ann., vol. 12, pp. 139-186. [Coelenterata pp. 144-146.]

1901a. *Notice of a remarkable case of combination between two different genera of living corals.* Amer. Mus. Nat. Hist., Bull., vol. 14, art. 17, pp. 221-222, pls. 31, 32.

1901b. *Some observations on corals from the Bahamas, with description of a new species.* Amer. Mus. Nat. Hist., Bull., vol. 14, art. 18, pp. 223, 224, pls. 33, 34.

Whitfield, Robert Parr, and Hovey, Edmund Otis

1898-99. *Catalogue of the types and figured specimens in the palaeontological collection of the Geological Department, American Museum of Natural History.* Amer. Mus. Nat. Hist., Bull., vol. 11, pp. 16-23 *(Coelenterata)*; pp. 79-88.

Whitten, H. L., Rosene, H. F., and Hedgpeth, J. W.

1950. *The invertebrate fauna of Texas coast jetties. A preliminary survey.* Inst. Marine Sci. Univ. Texas, Publ., vol. 1, No. 2B, pp. 53-87, pl. 1, text-figs. 1-4.

Wiborg, K. F.

1954. *Investigations on zooplankton in coastal and offshore waters of western and northwestern Norway.* Fiskeridir. Skr. Havundersøk., vol. 11, No. 1, pp. 1-246, figs. [Coelenterates pp. 199-200.]

1955. *Zooplankton in relation to hydrography in the Norwegian Sea.* Fiskeridir. Skr. Havundersøk., vol. 11, No. 4, pp. 1-66, figs. 1-34. [Coelenterates pp. 51-55.]

Wiens, Herold Jacob

1962. *Atoll Environment and Ecology.* New Haven and London, Yale Univ. Press, pp. i-xxii, 1-532, pls. 1-93, text-figs. 1-93.

Wilford, G. E.

1961. *The geology and mineral resources of Brunei and adjacent parts of Sarawak with descriptions of Seria and Miri oilfields.* Geol. Sur. British Territ. Borneo, Mem., vol. 10, pp. i-xx, 1-319, pls. 1-77, text-figs. 1-82. [Corals pp. 71, 248.]

Wilkes, Charles

1845. *Narrative of the United States Exploring Expedition. During the years 1838, 1839, 1840, 1841, 8142.* Philadelphia, 5 vols.

Willey, Arthur

1898-1902. *Zoological results based on material from New Britain, New Guinea, Loyalty Islands and elsewhere, collected during . . . 1895, 1896 and 1897.* Cambridge, pp. i-ix, i-vi, i-viii, 1-830, 90 pls., text-figs., map.

1913. *Notes on plankton collected across the mouth of the St. Croix River opposite to the biological station at St. Andrews, New Brunswick, in July and August 1912.* Geol. Soc. London, Proc., pp. 283-292, figs.

Willey, W., and Huntsman, A. G.

1921. *Faunal notes from the Atlantic Biological Station (1920).* Canadian Field Naturalist Ottawa, vol. 35, No. 1, pp. 1-7.

Williams, G.

1954. *Fauna of Strangford Lough and neighboring coasts.* Roy. Irish Acad., Proc., vol. 56B, No. 3, pp. 29-133, pls. 1-3. [Coelenterates pp. 47-53.]

Williams, Howel

1929. *Age of the Tahitian coral reefs.* Nature, vol. 124, pp. 727-728.

1933. *Geology of Tahiti, Morea and Maiao.* Bernice P. Bishop Mus. Honolulu, Bull., No. 105, pp. 1-89, 8 pls., 19 text-figs.

Williams, W.

1936. *A deep-water coral from southern California.* Jour. Ent. Zool. Claremont, Calif., vol. 28, pp. 27-28, fig.

1954. *The big stretch.* Natural History, vol. 63, No. 2, pp. 80-85, figs.

Wilson, D. D.
1963. *Geology of Waipara subdivision.* Geol. Sur. New Zealand, Bull., n. s., vol. 64, pp. 1-122, figs. 1-42, frontisp., map.
Wilson, Douglas P.
1949. *Notes from the Plymouth Aquarium.* Marine Biol. Assoc. Plymouth, Jour., vol. 28, No. 2, pp. 345-351, pl. 1.
1951. *Life of the Shore and Shallow Sea.* London, pp. 1-213, pls. 1-44, text-figs.
Wilson, Everett Edward
1957. *An investigation of the corals from the Cannonball Formation (Paleocene) of North Dakota.* North Dakota Acad. Sci., Proc., vol. 11, pp. 15-16. [Abstract.]
Wilson, Henry Van Peters
1888a. *Abstract of observations on the development of Manicina areolata.* Johns Hopkins Univ. Circ., vol. 7, pp. 31-33, 2 figs.
1888b. *On the development of Manicina areolata.* Jour. Morph., vol. 2, No. 2, pp. 191-252, pls. 14-20.
Wilson, Leonard R.
1956. *Composite micropaleontology and its application to Tertiary and near-Recent stratigraphy.* Micropaleontology, vol. 2, No. 1, pp. 1-6, table.
Wilson, R. L., Bergenbeck, R. E., and Finlayson, C. P.
1962. *Fossil coral reefs, Fresh Creek, Andros Island, Bahamas.* Geol. Soc. Amer., Spec. Papers, vol. 68, p. 82. [Abstract.]
Wilson-Barker, David
1888. *Coral formations.* Nature, vol. 37, pp. 604-605.
Winkler, G. G.
1861. *Der Oberkeuper, nach Studien in den bayerischen Alpen.* Deutsche Geol. Gesell., Zeitschr., vol. 13, pp. 457-521, pls. 5-9.
Wirz, D.
1935. *Die Korallen des norddeutschen Untermiozäns.* Preuss. Geol. Landesanst., Jahrb., vol. 55, No. 1, pp. 84-92, pl. 4.
Wirz, K., and Beyeler, M.
1954. *Recherches sur le zooplancton de surface dans l'ouest de la Méditerrannée occidentale en Juin et Juillet 1952. I. Partie générale.* Vie et Milieu, Suppl., No. 3, pp. 96-114, 5 figs.
Wiszwianski, H.
1909, 10. *Les îles Palau.* Soc. Neuchâteloise Géogr., Bull., vol. 20, pp. 467 *et seq.*
Wittich, Ernst [Ludwig Maximilian Emil]
1905. *Mitteloligocäner Meeresand bei Vilbel in Oberhessen.* Centralbl. f. Min. Stuttgart, Nos. 17-18, pp. 531-535.
Wolcott, Robert Henry
1940. *Animal Biology.* London, 2d ed., xxi + 649 pp., figs.
Wolff, Torben
1961. *Animal life from a single abyssal trawling.* Galathea Rept., vol. 5, pp. 129-162, pls. 7-10, text-figs. 1-26. [Coelenterates pp. 141-142, 158.]
Wollemann, [Ernst] August
1899. *Ueber Korallen aus dem Hilsconglomerat.* Vereins f. Naturwiss. Braunschweig, Jahresber., vol. 11, p. 199.
Wollemann, A., and Kloos, J. H.
1899. *Ueber das Vorkommen von Bryozoen und Korallen.* Vereins f. Naturwiss. Braunschweig, Jahresber., vol. 11, p. 200.
Wood, E. J. F., and Allen, F. E.
1958. *Common marine fouling organisms of Australian waters.* Navy Office Melbourne, pp. 1-23, pls. 1-43. [Hydrozoa pp. 11-12.]

Wood, Searles Valentine
1844. *Descriptive catalogue of the Zoophytes from the Crag.* Ann. Mag. Nat. Hist., ser. 1, vol. 13, pp. 10-21.
Wood-Jones, F. see Jones, Frederick Wood
Wood-Mason, James, and Alcock, Alfred William
1891. *Natural history notes from H. M. Indian Marine Survey steamer "Investigator." No. 21. Note on the result of last season's deep-sea dredging.* Ann. Mag. Nat. Hist., ser. 6, vol. 7, pp. 1-8; vol. 8, pp. 449-451.
Woodring, Wendell P.
1957. *Geology and paleontology of Canal Zone and adjoining parts of Panama.* U. S. Geol. Sur., Prof. Paper 306-A, pp. i-iv, 1-145, pls. 3-23. [Corals identified by J. W. Wells, pp. 21, 30, 36, 42, 50.]
1960. *Oligocene and Miocene in the Caribbean region.* Second Caribbean Geol. Conf. Mayagüez, Trans., pp. 27-32, fig. 1.
Woodring, W. P., Brown, J. S., and Burbank, W. S.
1924. *Geology of the Republic of Haiti.* Republic of Haiti Geol. Sur., 631 pp., 40 pls., 37 text-figs.
Woodring, W. P., Stewart, S., and Richards, R. W.
1940. *Geology of Kettleman Hills oilfield, California.* U. S. Geol. Sur., Prof. Paper 195, pp. 1-170, pls. 1-57, text-figs.
Woods, Rev. F. H.
1910. *Marine biology at Redcar.* Naturalist London, No. 646, pp. 408-410.
Woods, Julian Edmund Tenison
1876. *On some Tertiary fossils from Table Cape.* Roy. Soc. Tasmania, Proc., pp. 91-115.
1878a. *On the extra-tropical corals of Australia.* Linnean Soc. New South Wales, Proc., vol. 2, pp. 292-341, pls. 4-6.
1878b. *On some Australian Tertiary fossil corals and polyzoa.* Roy. Soc. New South Wales, Proc., vol. 11, pp. 183-195.
1878c. *On some fossil corals from Aldinga.* Philos. Soc. Adelaide, Trans. Proc. 1877-78, pp. 104-119, pls. 1, 2.
1879a. *On a new species of Psammoseris.* Linnean Soc. New South Wales, Proc., vol. 3, pp. 8-11, figs. 1-5.
1879b. *On a new species of Desmophyllum and a young stage of Cycloseris sinensis.* Linnean Soc. New South Wales, Proc., vol. 3, pp. 17-21, pl. 1.
1879c. *On three new genera and one new species of madreporarian corals.* Linnean Soc. New South Wales, Proc., vol. 3, pp. 96-100, pl. 10.
1879d. *On some corals from Darnley Island.* Linnean Soc. New South Wales, Proc., vol. 3, pp. 128-131, pls. 9, 11.
1879e. *On some new extra-tropical corals.* Linnean Soc. New South Wales, Proc., vol. 3, pp. 131-155, pls. 12, 13.
1879f. *In Heteropsammia michelini M. E. and H.* Linnean Soc. New South Wales, Proc., vol. 4, pp. 293-301, pl. 15.
1879g. *On some Australian Tertiary fossil corals and polyzoa.* Roy. Soc. New South Wales, Jour. Proc., vol. 12, pp. 57-61.
1879h. *On a new species of Millepora.* New Zealand Inst., Trans., vol. 11, pp. 345-347.
1880a. *Coral and Bryozoa of the Neozoic period in New Zealand.* Paleontology of New Zealand, pt. 4, xii + 34 pp., 4 pls.
1880b. *On a new species of Flabellum.* Linnean Soc. New South Wales, Proc., vol. 5, p. 301.
1880c. *On a new species of Diaseris.* Linnean Soc. New South Wales, Proc., vol. 5, pp. 459-461, pl. 15.

Wright, Bryce McMurdo
1882. *On some new species of coral.* Ann. Mag. Nat. Hist., ser. 5, vol. 9, pp. 73-78, pls. 2-4.
1884. *On new Stylasteridae.* Ann. Mag. Nat. Hist., ser. 5, vol. 13, pp. 218-219.

Wulff, R.
1916. *Ein Beitrag zur Präparation fossiler Korallen.* Centralbl. f. Min. Stuttgart, pp. 445-446.

Wurtz, C. B., and Roback, S. S.
1955. *The invertebrate fauna of some Gulf Coast rivers.* Acad. Nat. Sci. Philadelphia, Proc., vol. 107, pp. 167-206. [Coelenterata p. 178.]

Yabe, Hisakatsu
1932. *Colonial corals in the geological formations of the Japanese islands.* Imp. Acad. Japan, Proc., vol. 8, pp. 304-307.
1933a. *Corals and coral reefs. In* Vaughan, T. W., *International Committee on the Oceanography of the Pacific. Report of the chairman. Oceanographic activities according to countries. Japan.* Fifth Pan-Pacific Sci. Congr., Proc., vol. 1, p. 302.
1933b. *Geographical distribution of reef-corals in Japan, past and present.* Japanese Assoc. Adv. Sci., Proc., vol. 8, No. 3. Also, Fifth Pacific Sci. Congr. Canada, Proc., vol. 4, pp. 3115-3116, 1934.
1940. *Recent progress in paleontology in the Japanese Empire.* Sixth Pacific Sci. Congr. California, Proc., vol. 2, pp. 451-458.
1942. *Problems of the coral reefs.* Geol. Paleont. Inst. Tôhoku Imp. Univ., Rept., vol. 39, pp. 1 *et seq.*
1955. *The second discovery of Graphularia-like bodies from the Tertiary of Japan.* Imp. Acad. Japan, Proc., vol. 31, No. 5, pp. 288-293, text-figs. 1-5.

Yabe, H., and Aoki, R.
1922. *Reef conglomerate with small pellets of Lepidocyclina limestone found on the Jaluit Atoll.* Japanese Jour. Geol. Geogr., vol. 1, pp. 39.

Yabe, H., and Eguchi, M.
1932a. *Report of the biological survey of Mutsu Bay. 23. Rhizopsammia minuta van der Horst var. mutsuensis nov., an eupsammid coral.* Tôhoku Imp. Univ., Sci. Rept., ser. 4, Biology, vol. 7, No. 2, pp. 206-209, pl. 9.
1932b. *Some Recent and fossil corals of the genus Stephanophyllia H. Michelin from Japan.* Tôhoku Imp. Univ., Sci. Rept., ser. 2, Geology, vol. 15, pp. 55-64, pls. 8, 9.
1932c. *A study of the Recent deep-water coral fauna of Japan.* Imp. Acad. Japan, Proc., vol. 8, No. 8, pp. 387-390, 3 figs.
1932d. *Deep-water corals from the Riukiu Limestone of Kikai-jima, Riukiu Islands.* Imp. Acad. Japan, Proc., vol. 8, No. 9, pp. 442-445, 1 fig.
1932e. *Notes on a fossil turbinolian coral, Odontocyathus japonicus nov. sp., from Segoe, near Takaokamachi, province of Hyuga.* Japanese Jour. Geol. Geogr., vol. 9, Nos. 3, 4, pp. 149-153, pl. 14, 3 text-figs.
1932f. *A new species of Endopachys, Endopachys japonicum, from a younger Cenozoic deposit of Japan.* Japanese Jour. Geol. Geogr., vol. 10, Nos. 1-2, pp. 11-17, pl. 2.
1932g. *Corals of the genera Heteropsammia and Oulangia from Japan.* Japanese Jour. Geol. Geogr., vol. 10, Nos. 1-2, pp. 19-31, pls. 3, 4.
1933. *Supplementary notes on Oulangia stokesiana var. miltoni Yabe and Eguchi.* Japanese Jour. Geol. Geogr., vol. 10, pp. 83-85, figs.

1934. *Probable generic identity of Stephanophyllia Michelin and Micrabacia M. Edwards and J. Haime.* Imp. Acad. Japan, Proc., vol. 10, No. 5, pp. 278-281, figs.
1935a. *Oxyphyllia, a new genus of hexacorals.* Imp. Acad. Japan, Proc., vol. 11, pp. 376-378, figs.
1935b. *Revision of the reef coral genera Echinopora, Oxyphyllia, Mycedium, Oxypora and Physophyllia.* Imp. Acad. Japan, Proc., vol. 11, pp. 429-431.
1936a. *Eohydnophora, a new genus of Cretaceous corals.* Imp. Acad. Japan, Proc., vol. 12, pp. 141-143, 3 figs.
1936b. *Deep-water corals from off Owasi, Mie Prefecture.* Imp. Acad. Japan, Proc., vol. 12, pp. 167, 168, 3 figs.
1937. *Notes on Deltocyathus and Discotrochus from Japan.* Tôhoku Imp. Univ., Sci. Rept., ser. 2, Geology, vol. 19, No. 1, pp. 127-147, pl. 20.
1941a. *Simple corals from the Sumagai formation in the Philippine Islands.* Imp. Acad. Japan, Proc., vol. 17, pp. 210-215, figs.
1941b. *On some simple corals from the Neogene of Java.* Imp. Acad. Japan, Proc., vol. 17, pp. 269-273, figs.
1942a. *Fossil and Recent Flabellum from Japan.* Tôhoku Imp. Univ., Sci. Rept., ser. 2, Geology, vol. 22, No. 2, pp. 87-103, pls. 5-8.
1942b. *Fossil and Recent simple corals from Japan.* Tôhoku Imp. Univ., Sci. Rept., ser. 2, Geology, vol. 22, No. 2, pp. 105-178, pls. 9-12.
1943. *Note on the two hexacoralla Goniocorella dumosa (Alcock) and Bantamia gerthi, gen. et sp. nov.* Imp. Acad. Japan, Proc., vol. 19, pp. 494-500, figs.
1944. *Note on a fossil Dendrophyllia from the Miocene of the Tugaru District in Amori-Ken.* Geol. Soc. Japan, vol. 51, No. 607, pp. 135-137.
1946. *Generic identity of Notocyathus Tenison-Wood and Citharocyathus Alcock.* Imp. Acad. Japan, Proc., vol. 22, pp. 6-8, figs.

Yabe, H., and Ehara, E.
1936. *Two new corals from Taiwan.* Imp. Acad. Japan, Proc., vol. 12, pp. 25-27, figs.

Yabe, H., and Hanzawa, S.
1924. *Geological age of the raised coral reefs of the Riukiu Islands and Taiwan.* Second Pan-Pacific Sci. Congr. Australia, Proc., vol. 2, pp. 1135-1143.

Yabe, H., and Hatasaka, I.
1920. *III. Paleontology of southern China.* Tokyo Geogr. Soc., Geographic Research in China 1911-1916, Rept., 221 pp., 28 pls. in 3 vols.

Yabe, H., and Sugiyama, T.
1931a. *A study of Recent and semi-fossil corals of Japan. I. Antillia. II. Caulastraea.* Tôhoku Imp. Univ., Sci. Rept., ser. 2, Geology, vol. 14, No. 2, pp. 119-133, pls. 37-39, 1 text-fig.
1931b. *Reef-building coral fauna of Japan.* Imp. Acad. Japan, Proc., vol. 7, No. 9, pp. 357-360.
1932a. *A living species of Stylocoenia recently found in Japan.* Japanese Jour. Geol. Geogr., vol. 9, Nos 3-4, pp. 153-154, pl. 15.
1932b. *Reef corals found in Japanese seas.* Tôhoku Imp. Univ., Sci. Rept., ser. 2, Geology, vol. 15, pp. 145-168.
1932c. *Some Recent and fossil corals of the genus Stephanophyllia H. Michelin from Japan.* Tôhoku Imp. Univ. Sendai, Sci. Rept., ser. 2, vol. 15, No. 2, pp. 55-63, pls. 8-9, text-figs. 1-3.
1933. *Notes on three new corals from Japan.* Japanese Jour. Geol. Geogr., vol. 11, pp. 11-18, pls. 2-4.
1934. *A new species of Disjectopora from Japan.* Japanese Jour. Geol. Geogr., vol. 11, Nos. 3, 4, pp. 171-174, 1 pl., 1 text-fig.

1935a. *Note on a new fossil coral, Saipania tayami, gen. et sp. nov., found in the Island Saipan, Mariana Group.* Japanese Jour. Geol. Geogr., vol. 12, Nos. 1, 2, pp. 5-7, pls. 2, 3, 2 text-figs.
1935b. *Stylocoeniella, a new coral genus allied to Stylocoenia and Astrocoenia.* Japanese Jour. Geol. Geogr., vol. 12, Nos. 3-4, pp. 103-105, pl. 15.
1935c. *Revised lists of the reef corals from the Japanese seas and of the fossil reef corals of the raised reefs and the Ryukyu Limestone of Japan.* Geol. Soc. Japan, Jour., vol. 42, No. 502, pp. 379-403, pls. 9, 10.
1935d. *A new living coral, Pseudosiderastrea tayami, from Dobo, in Wamar, Aru Islands.* Imp. Acad. Japan, Proc., vol. 11, pp. 373-375, figs.
1935e. *Geological and geographical distribution of reef-corals in Japan.* Jour. Paleont., vol. 9, pp. 183-217, pl. 21.
1936. *Some deep-water corals from the Palao Islands.* Imp. Acad. Japan, Proc., vol. 12, No. 10, pp. 346-349, 5 figs.
1937a. *On some reef-building corals of a raised coral reef of Mindanao (Philippine Islands).* Imp. Acad. Japan, Proc., vol. 13, No. 10, pp. 421-424, 2 figs.
1937b. *Two new species of reef-building coral from Yoron-zima and Amami-Ô-sima.* Imp. Acad. Japan, Proc., vol. 13, No. 10, pp. 425-429, 4 figs.
1937c. *Sundry notes on living and fossil Tubipora.* Geol. Soc. Japan, Jour., vol. 44, No. 522, pp. 249-254, pls. 3, 4.
1937d. *On a Graphularia-like fossil from the Pleistocene Tyoka beds of Tokyo.* Geol. Soc. Japan, Jour., vol. 44, No. 531, pp. 1227-1230, 4 figs.
1939a. *Two new interesting Tertiary Hydrozoa from the Philippine Islands.* Geol. Soc. Japan, Jour., vol. 46, No. 546, pp. 145-148, pl. 9.
1939b. *Note on Eomontipora ? from the Eocene of the Palau Islands.* Geol. Soc. Japan, Jour., vol. 46, No. 548, pp. 258-260, 2 figs.
1940. *Notes on Heterophyllia and Hexaphyllia.* Geol. Soc. Japan, Jour., vol. 47, No. 557, pp. 81-86, pl. 4, 2 text-figs.
1941a. *Pseudoromingeria, a new genus of auloporoids from Japan.* Imp. Acad. Japan, Proc., vol. 17, pp. 379-382, figs.
1941b. *Cebuphyllia chitanii, gen. et sp. nov., a new fossil astreoporoid coral from Cebu, Philippine Islands.* Imp. Acad. Japan, Proc., vol. 17, pp. 421-424, figs.
1941c. *Recent reef-building corals from Japan and the South Sea Islands under the Japanese mandate. II.* Tôhoku Imp. Univ., Sci. Rept., ser. 2, Geology, spec. vol. 2, pp. 67-91, pls. 60-104.
1941d. *Corals of Toyama Bay.* Biogeogr. Soc. Japan, Bull., vol. 11, No. 12, pp. 101-104, figs.
1941e. *Discovery of Circoporella semiclathrata Hayasaka from Hokkaidô.* [In Japanese, with English resumé.] Geol. Soc. Japan, Jour., vol. 48, No. 568, pp. 38-42, fig.
1942a. *Younger Cenozoic reef-corals from the Nabire beds of Nabire, Dutch New Guinea.* Imp. Acad. Japan, Proc., vol. 18, pp. 16-23, figs.
1942b. *Notes on Anisocoenia Reuss and Favoidea Reuss.* Imp. Acad. Japan, Proc., vol. 18, pp. 194-199, figs.

Yabe, H., Sugiyama, T., and Eguchi, M.

1936. *Recent reef-building corals from Japan and the South Sea Islands under the Japanese mandate. I.* Tôhoku Imp. Univ., Sci. Rept., ser. 2, Geology, spec. vol. 1, pp. 1-66, pls. 1-59.

Yabe, H., and Tayama, R.

1937. *Depth of the atoll-lagoons in the South Sea Islands.* Imp. Acad. Japan, Proc., vol. 13, No. 2, pp. 50-52, 2 figs.

Yabe, H., and Yino, T.

1932. *Khmeria problematica Mansuy from Japan.* Japanese Jour. Geol. Geogr., vol. 10, Nos. 1-2, pp. 61-65, 1 pl., 1 text-fig.

Yamazi, Isamu

1952. *Plankton investigations in inlet waters along the coast of Japan. III-IV.* Seto Marine Biol. Lab., Publ., vol. 2, No. 2, pp. 289-330, figs.

1958. *Preliminary check-list of plankton organisms found in Tanabe Bay and its environs.* Seto Marine Biol. Lab., Publ., vol. 7, pp. 111-163. [Coelenterates pp. 135-140.]

Yeudo, Kichisaburo

1905. *A revised list of coralline.* College Sci. Imp. Univ. Tokyo, Jour., vol. 20, No. 12, p. 46.

Ying, T.

1934. *On the seasonal change of growth in a reef coral, Favia speciosa (Dana) and the water-temperature of the Japanese seas during the latest geological times.* Imp. Acad. Japan Tokyo, Proc., vol. 10, No. 6, pp. 353-357, 10 figs.

Yokoyama, M.

1923. *Fossils from the lower bed in the Joban coal field.* [In Japanese.] Geol. Soc. Japan Tokyo, Jour., vol. 30, p. 209.

Yonge, Charles Maurice

1930a. *Studies on the physiology of corals. I. Feeding mechanisms and food.* Great Barrier Reef Exped. 1928-29, Sci. Rept., vol. 1, No. 2, pp. 13-57, pls. 1, 2, text-figs. 1-34.

1930b. *Studies on the physiology of corals. II. Digestive enzymes. With notes on the speed of digestion* (by A. G. Nicholls). Great Barrier Reef Exped. 1928-29, Sci. Rept., vol. 1, No. 3, pp. 59-81, text-figs. 1-6, tables 1-18.

1930c. *A Year on the Great Barrier Reef.* London, xx + 246 pp., 83 pls., 6 charts.

1930d. *The Great Barrier Reef of Australia.* Nature, vol. 126, pp. 206-210, 4 figs.

1931a. *Studies on the physiology of corals. III. Assimilation and excretion.* Great Barrier Reef Exped. 1928-29, Sci. Rept., vol. 1, No. 4, pp. 83-91, pl. 1, text-fig. 1.

1931b. *The significance of the relationship between corals and Zooxanthellae.* Nature, vol. 128, p. 309-311.

1931c. *The Great Barrier Reef Expedition 1928-29.* Rept. Great Barrier Reef Comm. Brisbane, vol. 3, pp. 1-25, 6 pls.

1932. *A note on Balanophyllia, the only eupsammid coral in the British fauna.* Marine Biol. Assoc. Plymouth, Jour., vol. 18, No. 1, pp. 219-224, figs. 1, 2.

1934a. *Observations upon the ecology and physiology of corals.* Carnegie Inst. Washington, Yearbook 1934, No. 33, p. 263.

1934b. *Origin and nature of the association between invertebrates and unicellular algae.* Nature, vol. 134, p. 12.

1935a. *Studies on the biology of Tortugas corals. I. Observations on Meandra areolata Linn.* Carnegie Inst. Washington, Publ. No. 452, Papers Tortugas Lab., vol. 29, pp. 185-198, pls. 1-3.

1935b. *Studies on the biology of Tortugas corals. II. Variation in the genus Siderastrea.* Carnegie Inst. Washington, Publ. No. 425, Papers Tortugas Lab., vol. 29, No. 9, pp. 199-208, pl. 1.

1935c. *"Symbiosis" between invertebrates and unicellular algae.* Linnean Soc. London, Proc. 1934-1935, pp. 90-101.

1937. *Studies on the biology of Tortugas corals. III. The effect of mucus on oxygen consumption.* Carnegie Inst. Washington, Publ. No. 475, Papers Tortugas Lab., vol. 31, No. 9, pp. 209-214.

1940a. *The biology of reef-building corals.* Great Barrier Exped. 1928-29, Sci. Rept., vol. 1, No. 13, pp. 353-391, pls. 1-6, 2 text-figs.

1940b. *Observations on the biology of coral reefs.* Sixth Pac. Sci. Congr., Proc., vol. 3, pp. 605-613, fig.

1951. *The form of coral reefs.* Endeavour, vol. 10, No. 39, pp. 136-144, figs.

1954. *The Great Barrier Reef of Australia.* Zoo Life, vol. 9, pp. 66-71, figs.

Yonge, C. M., and Nicholls, A. G.

1931a. *Studies on the physiology of corals. IV. The structure, distribution and physiology of the Zooxanthellae.* Great Barrier Reef Exped. 1928-29, Sci. Rept., vol. 1, No. 6, pp. 135-176, pls. 1-2, text-figs. 1-19, tables 1-8.

1931b. *Studies on the physiology of corals. V. The effect of starvation in light and darkness on the relationship between corals and Zooxanthellae.* Great Barrier Reef Exped. 1928-29, Sci. Rept., vol. 1, No. 7, pp. 177-211, pls. 1-3, text-figs. 1-6, tables 1-3.

Yonge, C. M., Yonge, M. S., and Nicholls, A. G.

1932. *Studies on the physiology of corals. VI. The relationship between respiration in corals and the production of oxygen by their Zooxanthellae.* Great Barrier Reef Exped. 1928-29, Sci. Rept., vol. 1, No. 8, pp. 213-251, text-figs. 1-4, table 1-12.

Yoshiwara, Shigeyasu

1901a. *Notes on the raised coral reefs in the islands of the Riukiu Curve.* College Sci. Imp. Univ. Tokyo, Jour., vol. 16, No. 1, pp. 1-14, 2 pls.

1901b. *Geologic structure of the Riukiu (Loochoo) Curve and its relation to the northern part of Formosa.* College Sci. Imp. Univ. Tokyo, Jour., vol. 16, No. 2, pp. 1-67, pl.

1902. *Geological age of the Ogasawara Group (Bonin Islands) as indicated by the presence of Nummulites.* Geol. Mag., vol. 9, pp. 296-303, maps.

Young, John

1877a. *On turbinated corals from Cunningham Bedland, Dalry.* Nat. Hist. Soc. Glasgow, Proc., vol. 3, pp. 169-170.

1877b. *Corals in the Hunterian Museum figured by Ellis and Solander.* Ann. Mag. Nat. Hist., ser. 4, vol. 19, p. 116.

1880. *The spiral character of Coelenterata development.* Ann. Mag. Nat. Hist., ser. 5, vol. 5, No. 27, p. 212.

1883. *On Ure's "Millepore." Tabulipora (Cellepora) urii, Flem.* Ann. Mag. Nat. Hist., ser. 5, vol. 12, p. 154.

Young, M. W.

1929. *Marine fauna of the Chatham Islands.* New Zealand Inst., Trans. Proc., vol. 60, pp. 149-150.

Zahl, P. A.

1957. *On Australia's coral ramparts.* Nat. Geogr. Mag., vol 111, No. 1, pp. 1-48, figs.

Zahl, P. A., and McLaughlin, J. J. A.

1957. *Isolation and cultivation of Zooxanthellae.* Nature, vol. 180, No. 4578, pp. 199-200.

Zalokar, Marko
1955. *"Degenerate" coelenterates.* Syst. Zool., vol. 4, No. 4, pp. 191-192.
Zanevald, J. S., and Verstappen, H. T.
1952. *A recent investigation about the geomorphology and the flora of some coral islands in the Bay of Djakarta.* Jour. Sci. Research Djakarta, vol. 1, No. 2, pp. 38-43; No. 3, pp. 58-66, figs.
Zans, V. A.
1958a. *The Pedro Cay and Pedro Bank. Report on the survey of the Cays 1955-1957.* Geol. Sur. Dept. Jamaica, W.I., Bull. No. 3, pp. i-vi, 1-47, pls. 1-25 (figs. 1-50), figs. I-III, maps 1-5.
1958b. *Recent coral reefs and reef environments of Jamaica.* Geonotes, vol. 1, No. 2, pp. 18-25.
1959. *Recent stony corals of Jamaica.* Geonotes, vol. 2, No. 1, pp. 27-36.
1960. *Recent coral reefs and reef environment of Jamaica.* Caribbean Geol. Confer., Trans., vol. 2, p. 58.
Zbyszewski, Georges
1948. *O Miocenico marinho da região de Bensafrim (Algarve).* Soc. Geol. Portugal, Bol., vol. 7, Nos. 1, 2, pp. 55-56, pls., text-figs.
1954. *L'Aquitanien supérieur de Lisbonne et du Ribatejo.* Serv. Geol. Portug., Comunic., vol. 35, pp. 99-153. [Corals pp. 115-116.]
1957. *Le Burdigalien de Lisbonne.* Serv. Geol. Portug., Comunic., vol. 38, No. 1, pp. 91-226, pls. 1-19.
Zbyszewski, Georges, and Veiga Ferreira, Octavia da
1962. *La faune miocène de l'île de Santa Maria (Açores).* Serv. Geol. Portug., Comunic., vol. 46, pp. 247-289, pls. 1, 2, text-figs. [Corals p. 250.]
Zei, M.
1942. *Biologische Ergebnisse eininger Forschungsreisen in der Adria.* Arch. Oceanogr. Limnol. Roma, vol. 2, Nos. 2-3, pp. 171-195, figs. [Coelenterates p. 189.]
Zeller, Gustav Hermann von
1883. *Algen und Zoophyten in Nordischen Meer und Siberien.* Vereins Vaterland. Naturk. Württemberg, Jahreshef., vol. 39, pp. 104-106.
Zenkevitch, L.
1963. *Biology of the seas of the U.S.S.R.* [Translated into English by J. Botcharskaya.] London, 955 pp., 427 figs.
Zeuner, Friedrich Eberhard
1959. *The Pleistocene Period, its climate, chronology and faunal succession.* London, 2nd ed., xviii + 447 pp., figs. 1-78.
Zevina, G. B.
1963. *Fouling in the White Sea.* [Russian with English summary.] Inst. Okeanol. Moskva, Trud., vol. 70, pp. 52-71, figs. 1-10.
Zevina, G. B., Kuznetsova, I. A., and Starostin, I. V.
1963. *The composition of fouling in the Caspian Sea.* [Russian with English summary.] Inst. Okeanol. Moskva, Trud., vol. 70, pp. 3-25, figs. 1-9.
Zimmerman, Hans
1906-1907. *Thierwelt am Strande der blauen Adria. Eine naturwissenschaftliche Skizze zur Erlangung einer Uebersicht der Fauna von Rovigno (Istrien), sowie zur Einführung in die Sammeltechnik.* Zeitschr. Naturwiss. Stuttgart, vol. 78, pp. 292-322.
Zinck, K.
1955. *Of corals and things.* Aquarium Philadelphia, vol. 24, No. 11, pp. 340-344, 350, 7 figs.
Zlatarski, V.
1963a. *Sur Stylocoenia taurensis (Michelin), madréporaire du Tertiaire*

méditerranéen. Univ. Sofia Facul. Biol., Géol., Géogr., Ann., vol. 56, No. 2, Géol. 1961-1962, pp. 61-72, pls. 1-5.
1963b. *Sur Stylocoenia delicata Oppenheim, madréporaire du Tertiaire de France.* Univ. Sofia Facul. Biol., Géol., Géogr., Ann., vol. 56, No. 2, Géol. 1961-1962, pp. 73-77, pls. 1-3.

Zuffardi-Comerci, Rosina

1921. *Fauna del neo-Cretacico della Tripolitania: Coelenterati.* Descr. Cart. Geol. Ital., Mem., vol. 8, pt. 1, pp. 1-23, 3 pls.
1924. *Subtilicyathus nuovo genere di corallario.* Uff. Geol. Italiana Roma, Boll., vol. 49, 5 pp., 1 pl.
1925. *Coralli Cenozoici della Cirenaica.* Uff. Geol. Italiana Roma, Boll., vol. 50, pp. 1-28, pls. 1-3.
1927a. *Contributo alla fauna Turoniano di Calloneghe nel Cansiglio.* Gior. Geol. Bologna, ser. 2, vol. 2, p. 75.
1927b. *Faunetta di corallari Pliocenici dell'Isola di Rodi.* R. Accad. Sci. Torino, Atti, vol. 62, pp. 629-637, figs.
1929. *Coralli.* Resultati Scient. Missione Oasi di Giarabub, vol. 1, pp. 203-208.
1933. *Corallari-Zoantari fossili del Miocene della "Collina di Torino."* Palaeontogr. Italica Siena, vol. 33, pp. 85-132, 4 pls., 9 text-figs.
1935. *Corallari Paleogenici dell'Isola di Rodi.* R. Accad. Sci. Torino, Atti, vol. 70, pt. 1, No. 3, pp. 411-429, 2 figs.
1936. *Corallari Neogenici del Sahel Eritreo.* R. Accad. Sci. Torino, Atti, vol. 71, pt. 1, No. 2a, pp. 205-219, 1 pl.
1937a. *Di alcuni corallari dell'Eocene Istriano.* R. Accad. Sci. Torino, Atti, vol. 72, pp. 128-139, 1 pl.
1937b. *Contributo dato dai corallari durante i periodi geologici alla formazione dei terreni calcarei in Italia.* Riv. Italiana Paleont. Pavia, vol. 43, No. 1, pp. 9-35.
1937c. *Corallari Oligocenici e Miocenici della Somalia.* Palaeontogr. Italica, vol. 32, Suppl. 2, pp. 265-301, pls. 23-26.
1939. *Nuovi contributo allo studio di corallofauna della Tripolitania.* R. Accad. Sci. Torino, Atti, vol. 74, No. 1, pp. 147-156.
1940. *Nuovi contributo allo studio di corallofauna Cenozoiche della Sirtica (Libia).* Mus. Libico Storia Nat., Ann., vol. 2, pp. 203-210, figs.

Zvejska, Fr.

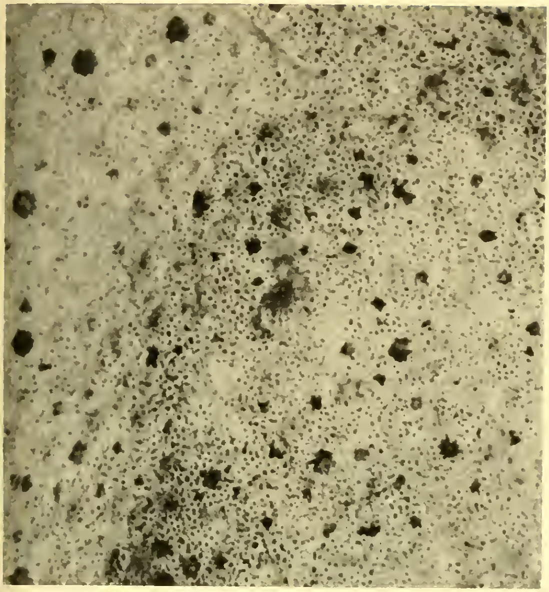
1946. *Horniny kridového útvaru v okolí Kumstátu.* Zemské Mus. Brno Morav., Čas., vol. 30, No. 2, pp. 127-161, pl. 1. [Corals p. 161.]

PLATES

EXPLANATION OF PLATE 1

Specimen B562a, 27555 PRI. Width 54 mm, height 50 mm. 1, 2. Views of opposite sides of frond, X 0.9. 3. Same as figure 2 but double natural size. 4. Greatly magnified view showing the porous structure of the coenosteum, a number of alveolae, and the cyclosystems of dactylopores around the gastropores. Recent. Washed up on beach southeast of Higuerote, State of Miranda.

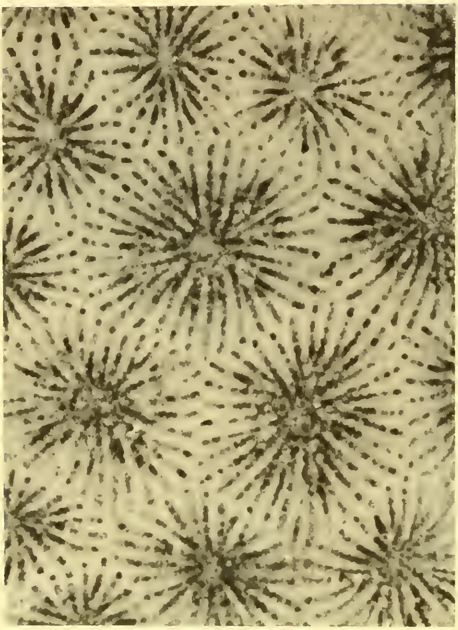
1



4

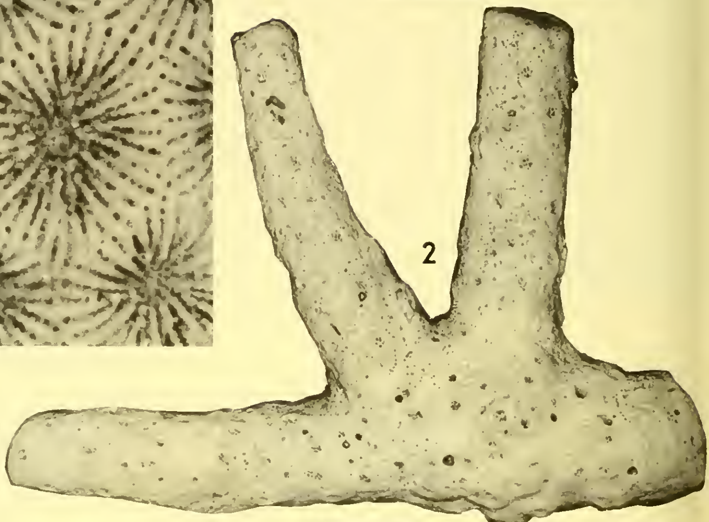
2

3

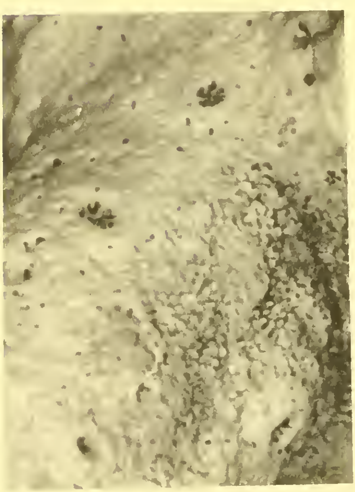


5

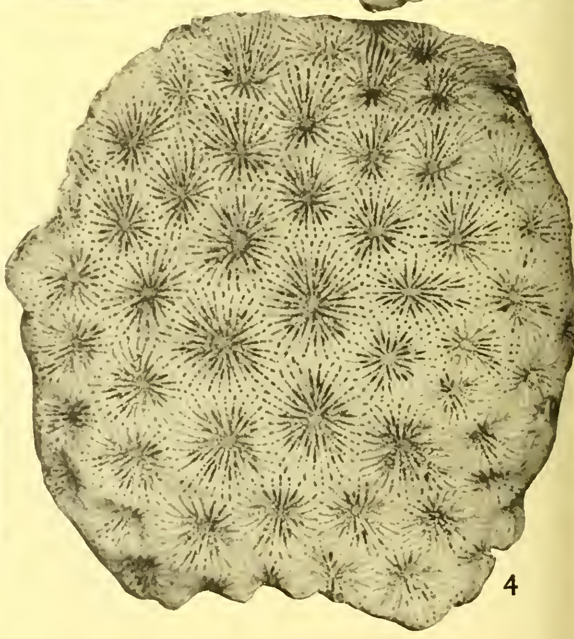
1



2



3



4

EXPLANATION OF PLATE 2

Figure *Page*

1-3. **Acropora prolifera** (Lamarck) 21

Specimen B563a, 27556 PRI. Length of largest branch of corallum 46 mm. 1. One side of corallum, X 1.2. 2. Opposite side of corallum, X 2. 3. View of crotch between branches showing papillose coenosteum, X 8. Recent. Washed up on beach southeast of Higuerote, State of Miranda.

4,5. **Siderastrea (Siderastrea) radians** (Pallas) 28

Specimen B569a, 27557 PRI. Length of corallum 25 mm, width 23 mm. 4. Calicular surface, X 3. 5. View showing details of calices, X 6. Recent. Washed up on beach southeast of Higuerote, State of Miranda.

EXPLANATION OF PLATE 3

Figure *Page*

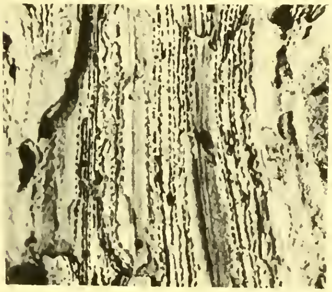
1-5. **Siderastrea (Siderastrea) siderea** (Ellis and Solander) 33

Specimen S567a, 27558 PRI. Corallum length 78 mm, width 63 mm, height 86 mm. 1. Lateral view of corallum, X 0.8. Note pelecypod valves in boring at lower left. 2, 3. View of calices looking down on upper surface of corallum, X 3. 4, 5. Views of side showing exposed costae and synapticulae. Playa Grande Formation (Maiquetía Member). Lower Pliocene.

1

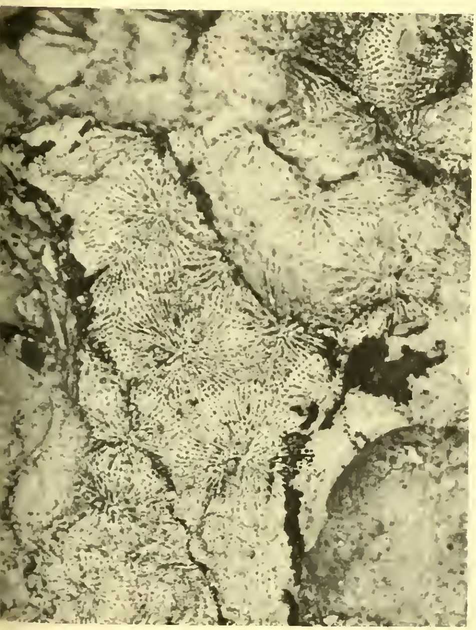
4

5

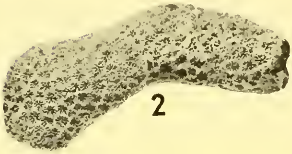


3

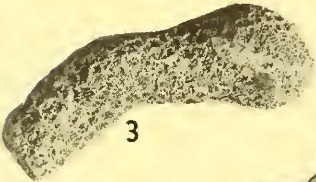
2



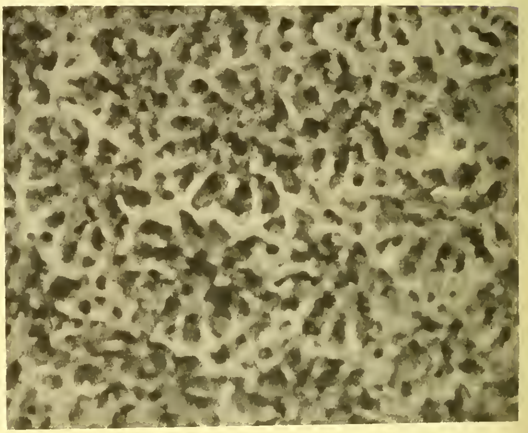
1



2



3



4

5

Explanation of Plate 4

Figure *Page*

1-4. **Porites furcata** Lamarck 38

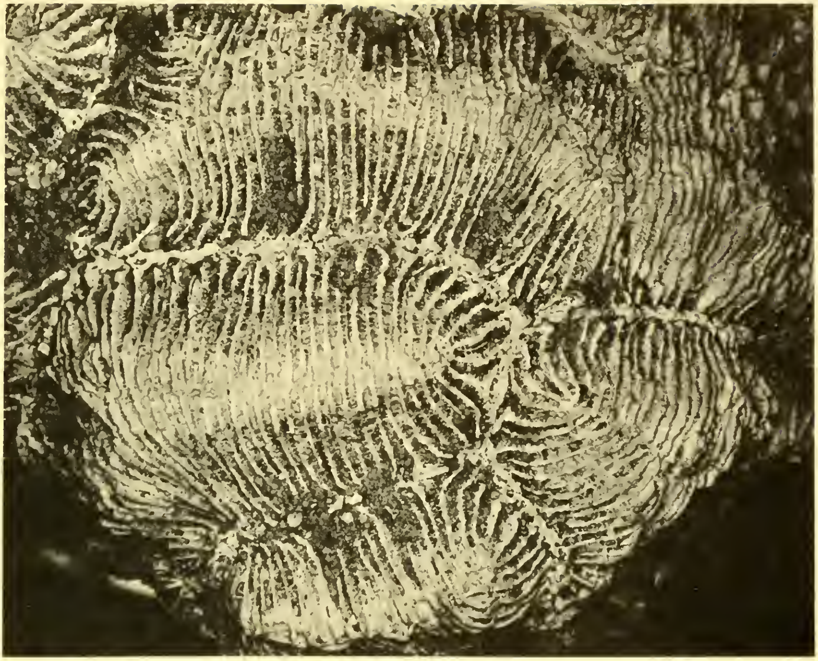
Specimen A575a, 27559 PRI. Length of branch 32.5 mm. 1. View of one side, X 3. 2. View of same side, slightly enlarged. 3. View of opposite side, slightly enlarged. 4. View of calices showing pali, X 10. Recent. Washed up on beach of Playa Grande Yachting Club, Distrito Federal.

5. **Manicina areolata puntagordensis,** n. subsp. 51

Holotype (S566a), 27560 PRI. Length 119 mm, width 92 mm, height 63 mm. About natural size. Playa Grande Formation (Maiquetía Member). Lower Pliocene. (See Pl. 5, figs. 1-5; Pl. 12, fig. 4 for other views of same specimen.)

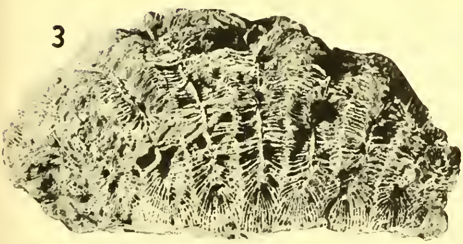
EXPLANATION OF PLATE 5

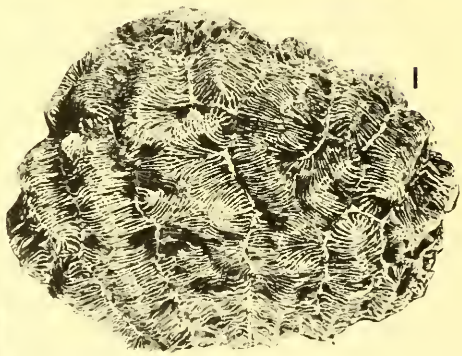
Holotype (S566a), 27560 PRI. Length 119 mm, width 92 mm, height 63 mm. 1-3. Views of upper surface, base, and side, X 0.5. 4. Portion of base enlarged to show character of costae and epitheca. 5. Enlargement of upper surface of corallum showing columellas, collines, valleys, and septa. Playa Grande Formation (Maiquetía Member). Lower Pliocene. (See Pl. 4, fig. 5; Pl. 12, fig. 4 for other views of same specimen.)



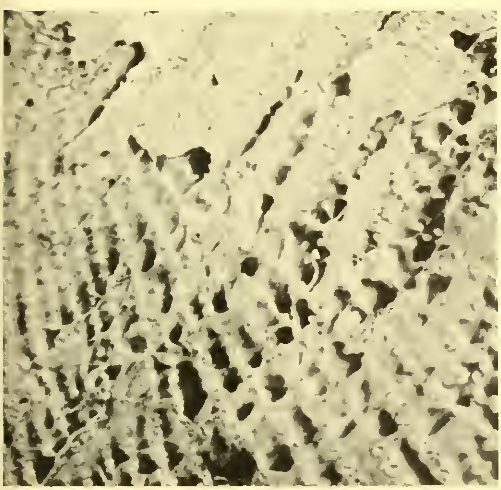
5

3



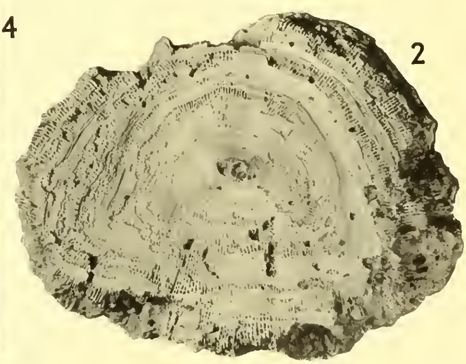


1



4

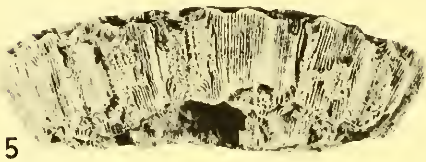
2



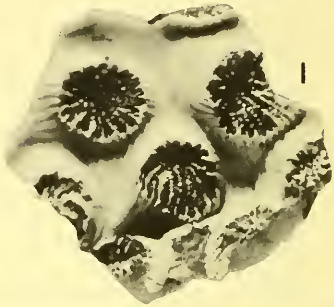
3

4

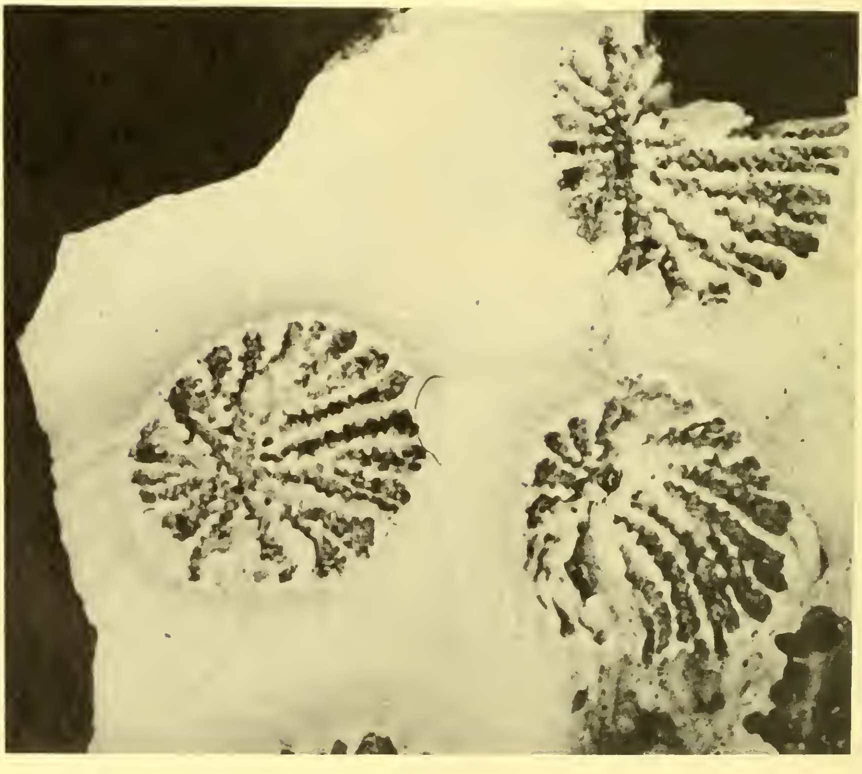
5



1



2



Explanation of Plate 6

Figure *Page*

1,2. **Oculina** sp. cf. **O. valenciennesi** Edwards and Haime 65
Specimen 1571a, 27561 PRI. Corallum length 14 mm, width 13 mm, thickness 2.2 mm. 1. View of calicular surface, X 3. 2. View of calices, X 12. Lower Mare Formation. Lower Pliocene.

3-5. **Diploria strigosa** (Dana) 48
Specimen N565a, 27562 PRI. Corallum length 120 mm, width 80 mm, thickness 30 mm. Views of upper surface, lower surface, and side, X 0.5. Playa Grande Formation (Catia Member). Lower Pliocene. (See Pl. 7, fig. 1 for details of costae and columella.)

EXPLANATION OF PLATE 7

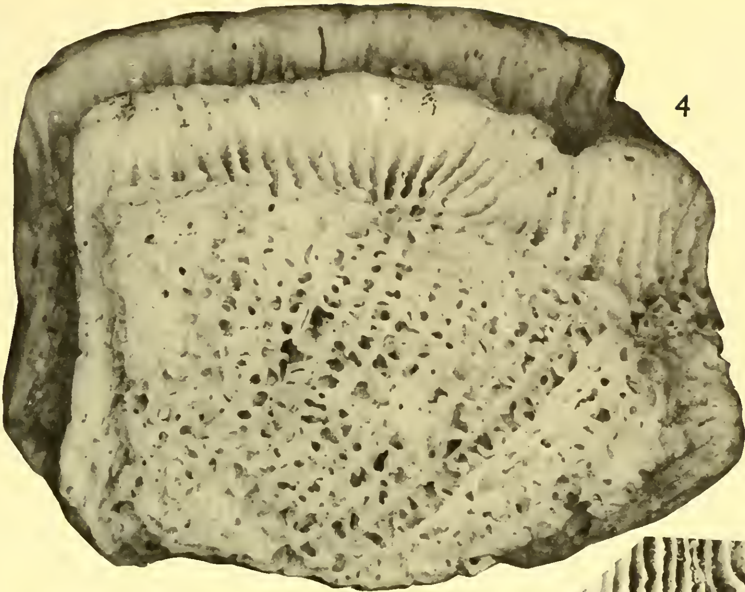
Figure *Page*

1. **Diploria strigosa** (Dana) 46

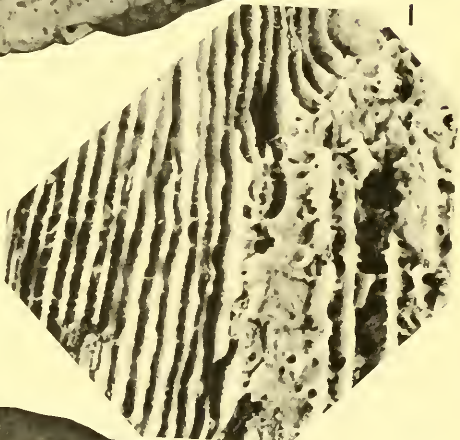
   Specimen N565a, 27562 PRI. Enlarged view of side showing details of exposed costae and columella. Playa Grande Formation (Catia Member). Lower Pliocene. (See Pl. 6, figs. 3-5 for views of corallum.)

2-4. **Diploria strigosa** (Dana) 46

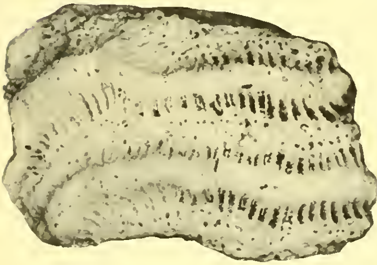
   Specimen A565a, 27563 PRI. Corallum fragment, length 25 mm, width 14 mm, height 20 mm. 2. View of upper surface showing collines, valleys, septa, and columella, X 2. 3. Same as fig. 2, X 4. 4. Longitudinal view along columella showing septa (above) and costae on side, X 4. Recent. Washed up on beach of Playa Grande Yachting Club, Distrito Federal.



4

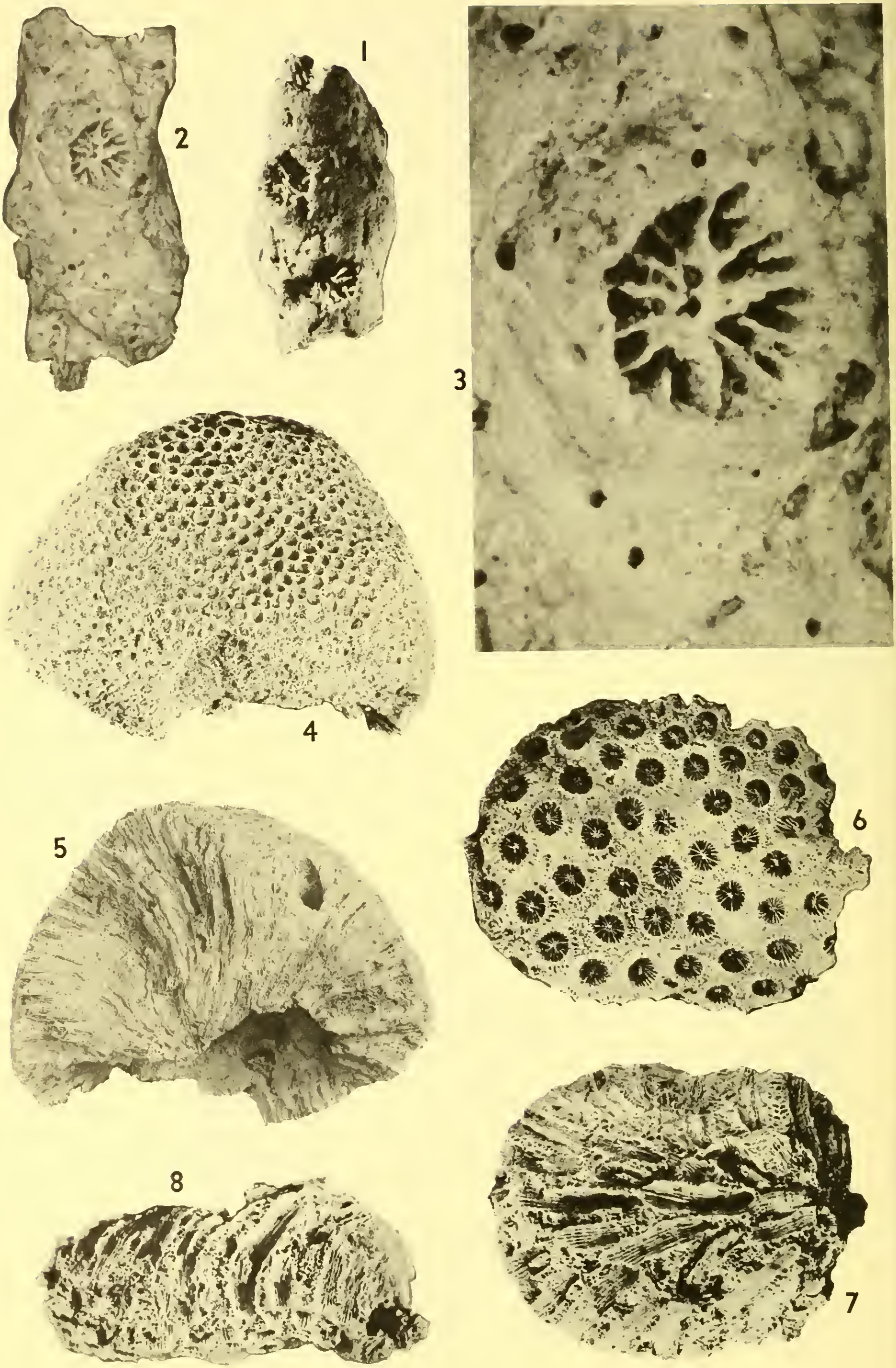


1



2

3


1
2
3
4
5
6
7
8

EXPLANATION OF PLATE 8

Figure *Page*

1-3. **Oculina diffusa** Lamarck 62
Specimen D577a, 27564 PRI. Corallum fragment, length 12 mm, maximum diameter 5 mm. 1. View of one side, X 3.5. 2. View of opposite side, X 4.5. 4. Enlarged view of figure 2 showing details of calice and coenosteum. Abisinia Formation. Lower Pleistocene.

4,5. **Solenastrea hyades** (Dana) 57
Specimen J568a, 27565 PRI. Corallum length 79 mm, width 68 mm, height 60 mm. Views of upper surface and exposed walls of side, X 0.75. Lower Mare Formation. Lower Pliocene.

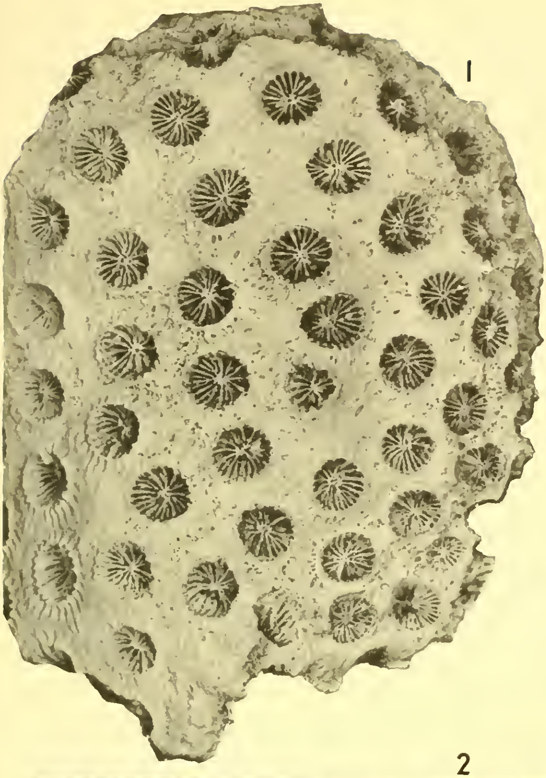
6-8. **Solenastrea hyades** (Dana) 57
Specimen C570a, 27566 PRI. Corallum fragment, length 35 mm, width 28 mm. Views of upper surface, under surface, and side, X 1.6. Guaiguaza Clay. Upper Pliocene. (See Pl. 9, figs. 1-4 for details of same specimen.)

EXPLANATION OF PLATE 9

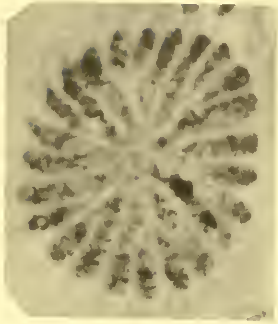
Figure		*Page*
1-4.	**Solenastrea hyades** (Dana)	57

Specimen C570a, 27566 PRI. Corallum fragment, length 35 mm, width 28 mm. 1. Calicular surface, X 2.8. 2. View of calices and blistered coenosteum, X 11. 3, 4. Individual calices showing character of septa, X 15. Guaiguaza Clay. Upper Pliocene. (See Pl. 8, figs. 6-8 for other views of same specimen.)

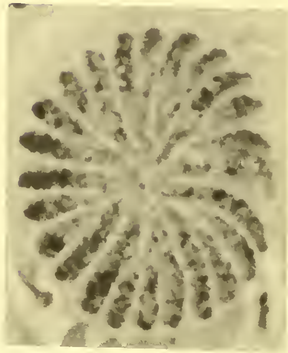
1



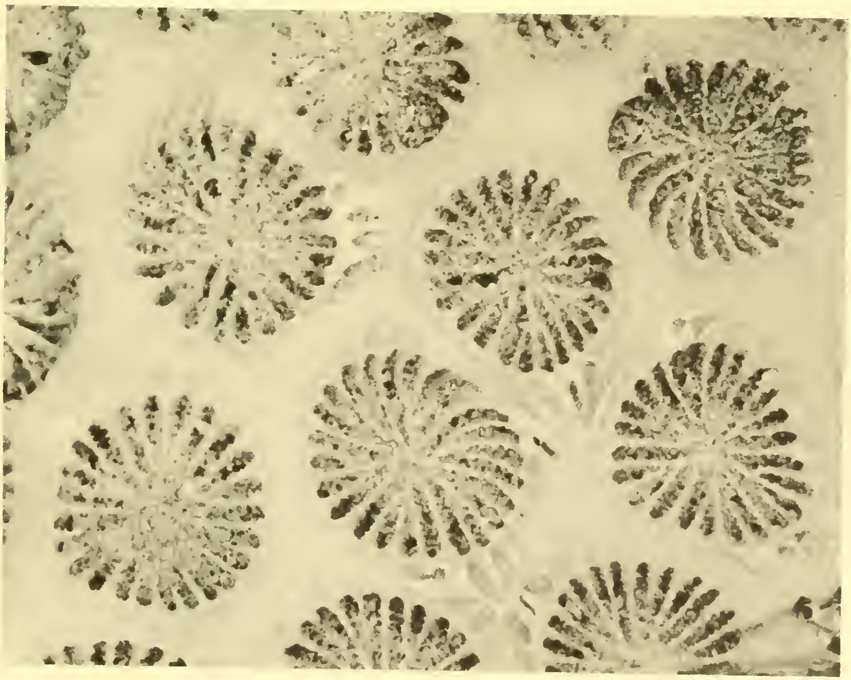
3

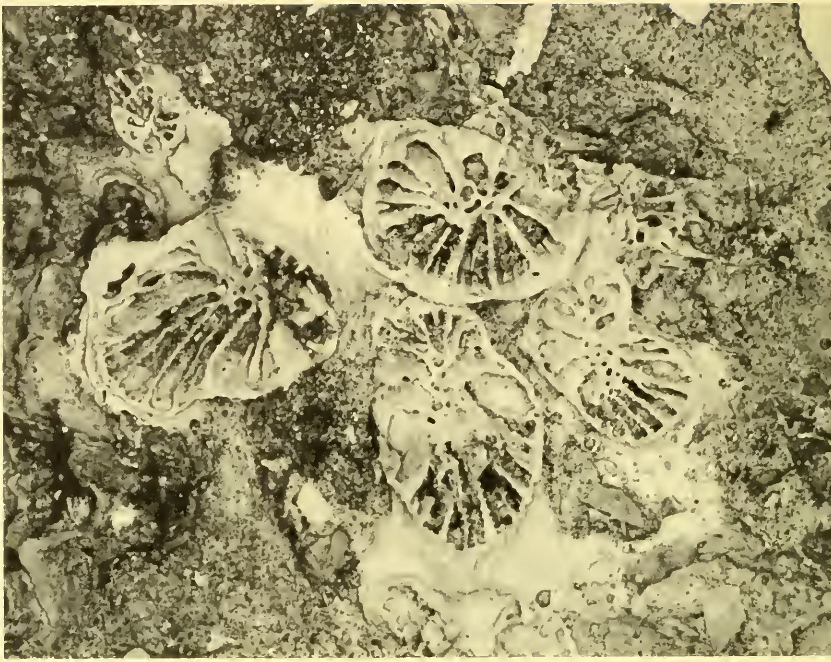


4

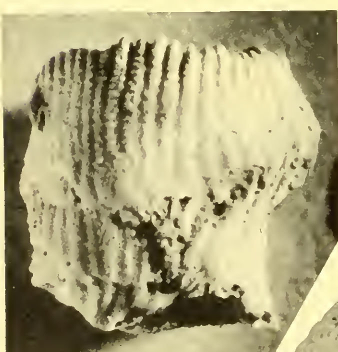


2



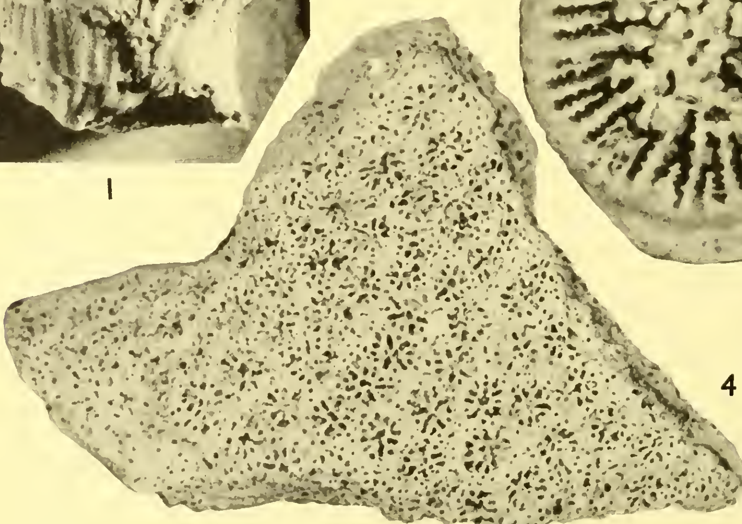


3



1

2



4

Explanation of Plate 10

Figure *Page*

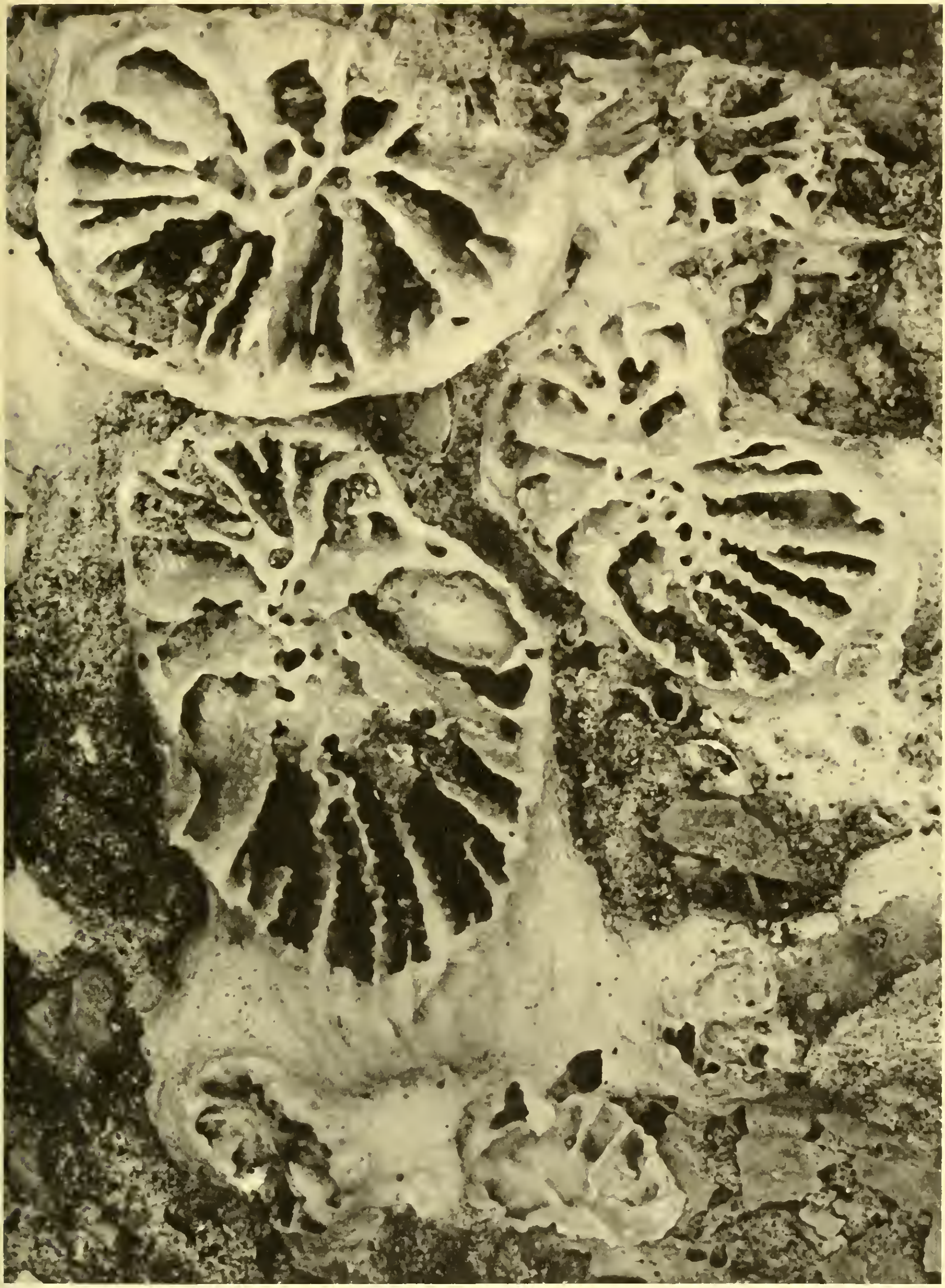
1,2. **Paracyathus defilippii** Duchassaing and Michelotti 71
Specimen S574a, 27568 PRI. Height of corallite 5.5 mm; diameters of calice 4.3 mm x 3.3 mm. 1. Side view of corallite, X 7. 2. Enlarged view of calice showing septa and pali. Playa Grande Formation (Maiquetía Member). Lower Pliocene.

3. **Phyllangia americana** Edwards and Haime 68
Specimen S688a, 27569 PRI. Length of colony 29 mm, width 20 mm. Enlarged 3 X. Playa Grande Formation (Maiquetía Member). Lower Pliocene. (See Pl. 11, fig. 1.)

4. **Porites branneri** Rathbun 42
Specimen C575a, 27570 PRI. Corallum fragment, height 12.5 mm, width 20.2 mm. Guaiguaza Clay. Upper Pliocene.

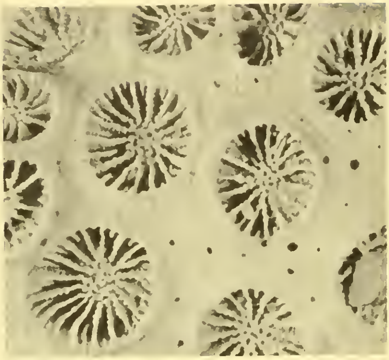
EXPLANATION OF PLATE 11

Figure		*Page*
1.	**Phyllangia americana** Edwards and Haime	68
	Specimen S688a, 27569 PRI. Length of colony 29 mm, width 20 mm. Enlarged 8 X. Playa Grande Formation (Maiquetía Member). Lower Pliocene. (See Pl. 10, fig. 3.)	

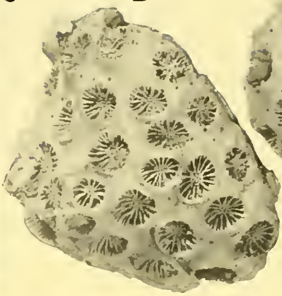


1

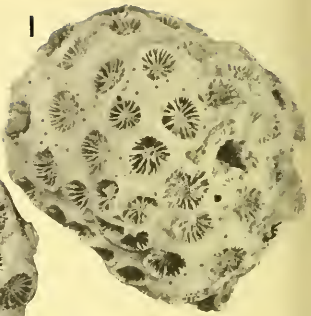
3



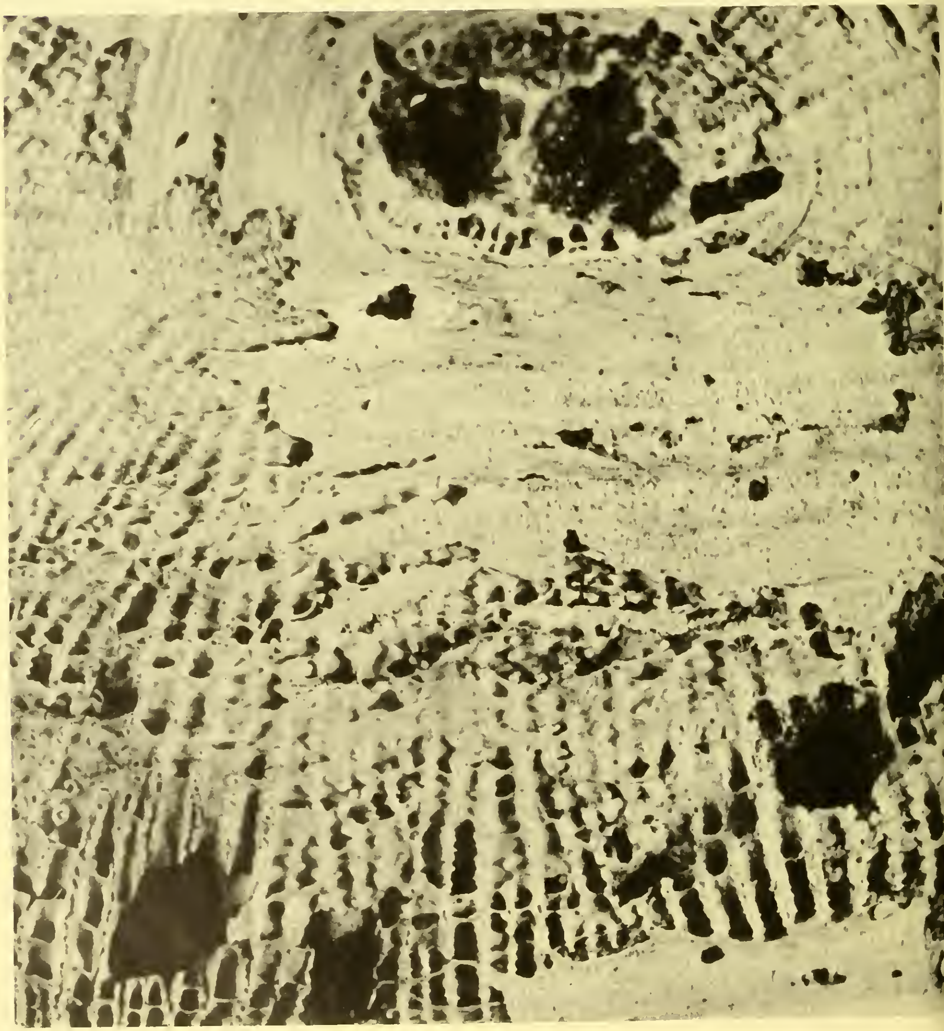
2



1



4



Explanation of Plate 12

Figure *Page*

1-3. **Solenastrea** cf. **S. bournoni** Edwards and Haime 60

Specimen H570a, 27571 PRI. Corallum length 27 mm, width 21 mm, height 19 mm. 1,2. Views of upper surface, X 1.4. 3. Enlarged view of calices, X 3. Mare formation. Lower Pliocene.

4. **Manicina areolata puntagordensis,** n. subsp. 51

Holotype (S566a), 27560 PRI. Length 119 mm, width 92 mm, height 63 mm. Enlargement showing details of epitheca, costae, and area of attachment. Playa Grande Formation (Maiquetía Member). Lower Pliocene. (See Pl. 4, fig. 5; Pl. 5, figs. 1-5 for other views of same specimen.)

INDEX

Number 246

Note: Light face figures refer to the page numbers. Bold face figures refer to the plate numbers.

A

B

BULLETINS
OF
AMERICAN
PALEONTOLOGY

(Founded 1895)

Vol. 55

No. 247

MIOCENE AND PLIOCENE MOLLUSKS FROM TRINIDAD

By

PETER JUNG

1969

Paleontological Research Institution
Ithaca, New York 14850 U.S.A.

BULLETINS OF AMERICAN PALEONTOLOGY

and

PALAEONTOGRAPHICA AMERICANA

Complete titles and price list of separate available numbers may be had on application.

For reprint, Vols. 1-23, Bulletins of American Paleontology see Kraus Reprint Corp., 16 East 46th St., New York, N.Y. 10017, U.S.A.

For reprint, vol. I, Palaeontographica Americana see Johnson Reprint Corporation, 111 Fifth Ave., New York, N.Y. 10003, U.S.A.

Subscription may be entered at any time by volume or year, with average price of $18.00 per volume for Bulletins. Numbers of Palaeontographica Americana invoiced per issue. Purchases in U.S.A. for professional purposes are deductible from income tax.

For sale by

Paleontological Research Institution
1259 Trumansburg Rd.
Ithaca, New York 14850
U.S.A.

BULLETINS
OF
AMERICAN
PALEONTOLOGY
(Founded 1895)

Vol. 55

No. 247

MIOCENE AND PLIOCENE MOLLUSKS FROM TRINIDAD

By
PETER JUNG

February 5, 1969

Paleontological Research Institution
Ithaca, New York 14850, U.S.A.

Library of Congress Card Number: GS 68-140

Printed in the United States of America

CONTENTS

MIOCENE AND PLIOCENE MOLLUSKS FROM TRINIDAD

PETER JUNG

ABSTRACT

A total of 325 species of mollusks from three stratigraphic units of Trinidad is described and figured. The fauna of the Melajo Clay Member of the Springvale Formation includes 168 species and is correlated with the Savaneta Glauconitic Sandstone Member of the Springvale Formation, but part of it may be somewhat younger. The fauna from the Courbaril Sand and Clay Member of the Upper Morne l'Enfer Formation contains 96 species and is considered to be of early Pliocene age. Also an early Pliocene age is attributed to the fauna (160 species) of the Matura Sand and Clay Member of the Talparo Formation, although the Courbaril fauna appears to be slightly older than the Matura fauna.

ACKNOWLEDGMENTS

The bulk of the material referred to herein has been collected by Dr. H. G. Kugler, who donated part of his collections to the U.S. National Museum. Thanks are extended to Dr. Kugler, with whom I was able to visit the fossil localities in Trinidad, and particularly to the Management of Texaco Trinidad Inc. for hospitality and working facilities.

I am greatly indebted to the Smithsonian Institution and to Dr. G. A. Cooper, then Chairman of the Department of Paleobiology of that institution, for a grant enabling me to stay at the U.S. National Museum. I am obliged to Dr. R. S. Boardman who offered facilities of the Division of Invertebrate Paleontology. Dr. W. P. Woodring generously gave access to his library, his invaluable card file of Caribbean Tertiary Mollusks, to the splendid Caribbean molluscan collections, and — last but not least — to his personal knowledge. I am grateful to Dr. J. Rosewater, Division of Mollusks, Department of Invertebrate Zoology, for the permission to use the mollusk library and the collections of Recent mollusks.

Special thanks are due to Dr. W. S. Cole of Cornell University, Ithaca, New York, for the loan of Maury's types described in 1912, and to Dr. K. V. W. Palmer, director of the Paleontological Research Institution, Ithaca, New York, for hospitality and working facilities during a short stay at that institution.

The director of the Natural History Museum Basel and the trustees of that museum generously supported this project.

INTRODUCTION

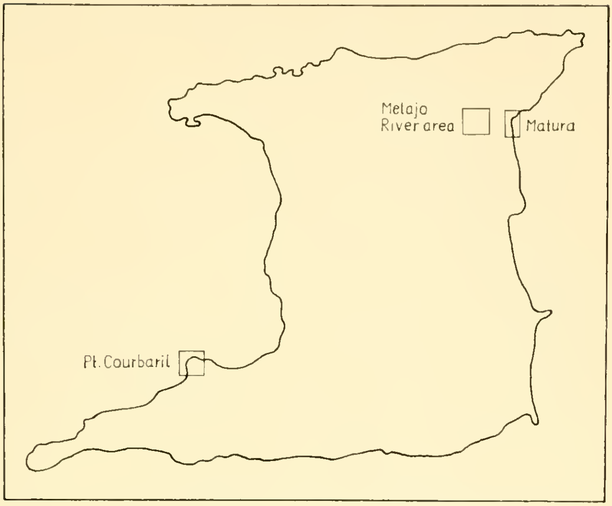
The present report deals with the molluscan faunas collected from the following three stratigraphic units of Trinidad: the Melajo Clay Member (Kugler, 1953, p. 54) of the Springvale Formation, the Courbaril Sand and Clay Member (Kugler MS) of the Upper Morne l'Enfer Formation, and the Matura Sand and Clay Member (Kugler MS) of the Talparo Formation.

There is practically no published information on mollusks from the Melajo Clay. Woodring (1958), in his discussion of *Springvaleia leroyi* (Guppy), referred to two specimens of that species from the Melajo Clay, and estimated the accompanying molluscan fauna to consist of about 120 species. A number of mollusks have been described from the Courbaril beds by Maury (1912, 1925). This fauna proves, however, to be considerably richer than indicated by Maury. The fauna from Matura is known for more than a hundred years. The first faunal list from Matura was published by Guppy in 1864. Subsequently Guppy (1867, 1874) described new species from Matura and gave more complete lists. Additional species from Matura have been described by various authors in different papers.

In 1942 R. F. Rutsch prepared a preliminary report for Trinidad Leaseholds, Ltd. on the Matura fauna. Rutsch realized that without access to Guppy's types a scientific description of the fauna would meet with great difficulty. Most of the species were poorly figured or not at all. The writer was able to study Guppy's types at the U.S. National Museum. Rutsch (1943, private report) also dealt with the mollusks from the Melajo Clay, but the collection at his disposal was small and unrepresentative.

This report is no more than a modest contribution toward the knowledge of the Tertiary mollusks of Trinidad. Much additional work is needed to give range charts of species, because the inventory of Trinidadian Tertiary mollusks is far from complete. Rich faunas from several formations or members are practically unstudied or incompletely described, *e.g.* the faunas of the Brasso Formation, the Manzanilla Formation, and the Gransaull Clay Member, and the Chickland Clay Member, both of the Springvale Formation, to mention a few. More detailed information on the formations, members referred to in this paper, and on the non-molluscan paleontology is contained in a manuscript on the stratigraphy of Trinidad by H. G. Kugler.

All the material mentioned, described, and figured in this report is deposited at the Naturhistorisches Museum, Basel, Switzerland, or at the U.S. National Museum, Washington, D. C.



Text-figure 1. Index map showing general areas of fossil localities.

LOCALITY DATA

MELAJO RIVER AREA

All the fossil localities of this area and referred to in this report are plotted in Text-figure 2. The material has been collected by A. G. Hutchinson, E. Lehner, H. G. Kugler, K. Rohr, and the writer. The material in the U.S. National Museum carries the USGS locality numbers 18399, 18411, 18634, and 21178.

The Melajo beds are situated on the south slope of the Northern Range of Trinidad to the west of Matura Bay. They dip about 5 degrees to south and rest transgressively on the phyllites of the Northern Range with a basal conglomerate of about 1 m thickness. This conglomerate consists of small quartz and phyllite pebbles and grades into a 1.5 m thick limestone with large mollusks. The limestone is overlain by a bed of coarse sand of about 1 m thickness. Above the sand follows the typical blue, yellowish weathering Melajo Clay and silty clay with occasional sandy layers. The total thickness of the Melajo Clay Member is about 200 feet. In the type area it is unconformably overlain by Pleistocene sand and gravel deposits.

The type locality of the Melajo Clay Member has been selected at USGS 18399 (= USGS 21178 = Hutch 47 = Hutch 48 = EL 1810 = KR 11862 = RR 290 = PJ 285).

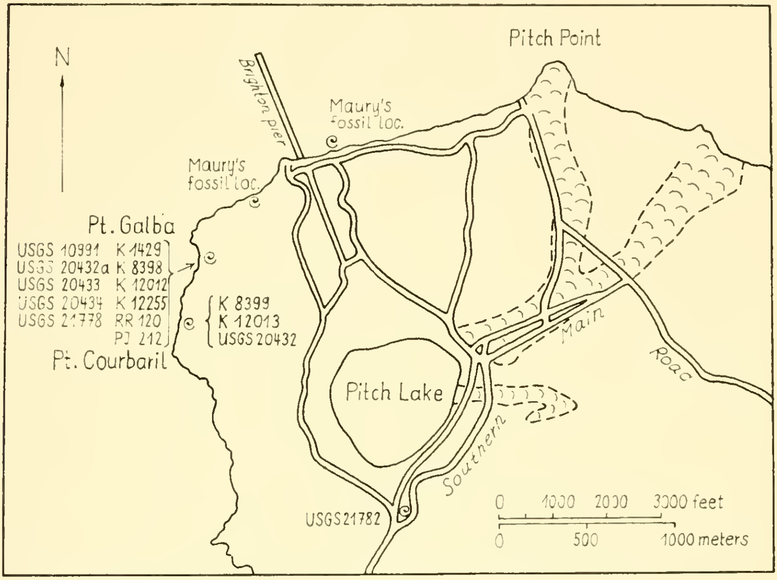
Text-figure 2. Geological sketch map of Melajo River area showing fossil localities.

POINT COURBARIL

The fossil localities of this area are shown on Text-figure 3. They are situated at the coast between Point Galba and Point Courbaril, westnorthwest of the Pitch Lake. USGS locality 20432a represents a collection picked up on the beach and is a mixture of fossil and Recent shells. Two good outcrops have been known in the past, but they are gradually changing on account of slowly moving layers of asphalt and erosion by the sea. To-day the southern locality (USGS 20432) is covered by rubbish hence is inaccessible. The other locality (USGS 10991) represents the type locality of the Courbaril Sand and Clay Member, and is placed by Kugler (MS) in the uppermost Morne l'Enfer Formation.

Also plotted in Text-figure 3 are the two localities on the coast referred to by Maury (1912, pp. 25, 26) as "1000 feet west of the Brighton pier" and "700 feet east of the Brighton pier", as well as the outcrop on the Southern Main Road, just south of the

Pitch Lake, near Mile Post 56¾ (now 49¾) (Maury, 1912, p. 27). This last locality is the same as USGS 21782.



Text-figure 3. Point Courbaril area showing fossil localities.

MATURA

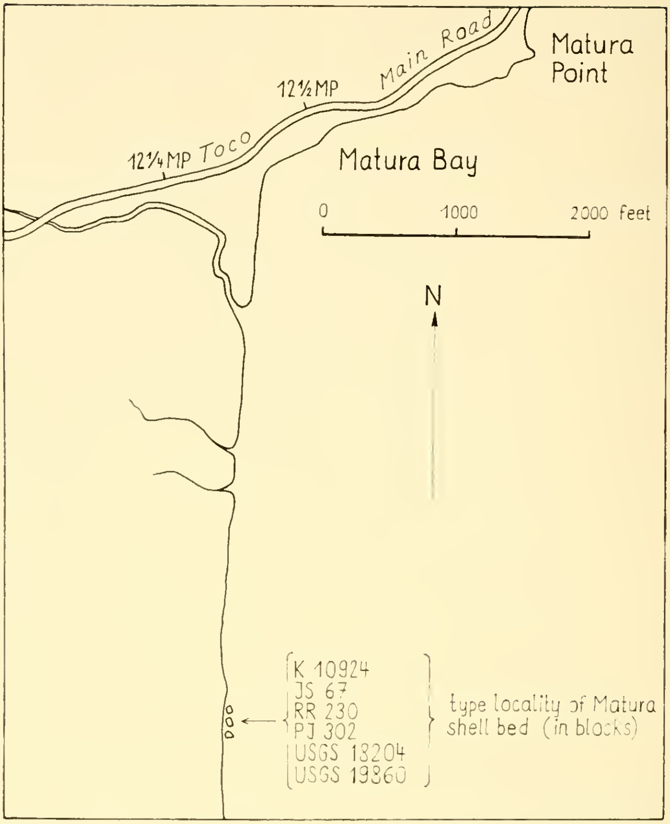
The geographic location of the Matura shell bed is shown in Text-figure 4. The type locality of the Matura Sand and Clay Member of the Talparo Formation (Kugler MS) is made up of a number of slipped blocks situated on the coast south of Matura Bay. These blocks consist of highly limonitic, brown coquina with intercalations of clay and silt. For the greatest part the shells are worn by wave action. According to Kugler (MS) the Matura beds unconformably overlap the Melajo beds.

All the collections from the Matura shell bed (K 10924, JS 67, RR 230, PJ 302, USGS 18204, USGS 19860) have been taken from these blocks.

COMPOSITION OF THE FAUNAS

A total of 325 species is considered in this report. The number of species in the three classes is as follows:

Scaphopoda	4



Text-figure 4. Geographic location of Matura shell bed.

Pelecypoda	115
Gastropoda	206

The following is a list of the species mentioned. Their occurrence in the different stratigraphic units is indicated.

	Melajo River	Point Courbaril	Matura
Scaphopoda			
Dentalium (Dentalium) divulgatum, n.sp.	o	o	
Dentalium (Dentalium) species			o
Dentalium (Graptacme) cf. amaliense Henderson			o
Dentalium (Laevidentalium ?) species			o

	Melajo River	Point Courbaril	Matura
Pelecypoda			
Nucula (Lamellinucula) vieta Guppy			o
Nucula (Lamellinucula) baccata Guppy	o	o	o
Nuculana (Saccella) ludificans, n.sp.	o	o	
Nuculana (Saccella) perlepida (Guppy)			o
Calorhadia (Calorhadia) solivaga, n.sp.	o		
Adrana perprotracta (Dall) ?	o	o	
Arca (Arca) zebra zebra (Swainson)			o
Arca (Arca) imbricata imbricata Bruguière		o	o
Barbatia (Barbatia) candida (Helbling)			o
Barbatia species	o		
Barbatia (Acar) domingensis (Lamarck)			o
Barbatia (Fugleria ?) millifila latrinidadis Maury			o
Arcopsis adamsi (Dall)	o		o
Anadara (Anadara) aff. inaequilateralis (Guppy)	o	o	
Anadara (Cunearca) brasiliana (Lamarck)		o	o
Anadara (Cunearca) aff. filicata (Guppy)	o	o	
Anadara (Scapharca ?) sanctidavidis (Maury)			o
Anadara (Scapharca) placata, n.sp.	o		
Lunarca billingsiana (Maury)		o	o
Noetia (Noetia) sheldoniana (Maury)	o	o	o
Noetia (Eontia) centrota (Guppy)	o	o	o
Glycymeris (Glycymeris) cf. undata (Linné)			o
Tucetona cf. pectinata (Gmelin)			o
Brachydontes (Brachydontes) species		o	o
Modiolus cf. americanus (Leach)			o
Atrina species	o		
Plicatula gibbosa Lamarck			o
Pecten (Pecten) archon Maury	o		
Aequipecten (Plagioctenium) cf. gibbus (Linné)			o
Aequipecten (Plagioctenium) demiurgus (Dall)	o		
Aequipecten (Plagioctenium) maturensis (Maury)			o
Aequipecten (Plagioctenium) cf. maturensis (Maury)	o		
Aequipecten (Plagioctenium) rutamensis, n.sp.			o
Aequipecten (Plagioctenium) species		o	
Cyclopecten species	o		
Ostrea species		o	
Crassostrea cf. virginica (Gmelin)		o	o
Lopha messor (Maury)	o		
Anomia simplex d'Orbigny	o	o	o
Eucrassatella trinitaria (Maury)	o		
Crassinella martinicensis (d'Orbigny)			o
Crassinella guppyi (Dall)	o	o	
Carditamera (Carditamera) guppyi (Dall)			o
Carditamera (Carditamera) species	o	o	
Carditamera (Byssomera) aff. affinis (G. B. Sowerby I)		o	
Condylocardia guppyi (Maury)			o
Lucina (Lucina) cf. pectinata (Gmelin)			o
Lucina (Lucinisca) roigi (Maury)	o	o	o
Chama cf. macerophylla Gmelin		o	
Chama spec. ind.			o
Pseudochama aff. caloosana (Dall)			o
Trachycardium (Dallocardia) sanctidavidis (Maury)	o	?	o
Trigoniocardia (Trigoniocardia) maturensis (Dall)	o	o	o

	Melajo River	Point Courbaril	Matura
Trigoniocardia (Trigoniocardia) melajoensis, n.sp.	o		
Trigoniocardia (Trigoniocardia) cf. caboblanquensis Weisbord		o	?
Laevicardium cf. laevigatum (Linné)		o	
Dosinia (Dosinia) grandis Nelson	o		
Dosinia (Dosinia) species	o	o	
Cyclinella aff. tenuis (Recluz)		o	
Cyclinella (?) species	o		
Tivela (Tivela) austeniana (Maury)			o
Macrocallista maculata (Linné)	o		
Pitar (Lamelliconcha) circinatus (Born)	o	o	o
Pitar (Lamelliconcha) labreanus (Maury)	o		
Chione (Chione) cancellata (Linné)	?		o
Chione (Nioche) veatchiana Maury		o	o
Chione (Lirophora) caroniana Maury	o		
Chione (Lirophora) species			o
Chione (Lirophora) sanctidavidis Maury	o	o	o
Anomalocardia brasiliana (Gmelin)			o
Mactra (Micromactra) cf. maracaibensis H. K. Hodson	o		o
Mulinia species		o	o
Moerella (Moerella) elinguis, n.sp.	o	o	
Eurytellina punicea (Born) ?	cf.	o	?
Eurytellina melajoensis, n.sp.	o	o	
Eurytellina ? oligoscissulata, n.sp.	o	o	
Merisca trinidadensis, n.sp	o		
Tellidora species	o		
Strigilla (Strigilla) carnaria (Linné) ?		o	o
Strigilla (Pisostrigilla) pisiformis (Linné)			o
Strigilla (Pisostrigilla ?) species		o	
Macoma (Psammacoma) species A	o		
Macoma (Psammacoma) species B		o	
Psammotreta galbana, n.sp.		o	
Apolymetis trinitaria (Dall)	o		
Temnoconcha aff. brasiliana (Dall)	o	o	
Semele proficua (Pulteney)		o	o
Semele purpurascens (Gmelin)		o	o
Semele laevis costaricensis Olsson	o	o	
Semele claytoni couvensis Maury	o		
Semele aff. anteriocosta Vokes	o	o	o
Abra cf. aequalis (Say)		o	
Abra ? species			o
Cumingia galbensis, n.sp.		o	
Donax striatus Linné ?		o	o
Donax fabagelloides Guppy			o
Donax brightonensis, n.sp.		o	
Donax (Machaerodonax ?) species			o
Tagelus (Tagelus) plebeius (Lightfoot)		o	
Tagelus (Mesopleura) cf. divisus (Spengler)		o	
Tagelus (Mesopleura ?) mansfieldi (Vokes)	o		
Pleiorytis caroniana (Maury)	o		
Solen (Solen) species	o		
Solen (Solena) obliquus Spengler		o	o
Caryocorbula (Caryocorbula) helenae (Maury)	o	o	
Caryocorbula (Caryocorbula) species	o	o	o

	Melajo River	Point Courbaril	Matura
Juliacorbula aequivalvis (Philippi)	o	o	o
Notocorbula islatrinitatis (Maury)	o		
Notocorbula species	o		
Notocorbula aff. disparilis (d'Orbigny)			o
Tenuicorbula melajoensis, n.sp.	o		
Tenuicorbula aff. melajoensis, n.sp.			o
Pholas species		o	
Martesia striata (Linné) ?		o	
Pandora species	o		
Gastropoda			
Diodora cayenensis (Lamarck)		o	o
Diodora (?) species			o
Acmaea species			o
Calliostoma decipiens (Guppy)	o		o
Calliostoma laticarinatum (Guppy)			o
Calliostoma caronianum Maury	o		
Calliostoma plicomphalus (Guppy)			o
Calliostoma olssoni Maury	o	o	o
Microgaza oblita, n.sp			o
Astraea (Astralium) cf. brevispina (Lamarck)			o
Parviturbo maturensis, n.sp.			o
Nerita (Nerita) exuvioides Trechmann ?	o		
Neritina (Vitta) cf. virginea (Linné)	o	o	o
Rissoina (Rissoina) species		o	o
Teinostoma (Pseudorotella) nugax, n.sp.	o		
Teinostoma (Pseudorotella) spretum, n.sp.	o		
Teinostoma (Aepystoma) caroniense Maury	o	o	
Teinostoma (Aepystoma) melajoense, n.sp.	o		
Cochliolepis pluscula, n.sp.	o		
Cyclostremiscus (Ponocyclus) pentagonus (Gabb)	o		
Cyclostremiscus (Ponocyclus) species			o
Solariorbis (subgenus ?) marginatus (Guppy)	?		o
Caecum species A	o		
Caecum species B	o		
Caecum species C	o		
Caecum species D		o	
Caecum species E			o
Turritella (Broderiptella) bifastigata cartagenensis Pilsbry and Brown	o	o	
Turritella (Broderiptella) aff. mimetes Brown and Pilsbry	o		
Turritella (Broderiptella) planigyrata Guppy	o		
Turritella (Broderiptella) aff. planigyrata Guppy			o
Turritella (Bactrospira) species			o
Springvaleia leroyi (Guppy)	o		
Vermicularia spirata (Philippi) ?			o
Vermicularia (?) trilineata (Guppy)			o
Serpulorbis decussatus (Gmelin)		o	o
Petaloconchus sculpturatus alcimus Mansfield	o		
Petaloconchus cf. floridanus Olsson and Harbison			o
Batillaria species	o		
Cerithium (subgenus ?) harrisi Maury	o	o	cf.
Bittium (Bittiolum) fretense, n.sp.		o	
Cerithiopsis (Cerithiopsis) species			o

	Melajo River	Point Courbaril	Matura
Cerithiopsis (subgenus ?) emersoni (C. B. Adams)			o
Cerithiopsis (subgenus ?) species			o
Seila cf. adamsi (H. C. Lea)			o
Modulus carchedonius (Lamarck)			o
Architectonica (Architectonica) nobilis nobilis Röding	o		o
Architectonica (Pseudotorinia) melajoensis, n.sp.	o		
Architectonica (Pseudotorinia) guppyi, n.sp.			o
Architectonica (Pseudotorinia) semidecussata (Guppy)			o
Architectonica (Pseudotorinia) cf. semidecussata (Guppy)		o	
Mathilda species A	o		?
Mathilda species B		o	
Triphora guttata (Guppy)		o	
Triphora species	o		
Epitonium (Epitonium) albidum (d'Orbigny)			o
Epitonium (Epitonium) aff. foliaceicostum (d'Orbigny)	o	o	
Epitonium (Epitonium) humphreysi (Kiener) ?		o	
Epitonium (Epitonium) maturense, n.sp.			o
Epitonium (Asperiscala) cf. multistriatum (Say)			o
Epitonium (Asperiscala) cf. candeanum (d'Orbigny)			o
Epitonium (Asperiscala) rohri, n.sp.	o	o	
Epitonium (Asperiscala) aff. sericifilum (Dall)			o
Eulima clavata (Guppy)			o
Eulima species A	o	?	
Balcis egregia (Guppy)	o		
Balcis species A			o
Niso grandis Gabb ?	o		
Niso species			o
Fossarus (Iselica) anomalus (C. B. Adams) ?			o
Hipponix cf. antiquatus (Linné)			o
Cheilea cf. equestris (Linné)			o
Crepidula (Crepidula) cf. maculosa Conrad	o		
Crepidula sp.	o		o
Crepidula plana Say	o		
Crepidula (Bostrycapulus) aculeata (Gmelin)			o
Calyptraea centralis (Conrad)	o	o	o
Trochita radians (Lamarck)			o
Crucibulum (Crucibulum) subsutum Guppy			o
Crucibulum (Crucibulum) piliferum Guppy	cf.	cf.	o
Erato maugeriae Gray			o
Trivia (Pusula) radians orientalis (Schilder)			o
Cypraea species			o
Cypraea (Erosaria) aliena (Schilder)			o
Neosimnia cf. uniplicata (G. B. Sowerby II)			o
Natica (Naticarius) canrena (Linné)	o		
Natica (Naticarius) aff. canrena (Linné)	o	o	o
Tectonatica pusilla (Say)			o
Polinices stanislasmeunieri Maury	o		
Polinices species			o
Cymatium species	o		
Colubraria species	o		
Bursa (Bursa) aff. thomae (d'Orbigny)	o		
Bursa (Marsupina) bufo (Bruguière)			o
Malea species	o		
Murex (Murex) chrysostoma G. B. Sowerby I	o		

	River Melajo	Courbaril Point	Matura
Murex (Phyllonotus) cf. pomum Gmelin	o		o
Murex (Chicoreus) cf. brevifrons Lamarck	o	o	
Eupleura lehneri, n.sp.	o		
Typhis (Typhinellus) cf. quadratus Hinds			o
Typhis (subgenus ?) species	o		
Calotrophon (?) hutchisoni, n.sp.	o		
Risomurex galbensis, n.sp.		o	
Thais (Stramonita) cf. haemostoma (Linné)		o	o
Thais (Stramonita) species A	o		
Cymia brightoniana Maury		o	
Cymia species	o		
Parametaria prototypus (Guppy)	o		
Parametaria rutschi, n.sp.			o
Anachis (Anachis) asphaltoda (Maury)		o	o
Anachis (Anachis) species			o
Anachis (Costoanachis) obesa (C. B. Adams)	o	o	o
Anachis (Costoanachis) fraudans, n.sp.	o		
Zanassarina species			o
Aesopus peculiaris (Guppy)			o
Aesopus aff. metcalfei Reeve			o
Strombina (subgenus ?) melajoensis, n.sp.	o		
Strombina (Sincola) crassilabrum (Guppy)	o	o	o
Strombinophos perdoctus, n.sp.	o		
Strombinophos species			o
Buccinid indet.		o	
Cantharus (subgenus ?) species A	o		
Hanetia semiglobosa (Guppy)	o		
Calophos rohri (Rutsch)	o		
Metaphos (?) species		o	
Metula aff. cancellata Gabb	o		
Pallacera species A	o		
Pallacera cf. guadelupensis (Petit de la Saussaye)			o
Nassarius (Phrontis) vibex (Say)		o	
Nassarius (Uzita) trinitatensis, n.sp.	o	o	
Nassarius (Uzita) cf. albus (Say)			o
Nassarius (Uzita) species A	o		
Nassarius (subgenus ?) galbanus, n.sp.		o	
Melongena melongena (Linné)		o	
Latirus (Polygona) cf. infundibulum (Gmelin)	o		
Fasciolaria cf. tulipa (Linné)			o
Fasciolaria (Pleuroploca) turamensis, n.sp.			o
Fusinus species	o		
Fusinus cf. henekeni (G. B. Sowerby I)			o
Oliva (Oliva) couvana Maury	o		
Jaspidella sanctidominici (Maury)	o		
Olivella (Olivella) species			o
Olivella (Dactylidia) aff. mutica (Say)	o		
Olivella (Niteoliva) cf. verreauxi (Ducros)			o
Olivella (Minioliva) fundarugata Weisbord	o	o	
Ancilla (Eburna) caroniana Maury	o		
Cancilla cf. sanctifrancisci (Maury)	o		
Scabricola nodulosa (Gmelin)			o
Conomitra species A	o		

	River Melajo	Courbaril Point	Matura
Turbinella riosecana (H. K. Hodson)	o		
Prunum (Prunum) dallianum (Maury)		o	?
Prunum (Egouena) springvalense (Maury)	o		
Prunum (Egouena) calypsonis (Maury)	o		
Volvarina (?) species A	o		
Volvarina (?) species B		o	o
Persicula (Rabicea) couviana (Maury)	o		
Persicula (Rabicea) cf. interruptolineata (Megerle von Mühlfeld)			o
Bullata maiae (Maury)	o		
Bullata maturensis, n.sp.		o	o
Cancellaria (Euclia) montserratensis Maury	o		
Cancellaria (Euclia) cf. codazzii Anderson	o		
Cancellaria (Narona) semota, n.sp.	o		
Cancellaria (Charcolleria) species	o		
Trigonostoma (Emmonsella) species	o		
Conus springvaleensis Mansfield	o		
Conus couvaensis Vokes	o		
Conus species			o
Polystira species A			o
Polystira species B	o		
Carinodrillia meraca, n.sp.	o		
Crassispira (Crassispira) cf. caroniana (Maury)	o		
Crassispira (Crassispira) faceta, n.sp.			o
Crassispira (Crassispirella) ritanida (Mansfield)			o
Agladrillia (?) lassula, n.sp.	o		
Lepicythara disclusa, n.sp.	o		
Ithycythara hilaris, n.sp.	o		
Ithycythara species		o	
Adelocythara (?) micropleura (Guppy)			o
Glyptaesopus species			o
Miraclathurella ralla, n.sp.	o		
Glyphostoma sculptile, n.sp.	o		
Strioterebrum cf. gatunense (Toula)	o		
Strioterebrum aff. laevifasciola (Maury)	o	?	
Strioterebrum aff. baculiforme (Pilsbry and Johnson)	o		
Strioterebrum species			o
Hastula aff. hastata (Gmelin)			o
Pyramidella (Longchaeus ?) species A			o
Pyramidella (Callolongchaeus) aff. jamaicensis Dall	o		
Pyramidella (Callolongchaeus) cf. diademata Maury	o		
Triptychus (Peristichia) species			o
Eulimella (Eulimella) species A	o		
Eulimella (Ebalina) mitis, n.sp.	o		o
Turbonilla species A	o		o
Turbonilla species B	o		
Turbonilla species C			o
Turbonilla species D	o		
Turbonilla species E	o		
Odostomia canaliculata C. B. Adams ?			o
Odostomia (Salassia ?) species			o
Rictaxis species	o		
Acteocina canaliculata (Say) ?	o		o
Cylichnella altera, n.sp.	o		

	River Melajo	Courbaril Point	Matura
Cylichnella species		o	
Sulcoretusa aff. sulcata (d'Orbigny)	o		
Rhizorus species A			o
Rhizorus species B	o		

MELAJO FAUNA

The fauna occurring in the Melajo Clay Member consists of 168 species of mollusks (1 scaphopod, 57 pelecypods, 110 gastropods). It is of about the same size as that of the Savaneta Glauconitic Sandstone Member. Rutsch (1942) cited 153 species from the latter member, but Woodring (1958, p. 169) stated that there are about 20 additional species. It must be remembered that much more collecting has been done in the Savaneta Glauconitic Sandstone Member than in the Melajo Clay and this for two reasons: first the fossiliferous beds at Springvale Quarry and along the Savaneta River have been known for a much longer time than the fossiliferous Melajo Clay; second the Melajo River area is not so easily accessible as the outcrops of the Savaneta Glauconitic Sandstone Member. It, therefore, can be expected that further collecting in the Melajo Clay will yield many additional species.

The Melajo fauna can be divided into two assemblages: one occurring in the limestone and coarse sand near the base of the Melajo Clay Member, the other one in the overlying clay and silty clay. The difference of the two assemblages is facies controlled; in terms of age, or difference in age, negligible, for the Melajo Clay Member is only about 200 feet thick. The basal assemblage represents a typical, tropical, near-shore fauna, whereas the overlying assemblage points to a deeper environment.

Despite the presence of *Nerita (Nerita) exuvioides* Trechmann ?, *Neritina (Vitta)* cf. *virginea* (Linné), *Batillaria* species, and *Cerithium* (subgenus ?) *harrisi* Maury, the brackish water influence must have been slight in the Melajo fauna. All the species mentioned are represented by one or a few specimens only. The Melajo fauna as a whole indicates normal marine conditions with an average salinity.

Associated with the mollusks are a few corals, Bryozoa, and spines of echinoderms. Van den Bold (1963, p. 364) listed 31 species of ostracods from the type locality of the Melajo Clay (KR 11862

= USGS 18399) and two species from KR 11863 (= USGS 18634). The foraminiferal assemblages from several localities in the Melajo River area have been studied by J. B. Saunders (private report). Most of these faunas are poor. The richest foraminiferal fauna is found at the type locality of the Melajo Clay (USGS 18399), from where Saunders listed 61 species. Most of these forms are benthonic. The planktonic species include *Globigerina bulloides* and *Globigerinoides rubra.*

COURBARIL FAUNA

The fauna of the Courbaril Sand and Clay Member consists of 96 species (1 scaphopod, 55 pelecypods, 40 gastropods). The fossils are generally well preserved but not so well as those from the Melajo Clay. Many specimens show adhering asphalt which derived from the asphalt flows from the Pitch Lake, spreading over the sediments during the deposition of the Courbaril beds. The Courbaril assemblage as a whole, the rock clinger *Diodora cayenensis,* and the intertidal genus *Brachydontes* point to a near-shore environment. The brackish water influence was probably higher than during deposition of the Melajo Clay. *Neritina (Vitta)* cf. *virginea* is represented by a few specimens, but *Cerithium* (subgenus ?) *harrisi* occurs in great numbers. Boring mollusks are represented by a species of *Pholas* and *Martesia striata* (Linné)?

Associated with the mollusks are a few crab claws, corals, fish teeth, and scarce Foraminifera. Van den Bold (1963, pp. 363, 368) described and listed the Ostracoda from the Courbaril beds.

MATURA FAUNA

The fauna from the Matura shell bed consists of 160 species of mollusks (3 scaphopods, 58 pelecypods, 99 gastropods). Guppy (1864, p. 40) considered the Matura fauna to be a dwarfed one and concluded "that there is some likelihood that glacial influences had a share in the modification of the fauna of the Matura beds". This, of course, is not the case. The Matura fauna is a typical, tropical, near-shore assemblage. Although there is a large number of small forms, large species are present as well, *e.g. Arca zebra, Anadara brasiliana, Lunarca billingsiana,* a large specimen of *Noetia sheldoniana, Ostrea* cf. *virginica, Lucina* cf. *pectinata, Cypraea* species, *Bursa bufo, Murex* cf. *pomum, Fasciolaria turamensis, Fusinus* cf. *henekeni,* and *Bullata maturensis.* As suggested by Rutsch (1942, private report) it is more likely that the Matura fossils have been sorted mechanically. This view is supported by the fact that a large percentage of the Matura specimens is rolled, and that there is a relatively high number of broken shells.

The postulation of a near-shore environment of the Matura fauna is supported by the presence of the rock clingers *Diodora cayenensis, Diodora* (?) species, *Acmaea* species, and the intertidal genus *Brachydontes*. The brackish water influence must have been low during deposition of the Matura beds. It is indicated only by a few specimens identified as *Neritina (Vitta)* cf. *virginea* and *Cerithium* cf. *harrisi*. The Matura fauna contains a surprisingly high number of Calyptraeidae, the species of which attach themselves to stones.

Associated with the mollusks are several species of corals, Bryozoa, lots of spines of echinoderms. Berry (1935, p. 430) described an ophiuran from Matura. In addition there are fish teeth, otoliths, *Balanus*, and ostracods. J. B. Saunders (private report) listed 31 species of Foraminifera from the type locality of the Matura beds.

AGES

The discussion on the relative ages of the three faunas described in this report is limited by the time interval between the Savaneta Glauconitic Sandstone Member of the Springvale Formation at the bottom and the Recent fauna on top. The relative age assignments of the three faunas is based on the affinities of each to the extremes mentioned above and their mutual relationships.

The upper (late) Miocene age of the Savaneta Glauconitic Sandstone Member of the Springvale Formation has never been contradicted since the discovery of its molluscan fauna: Guppy (1867), Maury (1925), Mansfield (1925), Vokes (1938), Rutsch (1942), Woodring (1966). This view is supported by the study of the ostracods (van den Bold, 1963). The affinities of this fauna to faunas of comparable age outside Trinidad have been pointed out by Rutsch (1942).

The percentage figures given on the following pages have to be taken, of course, *cum grano salis*.

MELAJO FAUNA

As mentioned above the Melajo fauna can be divided into two assemblages: one collected from the limestone and sand near the base of the Melajo Clay, the other one from the overlying clay and silty clay. The lower assemblage consists of 71 species, 40 of which (or more than 56%) are identical or closely related with species occurring in the Savaneta Glauconitic Sandstone Member. They are:

Pecten (Pecten) archon Maury
Aequipecten (Plagioctenium) demiurgus (Dall)
Anomia simplex d'Orbigny
Eucrassatella trinitaria (Maury)
Trigoniocardia (Trigoniocardia) melajoensis, n.sp.
Dosinia (Dosinia) grandis Nelson
Macrocallista maculata (Linné)
Chione (Lirophora) caroniana Maury
Macoma (Psammacoma) species A
Apolymetis trinitaria (Dall)
Semele claytoni couvensis Maury
Semele aff. *anteriocosta* Vokes
Tagelus (Mesopleura ?) mansfieldi (Vokes)
Pleiorytis caroniana (Maury)
Notocorbula islatrinitatis (Maury)
Calliostoma caronianum Maury
Turritella (Broderiptella) planigyrata Guppy
Springvaleia leroyi (Guppy)
Petaloconchus sculpturatus alcimus Mansfield
Architectonica (Architectonica) nobilis nobilis Röding
Balcis egregia (Guppy)
Calyptraea centralis (Conrad)
Natica (Naticarius) canrena (Linné)
Polinices stanislasmeunieri Maury
Parametaria prototypus (Guppy)
Hanetia semiglobosa (Guppy)
Calophos rohri (Rutsch)
Latirus (Polygona) cf. *infundibulum* (Gmelin)
Oliva (Oliva) couvana Maury
Jaspidella sanctidominici (Maury)
Ancilla (Eburna) caroniana Maury
Cancilla cf. *sanctifrancisci* (Maury)
Turbinella rioseccana (H. K. Hodson)
Prunum (Egouena) springvalense (Maury)
Prunum (Egouena) calypsonis (Maury)
Persicula (Rabicea) couviana (Maury)
Cancellaria (Euclia) montserratensis Maury
Conus springvaleensis Mansfield
Conus couvaensis Vokes
Lepicythara disclusa, n.sp.

The lower assemblage of the Melajo Clay and the mollusks from the Savaneta Glauconitic Sandstone Member must have lived under similar conditions and at about the same time. This, at least, would be the most reasonable explanation for the high number of species common to both faunas.

The upper Melajo assemblage has a far smaller number of species in common with the Savaneta fauna. This is principally due to different facies and much less so to a difference in age. The upper Melajo assemblage lived in deeper water than the Savaneta fauna. The entire Melajo fauna has about 32% of its species in common with the Savaneta fauna.

The lower Melajo assemblage is, therefore, correlated with the late Miocene Savaneta Glauconitic Sandstone Member of the Springvale Formation. The upper Melajo assemblage probably lived at the same time as the Savaneta fauna but in deeper water. Based on the fact that it rests on the lower assemblage it may be slightly younger than the Savaneta fauna.

Including the species that have been identified by means of the *nomenclatura aperta* there are 20 Melajo species (or about 12% of the total Melajo fauna) still living in the Recent fauna. The corresponding figure for the Savaneta fauna is 11%.

The Melajo fauna has 41 species (or a little more than 24%) in common with the Courbaril fauna; 31 species (or a little more than 18% of the Melajo fauna) occur in the Melajo and the Matura faunas. This figure shows that the Melajo fauna is more closely related to the Courbaril fauna than to the fauna from Matura.

COURBARIL FAUNA

Maury (1912, p. 27) attributed a late Oligocene age to the Courbaril fauna, but Maury (1925, p. 17) called it upper Pliocene. On the other hand van den Bold (1963, p. 367) proposed a correlation of the Courbaril beds with the Melajo Clay Member of the Springvale Formation. The study of the mollusks now available does not support any of these views.

The Courbaril fauna includes 29 species (or about 30%) still living in the Recent fauna. This percentage is considerably higher than the corresponding figure for the Melajo fauna (about 12%). This circumstance alone is reason to believe that there was a considerable time span between the deposition of the Melajo beds and that of the Courbaril beds. On the other hand the percentage of still living species occurring in the Matura fauna is more than 37. In terms of age the Courbaril fauna, therefore, is older than the Matura fauna, and according to its percentage of still living species it is more closely related to the Matura fauna than to the Melajo fauna.

This relation, however, is not well supported by the affinities of the Courbaril fauna to the other faunas studied. There are 41 species (or almost 43%) in the Courbaril fauna occurring in the Melajo fauna as well; and 40 species (or a little less than 42%) common to the Courbaril and Matura faunas. This figure is not too significant, because the Courbaril fauna is the least complete fauna studied. The corresponding percentages of the Matura fauna, however, again show that it is more closely related to the Courbaril fauna than to the Melajo fauna (see below).

For reasons becoming evident below the Courbaril fauna is considered to be of early Pliocene age.

MATURA FAUNA

The Matura shell bed has variously been attributed to the Pliocene or Pleistocene. Guppy (1864, 1867, 1874) considered it to be Pliocene. Maury (1925, p. 17) correlated the Matura fauna with that of Point Courbaril, which she thought is of upper Pliocene age. Kugler (1936, p. 1449) indicated a Pleistocene age, but Kugler (1953, p. 55) attributed a late Pliocene age to the Matura Formation. Rutsch (1942, private report) pleaded in favour of a Pliocene age, and Woodring (1966, p. 432) called the Matura fauna early Pliocene.

Including the species that have been identified by means of the *nomenclatura aperta* there are 60 Matura species still living in the Recent fauna. This number corresponds to a percentage of more than 37. The Matura fauna has 31 species (or more than 19%) in common with the Melajo fauna; and 40 species (or 25%) in common with the Courbaril fauna. The Matura fauna is thus more closely related to the Courbaril fauna than to the Melajo fauna, but it is closer to the Recent fauna than to the Courbaril fauna.

For reasons given below the Matura fauna seems to be of early Pliocene age.

AFFINITIES TO EASTERN PACIFIC RECENT GENERA, SUBGENERA, AND SPECIES

In application of the stimulating paper by Woodring (1966) the genera and subgenera extinct in the Western Atlantic but living in Eastern Pacific waters are listed. This list includes genera and subgenera occurring in the three faunas studied but does not pretend to be complete, although it contains two genera not tabulated by Woodring. They are:

In the Melajo fauna	In the Courbaril fauna	In the Matura fauna
Noetia (Noetia)	*Noetia (Noetia)*	*Noetia (Noetia)*
Mactra (Micromactra)		*Mactra (Micromactra)*
	Psammotreta	
Tenuicorbula		*Tenuicorbula*
		Trochita
Malea		
	Cymia	
Parametaria		*Parametaria*
Strombina (Sincola)	*Strombina (Sincola)*	*Strombina (Sincola)*
Hanetia		
Metula		
Cancellaria (Euclia)		
Cancellaria (Narona)		

In such a list the oldest fauna is expected to yield the highest number, and the youngest fauna the lowest number of paciphile genera or subgenera. This, however, does not apply to the Courbaril fauna, which is attributed to the fact that the Courbaril fauna is the smallest and least complete one. The Courbaril fauna has yielded more species of pelecypods than gastropods, whereas the Melajo and Matura faunas both contain almost twice as many gastropods as pelecypods.

In the following lists the fossil species closely related to Recent Eastern Pacific species are tabulated for each fauna.

Melajo fauna

Fossil species	Recent species
Calorhadia (Calorhadia) solivaga, n.sp.	*C. costellata* (G. B. Sowerby I)
Arcopsis adamsi (Dall)	*A. solida* (G. B. Sowerby I)
Dosinia (Dosinia) grandis Nelson	*D. ponderosa* (Gray)
Pitar (Lamelliconcha) circinatus (Born)	*P. alternatus* (Broderip)
Semele laevis costaricensis Olsson	*S. laevis* (G. B. Sowerby I)
Polinices stanislasmeunieri Maury	*P. uber* (Valenciennes)

Courbaril fauna

Fossil species	Recent species
Pitar (Lamelliconcha) circinatus (Born)	*P. alternatus* (Broderip)
Semele laevis costaricensis Olsson	*S. laevis* (G. B. Sowerby I)
Cymia brightoniana Maury	*C. tecta* (Wood)

Matura fauna

Fossil species	Recent species
Nucula (Lamellinucula) victa Guppy	*N. exigua* G. B. Sowerby I
Arcopsis adamsi (Dall)	*A. solida* (G. B. Sowerby I)
Pitar (Lamelliconcha) circinatus (Born)	*P. alternatus* (Broderip)
Crucibulum (Crucibulum) piliferum Guppy	*C. spinosum* (G. B. Sowerby II)
Trivia (Pusula) radians orientalis (Schilder)	*T. radians* (Lamarck)
Parametaria rutschi, n.sp.	*P. dupontiae* (Kiener)

As can be seen from the preceding lists the Matura fauna shows a relatively strong affinity to the Recent Eastern Pacific fauna. In addition there are two Matura species identical with Recent Eastern Pacific species, *i.e. Trochita radians* (Lamarck) and *Aesopus peculiaris* (Guppy) (see synonymy of the latter species).

It appears that the Matura fauna lived at a time when communication between Atlantic and Pacific was still possible or shortly thereafter. Authors differ as to the time of the final separation of the two oceans. According to Nygren (1950, p. 2005) the, "upper Miocene to Pliocene sediments of the Bolivar syncline are continental, excepting locally where the ocean entered through the destroyed western borderland or gulfs near the extremities of the geosyncline" and (p. 2006), "From upper Miocene to Recent the Bolivar portal was closed and should have been no obstacle for migration of many types of land faunas". Stirton (1950, p. 1541) stated that "in the late (Blancan) Pliocene a land route was established". According to Harrington (1962, p. 1806) and Whitmore and Stewart (1965, p. 185) the final separation of the two oceans occurred during the Pliocene.

It is concluded that the Matura fauna is of Pliocene, and probably of early Pliocene age, although a somewhat younger age cannot be excluded.

SUMMARY AS TO AGES

The following percentages are approximate only.

Percentage of still living species in:

Melajo fauna: 12
Courbaril fauna: 30
Matura fauna: 37

Affinities of the Melajo fauna to:

Courbaril fauna: 24%
Matura fauna: 18%
Recent fauna: 12%

Affinities of the Courbaril fauna to:

Melajo fauna: 43%
Matura fauna: 42%
Recent fauna: 30%

Affinities of the Matura fauna to:

Melajo fauna: 19%
Courbaril fauna: 25%
Recent fauna: 37%

The Melajo fauna is the oldest one of the three faunas studied. It is correlated, at least in part, with the late Miocene Savaneta Glauconitic Sandstone Member of the Springvale Formation. The Courbaril fauna is older than the Matura fauna and is considered to be of early Pliocene age. The Matura fauna indicates an early Pliocene age but is somewhat younger than the Courbaril fauna.

SYSTEMATIC PALEONTOLOGY
SCAPHOPODA

Family **DENTALIIDAE**

Genus **DENTALIUM** Linné

Linné, 1758, Systema Naturae, ed. 10, p. 785.

Type species (by subsequent designation, Montfort, 1810, Conchyliologie systématique, vol. 2, p. 23), *Dentalium elephantinum* Linné.

Subgenus **DENTALIUM** s.str.

Dentalium (Dentalium) divulgatum, n.sp. Pl. 13, figs. 1, 2

Shell of medium size, moderately slender, increasing regularly in diameter. Maximum of curvature usually confined to posterior part of shell. Apical cross section regularly hexagonal. Primaries sharply elevated but flattening in subsequent stages. Interspaces concave, crossed by faint growth lines. The two interspaces on the concave side of the shell usually somewhat wider. Six secondary longitudinal riblets are intercalated, those on the convex side mostly appearing earlier. Subsequently 12 tertiary threads are introduced. In late stages all the ribs are subequal in strength.

Holotype. — Natural History Museum Basel, No. G 12718.

Dimensions of holotype. — Length 33.5 mm; greatest diameter 3.8 mm.

Type locality. — Melajo River area: PJ 285.

D. divulgatum is common in the Melajo Clay and is represented by several hundred specimens. It is a variable species. The curvature is not constant, the secondaries are not always situated in the middle of the interspaces, and some of the tertiaries may be missing. On large specimens quaternary threads may be present. The number of ribs is usually larger on the convex side of the shell.

D. bocasense Olsson (1922, p. 166, pl. 15, figs. 2, 3) from the middle Miocene Gatun Formation of Panama has the same type of sculpture as *D. divulgatum*. But *D. bocasense* is a larger and heavier species with less curvature. *D. armillatum* Toula (1911, p. 496, pl. 31, fig. 8) from the Gatun Formation of the Panama Canal Zone is more delicately sculptured, has numerous faint circular constrictions, and is less arched than *D. divulgatum*.

Occurrence. — Melajo River area: EL 1810, Hutch 47, Hutch 51, K 9797, K 9816, K 9817, K 9902, K 9903, KR 11862, RR 290, RR 293, PJ 285, USGS 18399, USGS 18634, USGS 21178. Point Courbaril: K 1429, K 8399, PJ 212, USGS 10991, USGS 20432a, USGS 20433, USGS 20434, USGS 21778.

Dentalium (Dentalium) species

There are numerous fragments of a *Dentalium* representing many ontogenetic stages. There are six sharply elevated primary ribs with concave interspaces. The secondary sculpture consists of six riblets, and later 12 tertiary threads are intercalated. Most of the fragments are but slightly arched.

This form closely resembles *D. divulgatum,* n.sp. from the Melajo Clay, but the Matura specimens are not preserved well enough to be named.

Guppy (1867, p. 160; reprint, Harris, 1921, p. 39) listed the Recent *D. disparile* d'Orbigny and *D. antillarum* d'Orbigny from Matura. The latter species has nine primary ribs, a feature not represented in the material studied. *D. disparile* is a hexagonal species belonging to the subgenus *Antalis, i.e.* the longitudinal sculpture is lacking in old stages according to the definition.

Occurrence. — K 10924, JS 67, RR 230, PJ 302, USGS 18204, USGS 19860.

Subgenus **GRAPTACME** Pilsbry and Sharp

Pilsbry and Sharp, 1897, Manual of Conchology, ser. 1, vol. 17, p. 85.

Type species (by subsequent designation, Woodring, 1925, Carnegie Inst. Washington, Pub. 366, p. 201), *Dentalium eboreum* Conrad.

Dentalium (Graptacme) cf. **amaliense** Henderson Pl. 13, fig. 3

Shell small, moderately slender, circular in cross section. Sculpture limited to posterior part of shell, consists of faint longitudinal threads which are separated by narrow grooves. Anterior part of shell smooth and considerably longer than sculptured portion. Apical slit long and narrow, placed laterally.

There are a few small fragments which may be referred to the Recent *D. amaliense* Henderson (1920, p. 71, pl. 11, figs. 4, 5) from St. Thomas, Virgin Islands. The holotype of that species is 16 mm long. The largest but incomplete specimen at hand measures 10.2 mm in length, and its greatest diameter is 1.8 mm, thus being somewhat stouter than the Recent species. One of the fragments shows the laterally placed apical slit which is about 2 mm long.

Woodring (1925, p. 202) described a fragment from Bowden, Jamaica, as *Dentalium (Graptacme)* species b which he thought to be similar to *D. amaliense*.

Occurrence. — JS 67, RR 230, PJ 302, USGS 18204, USGS 19860.

Subgenus **LAEVIDENTALIUM** Cossmann

Cossmann, 1888, Catalogue illustré des coquilles fossiles de l'Eocène des environs de Paris, fasc 3, p. 11.

Type species (by original designation), *Dentalium incertum* Deshayes.

Dentalium (Laevidentalium ?) species

Three minute fragments from Matura, all of them about 3 mm long, are at hand. They seem to belong to *Laevidentalium*. Their surface is smooth, the cross section circular. No apical notch is observable.

Occurrence. — K 10924, RR 230.

PELECYPODA

Family NUCULIDAE

Genus NUCULA Lamarck

Lamarck, 1799, Mém. Soc. Hist. Nat. Paris, p. 87.

Type species (by monotypy), *Arca nucleus* Linné.

Subgenus LAMELLINUCULA Schenck

Schenck, 1944, Jour. Paleont., vol. 18, No. 1, p. 97.

Type species (by original designation), *Nucula tamatavica* Odhner.

Nucula (Lamellinucula) vieta Guppy — Pl. 13, figs. 4-7

1867. *Nucula vieta* Guppy, Proc. Sci. Assoc. Trinidad, pt. 3, p. 174; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 53.
1874. *Nucula vieta* Guppy, Guppy, Geol. Mag., new ser., decade 2, vol. 1, p. 443, pl. 18, figs. 8a, 8b.
1882. *Nucula vieta* Guppy, Guppy, Proc. Sci. Assoc. Trinidad, vol. 2, p. 171, pl. 7, fig. 11; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 92.
1925. *Nucula vieta* Guppy, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 21.

Shell small, obliquely trigonal, almost as high as long, strongly inflated. Sculpture consists of numerous rounded, concentric ridges with somewhat narrower interspaces. Interspaces sculptured by fine radial lines mostly crossing the much heavier concentrics. On the anterior part of the shell the concentric ridges are more crowded, and two of them may fuse. Lunule slightly sunken, its border marked by an angulation of the concentrics. Its sculpture thus consists of fine ridges running perpendicular to the hinge margin. Border of escutcheon also marked by an abrupt change of sculpture. The escutcheon then appears knobby. The straight teeth number about six anteriorly, about 12 posteriorly. The two rows are separated by an oblique, narrow, forward looking resiliar pit. Ventral margin finely crenulated interiorly.

Lectotype (herewith selected). — USNM 115562.

Dimensions of lectotype. — Length 3.1 mm; height 3.1 mm.

Type locality. — Matura, Trinidad.

The type lot of *N. vieta* consists of two small valves which had been glued to a card. The figured specimen from JS 67 is 4.9 mm long and 4.1 mm high. It is thus larger than the material studied by Guppy.

Rutsch (1942, p. 101) listed *Nucula* sp. ind. from Springvale Quarry. Examination of this material (Basel Natural History Museum, No. G 2318) suggests immature *N. vieta*. Larger specimens of later collections from Springvale Quarry confirm this determination.

N. gadsdenensis Mansfield (1937, p. 187, pl. 10, figs. 8, 10, 12) from the lower Miocene Tampa Limestone of Florida is even smaller than *N. vieta* but has the same general form and scultpure. It has no distinct escutcheon, whereas in *N. vieta* it is well developed. *N. cahuitensis* Olsson (1922, p. 171, pl. 18, figs. 21-24) from the middle Miocene Gatun Formation of Costa Rica is longer than *N. vieta* compared to the height and has a weaker sculpture.

N. venezuelana Weisbord (1964, p. 36, pl. 1, figs. 1-6) from the Pliocene Mare Formation of Venezuela is a similar species. Two small and apparently immature valves from the Cabo Blanco area, Venezuela, contained in the collections of the U. S. National Museum suggest *N. vieta,* although their concentrics are somewhat flatter.

N. vieta is practically indistinguishable from the Recent West Coast *N. exigua* G. B. Sowerby I (*in* Broderip and Sowerby, 1832-1833, p. 198, 1833; Olsson, 1961, p. 56, pl. 1, figs. 2, 2a, 2b, 10, 10a). *N. vieta* is known from a few shells only. More material might show that it should be treated as a synonym of *N. exigua*.

Occurrence. — JS 67, PJ 302.

Distribution. — Springvale Fm. (late Miocene). Matura shell bed.

Nucula (Lamellinucula) baccata Guppy Pl. 13, figs. 8-12

1867. *Nucula baccata* Guppy, Proc. Sci. Assoc. Trinidad, pt. 3, p. 174; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 53.
1874. *Nucula baccata* Guppy, Guppy, Geol. Mag., new ser., decade 2, vol. 1, p. 443, pl. 18, figs. 7a, 7b.
1882. *Nucula baccata* Guppy, Guppy, Proc. Sci. Assoc. Trinidad, vol. 2, p. 171, pl. 7, fig. 12; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 92.
1925. *Nucula baccata* Guppy, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 20, pl. 12, fig. 5.

Shell small, strongly inequilateral, moderately inflated. Anterior extremity angulated. Posterior end produced and slightly angulated. Ventral margin evenly rounded. Anterior umbonal ridge accentuated; posterior umbonal ridge broadly rounded. Sculpture consists of crowded, rounded concentric ridges with narrower interspaces crossed by fine radial striae. Occasionally two concentrics fuse on the anterior portion of the shell. Lunule and escutcheon slightly sunken but not well defined. The concentrics continue without interruption but weaker over the anterior and posterior umbonal ridges and cover lunule and escutcheon. Anterior teeth almost straight numbering about seven. Posterior teeth angulated, about 17 in number. Resiliar pit narrow and oblique. Inner side of ventral margin finely crenulated.

Lectotype (herewith selected). — USNM 115561.

Dimensions of lectotype (left valve). — Length 7.0 mm, height 5.3 mm.

Type locality. — Matura, Trinidad.

The type lot of *N. baccata* consists of three valves which were glued to a card. The largest specimen from Matura at hand measures 7.8 mm in length and 5.8 mm in height. Immature specimens have an extremely weak sculpture. The heavier concentrics appear toward the ventral margin only. *N. baccata* occurs in the Melajo Clay and in the Courbaril beds as well, but no specimens from the type area of the Springvale Formation have been found.

N. tenuisculpta Gabb (1873b, p. 255; Pilsbry 1922, p. 401, pl. 38, fig. 6) from the Miocene of the Dominican Republic is a much smaller species and has no marginal angulation anteriorly. *N. orbicella* Olsson (1922, p. 171, pl. 28, figs. 19, 20) from the middle Miocene Gatun Formation of Costa Rica is a closely related species having the same outline, sculpture, and number of teeth. However, the sculpture of the escutcheon is different being pustule-like in *N. orbicella*.

Occurrence. — Melajo River area: K 9816, K 9817. Point Courbaril: USGS 20432, USGS 20434. Matura Bay: JS 67, RR 230, PJ 302, USGS 18204, USGS 19860.

Distribution. — Melajo Clay Member of Springvale Fm. Courbaril beds of upper Morne l'Enfer Fm., Matura shell bed.

Family **NUCULANIDAE**

Genus **NUCULANA** Link

Link, 1807, Beschreibung der Naturalien-Sammlung der Universität zu Rostock, p. 155.

Type species (by monotypy), *Arca rostrata* Chemnitz (= *Mya pernula* Müller).

Subgenus **SACCELLA** Woodring

Woodring, 1925, Carnegie Inst. Washington, Pub. 366, p. 15.

Type species (by original designation), *Arca fragilis* Chemnitz (= *Leda commutata* Philippi).

Nuculana (Saccella) ludificans, n. sp. Pl. 13, figs. 13-16

Shell small. Beaks submedian. Anterior margin strongly rounded; posterior end pointed. Lunule indistinct. Rostral area sunken and concave, sculptured by straight, subparallel lines. Posterior umbonal ridge moderately prominent. Sculpture consists of fine concentric striae which are usually broader in young stages. Resilifer inconspicuous. Hinge with 20 to 23 anterior and 15 to 19 posterior teeth.

Holotype (right valve). — Natural History Museum Basel, No. G 12677.

Dimensions of holotype. — Length 7.4 mm, height 3.7 mm.

Type locality. — Melajo River area: PJ 285.

N. ludificans is represented by more than a hundred specimens from the type locality of the Melajo Clay. It is a variable species. There are specimens which are less produced posteriorly. As a rule the concentric striae are narrow, but they may be broader as well.

The type lot of *Leda illecta* Guppy (1867, p. 174) from the middle Miocene Manzanilla Formation of Manzanilla Bay, Triniday (USNM 115556), consists of six poorly preserved specimens. They all are fragmentary and attached to matrix thus not showing the interior. Guppy described them as smooth, but they are worn and show faint concentric sculpture on some specimens. Specimens of *N. ludificans* from Point Courbaril often show no concentric sculpture in the area of their greatest inflation which may be due to washing. They then closely resemble *N. illecta*. It is unsatisfactory, however, to identify *N. ludificans* as *N. illecta*.

N. leptalea (Gardner) [1926-1950 (1926), p. 16, pl. 3, figs.

7, 8] from the lower Miocene Chipola Formation of Florida is a smaller species with broader concentrics and a more prominent posterior umbonal ridge. *N. subibajana* Marks (1951, p. 49, pl. 1, figs. 1-3) from the lower Miocene Subibaja Formation of Ecuador is larger and considerably more convex. *N. extricata* (Pilsbry and Johnson) (1917, p. 185; Pilsbry 1922, pl. 38, figs. 1, 1a) from the Miocene of the Dominican Republic has the same general appearance but has different proportions. Its shell is higher compared to the length than in *N. ludificans.*

N. vulgaris (Brown and Pilsbry) (1913b, p. 499, fig. 3) from the Pleistocene near Mount Hope, Panama Canal Zone, has a coarser sculpture. Among the topotypes at hand there are specimens twice as large as *N. ludificans.* The Recent *N. eburnea* (G. B. Sowerby I) (*in* Broderip and Sowerby, 1832-1833, p. 198, 1833; Olsson, 1961, p. 62, pl. 2, figs. 4, 4a, pl. 3, fig. 10) from the west coast of Central America has virtually the same outline and type of sculpture as *N. ludificans. N. eburnea* differs by its larger size and the well-defined lunule.

Occurrence. — Melajo River area: EL 1810, Hutch 47, K 9817, K 9903, KR 11862, RR 290, PJ 285, USGS 18399, USGS 21178. Point Courbaril: K 1429, K 8399, RR 120, PJ 212, USGS 10991, USGS 20432, USGS 20433, USGS 20434.

Nuculana (Saccella) perlepida (Guppy) Pl. 13, figs. 17-19

1867. *Leda perlepida* Guppy, Proc. Sci. Assoc. Trinidad, pt. 3, pp. 163, 173; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, pp. 42, 52.
1874. *Leda perlepida* Guppy, Guppy, Geol. Mag., new ser., decade 2, vol. 1, p. 442, pl. 18, figs. 9a, 9b.
1925. *Leda perlepida* Guppy, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 26, pl. 12, fig. 4.

Shell small, strongly inflated in young stages, less so later. Umbones situated centrally to slightly anteriorly. Sculpture consists of fine concentrics. Anterior margin evenly rounded; posterior extremity somewhat pointed. Postero-dorsal margin straight. Hinge with two rows of chevron-shaped teeth. Anterior row with more teeth than posterior one. Escutcheon moderately well defined, sculptured by straight lines which are subparallel to the postero-dorsal margin.

Lectotype (herewith selected). — USNM 115557.

Dimensions of lectotype (right valve). — Length 6.0 mm, height 3.8 mm.

Type locality. — Matura, Trinidad.

The type lot of *Leda perlepida* consists of four specimens which had been glued to a card. The lectotype is the specimen figured by Guppy in 1874. The remaining three syntypes are immature. *N. perlepida* does not have "occasionally deeper and wider concentric furrows" in addition to the finer concentrics. These "furrows" are a matter of coloration and do not form any undulating relief. The lectotype and the shell figured by Maury are the only specimens so far showing this coloration.

N. perlepida is closely related to *N. subcerata* (Woodring) (1925, p. 17, pl. 1, figs. 6, 7) from Bowden, Jamaica. As stated by Woodring immature Bowden shells are practically indistinguishable from immature *N. perlepida.* Adult *N. subcerata,* however, consistently has a more upturned posterior extremity than adult Matura valves.

N. ludificans, n. sp. differs from *N. perlepida* in having a longer posterior extremity. *N. ludificans* typically has widely spaced concentric grooves in young stages, whereas in *N. perlepida* they are closely set. Immature *N. ludificans* is never so stout and strongly inflated as immature *N. perlepida.*

The type lot of the Recent *N. cerata* (Dall) (1881, p. 126) dredged at 100 fms. off Barbados consists of nine specimens. Their escutcheon is less well defined, the concentric grooves more widely spaced, and their anterior extremity more sharply curved.

Occurrence. — K 10924, JS 67, RR 230, PJ 302, USGS 18204, USGS 19860.

Distribution. — Known from type locality only.

Genus **CALORHADIA** Stewart

Stewart, 1930, Acad. Nat. Sci. Philadelphia, Spec. Pub. No. 3, p. 51.

Type species (by original designation), *Leda pharcida* Dall.

As suggested by Stenzel, Krause, and Twining (1957, p. 47) the genus *Costelloleda* Hertlein and Strong [1940-1951 (1940), p. 398] (type species: *Nucula costellata* G. B. Sowerby I) is a subjective synonym of *Calorhadia.*

Subgenus **CALORHADIA** s. str.

Calorhadia (Calorhadia) solivaga, n. sp. Pl. 14, figs. 1, 2

Shell elongate, thin. Anterior margin angulated in upper half, evenly arched below. Exterior sculptured by widely spaced, elevated concentric lamellae. Interspaces with fine incrementals. Posterior slope with two squamose ridges. Their interspace crossed by fine incrementals and sometimes by a weak continuation of the lamellae of the main shell disc. Escutcheon lanceolate, smooth. Lunule sharply defined, but narrow. Anterior row of teeth shorter than posterior one; both with more than 30 teeth. Resilifer triangular.

Holotype.—Natural History Museum Basel, No. G 12678.

Dimensions of holotype (left valve).—Length 17 mm, height 6.5 mm.

Type locality.—Melajo River area: PJ 285.

This species is represented from the Melajo Clay by a few complete valves and a number of fragments. One of the paratypes is heavier and more inflated.

A number of Calorhadias have been described from the Eocene of the southern United States, but none of these species shows the distinctive external sculpture of distant concentrics like *C. solivaga*. *C. pharcida* (Dall) [1890-1903 (1898), p. 587, pl. 32, fig. 8], the type species of *Calorhadia*, has also much more crowded concentrics and seems to reach a larger size.

C. solivaga is most closely related to the Recent West Coast *C. costellata* (G. B. Sowerby I) [*in* Broderip and Sowerby 1832-1833, p. 198, 1833; Hertlein and Strong 1940-1951 (1940), p. 398, pl. 2, fig. 10] which ranges from Lower California to Panama (Olsson, 1961, p. 67). According to the many Recent specimens of *C. costellata* at hand *C. solivaga* has somewhat more distant concentric laminae. *C. solivaga* is more inflated, and its ventral margin is more strongly curved. *C. marella* (Hertlein, Hanna, and Strong) [*in* Hertlein and Strong, 1940-1951 (1940), p. 399, pl. 2, figs. 12, 13], also a Recent West Coast species, is easily distinguished from *C. solivaga* by its more closely set concentric lamellae.

The type lot of *C. cestrota* (Dall) (1890, p. 255, pl. 13, fig. 7) which has been collected near Colon (Caribbean side of Panama) from a muddy bottom at a depth of 25 fms. consists of eight shells including one double-valved specimen (USNM 94088). *C. cestrota* is proportionately longer than *C. solivaga,* has closely spaced concentric lamellae, and its lower postero-dorsal ridge is only weakly indicated. *C. cestrota* may be the same as the Recent *C. egregia* (Guppy) (1882, p. 174, pl. 7, figs. 1, 2; reprint, Harris, 1921, p. 95, pl. 5, figs. 1, 2) from the Gulf of Paria, Trinidad. Guppy's original figures are so poor that the species cannot be recognized. In addition nothing is known about the types of *C. egregia*. However, *C. egregia* seems to have crowded concentric lamellae like *C. cestrota*.

Dall (*in* Guppy and Dall, 1896, p. 329) changed the name *Cercomya ledaeformis* Guppy (1866b, p. 581, pl. 26, fig. 1) into *Leda guppyi* which is unjustified. *Cercomya ledaeformis,* which has been collected from the middle Miocene Manzanilla Formation at Manzanilla Bay, Trinidad, is a *Calorhadia*. The type lot (USNM 115555) consists of a small and a larger specimen, both attached to matrix. They clearly show the two ridges on the posterior slope. Their concentric lamellae are distant on the umbonal area like in *C. solivaga* but become crowded toward the ventral margin. *C. ledaeformis* is proportionately more elongate than *C. solivaga*. *Leda dalliana* Olsson (1922, p. 175, pl. 28, fig. 17) from the middle Miocene Gatun Formation of Costa Rica seems to be a *Calorhadia*. According to the original description it must be closely related with *C. ledaeformis*.

Occurrence.—PJ 285, USGS 18399, USGS 21178.

Genus **ADRANA** H. and A. Adams

Adams, H. and A., 1858, The genera of Recent Mollusca; arranged according to their organization, vol. 2, p. 547.

Type species (by subsequent designation, Stoliczka, 1871, Palaeont. Indica, vol. 3, p. 320), *Nucula (Adrana) lanceolata* Lamarck.

Adrana perprotracta (Dall) ? Pl. 14, figs. 3, 4

1912. *Yoldia perprotracta* Dall, Smithsonian Misc. Coll., vol. 59, No. 2, p. 1.
1913. *Yoldia perprotracta* Dall, Brown and Pilsbry, Acad. Nat. Sci. Philadelphia, Proc., vol. 65, p. 496.
1925. *Yoldia perprotracta* Dall, Dall, U.S. Nat Mus., Proc., vol. 66, art. 17, p. 32, pl. 18, fig. 3.
1953. *Yoldia (Adrana) perprotracta* Dall, Warmke and Abbott, Jour. Washington Acad. Sci., vol. 43, No. 8, p. 260, figs. 1, 2.

Shell thin, elongated, inequilateral. Beaks low. Anterior end strongly arched, posterior end somewhat pointed. Ventral margin with a shallow sinus posterior to the beaks. Narrow lunule and escutcheon present. Sculpture consists of fine, concentric grooves with wider interspaces. Sculpture confined to the main shell disc, *i.e.*, to the area between anterior and posterior umbonal slopes. Anterior umbonal slope sometimes marked with a shallow radial depression. In front of the posterior umbonal slope the sculpture becomes eccentric, *i.e.*, the striae slowly approach the ventral margin. Rest of exterior surface coverd by faint incrementals. Hinge almost straight. Adult specimens have about 38 anterior and 45 to 50 posterior teeth. Resilifer asymmetrically triangular.

Type lots. — USNM 214350 (one left valve and one double-valved specimen). USNM 605551 (17 shells including two double-valved specimens). Both lots were collected at the same locality.

Type locality. — Pleistocene near Mount Hope, Panama Canal Zone.

This species occurs abundantly in the Melajo Clay but is rare in the Courbaril beds.

A. kurzi (Mansfield) (1932a, p. 36, pl. 2, figs. 5, 8), from the late Miocene of Florida, is closely related to *A. perprotracta* ? It differs in being proportionately higher. Its concentrics are more widely spaced and continuous over the antero-dorsal area which is not the case in *A. perprotracta* ? On the other hand all the specimens in the type lot of *A. perprotracta* are proportionately longer, and their concentrics more crowded but not continuous over the antero-dorsal area. Thus the Trinidad fossils are closer to *A. perprotracta* than to *A. kurzi.*

The status of *A. agronomica* (Maury) (1925a, p. 405, pl. 12, fig. 12) is not clear, because the type (and only specimen) crumbled after being drawn. Marks (1951, p. 51, pl. 1, fig. 6) described *Nuculana (Adrana)* sp. from the lower Miocene Subibaja Formation of Ecuador. This form is insufficiently preserved to allow a comparison.

Adrana quitanensis (Olsson) (1922, p. 174, pl. 18, fig. 19) from the middle Miocene Gatun Formation of Costa Rica has similar dimensions and outline as the Trinidad fossils, but it is said to be "crossed on the lower half of the anterior two-thirds by even, oblique lines." This is not the case in the material under study.

Among the Recent West Coast Adranas *A. exoptata* Pilsbry and Lowe (1932, p. 107, pl. 17, figs. 8, 9) has some resemblance with *A. perprotracta* but is somewhat angulated antero-dorsally, and has less teeth.

Occurrence. – Melajo River area: KR 11862, Hutch 47, PJ 285, USGS 18399, USGS 18634, USGS 21178. Point Courbaril: K 12013, PJ 212.

Family **ARCIDAE**

Genus **ARCA** Linné

Linné, 1758, Systema Naturae, ed. 10, p. 693.

Type species (defined by Opinion 189, Opinions and Declarations rendered by the Internat. Comm. Zool. Nomenclature, vol. 3, pp. 93-108, 1945), *Arca noae* Linné.

Subgenus **ARCA** s. str.

Arca (Arca) zebra zebra (Swainson) Pl. 14, figs. 5, 6

1833. *Byssoarca zebra* Swainson, Zoological Illustrations, ser. 2, vol. 3, pl. 118.
1844. Not *Arca zebra* Swainson, Reeve, Conch. Icon., vol. 2, *Arca*, species 69, pl. 11, fig. 69.
1845. *Arca barbadensis* d'Orbigny *in* La Sagra, Historia fisica, politica y natural de la isla de Cuba, Spanish edition, tomo 5, Moluscos, p. 345.
1847. *Arca occidentalis* Philippi, Abbildungen und Beschreibungen, vol. 3, p. 29, *Arca*, pl. 4, figs. 4a, 4b, 4c.
1907. *Arca zebra* Swainson, Lamy, Jour. de Conchyl., vol. 55 (ser. 4, vol. 9), p. 17.
1925. *Arca (Arca) occidentalis* Philippi, Woodring, Carnegie Inst. Washington, Pub. 366, p. 29, pl. 2, figs. 8, 9. For further citations see this publication.
1953. *Arca (Arca) occidentalis* Philippi, Olsson and Harbison, Acad. Nat. Sci. Philadelphia, Mon., No. 8, p. 32.
1964. *Arca (Arca) zebra* (Swainson), Weisbord, Bull. Amer. Paleont., vol. 45, No. 204, p. 50, pl. 2, figs. 16, 17. For additional citations see this publication.

More than 20 specimens from Matura representing many ontogenetic stages are at hand. The largest ones reach a length of more than 60 mm. The posterior emargination is not strongly pronounced usually but more so in young stages. The antero-dorsal angulation is variable like in Recent specimens.

Guppy listed the species from Matura as *A. noae*. *A. noae* is said to occur as far west as Bermuda (Lamy, 1907, p. 16). On the other hand *A. zebra* occurs as far east as Bermuda (Warmke and Abbott, 1961, p. 321, map 4). Comparison of many specimens of both species shows that there is no constant difference as both species are variable. Many opinions have been expressed as to their relationship but without definite result. A solution seems possible only by comparing the anatomy of both forms.

Specimens from Bowden, Jamaica, are more elongate on an average than those from Matura. The depth of the posterior emargination seems more pronounced but is also variable according to Woodring (1925, pp. 29-30). Specimens from the Springvale Formation of Springvale Quarry have been described as *A. occidentalis miocica* by Vokes (1938, p. 8, fig. 1). Rutsch (1942, p. 109) questioned the value of this subspecies stating that large suites of both forms should be compared before taking a definite decision. However, the fossil form has finer ribs and more secondary riblets on the postero-ventral portion of the shell. The latter feature may be found on Recent specimens as well. But even then their primaries are considerably broader than on the fossil subspecies.

Occurrence. — K 10924, JS 67, RR 230, PJ 302, USGS 18204, USGS 19860.

Distribution. — Miocene (Venezuela, Costa Rica, Jamaica, Dominican Republic, Florida). Pliocene (Florida). Pleistocene. Recent (West Indies to Cape Hatteras and Bermuda).

Arca (Arca) imbricata imbricata Bruguière Pl. 14, figs. 7, 8

1792. *Arca imbricata* Bruguière, Encyclopédie Méthodique, vol. 1, p. 98 (refers to Lister, pl. 367, fig. 207).
1819. *Arca umbonata* Lamarck, Histoire naturelle des animaux sans vertèbres, vol. 6, p. 37 (refers to Lister, pl. 367, fig. 207).
1845. *Arca americana* d'Orbigny *in* La Sagra, Historia fisica, politica y natural de la isla de Cuba, Spanish edition, tomo 5, Moluscos, p. 342. Atlas, pl. 28, figs. 1, 2, 1842.
1907. *Arca imbricata* Bruguière, Lamy, Jour. de Conchyl., vol. 55 (ser. 4, vol. 9), p. 26.
1964. *Arca (Arca) imbricata* Bruguière, Weisbord, Bull. Amer. Paleont., vol. 45, No. 204, p. 54, pl. 3, figs. 1-8. For additional citations see this publication.
1965. *Arca (Arca) umbonata* Lamarck, Jung, Bull. Amer. Paleont., vol. 49, No. 223, p. 420, pl. 51, figs. 2, 4.

Several small, immature specimens from Matura are at hand. Like Recent shells of this species, the shape varies considerably. The byssal gape may or may not be strongly accentuated, and the posterior umbonal ridge is prominent, angulated, or rounded.

A. umbonata morantensis Woodring (1925, p. 30, pl. 2, figs. 10, 11) from Bowden, Jamaica, is a smaller species with coarser sculpture. Its affinities to *A. bowdeniana* Dall [1890-1903 (1898),

p. 622, pl. 33, fig. 12] have been discussed by Woodring (1925, p. 31).

Occurrence. — Matura Bay: JS 67, RR 230, USGS 18204. Point Courbaril: USGS 20432a.

Distribution. — See Weisbord (1964, p. 58).

Genus **BARBATIA** Gray

Gray, 1842, Synopsis of the contents of the British Museum, ed. 44, p. 81.

Type species (by subsequent designation, Gray, 1847, Zool. Soc. London, Proc., pt. 15, p. 197), *Arca barbata* Linné.

Subgenus **BARBATIA** s. str.

Barbatia (Barbatia) candida (Helbling) Pl. 14, figs. 11, 12

1779. *Arca candida* Helbling, Abhandl. Privatges. Böhmen, vol. 4, p. 129, pl. 4, figs. 39, 40 and a.
1925. *Barbatia (Calloarca) candida* Gmelin, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 42, pl. 8, fig. 6.
1964. *Barbatia (Barbatia) candida* (Helbling), Weisbord, Bull. Amer. Paleont., vol. 45, No. 204, p. 58, pl. 3, figs. 9-14. For additional citations see this publication.

This form is represented from Matura by three immature shells. Comparison with Recent specimens of the same size suggests that the fossil belongs to *B. candida*. *B. candida* is treated as a species of *Cucullaearca* by Reinhart (1935, p. 27).

Occurrence. — K 10924, RR 230.

Distribution. — See Weisbord (1964, p. 61).

Barbatia species

A single fragment from the base of the Melajo Clay measuring 31 mm in length indicates that the Melajo fauna includes also a large species of *Barbatia*. The fragment represents the antero-ventral part of a left valve. Its external sculpture is regular consisting of pairs of radial ribs. Two pairs of radials form a group of four, and these groups are separated from each other by wider interspaces. All the radials are beaded anteriorly.

Occurrence. — USGS 18411.

Subgenus **Acar** Gray

Gray, 1857, Ann. Mag. Nat. Hist., ser. 2, vol. 19, p. 369.

Type species (by subsequent designation, Woodring, 1925, Carnegie Inst. Washington, Pub. 366, p. 36), *Arca gradata* Broderip and G. B. Sowerby I.

Stoliczka (1871, p. 340) did not designate a type species of *Acar* as indicated by some authors.

Barbatia (Acar) domingensis (Lamarck) Pl. 15, figs. 1, 2

1819. *Arca domingensis* Lamarck, Histoire naturelle des animaux sans vertèbres, vol 6, p. 40.
1907. *Arca (Acar) plicata* Chemnitz, Lamy, Jour. de Conchyl., vol. 55, (ser. 4, vol. 9), p. 80.
1925. *Barbatia (Acar) reticulata* Gmelin, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 43, pl. 8, figs. 18, 21.
1964. *Barbatia (Acar) domingensis* (Lamarck), Weisbord, Bull. Amer. Paleont., vol. 45, No. 204, p. 61, pl. 4, figs. 1-9. For further citations see this publication.

Shell of small to medium size. Anterior margin evenly rounded, with fine crenulations interiorly. Ventral margin oblique to hinge, smooth. Posterior margin pointed with interior crenulations. Umbos low, broad, strongly prosogyrate. Sculpture reticulate, considerably coarser on posterior portion of shell. Concentric ridges stronger and less numerous than the radial ribs. Radials thickened on concentric ridges but narrow in the interspaces of the concentrics. Posterior umbonal ridge strongly angulated. Cardinal area narrow. Behind the umbos a few ligamental grooves. Muscle scars prominent and elevated.

This is the species listed as *A. squamosa* by Guppy (1867, p. 164; 1874, p. 443). It is common at Matura being represented by more than 30 specimens.

Occurrence.—K 10924, JS 67, RR 230, PJ 302, USGS 18204, USGS 19860.

Distribution.—Miocene to Recent (see Weisbord, 1964, p. 64).

Subgenus **FUGLERIA** Reinhart

Reinhart, 1937, Jour. Paleont., vol. 11, No. 3, p. 184.

Type species (by original designation), *Barbatia (Fugleria) pseudoillota* Reinhart.

Barbatia (Fugleria ?) millifila latrinidadis Maury Pl. 14, figs. 9, 10

1925. *Barbatia (Acar) milifilia* [*sic*] *latrinidadis* Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 44, pl. 8, fig. 3.

Shell small, inequilateral. Umbos low, broad, strongly prosogyrate, somewhat angulated posteriorly. Anterior margin evenly rounded. Postero-ventral margin moderately produced. Sculpture consists of about 30 primary ribs. The anterior ones and those around the posterior umbonal ridge are broader and strongly beaded. The central ribs are narrow and only slightly beaded. Those on the posterior slope are narrower again but strongly beaded. Secondary ribs first appear anteriorly, then centrally. No secondaries around posterior umbonal ridge and on posterior slope. Cardinal area narrow, wider in front. Hinge with about 24 teeth, those of the posterior half shorter than the anterior ones. Inner margin smooth.

Holotype (left valve). — Paleont. Research Inst., Ithaca, N. Y., No. 817.

Dimensions of holotype. — Length 17.5 mm, height 13.0 mm, convexity 5.5 mm.

Type locality. — Matura, Trinidad.

Maury described this form as a subspecies of the Pliocene *B. millifila* (Dall) [1890-1903 (1903), p. 1629, pl. 56, figs. 21, 24] from Shell Creek, Florida. Reinhart (1937, p. 184) doubtfully included *B. millifila* in his subgenus *Fugleria*. Originally *Fugleria* was meant to include forms with reduced or absent posterior teeth as shown by its type species, *B. pseudoillota* Reinhart, from the Pliocene of California. But Olsson (1961, p. 83) enlarged its definition: ". . . the posterior set of teeth well developed or subobsolete." According to this statement *B. millifila,* which has well-developed posterior teeth, and the subspecies *latrinidadis,* which has only slightly reduced posterior teeth, belong to *Fugleria*.

The type lot of *B. millifila* (USNM 163473) consists of two specimens which are less elongate than the Trinidad fossils. The collections of the U. S. National Museum contain specimens from the late Miocene of Acline, Florida, which might be identified as *B. millifila,* although they have a more elongate outline like the Trinidad subspecies. On the other hand they may have divided primary radials postero-ventrally like specimens from Shell Creek, a feature never observed on Matura shells.

The collections of the U. S. National Museum contain a single specimen from the Pliocene of Moin Hill near Puerto Limon, Costa Rica (USGS locality 5884 b), which probably represents *B. millifila latrinidadis.*

A lectotype of the Recent Caribbean *B. tenera* (C. B. Adams) (1845, p. 9) has been selected and figured by Clench and Turner

(1950, p. 348, pl. 43, figs. 1, 2). This species has clearly reduced posterior teeth, thus being a real *Fugleria*. The Recent West Coast *B. illota* (G. B. Sowerby I) (1833-1834, p. 18, 1833; Maury, 1922, pl. 2, figs. 8, 14; Olsson, 1961, pl. 6, figs. 1, 1a, 1b) has tertiary riblets which do not seem to occur in *B. tenera*.

Occurrence. — RR 230, PJ 302, USGS 18204.

Distribution. — Matura, Trinidad. Pliocene of Costa Rica (?).

Genus **ARCOPSIS** von Koenen

Von Koenen, 1885, Abh. Königl. Ges. Wiss. Göttingen, Phys. Classe, vol. 32, pt. 2, p. 86.

Type species (by subsequent designation, Reinhart, 1935, Bull. Mus. royal Hist. nat. Belgique, vol. 11, No. 13, p. 30), *Arca limopsis* von Koenen.

Arcopsis adamsi (Dall) Pl. 15, figs. 3-6

1845. *Arca caelata* Conrad, Fossils of the Medial Tertiary Formations of the United States, p. 61, pl. 32, fig. 2. Not of Reeve, 1844.
1867. *Arca adamsi* Shuttleworth, Guppy, Proc. Sci. Assoc. Trinidad, pt. 3, p. 164; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 43.
1874. *Arca adamsi* Shuttleworth, Guppy, Geol. Mag., new ser., decade 2, vol. 1, p. 443.
1925. *Barbatia (Fossularca) adamsi* (Shuttleworth), Smith, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 45, pl. 8, figs. 1, 8.
1925. *Fossularca (Fossularca) adamsi sawkinsi* Woodring, Carnegie Inst. Washington, Pub. 366, p. 51, pl. 5, figs. 16, 17.
1964. *Arcopsis adamsi* "Shuttleworth" (E. A. Smith), Weisbord, Bull. Amer. Paleont., vol. 45, No. 204, p. 65, pl. 4, figs. 14-17, pl. 5, figs. 1-6. For further citations see this publication.
1965. *Arcopsis (Arcopsis) adamsi* (Dall), Bird, Palaeont. Amer., vol. 5, No. 34, p. 25, pl. 1, figs. 7, 8.

Shell small. Shape strongly variable, from moderately elongate-subrectangular to stout-subtrapezoidal. Umbos low, broad, subcentral. Posterior umbonal ridge accentuated. Sculpture consists of numerous radials which are crossed by fine concentrics forming more or less strong beads at the intersections. This reticulate sculpture is always developed in young stages, but on adult specimens the concentrics may disappear. Secondary radials are present on the central portion of the shell which is shallowly depressed in older individuals. Posterior teeth more numerous than anterior ones. Cardinal area narrow. Ligamental area triangular, subumbonal. Muscle scars elevated.

As mentioned above this species has considerable variability.

Rutsch (private report) listed *A. solida* (G. B. Sowerby I) (1833-1834, p. 18, 1833; Olsson, 1961, p. 85, pl. 6, figs. 3, 3a, 3b), the Recent West Coast analogue of *A. adamsi,* from Matura. Rutsch had four adult valves at hand which indeed look more like *A. solida* than *A. adamsi.* They are stout, strongly inflated, and have lost most of the concentric sculpture like the specimens figured by Maury (1925, pl. 8, figs. 1, 8). However, more recent collections from Matura yielded more elongate specimens with reticulate sculpture some of them being immature. Only a comparison of large series of both species could show whether there are steady transitions or not. Almost the same circumstances are found in a large lot of *A. adamsi* from the Caloosahatchee Pliocene of Shell Creek, Florida. In Recent lots the variability is less marked; stout and strongly inflated individuals retain the concentric sculpture even in adult stages.

Dall (1886, p. 243; 1902, p. 508, pl. 31, fig. 1) proposed the subspecific name *conradiana* for small, squarish, Recent shells. A sample from the Gulf of Mexico at hand, dredged at 54 fathoms east of the Mississippi Delta, contains specimens referable to this subspecies. They differ from *A. adamsi* by a more accentuated posterodorsal angulation and a much broader cardinal area.

The specimens described by Rutsch (1942, p. 111, pl. 3, figs. 3, 4) from Springvale Quarry are immature and identical with shells of the same size from Matura. Imperfectly preserved young specimens occur in the Melajo Clay as well.

Occurrence. — Melajo River area: K 9817, PJ 285. Matura Bay: JS 67, RR 230, PJ 302, USGS 18204, USGS 19860.

Distribution. — Miocene to Recent (see Weisbord, 1964, p. 68).

Genus **ANADARA** Gray

Gray, 1847, Zool Soc. London, Proc., pt. 15, p. 198.

Type species (by original designation), *Arca antiquata* Linné.

Subgenus **ANADARA** s. str.

Anadara (Anadara) aff. **inaequilateralis** (Guppy)

Shell elongate, ventral margin almost parallel to hinge. Umbos low and broad, mesially sulcate, situated well anteriorly. Ribs 27 to 29, somewhat broader on left valve with correspondingly wider interspaces on right valve. Ribs and interspaces crossed by fine concentric threads. The ribs around the posterior umbonal ridge seem to be divided in adult specimens. Cardinal area narrow. Inner margin crenulated.

A number of mostly immature shells from the Courbaril beds and the Melajo Clay have almost the same outline and degree of inflation as *A. inaequilateralis* (Guppy) (1866a, p. 293, pl. 18, fig. 2) from Bowden, Jamaica. Comparison with topotypes shows that the Bowden shells differ in being proportionately higher posteriorly and in having divided ribs anteriorly and posteriorly. Only a few specimens from the Courbaril beds and the Melajo Clay have an indication of divided ribs.

Occurrence. — Melajo River area: Hutch 51, K 9817, KR 11862, PJ 285, USGS 18399, USGS 18634, USGS 21178. Point Courbaril: K 1429, USGS 10991, USGS 20432, USGS 20434.

Subgenus **CUNEARCA** Dall

Dall, 1898, Wagner Free Inst. Sci. Philadelphia, Trans., vol. 3, pt. 4, p. 618.

Type species (by monotypy), *Arca incongrua* Say.

Anadara (Cunearca) brasiliana (Lamarck)

1819. *Arca brasiliana* Lamarck, Histoire naturelle des animaux sans vertèbres, vol. 6, p. 44.
1822. *Arca incongrua* Say, Acad. Nat. Sci. Philadelphia, Jour., ser. 1, vol. 2, pt. 2, p. 268.
1925. *Scapharca (Cunearca) incongrua* Say, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 66, pl. 7, fig. 6.
1925. *Scapharca (Cunearca) brasiliana* Lamarck, Maury, *ibidem,* p. 66, pl. 4, figs. 1, 4, 5.
?1925. *Scapharca (Cunearca) sanctiandreae* Maury, *ibidem,* p. 67, pl. 5, fig. 6.
1964. *Anadara (Cunearca) brasiliana* (Lamarck), Weisbord; Bull. Amer. Paleont., vol. 45, No. 204, p. 79, pl. 6, figs. 13-16. For additional citations see this publication.

Shell large, rhomboidal. Umbos high, subcentral, slightly prosogyrate. Sculpture consists of 26 to 30 broad radials carrying coarse transverse beads anteriorly. Sculpture on left valve stronger. Distal teeth of hinge converging ventrally. Cardinal area broad, triangular, transversely striated, bordered by a prominent groove. Inner margin strongly fluted.

There are two imperfectly preserved valves from Matura and a large right valve from Point Courbaril (length 47 mm, height 44 mm). The larger Matura specimen is 43 mm long.

Another valve from Matura resembles what Maury described as *A. sanctiandreae,* the type locality of which is Matura. This valve has also a shallow radial depression in front of the posterior umbonal ridge, but its beading is restricted to the anterior part of the shell, although it is a left valve. Recent specimens of *A. brasiliana* from Galveston, Texas, have also a shallow radial depression in front of the posterior umbonal ridge, but their ribs are more strongly beaded. There are also some Recent left valves from Trinidad which have this depression, and their beads on the ribs are restricted to the anterior part of the shell. Thus it seems that *A. sanctiandreae* is immature *A. brasiliana.*

A. willardausteni (Maury) (1917, p. 179, pl. 29, figs. 6, 7) from the Cercado Formation of the Dominican Republic is a smaller species, more inequilateral, and has more numerous but less strongly beaded ribs. According to Olsson (1961, p. 95) the Recent West Coast *A. bifrons* (Carpenter) is generally smaller, more rhombic in shape, and the sculpture is smoother. *A. esmeralda* (Pilsbry and Olsson) (1941, p. 53, pl. 13, figs. 4, 5) from the Pliocene of western Ecuador is a similar species but has chevron-shaped grooves on the cardinal area according to the original description.

Occurrence. — Point Courbaril: USGS 20433. Matura Bay: JS 67, RR 230.

Distribution. — Upper Miocene to Recent (see Weisbord, 1964, p. 82).

Anadara (Cunearca) aff. **filicata** (Guppy) Pl. 15, fig. 7

Shell of small to medium size, inequilateral, inequivalve. Umbos high and full. Anterior margin regularly rounded, ventral margin somewhat straightened, postero-ventrally produced. Sculpture consists of about 27 ribs which are transversely beaded on left but less so on right valve. Posterior umbonal ridge moderately accentuated to rounded.

This form belongs to a heterogeneous group which includes *A. filicata* (Guppy), *A. thalia* (Olsson), *A. pittieri* (Dall), *A. lloydi* (Olsson), *A. hindsi* (Olsson), the Recent *A. chemnitzi* (Philippi), and others. The material at hand shows a considerable variability mainly concerning the prominence of the posterior umbonal ridge which influences the general shape of the shell.

A. filicata (Guppy) (1866b, p. 583, pl. 26, fig. 5) from the Manzanilla Formation of Trinidad generally has a rounded posterior umbonal ridge. Maury (1925, p. 68, pl. 8, fig. 5) did not figure a typical specimen. The ribs of the right valve of *A. filicata* carry inconspicuous beads, whereas in the present form they are smooth in front of the posterior umbonal ridge. In *A. pittieri* (Dall) (1912, p. 9) from the Gatun Formation of the Panama Canal Zone and Costa Rica the posterior umbonal ridge is accentuated usually. The type of *A. pittieri* has been figured by Dall (1925, pl. 17, fig 7). The present material does not reach the size of *A. pittieri*. *A. alcima* (Dall) [1890-1903 (1898), p. 635, pl. 31, figs. 5, 7] from the Caloosahatchee Pliocene of Florida is a larger species. A single specimen from the Melajo River area reaches a similar size but has a higher cardinal area.

A. chemnitzioides (Maury) (1912, p. 44, pl. 7, figs. 13-15, pl. 8, fig. 1) should be considered as a *nomen dubium*. It is based on incomplete moulds. A lectotype of *A. chemnitzioides* is herewith selected and figured (Pl. 15, figs. 8, 9). Its type locality is at milepost 49¾ (new mileposts!) of the Southern Main Road of Trinidad, just south of the Pitch Lake (= USGS 21782). This locality falls within the Upper Morne l'Enfer Formation, and has approximately the same age as the Courbaril beds. It is not possible to differentiate topotypes of *A. chemnitzioides* (moulds) at hand from moulds clearly belonging to *A. filicata*. The Recent *A. chemnitzi* (Philippi) (1851, p. 50) mainly differs by its larger size.

Occurrence. — Melajo River area: Hutch 51, K 9797, K 9813, KR 11862, PJ 285, USGS 18399, USGS 18634, USGS 21178. Point Courbaril: K 1429, K 8399, K 12255, RR 120, PJ 212, USGS 10991, USGS 20432, USGS 20432a, USGS 20433, USGS 20434, USGS 21778.

Subgenus **SCAPHARCA** Gray

Gray, 1847, Zool. Soc. London, Proc., pt. 15, p. 198.

Type species (by original designation), *Arca inaequivalvis* Bruguière.

Anadara (Scapharca ?) sanctidavidis (Maury) Pl. 15, figs. 10, 11

1925. *Scapharca (Scapharca) transversa sanctidavidis* Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 64, pl. 6, fig. 3.

Shell of medium size, inequilateral, moderately inflated. Anterior and posterior margins evenly rounded. Ventral margin oblique to hinge line. Sculpture consists of 30 to 35 radials which may be beaded anteriorly. Umbos low. Posterior umbonal ridge inconspicuous. Teeth vertical centrally but converge ventrally toward the ends. Cardinal area narrow. Inner margin fluted.

Holotype. — Paleont. Research Inst., Ithaca, N.Y., No. 799.

Type locality. — Matura, Trinidad.

There are only four right valves at hand. The beading of the anterior ribs is inconspicuous due to rolling. The subgeneric assignment is doubtful as there are no left valves to show whether this species is inequivalve with discrepant sculpture.

Maury described this form as a subspecis of *A. transversa* (Say) (1822, p. 269). Bird (1965, p. 30, pl. 2, figs. 4, 5, 6, 7, 9; pl. 6, fig 5) redescribed *A. transversa* as an *Anadara s. str.* taking several of Conrad's species in its synonymy. It ranges from Miocene to Recent As stated by Maury the Matura species differs mainly from *A. transversa* by its oblique ventral margin. According to Warmke and Abbott (1961, p. 159) *A. transversa* occurs not only south of Cape Cod to Florida and Texas, but in the West Indies as well.

Occurrence. — RR 230.

Distribution. — Known from type locality only.

Anadara (Scapharca) placata, n. sp. Pl. 16, figs. 1-3

Shell small, strongly inequilateral, somewhat inequivalve. Umbos moderately high, strongly sulcated mesially. Anterior margin evenly rounded. Ventral margin extends upwards from lowest point into prominent postero-ventral production. Postero-dorsal margin straight. Posterior umbonal ridge prominent in young, rounded in older stages. Sculpture consists of 26 to 28 ribs which are beaded anteriorly but less so on right valve. Posterior ribs smooth. Interspaces crossed by fine threads. Cardinal area moderately broad, bordered by an incised line. In adult specimens hinge with about 17 anterior and 21 posterior teeth. Inner margin strongly fluted.

Holotype. — Natural History Museum Basel, No. G 12884.

Dimensions of holotype (right valve). — Length 19.6 mm, height 14.4 mm, convexity 6.4 mm.

Type locality. — Melajo River area: KR 11862.

A. placata is abundant in the type region. The sculptural discrepancy in the two valves is not pronounced. The postero-ventral production is less accentuated in immature specimens.

The Recent West Coast *A. adamsi* Olsson (1961, p. 90, pl. 6, figs. 7, 7a, 7b) has the same general appearance as *A. placata* but seems to be an *Anadara s. str.*. Moreover *A. adamsi* has a radial depression in front of the posterior umbonal ridge.

Occurrence. — Melajo River area: EL 1810, Hutch, 47, Hutch 51, KR 11862, K 9902, K 9903, K 9797, K 9817, RR 290, PJ 285, USGS 18399, USGS 18634, USGS 21178.

Genus **LUNARCA** Gray

Gray, 1857, Ann. Mag. Nat. Hist., ser. 2, vol. 19, p. 372.

Type species (by monotypy), *Arca costata* Gray = *A. pexata* Say = *A. campechiensis* Gmelin = *A. ovalis* Bruguière.

As pointed out by Reinhart (1943, p. 75), Bird (1965, p. 32), and others the name *Argina* Gray is preoccupied by *Argina* Huebner (Lepidoptera). According to Sherborn and Prout (1912, p. 179) Huebner's work "Verzeichniss bekannter Schmetterlinge" was issued in several parts, and the page (p. 167) on which *Argina* is described, probably appeared in 1822. As the type species of *Lunarca, A. costata,* is believed to be an abnormal form of the type species of *Argina* Gray, *A. pexata* Say (1822, p. 268) (type species by subsequent designation, Stoliczka, 1871, Palaeont. Indica, vol. 3, p. 339), the latter genus is a synonym of *Lunarca.*

McLean (1951, p. 17) proposed *Arginarca* (type species by original designation, *A. campechiensis* Gmelin = *A. pexata* Say) as a substitute name for *Argina* Gray. Because *A. campechiensis* and *A. pexata* are synonyms, *Arginarca* is a synonym of *Lunarca* as well. Moreover *A. campechiensis* Gmelin (Systema Naturae, vol. 1, pt. 6, p. 3312, 1791) is a synonym of *A. ovalis* Bruguière (Encycl. Méth., vol. 1, pt. 1, p. 110, 1789).

Lunarca billingsiana (Maury) Pl. 16, figs. 4-7; Pl. 17, figs. 1-4

1867. *Arca pexata* Say, Guppy, Proc. Sci. Assoc. Trinidad, pt. 3, p. 164; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 43 (cited from Matura).
1912. *Arca (Argina) billingsiana* Maury, Acad. Nat. Sci. Philadelphia, Jour., ser. 2, vol. 15, p. 45, pl. 8, figs. 2, 3.
1912. *Arca (Argina) brightonensis* Maury, *ibidem,* p. 46, pl. 8, figs. 4, 5, 6.
1925. *Scapharca (Argina) brightonensis* Maury, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 76, pl. 7, fig. 7.

1925. *Scapharca (Argina) billingsiana* Maury, Maury, *ibidem*, p. 76, pl. 6, fig. 2.
1925. *Argina billingsiana maturensis* Maury, *ibidem*, p. 78, pl. 5, fig. 3, pl. 6, figs. 9, 11.

Shell of medium size, inequilateral, elongate. Umbos strongly prosogyrate, broad, low. Anterior and posterior margins regularly rounded, ventral margin oblique to hinge. Ribs 30 to 35 with fine medial grooves on central part of left valve. Ribs of right valve usually somewhat narrower than those of left valve. Interspaces narrower than ribs, and crossed by fine growth lines. Cardinal area narrow, situated behind the beaks. Anterior set of teeth consists of about seven irregular and partly broken teeth; posterior set with about 35 teeth. Inner margin strongly fluted.

Lectotype of A. billingsiana (herewith selected). — Cornell University, Paleont. Museum, No. 38297: left valve.

Dimensions of lectotype of A. billingsiana. — Length 31.3 mm, height 22.7 mm.

Type locality of A. billingsiana. — Along shore, 700 feet east of Brighton pier, SW Trinidad.

Lectotype of A. brightonensis (herewith selected). — Cornell University, Paleont. Museum, No. 38295: left valve.

Dimensions of lectotype of A. brightonensis. — Length 24.7 mm, height 19.5 mm.

Type locality of A. brightonensis. — Along shore, 700 feet east of Brighton pier, SW Trinidad.

Lectotype of A. billingsiana maturensis (herewith selected). — Paleont. Research Inst., Ithaca, N.Y., No. 804: right valve. Specimen figured by Maury (1925, pl. 6, fig. 9).

Dimensions of lectotype of A. billingsiana maturensis. — Length 31.3 mm, height 22.2 mm, convexity 9.3 mm.

Type locality of A. billingsiana maturensis. — Matura, Trinidad.

Maury (1912) described a number of species of *Lunarca* from Trinidad. The two Recent species, *L. schultzana* and *L. pariaensis* are the same as *L. ovalis* (Bruguière). The three fossil forms listed in the above synonymy represent one species. The differences indicated by Maury fall within the variability. The pronounced postero-dorsal angulation is not typical for specimens from Matura but for immature shells in general, although not throughout. Specimens from Matura are not less inflated, their umbos are not lower, and the number of ribs is about the same as in *L. billingsiana*.

L. billingsiana is well separated from the Recent *L. ovalis* (Bruguière) by its more elongate form. Recent specimens from Puerto Mexico at hand are almost as high as long, and they rarely reach the number of 30 ribs. Recent shells from Trinidad are somewhat more elongate than those from Puerto Mexico, but clearly less than *A. billingsiana*. According to McLean (1951, pp. 17-18) the Recent species has a considerable variability as to shape and number of ribs, but no geographical correlation seems possible.

Occurrence. — Point Courbaril: K 1429, K 8399, RR 120, PJ 212, USGS 10991, USGS 20432, USGS 20433, USGS 20434, USGS 21778. Matura Bay: JS 67, RR 230, PJ 302, USGS 18204, USGS 19860.

Distribution. — Courbaril beds of Upper Morne l'Enfer Fm., Matura shell bed.

Genus **NOETIA** Gray

Gray, 1857, Ann. Mag. Nat. Hist., ser. 2, vol. 19, p. 371.

Type species (by monotypy), *Noetia triangularis* Gray (= *Arca reversa* G. B. Sowerby I).

Subgenus **NOETIA** s. str.

Noetia (Noetia) sheldoniana (Maury) Pl. 17, figs. 5-8; Pl. 18, figs. 1, 2

1912. *Arca (Noetia) sheldoniana* Maury, Acad. Nat. Sci. Philadelphia, Jour., ser. 2, vol. 15, p. 43, pl. 8, figs. 10, 11.
1925. *Noetia sheldoniana* Maury, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 39, pl. 8, fig. 11.
1938. *Noetia sheldoniana* Maury, MacNeil, U. S. Geol. Sur., Prof. Paper 189-A, p. 37, pl. 6, figs. 18, 19.

Holotype. — Cornell University, Paleont. Museum, Ithaca, N.Y., No. 38296.

Type locality. — Along shore, 1000 feet west of Brighton pier, Trinidad.

N. sheldoniana was described and compared in detail by MacNeil (1938). Its type locality, lying northwest of the Pitch Lake, has disappeared but was part of the Courbaril beds of the Upper Morne l'Enfer Formation. Specimens from the type locality of the Courbaril beds and from the Melajo River area exactly fit the descriptions and the several figures of the holotype of *N. sheldoniana*.

The material from Matura is assigned to *N. sheldoniana* as well, although the specimens are not typical. Matura shells reach a much larger size, the posterior margin is less steep and more produced postero-ventrally, and there are only 34 to 36 ribs instead of 38. Immature specimens from Matura, however, have the same shape as typical *N. sheldoniana*. The larger size, the more produced postero-ventral extremity, and the lower number of ribs seem to represent a development toward the Recent Pacific Coast *N. reversa* (G. B. Sowerby I) (1833-1834, p. 20, 1833; Olsson, 1961, p. 101, pl. 10, figs. 1, 1a, 1b). But *N. reversa* has a straighter posterior margin, and the beaks are situated more posteriorly.

Occurrence. — Melajo River area: Hutch 51, K 9813, PJ 285, USGS 18399, USGS 21178. Point Courbaril: K 1429, USGS 10991, USGS 20433, USGS 20434. Matura Bay: JS 67, RR 230, USGS 19860.

Distribution. — Melajo Clay Member of Springvale Fm., Courbaril beds of Upper Morne l'Enfer Fm., Matura shell bed.

Subgenus **EONTIA** MacNeil

MacNeil, 1938, U.S. Geol. Sur., Prof. Paper 189-A, p. 11.

Type species (by original designation), *Arca ponderosa* Say.

Noetia (Eontia) centrota (Guppy) Pl. 18, figs. 3-6

1867. *Arca centrota* Guppy, Proc. Sci. Assoc. Trinidad, pt. 3, p. 175; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 54.
1873. Not *Arca centrota* Guppy, Guppy, Proc. Sci. Assoc. Trinidad, vol. 2, p. 92, pl. 3, figs. 4a, 4b; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 75, pl. 1, figs. 4a, 4b.
1874. *Arca centrota* Guppy, Guppy, Geol. Mag., new ser., decade 2, vol. 1, p. 443 (part), pl. 18, fig. 23
1875. Not *Arca centrota* Guppy, Guppy, Ann. Mag. Nat. Hist., ser. 4, vol. 15, p. 51, pl. 7, figs. 4a, 4b.
1925. *Noetia centrota* Guppy, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 38, pl. 8, figs. 10, 12.
1938. *Eontia centrota* (Guppy), MacNeil, U.S. Geol. Sur., Prof. Paper 189-A, p. 12, pl. 1, figs. 11, 12. Lectotype figured.
1942. *Eontia centrota* (Guppy), Rutsch, Verh. Naturf. Ges. Basel, vol. 54, p. 110.

Lectotype. — USNM 496508.

Type locality. — Matura, Trinidad.

This species is abundant at its type locality. Its outline shows a considerable variability concerning the steepness of the posterior margin. Some specimens are unusually strongly produced postero-ventrally (see Pl. 18, figs. 3, 4).

N. centrota tends to be larger than the Recent Caribbean *N. bisulcata* (Lamarck), and usually it has more ribs. In *N. bisulcata* the ventral margin is less oblique to the hinge, although there are exceptions. Further comparisons have been given by MacNeil (1938, pp. 12, 13).

Miocene representatives of *N. centrota* are rare as stated by several authors. They differ from Matura specimens only by their smaller size but are indistinguishable from immature *N. centrota*. Except at Matura Bay *N. centrota* occurs in Trinidad in the Gransaull Clay Member, the Savaneta Glauconitic Sandstone Member, the Melajo Clay Member (all Springvale Formation), and in the Courbaril beds of the Upper Morne l'Enfer Formation. A form closely related to *N. centrota* has been recorded from the upper middle Miocene of Venezuela (Jung, 1965, p. 436, pl. 53, figs. 8, 9).

Occurrence.—Melajo River area: KR 11862, PJ 285, USGS 18399. Point Courbaril: K 1429, K 8399, PJ 212, USGS 20432, USGS 20433, USGS 20434, USGS 21778. Matura Bay: K 10924, JS 67, RR 230, PJ 302, USGS 18204, USGS 19860.

Distribution.—Springvale Fm., Courbaril beds of Upper Morne l'Enfer Fm., Matura shell bed.

Family **GLYCYMERIDAE**

Genus **GLYCYMERIS** da Costa

Da Costa, 1778, Historia Naturalis Testaceorum Brittanniae, or the British Conchology, p. 168.

Type species (by tautonymy), *Glycymeris orbicularis* da Costa (= *Arca glycymeris* Linné).

Subgenus **GLYCYMERIS** s. str.

Glycymeris (Glycymeris) cf. **undata** (Linné) Pl. 18, figs. 7, 8

A number of small and probably immature specimens from Matura have somewhat opisthogyrate beaks, but the ligament is amphidetic. Valves slightly inequilateral. Sculpture consists of numerous radials which are low and broad ventrally. With increasing age they carry superimposed radial threads. Fine concentric threads are developed.

The material is too poor, and the specimens are too much rolled to make a definite determination possible.

Occurrence.—JS 67, RR 230, PJ 302, USGS 18204, USGS 19860.

Genus **TUCETONA** Iredale

Iredale, 1931, Records of the Australian Museum, vol. 18, No. 4, p. 202.

Type species (by original designation), *Pectunculus flabellatus* Tennison-Woods.

Tucetona cf. **pectinata** (Gmelin)

There is a single, small fragment from Matura. It shows an erect, centrally placed umbo and an amphidetic ligament. The sculpture consists of 27 single, rounded ribs which are well separated by their interspaces. Ventral margin not preserved.

Occurrence. — PJ 302.

Family **MYTILIDAE**

Genus **BRACHYDONTES** Swainson

Swainson, 1840, Treatise on Malacology, p. 384.

Type species (by monotypy), *Modiola sulcata* Lamarck.

Subgenus **BRACHYDONTES** s. str.

Brachydontes (Brachydontes) species — Pl. 18, figs. 9, 10

The material from Matura is too poor and rolled to point out affinities to known species. It consists of a few fragments mostly having the umbonal region and the hinge preserved, but none is complete to show the entire outline.

The material from Point Courbaril is also poor, but more details are preserved. The beaks are subterminal, the hinge consists of three teeth, and the antero-dorsal margin is strongly crenulated. The antero-ventral margin may be somewhat concave. The sculpture consists of prominent radial ribs. Their number is increased by dichotomy and intercalation or intercalation. Concentric sculpture of fine threads, which cross the radials, give them a beaded appearance.

The specimens from Matura and Point Courbaril may represent the same species. They all have a strongly accentuated umbonal ridge and a steep ventral margin.

The umbonal ridge is less pronounced in *B. guppyi* (Dall) [1890-1903 (1898), p. 794, pl. 35, fig. 16; Woodring, 1925, p. 85, pl. 10, figs. 10-12] from Bowden, Jamaica, and in *B. venustus* Olsson and Harbison (1953, p. 62, pl. 8, fig. 12) from the Pliocene of

St. Petersburg, Florida. *B. guppyi* has a more produced postero-dorsal extremity.

The material studied, although smaller, most closely resembles the Recent *B. exustus* (Linné) (Systema Naturae, ed. 10, p. 705, 1758). This species has practically the same sculpture, also a steep ventral margin, and a sharp umbonal ridge.

Occurrence. — Point Courbaril: K 12255, PJ 212, USGS 20432, USGS 20432a, USGS 20433, USGS 20434. Matura Bay: K 10924, JS 67, RR 230, PJ 302, USGS 18204, USGS 19860.

Genus **MODIOLUS** Lamarck

Lamarck, 1799, Mém. Soc. Hist. Nat. Paris, p. 87.

Type species (by monotypy), *Mytilus modiolus* Linné.

According to Opinion 325 (Opinions and Declarations rendered by the International Comm. Zool. Nomenclature, vol. 9, pt. 16, pp. 251-266, 1955) *Modiolus* Lamarck is a *nomen conservandum,* and *Volsella* Scopoli, 1777, is suppressed.

Modiolus cf. **americanus** (Leach)

There is a single, incomplete left valve from Matura which might be conspecific with *M. americanus* (Leach) (Zool. Misc., vol. 2, p. 32, pl. 72, fig. 1, 1815). The position of the beak, the ligament, and the anterior curvature are the same as in the Recent species. According to the only sculptural element, the growth lines, the general outline is the same as well. The Matura shell, however, has a thicker and heavier shell than all the Recent specimens at hand. The greatest length of the Matura fragment measures 36 mm.

Occurrence. — RR 230.

Family **PINNIDAE**

Genus **ATRINA** Gray

Gray, 1842, Synopsis of the contents of the British Museum, ed. 44, p. 83.

Type species (by subsequent designation, Gray, 1847, Zool. Soc. London, Proc., pt. 15, p. 199), *Pinna nigra* Dillwyn (= *Pinna vexillum* Born).

Atrina species

This genus is represented from the Melajo Clay by a few poor fragments of the anterior portion of the shell. There is no longitudinal sulcus. The observable sculpture consists of longitudinal ribs dorsally and oblique waves ventrally.

Occurrence. — PJ 285.

Family PLICATULIDAE
Genus PLICATULA Lamarck

Lamarck, 1801, Système des animaux sans vertèbres, p. 132.

Type species (by monotypy), *Plicatula gibbosa* Lamarck.

As already stated by Dall [1890-1903 (1898), p. 761], *P. gibbosa* was the only species mentioned by Lamarck when he described the genus. Thus *Plicatula* is monotypic.

Plicatula gibbosa Lamarck — Pl. 19, figs. 1, 2

1801. *Plicatula gibbosa* Lamarck, Système des animaux sans vertèbres, p. 132.
1819. *Plicatula ramosa* Lamarck, Histoire naturelle des animaux sans vertèbres, vol. 6, p. 184 (*gibbosa* arbitrarily changed into *ramosa*).
1873. *Plicatula vexillata* Guppy, Proc. Sci. Assoc. Trinidad, vol. 2, p. 86, pl. 2, fig. 7; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 70.
1874. *Plicatula vexillata* Guppy, Guppy, Geol. Mag., new ser., decade 2, vol. 1, p. 436, pl. 17, fig. 7.
1925. *Plicatula gibbosa* Lamarck, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 91, pl. 11, figs. 4, 5.
1964. *Plicatula gibbosa* Lamarck, Weisbord, Bull. Amer. Paleont., vol. 45, No. 204, p. 113, pl. 10, figs. 10-13. For further citations see this publication.

The Matura specimens of this species are indistinguishable from Recent shells. The outline and the size of the attachment area vary considerably. The general form is subtrigonal to subcircular. Matura specimens are not smaller than Recent ones as they may attain a height of 28 mm.

P. marginata Say (1824, p. 136, pl. 9, fig. 4) and *P. densata* Conrad (1843, p. 311), both North American Miocene species, mainly differ from *P. gibbosa* by their coarser plications. *P. guppyi* Woodring (1925, p. 78, pl. 9, figs. 9-11) from Bowden, Jamaica, is said to be a smaller species than *P. gibbosa* with more distinctly foliaceous ribs.

Occurrence.—JS 67, RR 230, PJ 302, USGS 18204, USGS 19860.

Distribution.—See Weisbord (1964, p. 117).

Family PECTINIDAE
Genus PECTEN Müller

Müller, 1776, Zoologiae Danicae Prodromus, . . . p. 248.

Type species (by subsequent designation, Schmidt, 1818, Versuch über die beste Einrichtung . . ., Gotha, pp. 67, 177), *Ostrea maxima* Linné.

Subgenus **PECTEN** s. str.

Pecten (Pecten) archon Maury — Pl. 19, figs. 3, 4

1910. *Pecten crasicardo* Conrad, Guppy, Agric. Soc. Trinidad and Tobago, Soc. Paper No. 440, p. 13; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 155. Not of Conrad.
1925. *Pecten (Pecten) archon* Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 84, pl. 16, figs. 2, 3, 5.
1938. *Pecten (Pecten) archon* Maury, Vokes, American Museum Novitates, No. 988, p. 2.
1942. *Pecten (Notovola) archon* Maury, Rutsch, Verh. Naturf. Ges. Basel, vol. 54, p. 113, pl. 4, fig. 1.

Lectotype (herewith selected). — Paleont. Research Inst., Ithaca, N.Y., No. 798 (specimen figured by Maury, 1925, pl. 16, fig. 2).

Dimensions of lectotype. — Length 63.7 mm, height 53 mm (incomplete).

Type locality. — Springvale Quarry, Trinidad.

This species is represented from the base of the Melajo Clay by one right and several left valves. They are indistinguishable from topotypes. Rutsch (1942, p. 114) compared *P. archon* with related species.

P. archon has been assigned by Rutsch to the subgenus *Notovola* Finlay (1926, p. 451), type species, *Pecten novaezelandiae* Reeve. *Notovola,* however, is considered as a synonym of *Pecten s. str.* by Fleming (1957, p. 18). In *Euvola* Dall [1890-1903 (1898), p. 694], type species, *Ostrea ziczac* Linné, the radial sculpture is much weaker and the interspaces of the ribs reduced to grooves, whereas *Pecten maximus* (the type species of *Pecten*) has strong radial sculpture. On the other hand *P. archon* lacks secondary riblets on the primary radials and their interspaces, which are typical in *P. maximus.* It has only a medial groove on the radials near the ventral margin of adult specimens, which approaches it again in *P. ziczac.*

Occurrence. — USGS 18411, USGS 18634.

Distribution. — Savaneta Glauconitic Sandstone Member and Melajo Clay Member, both of Springvale Fm..

Genus **AEQUIPECTEN** Fischer

Fischer, 1886, Manuel de Conchyliologie, p. 944.

Type species (by monotypy), *Chlamys opercularis* (Linné).

Subgenus **PLAGIOCTENIUM** Dall

Dall, 1898, Wagner Free Inst. Sci. Philadelphia, Trans., vol. 3, pt. 4, p. 696.

Type species (by original designation), *Pecten ventricosus* G. B. Sowerby II (= *Pecten circularis* Sowerby).

Aequipecten (Plagioctenium) cf. gibbus (Linné) Pl. 19, figs. 5, 6

A few valves from Matura belong to the group of *Pecten gibbus*. The number of subspecific and varietal names of *P. gibbus* is so high that no attempt is made to compare them as this would be possible only with large series of topotypes. The Matura specimens have 20 ribs. Their concentric sculpture is inconspicuous due to washing. They mainly differ from Recent specimens by their narrower and more slender umbones and by the deeper concavity below the posterior auricle.

Maury (1925, p. 86, pl. 14, fig. 2, pl. 16, fig. 1) referred her shells from Matura without hesitation to *A. gibbus* stating that *Pecten nucleus* Born, cited by Guppy from Matura, probably represents this species.

According to Mansfield (1936, p. 182) *A. gibbus* ranges from Pliocene to Recent. Dall [1890-1903 (1898), p. 745] and Gardner [1943-1948 (1943), p. 31, pl. 5, fig. 3] reported *A. gibbus* from the Miocene of Virginia and North Carolina.

Occurrence.—JS 67, RR 230, USGS 18204, USGS 19860.

Aequipecten (Plagioctenium) demiurgus (Dall) Pl. 20, figs. 1, 2

1866. *Pecten comparilis* Tuomey and Holmes, Guppy, Quart. Jour. Geol. Soc. London, vol. 22, p. 576. Not of Tuomey and Holmes, 1857.
1867. *Pecten comparilis* Tuomey and Holmes, Guppy, Proc. Sci. Assoc. Trinidad, pt. 3, p. 164; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 43. Not of Tuomey and Holmes, 1857.
1874. *Pecten comparilis* Tuomey and Holmes, Guppy, Geol. Mag., new ser., decade 2, vol. 1, p. 443. Not of Tuomey and Holmes, 1857.
1898. *Pecten (Plagioctenium) demiurgus* Dall, Wagner Free Inst. Sci. Philadelphia, Trans., vol. 3, pt. 4, p. 718, pl. 26, fig. 3.
1910. *Pecten inaequalis* Sowerby, Guppy, Agric. Soc. Trinidad and Tobago, Soc. Paper No. 440, pp. 7, 12; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, pp. 150, 155. Not of G. B. Sowerby I, 1850.
1925. *Pecten (Plagioctenium) demiurgus* Dall, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 85, pl. 14, fig. 5, pl. 16, fig. 6.
1926. *Pecten demiurgus* Dall, Harris *in* Waring, Johns Hopkins Univ. Studies in Geology, No. 7, p. 109, pl. 20, figs. 3, 4.
1938. *Chlamys (Plagioctenium) reedsi* Vokes, American Museum Novitates, No. 988, p. 10, fig. 7.
1942. *Chlamys (Plagioctenium) gibbus demiurgus* (Dall), Rutsch, Verh. Naturf. Ges. Basel, vol. 54, p. 112, pl. 3, fig. 5.

Holotype. — USNM 115527.

Type locality. — Savanetta, Trinidad (Dall). This locality is near Philippine Estate, west of Gran Couva, Trinidad.

This species is abundant at the base of the Melajo Clay. The specimens agree with topotypes of *A. demiurgus.*

Rutsch is probably correct in suggesting that the species described from the Pliocene of Venezuela as *Pecten circularis caucanus* by Hodson and Hodson (*in* Hodson, Hodson, and Harris, 1927, p. 27, pl. 15, figs. 1, 8) is the same as *A. demiurgus.*

Occurrence. — RR 291, USGS, 18411, USGS 18634.

Distribution. — Miocene of Columbia (Anderson, 1929, p. 155)? Upper Miocene Springvale Fm. of Trinidad. Pliocene of Lower California (Grant and Gale, 1931, p. 220)?

Aequipecten (Plagioctenium) maturensis (Maury) Pl. 20, figs. 3, 4

1925. *Pecten maturensis* Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 89, pl. 14, figs. 3, 4.

Shell of medium size, subcircular, subequivalve. Both valves flat. Sculpture consists of about 16 smooth radials which are crossed by fine growth lines. The ribs of the left valve tend to be narrower and more elevated with correspondingly broader interspaces, whereas those of the right valve are low and rounded. Right anterior auricle produced, sculptured by five to seven radial threads. Inner margin below it with four denticles.

Lectotype (herewith selected). — Paleont. Research Inst., Ithaca, N.Y., No. 900 (specimen figured by Maury, 1925, pl. 14, fig. 3).

Dimensions of lectotype. — Length 33.5 mm, height 30.8 mm.

Type locality. — Matura, Trinidad.

This species is common at Matura, and the material is usually well preserved. The concentric sculpture is mostly inconspicuous due to washing.

A. thompsoni (Maury) (1917, p. 188, pl. 34, figs. 9, 10) from the Gurabo Formation of the Dominican Republic is also a flat-valved species with the same number of ribs but is smaller, and its ribs are narrower. *A. nelsoni* (Olsson) (1932, p. 82, pl. 5, figs. 3, 6) from the Tumbes Formation of northern Peru is similar and seems to differ from *A. maturensis* only by its larger size. The same seems to be true for the Venezuelan Neogene *A. coderensis* (Harris) (*in* Hodson, Hodson, and Harris, 1927, p. 34, pl. 18, figs. 2, 4, 5).

Occurrence.—JS 67, RR 230, PJ 302, USGS 18204, USGS 19860.

Distribution.—Known from type locality only.

Aequipecten (Plagioctenium) cf. maturensis (Maury)

A few small, complete valves and a number of fragments of large specimens from the Melajo Clay are closely related to *A. maturensis*. But the material is inadequate for full description.

Occurrence.—Hutch 47, Hutch 51, K 9816, K 9817, K 9903, PJ 285, USGS 18399, USGS 21178.

Aequipecten (Plagioctenium) rutamensis, n. sp. Pl. 20, figs. 5, 6

Shell small. Valves flat to little inflated. Sculpture consists of 16 to 17 highly elevated, flat-topped or rounded ribs. Interspaces with secondary riblets on ventral half which appear somewhat earlier anteriorly. Unwashed specimens show fine, somewhat imbricated concentrics which are more conspicuous in the interspaces. Auricles unequal, sculptured by a few radials. Right anterior ear produced, with a deep notch. Inner margin below it with three to four denticles. Crura inconspicuous.

Holotype.—Natural History Museum Basel, No. G 12961.

Dimensions of holotype (right valve).—Length 14.7 mm, height 14.5 mm.

Type locality.—Matura, Trinidad.

This species is represented by more than 30 specimens. No comparable form has been found.

Occurrence.—JS 67, RR 230, PJ 302, USGS 18204, USGS 19860.

Aequipecten (Plagioctenium) species

A number of specimens from the Courbaril beds seem to be intermediate between *A. maturensis* (Maury) and *A. rutamensis,* n. sp. Some valves have distant, rounded ribs like *A. maturensis.* Others have highly elevated ribs like *A. rutamensis,* n. sp., but they lack secondary riblets and have stronger concentric threads.

Occurrence.—K 1429, PJ 212, USGS 10991, USGS 20432, USGS 20434.

Genus **CYCLOPECTEN** Verrill

Verrill, 1897, Conn. Acad. Arts and Sci., Trans., vol. 10, art. 2, p. 70.

Type species (by subsequent designation, Suter, 1913, Manual of the New Zealand Mollusca, p. 880), *Pecten pustulosus* Verrill.

Cyclopecten species Pl. 20, figs. 7, 8

A single, right valve measuring 3 mm in length and 2.8 mm in height from the Melajo Clay is at hand. Shell almost circular. The anterior auricle is larger leaving a small notch. It carries a fine radial thread. Prodissoconch white. Entire surface of shell smooth except a few inconspicuous, concentric, sculptural elements in the young stage. Near the antero-dorsal margin there is an unpronounced umbonal ridge. Inner surface and margin entirely smooth. No ctenolium.

There are several similar Miocene species which should be compared by means of topotypes. Numerous topotypes of *C. guppyi* (Dall) [1890-1903 (1898), p. 718, pl. 34, figs. 12, 13] from Bowden, Jamaica, are at hand. This species reaches a much larger size than the Melajo specimen, and it is proportionately higher. *C. aotus* (Olsson) (1922, p. 204, pl. 18, figs. 17, 18) and *C. oligolepis* (Brown and Pilsbry) (1913a, p. 512, text fig. 5) from the Gatun Formation of Costa Rica, and the Panama Canal Zone, respectively, have about the same dimensions. *C. defuniak* (Gardner) [1926-1950 (1926), p. 49, pl. 12, figs. 10-12] from the Shoal River Formation of Florida is also almost smooth. However, more material from the Melajo Clay is needed to allow reliable comparisons.

Occurrence.— K 9817.

Family **OSTREIDAE**

Some poor, indeterminable fragments and small specimens which may belong to different ostreid genera occur in the Melajo Clay.

Genus **OSTREA** Linné

Linné, 1758, Systema Naturae, ed. 10, p. 696.

Type species (by subsequent designation, Schmidt, 1818, Versuch über die beste Einrichtung . . ., Gotha, pp. 69, 177), *Ostrea edulis* Linné. (Not seen). *Fide* Gardner [1943-1948 (1943), p. 41].

Ostrea species

An *Ostrea s. str.* is represented from Point Courbaril by some large fragments. The general outline is broadly elongate to subcircular. Valves flat. Sculpture consists of concentric markings only. Lateral margins near the beak with some distant denticles. Muscle scar large, pear-shaped, situated on lower half.

Occurrence. — K 8399, PJ 212, USGS 21778.

Genus **CRASSOSTREA** Sacco

Sacco, 1897, I Molluschi dei terreni terziarii del Piemonte e della Liguria, pt. 23, p. 15.

Type species (by original designation), *Ostrea virginica* Gmelin.

Crassostrea cf. virginica (Gmelin) Pl. 21, fig. 7

Some fragments from Matura and Point Courbaril may belong to *C. virginica*. A strongly elongate specimen from Matura is figured.

Occurrence. — Point Courbaril: USGS 20434. Matura Bay: RR 230, USGS 19860.

Genus **LOPHA** Röding

Röding, 1798, *in* Museum Boltenianum, p. 168.

Type species (by subsequent designation, Dall, 1898, Wagner Free Inst. Sci. Philadelphia, Trans., vol. 3, pt. 4, p. 672), *Mytilus cristagalli* Linné.

Stenzel (1947, p. 177) considered *Lopha* as a synonym of *Alectryonia*. According to the now valid International Code of Zoological Nomenclature [art. 12, art. 16 (a) (v), 1961] the contrary is the case, *i.e. Alectryonia* is a synonym of *Lopha* both having the same type species. Röding's citation of *O. cristagalli* (which is an available specific name) constitutes an indication.

Lopha messor (Maury) Pl. 21, fig. 5

?1922. *Ostrea megodon* Hanley, Olsson, Bull. Amer. Paleont., vol. 9, No. 39, p. 195, pl. 18, fig. 1.
1925. *Ostrea messor* Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 81, pl. 10, figs. 3, 4.
1942. *Ostrea (Lopha) messor* Maury, Rutsch, Verh. Naturf. Ges. Basel, vol. 54, p. 101.

Holotype. — Paleont. Research Inst., Ithaca, N.Y., No. 962.

Type locality. — Springvale Quarry, Trinidad.

This species is represented by a single fully grown valve from the lower part of the Melajo Clay. It has five sharp plications and some inconspicuous denticles on the lateral margin near the beak. The curving growth seems to be typical. The specimen agrees with material from the type area of the Springvale Formation.

The Recent West Coast *L. megodon* (Hanley) (1845b, p. 106) is a larger species, and its plications are less sharp according to Olsson's figures (1961, pl. 23, figs. 3, 3a). *L. paramegodon* (Woodring) (1925, p. 60, pl. 6, figs. 12-14) from Bowden, Jamaica, has even less accentuated plications.

Occurrence. — Hutch 51.

Distribution. — Savaneta Glauconitic Sandstone Member and Melajo Clay Member, both of Springvale Fm., Trinidad. Gatun Fm. of Costa Rica?

Family **ANOMIIDAE**

Genus **ANOMIA** Linné

Linné, 1758, Systema Naturae, ed. 10, p. 700.

Type species (by subsequent designation, Gray, 1847, Zool. Soc London, Proc., pt. 15, p. 201) *Anomia ephippium* Linné.

Anomia simplex d'Orbigny Pl. 21, fig. 6

1842. *Anomia simplex* d'Orbigny *in* La Sagra, Histoire physique, politique et naturelle de l'Ile de Cuba. Atlas, pl. 28, figs. 31-33.
1845. *Anomia simplex* d'Orbigny *in* La Sagra, Historia fisica, politica y natural de la Isla de Cuba. Segunda parte. Historia natural, vol. 5, Moluscos, p. 371.
1922. *Anomia simplex* d'Orbigny, Olsson, Bull. Amer. Paleont., vol. 9, No. 39, p. 209, pl. 21, fig. 6.
1925. *Anomia simplex* d'Orbigny, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 92, pl. 12, fig. 8.
1932. *Anomia simplex* d'Orbigny, Mansfield, Florida State Geol. Sur., Bull. No. 8, p. 67, pl. 13, fig. 2.
1938. *Anomia simplex* d'Orbigny, Vokes, Amer. Museum Novitates, No. 988, p. 11.
1942. *Anomia* aff. *simplex* d'Orbigny, Rutsch, Verh. Naturf. Ges. Basel, vol. 54, p. 101.
1951. *Anomia simplex* d'Orbigny, McLean, New York Acad. Sci., Sci. Sur. Porto Rico Virgin Islands, vol. 17, pt. 1, p. 37, pl. 8, fig. 2.
1953. *Anomia simplex* d'Orbigny, Olsson and Harbison, Acad. Nat. Sci. Philadelphia, Mon., No. 8, p. 61.
1954. *Anomia simplex* d'Orbigny, Abbott, American Seashells, p. 372, pl. 35 k.
1961. *Anomia simplex* d'Orbigny, Warmke and Abbott, Caribbean Seashells, p. 172, pl. 34 h.

This species is represented by left valves only. The shells from Matura are small (16-18 mm in height) and not abundant. The shell from Matura figured by Maury measures 26 mm in height.

A specimen clearly showing the three muscular impressions is figured.

Matura shells closely resemble the form described as *A. indecisa* Dall [1890-1903 (1898), p. 783; Woodring, 1925, p. 84, pl. 10, figs. 6-9] from Bowden, Jamaica. Outline, size, and position of the muscle scars are the same. Size and position of the scars, however, are variable. The two lower scars may be almost as large as the upper one, and the distances between them are not constant. A case, where the position of the scars is inverted, occurs in the Melajo Clay: the large scar is situated below the two smaller scars.

Specimens from the Courbaril beds are larger than those from Matura (about 25 mm in length). But the largest shells occur in the Melajo Clay. An incomplete specimen measures more than 50 mm in height and over 60 mm in length.

Rutsch (1942, p. 101) listed *A.* aff. *simplex* from the type area of the Springvale Formation. In a private report he separated the Springvale form from the Recent species because of its larger size and thicker shell. Melajo specimens of the same size as Recent ones have about the same thickness of the shell.

Occurrence.—Melajo River area: Hutch 47, Hutch 51, KR 11862, K 9813, K 9817, K 9903, PJ 285, USGS 18399, USGS 18634, USGS 21178. Point Courbaril: K 1429, PJ 212, USGS 10991, USGS 20432, USGS 20433, USGS 20434, USGS 21778. Matura Bay: RR 230, USGS 18204.

Distribution.—Miocene to Recent.

Family **CRASSATELLIDAE**

Genus **EUCRASSATELLA** Iredale

Iredale, 1924, Linnean Soc. New South Wales, Proc., vol. 49, p. 202.

Type species (by original designation), *Crassatella kingicola* Lamarck.

Eucrassatella trinitaria (Maury) Pl. 21, figs. 1-4

?1911. *Crasatela* [*sic*] *melina* Conrad, Guppy, Agric. Soc. Trinidad and Tobago, Soc. Paper No. 454, p. 5; not p. 8: = *E. montserratensis* (Maury); reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 161; not p. 164.

1925. *Crassatellites (Scambula) trinitarius* Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 175, pl. 31, figs. 1, 7.

1942. *Eucrassatella trinitaria* (Maury), Rutsch, Verh. Naturf. Ges. Basel, vol. 54, p. 102.

Shell of medium size, elongate, moderately inflated. Umbones flattened. Beaks weakly prosogyrate. Lunule and escutcheon depressed. Anterior end rounded, posterior end produced. Adult specimens with two feeble posterior umbonal ridges. Sculpture consists of about seven wavelike concentric ridges near the beaks, ventrally of fine concentrics. Hinge of both valves with two cardinals. The right posterior, the left anterior, and the anterior side of the left posterior have lateral crenulations. Left hinge with an anterior and a posterior lateral tooth. Right hinge not sufficiently preserved. Muscle scars deep. Pallial line simple. Ventral margin smooth.

Lectotype (herewith selected). — Paleont. Research Inst., Ithaca, N.Y., No. 998 (specimen figured by Maury, 1925, pl. 31, fig. 7).

Dimensions of lectotype. — Length 52.2 mm, height 32.4 mm, convexity (both valves) 17.3 mm.

Type locality. — Springvale Quarry, Trinidad.

This species is well represented from the Melajo Clay. *E. trinitaria* is easily distinguished from *E. montserratensis* (Maury) (1925, p. 176, pl. 31, fig. 3), with which it is associated at its type locality, by its more elongate shape. *E. montserratensis* has less and coarser concentric ridges on the umbones and is more inflated. *E. venezuelana* (F. Hodson) (*in* Hodson, Hodson, and Harris, 1927, p. 45, pl. 28, figs. 2, 6, 9) from the middle Miocene of Falcón, Venezuela, is a proportionately shorter, higher, and more inflated species.

Occurrence. — Hutch 51, K 9902, USGS 18411, USGS 18634.

Distribution. — Savaneta Glauconitic Sandstone Member and Melajo Clay Member, both of Springvale Fm., Trinidad.

Genus **CRASSINELLA** Guppy

Guppy, 1874, Geol. Mag., new ser., decade 2, vol. 1, p. 442.

Type species (by monotypy), *Crassatella martinicensis* d'Orbigny.

Crassinella martinicensis (d'Orbigny) Pl. 22, figs. 1, 2

1842. *Crassatella martinicensis* d'Orbigny *in* La Sagra, Histoire physique, politique et naturelle de l'Ile de Cuba. Atlas, pl. 27, figs. 21-23.
1845. *Crassatella martinicensis* d'Orbigny, *in* La Sagra, Historia fisica, politica y natural de la Isla de Cuba. Segunda parte, vol. 5, Moluscos, p. 325.
1864. *Astarte (Gouldia) martinicensis* d'Orbigny, Guppy, Trans. Sci. Assoc.

Trinidad for 1864, p. 36; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 16.

1867. *Gouldia martinicensis* d'Orbigny, Guppy, Proc. Sci. Assoc. Trinidad, pt. 3, p. 162; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 41.

1874. *Crassinella martinicensis* d'Orbigny, Guppy, Geol. Mag., new ser., decade 2, vol. 1, p. 442.

1875. *Crassinella martinicensis* d'Orbigny, Guppy, Geol. Mag., new ser., decade 2, vol. 2, p. 42.

1925. *Crassinella guadalupensis* d'Orbigny, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 177, pl. 31, figs. 4, 6.

1925. *Crassinella martinicensis* d'Orbigny, Maury, *ibidem*, p. 178, pl. 31, fig. 2.

?1956. *Crassinella martinicensis* (d'Orbigny), Parker, Amer. Assoc. Petr. Geol., Bull., vol. 40, No. 2, p. 329, pl. 2, figs. 12A, 12B.

1961. *Crassinella martinicensis* d'Orbigny, Warmke and Abbott, Caribbean Seashells, p. 173.

Shell small. General outline trigonal, equilateral to inequilateral. Valves usually higher than long. Inflation variable. Sculpture consists of a varying number of concentric ridges; their development ranges from lamellar to rounded. An inconspicuous, shallow, radial depression near the postero-dorsal margin may be present.

Type locality. — Martinique (Recent).

The separation of the two Recent species *C. martinicensis* and *C. guadalupensis* is based on differences of the symmetry and inflation of the valves as well as on the regularity of the concentric ridges. A number of rich samples of Recent specimens from the Gulf of Paria, Trinidad, suggests that they represent one strongly variable species. Many transitional forms can be found in one lot; from equilateral to stongly inequilateral; many degrees of inflation. The concentric ridges are mostly lamellar, but rounded ones occur as well. Their number and the width of their interspaces are not constant. If the identity of *C. martinicensis* and *C. guadalupensis* can be shown to be true by a study of rich topotype material, the name *martinicensis* will have to be used as it has page priority. The Recent *Thetis parva* C. B. Adams (1845, p. 9; Clench and Turner, 1950, p. 322, pl. 44, figs. 5, 6) from Jamaica is the same as *C. guadalupensis*.

An analogue "pair of species" is known from the Pacific Coast of America: *C. pacifica* (C. B. Adams) (1852, p. 499) and *C. mexicana* Pilsbry and Lowe (1932, p. 103, pl. 14, figs. 8, 9). The lectotype of *C. pacifica* has been figured by Turner (1956, pl. 20, figs. 3, 4).

C. martinicensis is represented from Matura by hundreds of specimens. They show exactly the same variability as the Recent material.

The typical feature of *C. clementia* Pilsbry and Olsson (1941, p. 56, pl. 12, fig. 8) from the Pliocene of western Ecuador is its almost smooth surface near the ventral margin. Analogue specimens can be found (although rarely) in the Recent material from the Gulf of Paria.

Topotype material of *C. guppyi* (Dall) (*in* Guppy and Dall, 1896, p. 326, pl. 30, fig. 5) from Bowden, Jamaica, shows that this species is longer than high, and the shallow, radial depression near the posterior margin is frequently (but not always) developed. Bowden specimens are difficult to separate from Matura shells. In fact Dall [1890-1903 (1903), p. 1476] thought them to be conspecific.

Occurrence.—K 10924, JS 67, RR 230, PJ 302, USGS 18201, USGS 19860.

Distribution.—Recent, West Indies.

Crassinella guppyi (Dall) Pl. 22, figs. 3, 4

1896. *Crassatellites (Crassinella) guppyi Dall,* (*in* Guppy and Dall), U. S. Nat. Mus., Proc., vol. 19, p. 326, pl. 30, fig. 5.
1903. *Crassatellites (Crassinella) guppyi* Dall, Dall, Wagner Free Inst. Sci. Philadelphia, Trans., vol. 3, pt. 6, p. 1476 (part).
1910. *Crasinela gupyi* (*sic*) Dall, Guppy, Agric. Soc. Trinidad and Tobago, Soc. Paper No. 440, p. 7; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 149.
?1917. *Crassinella guppyi* Dall, Maury, Bull. Amer. Paleont., vol. 5, No. 29, p. 197, pl. 26, fig. 21.
?1922. *Crassatellites (Crassinella) guppyi radiata* Pilsbry, Acad. Nat. Sci. Philadelphia, Proc., vol. 73, p. 415, pl. 38, fig. 4.
1925. *Crassinella guppyi* Dall, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 177, pl. 31, fig. 5.
1925. *Crassinella guppyi* (Dall), Woodring, Carnegie Inst. Washington, Pub. 366, p. 96, pl. 11, figs. 18-20.
1942. *Crassinella guppyi plana* Rutsch, Verh. Naturf. Ges. Basel, vol. 54, p. 115, pl. 3, figs. 6, 7.

Holotype.—Of *guppyi*: USNM 107151; of *guppyi radiata*: Acad. Nat. Sci. Philadelphia, No. 3994; of *guppyi plana*: Natural History Museum Basel, No. G 2541.

Type locality.—Of *guppyi*: Bowden, Jamaica; of *guppyi radiata*: Miocene, Dominican Republic; of *guppyi plana*: Springvale Quarry, Trinidad.

The above synonymy is based on a rich material from the Melajo Clay, numerous topotypes of *C. guppyi,* and the type material of *C. guppyi plana.* As stated by Woodring (1925, p. 211) and Rutsch (1942, p. 115) specimens from the Savaneta Glauconitic Sandstone Member of the Springvale Formation are flatter than those from Bowden, and have fewer concentrics, but the Melajo material shows a variability embracing both extremes. There are paratypes of *C. guppyi plana* which are much more inflated than the holotype and which carry more concentrics. The separation of this subspecies seems artificial. The variability shown by the Melajo specimens is analogous to that of Recent shells of *C. martinicensis* from the Gulf of Paria and the rich material from the Pliocene of Matura Bay. In fact it is difficult to separate Melajo shells from Matura specimens. The Melajo valves, like those from Bowden, tend to be longer than high. But this separation is not satisfactory.

C. guppyi radiata from the Miocene of the Dominican Republic is tentatively placed in the synonymy of *C. guppyi.* Its distinguishing feature, the fine radial striation, can be observed on somewhat worn specimens from the Melajo Clay as well. The same can be seen in Recent specimens of *C. martinicensis.*

A number of similar Miocene and Pliocene North American and Central American species of *Crassinella* have been described. Their relations should be studied with topotype material as some of them are insufficiently figured. They include *C. acuta* (Dall) [1890-1903 (1903), p. 1479, pl. 50, figs. 1, 4], *C. cahuitensis* Van Winkle (1923, p. 12, pl. 2, fig. 2), *C. lunulata* (Conrad) (1834, p. 133), *C. midiensis* (Olsson) (1922, p. 213, pl. 29, fig. 11), *C. profundorum* Pilsbry and Harbison (1933, p. 117, pl. 4, figs. 22, 23), and others.

Occurrence. — Melajo River area: EL 1810, KR 11862, K 9817, K 9902, K 9903; RR 293, PJ 285, USGS 18399, USGS 21178. Point Courbaril: RR 120 (rare).

Distribution. — Miocene, Dominican Republic ?, Bowden Fm., Jamaica. Savaneta Glauconitic Sandstone Member and Melajo Clay Member, both of Springvale Fm., and Courbaril beds of Upper Morne l'Enfer Fm., Trinidad.

Family **CARDITIDAE**

Genus **CARDITAMERA** Conrad

Conrad, 1838, Fossils of the Medial Tertiary of the United States, p. 11.

Type species (by subsequent designation, Dall, 1903, Wagner Free Inst. Sci. Philadelphia, Trans., vol. 3, pt. 6, p. 1408), *Cypricardia arata* Conrad.

Subgenus **CARDITAMERA** s. str.

Carditamera (Carditamera) guppyi (Dall) Pl. 22, figs. 5-7

1867. *Cardita minima* "Sowerby", Guppy, Proc. Sci. Assoc. Trinidad, pt. 3, p. 163; reprint, Harris. 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 42. Not of Reuss 1844; see Dall, 1903, p. 1413.
1874. *Cardita minima* Sowerby, Guppy, Geol. Mag., new ser., decade 2, vol. 1, p. 442. Not of Reuss, 1844.
1903. *Cardita (Carditamera) guppyi* Dall, Wagner Free Inst. Sci. Philadelphia, Trans., vol. 3, pt. 6, p. 1413, pl. 56, fig. 3.
1925. *Cardita (Carditamera) guppyi* Dall, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 170.

Shell small, elongate. Beaks situated well anteriorly. Sculpture consists of about 14 radials which are strongest on the posterior umbonal ridge. Interspaces narrower, crossed by growth lines. Ribs with transversely elongated nodes which are usually stronger and higher on posterior half of shell. Right hinge with two cardinals and a posterior lateral tooth. Anterior cardinal strong, its base extended along lower margin of hinge plate. Posterior cardinal narrow, inconspicuous. Left hinge with two subequal cardinals and an anterior lateral. Socket for right posterior lateral tooth prominent. Inner margin fluted, strongest postero-ventrally.

Lectotype.—USNM 115668 (specimen figured by Dall).

Type locality.—Matura, Trinidad.

Guppy listed this species not only from Matura, where it is abundant, but also from the Recent fauna. The latter needs confirmation. *C. guppyi* shows some variability. When typical the shells are strongly inflated and have a broad posterior umbonal ridge. Some specimens, however, are less inflated, and the umbonal ridge is narrower, thus having a different appearance. As intergrading forms are present they are thought to belong to the same species.

The presence of an inconspicuous posterior cardinal in the right hinge is surprising and does not fit the generic definition.

C. guppyi belongs to the group of *C. arata* (Conrad) (see

Olsson and Harbison, 1953, p. 74) from the Miocene and Pliocene and *C. floridana* (Conrad) (1838-1845, p. 12, 1838) from the Pliocene and Recent fauna of the southeastern United States but is much smaller. *C. catharia* (Dall) [1890-1903 (1903), p. 1416, pl. 56, fig. 1], from the Caloosahatchee Pliocene of Florida, is also a small species but has many more ribs and is more elongate.

Occurrence. — K 10924, JS 67, RR 230, PJ 302, USGS 18204, USGS 19860.

Distribution. — Known from type locality only.

Carditamera (Carditamera) species Pl. 22, figs. 8, 9

Shell small, elongate. Ventral margin straight, postero-ventrally produced. Beaks low, situated well anteriorly. Sculpture consists of 15 ribs with narrower interspaces. Anterior ribs beaded, posterior ones crossed by some growth lines which give an imbricated appearance. Lunule depressed. Right hinge with one cardinal which is extended along the lower margin of the hinge plate. It is bordered by a triangular socket anteriorly and a narrow, long socket posteriorly. One right posterior lateral. Socket for left anterior lateral conspicuous. Inner margin coarsely fluted.

This species is represented by two right valves only; one from Point Courbaril, the other from the Melajo Clay. Maury (1912, p. 53, pl. 9, figs. 2, 3) described *C. virginiae* from a locality just south of the Pitch Lake, Trinidad. This locality yields only molds, and the hinges are not preserved. Although the specimens from Point Courbaril and the Melajo River area have the same external sculpture, general outline, and size as Maury's species, it seems best to treat *C. virginiae* as a *nomen dubium*. The lectotype of *C. virginiae* is here selected and figured (Pl. 22, fig. 10).

Occurrence. — Melajo River area: K 9816. Point Courbaril: K 8399.

Subgenus **BYSSOMERA** Olsson

Olsson, 1961, Panamic-Pacific Pelecypoda, Paleont. Res. Inst., p. 189.

Type species (by original designation), *Cardita affinis* G. B. Sowerby I.

Carditamera (Byssomera) aff. **affinis** (G. B. Sowerby I) Pl. 22, figs. 11, 12

This species occurs in the Courbaril beds. The specimens measure 30 to 35 mm in length. According to Olsson (1961, p. 189) the Recent West Coast *C. affinis* (G. B. Sowerby I) (*in* Broderip and Sowerby, 1832-1833, p. 195, 1833) reaches a much larger size. It is said to be strongly variable as to size, shape, and sculpture.

The Trinidad shells have about 16 ribs; those on the posterior umbonal ridge are large, the central ones flattened and but weakly sculptured, and the anterior ones narrow and crossed by conspicuous incrementals. Beaks situated even more anteriorly than in *C. affinis*. The antero-dorsal margin is steeper. Lunule small, but distinct, and deeply impressed. Anterior margin strongly curved. Hinge almost identical with that figured by Olsson (1961, pl. 26, fig. 3). Anterior and posterior inner margins strongly fluted. Muscle scars deeply impressed.

The Recent Caribbean *C. gracilis* (Shuttleworth) (1856, p. 173) is strongly angulated postero-dorsally; it is less constricted anteriorly, and its central ribs seem to be less flattened than in *C.* aff. *affinis*. *C. gracilis* has also been recorded from the Pliocene of Venezuela by Weisbord (1964, p. 200, pl. 26, figs. 3-17).

Less closely related than *C. affinis* is *C. verdevilla* Gardner [1943-1948 (1943), p. 69, pl. 15, figs. 5, 6] from the Miocene of North Carolina. This species was originally described as a subspecies of *C. arata* (Conrad) (see Olsson and Harbison, 1953, p. 74), but it seems to belong to the subgenus *Byssomera*. The central ventral sinus is weak, and the anterior portion of the shell less contracted than in the Trinidad valve.

Occurrence. — K 8399, USGS 20432, USGS 20432a, USGS 21778.

Family **CONDYLOCARDIIDAE**

Genus **CONDYLOCARDIA** Bernard

Bernard, 1897, Jour. de Conchyliologie, vol. 44 (ser. 3, vol. 36), p. 174. For date of publication see Winckworth, 1936, Malac. Soc. London, Proc., vol. 22, p. 156.

Type species (by original designation), *Condylocardia sanctipauli Munier Chalmas* (= *Condylocardia pauliana* Bernard). See Lamy, 1922, Jour. de Conchyliologie, vol. 66 (ser. 4, vol. 20), p. 363.

Condylocardia guppyi (Maury) Pl. 23, figs. 1-4

1925. *Erycinella (Carditopsis) guppyi* Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 172, pl. 27, fig. 14.

Shell minute, strongly inflated, subrectangular. Beaks situated well anteriorly. Behind the umbones there is a broad and slightly concave escutcheon. Prodissoconch prominent, with inconspicuous radial striae, bordered by a thickened, rounded margin. External sculpture consists of 12 radials with deep, narrow interspaces. The penultimate rib is smaller, the posteriormost interspace broader than the others. Ribs with nodes which may become foliaceous especially on posterior slope. Left hinge consists of a cardinal on each side of the resiliary pit, an anterior marginal lateral tooth, and a prominent posterior lateral tooth which is separated from the margin by a deep socket. Right hinge with a well-developed cardinal in front of the resiliary pit, a weak anterior lamina, an incomplete posterior cardinal, a marginal posterior lateral, and an anterior lateral tooth separated from the margin by a socket. Inner margin fluted ventrally. Muscle scars small.

Holotype. — Paleont. Research Inst., Ithaca, N.Y., No. 959.

Type locality. — Matura, Trinidad.

This is a rare species; it is represented only by a few specimens from Matura.

The type of *C. bernardi* (Dall) [1890-1903 (1903), p. 1438, pl. 53, fig. 10], a right valve (USNM 135637) from the Pliocene of Limón, Costa Rica, is glued to a card showing the exterior. The original figure shows the interior. *C. guppyi* is easily distinguished from *C. bernardi* by its longer postero-dorsal margin, *i.e.* it is more inequilateral. *C. bernardi* is about as long as high and has more ribs with shallower interspaces. *C. bernardi* has also been recorded from the Recent fauna of the Caribbean coast of Panama by Olsson and McGinty (1958, p. 52, pl. 5, fig. 6).

The collections of the U.S. National Museum contain a broken specimen from USGS station 18249: Pliocene of Cabo Blanco, Venezuela, which may represent immature *C. bernardi.*

The distribution of fossil and Recent species of *Condylocardia* has been outlined briefly by Hertlein and Strong (1948, p. 106).

Occurrence. — JS 67, RR 230, USGS 19860.

Distribution. — Known from type locality only.

Family **LUCINIDAE**

Genus **LUCINA** Bruguière

Bruguière, 1797, Encycl. Méth., Tabl. Vers, pls. 284, 285, 286. For date of publication see Sherborn and Woodward, 1906, Ann. Mag. Nat. Hist., ser. 7, vol. 17, p. 579.

Type species (by subsequent designation, Gray, 1847, Zool. Soc. London, Proc., pt. 15, p. 195), *Venus jamaicensis* Spengler (= *Tellina pectinata* Gmelin).

Subgenus **LUCINA** s. str.

Lucina (Lucina) cf. pectinata (Gmelin)

This form is represented from Matura by a single right, incomplete valve. Comparison with Recent specimens of *L. pectinata* shows that the Matura specimen has a shorter but broader lunule. Otherwise they are identical.

L. pectinata occurs from the southeastern United States through the West Indies south to Uruguay. It is also known from the Pliocene of Florida.

Occurrence.—RR 230.

Subgenus **LUCINISCA** Dall

Dall, 1901, U. S. Nat. Mus., Proc., vol. 23, No. 1237, p. 805.

Type species (by original designation), *Lucina nassula* Conrad.

Lucina (Lucinisca) roigi (Maury) Pl. 23, figs. 5-11

1867. *Lucina muricata* Chemnitz, Guppy, Proc. Sci. Assoc. Trinidad, pt. 3, p. 162; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 41.
1874. *Lucina muricata* Chemnitz, Guppy, Geol. Mag., new ser., decade 2, vol. 1, p. 442.
1925. *Phacoides (Lucinisca) roigi* Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 167, pl. 29, fig. 6.

Shell of small to medium size, subcircular, usually somewhat truncated posteriorly. Umbones situated centrally. Sculpture consists of some concentric lamellar ridges in young stages and of radial ribs. Concentrics inconspicuous in the adult. Radials 20 to 40 carrying hollow scales. On the posterior slope there is one wide interspace which is smooth or carries three or four fine radial riblets. Left hinge with two cardinals, and an anterior and a posterior pair of lateral teeth, the dorsal one of each is smaller. Right hinge with three cardinals; the middle one is well developed, the others rudimentary, and an anterior and posterior lateral tooth. Lunule small. Anterior muscle scar elongate. Pallial line simple. Inner margin with fine crenulations.

Holotype.—Paleont. Research Inst., Ithaca, N.Y., No. 977.

Type locality.—Matura, Trinidad.

This species is rare at Matura. It is represented by a few valves only, the largest one measuring 17.1 mm in length and 15.7 mm in height.

In contrast to Matura *L. roigi* is abundant in the Melajo River area and at Point Courbaril. These specimens tend to be higher than long, but this is not a rule. Also they usually have some more radials than Matura shells, but otherwise they are identical.

Weisbord (1964, p. 224) questionably included *L. roigi* in the synonymy of the Recent *L. muricata* (Spengler). Although these two species are most closely related, *L. roigi* may be distinguished by its less numerous radials which usually carry more conspicuous hollow vaulted scales. This is especially true for specimens from the Melajo Clay.

The Recent Pacific Coast *L. liana* (Pilsbry) (1931, p. 435, pl. 41, fig. 3), which has also been reported from the Pliocene Canoa Formation of western Ecuador, and *L. fausta* Pilsbry and Olsson (1941, p. 58, pl. 17, figs. 3, 6), also from the Pliocene Canoa Formation of western Ecuador, possibly represent one species. They are considerably larger than *L. roigi,* and their radials are arranged differently. In *L. arrogans* Olsson (1964, p. 49, pl. 7, fig. 3) from the middle Miocene Angostura Formation of northwestern Ecuador the radials are finer and the concentric sculptural element more pronounced.

Occurrence. — Melajo River area: EL 1810, Hutch 47, Hutch 51, KR 11862, K 9797, K 9813, K 9816, K 9817, K 9903, RR 290, RR 293, PJ 285, USGS 18399, USGS 21178. Point Courbaril: K 1429, K 8399, K 12255, RR 120, PJ 212, USGS 10991, USGS 20432, USGS 20433, USGS 20434, USGS 21778. Matura Bay: JS 67, RR 230, PJ 302, USGS 19860.

Distribution. — Melajo Clay Member of Springvale Fm., Courbaril beds of Upper Morne l'Enfer Fm., Matura shell bed.

Family **CHAMIDAE**

Genus **CHAMA** Linné

Linné, 1758, Systema Naturae, ed. 10, p. 691.

Type species (by subsequent designation, Schumacher, 1817, Essai d'un nouveau système des habitations des vers testacés, p. 123), *Chama gryphoides* Linné.

Chama cf. **macerophylla** Gmelin Pl. 24, figs. 1, 2

This form is represented from Point Courbaril by a number of small and a few apparently adult right (unattached) valves. Some left valves are cemented together on a piece of oyster shell. These specimens show the two most characteristic features of *C. macerophylla*: the crenulations of the inner margins, and the pallial line which joins the anterior muscle scar anteriorly and not ventrally. The right valves are subcircular, and their sculpture consists of concentric, foliated lamellae.

According to Woodring (1925, p. 104) *C. macerophylla* ranges from Miocene to Recent.

Occurrence.— K 1429, K 8399, K 12013, K 12255, PJ 212, USGS 10991, USGS 20432, USGS 20433, USGS 20434, USGS 21778.

Chama spec. ind.

This genus is represented from Matura by a few right (unattached) valves. Their sculpture consists of concentric lamellae and radial foliations resembling worn specimens of the Recent Caribbean *C. macerophylla* Gmelin.

This probably is the form listed by Guppy (1864, p. 36; reprint, Harris, 1921, p. 16) as *Chama macrophylla* Chemnitz in his report on the Matura fossils, but the material at hand is too meager to allow a definite determination.

Occurrence.— JS 67, RR 230, PJ 302, USGS 18204, USGS 19860.

Genus **PSEUDOCHAMA** Odhner

Odhner, 1917, Kungl. Svenska Vetenskaps-akademiens Handlingar, vol. 52, No. 16, pp. 28-31.

Type species (by subsequent designation, Gardner, 1926, U.S. Geol. Sur., Prof. Paper 142-B, p. 92), *Chama cristella* Lamarck

Pseudochama aff. **caloosana** (Dall) Pl. 23, fig. 12-14

1867. *Chama ruderalis* Lamarck, Guppy, Proc. Sci. Assoc. Trinidad, pt. 3, p. 163; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 42.
1874. *Chama ruderalis* Lamarck, Guppy, Geol. Mag., new ser., decade 2, vol. 1, p. 442.
1903. *Chama caloosana* Dall, Wagner Free Inst. Sci. Philadelphia, Trans., vol. 3, pt. 6, p. 1402 (part), not pl. 54, figs. 2, 5.

There are more than 20 specimens of this form from Matura. They possibly represent immature *P. radians* Lamarck, but the lack of unworn Recent specimens does not allow a reliable comparison. Weisbord (1964, p. 245) recorded *P. radians* from the Pleistocene of Venezuela.

In many respects, however, the Matura shells resemble *P. caloosana* (Dall) from the Pliocene of Florida but differ in the following points: they only reach about half the size of the Florida species, and there is no divaricate surface scupture on the left valve. The Matura shells have smaller foliations, and the sulcus near the posterior dorsal border is present but not conspicuous. The inner margins are not crenulated. The surface behind the attachment area usually is smooth or crossed by a few growth lines. The left valve is not subquadrate but rather subcircular.

The prodissoconch is smooth except for a few distant, concentric markings. The size of the attachment area is variable. In some shells it occupies the entire anterior half of the shell, in others, however, the antero-ventral margin becomes free soon, in which case conspicuous foliations may be developed.

Like *P. draconis* (Dall) [1890-1903 (1903), p. 1399, pl. 56, figs. 17, 18] from the Chipola Formation of Florida, the Matura species tends to form radial rows of large foliations but lacks the finer sculpture of that species.

Occurrence. — JS 67, RR 230, PJ 302, USGS 18204, USGS 19860.

Family **CARDIIDAE**

Genus **TRACHYCARDIUM** Mörch

Mörch, 1853, Catalogus Conchyliorum quae reliquit D. Alphonso d'Aguirra et Gadea, Comes de Yoldi, pt. 2, p.34.

Type species (by subsequent designation, von Martens, 1870, Zool. Rec. for 1869, vol. 6, p. 586), *Cardium isocardia* Linné.

Sugbenus **DALLOCARDIA** Stewart

Stewart, 1930, Acad. Nat. Sci. Philadelphia, Spec. Pub. No. 3, p.264.

Type species (by original designation), *Cardium quadragenarium* Conrad.

Trachycardium (Dallocardia) sanctidavidis (Maury) Pl. 24, figs. 3-7

1867. *Cardium muricatum* Linné, Guppy, Proc. Sci. Assoc. Trinidad, pt. 3, p. 163; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 42.
1874. *Cardium muricatum* Linné, Guppy, Geol. Mag., new ser., decade 2, vol. 1, p. 442.
1925. *Cardium (Trachycardium) sanctidavidis* Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 129, pl. 22, fig. 3.

Shell of medium size, subcircular, thin, almost equilateral. Sculpture consists of about 40 ribs. Posterior umbonal ridge inconspicuous. The radials behind it (about 10) are flattish, sometimes grooved, with some minute nodules on their posterior edge. Anterior ribs narrower than central ones, with spiny nodes ventrally which are mostly situated on the anterior part of the rib. Hinge with two cardinals bordering a deep socket, one of them projecting. The two laterals almost symmetrically placed. Interior fluted.

Holotype. — Paleont. Research Inst., Ithaca, N. Y., No. 891.

Type locality. — Matura, Trinidad.

This species is represented from Matura by about 40 specimens. They are almost indistinguishable from specimens of the same size of the Recent *T. muricatum* (Linné) (Systema Naturae, ed. 10, p. 680, 1758; Clench and Smith, 1944, p. 7, pls. 1,5). But adult valves are much larger than the Matura shells and more inequilateral. Other differences have been pointed out by Maury. *T. muricatum* has also been reported from the Pliocene of Florida (Olsson and Harbison, 1953, p. 101). *T. bowdenense* (Dall), [1890-1903 (1900), p. 1087] from Bowden, Jamaica, essentially is a smaller species than *T. sanctidavidis*. *T. oedalium* (Dall) [1890-1903 (1900), p. 1088; Olsson and Harbison, 1953, p. 101, pl. 10, fig. 6] from the Pliocene of Florida has less radials with stronger sculpture. Topotypes of *T. couvense* (Maury) (1925, p. 128, pl. 23, fig. 12) from Springvale Quarry, Trinidad, have less nodes, are more inflated, and their valves are less high proportionately.

There are a number of other similar species like *T. oedalium harveyense* (Mansfield) (1932a, p. 110, pl. 23, figs. 9-11) from the upper Miocene of Florida, *T. tintinnabularum* (Maury) (1917, p. 210, pl. 36, fig. 3) from the Cercado Formation of the Dominican Republic, and *T. quadragenarium* (Conrad) (1837, p. 230, pl. 17, fig. 5) from California which ranges from Miocene to Recent according to Grant and Gale (1931, p. 306).

T. sanctidavidis also occurs in the Melajo Clay. Two immature specimens from the Courbaril beds are tentatively referred to this species.

Occurrence. — Melajo River area: Hutch 47, Hutch 51, USGS 18399, USGS 18411. Point Courbaril: USGS 10991 (?), USGS

20432a (?). Matura Bay: JS 67, RR 230, PJ 302, USGS 18204, USGS 19860.

Distribution. — Melajo Clay Member of Springvale Fm., Courbaril beds of Upper Morne l'Enfer Fm. (?), Matura shell bed.

Genus **TRIGONIOCARDIA** Dall

Dall, 1900, Wagner Free Inst. Sci. Philadelphia, Trans., vol. 3. pt. 5, p. 1075.

Type species (by original designation), *Cardium graniferum* Broderip and G. B. Sowerby I.

Subgenus **TRIGONIOCARDIA** s. str.

Trigoniocardia (Trigoniocardia) maturensis (Dall) Pl. 25, figs. 1-10

1867. *Cardium haitense* G. B. Sowerby I, Guppy, Proc. Sci. Assoc. Trinidad pt. 3, p. 163; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35 p. 42.
1874. *Cardium haitense* Sowerby, Guppy, Geol. Mag., new ser., decade 2, vol 1, p. 442 (part).
1900. *Cardium (Trigoniocardia) maturense* Dall, Wagner Free Inst. Sci. Philadelphia, Trans., vol. 3, pt. 5, p. 1105; *ibidem,* vol. 3, pt. 6, pl. 48, fig. 7, 1903.
?1912. *Cardium (Trigoniocardia) carolinae* Maury, Acad. Nat. Sci. Philadelphia Jour., ser. 2, vol. 15, p. 54, pl. 9, figs. 5, 6.
1925. *Cardium (Trigoniocardia) maturense* Dall, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 135, pl. 23, figs. 1, 9.
?1925. *Cardium (Trigoniocardia) carolinae* Maury, Maury, *ibidem*, p. 136.

Shell of small to medium size, high-oval, strongly inflated. Umbones high. Beaks slightly prosogyrate. Posterior umbonal ridge prominent, rounded, not angulated. Sculpture consists of about 20 ribs (average 19). Posterior slope with eight flattish ribs which are smooth or beaded to a varying degree. If there are beads, they are situated on the middle of the ribs usually. The one or two ribs marking the posterior umbonal ridge mostly carry transversely elongated, closely set nodes. The anteriormost ribs are low and flattish, smooth or beaded. Those in front of the posterior umbonal ridge are asymmetrical with the short, steep slope on the posterior side, and their nodes are restricted to the posterior part of the ribs. Interspaces crossed by threads. Hinge with two cardinals; the right posterior one and the left anterior one projecting. Anterior lateral teeth situated nearer the beaks than posterior laterals. Lunule well defined. Inner margin coarsely fluted.

Lectotype (herewith selected). — USNM 115665 (specimen figured by Dall).

Type locality. — Matura, Trinidad.

The type lot of *T. maturensis* consists of five valves. The lectotype (height 6 mm) is an immature specimen. Young shells are usually less beaded and do not have the high-oval outline of the adult, *i.e.* they are not produced postero-ventrally. *T. maturensis* is rare at Matura, whereas at Point Courbaril and in the Melajo River area, it is abundant. Matura specimens are usually strongly rolled and their nodes but poorly preserved.

Maury described her *T. carolinae* from a locality 1000 feet west of the Brighton pier, near Pitch Lake, Trinidad. This locality is attributed to the Upper Morne l'Enfer Formation like the Courbaril beds, where *T. maturensis* is abundant. A lectotype of *T. carolinae* is here selected and figured (Pl. 25, fig. 10).

T. casta (Guppy) (1866b, p. 582, pl. 26, fig. 4) from the middle Miocene Manzanilla Formation of Manzanilla Bay, Trinidad, is a much smaller species and is proportionately longer than *T. maturensis.* Immature *T. maturensis* is at once distinguishable from *T. casta* by the lack of a pronounced posterior umbonal ridge. *T. manzanillensis* (Maury) (1925, p. 133, pl. 23, fig. 4) is also smaller and proportionately longer than *T. maturensis.*

T. hannai (Olsson) (1932, p. 99, pl. 8, figs. 4, 9, 10, 11) from the lower Zorritos Formation of Peru, which has also been recorded from the middle Miocene of Ecuador and Venezuela, is a smaller species with more squarish ribs. *T. maturensis* is strikingly similar to *T. cabopasada* (Pilsbry and Olsson) (1941, p. 59, pl. 12, figs. 6, 7) from the Pliocene Jama Formation of western Ecuador in outline and proportions. But that species reaches twice the size of the Matura form and tends to have more ribs with a different cross section.

Occurrence. — Melajo River area: EL 1810, Hutch 47, Hutch 51, KR 11862, K 9797, K 9903, RR 290, RR 293, PJ 285, USGS 18399, USGS 18634, USGS 21178. Point Courbaril: K 1429, K 8399, K 12255, RR 120, PJ 212, USGS 10991, USGS 20432, USGS 10432a, USGS 20433, USGS 20434, USGS 21778. Matura Bay: JS 67, RR 230, PJ 302, USGS 19860.

Distribution. — Melajo Clay Member of Springvale Fm., Courbaril beds of Upper Morne l'Enfer Fm., Matura shell bed.

Trigoniocardia (Trigoniocardia) melajoensis n. sp. Pl. 25, figs. 11, 12

Shell small, subrhomboidal. Posterior umbonal angulation pronounced. Sculpture consists of 18-20 ribs. Posterior slope mostly with seven low, flat ribs sometimes carrying beads; their interspaces narrow. Central part of shell disc covered by three or four much stronger, elevated ribs with interspaces which are narrow at the bottom and crossed by concentric threads. Their cross section is triangular, and their crest is usually ornamented with beads. The anterior ones of these ribs become asymmetrically triangular in cross section with the steeper slope posteriorly. Toward the anterior slope the ribs become lower and flatter carrying transverse beads. Hinge normal. Inner margin strongly fluted.

Holotype. — USNM 645354.

Dimensions of holotype (left valve). — Length 10.0 mm, height 10.6 mm.

Type locality. — Melajo River area: USGS 18411.

This species occurs at the base of the Melajo Clay but is rare. It is more abundant in the Savaneta Glauconitic Sandstone Member of the Springvale Formation, where it is represented from the following USGS localities: 19883, 20428, 20429 (all Savaneta River), and 21809 (Springvale Quarry).

T. heredium (Olsson) (1922, p. 227, pl. 27, fig. 10) from the middle Miocene Gatun Formation of Costa Rica is more oval in outline, less produced postero-ventrally. The discrepancy in size of the ribs is less marked. *T. thaumastum* (Woodring) (1925, p. 144, pl. 19, figs. 12, 13) from Bowden, Jamaica, is considerably higher than long. Its ribs have a different cross section, their discrepancy in prominence is less conspicuous, and the posterior umbonal angulation sharper than in *T. melajoensis.*

T. deadenensis (Mansfield) (1932a, p. 113, pl. 22, figs. 2-5) from the middle and upper Miocene of Florida has a heavier hinge, less marked dissimilarity of the ribs. *T. caboblanquensis* Weisbord (1964, p. 256, pl. 35, figs. 10-12, pl. 36, figs. 2-6), from the Pliocene Mare Formation of Venezuela, essentially differs by its less pronounced posterior umbonal angulation.

Occurrence. — USGS 18411, USGS 18634.

Distribution. — Savaneta Glauconitic Sandstone Member and Melajo Clay Member, both of Springvale Fm.

Trigoniocardia (Trigoniocardia) cf. **caboblanquensis** Weisbord
Pl. 25, figs. 15, 16

A single right valve from the Courbaril beds is at hand. It is worn, so that no nodes are preserved on the ribs. Outline subrhomboidal, about as long as high. Sculpture consists of 19 ribs. Seven low and closely set ribs on the posterior slope. In front of the posterior umbonal ridge there are four strong, widely spaced ribs. Anterior ribs low again. Central and anterior ribs with transverse beads, if not worn. All the interspaces crossed by threads. Hinge with two cardinals. Anterior lateral tooth much nearer to the cardinals than posterior lateral. Inner surface coarsely fluted.

T. caboblanquensis Weisbord (1964, p. 256, pl. 35, figs. 10-12, pl. 36, figs. 2-6) from the lower Pliocene Mare Formation of the Cabo Blanco area, Venezuela, has the same dimensions, proportions, and number of ribs. The single valve from Point Courbaril, however, does not allow a positive determination.

A single, immature specimen from Matura (USGS 19860) identified as *Trigoniocardia (Trigoniocardia)* spec. may represent the same form as the Courbaril shell.

There has been some confusion as to the identity of the Recent *T. antillarum* (d'Orbigny) (1842, pl. 27, figs. 53-55; 1845, p. 338) and *T. ceramida* (Dall) (1886, p. 269, pl. 4, fig. 6). Dall (1901, p. 387) put *T. ceramida* in the synonymy of *T. antillarum*. As pointed out by Abbott (1958, p. 125) *T. antillarum* of Clench and Smith (1944, p. 19, pl. 11, figs. 3, 4) is *T. guppyi* (Thiele) (1910, p. 129, pl. 9, figs. 25, 26) from Barbados, of which many topotypes are at hand. Apparently D'Orbigny's original figure of *T. antillarum* was misleading for the later interpretations of that species (see also McLean, 1951, p. 72, pl. 14, fig. 4). But in the original description, although not satisfactory, D'Orbigny clearly stated: ". . . radiatim inaequaliter 21-costata. . ., costis. . . medio latis. . ." and ". . . fácil de distinguir por sus costillas desiguales. . ." These features are certainly not applicable to *T. guppyi* originally described as having 27 ribs, although the number of ribs is somewhat variable in *T. antillarum* as well as in *T. guppyi*. Thus Abbott's interpretation (1958, pp. 123, 124) of the three taxa mentioned above is adopted here.

The shell from the Courbaril beds is strikingly similar to the specimen described from the middle Miocene of Venezuela (Jung, 1965, p. 453, pl. 57, figs. 3, 6) as *T.* aff. *ceramida* (Dall). The latter is somewhat larger, and its ribs just in front of the posterior umbonal ridge are narrower, and have a different cross section.

The Recent *T. granifera* (Broderip and G. B. Sowerby I) (see Olsson, 1961, p. 251, pl. 38, fig. 3) from the Pacific Coast of America has much wider interspaces and narrower ribs centrally. Also there are more ribs on its posterior slope.

Occurrence. — RR 120.

Subgenus **AMERICARDIA** Stewart

Stewart, 1930, Acad. Nat. Sci. Philadelphia, Spec. Pub. No. 3, p. 267.

Type species (by original designation), *Cardium medium* Linné.

Trigoniocardia (Americardia) periimaris (Maury)

1925. *Cardium (Trigoniocardia) perii-maris* Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 136, pl. 23, fig. 8.

Shell small, subquadrate. Umbones high. Posterior carina prominent. In front and behind the carina there are radial depressions. There are 15 ribs in front of the carina and nine behind it. Ribs on central part of shell broad, their interspaces narrow and crossed by fine concentric threads. Inner margin fluted.

Holotype. — Paleont. Research Inst., Ithaca, N. Y., No. 928.

Dimensions of holotype. — Length 10.8 mm, height 11.0 mm, convexity 5.2 mm.

Type locality. — Matura, Trinidad.

This species is not represented in the material under study. It is known from the holotype only which is somewhat worn and damaged.

T. periimaris closely resembles the middle Miocene *T. stewarti* Olsson (1964, p. 56, pl. 8, fig. 9) from Ecuador. *T. stewarti* has 12 broad radials in front of the postero-umbonal ridge instead of 15, which carry transversely elongated nodes anteriorly and near the umbo. The Ecuadorian *T. stewarti* needs a new name as the name is preoccupied by *T. (Americardia) stewarti* (Olsson) (1932, p. 101, pl. 8, fig. 8) from Peru.

Occurrence. — Matura, Trinidad.

Distribution. — Known from type locality only.

Genus **LAEVICARDIUM** Swainson

Swainson, 1840, Treatise on Malacology, p. 373.

Type species (by subsequent designation, Bucquoy, Dautzenberg, and Dollfus, 1892, Mollusques marins du Roussillon, vol. 2, p. 298), *Cardium europaeum* Wood (= *Cardium norvegicum* Spengler).

Laevicardium cf. **laevigatum** (Linné)

This form is represented by two specimens from the Courbaril beds. They are filled with matrix and not complete.

Clench and Smith (1944, pp. 22-23) showed that *laevigatum* is the correct name for the widely distributed Western Atlantic species which had been known formerly as *serratum*. *L. laevigatum* ranges in time from Miocene to Recent.

Occurrence. — USGS 20432a.

Family **VENERIDAE**

Genus **DOSINIA** Scopoli

Scopoli, 1777, Introductio ad historiam naturalem, . . . p. 399.

Type species (by monotypy and tautonymy), *Chama dosin* Adanson (= *Venus concentrica* Born).

Subgenus **DOSINIA** s. str.

According to Fischer-Piette (1942, pp. 308-314) *Chama dosin* Adanson is the same as *Venus concentrica* Born. As the latter is the type species (by original designation) of the subgenus *Dosinidia* Dall (1902a, p. 347), *Dosinidia* becomes an objective synonym of *Dosinia s. str.*

Dosinia (Dosinia) grandis Nelson

1870. *Dosinia grandis* Nelson, Connecticut Acad. Sci., Trans., vol. 2, p. 201.
1910. *Dosinia liogona* Dall, Guppy, Agric. Soc. Trinidad and Tobago, Soc. Paper No. 440, pp. 6, 12; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, pp. 149, 154. Not of Dall, 1903.
1922. *Dosinia (Dosinidia) grandis* Nelson, Spieker, Johns Hopkins Univ. Stud. Geol., No. 3, p. 138, pl. 8, fig. 4: same specimen as lectotype selected by Palmer.
1925. *Dosinia (Dosinidia) titan* Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 139, pl. 24, figs. 1, 2, pl. 25, fig. 3.
1927. *Dosinia (Dosinidia) grandis* Nelson, Palmer, Palaeont. Amer., vol. 1, No. 5, p. 67, 1929, *ibidem,* pl. 17, fig. 12 (lectotype), pl. 19, fig. 8, pl. 20, fig. 14, pl. 45, figs. 1-4.
1932. *Dosinia (Dosinidia) grandis* Nelson, Olsson, Bull. Amer. Paleont., vol. 19, No. 68, p. 105.

1941. *Dosinia (Dosinidia) grandis* Nelson, Pilsbry and Olsson, Acad. Nat. Sci. Philadelphia, Proc., vol. 93, p. 60.
1942. *Dosinia (Dosinidia) grandis* Nelson, Rutsch, Verh. Naturf. Ges. Basel, vol. 54, p. 116, pl. 5, figs. 1-3.

This species is represented from the base of the Melajo Clay by a few incomplete valves. They are the same as topotypes of *D. titan* from Springvale Quarry. Rutsch (1942, p. 117) gave some remarks on the variability of *D. grandis*.

D. grandis is more inflated than the Recent Caribbean species of *Dosinia* (Clench, 1942, pp. 1-5) and the species from the Cabo Blanco area (Venezuela) described as *D. concentrica prosapia* by Weisbord (1964, p. 268). According to Olsson (1961, p. 260) *D. grandis* is the same as the Recent West Coast *D. ponderosa* (Gray), a species ranging from late Miocene to Recent.

Occurrence. — RR 291, USGS 18411, USGS 18634.

Distribution. — See Olsson (1961, pp. 260-261).

Dosinia (Dosinia) species

There is a species of *Dosinia* represented by a few valves and some fragments from the Melajo Clay and the Courbaril beds. It clearly differs from *D. grandis* by its finer sculpture. The concentrics of early stages of *D. grandis* from Springvale and the base of the Melajo Clay are considerably coarser.

The width of the concentrics of the material at hand corresponds best with that of the Recent *D. discus* (Reeve), but this species is less inflated. According to Clench (1942, p. 5) the range of *D. discus* is from Virginia to Yucatan, but records from the Gulf coast of Mexico and Central America are rare. The present material seems to belong to the vicinity of the Recent *D. concentrica* (Born) which ranges from Cuba and Panama throughout the West Indies to Brasil.

Occurrence. — Melajo River area: Hutch 51, KR 11862, PJ 285, USGS 18399, USGS 21178. Point Courbaril: K 1429, PJ 212, USGS 10991, USGS 20432a, USGS 20433, USGS 20434.

Genus **CYCLINELLA** Dall

Dall, 1902, Nautilus, vol. 16, No. 4, p. 44.

Type species (by subsequent designation, Dall, 1902, U. S. Nat. Mus., Proc., vol. 26, p. 357), *Dosinia (Artemis) tenuis* Recluz.

Cyclinella aff. **tenuis** (Recluz) Pl. 26, figs. 1, 2

Only one right valve from the Courbaril beds is at hand. It differs from the Recent *C. tenuis* (Recluz) (1852, p. 250, pl. 10, figs. 1, 1′) from Guadeloupe in being more inflated and in having coarser concentrics. Its lunular area is more concave, and its posterior, bifid cardinal is more oblique and narrower.

Occurrence. — USGS 20432a.

Cyclinella (?) species

A species probably belonging to *Cyclinella* is represented from the Melajo Clay by a single fragment. Its hinge is concealed by matrix. No specific affinities can be recognised.

Occurrence. — USGS 21178.

Genus **TIVELA** Link

Link, 1807, Beschreiburg der Naturalien-Sammlung der Universität zu Rostock, 3. Abtheilung, p. 152.

Type species (by subsequent designation, Dall, 1902, U. S. Nat. Mus., Proc., vol. 26, No. 1312, p. 349), *Venus corbicula* Gmelin (= *Venus mactroides* Born).

Subgenus **TIVELA** s. str.

Tivela (Tivela) austeniana (Maury) Pl. 25, figs. 13, 14; Pl. 26 figs. 3-6

1864. *Trigona mactroides* Chemnitz, Guppy, Trans. Sci. Assoc. Trinidad for 1864, p. 36; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 16.
1867. *Trigona mactroides* Born, Guppy, Proc. Sci. Assoc. Trinided, pt. 3, p. 162; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 41.
1912. *Mactra austeniana* Maury, Acad. Nat. Sci. Philadelphia, Jour. ser. 2, vol. 15, p. 61, pl. 9, figs. 22, 23.
1925. *Tivela austeniana* Maury, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 144, pl. 27, fig. 2.
1925. *Tivela austeniana maturensis* Maury, *ibidem*, p. 144, pl. 27, fig. 1.
1927. *Tivela nasuta austeniana* (Maury), Palmer, Palaeont. Amer., vol. 1, No. 5, p. 109. 1929, pl. 22, figs. 5, 12.
1927. *Tivela nasuta maturensis* Maury, Palmer, *ibidem*, p. 109; 1929, pl. 22, fig. 5a.

Shell of medium size, equilateral to slightly inequilateral, little longer than high. Umbones inflated. Dorsal margins straight. Anterior and posterior ends evenly curved. Sculpture consists of incrementals only. Hinge with two pairs of cardinal teeth. Left anterior lateral tooth strong, right one less so. Ligamental area sunken, well defined. Pallial sinus not deep.

Lectotype (of austeniana). — Cornell Univ., Paleont. Museum, Ithaca, N. Y., unnumbered.

Dimensions of lectotype (of austeniana). — Length 27.0 mm, height 21.3 mm.

Type locality (of austeniana). — Along shore, 1000 feet west of Brighton pier, near Pitch Lake, Trinidad.

Holotype (of austeniana maturensis). — Paleont. Res. Inst., Ithaca, N. Y., No. 951.

Type locality (of austeniana maturensis). — Matura, Trinidad.

The type locality of *T. austeniana* belongs to the Upper Morne l'Enfer Formation. The lectotype of *T. austeniana* is here selected and figured (Pl. 25, figs. 13, 14). Brighton specimens are said to be longer than Matura shells. This is true but not a rule: the proportions of the Matura shells are not constant.

Guppy identified the material from Matura as *T. mactroides* (Born) (see also Weisbord, 1964, p. 276). The differences of the two species are slight indeed. The Recent species usually reaches a much larger size. Comparing series of equally sized specimens of both forms shows that the Matura shells have somewhat more accentuated umbonal ridges on an average, and that the pallial sinus is deeper in *T. mactroides.*

The Recent *T. nasuta* Dall (1902a, p. 380, pl. 12, fig. 2) from Santa Marta, Colombia, has a well-defined lunule which is not the case in *T. austeniana.*

Occurrence. — K 10924, JS 67, RR 230, USGS 18204, USGS 19860.

Distribution. — Upper Morne l'Enfer Fm. and Matura shell bed, Trinidad.

Genus **MACROCALLISTA** Meek

Meek, 1876, Rept. U. S. Geol. Survey of the Territories, vol. 9, p. 179.

Type species (by monotypy), *Venus gigantea* Gmelin (= *Venus nimbosa* (Lightfoot).

Macrocallista maculata (Linné)

1758. *Venus maculata* Linné, Systema Naturae, ed. 10, p. 686.
1964. *Macrocallista maculata* (Linnaeus), Weisbord, Bull. Amer. Paleont., vol. 45, No. 204, p. 286, pl. 41, figs. 11-15, pl. 42, figs. 1-6. For further citations see this publication.
1965. *Macrocallista maculata* (Linné), Jung, Bull. Amer. Paleont., vol. 49, No. 223, p. 460, pl. 58, figs. 4-6.

This species is well represented from the base of the Melajo Clay.

Occurrence. — RR 291, USGS 18411, USGS 18634.

Distribution. — Miocene to Recent. For details see Weisbord (1964, p. 291).

Genus **PITAR** Römer

Römer, 1857, Kritische Untersuchung der Arten des Molluskengeschlechts Venus bei Linné und Gmelin, p. 15.

Type species (by monotypy), *Venus tumens* Gmelin.

Subgenus **LAMELLICONCHA** Dall

Dall, 1902, U. S. Nat. Mus., Proc., vol. 26, No. 1312, p. 354.

Type species (by original designation), *Cytherea concinna* G. B. Sowerby I.

Pitar (Lamelliconcha) circinatus (Born) Pl. 26, figs. 7-13; Pl. 27, figs. 1, 2

1780. *Venus circinata* Born, Testacea Musei Caesarei Vindobonensis, p. 61, pl. 4, fig. 8.
1867. *Cytherea circinata* Born, Guppy, Proc. Sci. Assoc. Trinidad, pt. 3, p. 162; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 41.
1874. *Cytherea circinata* Born, Guppy, Geol. Mag., new ser., decade 2, vol. 1, p. 442.
1925. *Pitaria (Lamelliconcha) circinata* Born, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 149, pl. 27, figs. 12, 13.
1927. *Pitaria (Lamelliconcha) circinata* (Born), Palmer, Palaeont. Amer., vol. 1, No. 5, p. 48. 1929, pl. 9, figs. 10, 11, 12, 15, 16, 19. For further citations see this publication.
1931. *Pitaria (Lamelliconcha) circinata* (Born), Hodson and Hodson, Bull. Amer. Paleont., vol. 16, No. 59, p. 10, pl. 4, figs. 5, 7.
1951. *Pitar (Hysteroconcha) circinata* (Born), McLean, New York Acad. Sci., Sci. Sur., Porto Rico Virgin Islands, vol. 17, pt. 1, p. 81, pl. 16, fig. 8.
1960. *Pitaria (Lamelliconcha) circinata* Born, Barrios, Bol. Geol., vol. 6, Nos. 1-3, Informe No. 1082, p. 252, pl. 5, fig. 11.
1961. *Pitar circinata* (Born), Warmke and Abbott, Caribbean Seashells, p. 189, pl. 39 j.
1965. *Pitar (Lamelliconcha) circinatus* (Born), Jung, Bull. Amer. Paleont., vol. 49, No. 223, p. 463, pl. 59, figs. 1-3.

Syntypes. — Vienna Natural History Museum, Nos. 76522, 76523, 76524.

This species is well represented from Matura, the Courbaril beds, and the Melajo Clay. Matura representatives of *P. circinatus* have been considered as dwarfed by Maury. Specimens at hand, however, reach a length of 29 mm and a height of 25 mm.

Specimens from the Melajo Clay are somewhat more elongate. They are well preserved having highly elevated concentric lamellae which may alternate in size. These slight differences from typical *P. circinatus* fall within the variability as the same features are shown by Recent specimens.

For a discussion of the relations of *P. circinatus* and *P. alternatus* (Broderip) see Olsson (1961, p. 286).

Occurrence. — Melajo River area: EL 1810, Hutch 47, Hutch 51, KR 11862, K 9797, PJ 285, USGS 18399, USGS 21178. Point Courbaril: K 1429, K 8399, PJ 212, USGS 10991, USGS 20432, USGS 20433, USGS 20434, USGS 21778. Matura Bay: RR 230, USGS 18204, USGS 19860.

Distribution. — Miocene to Recent (see Palmer, 1927-1929, p. 50, 1927).

Pitar (Lamelliconcha) labreanus (Maury) Pl. 27, figs. 3-6

1912. *Pitaria (Lamelliconcha) labreana* Maury, Acad. Nat. Sci. Philadelphia, Jour., ser. 2, vol. 15, p. 57, pl. 9, figs. 14, 15.
1925. *Pitaria (Lamelliconcha) labreana* Maury, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 151, pl. 27, fig. 11.
1927. *Pitaria (Lamelliconcha) labreana* Maury, Palmer, Palaeont. Amer., vol. 1, No. 5, p. 51. 1929, pl. 8, figs 19, 28.

Shell of medium size, elongate, inequilateral. Anterior end produced, posterior end somewhat pointed. There is a shallow, radial depression in front of the posterior umbonal ridge. Sculpture consists of numerous, rounded concentrics with wider interspaces. Lunule well defined. Right hinge with three cardinals and a deep socket for the left anterior lateral. Right anterior and posterior cardinals connected. Left hinge with three cardinals, the anterior and middle ones connected dorsally. Pallial sinus deep.

Holotype. — Cornell Univ., Paleont. Museum, Ithaca, N. Y., unnumbered.

Dimensions of holotype (left valve). — Length 17.3 mm, height 13.5 mm.

Type locality. — A thousand feet west of Brighton pier, near Pitch Lake, Trinidad.

This species is represented from the Melajo Clay. Melajo specimens grow larger than the holotype which does not seem to be adult. The material under study does not contain specimens from the type area.

P. labreanus is most closely related to the Recent Pacific Coast *P. paytensis* (d'Orbigny) (see Olsson, 1961, p. 288, pl. 48, figs. 6-6b) and *P. concinnus* (G. B. Sowerby I) (1835, p. 23; Olsson, 1961, p. 287, pl. 48, figs. 4-4c). The former is more elongate, the latter shorter than *P. labreanus,* but they all have the same kind of sculpture and the radial depression in front of the posterior umbonal ridge.

P. salanga Pilsbry and Olsson (1941, p. 61, pl. 15, figs. 10, 11) from the Pliocene of Ecuador is a larger species and proportionately higher. *P. labreanus* has also been compared with the larger *P. hilli* Dall [1890-1903 (1903), p. 1268, pl. 54, fig. 7] from the middle Miocene Gatun Fm. of the Panama Canal Zone.

Occurrence. — Hutch 51, USGS 18399, USGS 21178.

Distribution. — Melajo Clay Member of Springvale Fm., Courbaril beds of Upper Morne l'Enfer Fm.

Genus **CHIONE** Megerle von Mühlfeld

Megerle von Mühlfeld, 1811, Mag. Ges. Naturf. Freunde zu Berlin, vol. 5, p. 51.

Type species (by subsequent designation, Gray, 1847, Zool. Soc. London, Proc., pt. 15, p. 183). *Venus dysera* Chemnitz (= *Venus cancellata* Linné).

Subgenus **CHIONE** s. str.

Chione (Chione) cancellata (Linné) Pl. 27, fig. 7; Pl. 28, figs. 1, 2

1767. *Venus cancellata* Linné, Systema Naturae, ed. 12, p. 1130.
1864. *Venus cingenda* Dillwyn, Guppy, Trans. Sci. Assoc. Trinidad for 1864, p. 36; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 16.
1867. *Venus cancellata* Gronov., Guppy, Proc. Sci. Assoc. Trinidad, pt. 3, p. 162; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 41.
1874. *Venus cancellata* Gron., Guppy, Geol. Mag., new ser., decade 2, vol. 1, p. 442.
1925. *Chione (Chione) cancellata* Linnaeus, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 153, pl. 28, figs. 1, 5.
1964. *Chione (Chione) cancellata* (Linnaeus), Weisbord, Bull. Amer. Paleont., vol. 45, No. 204, p. 306, pl. 44, figs. 1-8. For additional citations see this publication.

This species is abundant at Matura, but most specimens are worn. Large valves have a length of more than 30 mm. Three small valves from the Melajo Clay seem to belong to this species.

Occurrence. — Melajo River area: KR 11862 (?), USGS 18399 (?). Matura Bay: JS 67, RR 230, PJ 302, USGS 18204, USGS 19860.

Distribution. — Miocene to Recent. For details see Weisbord (1964, p. 311).

Subgenus **NIOCHE** Hertlein and Strong

Hertlein and Strong, 1948, Zoologica, New York Zool. Soc., vol. 33, pt. 4, No. 13, p. 186.

Type species (by original designation), *Venus asperrima* G. B. Sowerby I.

Chione (Nioche) veatchiana Maury Pl. 28, figs. 3-11

1912. *Chione veatchiana* Maury, Acad. Nat. Sci. Philadelphia, Jour., ser. 2, vol. 15, p. 58, pl. 9, figs. 17, 18.
1912. *Chione dalliana* Maury, *ibidem*, p. 59, pl. 9, fig 16.
1912. *Chione guppyana* Maury, *ibidem*, p. 59, pl. 9, fig. 19. Not of Gabb, 1873.
1925. *Chione (Chione) dalliana* Maury, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 156, pl. 28, fig. 10.
1925. *Chione dalliana veatchiana* Maury, Maury, *ibidem*, p. 157, pl. 28, fig. 14.
1925. *Chione dalliana guppyana* Maury, Maury, *ibidem*, p. 158, pl. 28, figs. 4, 13.
1927. *Chione (Chione) dalliana* Maury, Palmer, Palaeont. Amer., vol. 1, No. 5, p. 154, pl. 40, figs. 2, 7, 14, 15, 23.

Shell of small to medium size, subcircular to elongate-triangular. Sculpture consists of rounded, radial riblets, and concentric lamellae. Radials simple in young stages, double later, and triple toward the ventral margin. Concentrics scalloped. Anteriormost four to seven ribs much larger than the rest. Lunule large, mainly radially sculptured, bordered by an incised line. Escutcheon larger in left valve. Hinge with three cardinals in each valve. Right anterior cardinal lamellar, subparallel to lunular margin. Right central cardinal prolonged along base of hinge plate. Right posterior cardinal slightly bifid. Left anterior cardinal elongate, broader anteriorly; middle one stout, bifid; posterior one narrow, elongate. Inner margin with fine crenulations.

Lectotype of veatchiana (right valve).—Paleont. Museum, Cornell Univ., Ithaca, N. Y., No. 33504.

Dimensions of lectotype of veatchiana.— Length 25.1 mm, height 20.2 mm.

Type locality of veatchiana.—A thousand feet west of Brighton pier, near Pitch Lake, Trinidad.

Lectotype of dalliana (right valve).—Paleont. Museum, Cornell Univ., Ithaca, N. Y., No. 33495.

Dimensions of lectotype of dalliana.—Length 20.5 mm, height 18.0 mm.

Type locality of dalliana.—A thousand feet west of Brighton pier, near Pitch Lake, Trinidad.

Lectotype of guppyana (right valve). — Paleont. Museum, Cornell Univ., Ithaca, N. Y., unnumbered.

Dimensions of lectotype of guppyana. — Length 19.1 mm., height 17.2 mm.

Type locality of guppyana. — Along shore, 700 feet east of Brighton pier, near Pitch Lake, Trinidad.

As pointed out by Palmer (1927-1929, p. 155, 1927) the three forms described by Maury as *C. veatchiana, C. dalliana,* and *C. guppyana* should be treated as one species. The variability of the outline is considerable. *C. veatchiana* was meant to include elongate shells. But elongate shells occur together with shorter ones not only at the type locality of *C. veatchiana,* but also at the type locality of *C. guppyana,* and at Matura. For this variable species the name *veatchiana* should be used as it has page priority.

Maury compared *C. veatchiana* with *C. walli* (Guppy) (1866b, p. 581, pl. 26, fig. 16) from the middle Miocene Manzanilla Formation of Manzanilla Bay, Trinidad. *C. walli,* however, is a different species with a different hinge belonging to *Chionopsis.*

C. veatchiana is most closely related to the Recent *C. subrostrata* (Lamarck) (Animaux sans vertèbres, vol. 5, p. 588, 1818). Perhaps they should be treated as one species. On an average *C. subrostrata* may have a somewhat heavier shell and coarser sculpture. But these differences are slight. According to Weisbord (1964, p. 323) *C. subrostrata* probably occurs in the Pliocene of Venezuela as well.

Nioche marcottae Olsson and Petit (1964, p. 532, pl. 77, figs. 6, 6a) from the Pliocene of St. Petersburg, Florida, seems to differ from *C. veatchiana* by its more prominent concentric lamellae. In both species the escutcheon is not restricted to the left valve, although it is smaller in the right valve. *C. veatchiana* has the same hinge as the Recent Pacific Coast *Nioche beili* Olsson (1961, p. 310, pl. 50, figs. 1, 1a, 1b, 4), the type species of Olsson's subgenus *Antinioche,* but is smaller. *N. beili* has only simple radials.

Occurrence. — Point Courbaril: K 1429, K 8399, K 12255, RR 120, PJ 212, USGS 10991, USGS 20432, USGS 20432a, USGS 20433, USGS 20434. Matura Bay: K 10924, JS 67, RR 230, PJ 302, USGS 18204. USGS 19860.

Distribution. — Courbaril beds of Upper Morne l'Enfer Fm., Matura shell bed, and Pleistocene of southern Trinidad.

Subgenus **LIROPHORA** Conrad

Conrad, 1863, Acad. Nat. Sci. Philadelphia for 1862, Proc., pp. 575, 586.

Type species (by subsequent designation, Dall, 1902, U. S. Nat. Mus., Proc., vol. 26, No. 1312, p. 358), *Circomphalus athleta* Conrad (= *Venus latilirata* Conrad).

Chione (Lirophora) caroniana Maury Pl. 29, figs. 1-8

1910. *Venus glyptocyma* (Dall), Guppy, Agric. Soc. Trinidad and Tobago, Soc. Paper No. 440, p. 11; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 153. Not of Dall, 1903.
1925. *Chione (Lirophora) caroniana* Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 163, pl. 29, figs. 5, 7, 8.
1927. *Chione (Lirophora) caroniana* Maury, Palmer, Palaeont. Amer., vol. 1, No. 5, p. 173. 1929, pl. 44, fig 18.
1938. *Chione (Lirophora) caroniana* Maury, Vokes, Amer. Museum Novitates, No. 988, p. 3.
1942. *Chione (Lirophora) caroniana* Maury, Rutsch, Verh. Naturf. Ges. Basel, vol. 54, p. 102.
1942. *Chione (Lirophora)* sp. ind., Rutsch, *ibidem*, p. 102.

Shell of medium size, elongate-trigonal, heavy. Umbones situated slightly anteriorly. Antero-dorsal margin concave. Anterior end produced, strongly arched. Postero-ventrally straightened. Posterior end somewhat pointed. Postero-dorsal margin straight. Sculpture of young stages generally consists of some inflated concentrics. Later the concentrics are irregularly fused and form broad, flattish bands. At the anterior and posterior ends of these bands there are a few raised lamellae indicating the number and position of the "original" concentrics. Toward the ventral margin there are some narrower concentrics again. Lunule and escutcheon large, sculptured by growth lines. Hinge of both valves with three cardinals. Right anterior cardinal small and thin, middle one triangular and slightly extended along base of hinge plate, posterior one long and narrow. Left anterior cardinal elongate, somewhat thicker anteriorly, central one triangular, posterior one long and thin. Inner margin with fine crenulations. Pallial sinus small, but pointed.

Holotype. — Paleont. Research Inst., Ithaca, N. Y., No. 978.

Type locality. — Springvale Quarry, Trinidad.

C. caroniana is most abundant in the Savaneta Glauconitic

Sandstone Member of the Springvale Formation. From the Melajo Clay it is represented by about 100 specimens of all growth stages

Specimens from a single locality show an extraordinary variability concerning width and number of concentrics. Broad concentrics and coalescence of concentrics are prevailing in the material from the base of the Melajo Clay, where the matrix is coarse-grained, but rare and never extreme in the overlying silty clay. Thus it looks as if the ornamentation were facies controlled.

Although it is unsatisfactory comparisons are omitted here, because a considerable number of species showing features similar to those of *C. caroniana* have been described from northern South America, Central America, and the southeastern United States. But it would require a special study to show their mutual relationships.

Occurrence. — EL 1810, Hutch 51, K 9797, K 9816, K 9903, RR 290, RR 291, PJ 285, USGS 18399, USGS 18411, USGS 18634, USGS 21178.

Distribution. — Savaneta Glauconitic Sandstone Member and Melajo Clay Member, both of Springvale Fm.

Chione (Lirophora) species — Pl. 30, figs. 1-3

?1925. *Chione (Lirophora) latilirata* Conrad, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 161, pl. 29, figs. 1, 2, 9.
1925. *Chione (Lirophora) riomaturensis* Maury, *ibidem*, p. 162, pl. 29, fig. 4.
1927. *Chione (Lirophora) riomaturensis* Maury, Palmer, Palaeont. Amer., vol. 1, No. 5, p. 181. 1929, pl. 44, fig. 2.

C. riomaturensis is based on an inadequate sample. Fully grown specimens are not known. Maury considered *C. riomaturensis* intermediate in characters between the Miocene to Recent *C. latilirata* (Conrad) (1841, p. 28) and the Recent *C. paphia* (Linné) (Systema Naturae, ed. 12, p. 1129, 1767). It cannot be decided whether the Matura species belongs to *C. latilirata* or *C. paphia* as immature specimens of the latter two species are practically indistinguishable. The large collections in the U. S. National Museum of these two species show that the concentrics of immature *C. latilirata* may thin out just like those of *C. paphia.*

Weisbord (1964, p. 323, pl. 45, figs. 15, 16, pl. 47, figs. 1-6) recorded *C. riomaturensis* from the Pliocene Mare Formation of Venezuela. Specimens from the Cabo Blanco area at hand suggest that they are closer to *C. latilirata. C. cultellata* Weisbord (1964, p.

326, pl. 47, figs. 7-12), also from the Mare Formation of Venezuela, is based on a few immature valves.

Occurrence. — JS 67, RR 230, USGS 19860.

Chione (Lirophora) sanctidavidis Maury Pl. 30, figs. 4-9

1925. *Chione (Clausinella ?) sancti-davidis* Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 161, pl. 28, fig. 12.
1927. *Chione (Chione) sancti-davidis* Maury, Palmer, Palaeont. Amer., vol. 1, No. 5, p. 160. 1929, pl. 44, fig. 10.

Shell of small to medium size, inequilateral, moderately inflated. Antero-dorsal margin straight to slightly concave. Anterior end strongly rounded. Posterior end produced. Postero-dorsal margin almost straight. Sculpture of early stages consists of raised concentric lamellae and later of rounded concentrics which sometimes are bent upwards. Their interspaces usually broader. Ventral side of concentrics with fine radial striae crossing the interspaces. The concentrics may become lamellar anteriorly and posteriorly. Lunule and escutcheon well defined, sculptured by growth lines. Hinge of both valves with three cardinals. Right anterior cardinal small, lamellar, middle one trigonal and slightly extended along base of hinge plate, posterior one long. Left anterior cardinal elongate, slightly curved and thicker anteriorly, central one trigonal, posterior one long. Ventral and lunular margins finely crenulated. Pallial sinus short, but sharply pointed.

Holotype. — Paleont. Research Inst., Ithaca, N. Y., No. 972.

Type locality. — Matura, Trinidad.

This species is rare at its type locality. The holotype is an immature, worn, right valve. This situation is unfortunate, because this species is represented by numerous perfect specimens from the Courbaril beds as well as from the Melajo River area. The valves from Matura are less inflated than those from Point Courbaril, and those from the Melajo Clay are shorter on an average. The sculpture of *C. sanctidavidis* is variable. Usually the concentrics are regularly spaced, but irregularities as to spacing and thickness of the concentrics are not rare. The lamellar concentrics at the margins of lunule and escutcheon are not a rule but may be present.

It does not seem advisable to separate the Courbaril and Melajo specimens from those from Matura specifically or subspecifically. There is an unnamed species occurring in the Gransaull beds of the lower Springvale Formation which may have to be separated. That species is larger than *C. sanctidavidis,* and its concentrics are more closely set. *C. ebergenyii* (Böse) (1906, p. 28, pl. 2, figs. 4-17) from beds of questionable Pliocene age of Mexico has more numerous concentrics and a marked posterior umbonal ridge.

Occurrence. — Melajo River area: K 9813. Point Courbaril: K 1429, K 8839, K 12013, K 12255, RR 120, PJ 212, USGS 10991, USGS 20432, USGS 20432a, USGS 20433, USGS 20434, USGS 21778. Matura Bay: RR 230.

Distribution. — Melajo Clay Member of Springvale Fm., Courbaril beds of Upper Morne l'Enfer Fm., Matura shell bed.

Genus **ANOMALOCARDIA** Schumacher

Schumacher, 1817, Essai d'un nouveau système des habitations des vers testacés, p. 134.

Type species (by monotypy), *Anomalocardia rugosa* Schumacher (= *Venus flexuosa* Linné).

Anomalocardia brasiliana (Gmelin) Pl. 30, figs. 10, 11

1791. *Venus brasiliana* Gmelin, Systema Naturae, ed. 13, p. 3289.
1864. *Venus macrodon* Deshayes, Guppy, Trans. Sci. Assoc. Trinidad for 1864, p. 36; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 16.
1867. *Venus flexuosa* Linné, Guppy, Proc. Sci. Assoc. Trinidad, pt. 3, p. 162; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 41.
1925. *Anomalocardia brasiliana* Gmelin, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 165, pl. 29, figs. 10, 11.
1964. *Anomalocardia brasiliana* (Gmelin), Weisbord, Bull. Amer. Paleont., vol. 45, No. 204, p. 272, pl. 38, figs. 5-8. For further citations see this publication.

This species is rare at Matura. The figured specimen is worn and does not show much of the external sculpture. It is smaller and not as heavy as Recent specimens from Brasil at hand.

Occurrence. — JS 67, PJ 302, USGS 18204, USGS 19860.

Distribution. — Upper Miocene (?) to Recent. For details see Weisbord (1964, p. 274).

Family **MACTRIDAE**

Genus **MACTRA** Linné

Linné, 1767, Systema Naturae, ed. 12, p. 1125.

Type species (by subsequent designation, Gray, 1847, Zool. Soc. London, Proc., pt. 15, p. 185), *Cardium stultorum* Linné.

Subgenus **MICROMACTRA** Dall

Dall, 1894, Nautilus, vol. 8, No. 4, p. 40.

Type species (by monotypy), *Mactra californica* Conrad.

Mactra (Micromactra) cf. maracaibensis H. K. Hodson Pl. 30, figs. 12, 13; Pl. 31, figs. 1, 2

This form is represented from Matura and the Melajo Clay by a few specimens including only one complete shell. It might belong to *M. maracaibensis* H. K. Hodson (*in* Hodson and Hodson, 1931a, p. 20, pl. 9, figs. 6, 19) which had been described from the Miocene of Venezuela. Apparently the Trinidad specimens are immature looking exactly like the material described from the middle Miocene of the Paraguaná Peninsula, Venezuela (Jung, 1965, p. 468, pl. 60, figs. 3, 5). Adult specimens of *M. maracaibensis* from Venezuela have a similar outline as *M. macescens* (Guppy) (1866b, p. 581, pl. 26, fig. 2) from the middle Miocene Manzanilla Formation of Trinidad but are less produced anteriorly, *i.e.* their umbones are almost central and not behind the middle of the shell. Their posterior ridge is less pronounced, and the concentric waves are restricted to the dorsal part of the shell. *M.* aff. *macescens* from the Springvale Formation (Rutsch, 1942, p. 119) may be the same as the Melajo and Matura specimens.

The type specimen of *M. undula* Dall [1890-1903 (1898), p. 893, pl. 28, fig. 12] from the Pliocene of South Carolina reaches twice the size of the complete specimen from Matura. Additional specimens of *M. undula* in the collections of the U. S. National Museum from Shell Creek (USNM 153745) and the Caloosahatchee River (USNM 153743) have comparable dimensions. *M. undula* constantly differs from the Trinidad material by its less pronounced undulations on the umbo.

Occurrence.—Melajo River area: EL 1810. Matura Bay: RR 230, USGS 18204.

Genus **MULINIA** Gray

Gray, 1837, Mag. Nat. History, new ser., vol. 1, p. 375 (not seen).

Type species (by subsequent designation, Herrmannsen, 1847, Indicis generum malacozoorum, vol. 2, p. 61), *Mactra lateralis* Say.

Mulinia species Pl. 31, figs. 3-5

Shell of medium size, almost equilateral, broadly trigonal in young stages, highly trigonal in adult stage. Anterior end broadly rounded, posterior end somewhat pointed. Umbones moderately inflated. Posterior umbonal ridge well defined, angular. Anterior umbonal ridge rounded. Ligament entirely internal.

The characteristic feature of the genus *Mulinia* is its internal ligament. The chondrophoral pit is deep and covered by a thin roof. On worn specimens, like those from Matura, this roof is broken, and the chondrophoral pit may then reach up to the beaks.

The Matura specimens seem to differ from the Recent *M. cleryana* (d'Orbigny) (see Weisbord, 1964, p. 382, pl. 55, figs. 3-6) only by their less pronounced inflation of the umbones. *M. lateralis* (Say) (1822, p. 309) as figured by Abbott (1954, pl. 32o) has lower umbones than the Trinidad material. The Recent Pacific Coast *M. pallida* (Broderip and G. B. Sowerby I) (see Olsson, 1961, p. 330, pl. 58, figs. 2-2c) is of similar shape but much larger. It has also been recorded from the late Miocene to lower Pliocene Borbon Formation of Ecuador (Olsson, 1964, p. 64).

Occurrence. — Point Courbaril: K 1429, K 12013, PJ 212, USGS 10432, USGS 20434 (immature specimens). Matura Bay: RR 230, PJ 302, USGS 18204, USGS 19860.

Family **TELLINIDAE**

Genus **MOERELLA** Fischer

Fischer, 1887, Manuel de Conchyliologie, p. 1147.

Type species (by monotypy), *Tellina donacina* Linné.

Subgenus **MOERELLA** s. str.

Moerella (Moerella) elinguis, n. sp. Pl. 31, figs. 6-9

Shell small, elongate, strongly inequilateral. Dorsal margins somewhat convex. Anterior end broadly rounded. Posterior end subtruncated. Ventral margin straightened. Sculpture consists of fine, closely set concentrics. Posterior umbonal ridge pronounced, slightly angular. Posterior slope short and steep. Sometimes there is a shallow, radial depression in front of the posterior umbonal ridge. Right hinge with two cardinals, the posterior one bifid, and two laterals, the anterior one close to the cardinals. Left hinge with two cardinals, the anterior one bifid, the posterior one small. Left laterals rudimentary. Posterior muscle scar sunken. Pallial sinus deep, confluent with pallial line, amost reaching the anterior muscle scar.

Holotype. — Natural History Museum Basel, No. G 13327.

Dimensions of holotype (right valve). — Length 10.8 mm, height 6.3 mm.

Type locality. — Melajo River area: KR 11862.

M. elinguis, n. sp. is abundant in the Melajo Clay as well as in the Courbaril beds. The Courbaril specimens usually grow somewhat larger.

This species closely resembles the form from the Miocene of Peru described as *Tellina (Angulus) pressa* Dall by Spieker (1922, p. 159, pl. 10, fig. 4) and as *Tellina (Eurytellina)* cf. *felix* Hanley by Olsson (1932, p. 123, pl. 14, fig. 8). The Peruvian form is larger than the Trinidad fossils and its antero-dorsal margin tends to be more convex. *M. apomsa* (Woodring) (1925, p. 170, pl. 23, figs. 19, 20) from Bowden, Jamaica, is a considerably smaller species with coarser sculpture. The Recent Pacific Coast *M. felix* (Hanley) (1844, p. 71; Olsson, 1961, p. 403, pl. 69, figs. 6, 6a) is somewhat larger and less pointed posteriorly.

Occurrence. — Melajo River area: EL 1810, K 9817, K 9903, KR 11862, RR 290, PJ 285, USGS 18399, USGS 21178. Point Courbaril: K 8399, K 12255, USGS 10991, USGS 20432, USGS 20432a, USGS 20434, USGS 21778.

Genus **EURYTELLINA** Fischer

Fischer, 1887, Manuel de Conchyliologie, p. 1147.

Type species (by monotypy), *Tellina punicea* Born.

Eurytellina punicea (Born) ? Pl. 32, figs. 1-5

1780. *Tellina punicea* Born, Testacea Musei Caesarei Vindobonensis, p. 33, pl. 2, fig. 8.

1964. *Tellina (Eurytellina) punicea* Born, Weisbord, Bull. Amer. Paleont., vol. 45, No. 204, p. 335, pl. 48, figs. 14, 15, pl. 49, figs. 1, 2. For additional citations see this publication.

This species occurs frequently in the Courbaril beds but does not reach the size of Recent specimens. Immature valves look different, having a more rectangular outline, and an apparently more pronounced concentric sculpture. Recent immature valves of *E. punicea* are indistinguishable from those of the Courbaril beds. The concentric sculpture is usually obsolete on the umbonal region of adult *E. punicea*. Courbaril valves tend to be more flexed posteriorly than Recent specimens.

One immature valve from the Matura shell bed may belong to *E. punicea*. Fragments from the Melajo Clay are identified as *E* cf. *punicea*.

Occurrence. — Point Courbaril: K 1429, K 8399, K 12013, K 12255, RR 120, PJ 212, USGS 20432, USGS 20432a, USGS 20434, USGS 21778. Matura Bay: JS 67 (?).

Eurytellina melajoensis, n. sp. Pl. 32, figs. 6-9

Shell of medium size, slightly twisted to the right postero-ventrally. Beaks low, situated little behind center. Dorsal margins straight. Anterior margin broadly rounded. Posterior end truncated, slightly emarginate. Posterior umbonal ridge low but well marked. Surface smooth except for fine incrementals which are stronger on posterior slope. Right hinge with two cardinals, the posterior one bifid. Laterals well developed, anterior one closer to the cardinals. Left hinge with an anterior bifid cardinal, and a posterior, rudimentary, laminar cardinal. Left laterals weak to obsolete. Pallial sinus deep, touching the anterior muscle scar, confluent with pallial line. Ligamental area narrow, lanceolate.

Holotype. — Natural History Museum Basel, No. G 13310.

Dimensions of holotype (right valve). — Length 23.8 mm, height 15.0 mm, convexity 3.0 mm.

Type locality. — Melajo River area: PJ 285.

This species is well represented in the Melajo Clay but less so in the Courbaril beds. Its outline is remarkably constant. On worn specimens fine, somewhat irregular, radial striae are visible.

The Recent *E. trinitatis* Tomlin (1929, p. 310) from Colón, Panama, has similar dimensions and the same proportions. It differs in having fine, concentric grooves, whereas *E. melajoensis,* n. sp. has no concentric sculpture except incrementals.

Occurrence. — Melajo River area: EL 1810, Hutch 51, KR 11862, PJ 285, USGS 18399, USGS 18634, USGS 21178. Point Courbaril: K 8399, K 12013, K 12255, USGS 10991, USGS 20434.

Eurytellina ? oligoscissulata, n. sp. Pl. 33, figs. 1-4

Shell of medium size, almost equilateral, moderately inflated. Dorsal margins straight to slightly convex. Anterior end broadly rounded. Posterior end narrowly rounded. Ventral margin evenly curved. Posterior umbonal ridge inconspicuous. Sculpture consists of incrementals. Anteriorly there are fine, equidistant, incised concentrics (about four per mm) which become oblique on the middle portion of the shell disc and then disappear posteriorly. Right hinge with two cardinals, the posterior one bifid, and two well-developed laterals, the anterior one closer to the cardinals. Left hinge with two cardinals, the anterior one bifid, the posterior one rudimentary, laminar. Left laterals weak. Ligamental area narrow. Pallial sinus deep, confluent with pallial line, not reaching the anterior muscle scar.

Holotype. – Natural History Museum Basel, No. G 13319.

Dimensions of holotype (left valve). – Length 22.0 mm, height 12.4 mm, convexity 2.8 mm.

Type locality. – Melajo River area: PJ 285.

The generic assignment of this species is somewhat questionable. On one hand it has the typical hinge and general shape of *Eurytellina,* on the other hand it has oblique lines on the surface recalling *Moerella (Scissula).* But it does not have the short, pronounced posterior slope of *Moerella,* and the zone of oblique lines crossing the incrementals is narrow looking like the beginning of a scissulation.

E. ? oligoscissulata somewhat resembles the rare Recent West Coast *Tellina (Scissula) nicoyana* Hertlein and Strong [1940-1951 (1949), p. 85, pl. 1, figs. 23-26], for which Olsson (1961, p. 409) erected the genus *Hertellina.* The Trinidad species is smaller, has a less convex postero-dorsal margin, and the zone of oblique sculpture is narrower.

Occurrence. – Melajo River area: Hutch 51, KR 11862, PJ 285, USGS 18399, USGS 21178. Point Courbaril: K 1429, K 12255, USGS 10991, USGS 20432, USGS 20434, USGS 21778.

Genus **MERISCA** Dall

Dall, 1900, U. S. Nat. Mus., Proc., vol. 23, p. 290.

Type species (by original designation), *Tellina crystallina* Wood.

Merisca trinidadensis, n. sp. Pl. 33, figs. 5-9

Shell small, inequilateral, inequivalve, strongly inflated. Anterior side broadly rounded. Posterior part twisted to the right. Posterior end rostrate but less so in left valve. Left valve somewhat more inflated than right valve. Right valve with a radial depression in front of the posterior umbonal ridge which is inconspicuous in left valve. Sculpture consists of closely spaced, lamellar concentrics. Right hinge with a small anterior and a trigonal, bifid, posterior cardinal. Laterals strong, almost equidistant from cardinals, with deep sockets above. Left anterior cardinal bifid, posterior one rudimentary. No left laterals. Lunule broad, better defined in left valve. Escutcheon sculptured by growth lines, bordered by a sharp ridge. Ligamental area narrow. Pallial sinus high and deep, almost reaching the anterior muscle scar; only halfway confluent with pallial line.

Holotype. – Natural History Museum Basel, No. G 13338.

Dimensions of holotype (right valve). – Length 12.1 mm, height 9.2 mm, convexity 2.8 mm.

Type locality. – Melajo River area: Hutch 51.

This species is represented by a number of right valves from the Melajo Clay. Although there is no double-valved specimen, the left valves at hand are thought to belong to the same species. Parts of the inner margins of lunule and escutcheon in the left valve seem to have the function of laterals as they are slightly thickened.

M. acrocosmia (Dall) [1890-1903 (1900), p. 1020, pl. 46, fig. 10] from Bowden, Jamaica, is a smaller species. It has radial threads between the concentrics which are lacking in *M. trinidadensis,* n. sp., and the radial depression in front of the posterior umbonal ridge is less pronounced. The Recent West Coast *M. margarita* Olsson (1961, p. 383, pl. 70, figs. 5, 5a) is a larger species with similar outline, but the pallial sinus is wholly confluent with the pallial line.

Most closely related to *M. trinidadensis,* n. sp. is the Recent Caribbean *M. martinicensis* (d'Orbigny) (1842, pl. 26, figs. 6-8; 1845, p. 305). It has about the same dimensions and outline. Its pallial features are the same (Warmke and Abbott, 1961, p. 196, text fig. 30b), but its postero-dorsal margin is almost straight, whereas in *M. trinidadensis* it is convex. In addition D'Orbigny's original figure shows radial striae between the concentrics.

Occurrence. – Hutch 51, K 9817, RR 290, PJ 285, USGS 18399, USGS 21178.

Genus **TELLIDORA** H. and A. Adams

H. and A. Adams, 1858, Genera of Recent Mollusca, vol. 2, p. 401.

Type species (by subsequent designation, Dall, 1900, Wagner Free Inst. Sci. Philadelphia, Trans., vol. 3, pt. 5, p. 1037), *Tellina burneti* Broderip and G. B. Sowerby I.

Tellidora species

A number of fragments from the Melajo Clay belong to *Tellidora,* but a specific determination is not possible. Some hinges are preserved, but the entire outline of the shell cannot be reconstructed.

The Melajo species is close to the Recent Atlantic *T. cristata* (Recluz) (Rev. Zool. Soc. Cuvierienne, vol. 5, p. 270, 1842) and the Recent West American *T. burneti* (Broderip and G. B. Sowerby I) (Zool Jour., vol. 4, No. 15, p. 362, pl. 9, fig. 2, 1829; Olsson, 1961, p. 381, pl. 69, figs. 1-1b).

Dall [1890-1903 (1900) p. 1037] put *T. lunulata* Holmes in the synonymy of *T. cristata,* whereas Olsson and Harbison (1953, p. 131) consider it a distinct species.

A species of *Tellidora* identified as *T. cristata* has been reported from the middle Miocene Gatun Formation of Costa Rica by Olsson (1922, p. 254, pl. 26, figs. 1, 2).

Occurrence.—PJ 285, USGS 18399, USGS 21178.

Genus **STRIGILLA** Turton

Turton, 1822, Conchylia Insularum Britannicarum, p. 117.

Type species (by subsequent designation, Gray, 1847, Zool. Soc. London, Proc., pt. 15, p. 186), *Tellina carnaria* Linné.

Subgenus **STRIGILLA** s. str.

Strigilla (Strigilla) carnaria (Linné) ? Pl. 33, figs. 10, 11

1758. *Tellina carnaria* Linnaeus, Systema Naturae, ed. 10, p. 676.
1864. *Strigilla carnaria* Linné, Guppy, Trans. Sci. Assoc. Trinidad for 1864, p. 36; reprint, Harris, 1921, Bull. Amer. Paleont, vol. 8, No. 35, p. 16.
1867. *Strigilla carnaria* Linné, Guppy, Proc. Sci. Assoc. Trinidad, pt. 3, p. 162; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 41.
1874. *Strigilla carnaria* Linné, Guppy, Geol. Mag., new ser., decade 2, vol. 1, p. 441.
1964. *Strigilla carnaria* (Linnaeus), Weisbord, Bull. Amer. Paleont., vol. 45, No. 204, p. 349, pl. 50, figs. 9-12, pl. 51, figs. 1-6. For additional citations see this publication.

S. carnaria ? was thought to be absent at Matura (Maury, 1925, p. 120), but it occurs in the Courbaril beds as well as in the Matura shell bed. The fossils are smaller on an average, the sulci coarser, and their interspaces wider than in Recent specimens. It is questionable whether this should be considered as of subspecific value, because these features are variable to some degree in Recent shells. There are not enough fossil specimens, however, to show the variability which would allow their subspecific separation.

As to the wide spacing of the sulci the Trinidad fossils resemble the Recent West Coast *S. dichotoma* (Philippi) and *S. cicerula* (Philippi) as figured by Olsson (1961, pl. 73, figs. 2, 3).

Occurrence. — Point Courbaril: K 12255, USGS 20432, USGS 20432a. Matura Bay: USGS 18204, USGS 19860.

Distribution. — Pliocene and Pleistocene, Venezuela. Pleistocene, Alabama. Recent from North Carolina to Brasil, and on the West Coast from Panama to northern Peru.

Subgenus **PISOSTRIGILLA** Olsson

Olsson, 1961, Panamic-Pacific Pelecypoda (Paleont. Res. Inst., Ithaca, N.Y.), p. 390.

Type species (by original designation), *Tellina pisiformis* Linné.

Strigilla (Pisostrigilla) pisiformis (Linné) Pl. 33, figs. 12-14

1758. *Tellina pisiformis* Linné, Systema Naturae, ed. 10, p. 677.
1925. *Strigilla pisiformis* Linnaeus, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 120, pl. 20, fig. 13.
1964. *Strigilla pisiformis* (Linnaeus), Weisbord, Bull. Amer. Paleont., vol. 45, No. 204, p. 346, pl. 50, figs. 3-8. For additional citations see this publication.

This species is fairly common at Matura. Matura valves reach a length of 12 mm. *S. pisiformis* is most closely related to the Recent West Coast *S. panamensis* Olsson (1961, p. 390, pl. 39, figs. 8-8b).

Occurrence. — RR 230, USGS 18204, USGS 19860.

Distribution. — Miocene to Recent. For details see Weisbord (1964, p. 349).

Strigilla (Pisostrigilla ?) species

There is a single, left, small valve (length 4.5 mm) from the Courbaril beds with a peculiar sculpture. On the anterior part of the shell the incised lines are not curved as in the Recent West Coast *S. strata* Olsson (1961, p. 390, pl. 39, fig. 7), the type species of the subgenus *Simplistrigilla* Olsson. The same feature is present on the upper Miocene (?) *S. galvestonensis* Harris (1895, p. 10, pl. 1, fig. 4) from Texas (Galveston well), *S. eutykta* Gardner and Aldrich (1919, p. 47, pl. 3, figs. 4, 8, 10) from the upper Miocene and Pliocene of the southeastern United States (see also Mansfield, 1932a, p. 139), and *S. georgiana* Gardner [1926-1950 (1928), p. 199, pl. 30, figs. 12, 13] from the Oak Grove Sand of Georgia.

The posterior slope of species belonging to *Pisostrigilla* is characterised by radial rows of acute angles formed by the incised lines. In *S. pisiformis* and other species there are two of these rows bordering a zone with parallel lines. On the valve from the Courbaril beds this zone is extremely narrow and visible only under a good lens.

Occurrence.—K 12255.

Genus **MACOMA** Leach

Leach, 1819, *in* John Ross, A voyage of discovery made under the orders of the Admiralty in His Majesty's ships *Isabella* and *Alexander* for the purpose of exploring Baffins Bay and inquiring into the probability of a north-west passage, Appendix II, p. LXII (not seen).

Type species (by monotypy), *Macoma tenera* Leach (= *Tellina calcarea* Gmelin).

Subgenus **PSAMMACOMA** Dall

Dall, 1900, U. S. Nat. Mus., Proc., vol. 23, No. 1210, p. 292.

Type species (by original designation), *Tellina candida* Lamarck.

Macoma (Psammacoma) species A — Pl. 34, figs. 1, 2

?1938. *Tellina couvaensis* Vokes, Amer. Museum Novitates, No. 988, p. 14, fig. 9.

Shell elongate, inequilateral. Dorsal margins straight, anterior end regularly curved. Posterior side short, truncated. Posterior umbonal ridge moderately pronounced. Sculpture consists of incrementals only. Pallial sinus deep, but not high, partly confluent with pallial line.

This form is represented from the Melajo Clay by a few incomplete valves. It may be the same as *Tellina couvaensis* Vokes from Springvale Quarry. *T. couvaensis* is based on the holotype only which is an incomplete specimen with its interior concealed by matrix.

M. olivella Dall [1890-1903 (1900), p. 1054, pl. 47, fig. 20;

Woodring, 1925, p. 177, pl. 24, figs. 20, 21] from Bowden, Jamaica, is also based on the holotype only which is an incomplete valve. It is easily distinguished from the Melajo species by its concave postero-dorsal margin and its longer ligamental area.

Occurrence.—USGS 18411, USGS 18634, USGS 21178 (?).

Macoma (Psammacoma) species B Pl. 34, figs. 3, 4

A few valves occurring in the Courbaril beds have about the same size as *Macoma* species A from the Melajo Clay. However, they are less inflated and their posterior side is longer. The pallial sinus of the Melajo species is narrower and its posterior umbonal ridge more pronounced.

M. hybrida Weisbord (1964, p. 352, pl. 46, figs. 3, 4) from the Pliocene Mare Formation of Venezuela is known from the holotype only. It has a much shorter posterior side, a steeper posterior slope, and a smaller pallial sinus.

Occurrence.—USGS 20432.

Genus **PSAMMOTRETA** Dall

Dall, 1900, U. S. Nat. Mus., Proc., vol. 23, No. 1210, p. 292.

Type species (by original designation), *Tellina aurora* Hanley.

Psammotreta galbana, n. sp. Pl. 34, figs. 5, 6

Shell of medium size, moderately inflated. Posterior side shorter than anterior one. Posterior end of right valve slightly flexed. Posterior umbonal ridge inconspicuous. Left valve with a shallow radial depression posteriorly which is not developed in right valve. Sculpture consists of incrementals which are more conspicuous on posterior area. Right hinge with a bifid cardinal posteriorly and a narrow cardinal anteriorly. Left hinge with a scarcely bifid anterior cardinal and a narrow posterior cardinal. Ligamental area short, but high. Anterior adductor scar larger than posterior one. Pallial sinus deep its highest point lying behind the beaks; partly confluent with pallial line.

Holotype.—USNM 645335.

Dimensions of holotype (right valve).—Length 37.8 mm, height 28.2 mm, convexity 7.7 mm.

Type locality.—Point Courbaril: USGS 20432.

P. galbana is represented by a few valves which occur only in the Courbaril beds. It seems that no Recent species of *Psammotreta* has ever been recorded from the Western Atlantic. *P. galbana* is related to the Recent Eastern Pacific species.

P. aurora (Hanley) (1844, p. 147; Olsson, 1961, p. 411, pl. 74, figs. 6, 6a) is less inflated, less inequilateral, and the highest point of its pallial sinus lies below the beaks. *P. dombei* (Hanley) (1844, p. 144) and *P. gubernaculum* (Hanley) (1844, p. 142) reach considerably larger dimensions than *P. galbana*. *P galbana* has about the same proportions as the form figured by Olsson (1961, pl. 74, figs. 8, 8a) as *Psammotreta* sp. (Pearl Islands, Panama) but is larger.

Occurrence. — K 12013, USGS 20432.

Genus **APOLYMETIS** Salisbury

Salisbury, 1929, Malac Soc. London, Proc., vol. 18, p. 258.

Type species (by original designation), *Tellina meyeri* Philippi (= *Tellina meyeri* Dunker).

Apolymetis trinitaria (Dall) Pl. 34, figs. 7, 8

1900. *Metis trinitaria* Dall, Wagner Free Inst. Sci. Philadelphia, Trans., vol. 3, pt. 5, p. 1041, pl. 46, fig 24 (see also for further citations).
1910. *Tetina sagrae* d'Orbigny, Guppy, Agric. Soc. Trinidad and Tobago, Soc. Paper No. 440, pp. 6, 12; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, pp. 149, 154.
1919. Not *Metis trinitaria* Dall, Cooke, Carnegie Inst. Washington, Pub. 291, p. 148, pl. 14, figs. 2a, 2b.
1920. Not *Metis trinitaria* Dall, Maury, New York Acad. Sci., Sci Sur. Porto Rico and the Virgin Islands, vol. 3, pt. 1, p. 42.
1920. Not *Metis trinitaria* Dall, Hubbard, New York Acad. Sci., Sci. Sur. Porto Rico and the Virgin Islands, vol. 3, pt. 2, p. 125, pl. 10, fig. 7.
1925. *Metis trinitaria* Dall, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 121, pl. 22, figs. 1, 2, 8.
1925. Not *Metis trinitaria* Dall, Maury, Serv. Geol. Min. Brasil, Mon. No. 4, p. 357, pl. 19, fig. 3.
1929. *Metis trinitaria colombiensis* Weisbord, Bull. Amer. Paleont., vol. 14, No. 54, p. 24, pl. 5, fig. 6.
?1931. *Metis falconensis* H. K. Hodson, *in* Hodson and Hodson, Bull. Amer. Paleont., vol. 16, No. 59, p. 13, pl. 4, figs. 1, 4.
1931. *Metis colombiensis* Weisbord, Hodson and Hodson, Bull. Amer. Paleont., vol. 16, No. 60, p. 8, pl. 4, fig. 1 (holotype).
1938. *Metis trinitaria* Dall, Vokes, Amer. Museum Novitates, No. 988, p. 3.
1942. *Apolymetis colombiensis* (Weisbord), Rutsch, Verh. Naturf. Ges. Basel, vol. 54, p. 123, pl. 6, figs. 2, 3.

Lectotype (herewith selected). — USNM 115660.

Dimensions of lectotype. — Length 53 mm, height 42 mm, convexity (both valves) 21.6 mm.

This species occurs at the very base of the Melajo Clay but is rare. The material from Melajo is indistinguishable from that from Springvale Quarry, where the species is common.

Guppy had two specimens which he first labelled *Tellina biplicata* Conrad and later *Tellina sagrae*. The same specimens became Dall's type lot for his *Metis trinitaria*. They were collected in the type area of the Springvale Formation, and their color and adhering matrix show that they belong to the Savaneta Glauconitic Sandstone Member. Dall's figured specimen, the lectotype, is unusual in its proportions. None of the topotypes has such an elongate anterior part.

The remaining syntype (USNM 645187) is larger, less complete, but with almost centrally placed umbones. Typical topotypes are those figured by Rutsch (1942). Springvale specimens show a considerable variability. The proportions of length to height are not constant, *i.e.* subquadrate valves occur together with subrectanguair ones. The deepness of the central, radial concavity of the right valve is variable to some degree. A second posterior umbonal ridge is, although not prominently, frequently developed. These variable features have been used to separate *A. falconensis* from *A. colombiensis*. Material from the middle Miocene of Colombia cannot be separated from the Trinidad fossils.

D'Orbigny's figures of *Tellina sagrae* (1852 ?, Palaeontologia Cubana, pl. 4, figs. 8, 9, 10) are based on an internal mold. According to Dall [1890-1903 (1900), p. 1043] it is the same as the Recent *Metis intastriata* Say (1826, p. 218).

It is difficult to separate *A. intastriata* from *A. trinitaria* according to the many Recent valves at hand. The fossils are always double-valved specimens. Fossil single valves, if available, might show that *A. trinitaria* is the same as the Recent species.

On the other hand *A. trinitaria* as mentioned and figured by Cooke (1919), Maury (1920), and Hubbard (1920) represents a different species. The collections of the U. S. National Museum contain many lots of that form from the early Miocene of Anguilla (Crocus Bay), Cuba (largest lots from La Cruz Formation near Santiago de Cuba) and Puerto Rico. This species differs from *A. trinitaria* in being constantly smaller and much more inequilateral.

Occurrence.—RR 291, USGS 18411, USGS 18634.

Distribution. — Middle Miocene of Colombia and Venezuela (?). Trinidad: Savaneta Glauconitic Sandstone Member and Melajo Clay Member, both of Springvale Fm. (late Miocene).

Genus **TEMNOCONCHA** Dall

Dall, 1921, Nautilus, vol. 34, No. 4, p. 132.

Type species (by monotypy), *Psammacoma (Temnoconcha) brasiliana Dall.*

Temnoconcha aff. **brasiliana** (Dall) Pl. 34, fig. 9; Pl. 35, figs. 1-3

Shell of medium size, thin and delicate, slightly inequilateral. Umbones low, situated a little behind center. Antero-dorsal margin slightly convex, postero-dorsal margin somewhat concave. Margin broadly rounded anteriorly, obliquely truncated and a little angulated posteriorly. Posterior umbonal ridge marked. Sculpture consists of incrementals which are conspicuous on posterior slope. Scissulation concentric anteriorly, oblique centrally, disappearing in front of umbonal ridge. Hinge with two cardinals in each valve, no laterals. Both right cardinals bifid. Anterior left cardinal bifid, posterior one rudimentary, thin. Ligamental area small, lanceolate.

The type locality of *T. brasiliana* (Dall) (1921, p. 132) is San Sebastian Island off the southern coast of Brasil. The species has been discussed, and its holotype (USNM 333023) figured by Boss and Kenk (1964). Pallial line and sinus of the Trinidad fossils have the same shape as on Recent shells, but the fossil specimens never attain the size of Recent ones. The shells from Point Courbaril are more elongate than those from the Melajo Clay. The oblique lines are somewhat more widely spaced on the fossil specimens.

T. brasiliana has been compared with the Recent Eastern Pacific *T. cognata* (C. B. Adams) (1852, p. 503) = *T. concinna* (C. B. Adams) (1852, p. 504) by Boss and Kenk. *T. cognata* essentially is a larger species. It has been recorded from the Pliocene of Ecuador by Pilsbry and Olsson (1941, p. 69). *T. ecuadoriana* Olsson (1964, p. 70, pl. 9, fig. 1) from the late Miocene to early Pliocene Borbon Formation of Ecuador is even larger than *T. cognata.*

The Trinidad fossils should possibly be identified as *T. cercadica* (Maury) (1917, p. 224, pl. 38, fig. 9) which has been described from the middle Miocene Cercado Formation of the

Dominican Republic. The collections of the U. S. National Museum contain only fragmentary topotypes, but *T. cercadica* seems to have similar dimensions as the Trinidad fossils.

Some specimens of probable middle Miocene age are contained in a lot from USGS Station 7996a: about midway between Boca del Canalete and Puerta de Arboletes, Caribbean coast of Colombia. They possibly represent *T. cercadica*.

Occurrence. — Melajo River area: EL 1810, USGS 18399, USGS 21178. Point Courbaril: K 1429, K 12255, PJ 212, USGS 20432, USGS 20434.

Family SEMELIDAE

Genus SEMELE Schumacher

Schumacher, 1817, Essai d'un nouveau système des habitations des vers testacés, p. 165.

Type species (by monotypy), *Tellina reticulata* Spengler (= *Tellina proficua* Pulteney).

Semele proficua (Pulteney) Pl. 35, figs. 4, 5

1799. *Tellina proficua* Pulteney, Hutch. Dorsetshire, p. 29, pl. 5, fig. 4 (not seen).
1925. *Semele proficua* Pulteney, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 117, pl. 21, fig. 5.
1964. *Semele proficua* (Pulteney), Weisbord, Bull. Amer. Paleont., vol. 45, No. 204, p. 356, pl. 51, figs 9-14. For additional citations see this publication.

Like *S. purpurascens* this species occurs at Matura (rare) and in the Courbaril beds (frequent). The material at hand has thicker shells than Recent specimens, the valves are somewhat more inflated, and the chondrophore is deeper.

Occurrence. — Point Courbaril: K 8399, K 12013, K 12255, PJ 212, USGS 20432, USGS 20432a, USGS 21778. Matura Bay: RR 230.

Distribution. — Pliocene to Recent (see Weisbord, 1964, p. 358).

Semele purpurascens (Gmelin) Pl. 35, figs. 6, 7

1791. *Venus purpurascens* Gmelin, Systema Naturae, ed. 13, vol. 1, pt. 6, p. 3288.
1867. *Semele variegata* Lamarck, Guppy, Proc. Sci. Assoc. Trinidad, pt. 3, p. 162; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 41.
1874. *Semele variegata* Lamarck, Guppy, Geol. Mag., new ser., decade 2, vol. 1, p. 441.
1925. *Semele purpurascens* Gmelin, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 117. Not pl. 20, fig. 17.

1964. *Semele purpurascens* (Gmelin), Weisbord, Bull. Amer. Paleont., vol. 45, No. 204, p. 353, pl. 51, figs. 7, 8. For additional citations see this publication.

This species is rare at Matura as well as in the Courbaril beds.

Occurrence.—Point Courbaril: PJ 212, USGS 20432, USGS 10432a. Matura Bay: RR 230.

Distribution.—Late Miocene to Recent (see Weisbord, 1964, p. 356).

Semele laevis costaricensis Olsson Pl. 36, figs. 1, 2

1922. *Semele laevis* Sowerby var. *costaricensis* Olsson, Bull. Amer. Paleont., vol. 9, No. 39, p. 258, pl. 29, fig. 1.
1931. *Semele laevis costaricensis* Olsson, Hodson and Hodson, Bull. Amer. Paleont., vol. 16, No. 59, p. 17, pl. 8, fig. 5.
1932. *Semele laevis costaricensis* Olsson, Olsson, Bull. Amer. Paleont., vol. 19, No. 68, p. 126.
1942. *Semele laevis* Sowerby, var. *costaricensis* Olsson, Haas, Jour. Paleont., vol. 16, No. 3, p. 309.

Holotype.—Paleont. Research Inst., Ithaca, N. Y., No. 21287.

Type locality.—Hill 3, Banana River, Limón Prov., Costa Rica: Gatun Fm. (middle Miocene).

This species is represented from the Melajo Clay by two right valves and a fragment and from the Courbaril beds by one double-valved specimen and a hinge fragment.

S. laevis costaricensis essentially is a smaller form than the Recent *S. laevis* (G. B. Sowerby I) (*in* Broderip and Sowerby, 1832-1833, p. 199, 1833; Olsson, 1961, p. 361, pl. 64, fig. 6) from the west coast of Central America. The Melajo specimens have a somewhat narrower pallial sinus, and the right cardinal teeth are shorter and stouter. Large specimens of *S. laevis* have been recorded from the Pliocene Jama Formation of western Ecuador by Pilsbry and Olsson (1941, p. 70), and Olsson (1964, p. 65, pl. 9, fig. 9) mentioned *Semele* cf. *costaricensis* from the middle Miocene Angostura Formation of northwestern Ecuador.

S. laevis costaricensis occurs frequently in the Gransaull Clay Member of the Springvale Formation, but it does not seem to have been found in the Chickland Clay Member of the same formation.

Occurrence.—Melajo River area: USGS 18399, USGS 21178. Point Courbaril: USGS 10991, USGS 20432.

Distribution.—Costa Rica: Gatun Fm. (middle Miocene). Peru: Zorritos Fm. (middle Miocene). Venezuela: "upper middle

Miocene". Trinidad: Gransaull Clay Member and Melajo Clay Member, both of Springvale Fm., Courbaril beds of Upper Morne l'Enfer Fm.

Semele claytoni couvensis Maury Pl. 36, fig. 3

1925. *Semele claytoni* var. *couvensis* Maury, Bull. Amer. Paleont., vol. 10, No 42, p. 118, pl. 21, fig. 4.
1938. *Semele claytoni couvensis* Maury, Vokes, Amer. Museum Novitates, No. 988, p. 3.
1942. *Semele claytoni couvensis* Maury, Rutsch, Verh. Naturf. Ges. Basel, vol. 54, p. 122, pl. 5, fig. 4.

Holotype. — Paleont. Research Inst., Ithaca, N. Y., No. 888.

Type locality. — Springvale Quarry, Trinidad.

There is a single right valve from the base of the Melajo Clay. It is attached to matrix, but part of the hinge is visible showing clearly that it belongs to *Semele*. It is smaller than specimens from Springvale Quarry.

Topotypes of *S. claytoni* Maury (1917, p. 227, pl. 35, fig. 9) from the middle Miocene Cercado Formation of the Dominican Republic show that the subspecies *couvensis* has a less accentuated posterior umbonal ridge, and that its concentrics almost disappear toward the postero-dorsal margin.

S. leana Dall [1890-1903 (1900), p. 992, pl. 37, figs. 1, 2] from the Pliocene of Florida is a more inflated and inequilateral species with stronger radials between the concentrics. *S. perlamellosa* Heilprin (1887, p. 92, pl. 11, fig. 23) from the Pliocene of Florida is a much longer form compared to its height.

Occurrence. — USGS 18411.

Distribution. — Savaneta Glauconitic Sandstone Member and Melajo Clay Member, both of Springvale Fm.

Semele aff. **anteriocosta** Vokes Pl. 36, figs. 4-9

Shell of small to medium size, flattish, somewhat inequilateral. Umbones behind the middle, low. Dorsal margins almost straight. Anterior margin regularly rounded. Posterior end subtruncated. Prodissoconch smooth, glassy. First sculpture consists of narrow concentrics with wider interspaces followed by a number of coarser concentrics with wider interspaces as well. Subsequently the interspaces become narrower and sometimes irregular in width. Antero-dorsal portion of shell with a varying number of radial, incised lines crossing the concentrics. Postero-dorsal area with an inconspicuous radial depression. Lunule small, sunken. Escutcheon elongate, narrow, with growth lines. Right hinge with two small cardinals and an elonate chondrophore behind them. One anterior and one posterior lateral teeth with a socket dorsally. Left hinge with two cardinals, the posterior one rudimentary. One anterior and one posterior lateral. Pallial sinus large.

This form occurs in the Melajo Clay, the Courbaril beds, and at Matura. *S. anteriocosta* Vokes (1938, p. 14, fig. 5) from the Savaneta Glauconitic Sandstone Member of the Springvale Fm. of Springvale Quarry is rare. Comparison with two topotypes shows that *S.* aff. *anteriocosta* is a consistently smaller form with finer concentric sculpture. Some Matura valves even tend to have a smooth surface during part of the ontogeny. The number of the radial, incised lines on the antero-dorsal part of the shell is variable.

If the variability of *S. anteriocosta* were known, the present material might prove to belong to that species. The specimen from Matura figured by Maury (1925, pl. 20, fig. 17) as *S. purpurascens* is *S.* aff. *anteriocosta*.

There are three species of *Semele* having the radial, incised lines like *S. anteriocosta*: *S. pulchra* (G. B. Sowerby I) (*in* Broderip and Sowerby, 1832-1833, p. 57, 1832; Olsson, 1961, p. 368, pl. 65, fig. 5), *S. guaymasensis* Pilsbry and Lowe (1932, p. 92, pl. 12, figs. 8, 9), both Recent Eastern Pacific species, and *S. quentinensis* Dall (1921, West American Scientist, vol. 19, No. 3, p. 22; Dall, 1925, p. 26, pl. 8, fig. 4) from the Pleistocene of Lower California, Mexico. *S. pulchra* is higher and trigonal in outline, *S. guaymasensis* has coarser concentrics, and *S. quentinensis* has a finer sculpture.

Occurrence.—Melajo River area: KR 11862, K 9817, USGS 18399, USGS 18411, USGS 21178. Point Courbaril: K 1429, K 12255, USGS 10991, USGS 20432a, USGS 20434. Matura Bay: RR 230, USGS 19860.

Genus **ABRA** Lamarck

Lamarck, 1818, Histoire naturelle des animaux sans vertèbres, vol. 5, p. 492.

Type species (by monotypy), *Mactra tenuis* Montagu.

Abra cf. aequalis (Say) Pl. 37, figs. 1-3

A number of partly broken valves from the Courbaril beds may belong to *A. aequalis* (Say) (1822, p. 307). According to the figures given by Gardner [1943-1948 (1943), pl. 17, figs. 12-15] the outline is almost the same. The postero-ventral margin of the Trinidad shells is less regularly rounded being slightly angulated. The right hinge consists of two small, subequal cardinals in front of the oblique chondrophoral pit, and feeble lateral grooves. The anterior cardinal of the left valve is somewhat stronger than the posterior one; no laterals. Pallial sinus deep. Exterior surface almost smooth, some faint incrementals discernible.

A. aequalis is wide spread in North America and ranges from Miocene to Recent according to Gardner [1943-1948 (1943), p. 104]. The Recent *A. uruguayensis* (Pilsbry) (1897, p. 293, pl. 7, figs. 27-29) differs in details of the dentition and by its longer and straight antero-dorsal margin.

Occurrence. — K 1429, K 8399, K 12013, RR 120, PJ 212, USGS 10991, USGS 20432, USGS 20432a, USGS 20433, USGS 20434, USGS 21778.

Abra ? species

A few small, poorly preserved specimens from Matura mostly attached to matrix suggest a species of *Abra*. They differ from *Abra* cf. *aequalis* from the Courbaril beds not only by their smaller size but also in being more inequilateral.

Occurrence. — USGS 18204, USGS 19860.

Genus **CUMINGIA** G. B. Sowerby I

Sowerby, G. B. I, 1833, Zool. Soc. London, Proc., pt. 1, p. 34.

Type species (by subsequent designation, Gray, 1847, Zool. Soc. London, Proc., pt. 15, p. 187), *Cumingia lamellosa* G. B. Sowerby I.

Cumingia galbensis, n. sp. Pl. 37, figs. 4-6

Shell of small to medium size, inflated for the genus. Outline variable due to nestling mode of life. Umbones almost central. Anterior extremity broadly rounded, postero-ventral margin somewhat angulated. General aspect usually stout. Sculpture consists of almost equally spaced, concentric lamellae. Their interspaces with minute radial striae. Hinge with a large chondrophore, a small cardinal tooth in front of it, and two laterals. The right laterals are much larger. The anterior right lateral is the largest, and is strongly projecting. Lunule relatively large. Pallial sinus partly confluent with pallial line.

Holotype. — USNM 645355.

Dimensions of holotype (right valve). — Length 13.5 mm, height 11.4 mm, convexity 4.6 mm.

Type locality. — Point Courbaril: USGS 20432.

This species occurs in the Courbaril beds only. Right and left valves are well represented.

Specimens in the collections of the U. S. National Museum labelled *C. tellinoides* Conrad from the Western Atlantic are longer, less inflated, and tend to have more distant concentrics. The Recent *C. coarctata* G. B. Sowerby I (1833-1834, p. 34, 1833) as figured by Abbott (1958, p. 136, pl. 5, 1, m), and by Olsson and Harbison (1953, p. 136, pl. 15, fig. 5) from the Pliocene of St. Petersburg, Florida, is a smaller form with more widely spaced concentrics. *C. amydra* Olsson and Harbison (1953, p. 136, pl. 15, fig. 6) from the Pliocene of Florida is known from a left valve only. It is smaller, and has more closely set concentrics than *C. galbensis*. A species of *Cumingia* in the collections of the U. S. National Museum occurring abundantly in the late Miocene of Acline, Florida, is considerably larger, proportionately longer, and less inflated.

C. galbensis resembles immature specimens of the Recent West Coast *C. lamellosa* G. B. Sowerby I (1833-1834, p. 34, 1833). They have the same degree of inflation and similar proportions. But *C. lamellosa* reaches a much larger size, and has coarser sculpture.

Occurrence. — K 8399, USGS 10991, USGS 20432, USGS 20432a, USGS 20434.

Family **DONACIDAE**

Genus **DONAX** Linné

Linné, 1758, Systema Naturae, ed. 10, p. 682.

Type species (by subsequent designation, Herrmannsen, April 18, 1847, Indicis generum malacozoorum, vol. 1, p. 404), *Donax rugosa* Linné.

Donax striatus Linné ? Pl. 37, figs. 7, 8

1864. *Donax striata* Linné, Guppy, Trans. Sci. Assoc. Trinidad for 1864, p. 36; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 16.

1867. *Donax striata* Linné, Guppy, Proc. Sci. Assoc. Trinidad, pt. 3, p. 162; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 41.

D. striatus has been cited from Matura by Guppy already. The specimens at hand are strongly worn leaving sculptural details almost unrecognizable.

Some small valves occur in the Courbaril beds. Their shape and sculpture suggest that they may be immature *D. striatus,* and that they do not belong to *D. vagus* Weisbord (1964, p. 368, pl. 53, figs. 10, 11) nor to *D. marensis* Weisbord (1964, p. 369, pl. 53, figs. 12, 13), both small species from the Pliocene Mare Formation of Venezuela.

Occurrence. — Point Courbaril: K 1429, K 8399, PJ 212, USGS 10991, USGS 20433, USGS 20434. Matura Bay: JS 67, RR 230, PJ 302.

Donax fabagelloides Guppy — Pl. 37, fig. 9; Pl. 38, figs. 1-4

1864. *Donax fabagella* Lamarck, Guppy, Trans. Sci. Assoc. Trinidad for 1864, p. 36; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 16.
1867. *Donax fabagelloides* Guppy, Proc. Sci. Assoc. Trinidad, pt. 3, pp. 162, 173; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, pp. 41, 52.
1874. *Donax fabagelloides* Guppy, Guppy, Geol. Mag., new ser., decade 2, vol. 1, pp. 435, 442, pl. 18, fig. 10.
1925. *Donax fabagelloides* Guppy, Maury, Bull. Amer. Paleont. vol. 10. No. 42, p. 115.

Shell of medium size, thin, elongate, inequilateral. Anterior side longer. Anterior and posterior ends narrowly arched. Ventral margin straight to slightly curved. Postero-dorsal margin straight. Antero-dorsal margin somewhat curved. Surface smooth, radially striated below outer layer. Posterior umbonal ridge inconspicuous. Right hinge with two cardinals, the posterior one triangular. Posteriorly there is a prominent socket for the left posterior lateral. Left hinge with two cardinals; posterior one bifid. Anterior lateral elongate, posterior lateral small, knoblike. Ligament external, sitting on a small platform giving the appearance of a third cardinal tooth in the right valve. Inner margin crenulated. Pallial sinus moderately deep, broadly rounded, partly confluent with pallial line.

Holotype. — USNM 115654.

Dimensions of holotype. — Length 20.5 mm, height 9.7 mm.

Type locality. — Matura, Trinidad.

The type specimen of *D. fabagelloides* is filled with matrix and its hinge cannot be seen. Compared with other Matura material the specimens of this species are astonishingly well preserved. The original colour pattern is preserved in form of greyish, concentric bands of varying width. Outline and proportions of *D. fabagelloides* are constant.

D. fabagelloides seems to have no Recent analogue in the Caribbean area. *D. aequilibratus* Dall (1892, p. 126) from the Pliocene Waccamaw Formation of North Carolina [see Gardner, 1943-1948 (1943), p. 106, pl. 17, fig. 29] has a more accentuated posterior umbonal ridge and stronger radial sculpture. *D. punaensis* Pilsbry and Olsson (1941, p. 72, pl. 12, fig. 2) from the Pliocene of the north end of Puna Island, Ecuador, seems to differ from *D. fabagelloides* in minor details only. *D. punaensis* is not known enough yet. The Recent *D. gracilis* Hanley (1845a, p. 15) which ranges from the Gulf of California to northern Peru according to Olsson (1961, p. 341) has a higher anterior extremity, and its beaks are situated more posteriorly.

The above mentioned species seem to represent a uniform group well separated from other species of *Donax*. They all have inconspicuous sculpture and posterior umbonal ridge, and might be united in a supraspecific category.

Occurrence. — K 10924, JS 67, RR 230, USGS 18204, USGS 19860.

Distribution. — Known from type locality only.

Donax brightonensis, n. sp. Pl. 38, figs. 5-8

Shell small, elongate, inequilateral. Beaks opisthogyrate. Anterior side longer. Posterior end more narrowly curved than anterior end. Dorsal margins inconspicuously curved. Posterior umbonal ridge moderately accentuated. Sculpture consists of radial striae below outer layer. Central part of shell disc with flattish, broad, somewhat irregular concentrics with narrower interspaces. Anteriorly and posteriorly the concentrics disappear. Right hinge with two cardinals; the posterior one triangular and inconspicuously bifid. Posteriorly there is a prominent socket for the left posterior lateral. Anterior lateral obscure. Ligamental platform looking like a third cardinal. Left hinge with two cardinals; posterior one bifid, anterior one triangular. Anterior lateral tooth elongate, posterior lateral knoblike. Inner margin crenulated.

Holotype. — Natural History Museum Basel, No. G 12861.

Dimensions of holotype (left valve). — Length 13.2 mm, height 6.1 mm.

Type locality.—Point Courbaril: RR 120.

D. brightonensis, n. sp. strikingly resembles *D. fabagelloides* Guppy from the Matura shell bed. But it is easily distinguished from it by the concentrics on the central portion of the shell disc which are lacking in *D. fabagelloides. D. brightonensis* further differs in the following minor points: the antero-dorsal margin is slightly curved instead of straight, the left anterior cardinal is heavier, and the posterior umbonal ridge is more pronounced.

Occurrence.—K 12255, RR 120, USGS 20432a.

Subgenus **MACHAERODONAX** Römer

Römer, 1870, Systematisches Conchilien-Cabinet, vol. 10, pt. 3, p. 77.

Type species (by subsequent designation, Dall, 1900, Wagner Free Inst. Sci Philadelphia, Trans., vol. 3, pt. 5, p. 963), *Donax scalpellum* Gray.

Donax (Machaerodonax ?) species Pl. 37, figs. 10, 11

A single fragment from Matura suggests the subgenus *Machaerodonax.* Only the posterior part of a left valve including the hinge is preserved. The posterior ridge is sharp, the main shell disc smooth, and the postero-dorsal slope sculptured by finely beaded, radial riblets which are crossed by still finer concentrics.

This fragment seems to be most closely related to the Recent West Coast *D. transversus* G. B. Sowerby I (see Olsson, 1961, p. 345, pl. 59, figs. 4-4b). The sculpture on the posterior slope is almost the same, but the hinge differs in details. The Matura specimen seems to be immature as it does not show the slight sinus of the postero-dorsal margin marking the position of the posterior gap.

Occurrence.—USGS 19860.

Family **SANGUINOLARIIDAE**

Genus **TAGELUS** Gray

Gray, 1847, Zool. Soc. London, Proc., pt. 15, p. 189.

Type species (by original designation), *Solen guinensis* Chemnitz = *Solen gibbus* Spengler = *Solen plebeius* Lightfoot.

Subgenus **TAGELUS** s. str.

Tagelus (Tagelus) plebeius (Lightfoot)

1786. *Solen plebeius* Lightfoot, A catalogue of the Portland Museum, pp. 42, 101, 156. See Rehder, 1967, p. 11.

1964. *Tagelus plebeius* (Solander), Weisbord, Bull. Amer. Paleont., vol. 45, No. 204, p. 373, pl. 54, figs. 1-4. For additional citations see this publication.

This species is represented by a single, incomplete, left valve from the Courbaril beds.

Occurrence. — K 12255.

Distribution. — Late Miocene to Recent. For details see Weisbord (1964, p. 376).

Subgenus **MESOPLEURA** Conrad

Conrad, 1867, Amer. Jour. Conchology, vol. 3, app., p. 23.

Type species (by subsequent designation, Gardner, 1928, U. S. Geol. Sur., Prof. Paper 142-E, p. 214), *Solen bidentatus* Spengler (= *Solen divisus* Spengler).

Tagelus (Mesopleura) cf. divisus (Spengler) Pl. 38, figs. 9, 10

One small, but complete left valve from the Courbaril beds may be *T. divisus*. The internal, radial ridge in the umbonal cavity is well visible. It differs from Recent specimens in details only: the posterior extremity is somewhat higher, and the ventral margin slightly sinused, and not straight as in Recent shells.

Occurrence. — USGS 20434.

Tagelus (Mesopleura ?) mansfieldi (Vokes)

1938. *Psammosolen (?) mansfieldi* Vokes, Amer. Museum Novitates, No. 988, p. 15, fig. 13.
1942. *Tagelus ? mansfieldi* (Vokes), Rutsch, Verh. Naturf. Ges. Basel, vol. 54, p. 122.

Holotype. — Amer. Museum of Natural History, No. 24995.

Type locality. — Springvale Quarry, Trinidad.

A few incomplete valves of this species occur at the base of the Melajo Clay. A weak, radial ridge below the hinge indicates that they may belong to *Mesopleura*. *T. mansfieldi* is still insufficiently known. Only incomplete specimens are at hand, and most of them are attached to hard matrix.

Gardner [1926-1950 (1928), p. 215, pl. 32, fig. 27] recorded *T.* cf. *divisus* from the Chipola Formation of Florida, and a larger, unnamed species from the Shoal River Formation. Valves of *T. mansfieldi*, if complete, would reach a length of well over 50 mm, a length never attained by Recent specimens of *T. divisus*.

T. whitei Maury (1925a, p. 367, pl. 20, fig. 1) from the lower Miocene Pirabas Formation of Brasil is based on an insufficient fragment, and *T. hubbardi* Maury (1920, p. 44, pl. 7, fig. 3), from the Collazo shales (San Sebastian shales: Oligocene) of Puerto Rico, is based on an internal mold.

T. cebus Olsson (1922, p. 261, pl. 29, fig. 9) from the middle Miocene Gatun Formation of Costa Rica is a smaller species. Its interior is unknown. *T. subaequalis* (Gabb) (1873b, p. 247; Pilsbry, 1922, p. 426, text fig. 48) from the middle Miocene of the Dominican Republic is a small (length 19 mm) *Mesopleura*.

T. lineatus Gabb (1881b, p. 370, pl. 47, fig. 71) from the Pliocene of Moín, Puerto Limón, Costa Rica, is a *Solecurtus*. *T. peruvianus* Pilsbry and Olsson (1941, p. 70, pl. 18, fig. 5) from the Pliocene Canoa Formation of western Ecuador is a much larger and heavier species than *T. mansfieldi*.

Occurrence. — USGS 18411, USGS 18634.

Distribution. — Savaneta Glauconitic Sandstone Member and Melajo Clay Member, both of Springvale Fm., Trinidad.

Genus **PLEIORYTIS** Conrad

Conrad, 1862, Acad. Nat. Sci. Philadelphia, Proc. for 1862, p. 286.

Type species (by monotypy), *Pleiorytis ovata* Conrad (= *Petricola centenaria* Conrad).

Pleiorytis caroniana (Maury) Pl. 38, fig. 11

1925. *Petricola caroniana* Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 122, pl. 20, fig. 16.
1929. *Asaphis delicatus* Weisbord, Bull. Amer. Paleont., vol. 14, No. 54, p. 25, pl. 5, figs. 4, 5.
1938. *Pleiorytis caroniana* (Maury), Vokes, Amer. Museum Novitates, No. 988, p. 15, fig. 11.
1965. *Pleiorytis caroniana* (Maury), Jung, Bull. Amer. Paleont., vol. 49, No. 223, p. 470, pl. 60, fig. 8.

Holotype. — Paleont. Research Inst., Ithaca, N. Y., No. 883.

Type locality. — Springvale Quarry, Trinidad.

This species is represented from the base of the Melajo Clay by a single, double-valved specimen. Length 56.7 mm, height 40.7 mm. The two valves are not entirely joint. Thus the left hinge with two cardinals and a large ligamental area behind them are partly visible. The holotype of *P. caroniana* is an immature, somewhat deformed, double-valved specimen measuring 25.7 mm in length.

Occurrence. — USGS 18634.

Distribution. — Savaneta Glauconitic Sandstone Member and Melajo Clay Member, both of Springvale Fm., Trinidad. Middle Miocene of Venezuela and Colombia.

Family SOLENIDAE

Genus SOLEN Linné

Linné, 1758, Systema Naturae, ed. 10, p. 672.

Type species (by subsequent designation, Schumacher, 1817, Essai d'un nouveau système des habitations des vers testacés, p. 124), *Solen vagina* Linné.

Subgenus SOLEN s. str.

Solen (Solen) species

Some small fragments of right valves from the Melajo Clay are available. The position of the cardinal tooth at the anteriormost extremity indicates that they belong to a species of *Solen s. str.*

Occurrence.—PJ 285.

Subgenus SOLENA Mörch

Mörch, 1853, Catalogus conchyliorum quae reliquit D. Alphonso d'Aguirra et Gadea Comes de Yoldi, pt. 2, p. 7.

Type species (by subsequent designation, Stoliczka, 1871, Palaeontologia Indica, vol. 3, p. xvi), *Solen obliquus* Spengler.

Solen (Solena) obliquus Spengler — Pl. 38, fig. 14

1794. *Solen obliquus* Spengler, Skrivt. Nat. Selsk. Copenhagen, vol. 3, p. 92.
1925. *Solen (Solena) obliquus* Spengler, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 115, pl. 18, fig. 12.
1964. *Solen (Solena) obliquus* Spengler, Weisbord, Bull. Amer. Paleont., vol. 45, No. 204, p. 376, pl. 54, figs. 5, 6. For additional citations see this publication.

This species is represented by fragments from Matura and the Courbaril beds. The specimens are usually worn so that the surface sculpture is poorly preserved.

Occurrence.—Point Courbaril: K 12013. Matura Bay: JS 67, RR 230.

Distribution.—Miocene to Recent (see Weisbord, 1964, p. 378).

Family CORBULIDAE

Genus CARYOCORBULA Gardner

Gardner, 1926, Nautilus, vol. 40, No. 2, p. 46.

Type species (by original designation), *Corbula alabamiensis* Isaac Lea.

Subgenus CARYOCORBULA s. str.

Caryocorbula (Caryocorbula) helenae (Maury) — Pl. 38, figs. 12, 13; Pl. 39, figs. 1-9

1912. *Corbula (Cuneocorbula) helenae* Maury, Acad. Nat. Sci. Philadelphia, Jour., ser. 2, vol. 15, p. 62, pl. 9, fig. 25.
1925. *Corbula (Cuneocorbula) helenae* Maury, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 108, pl. 20, fig. 15.

Lectotype (herewith selected). — Cornell University, Paleont. Museum, Ithaca, N. Y., No. 33497.

Dimensions of lectotype (double-valved specimen). — Length 7.3 mm, height 5.0 mm.

Type locality. — A thousand feet west of the Brighton pier, near Pitch Lake, Trinidad.

The description of forms belonging to *Caryocorbula* from the younger Tertiary of Trinidad has been overdone. Several of these "species" are based on insufficient type material and should therefore be considered as *nomina dubia.*

The type of *C. helenae* itself is probably immature. A rich material from the type area is at hand including shells measuring up to 13 mm in length. This material shows a great variability: the concentrics are usually fine and closely set, but coarser, wider concentrics occur as well; the radial striae may be present or absent; the prominence of the posterior production and the posterior umbonal ridge is variable. An analogue variability can be observed in a single good sample of the Recent *C. caribaea* (d'Orbigny) (1842, pl. 27, figs. 5-8; 1845, p. 323), a species which *C. helenae* closely resembles.

C. smithiana (Maury) (1912, p. 63, pl. 9, figs. 29, 30) has been described from the same locality as *C. helenae.* Its lectotype (herewith selected: Pl. 39, figs. 1, 2) is the only specimen known. Specimens in the present material exactly analogous to *C. smithiana* are thought to fall within the variability of *C. helenae.*

C. caribaea pergrata (Maury) (1925, p. 103, pl. 20, fig. 8) from the Brighton area is known from a single specimen. It may belong to *C. helenae* or *C. caribaea. C. daphnis* (Maury) (1925, p. 104, pl. 20, figs. 10, 11) from Matura is known from two valves. Like the preceding it may belong to *C. helenae* or *C. caribaea.* Matura specimens are often worn so that the sculpture becomes obsolete.

Well-preserved and relatively large (up to 16 mm long) specimens of a *Caryocorbula* occur in the Melajo Clay. Provisionally they are identified as *C. helenae.* Their concentrics remain fine, and the radial striation is present on most valves. They differ from Courbaril specimens by their larger size and by their somewhat more elongate shape.

The Melajo specimens closely resemble *C. urumacoensis* (F. Hodson) (*in* Hodson and Hodson, 1931a, p. 25, pl. 12, figs. 1-7) from the "upper middle Miocene" of Falcón, Venezuela. *C. urumacoensis* seems to lack the radial striation.

Occurrence.—Melajo River area: Hutch 51, KR 11862, PJ 285, USGS 18399, USGS 18411, USGS 18634, USGS 21178. Point Courbaril: K 1429, K 8399, K 12255, PJ 212, USGS 10991, USGS 20432, USGS 20433, USGS 20434, USGS 21778.

Distribution.—Melajo Clay Member of Springvale Fm. (?), Courbaril beds of Upper Morne l'Enfer Fm.

Caryocorbula (Caryocorbula) species Pl. 39, fig. 10

A species of *Caryocorbula* occurs in great numbers at Matura, Point Courbaril, and in the Melajo River area. The specimens are small and variable. Generally they have a well-marked posterior umbonal ridge and concentric sculpture. The posterior production varies in shape from subtruncated to pointed. Radial striae are common but less so on Matura specimens.

Rutsch (1942, p. 102) listed *Caryocorbula* sp. ind. A and *Caryocorbula* sp. ind. B from Springvale Quarry. In a private report he characterised them by the presence and absence of radial striae respectively but stated that they might have to be united. The Springvale specimens are almost like the material under consideration.

The material from Matura represents what Maury (1925, p. 103) called immature *C. caribaea*. *C. arionis* (Maury) (1925, p. 111, pl. 19, figs. 11, 12, 17) from Matura is based on three specimens. Some rolled valves in the present material correspond with Maury's description and figures of *C. arionis* but are identified as *Caryocorbula* species.

Occurrence.—Melajo River area: EL 1810, Hutch 47, KR 11862, K 9797, K 9813, K 9816, K 9817, K 9902, K 9903, RR 290, RR 293, PJ 285, USGS 18399, USGS 21178. Point Courbaril: K 1429, K 8399, PJ 212, USGS 10991, USGS 20432, USGS 20432a, USGS 20433, USGS 20434. Matura Bay: K 10924, JS 67, RR 230, PJ 302, USGS 18204, USGS 19860.

Genus **JULIACORBULA** Olsson and Harbison

Olsson and Harbison, 1953, Acad. Nat. Sci. Philadelphia, Mon. 8, p. 148.

Type species (by original designation), *Corbula cubaniana* d'Orbigny (= *Corbula knoxiana* C. B. Adams = *Corbula aequivalvis* Philippi).

Juliacorbula aequivalvis (Philippi) Pl. 39, figs. 11-15

1836. *Corbula aequivalvis* Philippi, Archiv für Naturg., vol. 2, p. 227, pl. 7, fig. 4.
1845. *Corbula cubaniana* d'Orbigny, *in* La Sagra, Historia fisica, politica y natural de la Isla de Cuba. Segunda parte, vol. 5, Moluscos, p. 322. Atlas, pl. 26, figs. 51-54, 1842.
1867. *Corbula cubaniana* d'Orbigny, Guppy, Proc. Sci. Assoc. Trinidad, pt. 3, p. 161; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 40.
1874. *Corbula cubaniana* d'Orbigny, Guppy, Geol. Mag., new ser., decade 2, vol. 1, p. 441.
1925. *Corbula (Cuneocorbula) cubaniana* d'Orbigny, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 103, pl. 20, figs. 2, 3, 4.
1964. *Corbula (Juliacorbula) aequivalvis* Philippi, Weisbord, Bull. Amer. Paleont., vol. 45, No. 204, p. 393, pl. 57, figs. 3-6. For further citations see this publication.

C. cubaniana and *C. knoxiana* C. B. Adams (lectotype figured by Clench and Turner, 1950, pl. 47, fig. 11) are usually treated as synonyms of *C. aequivalvis*. This procedure implies a considerable variability of *C. aequivalvis*. The Matura specimens vary in shape from subquadrate to subrectangular. The coarseness of the concentrics is variable as well. It must be emphasized, however, that subquadrate, strongly inflated valves are predominant at Matura. *J. aequivalvis* is rare in the Courbaril beds and in the Melajo Clay, but the specimens are like those from Matura.

J. aequivalvis stainforthi (Rutsch) (1942, p. 124, pl. 3, figs. 8, 9) from the Springvale Formation of Springvale Quarry is known from two valves only. They differ from *J. aequivalvis* only by their coarser concentrics.

J. knoxiana fossilis (Pilsbry) (1922, p. 427, pl. 46, fig. 14) from the middle Miocene of the Dominican Republic is said to differ from Recent specimens by its less projecting carina.

J. scutata (Gardner) [1943-1948 (1943), p. 140, pl. 23, figs. 26, 30-32] from the Pliocene of Florida and North Carolina is said to differ from *C. cubaniana* by its coarser sculpture. Matura specimens of *J. aequivalvis* mostly have coarser concentrics than Recent valves as well.

The Recent West Coast *J. bicarinata* (G. B. Sowerby I) (1833-1834, p. 35, 1833; Olsson, 1961, p. 436, pl. 75, figs. 6-6b) is also a short and stout species but is more trigonal than subquadrate in outline. The Recent *J. ira* (Dall) (1908, p. 423) from the Gulf of Panama may be the same as *J. bicarinata* according to Olsson (1961, p. 436, pl. 76, fig. 5).

Occurrence.—Melajo River area: PJ 285. Point Courbaril: K 1429, USGS 10991, USGS 20432. Matura Bay: K 10924, JS 67, RR 230, PJ 302, USGS 18204, USGS 19860.

Distribution.—Pliocene to Recent. See also Weisbord (1964, p. 396).

Genus **NOTOCORBULA** Iredale

Iredale, 1930, Australian Museum Records, vol. 17, No. 9, p. 404.

Type species (by original designation), *Notocorbula vicaria* Iredale.

Stenzel, Krause, and Twining (1957, pp. 169-170) expressed the opinion that *Varicorbula* Grant and Gale (1931, p. 420) should be considered as a synonym of *Notocorbula*.

Notocorbula islatrinitatis (Maury) Pl. 40, figs. 1, 2

1925. *Corbula (Aloidis) isla-trinitatis* Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 101, pl. 19, figs 1, 8, 9, 10.
1938. *Corbula (Corbula) isla-trinitatis* (Maury), Vokes, Amer. Museum Novitates, No. 988, p. 3.
1942. *Corbula isla-trinitatis* Maury, Rutsch, Verh. Naturf. Ges. Basel, vol. 54, p. 102.

Lectotype (herewith selected).—Paleont. Research Inst., Ithaca, N.Y., No. 909 (specimen figured by Maury, 1925, pl. 19, fig. 9).

Dimensions of lectotype.—Length 18.1 mm, height 16.1 mm, convexity 9.5 mm.

Type locality.—Springvale Quarry, Trinidad.

This species is but poorly represented from the Melajo Clay. *N. islatrinitatis* is abundant at Springvale Quarry. The Melajo specimens do not reach the size of topotypes.

The type and only specimen of *N. prenuncia* (Spieker) (1922, p. 172, pl. 10, fig. 12) (USNM 562439) from the Miocene Zorritos Fm. of Peru is a smaller species. It is considerably higher than long. *N. heterogena* (Dall) [1890-1903 (1898), p. 850, pl. 46, fig. 15;

Woodring, 1925, p. 187, pl. 26, figs. 1-4] from Bowden, Jamaica, essentially is a smaller species with finer concentric sculpture.

Occurrence. — USGS 18411, USGS 18634.

Distribution. — Brasso Fm. (Maury), Savaneta Glauconitic Sandstone Member and Melajo Clay Member, both of Springvale Fm., Trinidad.

Notocorbula species Pl. 40, figs. 3, 4

A few right, partly immature valves from the Melajo Clay differ from *N. islatrinitatis* in having a decidedly finer concentric sculpture and in being more produced posteriorly. Some valves have fine, radial striae in young stages.

Occurrence. — PJ 285, USGS 18399, USGS 21178.

Notocorbula aff. **disparilis** (d'Orbigny) Pl. 40, figs. 5, 6

The *Notocorbula* occurring in the Matura shell bed is identified as *N.* aff. *disparilis.* This is unsatisfactory, because the Recent species of *Notocorbula*, for which several names have been used, are not sufficiently defined. In addition a number of Caribbean Tertiary species of *Notocorbula* are based on insufficient material.

The numerous lots in the collections of the U. S. National Museum labelled *disparilis* show constant differences from Matura lots. Matura specimens may reach a larger size, their concentrics are coarser, and their posterior umbonal ridge is less angulated than in Recent specimens. Specimens from the Pliocene of Moín Hill, Costa Rica, seem to be closer to the Recent species than to Matura valves.

Guppy (1867, p. 161; 1874, p. 441) as well as Dall [1890-1903 (1898), p. 849] cited the Matura *Notocorbula* as *Corbula vieta.* The type lot of *C. vieta* Guppy (1866b, p. 580, pl. 26, fig. 8) from the middle Miocene Manzanilla Formation of Trinidad consists of nine right valves (USNM 115650). The type lot of *Erycina tensa* Guppy (1866b, p. 582, pl. 26, fig. 6), also from the Manzanilla Formation, consists of four specimens (USNM 115652). They represent the left valves of *C. vieta* (see also Woodring, 1925, p. 188).

The new material from Matura contains only one left valve. It is incomplete and worn so that the radials are obsolete. Right valves from Matura are usually more produced posteriorly than right valves of *C. vieta* from Manzanilla, and their posterior angulation is more pronounced.

N. bruscasensis (Weisbord) (1964, p. 399, pl. 46, figs. 5, 6) from the Pliocene Playa Grande Formation as well as *N. puntagordensis* (Weisbord) (1964, p. 401, pl. 57, figs. 15, 16) from the Pliocene Mare Formation of Venezuela are both based on a single, immature, left valve. *N. granti* (Olsson) (1942, p. 45, pl. 2, figs. 8, 9) from the Pliocene Charco Azul Formation of Panama does not have any radials on the left valve.

Occurrence. — K 10924, JS 67, RR 230, PJ 302, USGS 18204, USGS 19860.

Genus **TENUICORBULA** Olsson

Olsson, 1932, Bull. Amer. Paleont., vol. 19, No. 68, p. 141.

Type species (by original designation), *Corbula tenuis* G. B. Sowerby I.

Tenuicorbula melajoensis, n. sp. Pl. 40, figs. 7-9

Shell of medium size, thin, elongate, inequilateral, slightly inequivalve. Umbones low. Anterior end produced, strongly curved. Posterior end obliquely truncated. Ventral margin almost straight. Right valve a little larger than left valve. Central part of shell with a shallow, radial depression. Sculpture consists of concentrics which become lamellar antero-ventrally. Interspaces wider, with incrementals. The concentrics weaken toward the sharply elevated, posterior umbonal ridge. This ridge carries beadlike thickenings, where it is crossed by the concentrics. The concentrics are thicker and less numerous on the posterior slope which is bordered dorsally by another sharp ridge. Right valve with a hook-shaped cardinal. Left valve with a grooved, projecting, chondrophoral plate. No lunule. Escutcheon conspicuous, sculptured by growth lines.

Holotype. — Natural History Museum Basel, No. G 14047.

Dimensions of holotype (right valve). — Length 20.0 mm, height 9.6 mm.

Type locality. — Melajo River area: Hutch 51.

This species occurs in the Melajo Clay. It is rare being represented by a few complete valves and some fragments. The posterior keel may project some distance over the postero-ventral margin as a rostrum.

T. melajoensis is at once distinguished from the Recent West Coast *T. tenuis* (G. B. Sowerby I) (1833-1834, p. 36, 1833; Olsson, 1961, p. 434, pl. 77, figs. 3, 3a), its subspecies *lupina* (Olsson) (1932, p. 143, pl. 14, figs. 7, 10) from the Tumbes Fm. of Peru, and the shell described as *T.* aff. *tenuis lupina* from the upper middle Miocene of the Paraguaná Peninsula, Venezuela (Jung, 1965, p. 477, pl. 62, figs. 8, 9), by its much coarser concentric sculpture.

T. acutirostra (Spieker) (1922, p. 176, pl. 10, figs. 18, 19) and its subspecies *zorritensis* (Olsson) (1932, p. 144, pl. 14, fig. 3), both from the Zorritos Formation of Peru, are shorter forms with finer sculpture.

Occurrence.—Hutch 47, Hutch 51, K 9817, PJ 285, USGS 18399, USGS 21178.

Tenuicorbula aff. melajoensis, n. sp. Pl. 40, figs. 10, 11

A single, incomplete, left valve from Matura has about the same dimensions as *T. melajoensis.* It differs from that species by its shorter anterior end, *i.e.* its antero-dorsal margin is steeper. Its concentrics are somewhat lower which is probably due to washing.

Occurrence.—PJ 302.

Family **PHOLADIDAE**

Genus **PHOLAS** Linné

Linné, 1758, Systema Naturae, ed. 10, p. 669.

Type species (by subsequent designation, Children, 1822), *Pholas dactylus* Linné (see Turner, 1954, p. 44).

Pholas species

Two small fragments from the Courbaril beds represent the septate umbonal reflection.

The type specimen of *P. mackiana* Maury (1912, p. 64, pl. 9, fig. 31) from 700 feet east of the Brighton pier near the Pitch Lake, Trinidad, is at hand and refigured here (Pl. 40, fig. 12). It is a fragment representing the anterior part of the shell with the septate umbonal reflection. A definite comparison with *P. campechiensis* Gmelin (see Turner, 1954, p. 48) and *P. chiloensis* Molina (Turner, 1954, p. 51) is not possible as the specimen is too incomplete. The anterior radials are considerably broader, and the anteriormost radial is situated much closer to the antero-dorsal margin than in the two Recent species. The specimen of *P. chiloensis* figured by

Olsson (1961, pl. 78, fig. 4) seems to have broader anterior radials than is usual. *P. mackiana* may be a valid species, if broad anterior radials do not prove to fall within the variability of one of the above mentioned species.

Occurrence. — PJ 212, USGS 20434.

Genus **MARTESIA** G. B. Sowerby I

Sowerby, G. B., I, 1824, Genera of Recent and Fossil Shells, part 23, *Pholas*, p. 2.

Type species (by monotypy), *Pholas clavata* Lamarck (= *Pholas striatus* Linné).

Martesia striata (Linné) ?

Fragments of the umbonal region from the Courbaril beds suggest *M. striata*. They show the umbonal-ventral sulcus, and the discrepant sculpture is indistinguishable from that of Recent specimens.

M. oligocenica Maury (1912, p. 65, pl. 9, figs. 32, 33) from a locality just south of the Pitch Lake, Trinidad, belonging to the Upper Morne l'Enfer Formation probably represents *M. striata*. This locality yields only internal molds. A syntype at hand which is refigured here (Pl. 40, fig. 13) is smaller than that figured by Maury. It shows the umbonal-ventral sulcus and the anterior margin of the shell which separates the anterior part of the shell from the callum. Obscure traces of sculpture are preserved on the anterior slope. *M. oligocenica* should be treated as a *nomen dubium*.

M. striata has also been cited from Matura by Guppy (1867, p. 161; reprint, Harris, 1921, p. 40; and 1874, p. 441).

Occurrence. — PJ 212, USGS 20432, USGS 20433, USGS 20434.

Family **PANDORIDAE**

Genus **PANDORA** Bruguière

Bruguière, 1797, Encycl. Méth., Vers Testacés, vol. 2, pl. 250, figs. 1a-c.

Type species (by subsequent monotypy, Lamarck, 1799, Mém. Soc. Hist. Nat. Paris, p. 88), *Tellina inaequivalvis* Linné. See also Boss and Merrill (1965, pp. 189-190).

Pandora species

A single, broken left valve from the Melajo Clay is available. The hinge is not visible, because the specimen is attached to matrix.

Length 24.5 mm (incomplete), height 15 mm (incomplete). The posterior submargin carries one carina, and the external sculpture consists of weak, concentric undulations. A second postero-dorsal ridge is not visible, because the margin is incomplete.

The state of preservation of this fragment does not allow one to point out specific affinities. However, it seems to belong to the group of *P. crassidens* Conrad which has been recorded from the Miocene of Maryland, Virginia, North Carolina, and Florida, and the Pliocene of North Carolina [see Gardner, 1943-1948 (1943), p. 47], and the Recent *P. gouldiana* Dall which ranges from Gaspé to North Carolina, according to Boss and Merrill (1965, p. 194). Olsson and Harbison (1953, p. 65) recorded a *Pandora* from the Pliocene of St. Petersburg, Florida, which they thought to be intermediate between *P. crassidens* and *P. gouldiana*.

Occurrence. — USGS 21178.

GASTROPODA

Family **FISSURELLIDAE**

Genus **DIODORA** Gray

Gray, 1821, London Medical Repository, Monthly Journal and Review, vol. 15, p. 233.

Type species (by monotypy), *Patella apertura* Montagu (= *Patella graeca* Linné).

Diodora cayenensis (Lamarck) Pl. 41, figs. 1-3

1822. *Fissurella cayenensis* Lamarck, Histoire naturelle des animaux sans vertèbres, vol. 6, pt. 2, p. 12.
1822. *Fissurella alternata* Say, Acad. Nat. Sci. Philadelphia, Jour., ser. 1, vol. 2, pt. 2, p. 224.
1867. *Fissurella cayennensis* Lamarck, Guppy, Proc. Sci. Assoc. Trinidad, pt. 3, p. 160; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 39.
1874. *Fissurella cayennensis* Lamarck, Guppy, Geol. Mag., new ser., decade 2, vol. 1, p. 441.
?1917. *Fissuridea henekeni* Maury, Bull. Amer. Paleont., vol. 5, No. 29, p. 157, pl. 24, fig. 21.
1917. *Fissuridea alternata* Say, Maury, *ibidem*, p. 157, pl. 24, fig. 22.
1925. *Fissuridea alternata* Say, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 249, pl. 43, fig. 1.
1928. *Diodora alternata henekeni* (Maury), Woodring, Carnegie Inst. Washington, Pub. 385, p. 452, pl. 39, figs. 11-17.
1943. *Diodora cayenensis* Lamarck, Pérez Farfante, Johnsonia, vol. 1, No. 11, p. 5, pl. 2, figs. 1-6.
1953. *Diodora cayenensis* (Lamarck), Olsson and Harbison, Acad. Nat. Sci. Philadelphia, Mon. No. 8, p. 359, pl. 63, fig. 5.
1962. *Diodora cayenensis* (Lamarck), Weisbord, Bull. Amer. Paleont., vol. 42, No. 193, p. 50, pl. 2, figs. 15-20. For further citations see this publication.

This species is represented from Point Courbaril and Matura. Matura shells show a considerable variability as to height and convexity of the posterior slope. According to Recent specimens and literature the coarseness of the radials seems to be variable as well. The Matura specimens are usually small but may reach 25 mm in length.

D. compsa Woodring (1928, p. 454, pl. 39, figs. 18-20) from Bowden, Jamaica, is based on a single small specimen which is separated from *D. cayenensis* by its clearly finer sculpture. *D. dorsenula* Weisbord (1962, p. 58, pl. 3, figs. 18, 19), from the Pliocene Mare Formation of northern Venezuela, is based on a single worn fragment of the apical area and is virtually unrecognizable.

Occurrence.—Point Courbaril: K 1429, USGS 10991, USGS 20432, USGS 20434, USGS 21778. Matura Bay: JS 67, RR 230, PJ 302, USGS 18204, USGS 19860.

Distribution.—Miocene to Recent (see also Weisbord, 1962, p. 53).

Diodora (?) species Pl. 41, figs. 4, 5

A single worn specimen from Matura differs from *D. cayenensis* in having less, but more prominent, primary radials and an oval orifice. The generic position of this shell is not clear as the posterior truncation of the internal callus is not recognizable. This, however, may be due to washing; if not, it would represent a *Fissurella*.

Occurrence.—RR 230.

Family **ACMAEIDAE**

Genus **ACMAEA** Eschscholtz

Eschscholtz, 1830, *in* Kotzebue, Neue Reise um die Welt in den Jahren 1823, 24, 25 und 26, vol. 2, Appendix, p. 24.

Type species (by subsequent designation, Dall, 1871, Amer. Jour. Conch., vol. 6, pt. 3, p. 238), *Acmaea mitra* Eschscholtz.

Acmaea species

There are two worn and partly damaged specimens from Matura. The external sculpture consists of about 15 radial ridges. The larger specimen is 7.2 mm long, and its horseshoe-shaped muscle scar is well recognizable.

Occurence.—JS 67, USGS 19860.

Family TROCHIDAE

Genus CALLIOSTOMA Swainson

Swainson, 1840, Treatise on Malacology, pp. 218, 351.

Type species (by monotypy), *Trochus zizyphinus* Linné.

Many subgeneric names have been proposed for *Calliostoma*. There seems to be no satisfactory classification based on shell morphology. Clench and Turner (1960) introduced two subgeneric names based on differences of the jaws. Until there will be a system correlating differences in anatomy with those of shell morphology (if this is possible), it seems best to omit subgeneric assignments, a conclusion also reached by Staadt (1956).

Calliostoma decipiens (Guppy) Pl. 41, figs. 6-12

1867. *Trochus decipiens* Guppy, Proc. Sci. Assoc. Trinidad. pt. 3, p. 172; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 51.
1874. *Trochus decipiens* Guppy, Guppy, Geol. Mag., new ser., decade 2, vol. 1, p. 435, pl. 18, fig. 18; p. 441 (part: not from Bowden).
1903. Not *Calliostoma decipiens* Guppy, Dall, Wagner Free Inst. Sci. Philadelphia, Trans., vol. 3, pt. 6, p. 1585.
1925. *Calliostoma decipiens* Guppy, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 244, pl. 43, fig. 9.

Shell of medium size, conical. Protoconch consists of about one volution. Early sculpture consists of three spirals carrying nodules. The nodules are connected by prosocline lines which disappear on later whorls. Additional granulated spirals are introduced alternating in size with the primary ones. Immature specimens may have an open umbilicus, whereas in the adult stage it is closed by callus. The periphery of the volutions is usually slightly keeled. Base of whorls covered by many spirals, the more central ones granulated.

Lectotype (herewith selected). — USNM 115619.

Dimensions of lectotype. — Height 8.7 mm, diameter 11.7 mm.

Type locality. — Matura, Trinidad.

The type lot of *C. decipiens* consists of two specimens. One of them is incomplete. *C. decipiens* shows some variation as to the sharpness of the peripheral angulation and the intensity of the granulation of the spirals. It is common at Matura but rare in the Melajo Clay.

C. decipiens has some affinities to the Recent Atlantic *C. adspersum* (Philippi) (see Clench and Turner, 1960, p. 46, pls. 30,

31) and *C. euglyptum* (A. Adams) (Clench and Turner, 1960, p. 48, pl. 32).

Occurrence. — Melajo River area: PJ 285, USGS 18411. Matura Bay: JS 67, RR 230, PJ 302, USGS 18204, USGS 19860.

Distribution. — Melajo Clay Member of Springvale Fm. (rare). Matura shell bed.

Calliostoma laticarinatum (Guppy) Pl. 41, figs. 13-17

1864. *Trochus granulatus* Born, Guppy, Trans. Sci. Assoc. Trinidad for 1864, p. 35; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 15.
1867. *Trochus decipiens laticarinatus* Guppy, Proc. Sci. Assoc. Trinidad, pt. 3, p. 172; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 51.
1874. *Trochus decipiens laticarinatus* Guppy, Guppy, Geol. Mag., new ser., decade 2, vol. 1, p. 435, pl. 18, fig. 19.
1925. *Calliostoma decipiens laticarinatum* Guppy, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 245, pl. 43, figs. 5, 10.

Holotype. — USNM 115618.

Dimensions of holotype. — Height 9.7 mm, diameter 11.4 mm

Type locality. — Matura, Trinidad.

This form is separated from *C. decipiens* by its sharper angulation at the periphery of the whorls. The distance between angulation and suture is larger in *C. laticarinatum*. Moreover the whorls tend to be more concave above the angulation. However, the protoconch and the early whorls are the same in both forms. There are some transitional shells in the material at hand. This may indicate that they should be synonymised. But examination of further material is needed.

Worn specimens having almost no external sculpture left somewhat resemble the larger Pliocene *C. nonurum* Pilsbry and Olsson (1941, p. 46, pl. 8, figs. 7, 10, 11) from Ecuador which has also been found in the Recent fauna of northern Peru. *C. caronianum* Maury (1925, p. 245, pl. 43, fig. 8) from the late Miocene Springvale Fm. of Trinidad differs from *C. laticarinatum* by its smaller apical angle and its more concave whorls. *C. caribbeanum* Weisbord (1962, p. 70, pl. 4, figs. 8-10) from the Pliocene Mare Fm. of northern Venezuela is said to differ from *C. laticarinatum* by its larger apical angle.

Occurrence. — RR 230, PJ 302, USGS 19860.

Distribution. — Kown from type locality only.

Calliostoma caronianum Maury Pl. 41, figs. 22, 23

1925. *Calliostoma caronianum* Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 245, pl. 43, fig. 8.

1938. *Calliostoma (Calliostoma) caroniana* Maury, Vokes, Amer. Museum Novitates, No. 988, p. 5.
1942. *Calliostoma caronianum* Maury, Rutsch, Verh. Naturf. Ges. Basel, vol. 54, p. 102.

Holotype. — Paleont. Research Inst., Ithaca, N.Y., No. 1110.

Type locality. — Springvale Quarry, Trinidad.

This species is represented by a single specimen from the base of the Melajo Clay. As mentioned above it is related to *C. laticarinatum* but differs from that species in having a smaller apical angle and in being proportionately higher.

C. attrinum Mansfield (1925, p. 58, pl. 10, figs. 7, 8) from the (middle ?) Miocene of Trinidad has about the same proportions and outline as *C. caronianum,* but its sculpture is much coarser.

Occurrence. — USGS 18634.

Distribution. — Savaneta Glauconitic Sandstone Member, and Melajo Clay Member, both of Springvale Fm., Trinidad.

Calliostoma plicomphalus (Guppy) Pl. 41, figs. 18-21

1867. *Trochus plicomphalus* Guppy, Proc. Sci. Assoc. Trinidad, pt. 3, pp. 161, 173; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, pp. 40, 52.
1874. *Trochus plicomphalus* Guppy, Guppy, Geol Mag., new ser., decade 2, vol. 1, pp. 435, 441, pl. 18, fig. 17.
1925. *Calliostoma (Eutrochus) plicomphalus* Guppy, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 246, pl. 43, figs. 11, 13, 15.

Shell of medium size. Protoconch consists of a little more than one volution. First sculpture with two and after half a volution with three spirals which are crossed by slightly prosocline axials forming beads at the intersections. The axials disappear soon and additional granular spirals are introduced. Aperture rhombic. Umbilicus open. Periphery usually rounded, not angular. Base sculptured by numerous spirals; the outer ones smooth, but toward the umbilicus the beads gradually increase in size. The spiral bordering the umbilicus carries still larger beads.

Lectotype (herewith selected). — USNM 115617.

Dimensions of lectotype. — Height 11.2 mm, diameter 12.2 mm.

Type locality. — Matura, Trinidad.

Immature specimens are usually flat-sided, but adult shells have somewhat convex whorls. The periphery is angulated in young individuals but rounded later. The width of the umbilical opening and the apical angle are not constant.

As stated by Maury this species has some resemblance to the

Recent West Indian *C. jujubinum* (Gmelin) (Clench and Turner, 1960, p. 31, pl. 21), but that species has a sharper periphery, and the adult whorls tend to be concave, whereas in *C. plicomphalus* they are convex. Clench and Turner noted a considerable variability of *C. jujubinum* as to apical angle and width of the umbilicus.

Occurrence. — JS 67, RR 230, USGS 18204, USGS 19860.

Distribution. — Known from type locality only.

Calliostoma olssoni Maury Pl. 42, figs. 1-3

1925. *Calliostoma (Eutrochus) olssoni* Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 247, pl. 43, figs. 6, 14.

Shell of medium size. Apical angle large. Protoconch consists of one volution. First sculpture with three spirals and prosocline axials which soon produce beads at the intersections. After about 1½ volutions the axials disappear and additional beaded spirals are intercalated which tend to alternate in size with the primary spirals. The uppermost spiral of the whorl carries larger beads than the others. Periphery sharply angulated. Base covered by spirals. The two to four central ones granulated, the others narrower, smooth, with concave interspaces.

Lectotype (herewith selected). — Paleont. Research Inst., Ithaca, N.Y., No. 1108.

Dimensions of lectotype. — Height 7.5 mm, diameter 12.3 mm.

Type locality. — Matura, Trinidad.

This species is not frequent at Matura, whereas in the Melajo Clay it is common. From Point Courbaril it is represented by a single immature shell. Its characters are constant, although the Melajo specimens tend to have a smaller apical angle than topotypes. The two syntypes figured by Maury are immature. The larger specimen (fig. 6) is here selected as lectotype.

C. olssoni with its large apical angle and the spiral just below the suture carrying conspicuous beads is a distinctive species. No allied forms have been found.

Occurrence. — Melajo River area: Hutch 47, Hutch 51, EL 1810, KR 11862, K 9817, K 9902, RR 290, PJ 285, USGS 18399, USGS 21178. Point Courbaril: PJ 212. Matura Bay: K 10924, JS 67, RR 230, USGS 18204, USGS 19860.

Distribution. — Melajo Clay Member of Springvale Fm., Courbaril beds of Upper Morne l'Enfer Fm., Matura shell bed.

Genus **MICROGAZA** Dall

Dall, 1881, Bull. Mus. Comp. Zool., vol. 9, p. 50.

Type species (by monotypy), *Callogaza (Microgaza) rotella* Dall.

Microgaza oblita, n. sp. Pl. 42 figs. 4-9

1867. *Solarium semidecussatum* Guppy, Proc. Sci. Assoc. Trinidad, pt. 3, pp. 156, 170; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, pp. 35, 49. Part.

1874. *Solarium semidecussatum* Guppy, Guppy, Geol. Mag., new ser., decade 2, vol. 1, p. 408 (part) ; not pl. 18, fig. 14.

Shell small, with four to five whorls. Protoconch consisting of 1¼ smooth volutions. Early sculpture with prosocline axials which are restricted to the uppermost part of the whorls after about one volution. At the same time a spiral appears just below the suture carrying the former prosocline axials in form of beads. Their interspaces become larger with increasing age. Whorls sharply angulated at periphery. Base strongly convex and smooth except the umbilical margin which carries short, radial wrinkles crossed by two to four faint spiral grooves. Inside of umbilical wall with a number of spirals. Aperture subquadrate. Inner lip with callus.

Holotype. — USNM 645185.

Dimensions of holotype. — Height 2.1 mm, diameter 4.2 mm.

Type locality. — Matura, Trinidad.

This species is represented by a few specimens only. Most of them are worn resulting in an indistinct sculpture. As mentioned by Woodring (1928, p. 358) the type lot of *Solarium semidecussatum* Guppy (USNM 115468) consists of two specimens. One of them is the holotype of *Architectonica (Pseudotorinia) semidecussata* and the other one the holotype of *Microgaza oblita,* n. sp.

A closely related form has been described as *M. rotella vetula* from the Bowden Formation of Jamaica by Woodring (1928, p. 435, pl. 37, figs. 1-3). The many topotypes at hand show that both species have about the same apical angle, but the whorls of *M. oblita* are higher. Moreover the Jamaican species has more closely set beads on the spiral just below the suture, and the wrinkles bordering the umbilicus are longer and not crossed by spiral grooves. *M. oblita* lacks the fine spiral threads on and near the periphery of the body whorl.

The Recent West Indian *M. rotella* (Dall) (1881, p. 51) has considerably weaker radial wrinkles at the umbilical margin. According to Dall's figures (1889a, pl. 22, figs. 5, 5a) its periphery is not angulated.

Occurrence. — JS 67, RR 230, PJ 302, USGS 19860.

Distribution. — Known from type locality only.

Family **TURBINIDAE**

Genus **ASTRAEA** Röding

Röding, 1798, Museum Boltenianum, pt. 2, p. 79.

Type species (by subsequent designation, Suter, 1913, Manual of New Zealand Mollusca, p. 166), *Trochus imperialis* Gmelin (= *Trochus heliotropium* Martyn).

Subgenus **ASTRALIUM** Link

Link, 1807, Beschreibung der Naturalien-Sammlung der Universität zu Rostock, p. 135.

Type species (by subsequent designation, Woodring, 1928, Carnegie Inst. Washington, Pub. 385, p. 412), *Astralium deplanatum* Link (= *Trochus costulatus* Lamarck).

Astraea (Astralium) cf. brevispina (Lamarck) Pl. 42, figs. 10, 11

The few specimens from Matura are immature and too incomplete to allow a definite determination.

A. brevispina basalis (Olsson) (1922, p. 162, pl. 15, figs. 4, 5) from the Gatun Formation of Costa Rica, which has also been recorded from the Bowden Formation of Jamaica by Woodring (1928, p. 413, pl. 33, figs. 4-6), mainly differs from the Recent *A. brevispina* (Lamarck) (see Weisbord, 1962, p. 94, pl. 6, figs. 16-18) by its finer sculpture on the early whorls.

The Matura specimens have about the same strength of the early sculpture as Recent shells. Their base is covered by five spirals which are crossed by lamellar growth lines. The second spiral from the periphery is stronger than the others. On all the Recent shells of *A. brevispina* available these spirals are nodose which is not the case on the Matura specimens.

Occurrence. — JS 67, RR 230, PJ 302, USGS 19860.

Genus **PARVITURBO** Pilsbry and McGinty

Pilsbry and McGinty, 1945, Nautilus, vol. 59, No. 2, p. 54.

Type species (by original designation), *Parviturbo rehderi* Pilsbry and McGinty.

Parviturbo maturensis, n. sp. Pl. 42, figs. 14-17

Shell small, solid. Spire moderately depressed. Protoconch consists of a little more than one volution. Adult shell with 3½ whorls. Sculpture consists of seven prominent spirals, the strongest one forming the periphery. Two spirals are situated between periphery and suture, the rest below the periphery. The lowest spiral borders the deep umbilicus. Spirals below the periphery less prominent. Interspaces crossed by faint, prosocline, axial threads. Aperture circular. Peristome thick. Parietal callus prominent.

Holotype. — Natural History Museum Basel, No. H 14625.

Dimensions of holotype. — Height 2.0 mm, diameter 2.9 mm.

Type locality. — Matura, Trinidad.

This species is based on the holotype and one immature paratype. The parietal callus of the holotype is broken. Although almost filled with matrix, the holotype seems to have a nacreous inner layer.

The genus *Parviturbo* is known to range only from Pliocene to Recent until now. *P. milium* (Dall) [1890-1903 (1892), p. 409, pl. 18, fig. 4; Olsson and Harbison, 1953, p. 349] from the Pliocene of Florida has a higher spire and does not show the prominent peripheral spiral. The same is true for the living Floridian *P. rehderi, P. francescae,* and *P. calidimaris,* all described by Pilsbry and McGinty (1945b, pp. 54-57). *P. venezuelensis* Weisbord (1962, p. 99, pl. 7, figs. 5-7), from the Pliocene Mare Formation of northern Venezuela, is based on a single, incomplete specimen which lacks the protoconch.

Occurrence. — PJ 302.

Family **NERITIDAE**

Genus **NERITA** Linné

Linné, 1758, Systema Naturae, ed. 10, p. 776.

Type species (by subsequent designation, Montfort, 1810, Conchyliologie systématique, vol. 2, p. 347), *Nerita peloronta* Linné.

Subgenus **NERITA** s. str.

Nerita (Nerita) exuvioides Trechmann ? Pl. 42, figs. 12, 13

Shell large, thick. Spire low. Sculpture consists of 16 coarse, flat-topped, spiral ridges with interspaces of about the same width. Spirals and interspaces crossed by fine, closely set, but prominent growth lines. Outer lip thick, with two coarse teeth above, six denticles and one large denticle below. Basal lip with two indistinct denticles. Inner lip with one denticle above, which continues into the aperture, one sharp and one rounded denticle below. Parietal callus with indications of rugae. Aperture semilunar.

This form is represented by a single specimen from the Melajo Clay. Its apex is worn, and part of the parietal callus broken. It is curious enough that it does not have two central teeth on the inner lip like similar Caribbean species of *Nerita s.str.*

N. exuvioides Trechmann (1935, p. 551, pl. 20, fig. 30) has originally been described from beds of questionable Pliocene age of Carriacou. Its type is an incomplete specimen. A reliable diagnosis must await the availability of well-preserved topotypes. *N. exuvioides* is said to have 12 spirals on the body whorl compared with 16 on the Melajo shell.

N. fulgurans Gmelin described by the writer (Jung, 1965, p. 479, pl. 62, fig. 14) from the middle Miocene of the Paraguaná Peninsula, Venezuela, is probably the same as the Melajo shell. It has also 16 spirals but is not so heavy, and has two central teeth on the inner lip, and some more denticles on the outer lip. The Recent *N. fulgurans* has about 20 spirals with much narrower interspaces than the fossils mentioned above.

Occurrence. — Hutch 51.

Genus **NERITINA** Lamarck

Lamarck, 1816, Encycl. Méthodique, Vers, vol. 3, pl. 455; liste, p. 11.

Type species (by subsequent designation, Children, 1823, Lamarck's genera of shells, p. 111), *Nerita pulligera* Linné.

Subgenus **VITTA** Mörch

Mörch, 1852, Catalogus conchyliorum . . . . Comes de Yoldi, pt. 1, p. 166.

Type species (by subsequent designation, Baker, 1923, Acad. Nat. Sci. Philadelphia, Proc., vol. 75, p. 137), *Nerita virginea* Linné.

Neritina (Vitta) cf. virginea (Linné) Pl. 43, figs. 1-3

Shell small. Spire somewhat elevated. Early whorls more convex than later ones. Body whorl slightly concave below suture.

Parietal callus moderately thick. Columellar lip with denticles. Growth lines, *i.e.* also the outer lip, proscoline. Color pattern consists of irregularly undulating, black lines which leave subcircular, white spots from time to time.

The above description is based on a complete specimen from the Melajo Clay. Specimens from the Courbaril beds and the Matura shell bed have the same color pattern and are thought to represent the same form. Most of them, however, are immature. An adult shell from Matura has an eroded spire and no colors preserved.

The adult shells at hand reach about the size of the Recent Caribbean *N. virginea*. Color patterns similar to that of the fossils are found on Recent specimens. The outer lip of the fossils under consideration is more oblique to the shell axis than in *N. virginea*.

Occurrence. — Melajo River area: Hutch 51, KR 11862, PJ 285, USGS 21178. Point Courbaril: K 8399, PJ 212, USGS 20432. Matura Bay: JS 67, RR 230, PJ 302, USGS 19860.

Family **RISSOINIDAE**

Genus **RISSOINA** d'Orbigny

D'Orbigny, 1840, Voyage dans l'Amerique Méridionale, vol. 5, (Mollusques), p. 395.

Type species (by monotypy), *Rissoina inca* d'Orbigny.

Subgenus **RISSOINA** s. str.

Rissoina (Rissoina) species

A single, probably not adult specimen (height 2.5 mm) from the Courbaril beds and two worn shells from Matura are available.

The protoconch of the Courbaril specimen is not entirely preserved but consisted of about three whorls. Postnuclear whorls five, sculptured by about 12 somewhat opisthocline axials. The strong axials which are aligned on successive whorls give a convex appearance to the whorls. Interspaces smooth. Outer lip thick. Parietal callus heavy.

The specimens at hand are similar to the Recent Caribbean *R. fischeri* Desjardin (1949, p. 199, pl. 9, fig. 6; Warmke and Abbott, 1961, p. 56, pl. 10 n), but more material is needed to point out affinities.

Occurrence. — Point Courbaril: K 1429. Matura Bay: PJ 302.

Family **VITRINELLIDAE**

Genus **TEINOSTOMA** H. and A. Adams

Adams, H. and A., 1853, Genera of Recent Mollusca, vol. 1, p. 122.

Type species (by subsequent designation, Adams, A., 1863, Thesaurus conchyliorum, pt. 22, p. 259), *Teinostoma politum*. A. Adams..

Subgenus **PSEUDOROTELLA** Fischer

Fischer, 1857, Jour. de Conchyl., vol. 6, p. 52.

Type species (by monotypy), *Rotella semistriata* d'Orbigny.

Teinostoma (Pseudorotella) nugax, n. sp. Pl. 43, figs. 7-9

Shell small, with about 3½ whorls, entirely smooth except for faint growth lines. Spire low. Periphery rounded. Suture usually distinct but sometimes partly covered by succeeding whorl. Umbilicus covered by callus, its border more or less distinct. Peristome thin. Parietal callus separated from umbilical callus by a faint groove.

Holotype. — Natural History Museum Basel, No. H 14599.

Dimensions of holotype. — Height 0.6 mm, diameter 1.6 mm.

Type locality. — Melajo River area: KR 11862.

This species is represented by numerous specimens from the Melajo Clay. The thickness of the umbilical callus undergoes some variability. The margin of the umbilical callus and the groove between it and the parietal callus may be obscure.

T. nugax differs in details of the umbilical callus and the convexity of the whorls from the following three Pliocene species: *T. antilleanum* Weisbord (1962, p. 131, pl. 12, figs. 7-9) from northern Venezuela, *T. avunculus* Pilsbry (*in* Olsson and Harbison, 1953, p. 413, pl. 49, figs. 3-3d) from Florida, and *T. ecuadorianum* Pilsbry and Olsson (1941, p. 47, pl. 9, fig. 1) from Ecuador. *T. ecuadorianum* has also been recorded from the Recent fauna of Peru.

Occurrence. — EL 1810, KR 11862, PJ 285, USGS 18399.

Teinostoma (Pseudorotella) spretum, n. sp. Pl. 43, figs. 4-6

Shell small, with about 3½ whorls. Surface smooth except for faint growth lines. Spire relatively high. Whorls convex. Suture incised. Aperture almost circular. Peristome solid. Parietal callus small. Umbilicus entirely covered by a smooth callus which may be bordered by an obscure line. Parietal callus separated from umbilical callus by a groove.

Holotype. — Natural History Museum Basel, No. H 14607.

Dimensions of holotype. — Height 1.5 mm, diameter 2.3 mm.

Type locality. — Melajo River area: KR 11862.

This species is not abundant. The umbilicus of immature specimens is not entirely covered by callus. On some shells one, two or even three faint spirals may be developed at the beginning of the last whorl which, however, disappear after half a volution. The uppermost of these spirals forms the periphery.

The type and only specimen of *T. caronense* Mansfield (1925, p. 60, pl. 8, figs. 9, 11), from the Brasso Formation of Trinidad, has a heavier shell and a less elevated spire than *T. spretum.* Although apparently worn it shows faint spiral sculpture.

T. spretum has dimensions and proportions similar to *T. pycnum* (Woodring) (1928, p. 446, pl. 38, figs. 10-12) from the Bowden Formation of Jamaica, but *T. pycnum* has a thicker shell and differs in details of the callus. *T. vitreum* (Gabb) (1873b, p. 243; Pilsbry, 1922, p. 399, pl. 37, figs. 3-3b) from the Cercado Formation of the Dominican Republic mainly differs by the shape of its umbilical callus. *T. altum* Pilsbry (*in* Olsson and Harbison, 1953, p. 413, pl. 49, figs. 2-2f) from the Pliocene of Florida has the same type of spire, but its umbilicus is not entirely closed even in the adult stage.

Occurrence. — KR 11862, PJ 285, USGS 18399.

Subgenus **AEPYSTOMA** Woodring

Woodring, 1957, U. S. Geol. Sur. Prof. Paper 306-A, p. 70.

Type species (by original designation), *Teinostoma (Aepystoma) andrium* Woodring.

Teinostoma (Aepystoma) caroniense Maury — Pl. 43, figs. 10-17

1925. *Teinostoma caroniense* Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 249, pl. 43, figs. 3, 4.
1938. *Teinostoma (Pseudorotella ?) caroniense* Maury, Vokes, Amer. Museum Novitates, No. 988, p. 5.
1942. *Solariorbis ? nov. sp.* ind., Rutsch, Verh. Naturf. Ges. Basel, vol. 54, p. 127, pl. 4, figs. 4, 5.

Shell solid. Spire depressed. Protoconch with a little more than two volutions. Postnuclear whorls a little less than two. Periphery rounded. Suture clearly incised. Sculpture consists of prosocyrt growth lines. On the third volution these are crossed by obscurely punctate spiral striae producing a cancellate pattern below the periphery. Peristome solid. Umbilical and parietal callus not separated by a groove.

Lectotype (herewith selected). — Paleont. Research Inst., Ithaca, N.Y., No. 1105 (specimen figured by Maury, 1925, pl. 43, fig. 3).

Dimensions of lectotype. — Height 2.0 mm, diameter 4.5 mm.

Type locality. — Springvale Quarry, Trinidad.

This species is represented from the Melajo Clay and the Courbaril beds by specimens of different ontogenetic stages showing that immature shells look entirely different than adult ones. Young specimens have an open umbilicus, and their third whorl is sculptured by punctate spirals which are usually more conspicuous below the periphery. Adults have a closed umbilicus and a smooth base. The sculpture of the earlier stages is visible only on the spire. The body whorl may be somewhat shouldered.

Topotypes of *T. caroniense* at hand are too much worn to show the sculpture on the third whorl. *Solariorbis* ? n. sp. ind. described and figured by Rutsch from Springvale Quarry represents immature *T. caroniense*.

T. andrium Woodring (1957 p. 70, pl. 17, figs. 40-42, pl. 18, figs. 9-11) from the Gatun Formation of Panama is a similar species differing only by its thicker parietal callus and the somewhat more convex upper part of the body whorl.

Occurrence. — Melajo River area: EL 1810, KR 11862, K 9903, PJ 285, USGS 18399, USGS 21178. Point Courbaril: K 1429, PJ 212, USGS 10991, USGS 20433, USGS 20434.

Distribution. — Savaneta Glauconitic Sandstone Member and Melajo Clay Member, both of Springvale Fm. Courbaril beds of Upper Morne l'Enfer Fm.

Teinostoma (Aepystoma) melajoense, n. sp. Pl. 43, figs. 18-20

Shell small, solid. Protoconch with $2\frac{1}{4}$ smooth volutions; post-nuclear whorls a little less than two. Spire somewhat elevated, whorls convex. Suture clearly incised. Periphery broadly rounded. Sculpture consists of numerous spirals which are somewhat broader and more conspicuous on base. Umbilicus open in immature specimens. Umbilical callus small, but closing umbilicus in adults.

Peristome solid. Parietal callus thick, not clearly separated from umbilical callus.

Holotype. — Natural History Museum Basel, No. H 14611.

Dimensions of holotype. — Height 1.8 mm, diameter 2.4 mm.

Type locality. — Melajo River area: PJ 285.

This species is represented by 10 specimens. *T. caronense* Mansfield (1925, p. 60, pl. 8, figs. 9, 11), from the Brasso Formation of Trinidad, is based on a single specimen (USNM 352690). It is closely related to *T. melajoense.* However, it is worn, and its spiral sculpture is hardly recognizable. Topotypes of *T. caronense* are needed for useful comparison.

T. melajoense differs from *T. caroniense* Maury by its higher spire and by its proportionately higher whorls. The aperture of *T. caroniense* is obliquely elongate but subcircular in *T. melajoense.* Moreover the body whorl of *T. caroniense* is smooth but carries spiral sculpture in *T. melajoense.*

The Recent *T. clavium* Pilsbry and McGinty (1945a, p. 4, pl. 1, fig. 1) from Florida has a lower spire. *T. pilsbryi* McGinty (1945, p. 142; Pilsbry and McGinty, 1945a, p. 3, pl. 1, fig. 5), also a Recent Floridian species, has a spire like *T. melajoense,* but its periphery is somewhat angulated and the umbilical callus much heavier.

Occurrence. — EL 1810, KR 11862, PJ 285, USGS 18399, USGS 21178.

Genus **COCHLIOLEPIS** Stimpson

Stimpson, 1858, Boston Soc. Nat. Hist., Proc., vol. 6, p. 307.

Type species (by monotypy), *Cochliolepis parasitica* Stimpson.

Cochliolepis pluscula, n. sp. Pl. 43, figs. 21-23

Small, thin-shelled, with about three whorls. Spire not elevated. Suture sharply incised. Whorls moderately convex, smooth except faint, slightly prosocyrt growth lines. Periphery evenly rounded. Umbilicus open. Aperture almost circular, angulated above. Peristome thin. Parietal callus conspicuous but translucent.

Holotype. — Natural History Museum Basel, No. H 14617.

Dimensions of holotype. — Height 0.8 mm, diameter 1.6 mm.

Type locality. — Melajo River area: PJ 285.

This species is represented from the Melajo Clay by the holotype and four paratypes, all perfectly preserved. It seems most closely related to *Delphinula lipara* H. C. Lea (1846, p. 261, pl. 36, fig. 71) from the Miocene of Virginia, the holotype of which has beeen refigured by Gardner [1943-1948 (1948), pl. 25, figs. 6-8]. *D. lipara* has more whorls, and its body whorl is somewhat shouldered. The Miocene *C. virginica* Pilsbry (*in* Olsson and Harbison, 1953, p. 434, pl. 52, figs. 4, 4a, 4b) from Virginia, for which Pilsbry proposed the subgeneric name *Tylaxis,* is much larger, and has an obliquely oval aperture.

Occurrence. — PJ 285, USGS 18399.

Genus **CYCLOSTREMISCUS** Pilsbry and Olsson

Pilsbry and Olsson, 1945, Acad. Nat. Sci. Philadelphia, Proc., vol. 97, p. 266.

Type species (by original designation), *Vitrinella panamensis* C. B. Adams.

Subgenus **PONOCYCLUS** Pilsbry

Pilsbry, 1953, Acad. Nat. Sci. Priladelphia, Mon., No. 8, p. 426.

Type species (by original designation), *Adeorbis beauii* Fischer.

Cyclostremiscus (Ponocyclus) pentagonus (Gabb) Pl. 43, figs. 24-26

1873. *Cyclostrema pentagona* Gabb, Amer Philos. Soc., Trans., new ser., vol. 15, p. 243.
1881. *Vitrinella pentagona* (Gabb), Gabb, Acad. Nat. Sci. Philadelphia, Jour., ser. 2, vol. 8, p. 368, pl. 47, fig. 68.
1957. *Cyclostremiscus (Ponocyclus) pentagonus* (Gabb), Woodring, U.S. Geol. Sur., Prof. Paper 306-A, p. 73, pl. 17, figs. 7-15. For further citations see this publication.

Shell small, with a little more than four whorls. Spire depressed. First 2½ volutions smooth. Later whorls with three carinae of about equal strength. The uppermost carina appears at the end of the third volution, the middle one forms the periphery, and corresponds to the position of the suture on earlier whorls. The lowest one forms a strong angulation on the base. Umbilical wall of last whorl with four spirals. Aperture almost circular, angulated above. Parietal callus inconspicuous.

Type. — Acad. Nat. Sci. Philadelphia, No. 2831.

Type locality. — Dominican Republic (Miocene).

C. pentagonus is frequent in the Melajo Clay. The morphological features of the Melajo specimens are constant. There are no bicarinate shells, and the carinae are constant in strength. The spirals on the umbilical wall of the last whorl are always present and not variable as pointed out by Pilsbry (*in* Olsson and Harbison, 1953, p. 429) for the Pliocene to Recent *C. trilix* (Bush) (1885, p. 464, pl. 45, figs. 7, 7a). Pilsbry separated *C. trilix* from *C. pentagonus* because of its larger size (diameter from 3 mm to 3.8 mm). The Melajo specimens do not grow larger than 2.5 mm in diameter.

Woodring (1957, p. 74) has discussed some related species from the Pleistocene and Recent faunas of the West Coast of America. Gardner [1926-1950 (1947), p. 600] recorded *C. trilix* from the Chipola and Shoal River Formations of Florida, but did not figure it. According to Woodring these specimens are larger than those from the Gatun Formation.

Occurrence. — EL 1810, KR 11862, PJ 285, USGS 18399, USGS 21178.

Distribution. — Middle to upper Miocene: Cercado and Gurabo Fms., Dominican Republic. Bowden Fm., Jamaica. Gatun Fm., Panama Canal Zone. Melajo Clay Member of Springvale Fm., Trinidad.

Cyclostremiscus (Ponocyclus) species

From the Matura shell bed a single, worn specimen (H 14623) is at hand. It is partly broken and has almost four whorls. The spirals on the umbilical wall are not recognizable. It looks like the Melajo specimens of *C. pentagonus,* but a definite determination is not possible. Diameter 2.0 mm.

Occurrence. — PJ 302.

Genus **SOLARIORBIS** Conrad

Conrad, 1865, Amer. Jour. Conch., vol. 1, p. 30.

Type species (by subsequent designation, Dall, 1892, Wagner Free Inst. Sci. Philadelphia, Trans., vol. 3, pt. 2, p. 414), *Delphinula depressa* Lea.

Solariorbis (subgenus ?) **marginatus** (Guppy) Pl. 43, figs. 27-29

1867. *Vitrinella marginata* Guppy, Proc. Sci. Assoc. Trinidad, pt. 3, pp. 161, 173; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, pp. 40, 52.

1874. *Vitrinella marginata* Guppy, Guppy, Geol. Mag., new ser., decade 2, vol. 1, pp. 435, 441, pl. 18, figs. 21a, 21b.

Shell small, spire depressed. Protoconch with two smooth volutions; postnuclear whorls a little less than one and a half. First sculpture consisting of faint prosocline axials which disappear after a little less than one volution. Body whorl sculptured by a few faint spirals just above the periphery. Periphery formed by a strong carina. Just below it follow a second carina of equal strength and a third weaker one. Interspace between middle and peripheral carinae deeply concave. Umbilicus wide. Aperture slightly obliquely oval. Basal lip somewhat everted. Parietal callus moderately prominent.

Type.—A collection of Tertiary fossils from the West Indies which included Guppy's types has been purchased by the U. S. National Museum in 1894. As it does not contain *S. marginatus,* the type of that species seems to be lost. The proper specimen to be selected for a neotype would be: Natural History Museum Basel, No. H 15345.

Dimensions of specimen Nat. Hist. Mus. Basel, No. 15345.—Height 0.8 mm, diameter 1.6 mm.

Type locality.—Matura Bay.

This species is exceedingly rare at Matura. A single specimen from the Melajo Clay is tentatively identified as *S. marginatus.* It is somewhat worn and differs from Matura specimens in having more inflated whorls.

The subgeneric assignment of *S. marginatus* is somewhat uncertain. It is intermediate between *Hapalorbis* Woodring (1957, p. 75; type species by original designation: *Circulus liriope* Bartsch) and *Systellomphalus* Pilsbry and Olsson (1941, p. 48; type species by original designation: *Systellomphalus perornatus* Pilsbry and Olsson). *S. marginatus* is clearly separated from *Hapalorbis* by the presence of axials on the spire. From the type species of *Systellomphalus* it differs by the absence of axial wrinkles on the base near the umbilicus.

The Recent *S. liriope* Bartsch (1911, p. 231, pl. 40, figs. 7-9), from the Gulf of California, and *S. hyptius anebus* Woodring (1957, p. 75, pl. 17, figs. 34-36), from the middle Miocene Gatun Formation of the Panama Canal Zone, have a prominent spiral above the periphery. This spiral is lacking in *S. marginatus* as well as in the Recent Panamic *S. seminudus* (C. B. Adams) (1852, p. 412; Pilsbry and Olsson, 1945, pl. 27, figs. 3, 3a, 3b). However, *S. seminudus* has wrinkles around the umbilicus.

S. marginatus seems to be more closely related to *Systellomphalus* as there are species assigned to that subgenus which do not have radial wrinkles on the base. The Recent *S. euzonus* Pilsbry and McGinty (1950, p. 85, pl. 5, figs. 7, 7a) from Florida is proportionately higher, and the spirals above the periphery are more conspicuous. *S. euzonus* has also been recorded from the Pliocene of Florida by Pilsbry (*in* Olsson and Harbison, 1953, p. 420, pl. 56, figs. 2, 2a, 2b).

Occurrence.—Melajo River area: KR 11862 (?). Matura Bay: PJ 302, USGS 19860.

Distribution.—Melajo Clay Member of Springvale Fm. (?). Matura shell bed.

Family CAECIDAE

The Caecidae are not only poorly represented in the three faunas under consideration, but there are also no complete specimens. For this reason it seems advisable not to name these species.

Genus CAECUM Fleming

Fleming, 1813, Brewster's Edinburgh Encyclopaedia, vol. 7, p. 67 (see Sherborn, Index Animalium, 1801-50, pt. 5, p. 950, 1924).

Type species (by subsequent designation, Gray, 1847, Zool. Soc. London, Proc., pt. 15, p. 203), *Dentalium trachea* Montagu.

Collins (1937) described the three growth stages of Mexican Tertiary caecids. Due to scarcity of material no attempt is made to assign the forms listed below to subgenera. Three species occur in the Melajo Clay, one in the Courbaril beds, and one at Matura.

Caecum species A

Protoconch with two planispiral volutions. The second stage consists of a weakly arched but rapidly enlarging tube. It is ornamented by annular rings with interspaces of about the same width. Length (including protoconch) 0.8 mm diameter 0.2 mm.

The specimens referred to this form are immature. They do not show a constriction toward the aperture. *C. properegulare* Mansfield (1925, p. 50, pl. 8, fig. 6), although collected from a float, probably came out of the Brasso Formation of Trinidad. It is larger and has coarser annular rings than *Caecum* species A.

Occurrence.—Melajo River area: USGS 18399.

Caecum species B

A few immature specimens represent the second stage. They are relatively strongly curved, smooth, and circular in cross section. Apical opening closed by a convex, somewhat projecting plug. Length 0.8 mm, diameter 0.2 mm.

Occurrence. — Melajo River area: USGS 18399.

Caecum species C

A few specimens probably representing the third stage are smooth except for growth lines. The apical opening is closed by a convex, somewhat projecting plug. They are much less curved than *Caecum* species B, and have a much larger diameter than either *Caecum* species A or *Caecum* species B. Length 1.5 mm, diameter 0.6 mm.

Occurrence. — Melajo River area: USGS 18399.

Caecum species D

Two specimens from the Courbaril beds are ornamented by annular rings with wider interspaces. Length 1.3 mm, diameter 0.3 mm.

This form is close to the upper Miocene to Recent *C. regulare* Carpenter (Zool. Soc. London, Proc., vol. 26, p. 428, 1858; Weisbord, 1962, p. 162, pl. 14, figs. 10, 11) but has finer annular rings.

Occurrence. — Point Courbaril: USGS 10991.

Caecum species E

Some specimens from Matura are entirely smooth. The tube does not show the thickening which is typical for *Meioceras*. Length 2.2 mm, diameter 0.4 mm.

Occurrence. — Matura Bay: RR 230, USGS 19860.

Family **TURRITELLIDAE**

Genus **TURRITELLA** Lamarck

Lamarck, 1799, Mém. Soc. Hist. Nat. Paris, p. 74.

Type species (by monotypy), *Turbo terebra* Linné.

Subgenus **BRODERIPTELLA** Olsson

Olsson, 1964, Neogene Mollusks from Northwestern Ecuador, Paleont. Research Inst., p. 188.

Type species (by original designation), *Turritella broderipiana* d'Orbigny.

Turritella (Broderiptella) bifastigata cartagenensis Pilsbry and Brown
Pl. 44, figs. 1-4

1917. *Turritella cartagenensis* Pilsbry and Brown, Acad. Nat. Sci. Philadelphia, Proc., vol. 69, p. 34, pl. 5, fig. 13.
1925. *Turritella cartagenensis* Pilsbry and Brown, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 233, pl. 42, fig. 13.
1926. *Turritella bifastigata maracaibensis* Hodson, Bull. Amer. Paleont., vol. 11, No. 45, p. 48, pl. 30, figs. 2, 4, 6.
1926. *Turritella bifastigata democraciana* Hodson, *ibidem*, p. 50, pl. 29, fig. 3, pl. 30, figs. 3, 5.
1929. *Turritella cartagenensis* Brown and Pilsbry, Weisbord, Bull. Amer. Paleont., vol. 14, No. 54, p. 30, pl. 9, figs. 1, 2.
1941. *Turritella* cf. *cartagenensis* Pilsbry and Brown, Merriam, Univ. Cal. Publ., Bull. Dept. Geol. Sci., vol. 26, No. 1, p. 207. pl. 38, fig. 9.

Of medium size. First sculpture consists of a medial spiral keel (mesocostate) and a smaller spiral at the lower suture. Additional minor spirals of varying size are first introduced on the lower half of the whorl, then on the upper half. With increasing age the medial primary spiral gradually looses its prominence until it is of the same size as the others. Adult whorls are slightly concave to almost straight in profile. In the gerontic stage the whorls are less tightly coiled, and their periphery is rounded. Base covered by numerous fine spirals. Growth lines prosocline on upper part of whorl, turning toward an orthocline direction on middle part of whorl, and running straight across the periphery to the columella.

Holotype. — Acad. Nat. Sci. Philadelphia.

Type locality. — Near Cartagena, Colombia (Miocene).

This species is represented from the Melajo Clay and the Courbaril beds. Most specimens from the Courbaril beds are strongly rolled, and their spiral sculpture has mostly disappeared. The Melajo specimens may attain a considerable size, when they reach the gerontic stage. No complete specimen including the protoconch is preserved in the material at hand.

As suggested by Woodring (1957, p. 111) Hodson's *T. bifastigata maracaibensis* and *T. bifastigata democraciana* seem to be conspecific with *T. cartagenensis*. The lectotype of *T. bifastigata* Nelson (1870, p. 189) has been figured by Hodson (1926, pl. 30, fig. 1). The sculpture of its base is much coarser, its whorls more concave, and the spiral sculpture weaker than in *T. cartagenensis*.

T. oreodoxa Olsson (1922, p. 152, pl. 14, fig. 1), from the Miocene of Costa Rica, and *T. cartagenensis* have been taken in the synonymy of *T. bifastigata* by Olsson (1964, p. 189).

Occurrence. — Melajo River area: Hutch 51, K 9813, K 9903, RR 290, USGS 18399. Point Courbaril: K 8399, K 12013, K 12255, RR 120, PJ 212, USGS 10991, USGS 20432, USGS 20432a, USGS 20433, USGS 20434, USGS 21778.

Distribution. — Miocene of Colombia. Beds of questionable upper Miocene age, Usiacuri region, Colombia. Miocene, Falcón, Venezuela. Trinidad: Manzanilla Fm. (Maury), Melajo Clay Member of Springvale Fm., Courbaril beds of Upper Morne l'Enfer Fm..

Turritella (Broderiptella) aff. mimetes Brown and Pilsbry Pl. 44, fig. 5

Of medium size. Early sculpture consists of a medial spiral, another spiral at the lower suture, and a third one between them. The medial spiral forms a moderately prominent carina. On the next volutions additional minor spirals appear on the lower and upper halves of the whorl. The strength of the medial spiral diminishes compared with the other spirals but is still well discernible in the adult stage. The spiral at the lower suture becomes the most prominent one, and forms a carina-like periphery in the adult stage. After about nine whorls the apical angle becomes somewhat smaller. Base sculptured by a few spirals with many fine spirals in their interspaces. Growth lines prosocline on upper part of whorl, turning in an almost orthocline direction below.

This form occurs in the Melajo Clay only. One of its most conspicuous features is the change of the apical angle after about nine whorls. Some specimens develop a real carina in the adult stage. The early whorls are almost like those of *T.* cf. *broderipiana* as figured by Merriam (1941, pl. 36, fig. 1).

T. mimetes Brown and Pilsbry (1911, p. 357, pl. 27, fig. 1), from the Gatun Formation of the Panama Canal Zone, has been redescribed and its allies discussed by Woodring (1957, p. 110, pl. 22, figs. 6-9). The early sculptured whorls of *T. mimetes* are more rounded in profile, and the spiral at the lower suture does not become as prominent as in the present form.

Occurrence. — EL 1810, Hutch 51, K 9816, RR 290, PJ 285, USGS 18399, USGS 21178.

Turritella (Broderiptella) planigyrata Guppy Pl. 45, figs. 1, 2

1867. *Turritella planigyrata* Guppy, Proc. Sci. Assoc. Trinidad, pt. 3, pp. 156, 169; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, pp. 35, 48.

1873. Not *Turritella planigyrata* Guppy, Gabb, Amer. Philos. Soc., Trans., new ser., vol. 15, p. 240.
1874. *Turritella planigyrata* Guppy, Guppy, Geol. Mag., new ser., decade 2, vol. 1, pp. 408, 437, pl. 18, fig. 5.
1876. Not *Turritella planigyrata* Guppy, Guppy, Quart. Journ. Geol. Soc. London, vol. 32, p. 519.
1910. *Turitela* (sic) *planigyrata* Guppy, Guppy, Agric. Soc. Trinidad and Tobago, Soc. Paper No. 440, pp. 5, 11; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, pp. 148, 153.
1917. Not *Turritella planigyrata* Guppy, Maury, Bull. Amer. Paleont., vol. 5, No. 29, p. 129, pl. 22, fig. 14 (=*T. mauryae* Hodson).
1925. *Turritella planigyrata* Guppy, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 232, pl. 42, figs. 6, 7, 8.
1925. *Turritella planigyrata* Guppy, Mansfield, U.S. Nat. Mus., Proc., vol. 66, art. 22, p. 55, pl. 9, figs. 1, 9.
1926. *Turritella planigyrata* Guppy, Hodson, Bull. Amer. Paleont., vol. 11, No. 45, p. 29, pl. 19, figs. 2, 9.
1938. *Turritella planigyrata* Guppy, Vokes, Amer. Museum Novitates, No. 988, p. 4.
1942. *Turritella planigyrata* Guppy, Rutsch, Verh. Naturf. Ges. Basel, vol. 54, p. 131, pl. 8, fig. 5.

Of small to medium size. Protoconch with about two volutions. First sculpture consists of a medial spiral (mesocostate) forming a carina, and a minor spiral a little below it. After one volution a third spiral appears at the lower suture. Subsequently additional fine spirals are intercalated all over the whorl. The medial carina remains prominent for about eight whorls, but afterwards it becomes less prominent until it is of almost the same size as the other spirals. The whorls remain somewhat convex even in the adult stage. The adult whorls are covered by closely set, subequal spirals, mostly alternating with still finer ones. Base sculptured by numerous spirals, some of them a little more prominent. Growth lines prosocline on upper part of whorl, turning in an orthocline direction on the middle part, and running from there straight down across the periphery to the columella.

Holotype.—USNM 115452. This lot contains only one rather worn specimen. Guppy collected it from the Caroni Series at Savanetta which is the only locality he indicated in the original description. It is thus the holotype.

Another lot (USNM 115626) labelled "types" and mentioned by Mansfield (1925, p. 56) has been collected by Guppy at a locality (Montserrat) not mentioned in the original description. Apparently this lot is no longer in the collections of the U. S. National Museum.

Type locality. — Guppy's Savanetta which is the same as the locality Brechin Castle Estate referred to by Rutsch (1942, p. 105, fig. 1).

T. planigyrata is frequent in the Melajo Clay. The spirals of the Melajo specimens are usually less uniform in size than those of specimens from the type area. The medial spiral of Springvale specimens is mostly not more prominent than the others on adult whorls.

The separation of *T.* aff. *mimetes* from *T. planigyrata* may seem artificial. Their early stages and their growth lines are the same, but the sculpture on later whorls is much coarser and less regular in *T.* aff. *mimetes.*

T. planigyrata has a larger apical angle than *T. maiquetiana* Weisbord (1962, p. 146, pl. 11, figs. 1-16) from the Pliocene Mare Formation of northern Venezuela. *T. maiquetiana* has a rounded periphery on the late adult to gerontic whorls, whereas in *T. planigyrata* it is angulated at the same stage.

Occurrence. — EL 1810, Hutch 47, Hutch 51, KR 11862, K 9816, K 9903, PJ 285, USGS 18399, USGS 18411, USGS 18634, USGS 21178.

Distribution. — Miocene, eastern Venezuela. Trinidad: Manzanilla Fm. (?), Savaneta Glauconitic Sandstone Member and Melajo Clay Member, both of Springvale Fm.

Turritella (Broderiptella) aff. **planigyrata** Guppy Pl. 45, figs. 4-6

Of medium size. First sculpture consists of a medial spiral which forms a carina, a second spiral at the lower suture, and a third minor one between them. The medial carina gradually disappears, whereas the spiral at the lower suture remains more prominent than the others, and may form an overhanging carina on adult whorls. Already in early stages numerous additional spirals are intercalated all over the whorl. These ususally alternate in size subsequently. But on adult whorls there are mostly five or six more prominent spirals with interspaces covered by minor spirals. Base sculptured by numerous spirals; a few near the periphery are more prominent.

This form which occurs at Matura evidently is intermediate between *T. planigyrata* and the Recent Caribbean *T. variegata*

(Linné). It differs from *T. planigyrata* by its less uniform sculpture on adult whorls and its more conspicuous lowest spiral. This lowest spiral is frequently accentuated in *T. variegata*. *T. variegata* may have a few more conspicuous spirals on adult whorls like *T.* aff. *planigyrata,* but the periphery of its late whorls is rounded which is never the case in the Matura specimens. On the early whorls of *T. variegata* the spirals above the medial carina appear before those below, whereas in *T.* aff. *planigyrata* the lower ones appear first.

Occurrence. — RR 230, PJ 302, USGS 18204, USGS 19860.

Subgenus **BACTROSPIRA** Cossmann

Cossmann, 1912, Essais de Paléoconchologie comparée, neuvième livraison, p. 129.

Type species (by original designation), *Turritella perattenuata* Heilprin.

Turritella (Bactrospira) species Pl. 45, fig. 3

A single, strongly worn fragment from Matura is at hand. It consists of three whorls, and is slender. It is sculptured by two broad spirals with a wide, concave interspace.

This fragment is related with the group of *T. altilira* Conrad. *T. altilira* has been rediscussed by Woodring (1957, p. 102, pl. 23, figs. 1, 7, 12, 13) and Olsson (1964, p. 193, pl. 36, figs. 2-2b). The specimen at hand is more closely related to *T. altilira* and to *T. perattenuata* Heilprin (1887, p. 88, pl. 8, fig. 13; Olsson and Harbison, 1953, p. 316, pl. 44, figs. 4-4c) from the Pliocene of Florida, the type species of *Bactrospira,* than to the Recent *T. exoleta* (Linné), the type species of *Torcula*. *T. exoleta* is a more fragile species than the Matura shell and has a larger apical angle.

Occurrence. — RR 230.

Genus **SPRINGVALEIA** Rutsch

Rutsch, 1942, Verh. Naturf. Ges. Basel, vol. 54, p. 133.

Type species (by original designation), *Scalaria leroyi* Guppy.

Springvaleia leroyi (Guppy)

1867. *Scalaria leroyi* Guppy, Proc. Sci. Assoc. Trinidad, pt. 3, pp. 155, 168; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, pp. 34, 47.

1958. *Springvaleia leroyi* (Guppy), Woodring, Bull. Amer. Paleont., vol. 38, No. 169, p. 166, pl. 17, figs. 1-5. For additional citations see this publication.

Type. — Rutsch (1942, p. 134) selected the specimen figured by Maury (1925, pl. 41, fig. 11) as neotype (Paleont. Research Inst., Ithaca, N.Y., No. 1087). This neotype, however, was not collected at the type locality but at Springvale Quarry. Woodring (1958, p. 167), therefore, designated another neotype: the specimen figured by Rutsch (1942, pl. 7, figs. 1a, 1b). Unfortunately this second neotype (Natural History Museum Basel, No. H 6146) is not a virtual topotype of *Scalaria leroyi*, *i.e.* it was not collected at the locality Brechin Castle Estate referred to by Rutsch (1942, p. 105, fig. 1) as stated by Woodring but at Springvale Quarry like the neotype designated by Rutsch.

The search for satisfactory specimens from Guppy's Savonetta [*sic*] area in the U.S. National Museum and the Natural History Museum Basel was not successful. Mr. D. L. F. Sealy informed me that there are no specimens at all from that area in the British Museum (Natural History). Rutsch's designation of the neotype, therefore, has to be validated until satisfactory topotypes of *Scalaria leroyi* are available.

Locality of neotype. — Springvale Quarry, Trinidad.

This species has been discussed by Woodring (1958). It is represented by two specimens from the base of the Melajo Clay. One of them has been illustrated by Woodring (1958, pl. 17, figs. 2-5). Protoconch and early stages of *S. leroyi* are still unknown.

Weisbord (1962, p. 150, pl. 12, figs. 2-6) described *S. leroyi secunda* from the Pliocene Mare Formation of the Cabo Blanco area, Venezuela. It differs from *S. leroyi* by its less inflated whorls, and the presence of lirations within the aperture. These differences are confirmed by specimens from the type area of *S. leroyi secunda* in the collections of the Natural History Museum Basel.

Occurrence. — USGS 18634.

Distribution. — Savaneta Glauconitic Sandstone Member and Melajo Clay Member, both of Springvale Fm., Trinidad.

Genus **VERMICULARIA** Lamarck

Lamarck, 1799, Mém. Soc. Hist. Nat. Paris, p. 78.

Type species (by monotypy), *Serpula lumbricalis* Linné.

According to Morton (1953, p. 86) the genus *Vermicularia* is close to *Turritella* in many respects and should probably be placed in the Turritellidae. On the other hand Olsson and Harbison (1953, p. 306) used the family heading Vermiculariidae.

Vermicularia spirata (Philippi) ? Pl. 44, fig. 11

1864. *Vermetus royanus* d'Orbigny, Guppy, Trans. Sci. Assoc. Trinidad for 1864, p. 35 (part); reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 15.
1864. *Vermetus lumbricalis* Linné, Guppy, *ibidem,* p. 35; reprint, Harris, 1921, *ibidem,* p. 15.
1867. *Vermetus lumbricalis* Linné, Guppy, Proc. Sci. Assoc. Trinidad, pt. 3, p. 156; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 35.
1874. *Vermetus lumbricalis* Linné, Guppy, Geol. Mag., new ser., decade 2, vol. 1, 1, p. 437.
1925. *Vermicularia spirata* var. *trilineata* Guppy, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 228, pl. 41, fig. 6.
?1925. *Vermicularia* cf. *radicula* Stimpson, Maury, *ibidem,* p. 228, pl. 41, fig. 1.

This form is represented from Matura by numerous, mostly small specimens. Fully grown shells with a long, irregularly coiled tube are lacking. The *Turritella* stage consists of about seven whorls. Their early sculpture consists of two primary spirals, the lower one usually being stronger, and a third spiral at the lower suture. The uppermost one of these spirals may be very weak.

Olsson and Harbison considered the Matura *Vermicularia* to be the same as what they described as *V. woodringi* (1953, p. 307, pl. 47, fig. 2) from the Pliocene of St. Petersburg, Florida. They also included in the synonymy of *V. woodringi* the *Vermicularia* occurring in the Bowden Formation of Jamaica which had been described as *V. spirata* by Woodring (1928, p. 344, pl. 26, fig. 5). Bowden specimens may have one or two primary spirals on the whorls of the *Turritella* stage.

Among the Recent material of *V. spirata* (Philippi) (Archiv f. Naturg., p. 224, pl. 7, figs. 1, a, b, c, 1836) shells with one prominent spiral in the *Turritella* stage are predominant. However, there are lots containing specimens with one or two spirals. A definite identification of the Matura fossils must wait until the variability of the Recent *V. spirata* is known.

Specimens from the Pliocene of Moín near Puerto Limón, Costa Rica, have one spiral but tend to have a shorter *Turritella* stage than the Recent *V. spirata.*

Occurrence. — JS 67, RR 230, PJ 302, USGS 18204, USGS 19860.

Vermicularia (?) trilineata (Guppy) Pl. 44, figs. 6-10

1864. *Vermetus royanus* d'Orbigny, Guppy (part), Trans. Sci. Assoc. Trinidad

for 1864, p. 35; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 15.
1867. *Vermetus trilineatus* Guppy (part), Proc. Sci. Assoc. Trinidad, pt. 3, pp. 156, 170; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, pp. 35, 49.
1874. *Vermetus trilineatus* Guppy, Guppy, Geol. Mag., new ser., decade 2, vol. 1, pp. 408, 437, pl. 18, fig. 12.
1925. Not *Vermicularia spirata* var. *trilineata* Guppy, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 228, pl. 41, fig. 6.

Shell small, slender. Protoconch consists of a little more than one volution. First sculpture with a medial spiral forming a carina. After less than one whorl a second spiral at the lower suture, and a third one a little distance from the upper suture appear. The medial carina gradually diminishes in strength until the whorl profile is straight.

Lectotype (herewith selected). — USNM 115455.

Dimensions of lectotype. — Height 12.0 mm, diameter 2.1 mm.

Type locality. — Matura, Trinidad.

The original type lot of *Vermetus trilineatus* consisted of six specimens. As pointed out by Woodring (1928, p. 345) it includes two species. Four specimens represent *V.* (?) *trilineata*, the largest one being the lectotype.

Despite of additional material from Matura there is no proof whether this species belongs to *Turritella* or *Vermicularia*, because it does not contain adult specimens showing all growth stages. The lectotype is slender, its whorls flat (but slight inflation of the whorls may occur as well), and there are no traces of uncoiling. Other specimens, however, with the same type of sculpture and suggestion of about the same apical angle, show the beginning of uncoiling. If *V.* (?) *trilineata* really is a *Vermicularia*, then it has a long *Turritella* stage.

If this species proves to be a *Turritelllla*, it will need a new name as *trilineata* is preoccupied by *Turritella trilineata* Smith (Strat. Syst. org. foss., p. 8, 1817; see Sherborn, Index Animalium, pt. 27, p. 6612, 1931).

Occurrence. — JS 67, RR 230, PJ 302, USGS 18204, USGS 19860.

Distribution. — Known from type locality only.

Family **VERMETIDAE**

Genus **SERPULORBIS** Sassi

Sassi, 1827, Giornale Ligustico di Scienze, Lettere ed Arti, pt. 5, p. 483.

Type species (by monotypy), *Serpulorbis polyphragma* Sassi (= *Serpula arenaria* Linné).

Serpulorbis decussatus (Gmelin) Pl. 43, figs. 30, 31

1791. *Serpula decussata* Gmelin, Systema Naturae, ed. 13, vol. 1, pt. 6, p. 3745.
1864. *Siphonium decussatum* Gmelin, Guppy, Trans. Sci. Assoc. Trinidad for 1864, p. 35; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 15.
1867. *Siphonium decussatum* Gmelin, Guppy, Proc. Sci. Assoc. Trinidad, pt. 3, p. 156; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 35.
1874. *Siphonium decussatum* Gmelin, Guppy, Geol. Mag., new ser., decade 2, vol. 1, p. 438.
1925. *Serpulorbis decussata* Gmelin, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 224, pl. 41, fig. 3.
1953. *Lemintina decussata* (Gmelin), Olsson and Harbinson, Acad. Nat. Sci. Philadelphia, Mon. No. 8, p. 305, pl. 46, figs. 3-3c.

This species occurs at Matura and in the Courbaril beds. A small specimen from the Courbaril beds shows part of its protoconch which has about three smooth volutions. The early sculpture consists of prominent longitudinal ribs with wide interspaces which are crossed by much finer and closely set concentrics. Beads are formed at the intersections. Subsequently additional longitudinal ribs are intercalated, and at the same time the concentrics greatly diminish in strength. Later stages also have tertiary longitudinal ribs which are indistinctly beaded but no concenrtics.

S. decussatus and *S. papulosus* (Guppy) (1866a, p. 292, pl. 17, fig. 3; Woodring, 1928, p. 346, pl. 26, fig. 6) originally described from Bowden, Jamaica, both occur in the Savaneta Glauconitic Sandstone Member of the Springvale Formation. They are easily distinguished from each other, because *S. papulosus* has coarse ribs carrying heavy pustules, whereas *S. decussatus* has no pustules and finer sculpture. *S. papulosus* ranges from middle to late Miocene (Woodring, 1959, p. 161) and may be the forerunner of *S. decussatus* which ranges from late Miocene to Recent.

Occurrence.—Point Courbaril: K 8399, PJ 212, USGS 20434. Matura Bay: JS 67, USGS 18204, USGS 19860.

Genus **PETALOCONCHUS** Lea

Lea, H. C., 1843. Amer. Philas. Soc., Proc., vol. 3, p. 162

Type species (by monotypy), *Petaloconchus sculpturatus* Lea.

Petaloconchus sculpturatus alcimus Mansfield Pl. 43, fig. 32

1867. *Petaloconchus sculpturatus* Lea, Guppy, Proc. Sci. Assoc. Trinidad, pt. 3,

p. 156 (part); reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 35.
1874. *Petaloconchus sculpturatus* Lea, Guppy, Geol. Mag., new ser., decade 2, vol. 1, p. 438 (part).
1910. *Petaloconchus sculpturatus* Lea, Guppy, Agric. Soc. Trinidad and Tobago, Soc. Paper No. 440, pp. 5, 10 (part); reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, pp. 148, 153.
1925. *Petaloconchus sculpturatus* var. *domingensis* G. B. Sowerby I, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 226 (part), pl. 41, figs. 2, 4, 7.
1925. *Petaloconchus alcimus* Mansfield, U.S. Nat. Mus., Proc., vol. 66, art. 22, p. 51, pl. 9, figs. 2, 3, 4.
1934. *Vermetus (Petaloconchus) sculpturatus domingensis* (G. B. Sowerby I), Rutsch, Abh. Schweiz. Pal. Ges., vols. 54-55, p. 45, pl. 1, figs. 11, 12, 13.
1938. *Petaloconchus alcimus* Mansfield, Vokes, Amer. Museum Novitates, No. 988, p. 4.
1942. *Vermetus (Petaloconchus) sculpturatus* (Lea), Rutsch, Verh. Naturf. Ges. Basel, vol. 54, p. 103.

Syntypes. — USNM 352674 (three specimens).

Type locality. — Springvale Quarry, Trinidad.

This form occurs at the base of the Melajo Clay only, where it is represented by eight specimens. The sculpture of the figured specimen is not prominent, because it is somewhat worn.

As pointed out by several authors the sculpture of *P. sculpturatus* is variable in strength and its growth habit not constant. As a result *P. domingensis* G. B. Sowerby I (1850, p. 51, pl. 10, fig. 9) from the middle Miocene of the Dominican Republic and *P. pulcher* (Böse) (1906, p. 32, pl. 3, figs. 22, 23) from the Miocene of Mexico are considered as synonyms. Pflug (1961), who figured the lectotype of *P. domingensis,* even included *P. alcimus* in the synonymy of *P. sculpturatus.*

Although the late Miocene *P. alcimus* has the same sculpture as *P. sculpturatus,* it may be considered as a subspecies on account of its larger size. In addition its growth habit is more regular. Loosely coiled tubes are not frequent among the Trinidad fossils as they are in material from the Gurabo Formation of the Dominican Republic, where *P. sculpturatus* is abundant.

Occurrence. — USGS 18411, USGS 18634.

Distribution. — Savaneta Glauconitic Sandstone Member and Melajo Clay Member, both of Springvale Fm., Trinidad. Punta Gavilán Fm. (late Miocene), Falcón, Venezuela.

Petalocouchus cf. **floridanus** Olsson and Harbison Pl. 43, fig. 33

A few small specimens from Matura are available. They are too fragmentary for a definite identification. Mostly they form an irregular short cylinder. The sculpture consists of longitudinal ribs and concentrics of almost equal size giving a reticulate pattern. Later the concentrics are less prominent.

P. floridanus Olsson and Harbison (1953, p. 304, pl. 46, figs. 2, 2a) was described from the Pliocene and Recent faunas of Florida. It is assigned to the subgenus *Macrophragma* Carpenter by Keen (1961, p. 198). The Matura specimens are immature, and thus do not attain the size of Recent shells of *P. floridanus* at hand. The largest specimen from Matura, forming an irregular coil, is figured.

The form from the Gatun Formation of the Panama Canal Zone described by Woodring (1959, p. 161, pl. 29, fig. 9) as *P.* aff. *floridanus* is taken in the synonymy of *P. sculpturatus* by Olsson (1964, p. 195).

Occurrence.—JS 67, PJ 302, USGS 19860.

Family **POTAMIDIDAE**

Genus **BATILLARIA** Benson

Benson, 1842, Ann. Mag. Nat. Hist., vol. 9, p. 448.

Type species (by monotypy), *Cerithium zonale* Bruguière.

Batillaria species Pl. 43, figs. 34, 35

Three specimens from the Melajo Clay are available. Two of them are well preserved but have lost their apices. The third one repesents some of the early whorls but is corroded.

The genus *Batillaria* has been reviewed by Bequaert (1942). In the Western Atlantic he only recognized *B. minima* (Gmelin) (Systema Naturae, ed. 13, vol. 1, pt. 6, p. 3564, 1791) and two subspecies. According to Bequaert *B. minima* is found "in shallow brackish water where it lives in the mud of the intertidal zone." The two subspecies both have reduced sculpture, and are stout or slender respectively. *B. minima minima* itself is a strongly variable species as to general shape and strength of sculpture.

The apertural features of the Melajo fossils are the same as those of *B. minima* (see Bequaert, 1942, pl. 1, fig. 2). Their sculpture consists of several spirals, some of which are much stronger than the others, and conspicuous axials. The axials are not present on the lower half of the body whorl, where there are only about six primary spirals with two secondary spirals in their interspaces.

The Melajo fossils differ from the Recent *B. minima* by their stouter form and their heavier sculpture.

Occurrence. — K 9813.

Family CERITHIIDAE

Genus CERITHIUM Bruguière

Bruguière, 1789, Encycl. Méth., Histoire naturelle des vers, vol. 1, p. xv.

Type species (by virtual tautonymy), *Cerithium adansonii* Bruguière (= *Cerithium erythraeonense* Lamarck).

Cerithium (subgenus ?) **harrisi** Maury Pl. 45, figs. 14-16

1912. *Cerithium harrisi* Maury, Acad. Nat. Sci. Philadelphia, Jour., ser. 2, vol. 15, p. 90, pl. 12, fig. 18.
1925. *Cerithium harrisi* Maury, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 212.

Shell of medium size, solid and stout. Protoconch with about two volutions. Sculptured whorls about five in number. Sculpture consists of three primary spirals which are more or less regularly noded. Their interspaces ornamented by two or three spiral threads. Suture indistinct. Aperture oval. Anterior canal short, bent backwards. Posterior channel conspicuous. Outer lip thickened, frilled within. There is a moderately pronounced varix opposite the outer lip.

Lectotype (herewith selected). — Cornell Univ., Paleont. Museum, Ithaca N.Y., unnumbered.

Dimensions of lectotype. — Height 15.2 mm, diameter 7.5 mm.

Type locality. — Along shore, 700 feet east of Brighton pier, near Pitch Lake, Trinidad.

C. harrisi is abundant in the Courbaril beds. Its sculpture usually is coarse and heavy, but specimens with finer sculpture occur as well. There are no varices on the spire whorls. The lectotype (which is refigured here) is not adult having only four sculptured whorls.

A few specimens from the Melajo Clay also represent this species. One of them is indistinguishable from Courbaril specimens; others have somewhat finer sculpture. A single worn and incomplete shell from Matura is identified as *C.* cf. *harrisi.*

Maury (1912, p. 91, pl. 12, fig. 19) described *C. isabellae* from the same locality as *C. harrisi.* They probably are the same. *C. tinkeri* Maury (1912, p. 92, pl. 12, fig. 17) has been described from a locality just south of the Pitch Lake, Trinidad, which is thought to be stratigraphically equivalent to the Courbaril beds. A natural mould with the corresponding artificial cast from that locality, which are deposited at the Department of Geology of Cornell University, Ithaca, New York, seem to have been at least part of the type material. The preservation is so bad, that it seems best to consider *C. tinkeri* as a *nomen dubium*.

C. harrisi has the same type of sculpture as the Recent Caribbean *C. variabile* C. B. Adams (1845, p. 5) but is larger, much heavier, and has a larger apical angle. The lectotype of *C. variabile* has been figured by Clench and Turner (1950, pl. 37, fig. 2).

Occurrence. — Melajo River area: PJ 285, USGS 18399, USGS 21178. Point Courbaril: K 1429, K 8399, K 8400, K 12012, K 12013, K 12255, PJ 212, USGS 10991, USGS 20432, USGS 20432a, USGS 20433, USGS 20434, USGS 21778. Matura Bay: RR 230 (cf.).

Genus **BITTIUM** Leach

Leach, 1847, Ann. Mag. Nat. Hist., vol. 20, p. 270.

Type species (by subsequent designation, Gray, 1847, Zool. Soc. London, Proc., pt. 15, p. 154), *Murex reticulatus* Montagu.

Subgenus **BITTIOLUM** Cossmann

Cossmann, 1906, Essais de paléoconchologie comparée, pt. 7, p. 139.

Type species (by original designation), *Bittium podagrinum* Dall.

Bittium (Bittiolum) fretense, n. sp. Pl. 45, figs. 12, 13

Shell small, stout. Protoconch consists of a little more than three rapidly enlarging, smooth volutions. Early sculpture consists of two spirals.Subsequently a third and fourth spirals as well as less prominent axials appear. On later whorls all the spirals and axials have the same strength forming a regular reticulate pattern with beads at the intersections. Body whorl with an inconspicuous varix after which the sculpture is reduced in strength and less regular. Whorl profile straight. Suture deeply incised. Base ornamented by about five spirals.

Holotype. — USNM 645372.

Dimensions of holotype. — Height 5.6 mm, diameter 2.0 mm.

Type locality. — Point Courbaril: USGS 10991.

This species is based on 11 specimens from the Courbaril beds. No outer lip is entirely preserved, but it seems to be thin. From the varix on the body whorl onward secondary spirals are usually intercalated.

B. fretense, n.sp. is related to the Recent Western Atlantic and Caribbean *B. varium* (Pfeiffer) (Arch. f. Naturg., vol. 6, p. 256, 1840). In *B. varium* the axials are more widely spaced and usually coarser than the spirals, and its whorls are more convex in later stages than in *B. fretense*. Both species have about five sculptured whorls, but they are somewhat higher in *B. fretense*.

B. galvestonense Harris (1895, p. 22, pl. 4, fig. 8) was described from a well near Galveston, Texas, from a depth of 2550 to 2871 feet, and its age indicated as upper Miocene. *B. galvestonense* has a regularly reticulate sculpture like *B. fretense* but is said to have varices on the spire whorls which are absent in *B. fretense*. *B. properatum* (Woodring) (1928, p. 338, pl. 25, fig. 12) from the Bowden Formation of Jamaica is more slender and the axial element of its sculpture more conspicuous than the spiral one.

Occurrence.—USGS 10991, USGS 20432.

Family **CERITHIOPSIDAE**

Genus **CERITHIOPSIS** Forbes and Hanley

Forbes and Hanley, 1853, History of British Mollusca, vol. 3, p. 364.

Type species (by monotypy), *Murex tubercularis* Montagu.

Subgenus **CERITHIOPSIS** s. str.

Cerithiopsis (Cerithiopsis) species Pl. 45, fig. 11

1864. *Cerithiopsis* sp., Guppy, Trans. Sci. Assoc. Trinidad for 1864, p. 35 (part); reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 15.

Shell small. Part of the protoconch preserved, consists of one smooth volution. Next whorl with a spiral on its lower half which is the lowest spiral on later whorls. This spiral is crossed by faint, opisthocyrt threads which soon become straight axials. A second spiral and later a third one appear above the primary spiral. They all are beaded at the intersections forming a regular pattern on late whorls. Suture furrowed. Base ornamented by one or two spirals. Anterior canal short. Inner lip with inconspicuous callus.

The lot of Guppy's *Cerithiopsis* sp. (USNM 115466) from Matura consists of two specimens. One represents the form described above, the other one is indeterminable but belongs to some other family.

It is not possible to name this Matura fossil which is represented only by a few shells, because the Recent species have not been worked up yet. Numerous names have been used for Recent species. Bartsch (1911a) had started to work on *Cerithiopsis* from the West Coast of America and proposed several subgeneric names based on nuclear characters.

The Matura fossil superficially resembles the Recent Jamaican *C. flavum* (C. B. Adams), the lectotype of which has been figured by Clench and Turner (1950, pl. 37, fig. 11).

Occurrence. — PJ 302, USGS 18204, USGS 19860.

Cerithiopsis (subgenus ?) **emersoni** (C. B. Adams) Pl. 45, fig. 10

1839. *Cerithium emersonii* C. B. Adams, Boston Soc. Nat. Hist., Jour., vol. 2, p. 284, pl. 4, fig. 10.
1864. *Cerithiopsis subulatum* Montagu, Guppy, Trans. Sci. Assoc. Trinidad for 1864, p. 35; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 15.
1867. *Cerithiopsis punctatum* Linné, Guppy, Proc. Sci. Assoc. Trinidad, pt. 3, p. 156; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 35.
1874. *Cerithiopsis punctatum* Linné, Guppy, Geol. Mag., new ser., decade 2, vol. 1, p. 438.
1948. *Cerithiopsis (Laskeya) emersonii persubulata* Gardner, U.S. Geol. Sur., Prof. Paper 199-B, p. 204, pl. 27, fig. 4.
1950. *Cerithium emersonii* C. B. Adams, Clench and Turner, Occas. Papers on Mollusks, vol. 1, No. 15, p. 276, pl. 37, figs. 12-14.
1953. *Cerithiopsis (Laskeya) emersonii* (C. B. Adams), Olsson and Harbison, Acad. Nat. Sci. Philadelphia, Mon. 8, p. 301, pl. 48, fig. 1.

Lectotype. — Museum Comp. Zool., Cambridge, Mass., No. 156201.

Type locality. — Massachusetts.

This species occurs at Matura, but most of the specimens are somewhat worn. One immature shell shows part of the smooth protoconch and indications of the first sculpture which consists of axial riblets (see Olsson and Harbison, 1953, pl. 48, fig. 1).

The sculpture as a whole is somewhat variable in strength according to Recent specimens. The central spiral of Matura shells is weak compared with the other two spirals, because no adult whorls are represented where this spiral becomes stronger.

The specimen from the Pleistocene of South Carolina (USNM 325145), figured by Gardner, is indistinguishable from Matura shells. Weisbord (1962, p. 184, pl. 15, figs. 21, 22) questionably referred a small specimen from the Pliocene of Venezuela to *C. emersoni*.

As stated by Olsson and Harbison it is still uncertain which name should be used for this species. *C. emersoni* is usually assigned to the subgenus *Laskeya* Iredale (Malac. Soc. London, Proc., vol. 13, p. 30, 1918), type species: *Turritella costulata* Möller 1842. According to the figure of *T. costulata* given by Jeffreys (British Conchology, vol. 5, pl. 81, fig. 5, 1869) that species has convex whorls, predominantly axial sculpture, and a different aperture, thus looking unlike *C. emersoni*.

Occurrence. — RR 230, PJ 302, USGS 19860.

Distribution. — Miocene to Recent (see Weisbord, 1962, p. 186).

Cerithiopsis (subgenus ?) species

A single specimen of 4½ whorls from Matura is similar to *C. emersoni*. It has also three spirals, but the uppermost one is the weakest one, whereas in *C. emersoni* the central one is weaker than the others. Slightly prosocline axials form beads at the intersections. They are less prominent than the spirals.

Occurrence. — USGS 19860.

Genus **SEILA** A. Adams

Adams, A., 1861, Ann. Mag. Nat. Hist., ser. 3, vol. 7, p. 131.

Type species (by subsequent designation, Dall, 1889, Bull. Mus. Comp. Zool., vol. 18, p. 250), *Triphoris dextroversus* Adams and Reeve.

Seila cf. adamsi (H. C. Lea) Pl. 45, fig. 9

The nomenclatorial history of *Seila adamsi* is summarized in the synonymy lists by Olsson and Harbison (1953, p. 302), Abbott (1958, p. 41), and Weisbord (1962, p. 192). The lectotype of *Cerithium terebrale* C. B. Adams has been figured by Clench and Turner (1950, p. 349, pl. 37, fig. 5).

A few incomplete specimens from Matura may represent the Recent *S. adamsi*. However, Recent specimens are somewhat stouter than the Matura fossils, an observation which has been made by Olsson and Harbison for Pliocene specimens from Florida. But the sculpture of Recent and fossil shells is identical.

From the Bowden Formation of Jamaica, Woodring (1928, p. 332) reported one specimen as *Seila* sp. This shell (USNM 369483) is stouter than the Matura specimens and in this respect closely resembles *S. adamsi*.

Occurrence. — K 10924, JS 67, PJ 302, USGS 19860.

Family MODULIDAE

Genus MODULUS Gray

Gray, 1942, Synopsis of the contents of the British Museum, ed. 44, p. 60.

Type species (by subsequent designation, Gray, 1847, Zool. Soc. London, Proc., pt. 15, p. 150), *Trochus modulus* Linné.

Modulus carchedonius (Lamarck)

1822. *Monodonta carchedonius* Lamarck, Histoire naturelle des animaux sans vertèbres, vol. 7, p. 33.
1944. *Modulus carchedonius* Lamarck, Abbott, Johnsonia, vol. 1, No. 14, p. 5, pl. 2, figs. 5-7. For additional citations see this publication.
1953. *Modulus carchedonius* (Lamarck), Olsson and Harbison, Acad. Nat. Sci. Philadelphia, Mon. No. 8, p. 303, pl. 39, fig. 11.
1961. *Modulus carchedonius* Lamarck, Warmke and Abbott, Caribbean Seashells, p. 71, pl. 11 k.

A single incomplete specimen from Matura shows the body whorl and the base. The toothlike end of the inner lip is not preserved. The specimen probably is immature; it does not reach the size of Recent shells.

The Recent West Coast *M. catenulatus* Philippi (see Abbott, 1944, p. 6) is larger than *M. carchedonius*, has a smaller peripheral angle, and its umbilicus is less closed.

Occurrence. — K 10924.

Distribution. — Pliocene of southern Florida. Recent from the Greater Antilles to the northern coast of South America (see Warmke and Abbott, 1961, p. 327, map 17).

Family ARCHITECTONICIDAE

Genus ARCHITECTONICA Röding

Röding, 1798, *in* Museum Boltenianum, pt. 2, p. 78.

Type species (by subsequent designation, Gray, 1847, Zool. Soc. London, Proc., pt. 15, p. 151), *Trochus perspectivus* Linné.

Subgenus ARCHITECTONICA s. str.

Architectonica (Architectonica) nobilis nobilis Röding Pl. 45, figs. 7, 8

1798. *Architectonica nobilis* Röding, *in* Museum Boltenianum, pt. 2, p. 78.
1959. *Architectonica (Architectonica) nobilis nobilis* Röding, Woodring, U.S. Geol. Sur., Prof. Paper 306-B, p. 165, pl. 29, figs. 1-6, 10-12, 14-16. For further citations see this publication.
1965. *Architectonica (Architectonica) nobilis nobilis* Röding, Jung, Bull. Amer. Paleont., vol. 49, No. 223, p. 486, pl. 64, figs. 1-7.

This species is rare at Matura. A single specimen is known from the base of the Melajo Clay.

Occurrence.—Melajo River area: USGS 18634. Matura Bay: RR 230, PJ 302, USGS 18204.

Distribution.—Widespread from lower Miocene to Recent (see Woodring, 1959, p. 167).

Subgenus **PSEUDOTORINIA** Sacco

Sacco, 1892, I Molluschi dei terreni terziarii del Piemonte e della Liguria, pt. 12, p. 66.

Type species (by original designation), *Solarium obtusum* Bronn.

Architectonica (Pseudotorinia) melajoensis, n.sp. Pl. 46, figs. 1-3

Small, spire but little elevated. The anastrophic protoconch shows 1½ volutions on the dorsal surface. Postnuclear whorls three. First sculpture with two beaded spirals close to the lower and upper sutures respectively. Their beads are connected by prosocline axial threads. Between these two spirals three minor ones are intercalated, the uppermost one appearing first. All of them are crossed by axials. On the body whorl the spiral next to the suture is the most prominent one. Periphery rounded. Umbilicus wide, bordered by a broad spiral carrying radially elongated nodes. Surface between this spiral and periphery sculptured by beaded spirals; one of them is more prominent than the others. Basal spirals crossed by radial threads.

Holotype.—Natural History Museum Basel, No. H 14640.

Dimensions of holotype.—Height 2.0 mm, diameter 4.8 mm.

Type locality.—Melajo River area: PJ 285.

This species is represented by the holotype only. Its periphery is formed by two subequal, noded spirals which, however, do not produce an angulation.

A. eurybis Olsson (1964, p. 185, pl. 33, figs. 6-6b), from the middle Miocene Angostura Formation of northwestern Ecuador, is a larger species with a somewhat higher spire. Its periphery is more rounded, and its umbilicus is bordered by two broad, noded spirals with a narrow interspace, whereas *A. melajoensis* has only one. *A. eurybis* is more closely related to *A. nupera* (Conrad) (1831, p. 141) from the Miocene Yorktown Formation of Virginia than is *A. melajoensis*. According to Gardner's figures [1943-1948 (1948), pl. 24, figs. 8, 11, 15] *A. nupera* has two broad, noded spirals bordering the umbilicus like *A. eurybis.* Like in *A. melajoensis* the uppermost spiral on the dorsal surface is more prominent than the others which is not the case in *A. eurybis.* The Recent *Heliacus mazatlanicus* Pilsbry and Lowe (1932, p. 83, pl. 8, figs. 6, 7, 8) from Mazatlan, Mexico, is similar to *A. eurybis.*

A. euprepes Woodring (1928, p. 357, pl. 27, figs. 15-17) from the Bowden Fm. of Jamaica is easily distinguishable from *A. melajoensis* by its sharp peripheral angulation. Its spirals are usually broader and more coarsely beaded leaving narrower interspaces. *A. watsonensis* Mansfield (1930, p. 111, pl. 16, figs. 5, 6) from the *Ecphora*-zone of Florida has been described originally as a subspecies of *A. nupera.* It is almost twice as large as *A. melajoensis* and is more coarsely sculptured.

Occurrence. — PJ 285.

Architectonica (Pseudotorinia) guppyi, n.sp. Pl. 46, figs. 4-6

Small, spire low. Visible part of anastrophic protoconch consists of one volution. At three-quarters of this volution the protoconch is broad and inflated. Postnuclear whorls 2½. Sculpture starting abruptly, consists of five spirals which are crossed by prosocline axials. With increasing age beads are formed at the intersections. On the penultimate and the body whorl a more prominent, noded spiral appears forming the upper and more conspicuous of the two peripheral spirals. Periphery slightly angulated. Umbilicus wide, bordered by two broad, subequal spirals carrying radially elongated nodes. Their interspace narrow. Toward the periphery follow four spirals of gradually decreasing width. They are crossed by many radial threads converging toward the nodes of the two innermost spirals.

Holotype. — Natural History Museum Basel, No. H 14641.

Dimensions of holotype. — Height 2.0 mm, diameter 4.2 mm.

Type locality. — Matura Bay: JS 67.

This species is represented by several, partly well-preserved specimens from Matura. It has some resemblance with the Recent Caribbean *A. bisulcata* (d'Orbigny) (1842, pl. 19, figs. 17-20; 1845, p. 188). *A. bisulcata,* however, has a more pronounced peripheral angulation, and the visible part of its protoconch is smaller and less inflated. Gardner [1926-1950 (1947), p. 590] included what she thought to be *A. semidecussata* in the synonymy of *A. bisulcata.*

Woodring (1959, p. 168) proposed *Astronacus* as a subgenus of *Heliacus* with *Heliacus planispira* Pilsbry and Lowe (1932, p. 83, pl. 8, figs. 9, 10, 11), from the Recent fauna of Mazatlan, Mexico, as its type species. *Astronacus* includes low-spired, bicarinate species with strong dorsal axial sculpture. A feature of eventual taxonomic importance is mentioned, namely the greater inflation and cruder sculpture on the first one-fourth of the first sculptured whorl. A similar inflation, but situated on the last part of the protoconch already, is observed in *A. guppyi*. Thus *A. guppyi* has several affinities with *Astronacus* except that its periphery is less angulated, and its axial sculpture not predominant.

A. guppyi is also similar to *A. melajoensis,* n. sp., but at once distinguishable by its wider protoconch, more angulated periphery, and the sculpture on the base. Despite of their differences, it would seem artificial to place them in different subgenera.

Occurrence. — JS 67, PJ 302, USGS 19860.

Architectonica (Pseudotorinia) semidecussata (Guppy) Pl. 46, figs. 10, 11

1867. *Solarium semidecussatum* Guppy, Proc. Sci. Assoc. Trinidad, pt. 3, pp. 156, 170; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, pp 35, 49
1874. *Solarium semidecussatum* Guppy, Guppy, Geol. Mag., new ser., decade 2, vol. 1, p. 408, pl. 18, fig. 14.
1925. *Solariellla (?) semidecussata* Guppy, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 248.

Small, spire relatively high. Visible part of anastrophic protoconch consists of one volution. Postnuclear whorls 2¾. Sculpture consists of prosocline axials which are crossed by five spirals, the uppermost spiral being the broadest one. Periphery almost rounded. Umbilicus wide, bordered by one broad spiral carrying radially elongated nodes.

Holotype. — USNM 115468.

Dimensions of holotype. — Height 2.1 mm, diameter 4.0 mm.

Type locality. — Matura, Trinidad.

The holotype is the only specimen known. It is strongly rolled leaving sculptural details obscure. Guppy's original description is misleading as the type lot originally included two specimens belonging to different genera (see under *Microgaza oblita,* n. sp.).

A. semidecussata is at once distinguishable from *A. guppyi,* n. sp., with which it occurs, by its higher spire. Some specimens of

A. guppyi have an almost flat dorsal surface. In addition *A. semidecussata* has only one spiral band bordering the umbilicus, whereas *A. guppyi* has two of them.

The sculpture of the base is more like that of *A. melajoensis*, but that species has also a lower spire and a much smaller protoconch.

Occurrence. — Matura Bay. Guppy coll.

Distribution. — Known from type locality only.

Architectonica (Pseudotorinia) cf. **semidecussata** (Guppy) Pl. 46, figs. 7-9

There is a single specimen from the Courbaril beds. It is much larger than the type of *A. semidecussata* measuring 3.8 mm in height and 7.2 mm in diameter. It has a large protoconch, the same type of sculpture, and about the same apical angle as *A. semidecussata*. The umbilicus is also bordered by a single, broad, spiral band carrying radially elongated nodes. The periphery is but slightly angulated.

The Courbaril specimen is also similar to *A. eurybis* Olsson referred to under *A. melajoensis* but differs from that species by its basal sculpture.

Occurrence. — USGS 10991.

Family **MATHILDIDAE**

Genus **MATHILDA** Semper

Semper, 1865, Jour. de Conchyliologie, vol. 13, p. 330.

Type species (by subsequent designation, Cossmann, 1888, Catalogue illustré des coquilles fossiles de l'éocène des environs de Paris, fasc. 3, p. 309), *Turbo quadricarinatus* Brocchi.

Mathilda species A Pl. 46, figs. 12, 13

Shell of small to medium size, with about 10 moderately convex whorls. First sculpture consists of a medial spiral and faint axial threads. A second spiral is introduced below the primary one. After a few whorls a third spiral appears above the primary one and reaches almost the strength of the other spirals on late whorls. A fourth, but faint spiral below the upper suture, is present on late whorls. The axial threads are regularly spaced except on the body whorl, where they are crowded. They do not cross the spirals, thus producing no beads at the intersections. Interspaces of spirals sculptured by minute spiral striae. Suture prominent. Aperture almost circular. Basal lip slightly everted.

The above description is based on a single somewhat worn specimen from the base of the Melajo Clay (height 10.0 mm, diameter 3.6 mm). Its protoconch is missing. Two fragments and a worn specimen of seven whorls from the Matura shell bed are identified provisionally as *Mathilda* species A ?. Their state of preservation leaves some doubt as to this determination.

The Melajo specimen is easily distinguished from *M. plexita* Dall (*in* Guppy and Dall, 1896, p. 320, pl. 29, fig. 5; Woodring, 1928, p. 406, pl. 32, figs. 7, 8), from the Bowden Formation of Jamaica, by its less convex whorls and the less incised suture. *M. plexita* has four spirals of almost equal size which are beaded at the intersections with the axials and differs in other details of the sculpture. The Melajo specimen has a larger apical angle than *M. plexita*. As pointed out by Woodring (1928, p. 406) the specimen (USNM 107120) from the *"Ditrupa"* bed near Pointe-à-Pierre, Trinidad (Upper Concord Marl Member of Tamana Formation: middle Miocene), is a small fragment slightly differing from topotypes of *M. plexita*.

The form from the Bowden Formation of Jamaica, recorded by Woodring (1928, p. 406) as *Mathilda* species, is also more slender than the Melajo specimen, and it has stronger axial sculpture.

Occurrence. — Melajo River area: USGS 18411. Matura Bay: PJ 302 (?).

Mathilda species B

A small fragment of four whorls from the Courbaril beds is similar to *Mathilda* species A. It differs from it by its more regularly convex whorls, *i.e.* by a less prominent primary spiral, and by its stronger axial sculpture. The apical angle is about the same in both forms.

Occurrence. — USGS 10991.

Family **TRIPHORIDAE**

Genus **TRIPHORA** Blainville

Blainville, 1828, Dictionnaire des sciences naturelles, vol. 55, p. 344.

Type species (by monotypy), *Triphora gemmatum* Blainville (= *Cerithium tristoma* Blainville).

Triphora guttata (Guppy) Pl. 46, figs. 14-16

1864. *Triforis ventricosus* Gmelin, Guppy, Trans. Sci. Assoc. Trinidad for 1864, p. 35; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 15.
1867. *Triforis guttata* Guppy, Proc. Sci. Assoc. Trinidad, pt. 3, pp. 156, 170; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, pp. 35, 49.
1874. *Triforis guttata* Guppy, Guppy, Geol. Mag., new ser., decade 2, vol. 1, pp. 408, 438, pl. 18, fig. 27.

Shell small, stout. Protoconch consists of five whorls. First volution smooth. Subsequent nuclear whorls with fine axials and at first one, later two spirals. On the last nuclear whorl one spiral disappears, the other one becomes stronger, and forms the lower of the two beaded spirals on the first postnuclear whorl. Postnuclear whorls about seven in number, the first ones with two beaded spirals and axials. Later a weak third spiral appears centrally which is also beaded, where it crosses the axials. On the body whorl it has about the same strength as the other spirals. Base sculptured by three spirals. Anterior canal short, bent backwards. Posterior canal not recognizable. Inner lip with a well-defined callus. Outer and basal lips not preserved.

Holotype. — USNM 115458.

Dimensions of holotype. — Height 3.1 mm, diameter 1.3 mm.

Type locality. — Matura, Trinidad.

The holotype is the only specimen in Guppy's collection. It is incomplete, somewhat worn, and has been glued to a card. *T. guttata* occurs at Matura and in the Courbaril beds. A protoconch of an unidentified *Triphora* has been found in the Melajo Clay (USGS 18399).

The Recent West Indian *T. melanura* (C. B. Adams) (see Clench and Turner, 1950, p. 307, pl. 38, fig. 10) has the same type of protoconch as *T. guttata*. All its whorls have the same apical angle, whereas in *T. guttata* the apical angle of later whorls becomes smaller. In general outline *T. guttata* looks more like the Recent *T. modesta* (C. B. Adams) (see Clench and Turner, 1950, p. 310, pl. 39, fig. 8).

Olsson and Harbison (1953, pp. 295, 296) proposed *Cosmotriphora* and *Cinctrifora* as subgenera of *Triphora* mainly on the basis of nuclear characters. Kosuge (1966, pp. 309-310) distinguished three types of protoconchs in the Triphoridae which are only of secondary taxonomic importance. Kosuge defined triphorid genera mainly by apertural features, sculpture, radula, and operculum. *T. guttata* would have to be assigned to *Cosmotriphora.*

Occurrence.—Point Courbaril: PJ 212, USGS 10991, USGS 20434. Matura Bay: K 10924, RR 230, PJ 302, USGS 18204, USGS 19860.

Distribution.—Courbaril beds of Upper Morne l'Enfer Fm. Matura shell bed.

Family **EPITONIIDAE**

Genus **EPITONIUM** Röding

Röding, 1798, *in* Museum Boltenianum, pt. 2, p. 91.

Type species (by subsequent designation, Suter, 1913, Manual of New Zealand Mollusca, p. 319), *Epitonium scalare* Röding (= *Turbo scalaris* Linné).

Subgenus **EPITONIUM** s.str.

Epitonium (Epitonium) albidum (d'Orbigny) Pl. 46, fig. 17

1845. *Scalaria albida* d'Orbigny, *in* La Sagra, Historia fisica, politica y natural de la Isla de Cuba. Segunda parte. Historia Natural. Tomo 5, Moluscos, p. 157. Atlas, pl. 10, figs. 24, 25, 1842.
1853. *Scalaria albida* d'Orbigny, *in* La Sagra, Histoire physique, politique et naturelle de l'Ile de Cuba. Mollusques, vol. 2, p. 17.
1951. *Epitonium (Epitonium) albidum* d'Orbigny, Clench and Turner, Johnsonia, vol. 2, No. 30, p. 260, pls. 113, 114. For further citations see this publication.
1952. *Epitonium (Epitonium) albidum* d'Orbigny, Clench and Turner, Johnsonia, vol. 2, No. 31, p. 351, pl. 174.

This species is fairly common at Matura. According to the Recent material of *E. albidum* at hand the apical angle is somewhat variable. The figured Matura specimen is more slender than the others and its axial lamellae slightly more oblique. Some tips assumed to belong to this species have a protoconch with three whorls.

Occurrence.—JS 67, RR 230, PJ 302, USGS 19860.

Distribution.—Recent from Florida through the West Indies to northern Argentina. *E. albidum* is also recorded from a few localities on the West African coast (see Clench and Turner, 1951, p. 262).

Epitonium (Epitonium) aff. foliaceicostum (d'Orbigny)

A number of small fragments and tips from the Courbaril beds and the Melajo Clay are identified as *E.* aff. *foliaceicostum.* The tips show protoconchs with three whorls, whereas the Recent *E. foliaceicostum* (see Clench and Turner, 1951, p. 273, pl. 123, figs. 1-3, pl. 124, figs. 1, 2) has only 1½ volutions. The early sculptured whorls cannot be separated from corresponding whorls of Recent specimens. There are about 10 axial lamellae at that growth stage which carry hooklike prolongations at the shoulder of the whorls.

Olsson and Harbison (1953, p. 336, pl. 58, fig. 2) reported *E.* cf. *foliaceicostum* from the Pliocene of Florida. The specimens from the middle Gatun Formation of the Panama Canal Zone identified as *E.* cf. *foliaceicostum* by Woodring (1959, p. 182, pl. 38, figs. 13, 16) have four nuclear whorls and are more slender than those from the Courbaril beds and the Melajo Clay.

Occurrence.—Melajo River area: KR 11862, PJ 285, USGS 18399. Point Courbaril: K 1429, USGS 10991, USGS 20433, USGS 20434.

Epitonium (Epitonium) humphreysi (Kiener) ? Pl. 46, fig. 18

1838. *Scalaria humphreysi* Kiener, Iconographie des coquilles vivantes, vol. 10, p. 15, pl. 5, fig. 16.
1951. *Epitonium (Epitonium) humphreysi* Kiener, Clench and Turner, Johnsonia, vol. 2, No. 30, p. 268, pl. 117, fig. 2, pls. 119, 120. For further citations see this publication.

Two incomplete specimens from the Courbaril beds seem to represent this species. The axial costae are fused at the margin of the inner lip, a feature which is observable on Recent specimens of *E. humphreysi.*

The larger and figured specimen has a little more than two whorls. The smaller specimen has four whorls and nine thickened lamellae on its last whorl. The axials are somewhat angulated on the shoulders which is typical for the early stages of *E. humphreysi* according to Clench and Turner.

Occurrence.—K 1429, USGS 10991.

Epitonium (Epitonium) maturense, n. sp. Pl. 46, figs. 20, 21

Of medium size, stout. Whorls loosely coiled; sutures open; the whorls connected by the axial lamellae. There are six axial lamellae per whorl. They are thin, curved backwards, and angulated on the shoulders. They are continuous from whorl to whorl, and form a spiral completing one turn within six whorls. Surface between varices smooth. Aperture circular. No basal disk.

Holotype. — Natural History Museum Basel, No. H 15040.

Dimensions of holotype. — Height 18.9 mm, diameter 8.1 mm.

Type locality. — Matura Bay: RR 230.

This species is based on three specimens from Matura. The holotype has seven whorls, but the apex is lost. One of the paratypes is immature (four whorls). The other paratype consists of a little more than four later whorls, and its axial lamellae are even larger than those of the holotype.

E. helikum Olsson and Harbison (1953, p. 335, pl. 58, figs. 1, 1a) was described from the Pliocene of St. Petersburg, Florida. It is much larger than *E. maturense*, its holotype (three whorls) is 23.7 mm high and has only four or five varices.

The Recent *E. strongi* Lowe (1932, p. 115, pl. 9, fig. 5) from the West Coast of Central America has about the same dimensions as *E. maturense*. It has only five varices per whorl, its whorls are compactly united and not loosely coiled. It is said to have faint spiral sculpture between the varices and a weak thread defining the base. Lowe (Nautilus, vol. 46, p. 36) renamed his species *strongianum* as it was preoccupied by *E. strongi* Bartsch (Wash. Acad. Sci., Jour., vol. 18, No. 3, p. 71, fig. 2, 1928). But *E. strongianum* is considered a synonym of *E. statuminatum* (G. B. Sowerby II) (Zool. Soc. London, Proc., pt. 12, p. 30, 1844; Thes. Conch., *Scalaria,* pl. 35, fig. 127) by Keen (1958, p. 274).

Occurrence. — RR 230.

Subgenus **ASPERISCALA** de Boury

De Boury, 1909, Jour. de Conchyliologie, vol. 57, p. 257.

Type species (by original designation), *Scalaria bellastriata* Carpenter.

Epitonum (Asperiscala) cf. multistriatum (Say) Pl. 46, fig. 19

One incomplete, somewhat worn specimen (height 5.9 mm, diameter 3.0 mm) from Matura shows part of its protoconch and four sculptured whorls. The last whorl has 26 axial costae which are not continuous from whorl to whorl. Their interspaces are crossed by numerous, faint spirals.

The Recent *E. multistriatum* (Say) (see Clench and Turner, 1952, p. 292, pls. 133, 134) has 16 to 19 costae on the body whorl but many more on earlier whorls. The Matura fossil has the same inflation of the whorls as the Recent species.

Occurrence. — RR 230.

Epitonium (Asperiscala) cf. candeanum (d'Orbigny) Pl. 46, fig. 22

Small, slender. Whorls strongly convex, especially in later stages. Sutures deep. Axial lamellae low, numbering about 13 on last preserved whorls. Interspaces of costae sculptured by numerous, faint spiral threads.

A few fragmentary shells from Matura may represent the Recent *E. candeanum* (d'Orbigny) (see Clench and Turner, 1952, p. 301, pls. 140, 141) which ranges from Florida through the Bahamas and the Lesser Antilles to Barbados. The number of axials seems to be variable in this species. According to Clench and Turner there are 18 to 25 costae on the body whorl. But Recent specimens of the size of the Matura shells have also about 13 costae.

Occurrence. — PJ 302, USGS 19860.

Epitonium (Asperiscala) rohri, n. sp. Pl. 46, figs. 23-25

Small, slender. Protoconch of four little convex, smooth volutions. Postnuclear whorls a little more than five in number, tightly coiled, strongly but not uniformly convex, somewhat angled just above the middle of the whorls. Axial sculpture consists of fairly uniform, low, oblique lamellae numbering 16 to 18 per whorl. They are continuous from whorl to whorl. Interspaces between lamellae sculptured by spirals which, however, are reduced or absent on the upper half of the whorl. Suture moderately deep. Aperture subcircular.

Holotype. — Natural History Museum Basel. No. H 15042.

Dimensions of holotype. — Height 4.8 mm, diameter 1.6 mm.

Type locality. — Melajo River area: PJ 285.

This species is represented from the Melajo Clay by about 50 specimens. According to this material its characters are constant. Two fragments from the Courbaril beds are also assigned to this species.

E. rohri, n. sp. is most closely related to the Recent *E. sericifilum* (Dall) (1889a, p. 313). Its holotype (USNM 61190) has been figured by Clench and Turner (1952, p. 317, pl. 152). It has been collected on the coast of Honduras and is the only specimen known. *E. sericifilum* has four nuclear whorls (not 2½ as stated by Clench and Turner) like *E. rohri,* and about the same apical angle but differs in having 25 axials per whorl. In addition the spiral sculpture of *E. sericifilum* is much finer, and not restricted to the lower part of the whorl.

The Recent western American *E. durhamianum* Hertlein and Strong [1940-1951 (1951), p. 89, pl. 3, fig. 9] from Nicaragua has about the same number of axial lamellae per whorl, but they are not angulated as in *E. rohri. E. durhamianum* lacks any spiral sculpture.

Occurrence. — Melajo River area: EL 1810, KR 11862, PJ 285, USGS 18399. Point Courbaril: USGS 20434.

Distribution. — Melajo Clay Member of Springvale Fm., Courbaril beds of Upper Morne l'Enfer Fm..

Epitonium (Asperiscala) aff. sericifilum (Dall)

A single, incomplete specimen (height 3.5 mm) from Matura has about the same number of axial lamellae as *E. sericifilum* referred to under *E. rohri,* n. sp. However, its whorls are less angulated, and its apical angle is clearly larger.

The Matura specimen shows part of its protoconch and four postnuclear whorls. Its spiral sculpture between the axials is as fine as in *E. sericifilum* and also not restricted to the lower part of the whorl as in *E. rohri.*

Occurrence. — PJ 302.

Family ACLIDIDAE

Aclis helecteroides Guppy

1867. *Aclis helecteroides* Guppy, Proc. Sci. Assoc. Trinidad, pt. 3, p. 169; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 48.

1874. *Aclis helecteroides* Guppy, Guppy, Geol. Mag., new ser., decade 2, vol. 1, pp. 407, 437, pl. 18, fig. 11.

Guppy described this species from Matura. It should be considered as a *nomen dubium,* because the type or any other specimens labelled by Guppy are missing. No additional shells have since been collected at Matura.

Family EULIMIDAE

Genus EULIMA Risso

Risso, 1826, Histoire naturelle des principales productions de l'Europe méridionale, vol. 4, p. 123.

Type species (by subsequent designation, Herrmannsen, 1846, Indicis generum malacozoorum primordia, vol. 1, p. 431), *Turbo subulatus* Donovan (= *Strombiformis glaber* da Costa).

Eulima clavata (Guppy) Pl. 46, fig. 26

1867. *Leiostraca clavata* Guppy, Proc. Sci. Assoc. Trinidad, pt. 3, p. 169; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 48.
1874. *Leiostraca clavata* Guppy, Guppy, Geol. Mag., new ser., decade 2, vol. 1. pp. 408, 437, pl. 18, fig. 16.

Small, slender. Whorls smooth, flat, about 10 in number. Apical angle of first four whorls small, slightly enlarging afterwards. Suture feebly incised. Aperture pointed above, rounded below. Outer lip thin, inner lip with a small, but well-defined callus. This callus slightly thickened on columella.

Lectotype (herewith selected). — USNM 115443.

Dimensions of lectotype. — Height 6.7 mm, diameter 1.7 mm.

Type locality. — Matura, Trinidad.

Guppy's original lot consisted of 11 specimens. The lectotype is the only complete shell. *E. clavata* is fairly common at Matura being represented by about 50 specimens in later collections. Comparisons are omitted, because the Recent Caribbean Eulimidae are not worked up yet.

Occurrence. — K 10924, JS 67, RR 230, PJ 302, USGS 18204, USGS 19860.

Eulima species A Pl. 46, fig. 27

1942. *Strombiformis* sp. ind. aff. *dalli* Gardner and Aldrich, Rutsch, Verh. Naturf. Ges. Basel, vol. 54, p. 135, pl. 4, fig. 6.

Shell slender. Protoconch consists of almost four glassy whorls. Postnuclear whorls nine, smooth, flat. Suture indistinct. Aperture pointed above, rounded below. Inner lip with a weak, but well defined callus.

This form is represented from the Melajo Clay by a few shells. It also occurs in the Savaneta Glauconitic Sandstone Member of the Springvale Formation. Two incomplete specimens from the Courbaril beds are doubtfully referred to it.

Comparison with the type specimen of *E. dalli* (Gardner and Aldrich) (1919, p. 39, pl. 2, fig. 5), from the Caloosahatchee Formation of Florida, shows that *E. dalli* is even more slender than the Melajo form, and that its protoconch has only about two whorls.

E. nobilis Guppy (*in* Guppy and Dall, 1896, p. 315, pl. 30, fig. 9) from the Bowden Formation of Jamaica is smaller. None of the four syntypes has the protoconch preserved.

Occurrence. — Melajo River area: PJ 285, USGS 21178. Point Courbaril: K 8399 (?), PJ 212 (?).

Genus **BALCIS** Leach

Leach, 1847, *in* Gray, Ann. Mag. Nat. Hist., vol. 20, p. 271.

Type species (by monotypy), *Balcis montagui* Leach (= *Strombiformis albus* da Costa).

Balcis egregia (Guppy) Pl. 47, figs. 1, 2

1896. *Eulima egregia* Guppy, *in* Guppy and Dall, Proc. U. S. Nat. Mus., vol. 19, p. 314, pl. 28, fig. 11.
1910. *Eulima egregia* Guppy, Guppy, Agric. Soc. Trinidad and Tobago, Soc. Paper No. 440, pp. 5, 8; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, pp. 148, 150.
1925. *Melanella (Eulima) egregia* Guppy, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 215, pl. 35, fig. 3.
1938. *Eulima egregia* Guppy, Vokes, Amer. Museum Novitates, No. 988, p. 5.
1942. *Melanella (Eulima) egregia* (Guppy), Rutsch, Verh. Naturf. Ges. Basel, vol. 54, p. 134.

Large, solid, stout. Whorls smooth, flat, numbering up to 17. Suture sharply incised. Body whorl evenly rounded. Aperture angulated above, rounded below. Outer lip thin, arched forward on lower part when viewed from side. Inner lip with a callus reaching down to the basal lip.

Holotype. — USNM 107082.

Type locality. — "Montserrat", Trinidad (Guppy).

The type locality of this species as indicated by Guppy cannot be reconstructed precisely. The holotype, an incomplete specimen of 11 whorls, was probably collected from the Savaneta Glauconitic Sandstone Member of the Springvale Formation at a spur of the Montserrat range. Guppy later listed *B. egregia* from Springvale Quarry, where it is fairly common.

In the material under consideration *B. egregia* is represented by a few specimens from the base of the Melajo Clay. At irregular intervals there are accentuated growth lines making an interruption in growth. *B. egregia* is unique in its large size. The figured specimen from the Melajo Clay is the largest one so far known (height 49.5 mm, diameter 14.3 mm). It has 17 whorls (apex broken).

Occurrence. — USGS 18411, USGS 18634.

Distribution. — Savaneta Glauconitic Sandstone Member and Melajo Clay Member, both of Springvale Fm., Trinidad.

Balcis species A

Small, stout, with about 10 flat whorls. Suture indistinct. Aperture oval, pointed above, rounded below. Inner lip with a weak callus. Outer lip somewhat arched when viewed from side.

A few incomplete, worn specimens from Matura are at hand. They resemble in general aspect the Recent *B. intermedia* Cantraine as figured by Warmke and Abbott (1961, pl. 26 h, text fig. 13 c). A specimen with five late whorls is 7 mm high.

Occurrence. — RR 230, PJ 302, USGS 18204, USGS 19860.

Genus **NISO** Risso

Risso, 1826, Histoire naturelle des principales productions de l'Europe méridionale, vol. 4, p. 218.

Type species (by monotypy), *Niso eburnea* Risso.

Niso grandis Gabb ? Pl. 47, figs. 3, 4

1873. *Niso grandis* Gabb, Amer. Philos. Soc., Trans., new ser., vol. 15, p. 227.
1917. *Niso grandis* Gabb, Maury, Bull. Amer. Paleont., vol. 5, No. 29, p. 143, pl. 24, fig. 8.
1922. *Niso grandis* Gabb, Pilsbry, Acad. Nat. Sci. Philadelphia, Proc., vol. 73, p. 394, pl. 34, fig. 17.

Of medium to large size. Whorls smooth, flat to slightly convex. At irregular intervals there are conspicuous growth lines in addition to a minute axial striation. Whorls usually with an angulated periphery but less so in adult stages.

Type. — Acad. Nat. Sci. Philadelphia, No. 3018.

Type locality. — Dominican Republic (Cercado Fm.: middle Miocene).

This species occurs in the Melajo Clay. Most of the specimens are immature, and their whorls have an angulated periphery. But late whorls may be entirely rounded at the periphery. However, there is some variability as to the peripheral angulation as there are immature specimens showing no angulation on the spire whorls.

The Melajo specimens tend to have flatter whorls than those from the Cercado Formation of the Dominican Republic. The largest Dominican shells at hand have up to 18 whorls reaching a height of 23.3 mm. They show a similar variability of the peripheral angulation of the whorls as the Melajo specimens. The same is true for material from the Bowden Formation of Jamaica.

However, the Bowden specimens have a somewhat larger apical angle, their whorls are lower on an average, and their umbilicus is slightly wider.

According to a topotype of *N. striatula* Böse (*in* Böse and Toula, 1910, p. 227, pl. 12, fig. 7), *i.e.* from late Miocene beds at kilometer 70 of the Tehuantepec Railroad, Mexico, that species has a larger apical angle, and lower and more convex whorls. The same applies to specimens from the Gatun Formation of the Panama Canal Zone.

Rutsch (1942, p. 136, pl. 4, figs. 7a, 7b) recorded a single large, but incomplete specimen from the Springvale Formation as *Niso* sp. ind. aff. *grandis*. This specimen seems to be closer to *N. striatula*. Additional specimens from Springvale are somewhat more slender, and have flat whorls. Their umbilicus is wider than in *N. grandis*, and the umbilical margin is more sharply angulated. These specimens then are difficult to distinguish from *N. willcoxiana gunteri* Mansfield (1930, p. 91, pl. 12, fig. 9) from the upper Miocene of Florida.

Occurrence.—EL 1810, K 9797, PJ 285, USGS 18399, USGS 21178.

Niso species

A small species of *Niso* occurs at Matura but is represented only by a few mostly immature specimens. The whorls are slightly convex and smooth, the suture not deep, the body whorl not sharply angulated at the periphery, and the umbilicus small. A specimen with 10 whorls including the protoconch measures 4.9 mm in height.

Occurrence.—K 10924, JS 67, RR 230, PJ 302, USGS 18204, USGS 19860.

Family **FOSSARIDAE**

Genus **FOSSARUS** Philippi

Philippi, 1841, Archiv für Naturgeschichte, year 7, vol. 1, pp. 42, 47.

Type species (by monotypy), *Fossarus adansonii* Philippi (= *Turbo ambiguus* Linné).

Subgenus **ISELICA** Dall

Dall, 1918, Biol. Soc. Washington, Proc., vol. 31, p. 137 (new name for *Isapis* H. and A. Adams, The Genera of Recent Mollusca, vol. 1, p. 320, 1854).

Type species (by monotypy), *Narica (?) anomala* C. B. Adams.

Fossarus (Iselica) anomalus (C. B. Adams) ? Pl. 47, fig. 5

1850. *Narica (?) anomala* C. B. Adams, Contributions to Conchology, No. 7, p. 109.
1890. *Isapis caloosaensis* Dall, Wagner Free Inst. Sci. Philadelphia, Trans., vol. 3, pt. 1, p. 187, pl. 9, fig. 10.
1892. *Fossarus (Isapis) anomala* C. B. Adams, Dall, *ibidem,* vol. 3, pt. 2, p. 322.
1950. *Narica (?) anomala* C. B. Adams, Clench and Turner, Occas. Papers on Mollusks, vol. 1, No. 15, p. 256, pl. 39, fig. 14.
1961. *Iselica anomala* C. B. Adams, Warmke and Abbott, Caribbean Seashells, p. 85, pl. 15 e.

Shell small, solid. Protoconch immersed at the tip, smooth, consists of a little less than one volution. Early sculpture of three strong spirals which appear almost simultaneously. Between the spirals there are numerous fine, slightly prosocline axials. Uppermost one of the three primary spirals forming a prominent shoulder. Between shoulder and upper suture a fourth, but weaker, spiral appears which is strongly noded by the axials. Last whorl with eight spirals which are slightly beaded by the axials. Umbilicus wide. Aperture oval. Outer lip denticulated by spirals. Inner lip with callus which is heavier on lower part. Columella with a small, transverse plait opposite the umbilicus.

Lectotype.—Museum of Comparative Zoology, Cambridge, Mass., No. 186034.

Type locality.—Jamaica.

This form is represented by 20 specimens from Matura. All of them are immature as they do not have more than 2½ sculptured whorls. No Recent specimens are at hand, but they are said to reach a height of 5 mm.

The type specimen of *F. anomala floridana* Mansfield (1930, p. 112, pl. 15, fig. 6) from the Miocene *Cancellaria* Zone of Florida is immature. Its spirals are less prominent, and its axial sculpture consists of more numerous and more closely set, but weaker threads.

F. florius Gardner [1926-1950 (1947), p. 571, pl. 57, fig. 30], from the Shoal River Formation of Florida, is related to *F. anomala floridana* and may be its forerunner. It differs mainly from it by its much less inflated protoconch. *F. florius* has a larger aperture than the Matura specimens. They both have the same number of spirals on the whorls, but in *F. florius* the shoulder is formed by the uppermost spiral, whereas the Matura fossils still have a spiral between shoulder and upper suture.

Occurrence.—JS 67, PJ 302.

Distribution.—Pliocene, Florida. Recent, West Indies.

Family **HIPPONICIDAE**

Genus **HIPPONIX** Defrance

Defrance, 1819, Journal de physique, de chimie, d'histoire naturelle et des arts, vol. 88, p. 217.

Type species (by subsequent designation, Gray, 1847, Zool. Soc. London, Proc., pt. 15, p. 157), *Patella cornucopia* Lamarck.

Hipponix cf. **antiquatus** (Linné) Pl. 47, figs. 6, 7

A single specimen (height 9 mm, greatest diameter 14.4 mm) from Matura is available. The apex is closer to the margin than to the center of the shell. The sculpture consists of coarse, concentric lamellae. The specimen is so worn that no radial sculpture is preserved. The shell wall is thick and solid and the horseshoe-shaped muscle scar well recognizable.

H. antiquatus (Linné) (Systema Naturae, ed. 12, p. 1259, 1767) has been recorded from the Pleistocene of Cuba and Barbados. In Recent seas it ranges from southeastern Florida through the West Indies to Brasil (see also Weisbord, 1962, p. 201).

Occurrence.—RR 230.

Family **CALYPTRAEIDAE**

Genus **CHEILEA** Modeer

Modeer, 1793, Kongl. Vetenskaps Academiens Nya Handlingar, vol. 14, pp. 110, 111.

Type species (by subsequent designation, Woodring, 1928, Carnegie Inst. Washington, Pub. 385, p. 374), *Patella equestris* Linné.

Cheilea cf. **equestris** (Linné)

A single, immature specimen (greatest diameter 8.1 mm) from Matura is available. Protoconch of about 1½ whorls followed by a smooth area. Subsequent sculpture consists of fine radials with interspaces of about their own width. Growth somewhat irregular. Apex eccentric. Internal process with its lateral opening facing the slope opposite the steepest slope of the shell.

Fossil records of this widespread Recent species are rare. It has been reported from the Pliocene of Florida by Dall [1890-1903 (1892), p. 348] and from the Bowden Formation of Jamaica by Woodring (1928, p. 375, pl. 30, figs. 1, 2).

Occurrence. — PJ 302.

Genus **CREPIDULA** Lamarck

Lamarck, 1799, Mém. Soc. Hist. Nat. Paris, p. 78.

Type species (by monotypy), *Patella fornicata* Linné.

Subgenus **CREPIDULA** s. str.

Crepidula (Crepidula) cf. maculosa Conrad Pl. 47, figs. 8, 9

A single adult but incomplete specimen, from the Melajo Clay, is available. The apex is free, the protoconch consists of a little more than one volution. The deck is partly broken, but its insertion on the right side is preserved. Just in front of it there is a muscle scar which is typical for *C. maculosa* according to Stingley (1952, p. 84), who carefully compared this species with *C. fornicata.*

Specimens from the Savaneta Glauconitic Sandstone Member of the Springvale Formation are greatly inflated like the Melajo shell, thus looking similar to many of the Recent shells of *C. fornicata* at hand. However, none of them has the interior exposed. They have been identified as *C. fornicata* by Maury (1925, p. 244), Vokes (1938, p. 5), and Rutsch (1942, p. 103).

A number of immature specimens from the Melajo Clay and the Matura shell bed are listed as *Crepidula* sp.

Occurrence. — Hutch 51.

Crepidula plana Say Pl. 47, figs. 10, 11

1822. *Crepidula plana* Say, Acad. Nat. Sci. Philadelphia, Jour., 1st ser., vol. 2, p. 226.
1957. *Crepidula plana* Say, Woodring, U. S. Geol. Sur., Prof. Paper 306-A, p. 79, pl. 19, figs. 1-3. For further citations see this publication.
1961. *Crepidula (Ianacus) plana* Say, Warmke and Abbott, Caribbean Seashells, p. 87, pl. 15 j.
1962. *Crepidula plana triangula* Weisbord, Bull. Amer. Paleont., vol. 42, No. 193, p. 212, pl. 19, figs 11-13.

This species is represented by a few, mostly immature specimens from the Melajo Clay. Their protoconch which is appressed to the shell is still preserved and consists of almost 1½ volutions. The shells are slightly convex or flat and are sculptured by more or less regular incrementals. Deck with an inconspicuous median elevation.

Weisbord described *C. plana triangula* from the Pliocene Mare Formation of Venezuela. It is based on the holotype and one immature specimen. The differences from *C. plana s. str.* pointed out, *e.g.*, the triangular shape and the overhanging anterior margin, can be observed in Recent specimens of *C. plana.*

Occurrence.—KR 11862, USGS 18399, USGS 18634.

Distribution.—Miocene to Recent (see Woodring, 1957, p. 79).

Subgenus **BOSTRYCAPULUS** Olsson and Harbison

Olsson and Harbison, 1953, Acad. Nat. Sci. Philadelphia, Mon. 8, p. 279.

Type species (by original designation), *Patella aculeata* Gmelin.

Crepidula (Bostrycapulus) aculeata (Gmelin)

1791. *Patella aculeata* Gmelin, Systema Naturae, ed. 13, p. 3693.
1864. *Crepidula aculeata* "Lamarck", Guppy, Trans. Sci. Assoc. Trinidad for 1864, p. 35; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 15.
1867. *Crepidula aculeata* "Lamarck", Guppy, Proc. Sci. Assoc. Trinidad, pt. 3, p. 160; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 39.
1874. *Crepidula aculeata* "Lamarck", Guppy, Geol. Mag., new ser., decade 2, vol. 1, p. 441.
1925. *Crepidula aculeata* Gmelin, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 243.
1953. *Crepidula (Bostrycapulus) aculeata* Gmelin, Olsson and Harbison, Acad. Nat. Sci. Philadelphia, Mon. No. 8, p. 280.
1961. *Crepidula aculeata* Gmelin, Warmke and Abbott, Caribbean Seashells, p. 86, pl. 15 i.

C. aculeata has been reported from Matura more than a century ago. The present collections contain only one immature specimen (length 6.5 mm). Its protoconch consists of 1½ volutions and is appressed to the shell. The radial ribs are inconspicuous, because they are strongly worn. Maury reported specimens measuring up to 25 mm in length from Matura.

Occurrence.—JS 67.

Distribution.—Miocene (?) to Recent (see Weisbord, 1962, p. 215).

Genus **CALYPTRAEA** Lamarck

Lamarck, 1799, Mém. Soc. Hist. Nat. Paris, p. 78.

Type species (by monotypy), *Patella chinensis* Linné.

Calyptraea centralis (Conrad)

1841. *Infundibulum centralis* Conrad, Amer. Jour. Sci., 1st ser., vol. 41, p. 348.

1867. *Trochita candeana* d'Orbigny, Guppy, Proc. Sci. Assoc. Trinidad, pt. 3, p. 160; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 39.
1874. *Trochita candeana* d'Orbigny, Guppy, Geol. Mag., new ser., decade 2, vol. 1, p. 440.
1910. *Trochita collinsii* Gabb, Guppy, Agric. Soc. Trinidad and Tobago, Soc. Paper No. 440, p. 5; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 148.
1912. *Calyptraea centralis* Conrad, Maury, Acad. Nat. Sci. Philadelphia, Jour., ser. 2, vol. 15, p. 100, pl. 13, fig. 6.
1925. *Calyptraea centralis* Conrad, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 243, pl. 43, fig. 2.
1938. *Calyptraea centralis* (Conrad), Vokes, Amer. Museum Novitates, No. 988, p. 5.
1942. *Calyptraea* cf. *centralis* (Conrad), Rutsch, Verh. Naturf. Ges. Basel, vol. 54, p. 103.
1947. *Calyptraea centralis* (Conrad), Gardner, U. S. Geol. Sur., Prof. Paper 142-H, p. 562, pl. 56, figs. 3, 4, 5. For additional citations see this publication.
1957. *Calyptraea centralis* (Conrad), Woodring, U. S. Geol. Sur., Prof. Paper 306-A, p. 80. For additional citations see this publication.

Type. — Missing according to Moore (1962, p. 47).

Type locality. — Natural Well, North Carolina (Duplin Fm.: late Miocene).

C. centralis occurs in the Melajo Clay, in the Courbaril beds, and at Matura. As pointed out by several authors Miocene specimens are larger than Recent shells, but they are usually considered as the same species. Specimens from the base of the Melajo Clay, the Courbaril beds, and Matura reach a diameter of up to 15 mm. But at the type locality of the Melajo Clay, where this species is represented by at least 200 shells, they have an average diameter of 6 to 7 mm.

The protoconch of this species consists of about 1½ whorls. On many (but not all) specimens from the Melajo Clay there are fine concentric riblets on the last part of the protoconch. However, there are transitions from smooth to incremental lines to riblets which seem to indicate that this feature is not relevant taxonomically.

Occurrence. — Melajo River area: EL 1810, Hutch 47, KR 11862, K 9903, RR 290, PJ 285, USGS 18399, USGS 18411, USGS 21178. Point Courbaril: K 12255, PJ 212, USGS 10991, USGS 20432, USGS 20434. Matura Bay: JS 67, RR 230, PJ 302, USGS 18204, USGS 19860.

Distribution. — Trinidad: Savaneta Glauconitic Sandstone Member and Melajo Clay Member, both of Springvale Fm., Courbaril beds of Upper Morne l'Enfer Fm., Matura shell bed. Outside Trinidad: Miocene to Recent, eastern United States to Caribbean (see Gardner and Woodring).

Genus **TROCHITA** Schumacher

Schumacher, 1817, Essai d'un nouveau système des habitations des vers testacés, pp. 57, 184.

Type species (by subsequent designation, Rehder, 1943, Biol. Soc. Washington, Proc., vol. 56, p. 41), *Trochita spiralis* Schumacher (= *Trochus radians* Lamarck).

Trochita radians (Lamarck) Pl. 47, figs. 12, 13

1816. *Trochus radians* Lamarck, Encyclopédie méthodique, Histoire naturelle des vers, vol. 3, pl. 445, figs. 3a, 3b; liste, p. 10.

1957. *Trochita trochiformis* (Born), Woodring, U. S. Geol. Sur., Prof. Paper 306-A, p. 81, pl. 19, figs. 11-14. For additional citations see this publication.

This species is represented from Matura by a few, mostly immature specimens. The protoconch, which is preserved on two specimens, consists of a little more than one volution. All the Matura fossils are relatively low-spired, and their radial sculpture fine.

According to Recent shells of *T. radians* at hand the coarseness of the radial sculpture is variable to some degree. The specimens from the middle Miocene of Panama figured by Woodring, and the shell recorded as *T.* cf. *radians* from the middle Miocene of Venezuela (Jung, 1965, p. 497, pl. 66, figs. 1, 2) have coarser radials. *T. floridana* Olsson and Petit (1964, p. 563, pl. 81, figs. 2, 2a) from the Neogene Pinecrest beds of Florida has much coarser radials with narrow interspaces.

The Matura specimens seem to be the youngest fossils of *Trochita* in the Caribbean region.

Occurrence. — RR 230, PJ 302, USGS 18204, USGS 19860.

Distribution. — Late Oligocene (?) to Recent (see Woodring, 1957, p. 82).

Genus **CRUCIBULUM** Schumacher

Schumacher, 1817, Essai d'un nouveau système des habitations des vers testacés, pp. 56, 182.

Type species (by subsequent designation, Burch, 1946, Conchological Club Southern California, Proc., No. 56, p. 19), *Crucibulum planum* Schumacher (= *Patella auricula* Gmelin).

Subgenus CRUCIBULUM s. str.

Crucibulum (Crucibulum) subsutum Guppy Pl. 47, figs. 17-19

1864. *Crucibulum striatum* Say, Guppy, Trans. Sci. Assoc. Trinidad for 1864, p. 35; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 15.
1867. *Crucibulum subsutum* Guppy, Proc. Sci. Assoc. Trinidad, pt. 3, pp. 160, 172; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, pp. 39, 51.
1874. *Crucibulum subsutum* Guppy, Guppy, Geol. Mag., new ser., decade 2, vol. 1, pp. 435, 441, pl. 18, fig. 4.

Of medium size, solid, moderately high. Shell margin somewhat irregularly oval. Protoconch consists of a little more than one volution. First sculpture weak but rapidly increasing in strength; consists of low, rounded, and closely set, somewhat irregular radials. These radials tend to form groups of two, three, four, or even more which are separated from each other by broader and deeper interspaces. Margin of internal cup free.

Lectotype (herewith selected). — USNM 115612.

Dimensions of lectotype. — Height 12.7 mm, greatest diameter 24 mm.

Type locality. — Matura, Trinidad.

The type lot of this species consists of three specimens, two of which are immature. *C. subsutum* is not frequent at Matura. Guppy compared his species with *C. striatum* Say which ranges from Nova Scotia to South Carolina, but that species is a *Dispotaea* (see Abbott, 1954, p. 170, pl. 21 r). Immature specimens have part of their internal cup attached to the shell, and their sculpture is not yet developed typically.

There seems to be no species closely allied to *C. subsutum*. The sculpture of the lectotype is relatively weak compared with specimens from later collections and somewhat reminds *C. chipolanum* Dall [1890-1903 (1892), p. 349] from the Chipola Formation of Florida [Gardner, 1926-1950 (1947), p. 567, pl. 56, figs. 10, 11]. *C. chipolanum* has also been recorded from the middle Miocene Gatun Formation of the Panama Canal Zone by Woodring (1957, p. 82, pl. 19, figs. 6, 7). *C. auricula* (Gmelin) which ranges from middle Miocene to Recent (see Weisbord, 1962, p. 215) has a different aspect.

Occurrence. — JS 67, RR 230, USGS 18204, USGS 19860.

Distribution. — Known from type locality only.

Crucibulum (Crucibulum) piliferum Guppy Pl. 47, figs. 14-16

1864. *Crucibulum tubifer* (J. de C. Sowerby), Guppy, Trans. Sci. Assoc. Trinidad for 1864, p. 35; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 15.
1867. *Crucibulum piliferum* Guppy, Proc. Sci. Assoc. Trinidad, pt. 3, pp. 160, 172; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, pp. 39, 51.
1874. *Crucibulum piliferum* Guppy, Guppy, Geol. Mag., new ser., decade 2, vol. 1, pp. 435, 441.

Of medium size, thin-shelled, ranging in height from almost flat to moderately elevated. Base subcircular to somewhat irregularly oval. Protoconch consists of a little more than one volution, its axis strongly oblique to later axis. Protoconch followed by a smooth area of variable size. Sculpture consists of fine and closely set radials, some of which carry spines or even erect tubes at irregular intervals. Margin of internal cup free.

Lectotype (herewith selected). — USNM 115611.

Dimensions of lectotype. — Height 10.8 mm, greatest diameter 23 mm.

Type locality. — Matura, Trinidad.

The type lot of *C. piliferum* consists of three specimens, two of which are immature. The interior of the lectotype is concealed by hard matrix.

This species is well represented at Matura. Height and shape vary considerably. There seems to be no rule as to the development of spines; they may be numerous or almost lacking. They may be present near the apex already or be restricted to the margin. The internal cup of immature specimens is attached to the shell on one side but becomes free in adults.

C. piliferum evidently is related to the Recent West Coast *C. spinosum* (G. B. Sowerby II) which ranges from southern California to Chile according to Abbott (1954, p. 170). The collection of Recent *C. spinosum* at hand shows a variability similar to that of the Matura fossils. Specimens with only a few spines are not rare, and shells with reduced height are almost indistinguishable from analogue Matura specimens. *C. spinosum* has been recorded from the Esmeraldas Formation (late Miocene or early Pliocene) of Ecuador by Olsson (1964, p. 196, pl. 34, fig. 5). *C. piliferum* might eventually be treated as a synonym of *C. spinosum*, although the Recent species attains larger dimensions.

Immature specimens from the Courbaril beds and the Melajo Clay sometimes showing a few spines are identified as *C.* cf. *piliferum.*

Occurrence. — K 10924, JS 67, RR 230, PJ 302, USGS 18204, USGS 19860.

Distribution. — Known from type locality only.

Family **ERATOIDAE**

Genus **ERATO** Risso

Risso, 1826, Histoire naturelle des principales productions de l'Europe méridionale, vol. 4, p. 240.

Type species (by monotypy), *Voluta cypraeola* Brocchi.

Erato maugeriae Gray — Pl. 48, figs. 1, 2

1832. *Erato maugeriae* Gray, *in* G. B. Sowerby I, Conch. Illustrations, Cypraeidae, p. 15, pl. 7, fig. 47.
1861. *Erato* sp., Guppy, Trans. Sci. Assoc. Trinidad for 1864, p. 35; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 15.
1867. *Erato maugeriae* Gray, Guppy, Proc. Sci. Assoc. Trinidad, pt. 3, p. 160; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 39.
1874. *Erato maugeriae* Gray, Guppy, Geol. Mag., new ser., decade 2, vol. 1, p. 440.
1953. *Erato maugeriae* Gray, Olsson and Harbison, Acad. Nat. Sci. Philadelphia, Mon. No. 8, p. 266, pl. 60, fig. 7. For additional citations see this publication.
1961. *Erato (Hespererato) maugeriae* Gray, Warmke and Abbott, Caribbean Seashells, p. 90, pl. 23 c.
1962. *Erato venezuelana* Weisbord, Bull. Amer. Paleont., vol. 42, No. 193, p. 224, pl. 18, figs. 6, 7.

Small, stout, solid, with about 4½ whorls including protoconch. Body whorl strongly inflated above, rapidly narrowing toward base. Spire low. Outer lip thick, denticulated, almost as high as apex. Inner lip with a varying number of inconspicuous denticles. A thin layer of callus spreads over the parietal region and some distance over the dorsal surface of the shell. Aperture long, widening at anterior canal.

This species is fairly well represented at Matura. The denticles of the outer lip may be weak in Recent specimens, but they remain fairly strong in Matura fossils. The prominence of the denticles on the inner lip is variable; part of them may be lacking at all.

E. venezuelana from the Pliocene Mare Formation of Venezuela is based on a single specimen which probably is not fully developed. The outer lip of a specimen from Matura is not thickened and slopes down from the suture instead of being strongly shouldered. It has the same dimensions as the holotype of *E. venezuelana* and looks like it. These two specimens have an "unfinished" appearance, although there are even smaller shells showing the features of adults.

E. domingensis Maury (1917, p. 118, pl. 21, fig. 8) from the Cercado Formation of the Dominican Republic is a smaller species with only three whorls including the protoconch. It is easily separable from *E. maugeriae* by its prominent, longitudinal ridge on the columella which is followed toward the interior by a concave area, and the lack of denticles on the inner lip. *E. domingensis trochala* Woodring (1928, p. 321, pl. 22, fig. 12), from the Bowden Formation of Jamaica, is also smaller than *E. maugeriae.* It has a weak longitudinal ridge on the columella in front of a shallowly concave area carrying a few denticles on its lower part.

Occurrence. — JS 67, RR 230, PJ 302, USGS 18204, USGS 19860.

Distribution. — Miocene (?), Pliocene to Recent (see Weisbord, 1962, p. 225).

Genus **TRIVIA** Broderip

Broderip, 1837, Penny Cyclopaedia, vol. 8, p. 256.

Type species (by subsequent designation, Gray, 1847, Zool. Soc. London, Proc., pt. 15, p. 142), *Cypraea europaea* Montagu.

Subgenus **PUSULA** Jousseaume

Jousseaume, 1884, Soc. Zool. France, Bull., vol. 9, p. 99.

Type species (by subsequent designation, Roberts, 1885, *in* Tryon's Manual of Conchology, vol. 7, p. 161), *Cypraea radians* Lamarck.

Trivia (Pusula) radians orientalis (Schilder) Pl. 48, figs. 3-5

1939. *Pusula (Pusula) radians orientalis* Schilder, Abh. Schweiz. Pal. Ges., vol. 62, p. 11, text figs. 2, 3.

Holotype. — Natural History Museum Basel, No. H 11228.

Dimension of holotype. — Length 17.1 mm.

Type locality. — Matura, Trinidad.

This form is based on two fragments. The holotype consists of the inner lip and part of the anterior dorsal surface showing part of the dorsal furrow with some adjoining pustules. The only paratype has the inner and outer lips preserved, but not the dorsal surface.

These fragments make a comparison with the Recent West Coast *T. radians* (Lamarck) unsatisfactory. Better specimens from Matura might prove to be conspecific with *T. radians,* because the differences pointed out by Schilder seem to fall within the variability of *T. radians.*

Occurrence. — Matura, Trinidad.

Distribution. — Known from type locality only.

Family **CYPRAEIDAE**

Genus **CYPRAEA** Linné

Linné, 1758, Systema Naturae, ed. 10, p. 718.

Type species (by subsequent designation, Montfort, 1810, Conchyliologie systématique, vol. 2, p. 631), *Cypraea tigris* Linné.

Cypraea species — Pl. 48, figs. 6, 7

Three immature specimens from Matura are available. The last whorl is moderately inflated, the outer lip not yet thickened. The apex is sunken, but the three-whorled protoconch rises from the middle of this depressed area.

Olsson and Petit (1964, pp. 556-561) discussed some species from the Neogene of Florida and the Carolinas. They gave generic rank to *Siphocypraea* Heilprin (1887, p. 86), type species by monotypy: *Cypraea problematica* Heilprin (Pliocene, Florida), stating that Siphocypraeas differ from other Cypraeas in having a depressed spire in juvenile stages. However, the same feature is shown by the Recent Western Pacific *C. tigris* Linné, the type species of *Cypraea,* and by immature specimens of the Recent southern Caribbean *C. mus* Linné which is the type species of *Muracypraea* Woodring (1957a, p. 88). Members of these supraspecific categories can be identified only, if adult specimens are available.

Comparison of the Matura specimens with shells of the corresponding growth stage of *C. problematica* and *C. mus* shows that they are intermediate in characters. The general outline of the Matura fossils is much like that of *C. mus,* whereas immature *C. problematica* is more slender, and its outer lip is arched upwards posteriorly producing a more deeply depressed area than in *C. mus* or the Matura shells. On the other hand the protoconch of *C. problematica* rises considerably above the surface of the depressed area as in the Matura specimens, whereas in *C. mus* this is the case to a lesser extent only.

Besides the three immature shells there is an adult specimen from Matura (height 55 mm). Its inner and outer lips are preserved, but not the dorsal surface. It is uncertain whether it is the adult of the immature form mentioned above or some other species. It lacks the flanges bordering the anterior canal which are typical in *C. mus,* and looks unlike any living Caribbean species. Its poor state of preservation leaves affinities to other species uncertain.

Occurrence. — RR 230, USGS 18204.

Subgenus **EROSARIA** Troschel

Troschel, 1863, Das Gebiss der Schnecken zur Begründung einer natürlichen Classification, vol. 1, p. 205.

Type species (by subsequent designation, Jousseaume, 1884, Bull. Soc. Zool. France, vol. 9, p. 96), *Cypraea erosa* Linné.

Cypraea (Erosaria) aliena (Schilder) Pl. 48, figs. 8-10

1939. *Erosaria (Ravitrona) aliena* Schilder, Abh. Schweiz. Pal. Ges., vol. 62, p. 20, text fig. 20.
1947. *Cypraea aliena* (Schilder), Ingram, Bull. Amer. Paleont., vol. 31, No. 122, p. 7.

Holotype. — Natural History Museum Basel, No. H 11263.

Dimensions of holotype. — Height 15 mm, greatest diameter 9.7 mm.

Type locality. — Matura, Trinidad.

This species is known from the holotype only. As pointed out by Schilder it is related to the Recent Caribbean *C. spurca acicularis* Gmelin as well as to the Recent West Coast *C. albuginosa* Gray. The type of *C. aliena* is somewhat worn, part of its spire is visible, but it lacks any remains of colour patterns. It does not seem to be entirely adult, and additional specimens might show that it represents one of the above mentioned Recent species.

Occurrence. — Matura, Trinidad.

Distribution. — Known from type locality only.

Family **OVULIDAE**

Genus **NEOSIMNIA** Fischer

Fischer, 1884, Manuel de Conchyliologie, p. 664.

Type species (by monotypy), *Bulla spelta* Linné.

Neosimnia cf. uniplicata (G. B. Sowerby II) Pl. 48, figs. 11, 12

Of medium size, stout. Outer lip somewhat thickened. Parietal callus prominent. There is a longitudinal ridge on the columella within the aperture with a slightly concave area in front of it, and a spiral ridge on the posterior end of the columella. Sculpture consists of fine growth lines and a few spiral grooves at each end of the shell.

This form is represented by a single shell (height 10.2 mm) from Matura. It is considerably smaller than the Recent *N. uniplicata* (G. B. Sowerby II) (Thes. Conch., pt. 9, p. 478, pl. 100, figs. 30, 31, 32, 1848; Zool. Soc. London, Proc., pt. 16, p. 135, 1849) which ranges from Virginia to Florida and the West Indies according to Warmke and Abbott (1961, p. 92). *N. uniplicata* shows some variability as to stoutness and size. The fine spiral striation covers the entire body whorl in young stages, but is restricted to the ends in adults as stated by Dall (1889 a, p. 236) which suggests that the Matura shell is adult.

A similar species is *N. immunita* (Guppy) (1873a, p. 78, pl. 1, fig. 7), from the Bowden Formation of Jamaica, which has been redescribed by Woodring (1928, p. 315, pl. 21, figs. 3-8). Bowden specimens, with dimensions similar to those of the Matura shell, are somewhat more slender, the posterior spiral plication is less pronounced, and the aperture narrower. Woodring suggested that *N. wisewoodae* (Maury) (1917, p. 113, pl. 22, fig. 17) from the middle Miocene Cercado Formation of the Dominican Republic might be a synonym of *N. immunita*.

Occurrence. — USGS 18204.

Family **NATICIDAE**

Genus **NATICA** Scopoli

Scopoli, 1777, Introductio ad historiam naturalem, p. 392.

Type species (by subsequent designation, Harris, 1897, Catalogue of Tertiary Mollusca in the British Museum; pt. 1, Australasian, p. 255), *Nerita vitellus* Linné.

Subgenus **NATICARIUS** Duméril

Duméril, 1806, Zoologie analytique . . ., p. 164.

Type species (by monotypy), *Nerita canrena* Linné. See Iredale, Malac. Soc. London, Proc., vol. 12, p. 83, 1916.

Natica (Naticarius) canrena (Linné)

1758. *Nerita canrena* Linné, Systema Naturae, ed. 10, p. 776.

?1867. *Natica canrena* Linné, Guppy, Proc. Sci. Assoc. Trinidad, pt. 3, p. 156; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 35.
?1874. *Natica canrena* Linné, Guppy, Geol. Mag., new ser., decade 2, vol. 1, p. 437.
1910. *Natica canrena* Linné, Guppy, Agric. Soc. Trinidad and Tobago, Soc. Paper No. 440, p. 5; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 148.
1925. *Natica canrena* (Linnaeus), Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 238, pl. 40, fig. 8.
1925. *Natica canrena* (Linnaeus), Mansfield, U. S. Nat. Mus., Proc., vol. 66, art. 22, p. 57.
1938. *Natica (Naticarius) canrena* Mörch, Vokes, Amer. Museum Novitates, No. 988, p. 5.
1942. *Natica (Naticarius) canrena* (Linné), Rutsch, Verh. Naturf. Ges. Basel, vol. 54, p. 103.
1962. *Natica (Naticarius) canrena* (Linnaeus), Weisbord, Bull. Amer. Paleont., vol. 42, No. 193, p. 244, pl. 23, figs. 1, 2. For additional citations see this publication.

This species is represented by a few shells from the Melajo Clay. As stated elsewhere (Jung, 1964) the most diagnostic features of species belonging to the group of *N. canrena* are the size of the shell, the size of the initial whorl, and the number of nuclear whorls. The protoconch of the Melajo specimens consists of a little more than two whorls like that of specimens from Springvale Quarry. The initial whorl is somewhat smaller than that of Recent shells.

Occurrence. — Hutch 51, USGS 18411, USGS 18634.

Distribution. — Miocene to Recent (see Weisbord, 1962, p. 246).

Natica (Naticarius) aff. **canrena** (Linné) Pl. 48, figs. 13, 14

Of medium size, with about two nuclear volutions and up to 3½ postnuclear whorls. Initial whorl small. Spire high. Sculpture consists of proscline wrinkles on upper part of whorl. Funicle small.

This form is abundant in the Melajo Clay and the Courbaril beds but much less so at Matura. Although the height of the spire usually is a variable feature, this form has a consistently higher spire than *N. canrena.* It does not reach the dimensions of *N. canrena,* and its initial whorl is much smaller. Although Guppy cited *N. canrena* from Matura, the present Matura shells are provisionally identified as *N.* aff. *canrena.*

Some specimens from the Courbaril beds reach a larger size than those from the Melajo Clay. They are more inflated and resemble *N. stenopa* Woodring (1957, p. 85, pl. 20, figs. 4-6) from the upper part of the Gatun Formation of the Panama Canal Zone. However, *N. stenopa* has more nuclear whorls. The figured specimen from the Courbaril beds (Pl. 48, fig. 13) has a somewhat everted basal lip.

The specimens from the Melajo Clay probably are immature. They have a slender appearance as their whorls are not much inflated. They are identical with Courbaril specimens of the same size.

Occurrence.—Melajo River area: Hutch 47, Hutch 51, KR 11862, K 9797, K 9813, K 9816, K 9903, PJ 285, USGS 18399, USGS 18634, USGS 21178. Point Courbaril: K 1429, K 8399, K 12013, K 12255, PJ 212, USGS 10991, USGS 20432, USGS 20433, USGS 20434, USGS 21778. Matura Bay: JS 67, RR 230, PJ 302, USGS 18204, USGS 19860.

Genus **TECTONATICA** Sacco

Sacco, 1890, Mus. Zool. Anat. Comp. R. Univ. Torino, Bol., vol. 5, No. 86, p. 33.

Type species (by monotypy), *Natica tectula* Bonelli.

Tectonatica pusilla (Say) Pl. 48, fig. 15

1822. *Natica pusilla* Say, Acad. Nat. Sci. Philadelphia, Jour., 1st ser., vol. 2, pt. 2, p. 257.
1928. *Tectonatica pusilla* (Say), Woodring, Carnegie Inst. Washington, Pub. 385, p. 384, pl. 30, fig. 12. For further citations see this publication.
1930. *Tectonatica pusilla* (Say), Mansfield, Florida State Geol. Sur., Bull. No. 3, p. 123, pl. 19, fig. 4. For further citations see this publication.
1953. *Tectonatica pusilla* (Say), Olsson and Harbison, Acad. Nat. Sci. Philadelphia, Mon. No. 8, p. 269, pl. 57, figs. 4, 4a.
1961. *Tectonatica pusilla* Say, Warmke and Abbott, Caribbean Seashells, p. 97, pl. 17 d.

Small, inflated, solid, with about four whorls. Suture clearly incised. Surface smooth except for growth lines. Parietal callus thick, continuous into the umbilicus which it completely fills leaving a prominent groove along the umbilical margin.

This species is represented from Matura by about 20 specimens. Although not recorded, it occurs in the Savaneta Glauconitic Sandstone Member of the Springvale Formation, but it has not been found in the Melajo Clay nor in the Courbaril beds. The spire of most of the Matura shells is low. Recent specimens show a considerable variability in this respect.

T. venezuelana Weisbord (1962, p. 248, pl. 23, figs. 5, 6), from the Pliocene Mare Formation of Venezuela, is said to have 3½ whorls and possibly represents immature, low-spired *T. pusilla*. *T. antilleana* Weisbord (1962, p. 249, pl. 43, figs. 22, 23), also from the Pliocene of Venezuela, is based on a single, incomplete specimen, and is virtually unrecognizable. *T. agna* Woodring (1957, p. 88, pl. 17, fig. 46), from the middle and upper parts of the Gatun Formation of the Panama Canal Zone (middle and late Miocene), is said to differ from *T. pusilla* by its "more distinct depresssion on the umbilical callus lobe and the narrower groove at the outer edge of the lobe." The depression is not always present in Recent shells of *T. pusilla,* and the prominence of the groove around the umbilical callus is variable. But the numerous topotypes of T. *agna* at hand are consistently smaller than *T. pusilla*.

Occurrence.—JS 67, RR 230, PJ 302, USGS 18204, USGS 19860.

Distribution.—Cercado and Gurabo Formations (middle Miocene), Dominican Republic. Bowden Formation, Jamaica. Upper Miocene, Florida, Trinidad. Pliocene, South Carolina, Florida, Venezuela (?). Living, Eastern United States, Gulf States, and West Indies.

Genus **POLINICES** Montfort

Montfort, 1810, Conchyliologie systématique, vol. 2, p. 223.

Type species (by original designation), *Polinices albus* Montfort (= *Natica mamillaris* Lamarck = *Natica brunnea* Link = *Albula hepatica* Röding).

Polinices stanislasmeunieri Maury Pl. 48, figs. 16-18

1917. *Polinices stanislas-meunieri* Maury, Bull. Amer. Paleont., vol. 5, No. 29, p. 136, pl. 23, figs. 15, 16.
1925. *Polinices stanislas-meunieri* Maury, Maury, *ibidem,* vol. 10, No. 42, p. 240, pl. 40, fig. 7.
1925. *Polinices caparona* Maury, *ibidem,* p. 241, pl. 40, fig. 6.
1925. *Polinices springvalensis* Maury, *ibidem*, p. 241, pl. 40, fig. 6.
1938. *Polinices stanislas-meunieri* Maury, and *Polinices springvalensis* Maury, Vokes, Amer. Museum Novitates, No. 988, p. 5.
1942. *Polinices (Dallitesta) stanislaus-meunieri* Maury, and *Polinices (Dallitesta) stanislas-meunieri springvalensis* Maury, Rutsch, Verh. Naturf. Ges. Basel, vol. 54, p. 103.
1957. *Polinices stanislas-meunieri* Maury, Woodring, U. S. Geol. Sur., Prof. Paper 306-A, p. 90, pl. 21, figs. 11-14. For additional citations see this publication.

Of medium to large size. Protoconch consists of about two whorls. Postnuclear whorls 4½. Spire moderately high. Body whorl strongly inflated and mostly somewhat shouldered. Spiral lineation fine, but well recognizable on unworn specimens. Parietal callus heavy. Umbilical callus small; umbilical opening usually small, but somewhat variable in size.

Type. — Cornell University, Paleont. Museum, Ithaca, N. Y., No. 36931.

Type locality. — Río Cana, Dominican Republic (middle Miocene).

This species occurs in the Melajo Clay and is represented by well over 100 specimens. They show that *P. stanislasmeunieri* is a strongly variable species in several respects: height of the spire, inflation of body whorl, prominence of shoulders, and size of umbilical opening.

P. caparonus Maury from the middle Miocene Manzanilla Formation of Trinidad is considered to represent this species. The largest Melajo shells reach the dimensions of Maury's type specimen. *P. subangulatus* Nelson (1870, p. 195, pl. 6, figs. 12, 13; not fig. 4) from the Miocene Tumbes Formation of Peru is also a variable species according to Olsson (1932, p. 209, pl. 24, figs. 1, 2). Paratypes and topotypes of *P. subangulatus* at hand show that it tends to have a heavier shell; its shoulders may reach a prominence which is never attained by Melajo specimens. The relations to other species have been discussed by Woodring (1957, pp. 90-91).

Occurrence. — EL 1810, Hutch 51, KR 11862, K 9797, K 9902, K 9903, RR 290, PJ 285, USGS 18399, USGS 18634, USGS 21178.

Distribution. — Middle to late Miocene in the Caribbean region (see Woodring, 1957, p. 91).

Polinices species

The genus *Polinices* is represented from Matura by a single, somewhat worn, immature shell (height 16.2 mm, diameter 13.8 mm). It consists of 4½ whorls including the protoconch. Its spire is low, the parietal callus heavy, and the umbilical opening relatively large. Umbilical callus small, forming a right angle with the lower margin of the parietal callus.

The specific affinities of this immature shell are uncertain, although immature specimens of the Recent Eastern Pacific *P. uber* (Valenciennes) contained in the collections of the U. S. National Museum closely resemble it.

Occurrence. — RR 230.

Family CYMATIIDAE

Genus CYMATIUM Röding

Röding, 1798, *in* Museum Boltenianum, p. 129.

Type species (by subsequent designation, Dall, 1904, Smithsonian Misc. Coll., vol. 47, No. 1475, p. 133), *Cymatium femorale* Röding (= *Murex femorale* Linné).

Cymatium species

A single, immature shell (height 25.4 mm) from the base of the Melajo Clay is available. The protoconch is missing; 4½ whorls are preserved. Early sculpture consists of five spirals with wider interspaces which are crossed by inconspicuous axials numbering about 16 on early whorls. Subsequent whorls are shouldered a little above the middle. The shoulder carries prominent nodes (nine on last preserved whorl). Siphonal canal long, bent backwards. Columella with numerous denticles.

The Melajo specimen is too immature even for subgeneric assignment. Rutsch (1942, p. 143, pl. 9, fig. 5) described *C. kugleri* from Springvale Quarry, but that species has a shorter spire, an inconspicuous shoulder, and a more inflated body whorl.

Occurrence. — USGS 18634.

Genus COLUBRARIA Schumacher

Schumacher, 1817, Essai d'un nouveau système des habitations des vers testacés, p. 251.

Type species (by monotypy), *Colubraria granulata* Schumacher.

Colubraria species

A single fragment from the base of the Melajo Clay, consisting of the protoconch and four sculptured whorls, is available. The protoconch has a little more than 2½ whorls. Initial whorl small and planispiral, but subsequent whorls rapidly enlarging and trochospiral. Early sculpture reticulate, consisting of six spirals which are crossed by numerous, somewhat opisthocline axials. On subsequent whorls secondary spirals are intercalated. There are two varices per whorl.

The shape of the protoconch and the early sculpture suggest a relationship with the Recent West Indian *C. lanceolata* (Menke)

(Synopsis methodica Molluscorum . . ., p. 87, 1828). The protoconch of *C. lanceolata* has been figured by Campbell (1961, p. 138, fig. 3). *C. lanceolata,* however, has less, but stronger varices than the Melajo specimen.

Occurrence. — USGS 18411.

Family **BURSIDAE**

Genus **BURSA** Röding

Röding, 1798, *in* Museum Boltenianum, p. 128.

Type species (by subsequent designation, Jousseaume, 1881, Soc. Zool. France, Bull., vol. 6, p. 174), *Bursa mammata* Röding (= *Murex bufonius* Gmelin).

Subgenus **BURSA** s. str.

Bursa (Bursa) aff. thomae (d'Orbigny) Pl. 49, figs. 1, 2

Of medium size. Protoconch consists of 3½ inflated, rapidly enlarging whorls. Postnuclear whorls a little more than four. Early sculpture consists of six beaded spirals which start abruptly. The fourth spiral from the upper suture is stronger and develops into a prominent shoulder subsequently. Varices two per whorl, almost alined on successive whorls, forming a sigmoid curve, when viewed from top. Shoulder of later whorls with two prominent knobs between varices. Spirals above shoulder weak. Body whorl with two spirals below shoulder which are prominent near the varices only. Their interspaces with weak, additional spirals. Inner lip with many elongate denticles. Outer lip with four pairs of denticles; their position corresponds externally to the interspaces of the spirals. Anterior canal bent backwards. Posterior canal well separated from parietal wall. Posterior canals of earlier stages visible after each varix.

This form is represented by a single, well-preserved shell from the base of the Melajo Clay. According to Morrison (1949, p. 11) the Recent *B. thomae* (d'Orbigny) (1845, p. 250; Atlas, pl. 23, fig. 23, 1842) which has been redescribed by Abbott (1958, p. 56, text fig. 1, pl. 1 j) is the only species of *Bursa s. str.* in the Western Atlantic. *B. thomae* also occurs in the Eastern Atlantic and the Indo-Pacific according to these authors.

B. thomae is represented in the collections of the U. S. National Museum by a few specimens only, and its variability is not well known. The smaller apical angle and the almost complete lack of sculpture above the shoulder separate the Melajo shell from that species. Two topotypes of *B. bufoniopsis* Maury (1917, p. 108, pl. 17, fig. 8), from the middle Miocene Gurabo Formation of the Dominican Republic, are at hand. They have stronger sculpture above the shoulder than *B. thomae,* but are certainly closely related to the Recent species.

Occurrence. — USGS 18634.

Subgenus **MARSUPINA** Dall

Dall, 1904, Smithsonian Misc. Coll., vol. 47, No. 1475, p. 118.

Type species (by original designation), *Buffo spadiceus* Montfort (= *Murex crassus* Dillwyn = *Murex bufo* Bruguière).

Bursa (Marsupina) bufo (Bruguière) Pl. 49, figs. 3-6

1792. *Murex bufo* Bruguière, Actes Soc. Hist. Nat. Paris, vol. 1, p. 126. Cayenne, French Guiana. Refers to Martini-Chemnitz, Neues systematisches Conchylien-Cabinet, vol. 4, p. 106, pl. 133, figs. 1272, 1273, 1780.
1810. *Buffo spadiceus* Montfort, Conchyliologie systématique, vol. 2, p. 575. Refers to Martini-Chemnitz, Neues syst. Conchylien-Cabinet, vol. 4, pl. 128, figs. 1233, 1234 (error ?). Montfort's illustration represents *B. bufo.*
1816. *Ranella granulata* Lamarck, Tableau encyclopédique et méthodique, pl. 412, figs. 4a, 4b. Liste, p. 4.
1817. *Murex crassus* Dillwyn, A descriptive catalogue of Recent shells, vol. 2, p. 692. Refers to Martini-Chemnitz, Neues syst. Conchylien-Cabinet, vol. 4, p. 106, pl. 133, figs. 1272, 1273.
1961. *Bursa (Bufonaria) spadicea* Montfort, Warmke and Abbott, Caribbean Seashells, p. 103, pl. 18 l.

Of medium to large size. Protoconch with 3½ smooth, rapidly enlarging volutions. Postnuclear whorls numbering up to more than five. First sculpture starting abruptly, consists of four spirals and fine axials which cause beads at the intersections. First varix appearing after a little more than half a whorl. Later varices practically alined on successive whorls. First and fourth spiral from upper suture have more prominent beads; the fourth one develops into a shoulder. Shoulder of late whorls inconspicuous or even absent. Inner and outer lips with numerous denticles. Anterior canal slightly bent backwards. Inner wall of posterior canal formed by penultimate whorl. Former posterior canals visible after each varix.

This species is represented from Matura by a few specimens only. One of them (Pl. 49, figs. 5, 6) is exceptionally large (height 75 mm). It is strongly compressed and has no shoulder on the body whorl. Immature specimens have a different appearance; they look stouter, and their whorls are shouldered.

The granulation of the spirals of Matura specimens is somewhat coarser than that of Recent shells. The collections of the U. S. National Museum contain specimens, the late whorls of which have obsolete spiral sculpture, but a pronounced shoulder carrying one heavy knob between two varices. Shells with granulated spirals do not have this knob. Only large collections can show, whether these forms are connected by transitions or not.

Several names have been proposed for the Miocene representatives of this species. According to Morrison (1949, p. 11) they all represent the Recent species. The Recent species has been cited as *Bursa crassa* Dillwyn from the middle Miocene of the Dominican Republic (Maury, 1917, p. 108, pl. 17, figs. 6, 7), Costa Rica (Olsson, 1922, p. 134, pl. 15, fig. 19), Jamaica (Guppy, 1866a, p. 288, pl. 18, fig. 9), and Trinidad (Maury, 1925 p. 217). For some of these records subspecific names have been proposed: *proavus* Pilsbry (1922, p. 360, pl. 29, figs. 4, 5) for the records from the Dominican Republic, *bowdenensis* Pilsbry (1922, p. 360, pl. 29, fig. 8) for the Jamaican record, and *colombiana* Weisbord (1929, p. 41, pl. 8, figs. 1, 2) for specimens from the middle Miocene of Columbia (see also Barrios, 1960, p. 277, pl. 9, figs. 4, 5). Several of the identifications mentioned above are based on immature specimens, and these are practically indistinguishable from Recent immature shells. However, all the Miocene specimens have somewhat coarser granulation than Recent ones. Adult shells from Bowden, Jamaica, at hand (see also Woodring, 1928, p. 303, pl. 19, fig. 4) have coarse granulation and one or more conspicuous nodes on the shoulder between two varices, a combination never occurring in Recent shells.

Whether *B. freya* Olsson (1932, p. 187, pl. 21, figs. 3, 4, 6) from the late Oligocene or early Miocene of Peru represents a distinct species cannot be decided without topotypes.

I am indebted to Dr. J. P. E. Morrison of the Division of Mollusks, U. S. National Museum, for calling my attention to Bruguière's name.

Occurrence. — RR 230, USGS 18204, USGS 19860.

Distribution. — Recent: southeastern Florida and West Indies.

Family **TONNIDAE**

Genus **MALEA** Valenciennes

Valenciennes, 1832, *in* Humboldt and Bonpland, Voyage aux régions équinoxales du nouveau continent; Recueil d'observations de zoologie et d'anatomie comparée, vol. 2, p. 324.

Type species (by subsequent designation, Herrmannsen, 1847, Indicis generum malacozoorum, vol. 2, p. 13), *Malea latilabris* Valenciennes (= *Cassis ringens* Swainson).

Malea species

Two fragments from the Melajo Clay, representing parts of the outer lip, are at hand. They have strong teeth which tend to be dichotomous toward the outer margin. The external surface shows some flat spirals with narrower interspaces. Some of the interspaces have secondary spirals. The larger fragment representing the lower part of the outer lip is 37 mm high and suggests that the entire shell must have reached a height of about 100 mm.

The fragments are insufficient to point out specific affinities. The widespread *M. camura* Guppy (1866a, p. 287, pl. 17, fig. 9) has been rediscussed by Woodring (1959, p. 208, pl. 33, figs. 1-4), and the late Miocene *M. densecostata* (Rutsch) (1934, p. 60, pl. 3, figs. 6, 7) by Olsson and Petit (1964, p. 554, pl. 79, figs. 5, 5a).

Occurrence. — USGS 21178.

Family **MURICIDAE**

Genus **MUREX** Linné

Linné, 1758, Systema Naturae, ed. 10, p. 746.

Type species (by subsequent designation, Montfort, 1810, Conchyliologie systématique, vol. 2, p. 619), *Murex pecten* Montfort (= *Murex tribulus* Linné).

Subgenus **MUREX** s. str.

Murex (Murex) chrysostoma G. B. Sowerby I — Pl. 49, figs. 8-10

1834. *Murex chrysostoma* "Gray" G. B. Sowerby I, Conchological Illustrations, pl. 58, fig. 1.

1945. *Murex (Murex) chrysostoma* Sowerby, Clench and Pérez Farfante, Johnsonia, vol. 1, No. 17, p. 10, pl. 5, figs. 1, 2.

1962. *Murex (Murex) chrysostomus* Sowerby, Weisbord, Bull. Amer. Paleont., vol. 42, No. 193, p. 282, pl. 25, figs. 17, 18. For further citations see this publication.

1963. *Murex (Murex) chrysostomus* Sowerby, Vokes, Tulane Studies in Geology, vol. 1, No. 3, p. 109, pl. 4, figs. 9a, 9b.

Of medium size. Protoconch consists of 1½ smooth whorls. First sculpture, which starts abruptly, with four spirals and numerous axials causing beads at the intersections. Subsequently the axials become much more prominent than the spirals. Varices three per whorl, the first one appearing on the third postnuclear whorl. There are two or three intervarical axials of varying strength which are most prominent on the shoulder of the whorl. Aperture subcircular. Outer lip with numerous, long denticles; inner lip with similar denticles, but the uppermost one stronger. Lower part of inner lip detached from parietal wall. Anterior canal moderately long. Body whorl with numerous, inconspicuous spirals which usually alternate in size.

This species is represented by a few specimens from the base of the Melajo Clay. None of them has a complete anterior canal. The varices sometimes carry a short, hollow spine on the shoulder which is the case in some Recent shells. Recent specimens have one to three intervarical axials. Generally the first axial after a varix is stronger than the others which is also true for the Melajo specimens.

M. polynematicus Brown and Pilsbry (1911, p. 353, pl. 26, fig. 1), from the middle Miocene Gatun Formation of the Panama Canal Zone, has more strongly shouldered whorls, less intervarical axials, more spirals, and lacks denticles on the upper part of the inner lip. Woodring (1959, p. 215, pl. 36, figs. 2, 3, pl. 37, figs. 6, 9) compared *M. polynematicus* with *M. chrysostoma* but stated that they are not closely related. According to Vokes (1965, p. 183) *M. polynematicus* belongs to the subgenus *Siratus*.

Occurrence. — USGS 18411, USGS 18634.

Distribution. — Pliocene, Venezuela. Recent, southern Caribbean region (one record from the Bahamas in the collections of the U. S. National Museum).

Subgenus **PHYLLONOTUS** Swainson

Swainson, 1833, Zoological Illustrations, ser. 2, vol. 3, pl. 109.

Type species (by monotypy) *Murex (Phyllonotus) imperialis* var. a = *Murex (Phyllonotus) margaritensis* Abbott (1958, p. 61, pl. 1 n and o). See also Keen, Nautilus, vol. 73, No. 3, p. 105, 1960.

Murex (Phyllonotus) cf. pomum Gmelin

Two fragmentary specimens from the base of the Melajo Clay and one shell from Matura suggest *M. pomum*. The larger specimen from the Melajo Clay is 93 mm high, and is encrusted by oysters and vermetids. It has 4½ varices, whereas the Matura shell has only three. They both have only one axially elongated node between the varices.

M. pomum has been recorded from middle Miocene to Recent (see Weisbord, 1962, p. 288).

Occurrence.—Melajo River area: USGS 18634. Matura Bay: RR 230.

Subgenus **CHICOREUS** Montfort

Montfort, 1810, Conchyliologie systématique, vol. 2, p. 611.

Type species (by monotypy), *Chicoreus ramosus* Montfort (= *Murex brevifrons* Lamarck).

Murex (Chicoreus) cf. brevifrons Lamarck Pl. 49, fig. 7

One immature shell from the base of the Melajo Clay and several, mostly fragmentary specimens from the Courbaril beds, are too incomplete or worn for positive identification. Most of the spines are broken or strongly worn which makes the recognition of the subtle differences between *M. brevifrons* and the Miocene *M. cornurectus* Guppy (1876, p. 521, pl. 28, fig. 4) from the Dominican Republic as indicated by Vokes (1965, p. 193) impossible.

Vokes (1965) accepted Pliocene records of *M. brevifrons* but rejected Miocene ones, whereas Woodring (1959, p. 216) synonymized *M. cornurectus* and *M. venezuelanus* F. Hodson (*in* Hodson and Hodson, 1931a, p. 37, pl. 18, fig. 1, pl. 19, figs. 1, 3) from the middle Miocene of Falcón, Venezuela, with *M. brevifrons.*

Occurrence.—Melajo River area: USGS 18634. Point Courbaril: K 12255, USGS 10991, USGS 20432a, USGS 21778.

Genus **EUPLEURA** H. and A. Adams

H. and A. Adams, 1853, The Genera of Recent Mollusca, vol. 1, p. 107.

Type species (by subsequent designation, Baker, 1895, Chicago Acad. Sci., Bull., vol. 2, p. 176), *Ranella caudata* Say.

Eupleura lehneri, n. sp. Pl. 50, figs. 1-4

Of small to medium size. Protoconch consists of two smooth whorls; initial whorl small. Postnuclear whorls numbering up to seven. Early sculpture consists of two spirals and numerous axials (about 14 on first sculptured whorl). The upper spiral forms a prominent shoulder on the first sculptured whorl already. Number of axials decreases rapidly on later whorls, but they become more and more lamellar. First varix usually appears on the penultimate whorl only. Later varices are almost directly opposite the earlier ones. Intervarical axials three but reduced to broad nodes on the shoulder or even become obsolete. Body whorl moderately inflated. Last varix with six spines which are grooved anteriorly. The uppermost one is larger than the others and is pointing steeply upwards. Body whorl with spirals corresponding to the spines. Outer lip with denticles corresponding to the interspaces of the spines. Inner lip smooth. Aperture subtriangular, most acute angle pointing toward base. Siphonal canal moderately long, straight, not bent backward.

Holotype. — USNM 645346.

Dimensions of holotype. — Height 27 mm, diameter (including spines) 19.6 mm.

Type locality. — Melajo River area: USGS 21178.

E. lehneri occurs in the Melajo Clay and is represented by five adult specimens and numerous fragments and immature specimens.

E. lehneri is closely related to the Recent Eastern Pacific *E. muriciformis* (Broderip) (*in* Broderip and G. B. Sowerby 1, 1832-1833, p. 179, 1833; Hertlein and Strong, 1955, p. 258) which has also been reported from the Pliocene of western Ecuador by Pilsbry and Olsson (1941, p. 37). The numerous Recent shells of *E. muriciformis* at hand are consistently larger and more slender than *E. lehneri.* They have a higher spire, their uppermost spine on the last varix is less steep, and their siphonal canal is slightly bent backward, whereas in *E. lehneri* it is straight.

The single specimen from the middle Miocene Angostura Formation of western Ecuador described by Olsson (1964, p. 139, pl. 29, fig. 9) as *E. thompsoni* Woodring subspecies has about the same dimensions as *E. lehneri.* Its siphonal canal is slightly bent backward, and there are four nodes on the shoulder between the last two varices.

E. thompsoni Woodring (1959, p. 218, pl. 36, figs. 6-9), from the middle Miocene Gatun Formation of the Panama Canal Zone, is a considerably larger species with more inflated whorls. It has a larger apical angle and much less projecting varices than *E.*

lehneri. E. kugleri Jung (1965, p. 524, pl. 70, figs. 3-6) from the middle Miocene of the Paraguaná Peninsula, Venezuela, has also much less prominent varices but more spines on the last varix.

Occurrence. — EL 1810, Hutch 47, Hutch 51, K 9903, PJ 285, USGS 18399, USGS 21178.

Genus **TYPHIS** Montfort

Montfort, 1810, Conchyliologie systématique, vol. 2, p. 615.

Type species (by original designation), *Purpura tubifer* Bruguière.

Subgenus **TYPHINELLUS** Jousseaume

Jousseaume, 1880, Le Naturaliste, deuxième année, vol. 1, No. 42, p. 335.

Type species (by original designation), *Typhis sowerbiyi* Broderip (= *Typhis sowerbyii* Broderip).

Typhis (Typhinellus) cf. quadratus Hinds Pl. 50, figs. 5, 6

?1867. *Typhis alatus* Sowerby, Guppy, Proc. Sci. Assoc. Trinidad, pt. 3, p. 157; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 36.
?1874. *Typhis alatus* Sowerby, Guppy, Geol. Mag., new ser., decade 2, vol. 1, p. 438.

Six strongly worn specimens from Matura are at hand. Most of them are fragmentary and immature. There are four tubes per whorl, situated a little closer to the preceding varix. Last varix narrower above aperture. No spiral sculpture present (due to washing ?).

T. quadratus Hinds (Zool. Soc. London, Proc., pt. 11, p. 18, 1843) from the Recent fauna of the tropical Eastern Pacific has been assigned to the subgenus *Typhina* by Keen, 1944 (p. 55) but to *Typhinellus* by Keen, 1958 (p. 367). The collections of the U. S. National Museum contain only five worn specimens of *T. quadratus* from Venado Beach, Panama Canal Zone. They are somewhat larger than the largest Matura shell, and the tubes of the latest whorls are closer to the preceding varix than it is the case in the Matura specimens. On earlier whorls, however, the tubes are midway between the varices like on earlier whorls of Matura specimens.

Occurrence. — JS 67, PJ 302, USGS 19860.

Typhis (subgenus ?) **species**

A single specimen from the Melajo Clay measuring 11.6 mm in height is too incomplete and worn to point out specific affinities.

It has four tubes per whorl which are situated somewhat closer to the preceding varix. It probably belongs to *Typhinellus* and may represent the same species as the shells from Matura.

Occurrence. — USGS 21178.

Genus **CALOTROPHON** Hertlein and Strong

Hertlein and Strong, 1951, New York Zool. Soc., Zoologica, vol. 36, pt. 2, p. 87.

Type species (by original designation), *Calotrophon bristolae* Hertlein and Strong.

Calotrophon (?) **hutchisoni,** n. sp. Pl. 50, figs. 7-9

Shell small, solid. Protoconch consists of 1½ whorls, its last part with a basal angulation. Postnuclear whorls a little more than five. Scupture starting abruptly, consists of nine axials on early whorls, but of seven on late whorls. Axials usually with a short vaulted spine on the shoulder of the whorls. There are two to four weak spirals above the shoulder, and two stronger ones below. Axials not persistent from suture to suture. Body whorl with numerous spirals below the shoulder; its axials usually reaching down to the prominent siphonal fasciole. Outer lip lirate within, its edge crenulated. Callus of inner lip prominent, with four elongate denticles near the base. Anterior canal short, slightly recurved.

Holotype. — USNM 645494.

Dimensions of holotype. — Height 16.6 mm, diameter 9.4 mm.

Type locality. — Melajo River area: USGS 21178.

This species occurs in the Melajo Clay and is represented by numerous specimens. The hollow, short spines on the shoulder are not always present. Single individuals may have spines in certain stages, but none in others. The strength of the axials below the shoulder of the body whorl is variable also.

The Recent *C. bristolae* Hertlein and Strong [1940-1951 (1951), p. 87, pl. 2, fig. 2] from the Gulf of California, the type species of the genus, is larger, has a higher spire, and it lacks the denticles near the base of its inner lip. Keen (1958, p. 364) treated *Calotrophon* as a subgenus of *Trophon*.

A Western Atlantic species similar to *C. bristolae* is *Urosalpinx floridana* Conrad (1869, p. 106, pl. 12, fig. 4), for which Olsson and Harbison (1953, p. 254) erected the subgenus *Pseudosalpinx*.

U. floridana is said to be the same as *Murex ostrearum* Conrad (1846, p. 25) (see also Robertson, 1957, p. 8).

Occurrence. — Hutch 47, K 9797, KR 11862, PJ 285, USGS 18399, USGS 21178.

Genus **RISOMUREX** Olsson and McGinty

Olsson and McGinty, 1958, Bull. Amer. Paleont., vol. 39, No. 177, p. 40.

Type species (by original designation), *Engina schrammi* Crosse.

Risomurex galbensis, n. sp. Pl. 50, figs. 10-13

Small, stout. Protoconch consists of a little less than 1½ smooth whorls. It is strongly keeled and flattened above forming a depression at the apex. Postnuclear whorls about five. Early sculpture consists of axials (about 10 on first sculptured whorl) and two spirals form beads at the intersections. On subsequent whorls the axials become much stronger, and the upper spiral forms a shoulder with acute nodes, where the axials cross. On the second or third sculptured whorl another spiral appears close to the lower suture which is noded as well. Spaces between spirals ornamented by several fine spirals. Body whorl with six to seven noded spirals and eight axials, the last ones being varix-like. Unworn specimens show undulating, somewhat lamellar growth lines. Outer lip thick, with five denticles on inner surface. Inner lip with two inconspicuous lirae on lower part. Anterior canal short. Siphonal fasciole inconspicuous.

Holotype. — USNM 645367.

Dimensions of holotype. — Height 13.8 mm, diameter 7.7 mm.

Type locality. — Point Courbaril: USGS 10991.

This species occurs in the Courbaril beds and is represented by about 50 specimens. Many of them are immature or strongly worn.

The type species of *Risomurex,* the Recent *R. schrammi* (Crosse) (1863, p. 82, pl. 1, fig. 7) from Guadeloupe, has about the same apical angle as *R. galbensis* but has heavier nodes and more spirals on the body whorl. Its protoconch has been figured by Olsson and McGinty (1958, pl. 2, fig. 2). The axials on the first sculptured whorl are much less prominent than in *R. galbensis. R. rosens* (Reeve) (Conch. Icon., vol. 3, *Ricinula,* pl. 6, fig. 46, 1856) has similar early stages and lamellar growth lines like *R. galbensis* but differs in having heavier and more crowded nodes. *R. muricoides* (C. B. Adams) (1845, p. 3; Clench and Turner, 1950, p. 313, pl. 39, fig. 9), originally described from Jamaica, is a more slender species with more spirals on the body whorl. *Tritonalia (Ocinebrina) caribbaea* Bartsch and Rehder (1939, p. 7, pl. 1, fig. 1) is considered a synonym of *R. muricoides* by Olsson and McGinty (1958, p. 41).

Muricidea striata Gabb (1873b, p. 203; Pilsbry, 1922, p. 354, pl. 28, fig. 7) from the Miocene of the Dominican Republic somewhat resembles *R. galbensis*. The outer lip of the type is not thickened (immature ?), and the protoconch is unknown. No topotypes are available.

Occurrence.—K 1429, K 8399, RR 120, PJ 212, USGS 10991, USGS 21778.

Family **THAIDIDAE**

Genus **THAIS** Röding

Röding, 1798, *in* Museum Boltenianum, p. 54.

Type species (by subsequent designation, Stewart, 1927, Acad. Nat. Sci. Philadelphia, Proc., vol. 78, p. 386), *Thais lena* Röding (= *Murex fucus* Gmelin = *Murex neritoideus* Linné = *Nerita nodosa* Linné).

Subgenus **STRAMONITA** Schumacher

Schumacher, 1817, Essai d'un nouveau système des habitations des vers testacés, p. 226.

Type species (by subsequent designation, Gray, 1847, Zool. Soc. London, Proc., pt. 15, p. 138), *Buccinum haemostoma* Linné.

Thais (Stramonita) cf. haemostoma (Linné)

?1912. *Purpura* sp. indet., Maury, Acad. Nat. Sci. Philadelphia, Jour., 2d ser., vol. 15, p. 82, pl. 12, fig. 4.

A few shells from the Courbaril beds and one specimen from Matura are identified as *T.* cf. *haemostoma*. They are all immature. As pointed out by Clench (1947, p. 73, pl. 36, figs. 1-6) *T. haemostoma* is a strongly variable species. Even the immature Courbaril specimens show considerable variation as to sculpture and shape.

The fragment described and illustrated by Maury as *Purpura* sp. indet. has been collected from a locality just south of the Pitch Lake, Trinidad, which is thought to be about the stratigraphic equivalent of the Courbaril beds.

T. haemostoma has been reported from the Pliocene of Venezuela by Weisbord (1962, p. 300, pl. 27, figs. 3, 4).

Occurrence. — Point Courbaril: RR 120, USGS 10991, USGS 20432a, USGS 20434, USGS 21778. Matura Bay: USGS 19860.

Thais (Stramonita) species A Pl. 51, figs. 5, 6

Of small to medium size. Spire high. Protoconch with about 2½ smooth, inflated whorls. Postnuclear whorls 4 to 4½. Early sculpture consists of numerous axials and about six spirals. The third spiral from the lower suture forms a shoulder. On subsequent whorls the shoulder becomes nodose, and the spiral next to the lower suture more prominent. Additional spirals are intercalated, and the axial sculpture disappears except for the slightly lamellar growth lines. Body whorl with seven projecting nodes on shoulder, and a similar, but less prominent, noded spiral below. Surface of body whorl covered by closely spaced, fine spirals of variable strength. Inner surface of outer lip with conspicuous lirations. Columella smooth. Anterior canal short. Siphonal fasciole inconspicuous.

This form is represented by three specimens from the base of the Melajo Clay. Only the figured one is complete.

This species is allied to the Recent Caribbean *T. rustica* (Lamarck) (see Clench, 1947, p. 80, pl. 39, figs. 4-6, 8, 10). Although *T. rustica* is variable as to height of spire and strength of sculpture, the Melajo specimens differ in having fewer and much more prominent nodes on the body whorl. The spire of *T. rustica* usually is shorter.

Occurrence. — USGS 18411, USGS 18634.

Genus CYMIA Mörch

Mörch, 1861, Malakozoologische Blätter, vol. 7, p. 98 (substitute name for *Cuma* Swainson).

Type species (by monotypy), *Cuma sulcata* Swainson (= *Buccinum tectum* Wood).

Cymia brightoniana Maury Pl. 51, figs. 1-4

1912. *Cymia woodii* Gabb, Maury, Acad. Nat. Sci. Philadelphia, Jour., 2d ser., vol. 15, p. 82, pl. 11, figs. 9, 10.
1925. *Cymia brightoniana* Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 215.

Moderately large to large, solid. Spire high. Protoconch consists of a little more than one whorl. Postnuclear whorls about six.

Early sculpture of numerous axials and three spirals, the lowest one forming a keel. On subsequent whorls the axials disappear, and additional spirals are intercalated. On the lowest spiral spirally elongated, projecting nodes are developed. Growth lines slightly lamellar, well visible on spirals. Body whorl covered by numerous closely set spirals of variable strength. Anal notch inconspicuous, anal ridge prominent. Columellar fold strong. Inner surface of outer lip with long, spiral ridges. Siphonal canal short. Siphonal fasciole prominent, lamellar.

Holotype.—Cornell University, Paleont. Museum, Ithaca, N.Y., No. 33609.

Type locality.—Along shore, 700 feet east of Brighton pier, near Pitch Lake, Trinidad.

This species is abundant in the Courbaril beds but well-preserved specimens are rare. The holotype has a second spiral with nodes below the angulation of the body whorl. This feature is not observed on specimens of later collections.

An immature, badly preserved specimen from the Melajo Clay (USGS locality 21178) is identified as *Cymia* species.

C. brightoniana is most closely related to the Recent Eastern Pacific *C. tecta* (Wood) (Supplement to the Index Testaceologicus, p. 12, pl. 4, fig. 13, 1828) which ranges from El Salvador to Ecuador. The apical angle of both species is variable to some degree. Their anal notch is inconspicuous. *C. tecta* differs in having fewer spirals with deeply incised interspaces.

The Caribbean Miocene species of *Cymia* have been discussed by Woodring (1959, pp. 223, 224). *C. brightoniana* and *C. tecta* have a much shallower anal notch than most of these species. As stated by Woodring *C. brightoniana* is the youngest species of the genus in the Caribbean region.

Occurrence.—K 12255, PJ 212, USGS 10991, USGS 20432, USGS 20432a, USGS 21778.

Distribution.—Known from type area only.

Family COLUMBELLIDAE

Genus PARAMETARIA Dall

Dall, 1916, Nautilus, vol. 30, No. 3, p. 25. Substitute name for *Meta* Reeve (April 1859, Conch. Icon., vol. 11, *Columbella*, pl. 32, under remarks for *C. picata* Swainson) which is a genus without species and preoccupied by *Meta* Koch, 1835.

Type species of *Meta* Reeve (by subsequent designation, Reeve, May 1859, Conch. Icon., vol. 11, *Meta*, pl. 1, under discussion of *Meta ovuloides*), *Conus dupontiae* Kiener.

Compare also Grant and Gale (1931, p. 680). Reeve's emendation of *Conus "dupontii"* Kiener to *dupontiae* is correct, because the species was named for Mrs. Dupont.

Parametaria prototypus (Guppy) Pl. 51, figs. 7-9; Pl. 52, figs. 1-2

1867. *Conus protoypus* Guppy, Proc. Sci. Assoc. Trinidad, pt. 3, p. 171; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 50.
1874. *Conus prototypus* Guppy, Guppy, Geol. Mag., new ser., decade 2, vol 1, pp. 409, 440, pl. 17, fig. 9, pl. 18, fig. 1.
1942. *Pyrene (Eupyrene) ? schideri* Rutsch, Verh. Naturf. Ges. Basel, vol. 54, p. 148, pl. 5, figs. 5a, 5b.

Of medium size, stout. Spire high. Protoconch consists of about two volutions which are not well distinguishable from subsequent whorls. Postnuclear whorls about six. The first postnuclear whorls are smooth and small. Subsequently the apical angle enlarges considerably, and the whorls become shouldered. Above the shoulder there may be a narrow, concave, spiral band not reaching the upper suture. Growth lines opisthocyrt above shoulder, almost orthocline below. Body whorl smooth and inflated above, constricted and sculptured by some spirals below. Last part of suture slightly ascending toward apex. Aperture long. Inner lip with thin callus which reaches down to the base of the columella. Lower part of inner lip with a few oblique, short denticles. Outer lip thin, smooth within. Anterior canal short, bordered by an inconspicuous ridge.

Holotype. — USNM 115593.

Dimensions of holotype. — Height 12.2 mm, greatest diameter 7.8 mm.

Type locality. — Guppy's Savanetta (Caroni Series), which is a locality near Savaneta River roughly corresponding to the locality Brechin Castle Estate referred to by Rutsch (1942, p. 105, fig. 1).

Guppy based his species on a single, immature shell. Later collections contain several adult specimens from the type area. The holotype of Rutsch's *Pyrene schideri* was collected at Springvale Quarry. *P. prototypus* is represented from the base of the Melajo Clay by one immature and one adult shell. The outer lip of the latter is broken.

The generic assignment of this species is based on the variability of the type species of *Parametaria,* the Recent Eastern Pacific *P. dupontiae* (Kiener) (Spécies général et Iconographie des coquilles vivantes, *Conus,* pl. 61, fig. 2, 1846; p. 273, 1849-50. For dates see Sherborn and Woodward, 1901, Malac. Soc. London, Proc., vol. 4, pp. 216-219). The collections of the U.S. National Museum contain a fairly good representation of *P. dupontiae* which shows that the height of the spire is strongly variable. The shoulder, which mostly is visible on the body whorl only, may be angulated or rounded. Denticles on the inner surface of the outer lip may be strongly developed, weak, or absent even in adult specimens.

P. prototypus is more loosely coiled than *P. dupontiae,* and its shoulder is never so strongly angulated. *Meta perplexabilis* Maury (1917, p. 94, pl. 15, figs. 4, 5), from the middle Miocene Cercado Formation of the Dominican Republic, is smaller, more slender, and has denticles on the inner surface of the outer lip. It probably is not a *Parametaria.*

Occurrence. — USGS 18634.

Distribution. — Savaneta Glauconitic Sandstone Member and Melajo Clay Member, both of Springvale Fm., Trinidad.

Parametaria rutschi, n. sp. Pl. 52, figs. 3-6

Of medium size, coniform. Spire low. Protoconch consists of a little more than one whorl but is not well separable from later whorls. Postnuclear whorls numbering up to $7\frac{1}{2}$. Spire whorls tightly coiled, smooth except for opisthocyrt growth lines. Body whorl with angulated shoulder, slightly inflated above, constricted below. Lower part of body whorl sculptured by numerous spirals. Aperture long and narrow. Suture near aperture ascending over the shoulder of penultimate whorl. Outer lip strongly thickened, with numerous denticles within. Inner lip with a thin callus. There is a spiral ridge on the lower part of the columella which is not visible in complete specimens.

Holotype. — Natural History Museum Basel, No. H 15171.

Dimensions of holotype. — Height 22.2 mm, diameter 15.0 mm.

Type locality. — Matura Bay: RR 230.

This species is based on four specimens from Matura. Already Rutsch (private report, 1942) considered them to represent a new species. *P. rutschi* differs from *P. prototypus* in having a tightly coiled, lower spire, and in having more spirals on the body whorl. The outer lip ascends over the shoulder of the penultimate whorl which is not the case in *P. prototypus.*

P. rutschi is most closely allied to the Recent Eastern Pacific *P. dupontiae* (Kiener) (for references see under *P. prototypus*). They have about the same dimensions. But *P. rutschi* has a thicker outer lip with stronger denticles within. There are less spirals on the body whorl of *P. dupontiae,* and they are more restricted to the base. *P. islahispaniolae* (Maury) (1917, p. 93, pl. 15, fig. 3) from the middle Miocene Cercado Formation of the Dominican Republic is considerably smaller and more slender. Its first three postnuclear whorls have axially elongated nodes near the lower suture.

P. rutschi is the youngest species of the genus in the Caribbean. *Parametaria* survived to the Recent fauna in the Eastern Pacific, where it is represented by two species.

Occurrence. — RR 230.

Genus **ANACHIS** H. and A. Adams

H. and A. Adams, 1853, The Genera of Recent Mollusca, vol. 1, p. 184.

Type species (by subsequent designation, Tate, 1870, *in*: Appendix to S. P. Woodward's A manual of the Mollusca, 2d edition, p. 13), *Columbella scalarina* G. B. Sowerby I.

Subgenus **ANACHIS** s. str.

Anachis (Anachis) asphaltoda (Maury) Pl. 52, figs. 7-10

1912. *Columbella asphaltoda* Maury, Acad. Nat. Sci. Philadelphia, Jour., ser. 2, vol. 15, p. 81, pl. 12, fig. 2.
1925. *Columbella asphaltoda* Maury, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 211.

Of medium size, stout. Whorls flat-sided. Protoconch consists of about three whorls. Postnuclear whorls about seven. Early sculpture with numerous axials and one spiral on the upper half of the whorl which forms beads at the intersections. Subsequently this spiral gradually disappears and a few (six to eight) fine spiral grooves appear which cross the axials. Axials near outer lip not reaching the base. Outer lip moderately thick, with a few denticles within, the uppermost one larger than the others. Inner lip with a moderately thick callus and a few small denticles near base. Anterior canal short.

Type. — The syntype figured in this paper (Cornell University, Paleont. Museum, Ithaca, N. Y., No. 33511) does not correspond to Maury's figured specimen.

Type locality. — Along shore, 700 feet east of Brighton pier, near Pitch Lake, Trinidad.

The syntype of *A. asphaltoda* figured in this paper is a worn, incomplete specimen. In later collections this species is represented by more than 50 specimens. They do not grow larger than 18 mm. A single, worn, incomplete shell from Matura is somewhat larger.

A. asphaltoda is most closely related to the Recent Eastern Pacific *A. varia* (G. B. Sowerby I) (1832, p. 116). Both species have the same stoutness and agree even in details of their sculpture. However, *A. varia* is larger, has more inflated whorls, and its axials tend to be sinuous on late whorls. *A. varia* has been cited by Gabb (1881b, p. 355) from the Pliocene of Costa Rica. The type species of *Anachis,* the Recent Eastern Pacific *A. scalarina* (G. B. Sowerby I) (1832, p. 116) is easily distinguished from *A. asphaltoda* by its shouldered whorls.

A. dalli Olsson (1964, p. 150, pl. 28, fig. 4), from the late Miocene to early Pliocene Esmeraldas Formation of Ecuador, is a more slender species with less pronounced axials and a higher aperture.

Occurrence. — Point Courbaril: K 1429, K 12255, PJ 212, USGS 10991, USGS 20432, USGS 20433, USGS 20434, USGS 21778. Matura Bay: USGS 19860.

Distribution. — Courbaril beds of Upper Morne l'Enfer Fm., Matura shell bed (rare).

Anachis (Anachis) species

A single, incomplete specimen (height 15.1 mm) from Matura is characterized by its strong axials which number 14 on the body whorl. Protoconch consists of about 1½ whorls. Postnuclear whorls five. Spire whorls strongly worn but apparently with a spiral near the upper suture producing small nodes at the intersections. Otherwise the spiral sculpture seems to be restricted to a few spirals near the base. Outer lip partly broken, but on its lower part a few denticles are visible. Anterior canal short but deeply notched. The axials are straight on early whorls but slightly sinuous on the body whorl.

This form is more slender and has stronger axials than *A. asphaltoda*. It has some resemblance to the Recent *A. fusidens* (Dall) (1908, p. 309, pl. 11, fig. 13) which had been dredged near the Galapagos Islands from 300 fms. They have the same dimensions and stoutness.

Occurrence. — RR 230.

Subgenus **COSTOANACHIS** Sacco

Sacco, 1890, I molluschi dei terreni terziarii del Piemonte e della Liguria, pt. 6, p. 57.

Type species (by subsequent designation, Pace, 1902, Malac. Soc. London, Proc., vol. 5, p. 43), *Columbella (Anachis) turrita* Sacco.

Anachis (Costoanachis) obesa (C. B. Adams) Pl. 52, fig. 11

1845. *Buccinum obesum* C. B. Adams, Boston Soc. Nat. Hist., Proc., vol. 2, p. 2.
1912. *Columbella labreana* Maury, Acad. Nat. Sci. Philadelphia, Jour., ser. 2, vol. 15, p. 80, pl. 12, fig. 1.
1925. *Columbella (Anachis) labreana* Maury, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 211.
1948. *Anachis (Costoanachis) obesa* (C. B. Adams), Gardner, U. S. Geol. Sur., Prof. Paper 199-B, 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.
1953. *Anachis (Costoanachis) obesa* (C. B. Adams), Olsson and Harbison, Acad. Nat. Sci. Philadelphia, Mon. No. 8, p. 232, pl. 38, fig. 11.
1962. *Anachis (Costoanachis) obesa* (C. B. Adams), Weisbord, Bull. Amer. Paleont., vol. 42, No. 193, p. 310, pl. 27, figs. 18-23. For further citations see this publication.

Lectotype. — Museum of Comparative Zoology, Cambridge, Mass., No. 156016.

Type locality. — Jamaica (Recent).

This common Recent Caribbean species is abundant in the Melajo Clay and at Matura but less so in the Courbaril beds. The type specimen of Maury's *Columbella labreana* is lost. The Courbaril specimens of the present collection are virtual topotypes of *C. labreana*.

The Recent *A. obesa* ranges from the Chesapeake Bay through the West Indies as far south as Argentina. It is a highly variable species as to apical angle (stoutness) and strength of sculpture. The variability does not only depend on geographical occurrence; it can be observed in single lots to some degree. The same is true for the lots from Matura and the Melajo Clay.

Occurrence.—Melajo River area: EL 1810, KR 11862, PJ 285, USGS 18399, USGS 21178. Point Courbaril: PJ 212, USGS 10991. Matura Bay: K 10924, JS 67, RR 230, PJ 302, USGS 18204, USGS 19860.

Distribution.—Miocene to Recent (see Weisbord, 1962, p. 313).

Anachis (Costoanachis) fraudans, n. sp. Pl. 53, figs. 1-5

Of medium size, slender. Protoconch consists of almost four smooth whorls; but not well separated from postnuclear whorls. Postnuclear whorls six. Axial sculpture moderately strong to absent. Axials slightly opisthocyrt. There is an obsolete subsutural spiral producing small nodes on moderately sized axials. A spiral groove runs along the lower suture. Outer lip moderately thickened, denticulated within. Callus of inner lip well developed, with fine denticles. Pillar sculptured by numerous spirals, the upper ones more closely spaced.

Holotype.—USNM 645502.

Dimensions of holotype.—Height 12.1 mm, diameter 4.2 mm.

Type locality.—Melajo River area: USGS 21178.

This species is based on four specimens from the Melajo Clay. They are constant as to apical angle, but their axial sculpture is strongly variable. The holotype has weak axials. They start on the third postnuclear whorl and persist for a little less than one whorl; for about half a whorl they are absent, but appear again. One of the paratypes has fairly strong axials which start on the third postnuclear whorl and persist to the body whorl. This shell has a well-developed subsutural spiral, and the spiral groove near the lower suture cuts through the axials. On the other hand another paratype with five postnuclear whorls lacks the axial sculpture almost entirely.

A similarly variable axial sculpture has been described for *A. mira* (Dall) (*in* Guppy and Dall, 1896, p. 312, pl. 29, fig. 7) by Woodring (1964, p. 248, pl. 39, figs. 13-18). *A. mira* occurs in the middle and late Miocene Gatun Formation of the Panama Canal Zone, and in the middle Miocene of Costa Rica. *A. fraudans* is never so stout as some specimens of *A. mira,* its spiral groove near the lower suture is more conspicuous, and it is larger on an average.

Occurrence.—KR 11862, PJ 285, USGS 21178.

Genus **ZANASSARINA** Pilsbry anl Lowe

Pilsbry and Lowe, 1932, Acad. Nat. Sci. Philadelphia, Proc., vol. 84, p. 75.

Type species (by original designation), *Nassarina (Zanassarina) poecila* Pilsbry and Lowe.

Zanassarina species Pl. 53, figs. 6, 7

Small, slender. Protoconch with three conical, smooth whorls. Postnuclear whorls 4½. Sculpture consists of axials and three somewhat narrower spirals producing a reticulate sculpture. Axials more widely spaced than spirals. Interspaces deep, pitlike. Intersections with nodes. Body whorl with eight spirals and a smaller, subsutural spiral which appears on the penultimate whorl already. Outer lip thickened, with three denticles within. Anal sinus shallow. Inner lip with a prominent callus, smooth. Anterior canal short.

This form is represented by two specimens from Matura. They have some resemblance with *Z. habra* Woodring (1964, p. 250, pl. 39, figs. 9, 10) from the middle Miocene Gatun Formation of the Panama Canal Zone. *Z. habra* is somewhat larger, its whorls are higher, and its axials stronger. The form from the Bowden Formation of Jamaica described by Woodring (1928, p. 280, pl. 16, fig. 20) as *Nassarina* species has even stronger axials than *Z. habra*.

Occurrence. — JS 67, USGS 18204.

Genus **AESOPUS** Gould

Gould, 1860, Boston Soc. Nat. Hist., Proc., vol. 7, p. 383.

Type species (by monotypy), *Aesopus japonicus* Gould.

Aesopus peculiaris (Guppy) Pl. 53, figs. 8-10

1867. *Columbella peculiaris* Guppy, Proc. Sci. Assoc. Trinidad, pt. 3, pp. 158, 171; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, pp. 37, 50.
1874. *Columbella peculiaris* Guppy, Guppy, Geol. Mag., new ser., decade 2, vol. 1, pp. 411, 439, pl. 18, fig. 20.
1896. *Aesopus peculiaris* (Guppy), Dall, *in* Guppy and Dall, U. S. Nat. Mus., Proc., vol. 19, No. 1110, p. 328.
1916. *Aesopus myrmecoon* Dall, Nautilus, vol. 30, No. 3, p. 27.
1919. *Aesopus sanctus* Dall, Biol. Soc. Washington, Proc., vol. 32, p. 250.
1927. *Aesopus sanctus* Dall, Oldroyd, Stanford Univ. Publ., Geol. Sci., vol. 2, pt. 1, p. 279.
1938. *Aesopus sanctus* Dall, Baker, Hanna, and Strong, Calif. Acad. Sci., Proc., 4th ser., vol. 23, No. 16, p. 252, pl. 24, fig. 7.

Small, solid. Protoconch with a little less than two smooth volutions; initial whorl large. Postnuclear whorls about 4½, slightly inflated. Sculpture consists of numerous, fine, closely spaced spirals. Near the upper suture the whorls are slightly concave, and one spiral may be somewhat more prominent or one interspace wider than the others. Interspaces with microscopical, axial striation. Suture distinct, sloping more steeply on penultimate and body whorls. Aperture low. Outer lip not thickened, with a few weak denticles at some distance from the margin. Inner lip with a thin callus. Siphonal fasciole slightly bulging. Anterior canal short, somewhat twisted to the left.

Lectotype. (herewith selected). — USNM 115520.

Dimensions of lectotype. — Height 5.0 mm, diameter 1.8 mm.

Type locality. — Matura, Trinidad.

The type lot of *A. peculiaris* consists of four specimens which had been glued to a card. In later collections the species is represented by 15 specimens.

The type specimen of the Recent *A. myrmecoon* (USNM 105498) has been collected at Point Abreojos, Lower California. It seems to be an immature specimen with 3½ postnuclear whorls. The type specimen of *A. sanctus* (USNM 308958) from Todos Santos Bay, near San Diego, California, as well as several topotypes, are at hand. They are slightly worn but show the axial striation between the spirals. The spirals tend to be a little narrower, but otherwise *A. sanctus* is indistinguishable from *A. peculiaris.*

Tryon (Manual of Conchology, vol. 5, p. 179, pl. 58, fig. 48, 1883) described *Columbella (Seminella) stearnsii* from Tampa Bay, West Florida (see also Dall, 1889a, p. 194, pl. 29, fig. 5). Dall [1890-1903 (1890), p. 138] cited *A. stearnsii* (Tryon) from the Pliocene of Florida, and Gardner [1943-1948 (1948), p. 232, pl. 30, fig. 19] from the Pliocene of North Carolina, South Carolina, and Florida. *A. stearnsii* is somewhat variable as to inflation of the sculptured whorls. It differs from *A. peculiaris* only by its slightly larger and more inflated nuclear whorls. But even this difference does not seem to be constant. *A. stearnsii* should possibly be synonymized with *A. peculiaris* as well.

The Recent *A. chrysalloideus* (Carpenter) (see Palmer, 1958, p. 213, pl. 23, figs. 18-20) from Southern California is about twice as large as *A. peculiaris.*

Occurrence. — RR 230, PJ 302, USGS 19860.

Distribution. — Matura shell bed, Trinidad. Recent, Southern California to Gulf of California.

Aesopus aff. **metcalfei** (Reeve) Pl. 53, fig. 11

Of medium size, slender. Protoconch with about 1½ smooth volutions; initial whorl large. Postnuclear whorls almost six. Sculpture consists of obsolete axials on early whorls and minute spirals. Aperature low. Outer lip thin, with a few denticles at a distance from the margin. Inner lip with a conspicuous callus. Anterior canal short, deeply notched.

This form is represented by three specimens from Matura. They are worn and their axials hardly recognizable. They differ from the Recent West Atlantic *A. metcalfei* (Reeve) (Conch. Icon., vol. 12, *Terebra,* pl. 26, species 139, 1860) in having faint spiral sculpture. Unworn specimens of *A. metcalfei* have stronger axial sculpture and are somewhat larger. Both forms have denticles on the outer lip.

Occurrence. — JS 67, RR 230.

Genus **STROMBINA** Mörch

Mörch, 1852, Catalogus conchyliorum . . . Comes de Yoldi, pt. 1, p. 85.

Type species (by subsequent designation, Cossmann, 1901, Essais de paléoconchologie comparée, pt. 4, p. 241), *Columbella lanceolata* G. B. Sowerby I (for the substitute name *Strombocolumbus*).

Strombina (subgenus ?) **melajoensis,** n. sp. Pl. 53, figs. 12, 13

Of medium size, slender. Spire high. Protoconch with three smooth volutions. Postnuclear whorls about eight, smooth except for minute spiral striae near the upper suture on the first three to four postnuclear whorls. Spire whorls flat to slightly convex, not shouldered. Body whorl stout, flattened in front, with a dorsal hump. Aperture low. Outer lip thickened, with about six denticles on inner surface. Posterior canal moderately prominent, bordered to the left by a callous ridge. Callus of inner lip prominent and detached from pillar on lower part, carrying a few denticles. Anterior canal short, deeply notched. Pillar sculptured by a few spirals.

Holotype. — USNM 645493.

Dimensions of holotype. — Height 16.9 mm, diameter 7.1 mm.

Type locality. — Melajo River area: USGS 18634.

This species is based on three specimens from the Melajo Clay. Its high, slender spire; the low, stout body whorl, and its almost complete lack of sculpture are distinctive.

The lack of sculpture recalls *S. quirosana* H. K. Hodson (*in* Hodson and Hodson, 1931a, p. 27, pl. 10, figs. 12, 13) from the early Miocene of Venezuela. But that species is smaller, and lacks the dorsal hump. Somewhat larger specimens of *S. quirosana* from the middle Miocene of the Paraguaná Peninsula, Venezuela, have been referred to *Mitrella* (Jung, 1965, p. 529, pl. 71, figs. 3, 4).

Most closely related to *S. melajoensis* is the Recent Eastern Pacific *S. dorsata* (G. B. Sowerby I) (1832, p. 120) which ranges from the Gulf of California to Ecuador according to Keen (1958, p. 394). *S. dorsata* is larger, its later whorls slightly shouldered, and its body whorl proportionately higher. Somewhat immature *S. dorsata* is even closer to *S. melajoensis.*

The Recent *S. clavulus* (G. B. Sowerby I) (1833-1834, p. 134, 1834) from the Eastern Pacific (Keen, 1958, p. 394) has similar proportions, but has a deep notch in the upper part of the outer lip, and lacks a prominent dorsal hump.

Occurrence. — Melajo River area: USGS 18634, USGS 21178.

Subgenus **SINCOLA** Olsson and Harbison

Olsson and Harbison, 1953, Acad. Nat. Sci. Philadelphia, Mon. 8, p. 230.

Type species (by original designation), *Strombina sincola* Olsson.

Strombina (Sincola) crassilabrum (Guppy) Pl. 53, figs. 14-20

1874. *Planaxis crassilabrum* Guppy, Geol. Mag., new ser., decade 2, vol. 1, pp. 411, 439, pl. 18, fig. 13.
1928. *Strombina crassilabrum* (Guppy), Woodring, Carnegie Inst. Washington Pub. 385, p. 341.

Small, stout. Protoconch with a little more than three smooth volutions. Postnuclear whorls six. Early sculpture consists of 11 to 12 narrow, straight axials and an inconspicuous spiral along the upper suture which causes small nodes at the intersections. The spiral disappears soon, but the axials may persist to the prepenultimate whorl. Body whorl large, smooth, slightly compressed, with a small dorsal hump. Outer lip strongly thickened; with a few denticles on its lower part, and two stronger denticles on its upper part. The interspace of the two stronger denticles is slightly notched. Posterior canal well developed, its left margin formed by a callous ridge. Inner lip with a thin callus and a few small denticles on its lower part. Pillar sculptured by spirals. Anterior canal short, deeply notched.

Lectotype (herewith selected). — USNM 115492.

Dimensions of lectotype. — Height 7.7 mm, greatest diameter 5.1 mm.

Type locality. — Matura, Trinidad.

Guppy based his species on three poorly preserved fragments. Although Guppy's original figure shows a complete spire, none of these fragments has the spire preserved. In later collections *S. crassilabrum* is represented from the type locality by a few fragments and one almost complete specimen (Pl. 53, figs. 19, 20).

S. crassilabrum is well represented in the Courbaril beds, but the best specimens have been found in the Melajo Clay. The axial sculpture is restricted to the first two postnuclear whorls in specimens from Matura and Point Courbaril but may be developed on the first four postnuclear whorls in Melajo shells.

S. walli Mansfield (1925, p. 47, pl. 8, figs. 5, 7) from the middle Miocene of Trinidad is a considerably smaller species with heavier denticles on the outer lip. Its body whorl is somewhat shouldered by the dorsal hump, and its axial sculpture is inconspicuous. The late Miocene *S. cunninghamcraigi* (Rutsch) (1942, p. 148, pl. 3, figs. 12a, 12b) from Springvale Quarry has more closely spaced axials which persist to the penultimate whorl. It lacks a dorsal hump.

Much more closely related than the above mentioned species is *S. gibberula galvestonensis* (Harris) (1895, p. 21, pl. 4, fig. 6) which had been obtained from a well near Galveston, Texas (upper Miocene ?). According to Harris' figure it has a less well-developed posterior canal.

There are no living species of the subgenus *Sincola* in the Western Atlantic. The Recent Eastern Pacific *S. gibberula* (G. B. Sowerby I) (1832, p. 115) lacks the axial sculpture on early whorls. *S. gibberula* has been recorded from the Pliocene of Ecuador by Pilsbry and Olsson (1941, p. 35), and the Pleistocene of Lower California by Grant and Gale (1931, p. 699).

Occurrence. — Melajo River area: KR 11862, PJ 285, USGS 18399, USGS 21178. Point Courbaril: K 1429, USGS 10991, USGS 20134. Matura Bay: JS 67, RR 230, USGS 18204.

Distribution. — Melajo Clay Member of Springvale Fm., Courbaril beds of Upper Morne l'Enfer Fm., Matura shell bed.

Genus **STROMBINOPHOS** Pilsbry and Olsson

Pilsbry and Olsson, 1941, Acad. Nat. Sci. Philadelphia, Proc., vol. 93, p. 35.

Type species (by original designation), *Strombinophos loripanus* Pilsbry and Olsson.

Strombinophos perdoctus, n. sp. Pl. 53, figs. 21, 22

Of medium size, slender. Spire high. Protoconch consists of four smooth whorls. Postnuclear whorls up to six. First sculpture consists of about four opisthocyrt axials. The following axials gradually become orthocline and are crossed by about five spirals. On subsequent whorls there are three to four primary spirals with one secondary spiral in each interspace. Between the uppermost primary spiral and the suture there are two spirals of secondary size. Axials near the outer lip crowded. Outer lip moderately to strongly thickened, lirate within. Near the base of the outer lip there is an inconspicuous emargination. Columellar callus denticulate. Anterior canal short, straight. Siphonal fasciole inconspicuous.

Holotype. — USNM 645503.

Dimensions of holotype. — Height 14.8 mm, greatest diameter 6.0 mm.

Type locality. — Melajo River area: USGS 21178.

S. perdoctus is represented in the Melajo Clay by eight specimens. It is most closely related to *S. maxwelli* Olsson and Harbison (1953, p. 238, pl. 33, fig. 11) from the Pliocene of St. Petersburg, Florida. *S. perdoctus* is distinguished by having a four-whorled protoconch, a larger apical angle, less axials, and a more inflated body whorl. The middle Miocene *S. estrellensis* (Olsson) (1922, p. 120, pl. 9, figs. 17, 18) from Costa Rica has also a four-whorled protoconch, but is somewhat stouter, and may reach a larger size.

S. mimicus Woodring (1964, p. 251, pl. 39, fig. 20, pl. 40, figs. 26, 27), from the middle Miocene Gatun Formation of Panama, has more numerous but less elevated axials. *S. telembus* Olsson

(1964, p. 157, pl. 36, fig. 7) from the middle Miocene of Ecuador may be the same as *S. mimicus*.

Occurrence. — K 9903, PJ 285, USGS 18399, USGS 21178.

Strombinophos species

Two fragments show that this genus occurs at Matura as well. The smaller fragment consists of part of the protoconch and the three first sculptured whorls, the larger one of the body whorl. The body whorl is larger, and has finer axials than that of *S. perdoctus*, n.sp.

Occurrence. — USGS 19860.

Family **BUCCINIDAE**

Buccinid indet. Pl. 54, figs. 1-4

Of medium to large size, solid. Protoconch missing. Sculptured whorls about six. Early sculpture consists of rounded axials (10 per whorl) extending from suture to suture. They are crossed by spirals of two orders of magnitude. Near the middle of the whorl two spirals are more prominent than the others; the upper one is situated on a gradually developing shoulder which is most prominent on the body whorl. As the shoulder develops the axials do not extend from suture to suture any more. Body whorl with nine axially elongated nodes on the shoulder and numerous spirals of three orders of magnitude. Aperture low. Outer lip not thickened, lirate within. Inner lip with a ridge near the posterior end of the aperture. Siphonal fasciole moderately swollen, sculptured by spirals and slightly lamellar growth lines. Anterior canal short, relatively broad.

This form occurs in the Courbaril beds and is represented by one almost complete, but worn shell and several immature or incomplete specimens. Its affinities are uncertain. There is a superficial resemblance with the Recent Eastern Pacific *Cantharus pagodus* (Reeve) (Conch. Icon., vol. 3, *Buccinum*, pl. 7, species 50, 1846) which is a rare species ranging from Mazatlan to Panama according to Keen (1958, p. 401). *C. pagodus* has more inflated whorls, stronger axials, but no noded shoulder on the body whorl.

Occurrence. — K 8399, K 12255, PJ 212, USGS 10991, USGS 20432, USGS 21778.

Genus **CANTHARUS** Röding

Röding, 1798, *in* Museum Boltenianum. pt. 2, p. 132.

Type species (by subsequent designation, Cossmann, 1889, Ann. Soc. Roy. Malac. Belgique, vol. 24, p. 137), *Cantharus globularis* Röding (= *Buccinum tranquebaricum* Gmelin).

Cantharus (subgenus ?) species A — Pl. 54, figs. 5, 6

Of medium size. Spire high. Protoconch only partly preserved. Postnuclear whorls 6½. Early whorls with nine, late whorls with seven to eight strong axial ribs. Early whorls evenly convex; their axials crossed by five spirals. Subsequently two spirals become more prominent than the others, the upper one forms a shoulder. Below these two spirals there are two minor ones; above them there are four spirals of unequal size. Outer lip thin, with many lirae within. Inner lip with a prominent callus with many somewhat irregular lirations. Siphonal fasciole moderately prominent. Siphonal canal short, slightly recurved.

This species is represented from the base of the Melajo Clay by one almost complete shell and one fragmentary specimen. It has some resemblance to the Recent Western Atlantic *C. multangulus* (Philippi) (see Robertson, 1957, p. 2). The Melajo form has stronger spirals and axials and is somewhat more slender. *C. multangulus* has a more inflated body whorl and lacks the prominent parietal callus. The strength of the spirals is more like that of the Recent Eastern Pacific *Pseudoneptunea panamica* Hertlein and Strong [1940-1951 (1951), p. 81, pl. 2, figs. 6, 10].

Occurrence.—USGS 18634.

Genus **HANETIA** Jousseaume

Jousseaume, 1880, Le Naturaliste, 2d year, No. 42, p. 335.

Type species (by original designation and tautonymy), *Murex haneti* Petit de la Saussaye.

Hanetia semiglobosa (Guppy)

1911. *Solenosteira semiglobosa* Guppy, Proc. Agric. Soc. Trinidad and Tobago, Soc. Paper No. 454, pp. 4, 7, pl. 2, figs. 5, 6; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, pp. 161, 163, pl. 8, figs. 5, 6.
1911. *Solenosteira cochlearis* Guppy, *ibidem,* pp. 4, 7, pl. 2, fig. 3; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, pp. 161, 164, pl. 8, fig. 3.
1925. *Solenosteira semiglobosa* Guppy, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 209, pl. 36, fig. 1.
1925. *Solenosteira cochlearis* Guppy, Maury, *ibidem,* p. 210, pl. 36, fig. 3.

1925. *Solenosteira semiglobosa* Guppy, Mansfield, U. S. Nat. Mus., Proc., vol. 66, art. 22, p. 44.
1926. *Solenosteira semiglobosa* Guppy, Harris *in* Waring, Johns Hopkins Univ., Studies in Geol., No. 7, p. 110, pl. 20, figs. 5, 6.
1938. *Solenosteira semiglobosa* Guppy, Vokes, Amer. Museum Novitates, No. 988, p. 4.
1938. *Solenosteira semiglobosa cochlearis* Guppy, Vokes, *ibidem,* p. 4.
1942. *Cantharus (Hanetia) semiglobosus* (Guppy), Rutsch, Verh. Naturf. Ges. Basel, vol. 54, p. 151, pl. 7, figs. 8, 10.
1942. *Cantharus (Hanetia) semiglobosus cochlearis* (Guppy), Rutsch, *ibidem,* p. 152, pl. 7, figs. 9a, 9b.

Type. — The type specimen of this species is not in the U.S. National Museum.

Type locality. — Springvale Quarry, Trinidad.

H. semiglobosa occurs at the base of the Melajo Clay. Its variation as to height of spire and inflation of the body whorl has been emphasized by Rutsch. Even the few Melajo specimens at hand show this variability to some degree.

The rounded axial ribs of *H. semiglobosa* are inconspicuous and usually restricted to the early spire whorls. If they persist to the body whorl, they are poorly and somewhat irregularly developed. A single specimen from the late Miocene Punta Gavilán Formation of Venezuela, probably representing *H. semiglobosa,* has been recorded by Rutsch (1934, p. 72, pl. 5, fig. 1).

In *H. gavilanensis* (Rutsch) (1934, p. 71, pl. 4, figs. 14-17) from the Punta Gavilán Formation of Venezuela, as well as in *H. magdalenensis* (Weisbord) (1929, p. 46, pl. 6, figs. 16, 17) from the middle Miocene of Colombia, the axials persist to the body whorl. *H. magdalenensis* and *H. semiglobosa* both have more axials and coarser spirals than *H. gavilanensis.*

The Pliocene *H. boggsi* Pilsbry and Olsson (1941, p. 28, pl. 5, figs. 3, 4) from Ecuador has more axials than *H. semiglobosa. H. boggsi* is related to the Recent Eastern Pacific *H. anomala* (Reeve).

Occurrence. — USGS 18411, USGS 18634.

Distribution. — Savaneta Glauconitic Sandstone Member and Melajo Clay Member, both of Springvale Fm., Trinidad. Punta Gavilán Fm. (late Miocene), Venezuela ?

Genus **CALOPHOS** Woodring

Woodring, 1964, U. S. Geol. Sur., Prof. Paper 306-C, p. 262.

Type species (by original designation), *Calophos ectyphus* Woodring.

Calophos rohri (Rutsch) Pl. 54, figs. 7-10

1942. *Phos ? rohri* Rutsch, Verh. Naturf. Ges. Basel, vol. 54, p. 150, pl. 7, figs. 5, 6.

Of medium to large size. Protoconch consists of almost two smooth whorls. Postnuclear whorls seven. Early sculpture reticulate. The axials disappear entirely after a few whorls, and the spirals become flatter. The spirals are absent on the middle portion of the body whorl or on the lower part of the penultimate whorl. Outer lip thin, with long lirations within. Inner lip smooth. Siphonal fasciole sculptured by four to six spirals, the uppermost one more prominent.

Holotype. — Natural History Museum Basel, No. H 6187.

Type locality. — Brechin Castle Estate, Trinidad (see Rutsch, 1942, p. 105, fig. 1).

The holotype of *C. rohri* is immature. Its last whorl still has spirals. Topotypes and other specimens from the Savaneta Glauconitic Sandstone Member of the Springvale Formation are not well preserved. In fact most specimens are deformed, whereas the shells from the Melajo Clay are almost perfect. Adult specimens of *C. rohri* are rare and fragmentary in the type area. In adult specimens the last part of the suture behind the outer lip is slightly ascending, but this part of the shell is rarely preserved.

The early sculpture of *C. rohri* is somewhat variable. The axials disappear sooner or later. The strength and width of the spirals are also variable. The spire is usually somewhat concave in profile.

C. rohri is most closely related to *C. baranoanus* (Anderson) (1929, p. 137, pl. 16, figs. 4, 5) from the middle Miocene of Colombia. *C. baranoanus* may have a thick shell. On an average its whorls are more convex, and its general shape stouter. Olsson (1964, p. 162, pl. 20, fig. 1) included *C. baranoanus* in his genus *Gordanops* (type species by original designation: *Gordanops esmeraldensis* Olsson). As mentioned above *C. rohri* has also a slightly ascending suture near the outer lip, but even less so than *C. baranoanus.*

C. mixteca (Perrilliat) (1963, p. 21, pl. 4, figs. 16, 17) from the middle Miocene Agueguexquite Formation, Isthmus of Tehuantepec, Mexico, is a smaller and more slender species. Its spirals disappear earlier than in *C. rohri.* Obscure axials may be present on the body whorl which are always lacking in *C. rohri* and *C. barano-*

anus. The type species of *Calophos*, *C. ectyphus* Woodring (1964, p. 263, pl. 42, figs. 12, 13, 16, 17) from the middle Miocene Gatun Formation of Panama, has even more prominent axials on the body whorl than *C. mixteca*.

Occurrence. — Hutch 47, Hutch 51, EL 1810, K 9797, RR 290, PJ 285, USGS 18399, USGS 18634, USGS 21178.

Distribution. — Savaneta Glauconitic Sandstone Member and Melajo Clay Member, both of Springvale Fm., Trinidad.

Genus **METAPHOS** Olsson

Olsson, 1964, Neogene Mollusks from Northwestern Ecuador, p. 154, Paleont. Research Inst.

Type species (by original designation), *Phos chelonia* Dall.

Metaphos (?) species Pl. 54, figs. 11, 12

Of medium size, slender. Spire high. Protoconch with four whorls. Postnuclear whorls 6½. First sculpture consists of fine spirals. After half a whorl these are crossed by opisthocline axials which gradually become orthocline. Early sculptured whorls somewhat shouldered but less so later. Axials sharply defined on early whorls but broader and rounded on late whorls. There are 11 axials on the body whorl. Number of spirals increasing with age, flattened on last whorl. Edge of outer lip not preserved; with fine lirations on inner surface. Columella smooth except for a basal fold which is followed by a shallow depression. Siphonal canal moderately short. Siphonal fasciole bordered by a sharp ridge.

This form is represented by two incomplete specimens from the Courbaril beds. Its generic assignment is questionable. It is not close to any of the species described by Olsson (1964, pp. 154-156). The Recent Eastern Pacific *Phos cocosensis* Dall (1896, p. 11) is considerably larger, and its axials do not become broader on late whorls.

Occurrence. — USGS 21778.

Genus **METULA** H. and A. Adams

H. and A. Adams, 1853, Genera of Recent Mollusca, vol. 1, p. 84.

Type species (by hidden tautonymy), *Metula hindsii* H. and A. Adams (= *Buccinum metula* Hinds).

Metula aff. **cancellata** Gabb Pl. 55, fig. 1

Of medium size, slender. Protoconch not preserved. Postnuclear whorls $5\frac{1}{2}$. First sculpture consists of six spirals which are crossed by numerous fine axials. Subsequently the axials become stronger than the spirals, and additional spirals are intercalated. On late spire whorls the spirals do not cross the axials with the exception of three spirals near the upper suture. On the body whorl axials and spirals are of almost the same size. Aperture long. Outer lip thickened, with numerous short denticles on inner surface. Columellar callus prominent, smooth.

This form is represented by a single, damaged specimen from the Melajo Clay. The type of *M. cancellata* Gabb (1873b, p. 205; Pilsbry, 1922, p. 349, pl. 22, figs. 19, 20) from the middle Miocene Gurabo Formation of the Dominican Republic has similar proportions and about the same size. In fact it differs only in having a somewhat finer sculpture.

An unnamed form occurring in deposits of late Miocene age near Puerto Limón, Costa Rica (USGS locality 18693) — not *M. limonensis* Olsson (1922, p. 116, pl. 10, figs. 5, 6) which is a stouter species with coarser sculpture than the Melajo shell — is probably conspecific with the Melajo specimen. As small species from the Pliocene of Moín Hill, Costa Rica (USGS locality 21051) has been recorded by Gabb (1881b, p. 351, pl. 46, fig. 32) as *M. cancellata*.

As pointed out by Woodring (1928, p. 286; 1964, p. 259) the status of *M. lintea* Guppy is uncertain.

Occurrence. — USGS 21178.

Family **NASSARIIDAE**

Genus **PALLACERA** Woodring

Woodring, 1964, U. S. Geol. Sur., Prof. Paper 306-C, p. 269.

Type species (by original designation), *Nassa myristicata* Hinds.

Pallacera species A — Pl. 55, figs. 2, 3

Of medium size, solid. Protoconch missing. Sculpture consists of prominent, rounded axials with wide interspaces and fine, closely spaced, spiral threads. There are eight axials on early whorls, six on body whorl. Whorls somewhat shouldered. Outer lip with long lirations on inner surface. Siphonal fasciole prominent.

A single, somewhat worn shell with a little more than four whorls from the base of the Melajo Clay is available. It closely resembles the probably immature specimen from the middle Miocene Gatun Formation of the Panama Canal Zone recorded by Woodring (1964, p. 270, pl. 43, figs. 2, 6) as *P.* aff. *guadelupensis* (Petit). The axials of the Gatun specimen are more regularly aligned on successive whorls than those of the Melajo shell.

Occurrence. — USGS 18411.

Pallacera cf. guadelupensis (Petit de la Saussaye)

A single fragment from Matura suggests the Recent West Indian *P. guadelupensis* (Petit de la Saussaye) (1852, p. 56, pl. 2, figs. 3, 4). It consists of the body whorl only but shows the apertural features and the siphonal fasciole typical of *Pallacera*. The Matura fragment has seven axials on the body whorl. *P. guadelupensis* has more of them. The same is true of *P. solidula* (Guppy) (1866b, p. 579, pl. 26, fig. 11) from Cumaná, Venezuela.

Occurrence. — USGS 19860.

Genus **NASSARIUS** Duméril

Duméril, 1806, Zoologie analytique, p. 166 (genus without species).

Type species (by monotypy, Froriep, 1806, C. Duméril's analytische Zoologie, p. 167), *Buccinum arcularia* Linné (see Iredale, 1916, Malac. Soc. London, Proc., vol. 12, p. 83).

Subgenus **PHRONTIS** H. and A. Adams

H. and A. Adams, 1853, The Genera of Recent Mollusca, vol. 1, p. 117.

Type species (by subsequent designation, Cossmann, 1901, Essais de paléoconchologie comparée, pt. 4, p. 207), *Nassa tiarula* Kiener.

Nassarius (Phrontis) vibex (Say) Pl. 55, figs. 4, 5

1822. *Nassa vibex* Say, Acad. Nat. Sci. Philadelphia, Jour., ser. 1, vol. 2, p. 231.
1962. *Nassarius (Phrontis) vibex* (Say), Weisbord, Bull. Amer. Paleont., vol. 42, No. 193, p. 349, pl. 30, figs. 13, 14. For further citations see this publication.

This species is represented by two specimens from the Courbaril beds. They are somewhat smaller than Recent shells, and their spiral sculpture is finer.

Occurrence. — K 1429, USGS 10991.

Distribution. — Widespread from late Miocene to Recent (see Weisbord, 1962, p. 351).

Subgenus **UZITA** H. and A. Adams

H. and A. Adams, 1853, The Genera of Recent Mollusca, vol. 1, p. 120.

Type species (by subsequent designation, Cossmann, 1901, Essais de paléoconchologie comparée, pt. 4, p. 205), *Buccinum migum* Bruguière.

Nassarius (Uzita) trinitatensis, n. sp. Pl. 55, figs. 6-8

Shell small, solid, stout. Protoconch consists of three smooth whorls. Early sculpture with spirals and axials of amost equal strength. Subsequently the axials become much stronger and rounded. On the body whorl there are about 11 axials exclusive the terminal varix, but they are narrower and more closely spaced behind the outer lip. Sutures usually deep, giving a somewhat angulated appearance to the whorls. There are five to six spirals on the penultimate whorl. On the body whorl there are occasional secondary spirals between the primaries. Outer lip thick, with a few elongate denticles on inner surface. Parietal callus prominent, its border detached from pillar; with a tooth posteriorly bordering a short posterior canal. Base of columella with a few rugae. Fossa deep. Siphonal fasciole with four to six spirals.

Holotype. — Natural History Museum Basel, No. H 15221.

Dimensions of holotype. — Height 9.3 mm, greatest diameter 5.3 mm.

Type locality. — Melajo River area: PJ 285.

N. trinitatensis occurs in great numbers in the Melajo Clay and in the Courbaril beds, and shows a considerable variation as to apical angle, number of spirals, and prominence of suture. The Courbaril shells tend to have somewhat broader axials.

N. trinitatensis is most closely related to *N. gurabensis* (Maury) (1917, p. 91, pl. 15, fig. 21) from the middle Miocene Gurabo Formation of the Dominican Republic. Both species have the same type of sculpture and a similar degree of variation. *N. gurabensis* usually has more numerous and finer spirals on the middle part of the body whorl. The aperture of *N. gurabensis* is more rounded, whereas that of *N. trinitatensis* is pointed above, *i.e.* its posterior canal is narrower.

N. brassicus (Maury) (1925, p. 210, pl. 36, fig. 12) and *N. brassoensis* (Mansfield) (1925, p. 46, pl. 7, fig. 3), both from the

Brasso Formation of Trinidad, have been considered as synonyms of *N. cercadensis* (Maury) (1917, p. 90, pl. 15, figs. 19, 20) from the middle Miocene Cercado Formation of the Dominican Republic by Woodring (1964, p. 271). Although similar in sculpture to *N. trinitatensis*, *N. cercadensis* mainly differs by its smaller size.

Occurrence.—Melajo River area: Hutch 47, EL 1810, KR 11862, K 9797, K 9817, K 9903, RR 293, PJ 285, USGS 18399, USGS 21178. Point Courbaril: K 1429, USGS 10991, USGS 20432, USGS 20434.

Nassarius (Uzita) cf. albus (Say)

1864. *Nassa incrassata* ? Müller, Guppy, Trans. Sci. Assoc. Trinidad for 1864, p. 34; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 14.
1867. *Nassa incrassata* Müller, Guppy, Proc. Sci. Assoc. Trinidad, pt. 3, p. 158 (part); reprint, Harris, 1921, *ibidem*, p. 37.
1874. *Nassa incrassata* Müller, Guppy, Geol. Mag., new ser., decade 2, vol. 1, p. 439 (part).

The *Nassarius* cited by Guppy from Matura long ago is represented in the present collections by a few poor, mostly incomplete specimens. The largest specimen available is still smaller than Recent adults of *N. albus*. As stated by Abbott (1958, p. 75, pl. 3 r) *N. albus* is a strongly variable species.

Occurrence.—JS 67, RR 230, PJ 302, USGS 19860.

Nassarius (Uzita) species A Pl. 55 figs. 9, 10

Of medium size. Protoconch consists of almost four whorls, its last part sculptured by slightly opisthocyrt axials. The axials soon become orthocline and are crossed by numerous fine spirals. Late spire whorls are slightly shouldered, and the spiral sculpture becomes obsolete except near the upper suture. Body whorl with nine axials exclusive terminal varix. Outer lip with lirations on inner surface. Posterior canal small. Parietal callus heavy, with denticles on lower part, and more or less prominent pustules on upper part. Fossa deep. Siphonal fasciole sculptured by a few spirals and sigmoid growth lines.

This form is represented by a few specimens from the base of the Melajo Clay. It suggests a relationship with the Recent Western Atlantic *N. consensus* (Ravenel) (1861, p. 43). The apertural features are the same, but the apical angle is smaller in the Melajo specimens. The spiral sculpture of *N. consensus* has about the same strength on all the whorls, whereas in Melajo shells it is stronger on early whorls but weaker on late whorls. According to Abbott (1954, p. 239, fig. 53b) *N. consensus* may be a form of *N. albus.*

N. fargoi Olsson and Harbison (1953, p. 223, pl. 33, fig. 3) from the Pliocene of Florida is considered by its authors as the prescursor of *N. consensus.*

Occurrence. — USGS 18411, USGS 18634.

Nassarius (subgenus ?) **galbanus,** n. sp. Pl. 55, figs. 11, 12

Of small to medium size. Protoconch with 2¾ smooth whorls. Early sculpture consists of three or four fine spirals which are soon crossed by straight axials. Subsequent whorls with heavy axials but obsolete spiral sculpture. Each axial divided into three parts by two constrictions. Body whorl with 12 axials exclusive terminal varix. Axials crossed by several spiral grooves on lower part of body whorl. Outer lip with about five denticles on inner surface. Inner lip with a denticle bordering the short posterior canal and an indistinct pustule near the base of the columella. Fossa missing. Siphonal fasciole not prominent, sculptured by a few nodulose spirals.

Holotype. — Natural History Museum Basel, No. H 15235.

Dimensions of holotype. — Height 7.7 mm, greatest diameter 4.1 mm.

Type locality. — Point Courbaril: K 1429.

N. galbanus occurs in the Courbaril beds only, where it is represented by more than 40 specimens.

N. galbanus is characterized by its predominantly axial sculpture and the lack of a fossa. The same general features are shown by *Nassa fontainei* d'Orbigny, the lectotype of which has been figured by Keen (1966, p. 4, pl. 1, fig. 3), and *Nassa panamensis* C. B. Adams (1852, p. 288; Turner, 1956, p. 71, pl. 5, fig. 9). These two species are considered as synonyms of *N. exilis* (Powys) (*in* G. B. Sowerby I and Powys, 1835, p. 95) by Keen (1958, p. 409). *N. galbanus* is considerably smaller than the West American species and differs in details of sculpture.

Occurrence. — K 1429, K 8399, PJ 212, USGS 10991, USGS 20432, USGS 20434.

Family **MELONGENIDAE**

Genus **MELONGENA** Schumacher

Schumacher, 1817, Essai d'un nouveau système des habitations des vers testacés, pp. 61, 212.

Type species (by monotypy), *Melongena fasciata* Schumacher (= *Murex melongena* Linné).

Melongena melongena (Linné) Pl. 56, figs. 1, 2

1758. *Murex melongena* Linné, Systema Naturae, ed. 10, p. 751.
1956. *Melongena melongena* (Linné), Clench and Turner, Johnsonia, vol. 3, No. 35, p. 165, pls. 96, 98.
1962. *Melongena melongena* (Linnaeus), Weisbord, Bull. Amer. Paleont., vol. 42, No. 193, p. 345, pl. 30, figs. 11, 12. For further citations see this publication.

M. melongena occurs in the Courbaril beds. Only three immature specimens and a piece of the wall of the body whorl of an adult shell are available. The fragment bears two spines of the row on the lower part of the body whorl. This row is mostly lacking in the Recent Eastern Pacific *M. patula* (Broderip and G. B. Sowerby I) (Clench and Turner, 1956, p. 168, pl. 99). The suture of the immature shells is deeply channeled. It is slightly ascending on the last part of the last preserved whorl which marks the beginning of the partial immersion of the spire so characteristic for Recent adult shells of *M. melongena*. The early spire whorls are shouldered but not so strongly angulated as in *M. patula*.

Occurrence.—K 8399, PJ 212, USGS 20432, USGS 21778.

Distribution.—See Clench and Turner (1956, pp. 167, 168) and Weisbord (1962, p. 348).

Family **FASCIOLARIIDAE**

Genus **LATIRUS** Montfort

Montfort, 1810, Conchyliologie systématique, vol. 2, p. 531.

Type species (by original designation), *Latirus aurantiacus* Montfort (= *Murex gibbulus* Gmelin).

Subgenus **POLYGONA** Schumacher

Schumacher, 1817, Essai d'un nouveau système des habitations des vers testacés, p. 241.

Type species (by monotypy), *Polygona fusiformis* Schumacher (= *Murex infundibulum* Gmelin).

Latirus (Polygona) cf. infundibulum (Gmelin)

Two poorly preserved, incomplete specimens from the base of the Melajo Clay are at hand. The strength of the sculpture is intermediate between the Recent Western Atlantic *L. infundibulum* and

L. infundibulum polius Woodring (1928, p. 253, pl. 15, figs. 4, 5) from the Bowden Formation of Jamaica. Specimens from the Savaneta Glauconitic Sandstone Member of the Springvale Formation have been identified as *L. infundibulum* by Rutsch (1942, p. 153) and as *L. infundibulum* cf. *polius* by Vokes (1938, p. 23, fig. 21).

Occurrence. — USGS 18634.

Genus **FASCIOLARIA** Lamarck

Lamarck, 1799, Mém. Soc. Hist. Nat. Paris, p. 73.

Type species (by monotypy), *Murex tulipa* Linné.

Fasciolaria cf. **tulipa** (Linné)

Two poorly preserved fragments from Matura seem to be identical or at least closely related to the Recent Western Atlantic *F. tulipa*. They are immature, the larger one measuring about 55 mm in height. No protoconch is preserved. The upper half of the whorls is slightly concave and is sculptured by stronger spirals than the rest of the whorl. The two columellar folds conspicuous.

On an average the apical angle of Recent shells is somewhat smaller than that of the Matura specimens.

Occurrence. — JS 67, RR 230.

Subgenus **PLEUROPLOCA** Fischer

Fischer, 1884, Manuel de conchyliologie, p. 616.

Type species (by monotypy), *Murex trapezium* Linné.

Fasciolaria (Pleuroploca) turamensis, n. sp. Pl. 56, figs. 4-6

Of small to medium size. Protoconch large, consists of about one whorl. Postnuclear whorls almost five. First sculpture consists of axials. After less than one whorl they disappear and are replaced by spirals of varying strength. At the same time the apical angle becomes larger, and the whorls slightly shouldered. Shoulder of body whorl prominent, carrying rounded nodes. Area between shoulder and upper suture somewhat concave, sculptured by widely spaced spirals. Spiral sculpture below shoulder obsolete but stronger again near base. Growth lines prosocline above shoulder, almost orthocline below. Outer lip with long, fine lirations on inner surface. Columellar callus thin, with a small ridge posteriorly which reaches far into the aperture. Siphonal canal moderately long. Siphonal fasciole inconspicuous.

Holotype. — Natural History Museum Basel, No. H 15243.

Dimensions of holotype. — Height 56.3 mm, greatest diameter 28.5 mm.

Type locality. — Matura Bay: RR 230.

This species is represented by two specimens from Matura. The front of the holotype is broken, but the protoconch is preserved and the anterior canal complete. The inner surface of the outer lip of the only paratype is encrusted by small oysters. Both specimens are probably not adult.

F. turamensis, n. sp. is most closely related to the Recent Eastern Pacific species or group of species listed by Keen (1958, p. 414) as *F. granosa* Broderip (*in* Broderip and G. B. Sowerby I, 1832-1833, p. 32, 1832) and *F. salmo* (Wood) (Supplement to the Index Testaceologicus, p. 51, pl. 5, fig. 14). Immature shells of about the same size as the Matura specimens tend to have more strongly shouldered early spire whorls (although this feature is variable in the Recent form). *F. turamensis,* however, has a considerably larger protoconch. In addition its spirals above the shoulder are widely spaced and not crowded as in the Recent shells. The growth lines above the shoulder are much more prosocline in the Matura species.

The body whorl of the Pliocene Venezuelan *F. crassinoda* Weisbord (1962, p. 354, pl. 31, figs. 3, 4) is more inflated and more constricted below than that of the Recent Eastern Pacific form. Its early spire whorls are more shouldered than those of *F. turamensis.* According to the original description *F. crassinoda* has a different protoconch.

Occurrence. — RR 230.

Family **FUSINIDAE**

Genus **FUSINUS** Rafinesque

Rafinesque, 1815, Analyse de la Nature, p. 145 (= *Fusus* Lamarck, 1799, not *Fusus* Helbling 1779).

Type species (of *Fusus* Lamarck, by monotypy), *Murex colus* Linné.

Fusinus species Pl. 56, fig. 3

Of medium size. Protoconch consists of 1¾ whorls, its last part sculptured by closely spaced, straight axials. First sculpture of four spirals and widely spaced axials. On subsequent whorls three spirals become more prominent, and additional spirals of secondary size are intercalated. The area above the strong spirals tends to be concave. There are 10 low axials on the last preserved whorl. Inner surface of outer lip with strong lirations. Canal sculptured by spirals of alternating size.

A few specimens from the base of the Melajo Clay are available. The size of a fragment of an anterior canal suggests that the other specimens are immature.

The axials of *F. springvalensis* (Maury) (1925, p. 206, pl. 35, fig. 11) from the Savaneta Glauconitic Sandstone Member of the Springvale Formation disappear on about the fifth spire whorl. In the Melajo species they decrease in strength on late spire whorls but do not disappear.

The *Fusinus* described by Woodring (1928, p. 257, pl. 15, fig. 8) from Bowden, Jamaica, has the same type of sculpture as the Melajo form, but is more slender, and has stronger axials, but weaker spirals. An almost complete specimen (USNM 559572) of the Bowden *Fusinus* referred to above is now available. Its straight, narrow anterior canal is as long as the spire.

Occurrence. — USGS 18411, USGS 18634.

Fusinus cf. **henekeni**[1] (Sowerby)

A single, incomplete specimen (height 86 mm) from Matura is available. It is related to the group of *F. henekeni* (G. B. Sowerby II) (1850, p. 49; Pflug, 1961, p. 47, pl. 12, figs. 1-5, 7, 9, 10) from the middle Miocene Cercado and Gurabo Formations of the Dominican Republic.

The whorls of the Matura specimen are regularly rounded. There are 10 low, rounded axials on the last preserved whorl which are crossed by spirals of two magnitudes. The axials of *F. esmeraldus* Olsson (1964, p. 143, pl. 24, figs. 3-3b) from the late Miocene or early Pliocene Esmeraldas Formation of Ecuador are heavier and broader. The axials of the Recent *F. eucosmius* (Dall) (1889a, p. 167, pl. 35, fig. 5) are more prominent and the whorls more constricted.

Occurrence. — RR 230.

Family OLIVIDAE

Genus OLIVA Bruguière

Bruguière, 1789, Encyclopédie méthodique, Histoire naturelle des vers, vol. 1, p. xv (genus without species).

---

[1]Originally inadvertently spelled *henikeri*, named for Colonel Heneken.

Type species (by monotypy and tautonymy, Lamarck, 1799, Mém. Soc. Hist. Nat. Paris, p. 70), *Voluta oliva* Linné.

Subgenus **OLIVA** s. str.

Oliva (Oliva) couvana Maury Pl. 56, fig. 8

1910. *Oliva cylindrica* Sowerby, Guppy, Agric. Soc. Trinidad and Tobago, Soc. Paper No. 440, p. 6; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 149.
1925. *Oliva cylindrica* Sowerby, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 195, pl. 33, figs. 3, 5.
1925. *Oliva couvana* Maury, *ibidem*, p. 195, pl. 33, fig. 6.
1938. *Oliva (Oliva) cylindrica* Sowerby, Vokes, Amer. Museum Novitates, No. 988, p. 4.
1938. *Oliva (Oliva) couvana* Maury, Vokes, *ibidem*, p. 4.
1942. *Oliva plicata couvana* Maury, Rutsch, Verh. Naturf. Ges. Basel, vol. 54, p. 157, pl. 8, fig. 4.

Holotype. — Paleont. Research Inst., Ithaca, N. Y., No. 1021.

Type locality. — Springvale Quarry, Trinidad.

O. couvana is represented by a few specimens from the base of the Melajo Clay. The close relationships of this species to *O. cristobalcoloni* Maury (1917, p. 67, pl. 10, fig. 15) from the middle Miocene Ceracado and Gurabo Formations of the Dominican Republic and *O. tuberaensis* Anderson (1929, p. 128, pl. 17, figs. 2, 3) from the middle Miocene of Colombia has been pointed out by Rutsch (1942, p. 158) and Woodring (1964, p. 278).

Occurrence. — USGS 18411, USGS 18634.

Distribution. — Savaneta Glauconitic Sandstone Member and Melajo Clay Member, both of Springvale Fm., Trinidad.

Oliva trinidadensis Maury Pl. 56, fig. 7

1912. *Oliva trinidadensis* Maury, Acad. Nat. Sci. Philadelphia, Jour., ser 2, vol. 15, p. 67, pl. 10, fig. 4.

Lectotype (herewith selected). — Cornell University, Paleont. Museum, Ithaca, N. Y., unnumbered.

Dimensions of lectotype. — Height 14.2 mm, diameter 7.8 mm.

Type locality. — Southern Main Road, at 56¾ milepost (today 49¾) just south of Pitch Lake, Trinidad. Stratigraphically this locality is about equivalent to the Courbaril beds.

The lectotype is preserved as an internal mold attached to matrix. The number of recognizable characters is insufficient to determine relationships. *Oliva trinidadensis* should be considered as a *nomen dubium*.

Genus **JASPIDELLA** Olsson

Olsson, 1956, Acad. Nat. Sci. Philadelphia, Proc., vol. 108, p. 212.

Type species (by original designation), *Voluta jaspidea* Gmelin.

Jaspidella sanctidominici (Maury) Pl. 55, fig. 21

1917. *Olivella sanctidominici* Maury, Bull. Amer. Paleont., vol. 5, No. 29, p. 69, pl. 11, fig. 4.

Of medium size, solid. Protoconch not well separated from later whorls, consists of less than one volution, large. Postnuclear whorls a little more than three, highly polished. Spire low. Suture channeled. Columella with a heavy basal fold and a few indistinct denticles above.

Holotype. — Cornell University, Paleont. Museum, Ithaca, N.Y.

Type locality. — Río Gurabo at Los Quemados, Dominican Republic (Gurabo Fm.).

This species is represented by a single well-preserved specimen from the base of the Melajo Clay. It is indistinguishable from topotypes of *J. sanctidominici* except that its protoconch is slightly lower. Two specimens from Springvale Quarry (USGS locality 21809) are somewhat deformed, but seem to represent the same species.

As pointed out by Maury *J. sanctidominici* has a lower spire than the Recent West Indian *J. jaspidea* (Gmelin) (Olsson, 1956, p. 212, pl. 15, figs. 1, 1a) and is somewhat more slender.

Occurrence. — USGS 18411.

Distribution. — Gurabo Fm. (middle Miocene), Dominican Republic. Savaneta Glauconitic Sandstone Member (?) and Melajo Clay Member, both of Springvale Fm., Trinidad.

Genus **OLIVELLA** Swainson

Swainson, 1831, Zoological Illustrations, ser. 2, vol. 2, explanation of pl. 58 (*Oliva*, pl. 2).

Type species (by subsequent designation, Dall, 1909, U.S. Geol. Sur., Prof. Paper 59, p. 31), *Oliva purpurata* Swainson (= *Voluta dama* Mawe).

Subgenus **OLIVELLA** s. str.

Olivella (Olivella) species Pl. 55, fig. 13

Shell small. Protoconch small. Postnuclear whorls about four. Sutures deeply channeled. Columellar callus with four to five elongate denticles. Parietal callus with two rather distant denticles. Columella more or less excavated.

This form is fairly common at Matura, but the specimens seem to be immature. It possibly represents the species listed by Maury (1925, p. 197; not pl. 33, fig. 2) as *Olivella mutica*. The columellar excavation is not always pronounced. The strength of the denticles near the base is variable. The Matura species is much smaller than the Recent Western Atlantic *O. nivea* (Gmelin) (Olsson, 1956, p. 172, pl. 11, figs. 3-3b).

Occurrence. — JS 67, RR 230, PJ 302, USGS 19860.

Subgenus **DACTYLIDIA** H. and A. Adams

H. and A. Adams, 1853, The Genera of Recent Mollusca, vol. 1, p. 146.

Type species (by subsequent designation, Cossmann, 1899, Essais de paléoconchologie comparée, pt. 3, p. 54), *Oliva mutica* Say.

Olivella (Dactylidia) aff. mutica (Say) Pl. 55, fig. 14

Of small to medium size. Protoconch not well separated from later whorls, consisting of about 1½ whorls. Postnuclear whorls up to 4½. Sutures deeply channeled. Parietal callus prominent. Pillar structure consists of a tongue-shaped ledge bearing a basal fold and several lirations above. Fasciolar band with a broad lower and a narrow upper part.

This species is represented by some specimens from the Melajo Clay. The same form occurs in the Savaneta Glauconitic Sandstone Member of the Springvale Formation.

The Recent Western Atlantic *O. mutica* (Say) (1822, p. 228; Olsson, 1956, p. 184, pl. 9, figs. 7-7b) essentially is a larger and stouter species with a larger initial whorl. It also differs in details of the pillar structure.

Occurrence. — EL 1810, KR 11862, K 9797, PJ 285, USGS 21178.

Subgenus **NITEOLIVA** Olsson

Olsson, 1956, Acad. Nat. Sci. Philadelphia, Proc., vol. 108, p. 189.

Type species (by original designation), *Porphyria minuta* Link.

Olivella (Niteoliva) cf. verreauxi (Ducros) Pl. 55, fig. 15

A few worn and mostly immature specimens from Matura are close to the Recent Caribbean *O. verreauxi* (Ducros) (Olsson, 1956, p. 191, pl. 9, fig. 3). The largest Matura shell is figured. It is incomplete and considerably smaller than Recent specimens. As pointed out by Olsson *O. verreauxi* is more slender than *O. minuta* (Link).

Occurrence. — JS 67, RR 230, PJ 302, USGS 19860.

Subgenus **MINIOLIVA** Olsson

Olsson, 1956, Acad. Nat. Sci. Philadelphia, Proc., vol. 108, p. 209.

Type species (by original designation), *Olivella (Minioliva) perplexa* Olsson.

Olivella (Minioliva) fundarugata Weisbord Pl. 55, figs. 16, 17

1962. *Olivella (Minioliva) fundarugata* Weisbord, Bull. Amer. Paleont., vol. 42, No. 193, p. 385, pl. 35, figs. 1-8.

1962. *Olivella (Minioliva) subfilifera* Weisbord, *ibidem*, p. 386, pl. 35, figs. 9, 10.

Shell small. Protoconch consists of less than one whorl. Postnuclear whorls about four. Sutures deeply channeled. Columella with an inconspicuous fold at base. Parietal callus thick near posterior end of aperture. Fasciolar band bordered by a fine spiral groove.

Holotype. — Paleont. Research Inst., Ithaca, N. Y., No. 26278.

Type locality. — Cabo Blanco area, Venezuela (Mare Fm.).

This species is represented in the Melajo Clay by several hundred specimens of all growth stages and by about 100 specimens from the Courbaril beds. They never exceed 4 mm in height. The height of the spire, the apical angle, as well as the stoutness of the body whorl, show a great variability. On some Melajo specimens the color pattern is preserved. It consists of closely set axial bands. The thickening of the parietal callus near the posterior end of the aperture, however, is constant. Only in young specimens with one or two postnuclear whorls it is not yet developed.

The type lot (USNM 214357) of the Subrecent to Recent *O. myrmecoon* Dall (1912, p. 4; Olsson, 1956, p. 211, pl. 12, figs. 10, 10a) from the Caribbean coast of the Panama Canal Zone consists of nine specimens. These shells also show some variability as to height of spire and apical angle. Some of them have retained a color pattern consisting of axial bands which are more widely spaced than in Melajo specimens. On an average *O. myrmecoon* is stouter than the Melajo shells, and its parietal callus is not thickened near the posterior end of the aperture.

O. maiquetiana Weisbord (1962, p. 388, pl. 35, figs. 11-14) and *O. salinae* Weisbord (1962, p. 389, pl. 35, figs. 15, 16) are both based on immature specimens and may represent a known species.

Occurrence. — Melajo River area: EL 1810, KR 11862, RR 290, PJ 285, USGS 18399, USGS 21178. Point Courbaril: K 1429, PJ 212, USGS 10991, USGS 20433.

Distribution. — Pliocene of Cabo Blanco area, Venezuela.

Genus **ANCILLA** Lamarck

Lamarck, 1799, Mém. Soc. Hist. Nat. Paris, p. 70 (genus without binominally named species).

Type species (by subsequent designation, Lamarck, 1801, Système des animaux sans vertèbres, p. 73), *Ancilla cinnamomea* Lamarck.

Subgenus **EBURNA** Lamarck

Lamarck, 1801, Système des animaux sans vertèbres, p. 78.

Type species (by monotypy), *Eburna flavida* Lamarck (= *Buccinum glabratum* Linné).

Ancilla (Eburna) caroniana Maury

1910. *Ancilaria lamelata* (*sic*) Guppy, Agric. Soc. Trinidad and Tobago, Soc. Paper No. 440, p. 10; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 153.
1911 *Ancilaria lamelata* (*sic*) Guppy, Agric. Soc. Trinidad and Tobago, Soc. Paper No. 454, p. 9; reprint, Harris, 1921, *ibidem*, p. 165.
1925. *Ancilla caroniana* Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 198, pl. 33, figs. 4, 10, 12
1925. *Ancilla caroniana* Maury, Mansfield, U. S. Nat. Mus., Proc., vol. 66, art. 22, p. 34, pl. 5, fig. 4.
1925. *Ancilla caroniana springvalensis* Mansfield, *ibidem*, p. 35, pl. 5, fig. 5.
1938. *Ancilla (Eburna) caroniana* Maury, Vokes, Amer. Museum Novitates, No. 988, p. 4.
1938. *Ancilla (Eburna) caroniana springvalensis* Mansfield, Vokes, *ibidem*, p. 4.
1942. *Ancilla (Eburna) caroniana* Maury, Rutsch, Verh. Naturf. Ges. Basel, vol. 54, p. 155, pl. 8, figs. 1, 3.
1942. *Ancilla (Eburna) caroniana springvalensis* Mansfield, Rutsch, *ibidem*, p. 156, pl. 8, fig. 2.

Types. — Lectotype of *A. caroniana* (herewith selected): Paleont. Research Inst., Ithaca, N. Y., No. 1025 (specimen figured by Maury, 1925, pl. 33, figs. 10, 12). Holotype of *caroniana springvalensis*: USNM 352666.

Dimensions of lectotype of caroniana. — Height 60.4 mm, diameter 28.7 mm.

Type locality. — For both forms: Springvale Quarry, Trinidad.

A. caroniana is represented by two incomplete specimens from the base of the Melajo Clay. In the Savaneta Glauconitic Sandstone Member *A. caroniana* is abundant, and all transitions from *A. caroniana* to Mansfield's subspecies *springvalensis* are represented. The Melajo specimens have an acute spire with flat-sided whorls.

A. caroniana has a distinct spiral line just above the middle of the body whorl which meets the parietal callus above the aperture. This line is absent in the type species of *Eburna,* the Recent West Indian *A. glabrata* (Linné) as well as in *A. glabrata speciosa* Rutsch (1934, p. 78, pl. 5, figs. 6, 7, text fig. 10) from the late Miocene Punta Gavilán Formation of Venezuela.

Maury's (1925, p. 199) record of *A. caroniana* from the middle Miocene Manzanilla Formation has not been confirmed.

Occurrence. — USGS 18411, USGS 18634.

Distribution. — Savaneta Glauconitic Sandstone Member and Melajo Clay Member, both of Springvale Fm., Trinidad.

Family **MITRIDAE**

Genus **CANCILLA** Swainson

Swainson, 1840, A treatise on malacology, pp. 130, 320.

Type species (by subsequent designation, Herrmannsen, 1846, Indicis generum malacozoorum primordia, vol. 1, p. 166), *Mitra isabella* Swainson. See Coan (1966, p. 129).

Cancilla cf. sanctifrancisci (Maury)

A fragment from the base of the Melajo Clay, consisting of a single late whorl, seems to belong to *C. sanctifrancisci* (Maury) (1925, p. 204, pl. 35, fig. 13) which had been described from the Savaneta Glauconitic Sandstone Member of the Springvale Formation. Its sculpture consists of five spirals without secondary spirals in its interspaces and fine axials.

Some small specimens, also from the base of the Melajo Clay, include well-preserved early stages. The protoconch is high, and consists of 3½ whorls. Sculpture starting abruptly, consists of four closely set spirals and weak axials in the interspaces. On later whorls the two central spirals are somewhat stronger than the others. Columella with three strong folds, below which there may be one or two smaller ones.

It is questionable whether these immature specimens represent *C. sanctifrancisci.* Rutsch (1942, pl. 8, figs. 6a, 6b) figured a much better specimen than Maury (1925, pl. 35, fig. 13) and included *Mitra woodringi* Vokes (1938, p. 22, fig. 15) in the synonymy of *C. sanctifrancisci.* The early whorls of the Melajo shells are more convex than those of specimens from Springvale.

Occurrence. — USGS 18411, USGS 18634.

Genus **SCABRICOLA** Swainson

Swainson, 1840, A treatise on malacology, pp. 130, 131, 319.

Type species (by subsequent designation, Gray, 1847, Zool. Soc. London, Proc., pt. 15, p. 141), *Mitra serpentina* Lamarck.

According to Cernohorsky (1966, p. 116) *Mitra serpentina* is the same as *Voluta variegata* Gmelin, and its radula "unique among all other mitrid radula types."

Scabricola nodulosa (Gmelin) Pl. 55, fig. 18

1791. *Voluta nodulosa* Gmelin, Systema Naturae, ed. 13, vol. 1, pt. 6, p. 3445.
1962. *Mitra (Uromitra) nodulosa* (Gmelin). Weisbord, Bull. Amer. Paleont., vol. 42, No. 193, p. 395, pl. 36, figs. 7, 8. For further citations see this publication.

A single, worn, not adult specimen from Matura is available. It is indistinguishable from Recent shells of corresponding size. As stated by Abbott (1958, p. 82), the sculpture and shape of *S. nodulosa* are strongly variable.

Mitra granulosa Lamarck is considered a synonym of *S. nodulosa* by some authors. Pilsbry's (1922, p. 340) record of *S. granulosa* from the Miocene of the Dominican Republic needs confirmation. A single specimen from late Miocene deposits near Puerto Limón, Costa Rica (USGS locality 21056), may be conspecific with *S. nodulosa*, although it has coarser axials than most of the Recent shells.

Occurrence. — USGS 19860.

Distribution. — Pleistocene of Cuba. Recent from Florida and the Bahamas through the West Indies.

Genus **CONOMITRA** Conrad

Conrad, 1865, Amer. Jour. Conchology, vol. 1, pt. 1, p. 25.

Type species (by subsequent designation, Fischer, 1884. Manuel de conchyliologie, p. 613), *Mitra fusoides* Lea.

Conomitra species A Pl. 55, figs. 19, 20

Of medium size, biconic. Protoconch consists of about two whorls. Postnuclear whorls almost five. Sculpture consists of numerous axials with wider interspaces and low, but broad spirals. There are three to four spirals on the spire whorls. Suture deep. Whorls shouldered near upper suture. Columella with four strong folds. On the lower part of the body whorl there may be secondary spirals.

A single, incomplete specimen from the base of the Melajo Clay is at hand. It is closely related to the Miocene Venezuelan *C. lavelana* F. Hodson (*in* Hodson and Hodson, 1931a, p. 43, pl. 24, figs. 1-4, 7, 11). The Melajo specimen has a somewhat larger apical angle and finer sculpture. *C. caribbeana* Weisbord (1929, p. 48, pl. 6, figs. 14, 15) from the middle Miocene of Colombia has even coarser axials than *C. lavelana* and is larger.

C. mauryae Rutsch (1942, p. 158, pl. 8, figs. 8a, 8b) from Springvale Quarry is a different species.

Occurrence.—USGS 18411.

Family **TURBINELLIDAE**

Genus **TURBINELLA** Lamarck

Lamarck, 1799, Mém. Soc. Hist. Nat. Paris, p. 73.

Type species (by monotypy), *Voluta pyrum* Linné.

Turbinella riosecana (H. K. Hodson)

1931. *Xancus praeovoideus riosecanus* H. K. Hodson, *in* Hodson and Hodson, Bull. Amer. Paleont., vol. 16, No. 60, p. 12, pl. 11, fig. 1, pl. 12, fig. 1.
1942. *Xancus trinitatis riosecanus* H. K. Hodson, Rutsch, Verh. Naturf. Ges. Basel, vol. 54, p. 161, pl. 9, figs. 1, 3.
1964. *Turbinella riosecana* (H. K. Hodson), Vokes, Tulane Stud. Geol., vol. 2, No. 2, p. 53. For further citations see this publication

Holotype.—Paleont. Research Inst., Ithaca, N. Y., No. 21148.

Type locality.—About 20 km northeast of Urumaco, Falcón, Venezuela.

A single, incomplete specimen from the base of the Melajo Clay is at hand. It consists of three smooth whorls and has a thick parietal callus. It is about 160 mm high, and its greatest diameter measures 95 mm. The relationships of this species to other forms have been discussed by Vokes (1964, pp. 40, 54).

Occurrence.—USGS 18411.

Distribution.—Savaneta Glauconitic Sandstone Member and

Melajo Clay Member, both of Springvale Fm., Trinidad. Rio Seco Fm. (Pliocene), Falcón, Venezuela.

Family MARGINELLIDAE

Genus PRUNUM Herrmannsen

Herrmannsen, 1852, Indicis generum malacozoorum. Supplementa et corrigenda, p. 113.

Type species (by monotypy), *Voluta prunum* Gmelin.

Subgenus PRUNUM s. str.

Prunum (Prunum) dallianum (Maury) Pl. 57, figs. 1-4

1912. *Marginella dalliana* Maury, Acad. Nat. Sci. Philadelphia, Jour., ser. 2, vol. 15, p. 67, pl. 10, figs 5, 6.
1925. *Marginella dalliana* Maury, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 201.

Of medium size, rather stout. Spire low. Outer lip moderately thickened, smooth. Columella with four folds, the two anterior ones with a narrow interspace and much more oblique than the two posterior ones. Columellar callus inconspicuous. Aperture somewhat broader anteriorly.

Lectotype (herewith selected). — Cornell University, Paleont. Museum, Ithaca, N. Y., unnumbered.

Dimensions of lectotype. — Height 20.3 mm, diameter 13.2 mm.

Type locality. — Point Courbaril area: 1000 feet west of Brighton pier, Trinidad.

Only a few specimens of *P. dallianum* are known from the Courbaril beds. Guppy (*e.g.* 1874, p. 440) cited *P. caerulescens* Lamarck from the Matura beds several times. *P. caerulescens* is considered as a synonym of *P. prunum* by some authors. A few specimens from Matura with broken outer lips may represent Guppy's *P. caerulescens*. Their stoutness, the position of their columellar folds, and the weak callus on the anterior part of the columella suggest that they are conspecific with *P. dallianum*.

The Recent Caribbean *P. prunum* is larger, more slender, and has a high spire. The Recent Eastern Pacific *P. curtum* (G. B. Sowerby I) (Coan and Roth, 1966, p. 280, pl. 48, figs. 4-6) has a somewhat higher spire, weaker columellar folds, and a prominent deposit of callus near the base of the columella which is lacking in *P. dallianum*.

Occurrence. — Point Courbaril: USGS 10991, USGS 20432, USGS 20434, USGS 21778. Matura Bay: JS 67 (?), USGS 19860 (?).

Subgenus **EGOUENA** Jousseaume

Jousseaume, 1875, Revue et Magasin de Zoologie, ser. 3, vol. 3, p. 167.

Type species (by subsequent designation, Tomlin, 1917, Malac. Soc. London, Proc., vol. 12, pt. 5, p. 244), *Marginella amygdala* Kiener.

Prunum (Egouena) springvalense (Maury) Pl. 57, figs. 5, 6

1925. *Marginella springvalensis* Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 200, pl. 34, figs. 10, 14.
1925. *Marginella springvalensis* Maury, Mansfield, U. S. Nat. Mus., Proc., vol. 66, art. 22, p. 38, pl. 6, fig. 13.
1938. *Marginella (Leptegouana) springvalensis* Maury, Vokes, Amer. Museum Novitates, No. 988, p. 4.
1942. *Marginella (Prunum) springvalensis* Maury, Rutsch, Verh. Naturf. Ges. Basel, vol. 54, p. 101.

Of medium to large size, solid. Spire moderately elevated. Outer lip strongly thickened. Parietal callus not prominent. The four columellar folds of about the same strength, the two anterior ones more closely set and more oblique than the others. Aperture wider anteriorly. Callus of outer lip not reaching beyond penultimate whorl posteriorly.

Lectotype (herewith selected). — Paleont. Research Inst., Ithaca, N. Y., No. 1038 (specimen figured by Maury, 1925, pl. 34, fig. 14).

Dimensions of lectotype. — Height 41.4 mm, greatest diameter 25.5 mm.

Type locality. — Springvale Quarry, Trinidad.

P. springvalense occurs abundantly in the Savaneta Glauconitic Sandstone Member, but at the base of the Melajo Clay only a few specimens have been found.

P. springvalense is related to the Miocene Venezuelan *P. democracianum* (F. Hodson) (*in* Hodson, Hodson and Harris, 1927, p. 76, pl. 40, fig. 20). *P. democracianum* has a higher spire and a more inflated body whorl. *P. springvalense* does not have a close Recent relative in the Western Atlantic or the Eastern Pacific.

Occurrence. — USGS 18411, USGS 18634.

Distribution. — Savaneta Glauconitic Sandstone Member and Melajo Clay Member, both of Springvale Fm., Trinidad.

Prunum (Egouena) calypsonis (Maury) Pl. 57, figs. 9, 10

?1910. *Marginela* (sic) *coniformis* G. B. Sowerby I, Guppy, Agric. Soc. Trinidad and Tobago, Soc. Paper No. 410, p. 8; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 151.

1925. *Marginella calypsonis* Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 199, pl. 34, figs. 12, 13.
1925. *Marginella calypsonis* Maury, Mansfield, U. S. Nat. Mus., Proc., vol. 66, art. 22, p. 39, pl. 6, fig. 11.
1938. *Marginella (Egouana) calypsonis* Maury, Vokes, Amer. Museum Novitates, No. 988, p. 4.
1942. *Marginella (Prunum) calypsonis* Maury, Rutsch, Verh. Naturf. Ges. Basel, vol. 54, p. 104.

Of medium size, solid. Spire moderately elevated. Outer lip strongly thickened. Callus of inner lip thick, reaching from the base of the columella to the top of the spire. Spire whorls recognizable on dorsal side only. Columellar folds four, the two anterior ones more oblique and somewhat stronger.

Lectotype (herewith selected). — Paleont. Research Inst., Ithaca, N. Y., No. 1037 (specimen figured by Maury, 1925, pl. 34, fig. 13).

Dimensions of lectotype. — Height 21.6 mm, greatest diameter 12.1 mm.

Type locality. — Springvale Quarry, Trinidad.

Like *P. springvalense* this species is abundant in the Savaneta Glauconitic Sandstone Member, but only a few specimens have been collected at the base of the Melajo Clay.

The Venezuelan Miocene *P. berjadinense* (F. Hodson) (*in* Hodson, Hodson and Harris, 1927, p. 75, pl. 37, figs. 11, 13, pl. 40, figs. 16, 18) seems to be related to *P. calypsonis,* although it is smaller and its parietal callus less prominent. The figured paratype of *P. suteri* (Rutsch) (1934, pl. 8, figs. 8, 9; not figs. 6, 7, 10), from the late Miocene Punta Gavilán Formation of Venezuela, has about the dimensions of *P. calypsonis.* Its parietal callus is not so thick as in *P. calypsonis* (in this respect more resembling *P. berjadinense*) and its outer lip less thickened.

The Recent Western Atlantic *P. cinctum* (Kiener) (Spéciés général, *Marginella,* p. 21, pl. 8, fig. 32) probably is a descendant of *P. calypsonis.* Its parietal callus and outer lip are even heavier.

Occurrence. — USGS 18411, USGS 18634.

Distribution. — Savaneta Glauconitic Sandstone Member and Melajo Clay Member, both of Springvale Fm., Trinidad.

Genus **VOLVARINA** Hinds

Hinds, 1844, Zool. Soc. London, Proc., pt. 12, p. 75.

Type species (by subsequent designation, Redfield, 1870, Amer.

Jour. Conch., vol. 6, pt. 2, p. 221), *Marginella nitida* Hinds (= *Voluta mitrella* Risso).

Volvarina (?) species A — Pl. 57, fig. 17

Shell large, solid. Spire low, but pointed. Outer lip thickened, straight. Columella with four folds of about equal strength. Aperture wider anteriorly. Columellar callus inconspicuous.

A few specimens of this form occur at the base of the Melajo Clay and probably represent a new species. They are somewhat larger, stouter, and have a lower spire than the middle Miocene *Marginella leander* Brown and Pilsbry (1911, p. 347, pl. 24, fig. 13; Olsson, 1922, p. 98, pl. 6, fig. 22) from Panama. *Marginella collina* Olsson (1922, p. 97, pl. 7, figs. 26, 27) from the middle Miocene of Costa Rica is smaller and more slender.

Occurrence.—USGS 18411, USGS 18634.

Volvarina (?) species B — Pl. 57, fig. 16

A few specimens from the Courbaril beds and Matura are similar to *Volvarina* (?) species A. Their outer lip, however, is not straight, and there is a shallow concavity near the base of the columella which is not present in the Melajo specimens.

There seems to be no closely related Recent Caribbean species. *V. avena* (Kiener) (Abbott, 1958, p. 85, pl. 2 l) is much more slender, and the central part of its outer lip is slightly constricted.

Occurrence.—Point Courbaril: USGS 20432. Matura Bay: JS 67, RR 230, PJ 302, USGS 19860.

Genus **PERSICULA** Schumacher

Schumacher, 1817, Essai d'un nouveau système des habitations des vers testacés, p. 235.

Type species (by monotypy), *Persicula variabilis* Schumacher (= *Voluta persicula* Linné).

Subgenus **RABICEA** Gray

Gray, 1857, Guide to the systematic distribution of Mollusca in the British Museum, p. 37.

Type species (by monotypy), *Marginella interrupta* Lamarck (= *Voluta interruptolineata* Megerle von Mühlfeld).

Persicula (Rabicea) couviana (Maury) — Pl. 57, figs. 13-15

1925. *Marginella (Persicula) couviana* Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 202, pl. 34, fig. 11.

1925. *Marginella (Persicula) propeobesa* Mansfield, U. S. Nat. Mus., Proc., vol. 66, art. 22, p. 41, pl. 6, fig. 10.
1938. *Marginella (Persicula) couviana* Maury, Vokes, Amer. Museum Novitates, No. 988, p. 4.
1938. *Marginella (Persicula) propeobesa* Mansfield, Vokes, *ibidem*, p. 4.
1942. *Persicula (Rabicea) couviana* (Maury), Rutsch, Verh. Naturf. Ges. Basel, vol. 54, p. 165.

Of medium size, solid. Outer lip thickened, denticulated within. Parietal callus thin, with an inconspicuous axial ridge. Columella with two prominent folds at base, the upper one being stronger. Above them there is a variable number of shorter and weaker ridges. Basal notch deep.

Holotypes. — Of *P. couviana*: Paleont. Research Inst., Ithaca, N. Y., No. 1035. Of *P. propeobesa*: USNM 352651.

Type locality. — For both species: Springvale Quarry, Trinidad.

P. couviana occurs at the base of the Melajo Clay. Most specimens are perfectly preserved. Some of the Melajo shells reach a larger size than topotypes. The prominence of the denticles on the inner surface of the outer lip is variable. The denticles may be lacking in immature shells but are present in adults.

P. couviana is closely related to the Miocene Venezuelan *P. venezuelana lavelana* (F. Hodson) (*in* Hodson, Hodson and Harris, 1927, p. 78, pl. 40, figs. 3, 10, 11). In fact the differences are slight. The Venezuelan species tends to be stouter and has a thicker parietal callus.

Occurrence. — USGS 18111, USGS 18634.

Distribution. — Savaneta Glauconitic Sandstone Member and Melajo Clay Member, both of Springvale Fm., Trinidad.

Persicula (Rabicea) cf. **interruptolineata** (Megerle von Mühlfeld)
Pl. 57, figs. 11, 12

A number of specimens from Matura may be referrable to the Recent Caribbean *P. interruptolineata*. No color patterns are preserved. They show a considerable variation as to stoutness. The denticulation on the inner surface of the outer lip is weak, if present. The groove above the two basal columellar folds is sometimes not pronounced at all.

A similar variability is shown by Recent specimens. According to Coan and Roth (1966, p. 284) *P. interrupta mareana* Weisbord (1962, p. 409, pl. 37, figs. 9-14) and *P. hodsoni* Weisbord (1962, p.

412, pl. 38, figs. 5-8), both from the Pliocene of Venezuela, probably represent *P. interruptolineata*.

Occurrence. — K 10924, JS 67, RR 230, USGS 18201, USGS 19860.

Genus **BULLATA** Jousseaume

Jousseaume, 1875, Revue et Magasin de Zoologie, ser. 3, vol. 3, pp. 167, 250

Type species (by tautonymy), *Voluta bullata* Born.

Bullata maiae (Maury) Pl. 57, figs. 7, 8

1925. *Marginella (Volutella) maiae* Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 201, pl. 34, fig. 9.
1938. *Marginella (Volutella) maiae* Maury, Vokes, Amer. Museum Novitates, No. 988, p. 4.
1942. *Marginella (Bullata) bullata maiae* Maury, Rutsch, Verh. Naturf. Ges. Basel, vol. 54, p. 165.

Holotype. — Paleont. Research Inst., Ithaca, N. Y., No. 1033.

Type locality. — Springvale Quarry, Trinidad.

B. maiae occurs in the Melajo Clay in fragments only. One fragment representing part of a body whorl reaches a height of 66 mm. A complete, but somewhat deformed specimen from the Savaneta Glauconitic Sandstone Member, is figured. Its spire is flat and submerged, and the outer lip reaches higher up.

The Recent *B. bullata* from Brasil is more inflated. Its outer lip bears denticles, whereas that of *B. maiae* is smooth. The outer lip of *B. maiae* is more thickened, and the base of the aperture much wider than in *B. bullata*.

B. popenoi (Mansfield) (1930, p. 51, pl. 4, figs. 9, 11) from the late Miocene of Florida is smaller, has a denticulated outer lip, and a narrower aperture.

Occurrence. — Hutch 47, Hutch 51, PJ 285, USGS 21178.

Distribution. — Savaneta Glauconitic Sandstone Member and Melajo Clay Member, both of Springvale Fm., Trinidad.

Bullata maturensis, n. sp. Pl. 58, figs. 1, 2

Shell large, slender. Spire flat, forming a horizontal plane with the uppermost part of the outer lip. Body whorl only slightly inflated. Aperture wider anteriorly. Outer lip thick, smooth, almost straight. Columellar folds four, the two anterior ones more oblique.

Holotype. — Natural History Museum Basel, No. H 15270.

Dimensions of holotype. — Height 40.0 mm, greatest diameter 19.5 mm.

Type locality. — Matura Bay: RR 230.

B. maturensis is represented from Matura by one adult shell, the holotype, and two immature specimens. Three immature shells from the Courbaril beds are identified as this species as well.

B. maturensis is characterised by its slender shape and its straight outer lip. None of the large species of *Bullata* show these features. The wide anterior part of the aperture is similar to that of *B. maiae,* but *B. maiae* is larger and more inflated. The Recent *B. bullata* is even more inflated, and the shape of the aperture entirely different.

Large species of *Bullata* occur in the Caribbean region from Miocene to Recent. No Recent analogue is known from the Eastern Pacific.

Occurrence. — Point Courbaril: K 12255, USGS 20134, USGS 21778. Matura Bay: RR 230.

Family **CANCELLARIIDAE**

Genus **CANCELLARIA** Lamarck

Lamarck, 1799, Mém. Soc. Hist. Nat. Paris, p. 71.

Type species (by monotypy), *Voluta reticulata* Linné.

Subgenus **EUCLIA** H. and A. Adams

H. and A. Adams, 1854, The Genera of Recent Mollusca, vol. 1, p. 277.

Type species (by subsequent designation, Cossmann, 1899, Essais de paléoconchologie comparée, pt. 3, p. 10), *Cancellaria cassidiformis* G. B. Sowerby I.

Cancellaria (Euclia) montserratensis Maury Pl. 58, figs. 6, 7

1925. *Cancellaria montserratensis* Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 194, pl. 35, figs. 6, 8.
1925. *Cancellaria springvaleensis* Mansfield, U. S. Nat. Mus., Proc., vol. 66, art. 22, p. 31, pl. 2, fig. 12.
1938. *Cancellaria (Cancellaria) couvana* Vokes, Amer. Museum Novitates, No. 988, p. 20, fig. 21.
1942. *Cancellaria montserratensis* Maury, Rutsch, Verh. Naturf. Ges. Basel, vol. 54, p. 163, pl. 9, figs. 7a, 7b.

Of medium size. Protoconch with 2½ whorls. Postnuclear whorls five. Early sculpture consisting of four to five spirals and about 10 axials. Subsequently the whorls become strongly shouldered. One spiral is sitting on the shoulder, two broad spirals are below the shoulder and a third one at the lower suture. Between shoulder and upper suture there are two or three minor spirals. Shoulder with nodes where crossed by axials. Parietal callus large and prominent. Columella with three folds, the lowest one inconspicuous. Between the upper two folds there are three small pustules near the margin of the callus. Outer lip lirate within. Umbilical opening small. Siphonal fasciole prominent, sculptured by several spirals.

Types. — Lectotype of *C. montserratensis* (herewith selected): Paleont. Research Inst., Ithaca, N. Y., No. 1046 (specimen figured by Maury, 1925, pl. 35, fig. 8). Holotype of *C. springvaleensis*: USNM 352662. Holotype of *C. couvana*: Amer. Museum Nat. Hist., No. 24667.

Dimensions of lectotype of montserratensis. — Height 27.6 mm, greatest diameter 15.8 mm.

Type locality (of all three species). — Springvale Quarry, Trinidad.

This species is represented by two shells from the base of the Melajo Clay. Both of them have a strongly angulated shoulder. As pointed out by Rutsch (1942, p. 164) the degree of this angulation is variable.

There are many species of *Euclia* in deposits of the late Tertiary Caribbean faunal province. The subgenus is now living in the Eastern Pacific but not in Caribbean waters. Many of these species have more or less shouldered whorls and more or less persistent axial and spiral sculpture. One of the strongly shouldered species is *C. triangularis* Nelson (1870, p. 191, pl. 6, fig. 10; Olsson, 1932, p. 158, pl. 18, figs. 1, 2) from the middle Miocene of Peru. It has stronger spirals, more axials, and the lower part of its body whorl is more constricted than in *C. montserratensis.*

The type species of *Euclia*, the Recent Eastern Pacific *C. cassidiformis* G. B. Sowerby I (*in* Broderip and Sowerby, 1832-1833, p. 53, 1832) is much larger, less strongly shouldered, and spiny at the shoulder.

Occurrence. — USGS 18634.

Distribution. — Savaneta Glauconitic Sandstone Member and Melajo Clay Member, both of Springvale Fm., Trinidad.

Cancellaria (Euclia) cf. codazzii Anderson Pl. 58, fig. 8

Of medium size. Spire high. Protoconch with 2½ smooth whorls. Postnuclear whorls 5½. Sculpture starting with axials. Early whorls strongly shouldered, with nine axials per whorl and three spirals. Subsequently the whorls are less shouldered and the number of axials increases rapidly. There are about 24 axials on the body whorl. Late spire whorls with a spiral on the weakly accentuated shoulder, two spirals below the shoulder, and one or two weak spirals near the upper suture. On the penultimate and the body whorls a fine spiral thread appears above the shoulder. There are about 18 spirals below the shoulder of the body whorl, some of which are of secondary size. Outer lip lirate within. Columellar folds three, the lowest one weak. Parietal callus thin. Umbilical opening small. Siphonal fasciole not prominent.

A single, damaged shell from the Melajo Clay is available. It may be conspecific with *C. codazzii* Anderson (1929, p. 116, pl. 14, figs. 4-7; Barrios, 1960, p. 291, pl. 11, fig. 5) from the middle Miocene of Colombia, but more specimens are needed to be certain. *C. acuticarinata* Weisbord (1929, p. 51, pl. 6, fig. 7), also from the Miocene of Colombia, seems to be related to *C. codazzii.*

The Melajo specimen is more slender and has more axials than the Recent *C. balboae* Pilsbry (1931, p. 139, pl. 41, figs. 7, 8) from Panama Bay.

Occurrence.—USGS 21178.

Subgenus **NARONA** H. and A. Adams

H. and A. Adams, 1854, The Genera of Recent Mollusca, vol. 1, p. 277.

Type species (by subsequent designation, Cossmann, 1899, Essais de paléoconchologie comparée, pt. 3, p. 5), *Cancellaria clavatula* G. B. Sowerby I.

Cancellaria (Narona) semota, n. sp. Pl. 58, figs. 4, 5

Of medium size, slender. Protoconch with 2¾ smooth whorls, its axis slightly oblique to main shell axis. The first 1¾ whorls of the protoconch are flat-sided, the remainder inflated. Postnuclear whorls almost six. Sculpture starts abruptly, consists of eight axials per whorl and two spirals which give a bicarinate appearance. Subsequently additional spirals are intercalated and the axials become swollen. There are six spirals on the penultimate whorl. Axials on body whorl of unequal size. Outer lip thickened, denticulated within. Parietal callus not well developed. Columella with two strong folds. Umbilical opening small. Siphonal fasciole moderately prominent. Canal long.

Holotype. — USNM 645498.

Dimensions of holotype. — Height 17.7 mm, greatest diameter 8.0 mm.

Type locality. — Melajo River area: USGS 21178.

This species is based on the holotype only which has been collected from the Melajo Clay. The anterior extremity of the shell is not complete.

C. bullbrooki Mansfield (1925, p. 31, pl. 5, fig. 3) from the Miocene of Trinidad is based on the holotype (USNM 352663) only which is probably immature. The axis of the protoconch of *C. bullbrooki* is even more oblique than that of *C. semota*. The early sculpture of both species is the same, but additional spirals appear later in *C. semota*. The nuclear and sculptured whorls are stouter and more inflated in *C. bullbrooki*. *C. semota* is more slender than *C. decaptyx* Brown and Pilsbry (1911, p. 346, pl. 24, figs. 5, 6) from the middle Miocene of the Panama Canal Zone, and has less axials on late whorls. *C. trema* Olsson (1932, p. 162, pl. 15, figs. 11, 12) from the upper Miocene of Peru has a larger apical angle, less incised sutures, and more axials on the body whorl.

The nuclear whorls of the Recent Eastern Pacific *C. clavatula* G. B. Sowerby I (*in* Broderip and Sowerby, 1832-1833, p. 52, 1832), the type species of *Narona*, are more inflated, and secondary spirals appear earlier than in *C. semota*. The Melajo species is more slender than *C. clavatula*.

Occurrence. — USGS 21178.

Subgenus **CHARCOLLERIA** Olsson

Olsson, 1942, Bull. Amer. Paleont., vol. 27, No. 106, p. 61.

Type species (by original designation), *Cancellaria (Charcolleria) perdiciana* Olsson.

Cancellaria (Charcolleria) species Pl. 58, fig. 3

A single, somewhat worn specimen from the base of the Melajo Clay is available. It consists of a little less than six whorls including protoconch. The sculpture is predominantly spiral, the interspaces of the spirals narrow. Whorls moderately convex. Sutures not deeply incised. Inner surface of outer lip with lirations. Columellar callus prominent. Columella with two strong folds. Anterior canal long.

Although much smaller, the Melajo shell seems to be more closely related to *C. perdiciana* Olsson (1942, p. 61, pl. 8, fig. 5) from the lower Miocene of Colombia than to the Pliocene *C. terryi* Olsson (1942, p. 62, pl. 8, fig. 1) from Panama. *C. terryi* is more slender, has more inflated whorls with deeply incised sutures and heavier sculpture.

Occurrence. — USGS 18634.

Genus **TRIGONOSTOMA** Blainville

Blainville, 1827, Manuel de malacologie et de conchyliologie, p. 652.

Type species (by monotypy and tautonymy), *Delphinula trigonostoma* Lamarck.

Subgenus **EMMONSELLA** Olsson and Petit

Olsson and Petit, 1964, Bull. Amer. Paleont., vol. 47, No. 217, p. 541.

Type species (by original designation), *Cancellaria tenera* Philippi.

Trigonostoma (Emmonsella) species

A single, incomplete shell from the base of the Melajo Clay is available. Protoconch with two whorls. Early sculpture consists of a few spirals with narrow interspaces. On later whorls one of the central spirals becomes more prominent than the others. Axial sculpture inconspicuous.

The Melajo shell is too incomplete to point out affinities. Although not recorded, a species of *Trigonostoma* occurs in the Savaneta Glauconitic Sandstone Member as well. The few specimens known are incomplete and deformed. They do not seem to be conspecific with the Melajo shell.

Occurrence. — USGS 18634.

Family **CONIDAE**

Genus **CONUS** Linné

Linné, 1758, Systema Naturae, ed. 10, p. 712.

Type species (by subsequent designation, Children, 1823), *Conus marmoreus* Linné. See Kennard, Salisbury and Woodward (1931, p. 35).

Conus springvaleensis Mansfield Pl. 58, fig. 9

1867. *Conus planiliratus* G. B. Sowerby I, Guppy, Proc. Sci. Assoc. Trinidad, pt. 3, p. 159; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 38.
1874. *Conus planiliratus* G. B. Sowerby I, Guppy, Geol. Mag., new ser., decade 2, vol. 1, p. 440 (part).
1910. *Conus planiliratus* G. B. Sowerby I, Guppy, Agric. Soc. Trinidad and Tobago, Soc. Paper No. 440, p. 6; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 149.
1925. *Conus planiliratus* G. B. Sowerby I, Maury, Bull. Amer. Paleont., vol. 10, No. 42, p. 186, pl. 34, fig. 6.
?1925. *Conus burckhardti* Böse, Maury, *ibidem*, p. 187, pl. 34, fig. 5.
1925. *Conus springvaleensis* Mansfield, U. S. Nat. Mus., Proc., vol. 66, art. 22, p. 11, pl. 1, figs. 3, 6.
1938. *Conus (Leptoconus) springvaleensis* Mansfield, Vokes, Amer. Museum Novitates, No. 988, p. 3.
1942. *Conus springvaleensis* Mansfield, Rutsch, Verh. Naturf. Ges. Basel, vol. 54, p. 101.

Of small to medium size, moderately slender. Spire somewhat concave in profile. Protoconch high, slender, consists of more than three smooth whorls. Postnuclear whorls nine. Early spire whorls strongly angulated on lower part, without tubercles. Sculpture consists of opisthocyrt growth lines only. Late spire whorls with a few scarcely visible spirals. Shoulder of body whorl strongly angulated. Sculpture of body whorl consists of a variable number of widely spaced spiral grooves which cover most of the body whorl. Anal notch moderately deep. Aperture slightly wider anteriorly.

Holotype. — USNM 352644.

Type locality. — Springvale Quarry, Trinidad.

This species is represented by a few specimens from the base of the Melajo clay. The sculpture of the last whorl of immature specimens is usually restricted to the lower half of the whorl.

C. springvaleensis is related to the widespread *C. imitator* Brown and Pilsbry (1911, p. 342, pl. 23, fig. 4), which has originally been described from the middle Miocene of the Panama Canal Zone. *C. imitator* is larger and has a less concave spire. The same is true for *C. imitator lius* Woodring (1928, p. 209, pl. 10, figs. 5, 6) from the Bowden Formation of Jamaica. In addition *C. imitator* has tubercles on early spire whorls and a smaller protoconch. *C. sophus* Olsson (1932, p. 154, pl. 16, figs. 6, 8, 9) from the Miocene of Peru has a similar protoconch, but it is a smaller species, and the anterior part of its body whorl is somewhat constricted.

The Recent Eastern Pacific *C. arcuatus* Broderip and G. B.

Sowerby I (Hanna and Strong, 1949, p. 292, pl. 5, figs. 2-4) essentially has a higher spire. Its Pliocene subspecies *C. vacuanus* Olsson (1942, p. 49, pl. 6, figs. 11, 12) from Costa Rica and Panama has a less concave spire.

Occurrence. — USGS 18411, USGS 18634.

Distribution. — Savaneta Glauconitic Sandstone Member and Melajo Clay Member, both of Springvale Fm., Trinidad.

Conus couvaensis Vokes Pl. 58, figs. 10, 11

1938. *Conus (Lithoconus) couvaensis* Vokes, Amer. Museum Novitates, No. 988, p. 18, fig. 16.

1942. *Conus couvaensis* Vokes, Rutsch, Verh. Naturf. Ges. Basel, vol. 54, p. 104.

Of medium size, stout. Spire low. Protoconch not preserved. Postnuclear whorls eight. Spire whorls concave above shoulder, sculptured by opisthocyrt growth lines only. Anal notch deep. Body whorl somewhat convex below shoulder, sculptured by a few spirals near the base.

Holotype. — Amer. Museum Nat. Hist., No. 24998.

Type locality. — Springvale Quarry, Trinidad.

C. couvaensis occurs at the base of the Melajo Clay. The stout shape and low spire suggest a relationship to the middle Miocene *C. aemulator* Brown and Pilsbry (1911, p. 342, pl. 23, fig. 9) from the Panama Canal Zone and *C. veatchi* Olsson (1922, p. 14, pl. 2, figs. 5, 8) from Water Cay, Panama, and the Panama Canal Zone, which are considered as synonyms by some authors. *C. couvaensis*, however, lacks the spirals above the shoulder and is smaller. Rutsch (1934, p. 104, pl. 9, figs. 7-11) recorded *C. aemulator* from the late Miocene Punta Gavilán Formation of Venezuela and treated it as a subspecies of the Recent Caribbean *C. proteus* Hwass.

The holotype of *C. manzanillaensis* Mansfield (1925, p. 12, pl. 2, figs. 5, 10) from the middle Miocene Manzanilla Formation of Trinidad is imperfect and the only specimen known. Its early spire whorls are tuberculated. The spire whorls are less concave than in *C. couvaensis*, and there are traces of spirals.

Occurrence. — USGS 18411, USGS 18634.

Distribution. — Savaneta Glauconitic Sandstone Member and Melajo Clay Member, both of Springvale Fm., Trinidad.

Conus species

A small species of *Conus* occurs in the Matura shell bed. Only two specimens are available. The larger one is 20.3 mm high and worn. The other shell is unworn and shows that the early spire whorls are tuberculated, and that there are a few fine spirals above the shoulder. These spirals disappear on later spire whorls. Spire moderately high, slightly concave. Shoulder of body whorl strongly angulated. Body whorl smooth except for spirals near the base.

Guppy cited *Conus pusio* Bruguière from Matura. According to Clench (1942a, p. 10) *Conus pusio* Hwass is the same as *C. jaspideus* Gmelin. The body whorl of *C. jaspideus* is usually covered by widely spaced spirals, whereas on the Matura specimens the spirals are restricted to the lowest part of the body whorl.

Occurrence. — RR 230, USGS 19860.

Family **TURRIDAE**

Genus **POLYSTIRA** Woodring

Woodring, 1928, Carnegie Inst. Washington, Pub. 385, p. 145.

Type species (by original designation), *Pleurotoma albida* Perry.

Polystira species A

The Matura shell bed has yielded a few small fragments of a *Polystira*. They are too worn to point out affinities. The strongest spiral is situated a little above the middle of the whorl. Below it there are two fine spirals, above it one stronger one.

Occurrence. — JS 67, RR 230, PJ 302, USGS 19860.

Polystira species B Pl. 59, fig. 13

A few immature specimens from the Melajo Clay are available. The figured specimen is perfectly preserved. The protoconch consists of 1½ whorls, and its last part is sculptured by a few fine axials. There are six postnuclear whorls preserved. First sculpture consists of opisthocyrt axials, a sharp subsutural spiral, and a stronger spiral at about the middle of the whorl. On subsequent whorls the spirals become stronger and the growth lines prominent. On the fourth sculptured whorl a secondary spiral and a little later a second one appear below the medial keel. Anterior canal slightly twisted to the left.

The early sculpture of the Recent Western Atlantic *P. florencae* Bartsch (1934, p. 9, pl. 3, figs. 4-7) is similar to the Melajo species, but the protoconch of *P. florencae* is larger, and the axials on the first sculptured whorl less prominent. *P. florencae* has a longer anterior canal.

The relations to *Polystira* species A from Matura are uncertain until better specimens are available, although both have a similar early sculpture.

Occurrence. — EL 1810, PJ 285, USGS 18399.

Genus **CARINODRILLIA** Dall

Dall, 1919, U. S. Nat. Mus., Proc., vol. 56, No. 2288, p. 17.

Type species (by original designation), *Clathrodrillia (Carinodrillia) halis* Dall.

Carinodrillia meraca, n. sp. Pl. 58, figs. 15, 16

Of small to medium size, slender. Protoconch with three smooth whorls. Postnuclear whorls nine. First sculpture consists of opisthocline axials which gradually become stronger. After a little more than half a whorl a subsutural spiral appears. At the same time or a little later two spirals appear on the lower part of the whorl. They are more prominent, where they cross the axials. Late spire whorls with one or two additional spirals near the lower suture. There are seven axials on late whorls. Anal fasciole sculptured by three or four spiral threads and conspicuous growth lines. Body whorl with about 11 spirals and about four minute spiral threads in their interspaces. Anal sinus deep. Outer lip thickened. Columellar callus prominent, smooth. Anterior canal moderately long. Siphonal fasciole slightly bulging, sculptured by a few spirals.

Holotype. — USNM 645199.

Dimensions of holotype. — Height 17.8 mm, greatest diameter 5.0 mm.

Type locality. — Melajo River area: USGS 21178.

This species occurs in the Melajo Clay and is represented by about 30 specimens. Many of them are immature or incomplete. The outer lip of the holotype is broken.

C. meraca is an extremely slender species. It is closely related to the Miocene *C. aquanica* Olsson (1922, p. 65, pl. 5, figs. 16, 17) from Costa Rica. *C. aquanica* has more and more prominent axials and is somewhat less slender.

C. propefusiformis (Mansfield) (1925, p. 20, pl. 2, figs. 3, 4) from the middle Miocene of Trinidad is considerably larger. It is less slender and has less, but much broader axials. Rutsch (1942, p. 168) reported two specimens from the Savaneta Glauconitic Sandstone Member of the Springvale Formation as *Carinodrillia* ? sp. ind. Although similar in sculpture, they differ in being less slender than *C. meraca*.

Occurrence. — EL 1810, K 9903, PJ 285, USGS 18399, USGS 21178.

Genus **CRASSISPIRA** Swainson

Swainson, 1840, Treatise on Malacology, p. 313.

Type species (by subsequent designation, Herrmannsen, 1847, Indicis generum malacozoorum primordia, vol. 1, p. 318), *Pleurotoma bottae* Kiener.

Subgenus **CRASSISPIRA** s. str.

Crassispira (Crassispira) cf. **caroniana** (Maury) Pl. 59, fig. 4

A single specimen from the Melajo Clay is available. Its tip and the outer lip are broken. There are 12 opisthocline, narrow axials on late whorls. Late spire whorls with four fine spirals. Opisthocyrt growth lines on anal fasciole prominent. Subsutural spiral sharp. Anterior canal long.

The axials of topotypes of *C. caroniana* (Maury) (1925, p. 189, pl. 32, fig. 12) from the Savaneta Glauconitic Sandstone Member are somewhat more rounded than those of the Melajo shell. The Melajo specimen has less spirals on the spire whorls.

C. henekeni (G. B. Sowerby II) (1850, p. 50, pl. 10, fig. 6) from the Miocene of the Dominican Republic is a different species. It has less, but broader axials, which are almost orthocline.

Occurrence. — PJ 285.

Crassispira (Crassispira) faceta, n. sp. Pl. 59, figs. 5, 6

Shell large, moderately slender. Protoconch with almost three whorls. Postnuclear whorls 8½. Sculpture consists of a sharp subsutural spiral and slightly opisthocline axials. There are 13 axials on the penultimate whorl; their crests somewhat sharpened. Anal fasciole concave, sculptured by opisthocyrt growth lines. Spire whorls with six or seven spirals below anal fasciole. Aperture long. Anterior canal moderately long. Siphonal fasciole slightly bulging.

Holotype. — Natural History Museum Basel, No. H 15317.

Dimensions of holotype. — Height 39.5 mm, greatest diameter 12.2 mm.

Type locality. — Matura Bay: RR 230.

This species is represented from Matura by the holotype and two immature, fragmentary specimens. The outer lip of the holotype is broken.

C. faceta is closely related to *C. caroniana* (Maury) (1925, p. 189, pl. 32, fig. 12). It differs in being less slender and in having lower, stouter whorls. It is also less slender than *C. aegis* Woodring (1928, p. 151, pl. 4, fig. 12) from the Bowden Formation of Jamaica. *C. aegis* has proportionately higher whorls, its axials are almost orthocline, and its protoconch has less whorls.

Occurrence. — RR 230, USGS 18204.

Subgenus **CRASSISPIRELLA** Bartsch and Rehder

Bartsch and Rehder, 1939, U. S. Nat. Mus., Proc., vol. 87, No. 3070, p. 135.

Type species (by original designation), *Turris (Crassispira) rugitecta* Dall.

Crassispira (Crassispirella) ritanida (Mansfield) Pl. 59, figs. 11, 12

1867. *Pleurotoma luctuosa* d'Orbigny, Guppy, Proc. Sci. Assoc. Trinidad, pt. 3, p. 159 (part); reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, p. 38.
1874. *Pleurotoma luctuosa* d'Orbigny, Guppy, Geol. Mag., new ser., decade 2, vol. 1, p. 440 (part).
1925. *Drillia ritanida* Mansfield, U. S. Nat. Mus., Proc., vol. 66, art. 22, p. 24, pl. 4, fig. 10.

Of small size. Protoconch consists of 1½ smooth whorls. Postnuclear whorls six. First sculpture consists of closely spaced axials with a few minute spirals in their interspaces. After about a quarter of a whorl the subsutural spiral appears which gradually becomes stronger. Axials on early sculptured whorls reach from subsutural cord to lower suture, but gradually disappear on anal fasciole. There are about 12 axials on the body whorl. Late spire whorls with five or six spirals between the axials and about four finer spirals on the anal fasciole. Body whorl with about 11 primary spirals below the anal fasciole and one or two secondary spirals in each interspace. Outer lip smooth within. Anal sinus moderately deep. Parietal callus smooth. Pillar sculptured by a few spirals.

Holotype. — USNM 115581.

Type locality. — Matura, Trinidad.

C. ritanida was originally based on the holotype only. Later collections from Matura have yielded 18 additional specimens, most of which, however, are incomplete.

C. ebenina (Dall) [1890-1903 (1890), p. 33, pl. 2, fig. 8], which is said to range from Miocene to Recent, essentially is a larger and stouter species with a sharper subsutural cord. According to Abbott (1958, p. 94) *C. ebenina* is a synonym of *C. fuscescens* (Reeve). *C. oerteli* (Böse) (*in* Böse and Toula, 1910, p. 249, pl. 13, fig. 24) from the upper Miocene of the Tehuantepec area, Mexico, has similar dimensions and proportions, but it has more axials which are crossed by the spirals.

Occurrence. — RR 230, PJ 302, USGS 18204, USGS 19860.

Distribution. — Known from type locality only.

Genus AGLADRILLIA Woodring

Woodring, 1928, Carnegie Inst. Washington Pub. 385, p. 157.

Type species (by original designation), *Agladrillia callothyra* Woodring.

Agladrillia (?) lassula, n. sp. Pl. 59, figs. 1-3

Of medium size, stout. Protoconch with 1¾ whorls, its last part with an anterior angulation. Postnuclear whorls nine. Early sculpture consists of opisthocline axials which are considerably broader near the lower suture. Axials of later whorls opisthocline below anal fasciole, weaker and opisthocyrt on anal fasciole. Spiral sculpture consists of narrow grooves; those below the anal fasciole more widely spaced. At some distance from the outer lip there is an inconspicuous hump, after which the axials (but not the spiral grooves) are practically suppressed. Anal sinus deep. Stromboid notch conspicuous. Anterior canal short, slightly widening near base. Parietal callus greatly thickened near anal sinus. Columellar callus somewhat detached from pillar.

Holotype. — Natural History Museum Basel, No. H 15311.

Dimensions of holotype. — Height 16.4 mm, greatest diameter 6.5 mm.

Type locality. — Melajo River area: Hutch 47.

This species occurs in the Melajo Clay and is represented by 20 incomplete specimens. It is assigned to the genus *Agladrillia* with hesitation only. The type species of the genus, A. *callothyra* Woodring (1928, p. 158, pl. 5, fig. 7), from the Bowden Formation of Jamaica, has stronger sculpture, more inflated whorls, and a subsutural spiral which is not developed in the Melajo species. However, there are species without subsutural spiral which have been assigned to *Agladrillia* such as *A. aulakoessa* Gardner [1926-1950 (1937), p. 310, pl. 40, figs. 2-4] from the Chipola Formation of Florida.

A. musacina (Olsson) (1922, p. 69, pl. 5, figs. 27, 28), from the middle Miocene of Costa Rica, is a smaller and more slender form. According to topotypes its protoconch is indistinguishable from that of *A.* (?) *lassula,* and there is no subsutural spiral as well.

Occurrence.—Hutch 47, Hutch 51, EL 1810, KR 11862, PJ 285, USGS 21178.

Genus **LEPICYTHARA** Olsson

Olsson, 1964, Neogene Mollusks from Northwestern Ecuador, p. 110, Paleont. Research Inst.

Type species (by original designation), *Cythara terminula* Dall.

Lepicythara disclusa, n. sp. Pl. 59, figs. 7-10

1942. "*Cythara*" (*Brachycythara ?*) cf. *terminula* Dall, Rutsch, Verh. Naturf. Ges. Basel, vol. 54, p. 169, pl. 3, figs. 10, 11.

Of medium size, biconic. Protoconch consists of two smooth whorls. Postnuclear whorls 6½. First sculptured whorl with numerous opisthocline axials. The second sculptured whorl is strongly inflated, or almost angulated at the middle of its height. It bears fewer, but much stronger axials, and a few spirals on its lower part. Subsequently the angulation of the whorl approaches the lower suture until it disappears. Late spire whorls with eight to ten, but usually nine broad, somewhat curved axials, which are crossed by numerous flat spirals with narrower interspaces. Spirals usually arranged in pairs. Inner lip smooth. Margin of outer lip weakly crenulated by external spiral sculpture. Inner surface of outer lip with a more or less pronounced axial ridge. Anterior canal moderately long. Anal sinus shallow.

Holotype.—Natural History Museum Basel, No. H 15291.

Dimensions of holotype.—Height 16.0 mm, greatest diameter 7.1 mm.

Type locality. — Melajo River area: PJ 285.

This species is represented from the Melajo Clay by about 40 specimens. Of these only few were collected from the base of the Melajo Clay. The axials are usually aligned on successive late whorls but never so on early postnuclear whorls. The specimens from the Savaneta Glauconitic Sandstone Member figured by Rutsch are not adult and have a stouter appearance.

Cythara sp. ind. as mentioned by Mansfield (1925, p. 26) from the Brasso Formation of Trinidad is a species of *Lepicythara,* but the specimen is immature and too incomplete for specific identification.

The type species of *Lepicythara, L. terminula* (Dall) [1890-1903 (1890), p. 38, pl. 2, fig. 5] from the Pliocene of Florida, essentially is a more slender species, *i.e.* it has a smaller apical angle. It has narrower axials, its spiral sculpture is less prominent, and its aperture is somewhat narrower. *L. turrita* (Mansfield) (1930, p. 43, pl. 3, fig. 8) from the upper Miocene of Florida is smaller and has less axials. Its spiral sculpture is even flatter than in *L. disclusa,* but its axials are heavier and more bulging.

L. costaricensis (Olsson) (1922, p. 77, pl. 5, figs. 21, 22) from the middle Miocene of Costa Rica is smaller, more slender, and its axials are narrower. *L. heptagona* (Gabb) (1873b, p. 211; Pilsbry, 1922, p. 322, pl. 17, fig. 9) and *L. cercadica* (Maury) (1917, p. 61, pl. 9, fig. 15), both from the middle Miocene of the Dominican Republic, are probably synonyms. *L. heptagona* is more slender than *L. disclusa*, n. sp., and has narrower axials. Its whorls are flatter, its spiral sculpture less prominent, and its anterior canal is shorter.

The holotype of *L. camaronensis* Olsson (1964, p. 110, pl. 20, fig. 3) from the late Miocene or Pliocene of Ecuador is an imperfect shell, its early whorls being strongly worn. The axials are much weaker in *L. camaronensis,* and the pairs of spirals are separated by wider interspaces than in *L. disclusa.*

Occurrence. — Hutch 47, Hutch 51, KR 11862, RR 293, PJ 285, USGS 18399, USGS 18634, USGS 21178.

Distribution. — Savaneta Glauconitic Sandstone Member and Melajo Clay Member, both of Springvale Fm., Trinidad.

Genus **ITHYCYTHARA** Woodring

Woodring, 1928, Carnegie Inst. Washington, Pub. 385, p. 168.

Type species (by original designation), *Mangilia psila* Bush.

Ithycythara hilaris, n. sp. Pl. 59, figs. 16, 17

Shell small, slender. Protoconch with 2½ smooth whorls. Postnuclear whorls seven. First sculptured whorl with numerous slightly opisthocyrt axials which gradually become stronger, and a spiral thread at the lower suture which disappears soon. On the second or third postnuclear whorl the number of axials is reduced to six, and the axials remain aligned on successive whorls. Axials angulated somewhat below the middle of the whorl. Later spire whorls and body whorl with faint spiral grooves. Parietal callus smooth. Outer lip thin, with one denticle below the moderately deep anal sinus. Anterior canal moderately long.

Holotype. — Natural History Museum Basel, No. H 15294.

Dimensions of holotype. — Height 5.9 mm, greatest diameter 2.0 mm.

Type locality. — Melajo River area: PJ 285.

This species occurs in the Melajo Clay and is represented by 20 specimens. Many of them, however, are immature or incomplete.

I. hilaris, n. sp. is more slender than *I. rata* Fargo (*in* Olsson and Harbison, 1953, p. 382, pl. 20, figs. 2, 2a) from the Pliocene of Florida. It lacks denticles on the outer lip and has a longer anterior canal. *I. kellumi* Fargo (*in* Olsson and Harbison, 1953, p. 383, pl. 20, fig. 1), also from the Pliocene of Florida, lacks spiral sculpture and has a shallower anal sinus. Adult specimens of the type species of *Ithycythara,* the Recent *I. psila* (Bush) (1885, p. 455, pl. 45, fig. 2) from the southeastern United States, have denticles on the outer lip. *I. psila* is not so slender as *I. hilaris,* n. sp. and lacks spiral sculpture.

Occurrence. — KR 11862, PJ 285, USGS 18399, USGS 21178.

Ithycythara species

A number of apparently immature specimens from the Courbaril beds are not preserved well enough to be described. They seem to differ from *I. hilaris,* n. sp. only by having seven axials per whorls instead of six.

I. scissa Woodring (1928, p. 170, pl. 6, fig. 10) from the Bowden Formation of Jamaica has also seven axials per whorl but is much larger. Its spiral sculpture causes small beads on part of the axials.

Occurrence. — USGS 10991, USGS 20433.

Genus **ADELOCYTHARA** Woodring

Woodring, 1928, Carnegie Inst. Washington, Pub. 385, p. 171.

Type species (by original designation), *Adelocythara primolevis* Woodring.

Adelocythara (?) **micropleura** (Guppy) Pl. 59, figs. 18, 19

1867. *Mangelia micropleura* Guppy, Proc. Sci. Assoc. Trinidad, pt. 3, pp. 159, 171; reprint, Harris, 1921, Bull. Amer. Paleont., vol. 8, No. 35, pp. 38, 50.
1874. *Mangelia micropleura* Guppy, Guppy, Geol. Mag., new ser., decade 2, vol. 1, pp. 410, 440, pl. 18, fig. 6.
1925. *Mangilia micropleura* Guppy, Mansfield, U. S. Nat. Mus., Proc., vol. 66, art. 22, p. 25, pl. 3, fig. 7.

Shell small, solid. Protoconch with about 1½ whorls, not well separated from postnuclear whorls. Postnuclear whorls about five. First sculpture appearing gradually, consists of numerous axials and a spiral which is situated a little below the middle of the whorl. On the second sculptured whorl the axials are much stronger, their number reduced, and the spiral forms a peripheral angulation, which is now situated a little above the middle of the whorl. Late spire whorls with eight or nine axials and one or two distant spirals below the angulation. Body whorl with about six faint spirals below the angulation. Outer lip thickened. Anal sinus conspicuous, denticle below it not prominent. Pillar with several oblique spirals.

Lectotype (herewith selected). — USNM 115583 (specimen figured by Mansfield).

Dimensions of lectotype. — Height 5.0 mm, greatest diameter 2.3 mm.

Type locality. — Matura, Trinidad.

The type lot of *Mangelia micropleura* consists of six specimens. Contrary to Mansfield's statement the lectotype (Mansfield's figured specimen) is not the largest one of the syntypes. The lectotype is a somewhat worn specimen, and its spiral sculpture is not well recognizable. Later collections have yielded better specimens.

Mansfield compared *A.* (?) *micropleura* with *Mangilia plicosa* C. B. Adams. But this is an entirely different form according to the figure of the lectotype given by Clench and Turner (1950, pl. 31, fig. 1).

This species is tentatively referred to the genus *Adelocythara*. Its protoconch and first sculpture are similar to those of the type species, *A. primolevis* Woodring (1928, p. 171, pl. 6, fig. 11) from the Bowden Formation of Jamaica. *A. primolevis* is smaller, more slender, and has more axials. Its spirals are stronger and cross the axials. In *A.* (?) *micropleura* the spirals are restricted to the interspaces of the axials.

Occurrence. — JS 67, RR 230, PJ 302, USGS 19860.

Distribution. — Known from type locality only.

Genus **GLYPTAESOPUS** Pilsbry and Olsson

Pilsbry and Olsson, 1941, Acad. Nat. Sci. Philadelphia, Proc., vol. 93, p. 36.

Type species (by original designation), *Aesopus xenicus* Pilsbry and Lowe (= *Mangilia cetolaca* Dall).

According to Radwin (in press) the radula of *Aesopus xenicus* Pilsbry and Lowe (1932, p. 73, pl. 14, fig. 7) indicates that *Glyptaesopus* is a genus of the Turridae. Radwin also shows that *A. xenicus* is a synonym of *Mangilia cetolaca* Dall (1908, p. 286).

Glyptaesopus species Pl. 60, figs. 1, 2

Shell small, slender. Sculptured whorls 5½. Sculpture consists of two rows of equally spaced nodules which are connected by weak axials and still weaker spirals. Sutures not deeply incised. Body whorl with three or four additional rows of smaller nodules below the periphery. Aperture long. Anterior canal short. Outer lip thin.

This species is represented by two worn specimens from Matura. No protoconch is preserved.

G. xenicus (Pilsbry and Lowe) is a Recent Eastern Pacific form. Its whorls are almost flat in profile. The spiral connections between the nodules are missing. Two species of *Glyptaesopus* are known from the Pliocene of Ecuador. But the Matura specimens are most closely related to *G. proctorae* (M. Smith) (1936a, pl. 9, fig. 14; 1936b, p. 21) originally described from the Pliocene of Florida. *G. coxi* (Fargo) (1948, p. 111, pl. 7, figs. 11, 12), also from the Floridian Pliocene, is considered as a synonym, or a subspecies of *G. proctorae* by Olsson and Harbison (1953, p. 240). The Trinidad specimens are more slender than *G. proctorae* and possibly represent a new species.

I am indebted to George E. Radwin for the information that *G. proctorae* has survived to the Recent fauna. So far, however, it is known from two Recent specimens only; one from Andros Island, Bahamas, the other one from the Florida Keys.

Occurrence. — JS 67.

Genus **MIRACLATHURELLA** Woodring

Woodring, 1928, Carnegie Inst. Washington, Pub. 385, p. 189.

Type species (by original designation), *Miraclathurella vittata* Woodring.

Miraclathurella ralla, n. sp. Pl. 58, figs. 12-14

Of medium to large size, slender. Protoconch consists of a little more than three whorls, the last half whorl with a few opisthocline axials and an angulation on its lower part. Postnuclear whorls up to six. First postnuclear whorl with a subsutural spiral and three spirals on its lower part, which cross broad axial swellings. Anal fasciole of late whorls without axials, on early whorls with axials of reduced size. Axials on late whorls more numerous, but weak. Penultimate whorl with six spirals below anal fasciole. Anal fasciole of late whorls with a few minute spirals and opisthocyrt growth lines. Interspaces of spirals on body whorl with fine spiral threads. Aperture long. Anal sinus deep. Outer lip varicose, with a stromboid notch. Anterior canal long. Parietal callus smooth, thickened near anal sinus.

Holotype. — USNM 645505.

Dimensions of holotype. — Height 15.6 mm, greater diameter 4.8 mm.

Type locality. — Melajo River area: USGS 18399.

M. ralla, n. sp. occurs in the Melajo Clay and is represented by 11 specimens. The number of spirals is somewhat variable. The varix of the outer lip usually carries one secondary spiral between the primary ones.

The type species of *Miraclathurella, M. vittata* Woodring (1928, p. 190, pl. 8, figs. 2-4) from the Bowden Formation of Jamaica is smaller, has more axials, and weaker spirals. *M. entemna* Woodring (1928, p. 190, pl. 8, figs. 5, 6) from the Bowden Formation of Jamaica has somewhat less inflated whorls. It has less spirals on the spire whorls, and the axials are present on the anal fasciole of late whorls.

M. subconsors (Böse) (*in* Böse and Toula, 1910, p. 250, pl. 13, fig. 25) from the upper Miocene of Mexico has been redescribed by Alencaster-Ibarra (1950, p. 568, fig. 11). The figures are not good enough for comparison. *M. ralla* seems to differ by having more inflated whorls.

Occurrence. — EL 1810, PJ 285, USGS 18399, USGS 21178.

Genus **GLYPHOSTOMA** Gabb

Gabb, 1873, Acad. Nat. Sci. Philadelphia, Proc., for 1872, vol. 24, p. 270.

Type species (by monotypy), *Glyphostoma dentiferum* Gabb.

Glyphostoma sculptile, n. sp. Pl. 59, figs. 14, 15

Shell small, slender. Spire higher than aperture. Protoconch with 3½ whorls, its last 1½ volutions with a sharp carina a little below the middle of the whorl. Postnuclear whorls almost seven. Sculpture consists of broad axial swellings and two spirals below the anal fasciole on early whorls, three or four spirals on late whorls. Anal fasciole sculptured by a few spiral threads on early whorls, on late whorls by two spiral threads and numerous opisthocyrt wrinkles. There are nine axials on the penultimate whorl. Body whorl with numerous spirals and axials. Anal sinus deep. Inner and outer lips denticulated. Parietal callus greatly thickened near anal sinus, bearing several denticles. Anterior canal moderately long, somewhat wider at base.

Holotype. — Natural History Museum Basel, No. H 15304.

Dimensions of holotype. — Height 11.0 mm, greatest diameter 5.4 mm.

Type locality. — Melajo River area: EL 1810.

This species is based on the holotype and one paratype. Although the paratype is smaller having only 5½ postnuclear whorls, its apertural features are fully developed.

G. sculptile, n. sp. is closely related to *G. golfoyaquense* Maury (1917, p. 61, pl. 9, figs. 17, 17a) from the middle Miocene Cercado Formation of the Dominican Republic. Both species are slender and have a low aperture. *G. golfoyaquense* essentially differs in having more axials and spirals on late spire whorls.

The Recent *G. myrakeenae* Olsson (1964, p. 110, pl. 18, fig. 4), from off Esmeraldas, Ecuador, has the same number of whorls. It is more slender than *G. sculptile,* n. sp., its aperture is proportionately lower, and it has more axials. The Recent Eastern Pacific *G. adrium* Dall (1919, p. 52, pl. 17, fig. 5) is smaller and has more axials. Its spirals on the spire whorls are broader, and its sculpture on the anal fasciole is weaker. *G. adanum* Dall (1919, p. 52, pl. 17, fig. 1), also from the Recent fauna of the Eastern Pacific, is smaller, more slender, and its axials are less prominent.

None of the forms described by Mansfield (1925, pp. 26-28) from the Brasso Formation of Trinidad represents a species of *Glyphostoma.*

Occurrence.—EL 1810, USGS 21178.

Family **TEREBRIDAE**

Genus **STRIOTEREBRUM** Sacco

Sacco, 1891, I Molluschi dei terreni terziarii del Piemonte e della Liguria, pt. 10, p. 33.

Type species (by original designation), *Terebra basteroti* Nyst.

Strioterebrum cf. **gatunense** (Toula) Pl. 60, fig. 3

A single shell with eight preserved whorls from the base of the Melajo Clay is available. The subsutural band is well separated from the remainder of the whorl which is sculptured by five spirals of unequal size and inconspicuous, discontinuous axials. No columellar folds developed at aperture.

S. gatunense (Toula) (1909, p. 705, pl. 25, fig. 14) is a widespread middle Miocene species. As pointed out by Rutsch (1934, p. 107) and Olsson (1964, p. 77) *T. wolfgangi* Toula as described and figured by Brown and Pilsbry (1911, p. 340, pl. 22, figs. 1, 3-6) is true *S. gatunense.* Late Miocene representatives of the same group from the Punta Gavilán Formation of Venezuela have been described as *S. gatunense kugleri* by Rutsch (1934, p. 106, pl. 8, figs. 18, 19, pl. 9, figs. 12, 13). They essentially differ by their larger size.

Occurrence.—USGS 18634.

Strioterebrum aff. **laevifasciola** (Maury) Pl. 60, figs. 4-6

Shell small, moderately slender. Protoconch high, consists of 3½ to 4 whorls. First two sculptured whorls without subsutural band. Early sculpture consists of about 10 axials which are somewhat broader and higher anteriorly, and a varying number of spiral grooves. The subsutural band appears on the third sculptured whorl and is not ornamented by spirals. Axials slightly prosocline on upper part of whorl numbering about 15 on late whorls. Columella with two low swellings. Siphonal fasciole pronounced. Base of body whorl with closely set spirals.

This form is represented by more than 20 specimens from the Melajo Clay. A few specimens from the Courbaril beds are tentatively referred to the same form as the Melajo shells, but their state of preservation allows a questionable identification only.

The Melajo shells are strongly variable as to strength of sculpture and especially as to spiral sculpture. The groove below the subsutural band is always prominent. Below this groove the spiral sculpture may be restricted to some faint grooves or may be lacking entirely.

Maury (1917, p. 27, pl. 3, fig. 19) described *S. gausapatum laevifasciola* from the middle Miocene Cercado Formation of the Dominican Republic. Protoconch and early sculptured whorls were not described. The later whorls are similar to those of the Melajo shells, except that the axials are not crossed by the spirals in the Dominican species.

S. cambiarsoi (Maury) (1917, p. 27, pl. 3, fig. 20), also from the Cercado Formation of the Dominican Republic, is smaller, and has more axials which are not thickened on the lower part of early whorls. The protoconch, however, is similar. The Melajo shells usually have more spirals, but specimens with three spiral grooves below the subsutural band occur. *S. cambiarsoi nugatorium* (Woodring) (1928, p. 142, pl. 4, figs. 2, 3) from the Bowden Formation of Jamaica has few spiral grooves below the subsutural band like some of the Melajo shells, but its protoconch consists of two whorls only.

S. brechincastrense (Rutsch) (1942, p. 172, pl. 4, figs. 9a, 9b) from the Savaneta Glauconitic Sandstone Member of the Springvale Formation of Trinidad is larger, and has less, but stronger and higher axials which give a convex appearance to the whorls.

Occurrence. — Melajo River area: EL 1810, KR 11862, RR 290, PJ 285. Point Courbaril: K 1429 (?), PJ 212 (?).

Strioterebrum aff. **baculiforme** (Pilsbry and Johnson) Pl. 60, figs. 8, 9

Shell small, slender. Early whorls almost flat in profile, late whorls somewhat convex. Protoconch stout, consists of 1½ whorls. First postnuclear whorl sculptured by axials only. Subsutural band appearing on second or third sculptured whorl. Late whorls with 17 to 20 opisthocyrt axials and about five spirals with interspaces of varying width. Groove below subsutural band moderately pronounced. Columella with a low, basal swelling. Siphonal fasiole bordered by a sharp ridge.

S. aff. *baculiforme* is represented by 13 specimens from the Melajo Clay. The convexity of the whorls, the number of the spirals, and the width of their interspaces are variable to some degree. The shape of the axials is only slightly affected when crossed by the spirals, although there are some exceptions.

The Miocene *S. baculiforme* (Pilsbry and Johnson) (1917, p. 152; Pilsbry 1922, p. 316, pl. 22, figs. 5, 6) from the Dominican Republic essentially is a larger species with more strongly opisthocyrt axials. Apparently its axials are less reduced in strength when crossing the groove below the subsutural band than it is the case in the Melajo shells. The subsutural band of Melajo specimens is not sculptured by spirals as in *S. baculiforme*. *S. baculiforme* has been cited from the middle Miocene of Mexico by Alencaster-Ibarra (1950, p. 563, fig. 7), but the figure is unrecognizable.

S. berlinerae (Maury) (1917, p. 34, pl. 4, figs. 7, 8) from the Cercado Formation of the Dominican Republic is considerably larger, stouter, and has many more axials. *Terebra (Strioterebrum)* species c of Woodring (1928, p. 140, pl. 3, fig. 16) from the Bowden Formation of Jamaica has also somewhat convex whorls, but its axials are almost orthocline.

Occurrence.—K 9816, RR 290, PJ 285.

Strioterebrum species

Nine specimens from Matura are insufficiently preserved for full description and statements on affinities. They are small and slender, sculptured by numerous orthocline to slightly opisthocyrt axials and six to seven spirals. Subsutural band well separated from remainder of whorl. No protoconch preserved. Columella with an inconspicuous basal swelling.

Occurrence.—JS 67, RR 230, PJ 302.

Genus **HASTULA** H. and A. Adams

H. and A. Adams, 1853, The Genera of Recent Mollusca, vol. 1, p. 225.

Type species (by subsequent designation, Cossmann, 1896, Essais de paléoconchologie comparée, pt. 2, p. 53), *Buccinum strigilatum* Linné.

Hastula aff. **hastata** (Gmelin) Pl. 60, fig. 7

Four worn fragments from Matura are available. One of them has its protoconch preserved. It consists of almost four whorls and is indistinguishable from that of the Recent Caribbean *H. hastata*. The third whorl of the protoconch is considerably higher than the fourth one.

Recent shells of *H. hastata* have about the same number of axials per whorl as the Matura specimens, whereas *H. hastata mareana* (Weisbord) (1962, p. 434, pl. 41, figs. 9-12) from the Pliocene of Venezuela is distinguished by its higher number of axials.

Matura specimens are more slender than Recent shells. The diameter of their whorls increases regularly, whereas in Recent shells the degree of increase is not regular. In this respect the Matura specimens resemble *H. vautrini* Jung (1965, p. 594) from Bowden, Jamaica. In that species, however, the axials are not persistent from suture to suture.

Occurrence. — RR 230, PJ 302.

Family **PYRAMIDELLIDAE**

Genus **PYRAMIDELLA** Lamarck

Lamarck, 1799, Mém. Soc. Hist. Nat. Paris, p. 76.

Type species (by monotypy), *Trochus dolabratus* Linné.

See also Opinion 386, Opinions and declarations rendered by the International Commission on Zoological Nomenclature, vol. 12, pt. 7, pp. 231-240, 1956.

Subgenus **LONGCHAEUS** Mörch

Mörch, 1875, Malakozool. Blätter, vol. 22, p. 158.

Type species (by subsequent designation, Dall and Bartsch, 1909, U. S. National Museum, Bull. 68, p. 21), *Pyramidella punctata* Schubert and Wagner.

Pyramidella (Longchaeus ?) species A . Pl. 60, fig. 10

Of medium size. Shape somewhat pupiform. Protoconch not preserved. Whorls with faint, short axial markings at upper suture, and a moderately pronounced spiral sulcus near lower suture. Uppermost columellar fold sharp, the two lower ones weak. Inner surface of outer lip lirate at some distance from the margin. Columellar callus thick.

This form is represented by a single specimen (height 10.0 mm, diameter 3.2 mm) from Matura. Although it is strongly worn, faint axials can be recognized in the spiral sulcus. Its state of preservation is not good enough to allow satisfactory comparisons.

Occurrence.—RR 230.

Subgenus **CALLOLONGCHAEUS** Dall and Bartsch

Dall and Bartsch, 1904, Biol. Soc. Washington, Proc., vol. 17, p. 5.

Type species (by original designation), *Pyramidella (Longchaeus) jamaicensis* Dall.

Pyramidella (Callolongchaeus) aff. jamaicensis Dall Pl. 60, fig. 11

Shell small, moderately slender. Peripheral sulcus situated at some distance from lower suture, deep, and crossed by numerous narrow axials. Surface of whorls polished except a narrow zone below the upper suture which is sculptured by short axials. Uppermost columellar fold conspicuous, the two lower ones weaker and more oblique. Columellar callus thick. Siphonal fasciole slightly bulging. Inner surface of outer lip with two denticles at some distance from the margin.

This species is represented by a few mostly immature specimens from the Melajo Clay. *P. jamaicensis* Dall (*in* Guppy and Dall, 1896, p. 315, pl. 29, fig. 10) from the Bowden Formation of Jamaica was based on an immature specimen measuring 3.25 mm in height. Topotypes at hand reach a height of more than 20 mm, although they are incomplete. Larger topotypes have two lirae within the aperture (as opposed to denticles in the Melajo specimens), although *P. jamaicensis* had originally been described as "non lirate inside." The Melajo specimens differ from *P. jamaicensis* in having a broader sculptured zone below the suture. The upper border of the peripheral sulcus is sharper in Melajo shells, and their whorls are more constricted in their upper part.

Maury (1917, pp. 144-146) described several species of *Pyramidella* from the Miocene of the Dominican Republic. The insufficient quality of her figures and the lack of topotypes do not allow to give comparative remarks. Maury compared her *P. cercadensis* (1917, p. 146, pl. 25, fig. 9) with *P. jamaicensis*. The type of *P. cercadensis* probably is immature as well.

Occurrence. — KR 11862, RR 293, PJ 285.

Pyramidella (Callolongchaeus) cf. diademata Maury Pl. 60, fig. 12

Shell small, moderately slender. Peripheral sulcus close to the lower suture; crossed by faint axials. Uppermost part of whorl finely crenulated. Uppermost columellar fold sharp, the two lower ones smaller. Inner surface of outer lip with two lirae well within the aperture. Siphonal fasciole somewhat bulging.

This species is represented by three immature specimens from the Melajo Clay. *P. diademata* Maury (1917, p. 145, pl. 25, fig. 7) from the middle Miocene Cercado Formation of the Dominican Republic differs from Melajo shells in being larger, and in having four denticles on the outer lip. The anterior border of the peripheral sulcus on the body whorl is crenulated in the Dominican species.

Occurrence. — KR 11862, PJ 285.

Genus **TRIPTYCHUS** Mörch

Mörch, 1875, Malakozool. Blätter, vol. 22, p. 158.

Type species (by monotypy), *Obeliscus (Triptychus) niveus* Mörch.

Subgenus **PERISTICHIA** Dall

Dall, 1889, Mus. Comp. Zool., Bull., vol. 18, p. 339.

Type species (by original designation), *Peristichia toreta* Dall.

Triptypchus (Peristichia) species

A single, immature specimen from Matura is available. The protoconch and 4½ postnuclear whorls are preserved. The sinistral protoconch consists of a little more than two whorls, and its axis is at right angles to the main shell axis. The first postnuclear whorl is sculptured by two prominent spiral ribs and numerous axials. On the second sculptured whorl a third spiral rib appears near the upper suture which becomes more prominent on later whorls. Last preserved whorls with a fourth spiral rib at the periphery, and another spiral on the base which continues into the aperture. The spirals form small nodes when crossed by the axials.

Although somewhat worn this immature Matura shell is almost identical with the young stages of *Turbonilla (Peristichia)* ? *springvaleensis* Rutsch (1942, p. 137, pl. 6, fig. 6) which had been described from the Savaneta Glauconitic Sandstone Member of the Springvale Formation of Trinidad. The protoconch of the Matura shell is somewhat smaller. The holotype of the Springvale species apparently is an adult shell. Its outer and basal lips are somewhat thickened, and the inner surface of the outer lip carries three denticles. The lack of these denticles in the Matura shell is possibly due to its immaturity.

The type species of *Peristichia*, the Recent *P. toreta* Dall (1889, pl. 42, fig. 10; 1889a, p. 340) from the southeastern coast of the United States is a larger species. Its nodes at the intersections of spirals and axials are much more pronounced, but its axial sculpture is weaker. *Peristichia agria* Dall (1889a, p. 340) has not been figured. According to the original description it is smaller than *P. toreta*, and the nodules are scarcely developed.

T. springvaleensis and the Matura specimen need comparison with the Recent West Mexican *T. hermosus* (Lowe) (1935, p. 22, pl. 3, fig. 4), *T. pliocena* Bartsch (1955, p. 8, pl. 1, fig. 1), and *Peristichia martschi* Bartsch (1955, p. 16, pl. 2, fig. 6), both from the Pliocene of Florida, and *Cerithium lordlyi* Gabb (1881b, p. 362, pl. 46, fig. 55) from the Pliocene of Costa Rica.

Occurrence.—PJ 302.

Genus **EULIMELLA** Forbes

Forbes, 1847, *in* Jeffreys, Ann. Mag. Nat. Hist., vol. 19, p. 311.

Type species (by subsequent designation, Gray, 1847, Zool. Soc. London, Proc. pt. 15, p. 160), *Eulimella crassula* Jeffreys (= *Melania scillae* Scacchi).

Subgenus **EULIMELLA** s. str.

Eulimella (Eulimella) species A Pl. 60, fig. 13

Shell small, slender. Protoconch with a little less than two whorls, sinistral; its axis at about right angles to the main shell axis. Postnuclear whorls nine, polished, rounded to slightly angulated at periphery, which is situated on lower half of whorl. Aperture somewhat squarish. Columella with two faint folds. These folds are not visible, if the aperture is complete.

This species is represented by three specimens from the Melajo Clay. Although they have many postnuclear whorls, they are probably immature. Protoconch and early whorls of *E. tenuilineata* (Guppy) (*in* Guppy and Dall, 1896, p. 317, pl. 28, fig. 8) from the Bowden Formation of Jamaica are not known. The whorls of the Melajo shells are more constricted at the suture. *E. tenuilineata* has some faint spirals below the periphery which are lacking in *E.* species A. The Miocene *E. turritelloides* (Gabb) (1873b, p. 226; Pilsbry, 1922, p. 391, pl. 36, fig. 1) from the Dominican Republic has even more spirals than *E. tenuilineata* and its protoconch is larger than that of the Melajo shells. The whorls of *E. tampaensis* Bartsch (1955, p. 13, pl. 2, fig. 1) from the Pliocene of Florida are less constricted at the suture. *E. tampaensis* lacks spiral sculpture like *E.* species A.

Occurrence. — KR 11862.

Subgenus **EBALINA** Thiele

Thiele, 1929, Handbuch der systematischen Weichtierkunde. Erster Teil, p. 236.

Type species (by monotypy), *Eulimella (Ebalina) monolirata* (Folin).

Eulimella (Ebalina) mitis, n. sp. Pl. 60, figs. 14, 15

Shell small, slender. Protoconch sinistral, consists of almost two whorls; its axis at about right angles to the main shell axis. Postnuclear whorls up to 14, polished. The first two postnuclear whorls with an angulation on the lower half of the whorl. On the third postnuclear whorl a smooth subsutural band appears, which gradually increases in strength. Space between subsutural band and angulation on lower part of whorl slightly concave. Aperture somewhat squarish. Columella straight, with two faint folds, which are not visible, if the aperture is complete.

Holotype. — Natural History Museum Basel, No. H 15362.

Dimensions of holotype. — Height 5.6 mm, diameter 1.1 mm.

Type locality. — Melajo River area: PJ 285.

This species is represented from the Melajo Clay by more than a hundred specimens. The prominence of the angulation on the lower half of the whorl is strongly variable. The whorls of some specimens are almost regularly convex below the subsutural band, in others, however, this angulation may develop almost into a keel. These extremes are connected by transitions.

A single specimen from the Matura shell bed is also identified as *E. mitis,* n. sp. No related species have been found.

Occurrence. — Melajo River area: KR 11862, PJ 285. Matura Bay: PJ 302.

Genus **TURBONILLA** Risso

Risso, 1826, Histoire naturelle des principales productions de l'Europe méridionale, vol. 4, p. 224.

Type species (by subsequent designation, Herrmannsen, 1852, Indicis generum malacozoorum. Supplementa et corrigenda, p. 136), *Turbonilla costulata* Risso. See also Palmer (1958, p. 251).

The following merely is a record of the Turbonillas occurring in the faunas under consideration. Despite the works of Dall and Bartsch (1904, 1909) and Bartsch (1955) no attempt is made to assign the different forms to subgenera as this would require a large comparative material which is not at hand. The lack of comparative material also prevents the use of specific names.

Turbonilla species A — Pl. 60, figs. 16, 17

Shell small, slender. Protoconch consists of about 2½ whorls; its axis at a little more than right angles to the main shell axis. The apex is slightly overhanging the upper suture of the first postnuclear whorl. Postnuclear whorls up to 10, somewhat convex. Sculpture consists of numerous opisthocline to slightly opisthocyrt axials with smooth interspaces of about the same width. Suture conspicuously incised. Base smooth. Aperture angulated above. Columellar fold not visible at aperture.

This form is abundant at Matura. It is stated above that the interspaces of the axials are smooth. However, there are some fragments representing late whorls which show microscopic spiral striation. This striation is probably easily washed away.

Turbonilla species A shows considerable variation as to width and shape of the axials. In some rare cases they are straight. Usually they are opisthocline to slightly opisthocyrt, but in some shells they are sigmoid. The interspaces stop abruptly at the periphery of the body whorl.

A few small, immature specimens from the Melajo Clay are identified as *Turbonilla* species A as well.

Occurrence. — Melajo River area: KR 11862, PJ 285. Matura Bay: K 10924, JS 67, RR 230, PJ 302.

Turbonilla species B Pl. 60, fig. 18

Shell small, moderately slender. Protoconch consists of about 2½ whorls, its axis at about 100° to the main shell axis. Apex slightly overhanging upper suture of first postnuclear whorl. Sculpture consists of almost orthocline axials and faint spiral grooves in the interspaces. Whorls somewhat inflated. Sculpture stops abruptly at periphery of body whorl. Base smooth. Columella straight, without fold at aperture.

This species is represented by about 20 specimens from the Melajo Clay. It has the same protoconch as *Turbonilla* species A, but differs by having spiral sculpture, more inflated whorls, broader interspaces, and less axials.

Occurrence. — EL 1810, KR 11862, PJ 285.

Turbonilla species C Pl. 60, fig. 19

Shell small, moderately slender. Protoconch consists of about two whorls, its axis at a little more than right angles to the main shell axis. Whorls practically straight in profile. Sculpture consists of orthocline axials; their interspaces crossed by a varying number of fine spiral threads. Below the periphery of the body whorl the axials gradually disappear, whereas the strength of the spirals increases on the base. Columella with one conspicuous fold. Outer lip partly lirate within.

This species is abundant at Matura. The liration of the inner surface of the outer lip is not developed throughout the ontogeny of the shell. Although the specimens with liration include different ontogenetic stages, the liration is not visible on others.

Occurrence. — JS 67, RR 230, PJ 302.

Turbonilla species D Pl. 60, figs. 20, 21

Shell small, slender. Protoconch consists of two whorls; its axis at about right angles to the main shell axis. Sculpture consists of orthocline axials with interspaces crossed by spiral grooves. The interspaces are narrow on early whorls, wider on late whorls. One spiral groove on the upper half of the whorls is wider and deeper than the others. Base sculptured by spiral grooves and weak axials. Basal lip somewhat everted. Outer lip without lirations. Columella with one fold.

This species is abundant in the Melajo Clay. Its slenderness and the pronounced spiral groove on the upper half of the whorl are characteristic.

Occurrence. — EL 1810, KR 11862, K 9797, PJ 285.

Turbonilla species E Pl. 60, fig. 22

Shell small, slender. Protoconch consists of about two whorls; its axis at about right angles to the main shell axis. Sculpture consists of almost orthocline axials and numerous spirals in the interspaces. Whorls evenly convex. Sutures well incised. On the first three or four sculptured whorls the axials are closely set. Later the interspaces become wider. Columellar fold hardly visible at aperture. Base sculptured by spirals and weak axials. Outer lip smooth within.

This species is represented by about 35 specimens from the Melajo Clay. The evenly convex whorls and the closely set axials on early whorls are characteristic features.

Occurrence. — EL 1810, KR 11862, PJ 285.

Genus **ODOSTOMIA** Fleming

Fleming, 1813, Brewster's Edinburgh Encyclopedia, vol. 7, pt. 1, p. 76.

Type species (by subsequent designation, Gray, 1847, Zool. Soc. London, Proc., pt. 15, p. 159), *Turbo plicatus* Montagu.

Odostomia canaliculata C. B. Alams ? Pl. 60, fig. 23

Shell small, moderately stout. Protoconch small, sinistral. Post-nuclear whorls six, straight in profile, polished. Suture somewhat channeled. Body whorl slightly angulated at periphery. Columella with one strong, almost horizontal fold. Umbilicus inconspicuous. Basal lip slightly everted.

O. canaliculata C. B. Adams is a Recent West Indian species which had originally been described from Jamaica. Clench and Turner (1950, p. 262, pl. 40, fig. 3) figured the lectotype. According to this figure the two shells from Matura are slightly stouter but otherwise indistinguishable. Abbott (1958, p. 103) was inclined to treat *O. canaliculata* as a synonym of *O. laevigata* (d'Orbigny), but Warmke and Abbott (1961, p. 148, pl. 26 1) considered it as a separate species.

O. mareana Weisbord (1962, p. 465, pl. 44, figs. 5, 6) from the lower Mare Formation (Pliocene) of northern Venezuela is based on a single specimen. It is not unlikely that it represents *O. canaliculata.* Maury (1917, p. 151, pl. 25, fig. 22) described *O. yaquica* from the middle Miocene Cerado Formation of the Dominican Republic, but the figure is insufficient for comparison.

Occurrence. — RR 230.

Subgenus **SALASSIA** de Folin

Folin, 1885, Const. d. Chemnitzidae, p. 15 (not seen).

Type species, *Odostomia (Salassia) tropidita* Dall and Bartsch (quoted from Dall and Bartsch, 1909, p. 134).

Odostomia (Salassia ?) species Pl. 60, fig. 24

Shell small, moderately slender. Protoconch with about two whorls, somewhat sunken into first spire whorl, its axis at about 135° to the main shell axis. Postnuclear whorls five, slightly convex. Sculpture consists of broad, rounded axials reaching from suture to suture. Interspaces smooth. Number of axials on body whorl 14. Axials on body whorl gradually disappearing below periphery. Aperture angulated above. Outer lip thin. No umbilicus. Columellar callus conspicuous, with one low fold.

This form occurs in the Matura shell bed but is represented only by two worn specimens. According to Dall and Bartsch (1909, p. 134) *Salassia* is characterised, among other things, by tabulated whorls. This, however, is not the case in the Matura shells. The shape of their whorls is more like that of *Salassiella* Dall and Bartsch (1909, p. 133; type species by original designation, *Odostomia (Salassiella) laxa* Dall and Bartsch), but *Salassiella* has occasional varices.

A similarly uncharacteristic *Salassia* is the Recent West American *O. hertleini* Strong (1938, p. 205, pl. 15, fig. 9). Its whorls are not tabulated, and it is more pupiform than the Matura shells.

Occurrence. — RR 230.

Family **ACTEONIDAE**

Genus **RICTAXIS** Dall

Dall, 1871, Amer. Jour. Conch., vol. 7, pt. 2, p. 136.

Type species (by original designation), *Tornatella punctocaelata* Carpenter.

Rictaxis species

Three small specimens (height 4 mm) with 1½ sculptured whorls from the Melajo Clay are available. They are too immature to be compared with *R. oryza* (Gabb) (1873a, p. 273, pl. 11, figs. 8, 8a; 1873b, p. 245; Pilsbry 1922, p. 310, pl. 23, fig. 12) from the Miocene of the Dominican Republic or with *R. myakkanus* (Dall) [1896a, p. 24; 1890-1903 (1903), pl. 59, fig. 1; Olsson and Harbison, 1953, p. 158, pl. 25, figs. 5, 5a] from the Pliocene of Florida. The Melajo specimens have the same type of spiral sculpture as the two species mentioned above.

Occurrence. — PJ 285, USGS 18399.

Family SCAPHANDRIDAE

Genus ACTEOCINA Gray

Gray, 1847, Zool. Soc. London, Proc., pt. 15, p. 160.

Type species (by original designation), *Acteon wetherelli* Lea (= *Volvaria canaliculata* Say).

Acteocina canaliculata (Say) ? Pl. 60 figs. 25, 26

This species is represented from Matura and the Melajo Clay by a few specimens. Matura shells usually have an elevated spire with strongly shouldered whorls. Protoconch with a little more than one volution, heterostrophic, its axis horizontal. Columella with one fold. Inner lip with callus.

A. canaliculata (Say) (1826, p. 211) is said to range from Miocene to Recent. Maury (1917, p. 13, pl. 3, fig. 2) figured a specimen from the middle Miocene of the Dominican Republic measuring 3 mm in height; Olsson and Harbison (1953, pl. 25, fig. 6) figured a 5.1 mm high shell from the Pliocene of Florida, but the Matura and Melajo shells do not attain 3 mm in height and may be immature.

Guppy (1867, p. 155; reprint, Harris, 1921, p. 34) and Guppy (1874, p. 437) cited *Tornatina canaliculata* (d'Orbigny) from Matura, a species which is not represented in the material available, if Guppy really meant *Bulla canaliculata* d'Orbigny (1845, p. 68; Atlas, pl. 4 bis, figs. 21-24, 1842).

A. persimilis (Dall) [1896a, p. 26; 1890-1903 (1903), pl. 59, fig. 22] from the Chipola Formation of Florida is a strikingly similar species. It has about the same dimensions and proportions, but the Matura shells have a stronger columellar fold, and their outer lip is not constricted posteriorly. *A. lepta* Woodring (1928, p. 121, pl. 2, fig. 5) from the Bowden Formation of Jamaica is a proportionately higher species with straight sides.

Occurrence. — Melajo River area: KR 11862, RR 293, PJ 285, USGS 18399. Matura Bay: K 10924, RR 230, PJ 302.

Genus **CYLICHNELLA** Gabb

Gabb, 1873, Acad. Nat. Sci. Philadelphia, Proc., for 1872, p. 273.

Type species (by monotypy), *Bulla bidentata* d'Orbigny.

Cylichnella altera, n. sp. Pl. 60, figs. 27, 28

Shell small, cylindrical, relatively solid. Spire sunken. Apex covered by callus. Outer lip thin, slightly constricted just above the middle of its height. Aperture broadens toward base. Columella with one strong, oblique fold. Surface smooth except for a few spiral, incised lines near the base.

Holotype. — Natural History Museum Basel, No. H 14550.

Dimensions of holotype. — Height 2.6 mm, diameter 1.4 mm.

Type locality. — Melajo River area: KR 11862.

This species is represented by about 20 specimens from the Melajo Clay. Its general shape is somewhat variable. Usually it is elongate, but stouter shells occur as well.

The type lot of *C. ovumlacerti* (Guppy) (1867, p. 168; reprint, Harris, 1921, p. 47) from the middle Miocene Manzanilla Formation of Manzanilla coast, Trinidad, consists of 10 specimens (USNM 115435). One of the syntypes has been figured by Mansfield (1925, pl. 1, figs. 7, 9). *C. ovumlacerti* has spiral, incised lines near the base like *C. altera* but differs in being larger and stouter, and in having a thicker shell.

According to topotypes *C. atacata* Woodring (1928, p. 124, pl. 2, fig. 9) from the Bowden Formation of Jamaica is a somewhat smaller and stouter species with a heavier shell. *C. triticumtritonis* (Maury) (1917, p. 14, pl. 3, fig. 4) from the middle Miocene Cercado Formation of the Dominican Republic essentially is a stouter form. *C. jacksonensis* Mansfield (1930, p. 28, pl. 1, fig. 11) from the upper Miocene of Florida is also a stouter species. Its outer lip descends more rapidly from the apex than in the Melajo form. *C. gabbi* (Dall) (1896a, p. 27; 1890-1903 (1903), pl. 59, fig. 12) from the Pliocene of Florida is a similar but larger species.

The specimen figured by Olsson and Harbison (1953, pl. 25, fig. 8) is a stouter shell which is probably not adult. *C. mareana* Weisbord (1962, p. 458, pl. 47, figs. 1, 2) from the Pliocene Mare Formation of the Cabo Blanco area, Venezuela, has no surface ornamentation. The type of *C. mareana* may be an immature shell. The Recent Caribbean *C. bidentata* (d'Orbigny) (1845, p. 63; Atlas, pl. 4, figs. 13-16, 1842) is clearly distinguished from *C. altera,* n. sp. by its spiral striae spread all over the body whorl.

Occurrence. — KR 11862, PJ 285, USGS 18399.

Cylichnella species

A few poorly preserved shells from the Courbaril beds are even more slender than *C. altera,* n. sp. from the Melajo Clay. Their surface sculpture consists of a few spiral, incised lines near the base.

Occurrence. — USGS 20433, USGS 20434.

Family **RETUSIDAE**

Genus **SULCORETUSA** Burch

Burch, 1945, Minutes Conch. Club Southern California, No. 47, p. 16. New name for *Sulcularia* Dall (1921a, p. 202), not *Sulcularia* Rafinesque, 1831.

Type species (= type species of *Sulcularia* Dall), *Bulla sulcata* d'Orbigny.

Sulcoretusa aff. **sulcata** (d'Orbigny) Pl. 60, figs. 29, 30

This form is represented by a single specimen from the Melajo Clay. It differs from the Recent *S. sulcata* (d'Orbigny) (1845, p. 66; Atlas, pl. 4 bis, figs. 9-12, 1842) by its narrower shape. *S. sulcata harveyensis* (Mansfield) (1930, p. 27, pl. 1, figs. 6, 7) from the upper Miocene of Florida is narrower posteriorly and has somewhat coarser sulcations. *S. lipara* (Woodring) (1928, p. 123, pl. 2, fig. 8) from the Bowden Formation of Jamaica is a stouter species, has coarser sulcations, and a pronounced constriction in the middle of the shell which is almost lacking in the Melajo specimen. Analogues from the Miocene of the Dominican Republic have been described as *S. sulcata fossilis* by Pilsbry (1922, p. 311). *S. prosulcata* (Gardner) [1926-1950 (1937), p. 265, pl. 37, fig. 19] from the Chipola Formation of Florida has proportions similar to those of the Melajo shell but reaches twice its size. *S. prosulcata* has also been cited from the Pliocene of Florida (Olsson and Harbison, 1953, p. 161).

Occurrence. — PJ 285.

Genus **RHIZORUS** Montfort

Montfort, 1810, Conchyliologie systématique, vol. 2, p. 339.

Type species (by original designation), *Rhizorus adalaidis* Montfort (= *Bulla acuminata* Bruguière).

Rhizorus species A

A single fragment (H 14559) from the Matura beds is available. A determination is not possible, although it seems to be closest to *R. oxytatus* (Bush) (1885, p. 468, pl. 45, fig. 12), a species ranging from Miocene to Recent (Woodring, 1928, p. 125). The Matura specimen lacks spiral grooves which may be due to washing.

Occurrence. — RR 230.

Rhizorus species B

There is a single shell (H 14560) from the Melajo Clay the base of which is missing. The genus *Rhizorus* usually includes forms which are swollen in the middle of the height. But the Melajo specimen has parallel sides, thus reminds one of *R. phoinicoides* (Gardner) [1926-1950 (1937), p. 268, pl. 37, fig. 26] from the Shoal River Formation of Florida and *R. triticus* (Olsson and Harbison) (1953, p. 163, pl. 25, figs. 3, 3a) from the Pliocene of Florida.

Occurrence. — PJ 285.

REFERENCES CITED

Abbott, R. T.

1944. *The genus Modulus in the Western Atlantic.* Johnsonia, vol. 1, No. 14, pp. 1-6, pls. 1-2.

1954. *American seashells.* New York, xiv + 541 pp., 40 pls., 100 figs.

1958. *The marine mollusks of Grand Cayman Island, British West Indies.* Acad. Nat. Sci. Philadelphia, Mon. No. 11, pp. 1-138, pls. 1-5, 10 maps, 7 text figs.

Adams, C. B.

1845. *Specierum novarum conchyliorum, in Jamaica repertorum, synopsis.* Boston Soc. Nat. Hist., Proc., vol. 2, pp. 1-17.

1852. *Catalogue of shells collected at Panama, with notes on synonymy, station and habitat.* Lyceum Nat. Hist. New York, Ann., vol. 5, pp. 222-549.

Alencaster-Ibarra, G.

1950. *Moluscos del Mioceno de la región de Ixhuatlán-Moloacán, Veracruz, Mexico.* Asoc. Mex. Geologos Petroleros, Bol., vol. 2, No. 9, pp. 557-583, 2 pls.

Anderson, F. M.

1929. *Marine Miocene and related deposits of north Colombia.* California Acad. Sci., Proc., ser. 4, vol. 18, No. 4, pp. 73-213, pls. 8-23.

Barrios, M.

1960. *Algunos Moluscos del Terciario medio de Colombia.* Bol. Geol., vol. 6, Nos. 1-3, Informe No. 1082, pp. 213-306, pls. 1-12.

Bartsch, P.

1911. *Descriptions of new mollusks of the family Vitrinellidae from the west coast of America.* U.S. Nat. Mus., Proc., vol. 39, pp. 229-234, pls. 39, 40.

1911a. *The Recent and fossil mollusks of the genus Cerithiopsis from the west coast of America.* U. S. Nat. Mus., Proc., vol. 40, pp. 327-367, pls. 36-41.

1934. *New mollusks of the family Turritidae.* Smithsonian Misc. Coll., vol. 91, No. 2, pp. 1-29, pls. 1-8.

1955. *The pyramidellid mollusks of the Pliocene deposits of North St. Petersburg, Florida.* Smithsonian Misc. Coll., vol. 125, No. 2, pp. 1-102, pls. 1-18.

Bartsch, P., and Rehder, H. A.

1939. *Mollusks collected on the Presidential Cruise of 1938.* Smithsonian Misc. Coll., vol. 98, No. 10, pp. 1-18, pls. 1-5.

Bequaert, J. C.

1942. *Cerithidea and Batillaria in the Western Atlantic.* Johnsonia, vol. 1, No. 5, pp. 1-11, pls. 1-5.

Berry, C. T.

1935. *A Pliocene ophiuran from Trinidad.* Jour. Paleont., vol. 9, No. 5, p. 430.

Bird, S. O.

1965. *Upper Tertiary Arcacea of the mid-Atlantic Coastal Plain.* Palaeont. Amer., vol. 5, No. 34, pp. 1-62, pls. 1-6.

Bold, W. A. van den

1963. *Upper Miocene and Pliocene Ostracoda of Trinidad.* Micropaleontology, vol. 9, No. 4, pp. 361-424, pls. 1-12.

Böse, E.

1906. *Sobre algunas faunas terciarias de Mexico.* Bol. Inst. Geol. Mexico, vol. 22, pp. 1-96, pls. 1-12.

Böse, E., and Toula, F.

1910. *Zur jungtertiären Fauna von Tehuantepec. I. Stratigraphie, Beschreibung und Vergleich mit amerikanischen Tertiärfaunen.* (Böse). *II. Vergleichung hauptsächlich mit europäischen und lebenden Arten.* (Toula). Jahrbuch Kaiserl.—Königl. Geol. Reichsanstalt, vol. 60, pp. 215-276, pls. 12-13.

Boss, K. J., and Kenk, V. C.

1964. *Anatomy and relationships of Temnoconcha brasiliana Dall.* Occas. Papers on Mollusks, vol. 2, No. 30, pp. 325-343, pls. 56-60.

Boss, K. J., and Merrill, A. S.

1965. *The family Pandoridae in the Western Atlantic.* Johnsonia, vol. 4, No. 44, pp. 181-215, pls. 115-126.

Broderip, W. J., and Sowerby, G. B., I

1832-1833. *Characters of new species of Mollusca and Conchifera, collected by Mr. Cuming.* Proc. Comm. Sci. Corr. Zool. Soc. London, pt. 2, pp. 25-33, 50-61, 104-108, 124-126, 1832; pp. 173-179, 194-202, 1833.

Brown, A. P., and Pilsbry, H. A.

1911. *Fauna of the Gatun Formation, Isthmus of Panama.* Acad. Nat. Sci. Philadelphia, Proc., vol. 63, pp. 336-373, pls. 22-29, text figs. 1-3.

1913a. *Fauna of the Gatun Formation, Isthmus of Panama. II.* Acad. Nat. Sci. Philadelphia, Proc., vol. 64, pp. 500-519, pls. 22-26, text figs. 1-5.

1913b. *Two collections of Pleistocene fossils from the Isthmus of Panama.* Acad. Nat. Sci. Philadelphia, Proc., vol. 65, pp. 493-500, text figs. 1-3.

Bush, K. J.
1885. *Additions to the shallow-water Mollusca of Cape Hatteras, N. C., dredged by the U.S. Fish Commission Steamer "Albatross", in 1883 and 1884.* Connecticut Acad. Arts and Sci., Trans., vol. 6, art. 11, pp. 453-480, pl. 45.

Campbell, G. B.
1961. *Colubrariidae (Gastropoda) of tropical west America, with a new species.* Nautilus, vol. 74, No. 4, pp. 136-142, pl. 10.

Cernohorsky, W. O.
1966. *A study of mitrid radulae and a tentative generic arrangement of the family Mitridae.* Veliger, vol. 9, No. 2, pp. 101-126, text figs. 1-47.

Clench, W. J.
1942. *The genera Dosinia, Macrocallista and Amiantis in the Western Atlantic.* Johnsonia, vol. 1, No. 3, pp. 1-8, pls. 1-6.
1942a. *The genus Conus in the Western Atlantic.* Johnsonia, vol. 1, No. 6, pp. 1-40, pls. 1-15.
1947. *The genera Purpura and Thais in the Western Atlantic.* Johnsonia, vol. 2, No. 23, pp. 61-91, pls. 32-40.

Clench, W. J., and Smith, L. C.
1944. *The family Cardiidae in the Western Atlantic.* Johnsonia, vol. 1, No. 13, pp. 1-32, pls. 1-13.

Clench, W. J., and Turner, R. D.
1950. *The Western Atlantic marine mollusks described by C. B. Adams.* Occas. Papers on Mollusks, vol. 1, No. 15, pp. 233-403, pls. 29-49.
1951. *The genus Epitonium in the Western Atlantic.* Johnsonia, vol. 2, No. 30, pp. 249-288, pls. 108-130.
1952. *The genera Epitonium (part II), Depressiscala, Cylindriscala, Nystiella and Solutiscala in the Western Atlantic.* Johnsonia, vol. 2, No. 31, pp. 289-356, pls. 131-177.
1956. *The family Melongenidae in the Western Atlantic.* Johnsonia, vol. 3, No. 35, pp. 161-188, pls. 94-109.
1960. *The genus Calliostoma in the Western Atlantic.* Johnsonia, vol. 4, No. 40, pp. 1-80, pls. 1-56.

Coan, E.
1966. *Nomenclatural units in the gastropod family Mitridae.* Veliger, vol. 9, No. 2, pp. 127-137.

Coan, E., and Roth, B.
1966. *The West American Marginellidae.* Veliger, vol. 8, No. 4, pp. 276-299, pls. 48-51, text figs. 1-5

Collins, R. L.
1937. *Growth stages of Mexican Tertiary caecids.* Jour. Paleont., vol. 11, No. 1, pp. 31-33, pl. 5, figs. 12-17.

Conrad, T. A.
1834. *Descriptions of new Tertiary fossils from the southern States.* Acad. Nat. Sci. Philadelphia, Jour., 1st ser., vol. 7, pt. 1, pp. 130-157.
1837. *Descriptions of new marine shells from Upper California.* Acad. Nat. Sci. Philadelphia, Jour., 1st ser., vol. 7, pt. 2, pp. 227-268, pls. 17-20.
1838-1845. *Fossils of the Medial Tertiary formations of the United States.* Philadelphia, pp. 1-80, pls. 1-45. No. 1, pp. 1-32, pls. 1-17, 1838; No. 2, pp. 33-56, pls. 18-29, 1840; No. 3, pp. 57-80, pls. 30-45, 1845.
1841. *Description of twenty-six new species of fossil shells from the Medial Tertiary deposits of Calvert Cliffs, Maryland.* Acad. Nat. Sci. Philadelphia, Proc., vol. 1, pp. 28-33.
1843. *Descriptions of a new genus, and of twenty-nine new Miocene, and*

one *Eocene fossil shells of the United States.* Acad. Nat. Sci. Philadelphia, Proc., vol. 1, pp. 305-311.

1846. *Descriptions of new species of fossil and Recent shells and corals.* Acad. Nat. Sci. Philadelphia, Proc., vol. 3, pp. 19-27, 2 pls.

1869. *Notes on Recent Mollusca.* Amer. Jour. Conch., vol. 5, pt. 2, pp. 104-108, pls. 10, 12, 13.

Cooke, C. W.

1919. *Tertiary molluscs from the Leeward Islands and Cuba.* Carnegie Inst. Washington, Publ. No. 291, pp. 103-156, pls. 1-16.

Crosse, H.

1863. *Description d'une espèce nouvelle de la Guadeloupe.* Jour. Conchyl., vol. 11 (ser. 3, vol. 3), pp. 82-84, pl. 1, fig. 7.

Dall, W. H.

1881. *Reports on the results of dredging, under the supervision of A. Agassiz, in the Gulf of Mexico, and in the Caribbean Sea, 1877-79, by the United States Coast Survey Steamer "Blake", Lieut.-Comm. C. D. Sigsbee, U.S.N., and Comm. J. R. Bartlett, U.S.N., commanding. XV. Preliminary report on the Mollusca.* Mus. Comp. Zool., Bull., vol. 9, No. 2, pp. 33-144.

1886. *Reports on the results of dredging, under the supervision of Alexander Agassiz, in the Gulf of Mexico (1877-78) and in the Caribbean Sea (1879-80), by the U.S. Coast Survey Steamer "Blake", Lieut.-Commander C. D. Sigsbee, U.S.N., and Commander J. R. Bartlett, U.S.N., commanding. XXIX. Report on the Mollusca. Part 1. Brachiopoda and Pelecypoda.* Mus. Comp. Zool., Bull., vol. 12, No. 6, pp. 171-318, pls. 1-9.

1889. *A preliminary catalogue of the shell-bearing marine mollusks and brachiopods of the southeastern coast of the United States, with illustrations of many of the species.* U.S. Nat. Mus., Bull. 37, pp. 1-221, pls. 1-74.

1889a. *Reports on the results of dredging, under the supervision of Alexander Agassiz, in the Gulf of Mexico (1877-78) and in the Caribbean Sea (1879-80), by the U.S. Coast Survey Steamer "Blake", Lieut.-Commander C. D. Sigsbee, U.S.N., and Commander J. R. Bartlett, U.S.N., commanding. XXIX. Report on the Mollusca. Part 2. Gastropoda and Scaphopoda.* Mus. Comp. Zool., Bull., vol. 18, pp. 1-492, pls. 10-40.

1890. *Scientific results of explorations by the U.S. Fish Commission Steamer Albatross. VII. Preliminary report on the collection of Mollusca and Brachiopoda obtained in 1887-88.* U.S. Nat. Mus., Proc., vol. 12, pp. 219-362, pls. 5-14.

1890-1903. *Contributions to the Tertiary fauna of Florida; with especial reference to the Miocene silex-beds of Tampa and the Pliocene beds of the Caloosahatchie River.* Wagner Free Inst. Sci. Philadelphia, Trans., vol. 3, pts. 1-6, 1654 pp., 60 pls.
1890. Pt. 1, pp. 1-200, pls. 1-12.
1892. Pt. 2, pp. 201-473, pls. 13-22.
1895. Pt. 3, pp. 474-570.
1898. Pt. 4, pp. 571-947, pls. 23-35.
1900. Pt. 5, pp. 948-1218, pls. 36-47.
1903. Pt. 6, pp. 1219-1654, pls. 48-60.

1892. *On the species of Donax of eastern North America.* Nautilus, vol. 5, No. 11, pp. 125-127.

1896. *Diagnoses of new species of molluscs from the west coast of America.* U.S. Nat. Mus., Proc., vol. 18, No. 1034, pp. 7-20.

1896a. *Diagnoses of new Tertiary fossils from the southern United States.* U.S. Nat. Mus., Proc., vol. 18, No. 1035, pp. 21-46.

1901. *Synopsis of the family Cardiidae and of the North American species.* U.S. Nat. Mus., Proc., vol. 23, No. 1214, pp. 381-392.
1902. *Illustrations and descriptions of new, unfigured, or imperfectly known shells, chiefly American, in the U.S. National Museum.* U.S. Nat. Mus., Proc., vol. 24, No. 1264, pp. 499-566, pls. 27-40.
1902a. *Synopsis of the family Veneridae and of the North American Recent species.* U.S. Nat. Mus., Proc., vol. 26, No. 1312, pp. 335-412, pls. 12-16.
1908. *Reports on the dredging operations off the west coast of Central America to the Galapagos, to the west coast of Mexico, and in the Gulf of California, in charge of Alexander Agassiz, carried on by the U.S. Fish Commission Steamer "Albatross", during 1891, Lieut. Commander Z. L. Tanner, U.S.N., commanding. XXXVII. Reports on the scientific results of the expedition to the eastern tropical Pacific, in charge of Alexander Agassiz, by the U.S. Fish Commission Steamer "Albatross", from October, 1904, to March, 1905, Lieut. Commander L. M. Garrett, U.S.N., commanding. XIV. The Mollusca and the Brachiopoda.* Mus. Comp. Zool., Bull., vol. 43, No. 6, pp. 205-487, pls. 1-22.
1912. *New species of fossil shells from Panama and Costa Rica.* Smithsonian Misc. Coll., vol. 59, No. 2, pp. 1-10.
1919. *Descriptions of new species of mollusks of the family Turritidae from the west coast of America and adjacent regions.* U.S. Nat. Mus., Proc., vol. 56, No. 2288, pp. 1-86, pls. 1-24.
1921. *Two new South American shells.* Nautilus, vol. 34, No. 4, pp. 132-133.
1921a. *Summary of the marine shellbearing mollusks of the northwest coast of America, from San Diego, California, to the Polar Sea, mostly contained in the collection of the United States National Museum, with illustrations of hitherto unfigured species.* U.S. Nat. Mus., Bull. 112, pp. 1-217, pls. 1-22.
1925. *Illustrations of unfigured types of shells in the collection of the United States National Museum.* U.S. Nat. Mus., Proc., vol. 66, No. 2554, art. 17, pp. 1-41, pls. 1-36.

Dall, W. H., and Bartsch, P.
1904. *Synopsis of the genera, subgenera and sections of the family Pyramidellidae.* Biol. Soc. Washington, Proc., vol. 17, pp. 1-16.
1909. *A monograph of West American pyramidellid mollusks.* U.S. Nat. Mus., Bull. 68, pp. 1-258, pls. 1-30.

Desjardin, M.
1949. *Les Rissoina de l'Ile de Cuba.* Jour. Conchyl., vol. 89, pp. 193-208, pls. 9-10.

Fargo, W. G.
1948. *New Vexillum and Aesopus from the Pliocene of St. Petersburg, Florida.* Nautilus, vol. 61, No. 4, pp. 109-112, pl. 7, figs. 4-8, 11-12.

Finlay, H. J.
1926. *A further commentary on New Zealand molluscan systematics.* New Zealand Inst., Trans., vol. 57, pp. 320-485, pls. 18-23.

Fischer-Piette, E.
1942. *Les mollusques d'Adanson.* Jour. Conchyl., vol. 85, pp. 101-366, pls. 1-16.

Fleming, C. A.
1957. *The genus Pecten in New Zealand.* New Zealand Geol. Sur., Paleont. Bull. 26, pp. 1-69, pls. 1-15.

Gabb, W. M.
1873a. *Description of some new genera of Mollusca.* Acad. Nat. Sci. Philadelphia, Proc., vol. 24, pp. 270-274, pls. 9-11.

1873b. *On the topography and geology of Santo Domingo.* Amer. Philos. Soc., Trans., new ser., vol. 15, pp. 49-259, 2 maps.

1881a. *Descriptions of Caribbean Miocene fossils.* Acad. Nat. Sci. Philadelphia, Jour., ser. 2, vol. 8, pp. 337-348, pls. 44-45.

1881b. *Descriptions of new species of fossils from the Pliocene clay beds between Limon and Moen, Costa Rica, together with notes on previously known species from there and elsewhere in the Caribbean area.* Acad. Nat. Sci. Philadelphia, Jour., ser. 2, vol. 8, pp. 349-380, pls. 45-47.

Gardner, J. A.

1926.-1950. *The Molluscan fauna of the Alum Bluff Group of Florida* U.S. Geol. Sur., Prof. Paper 142 A-I, pp. 1-709, pls. 1-62.
1926. Part 1 (A), pp. 1-79, pls. 1-15.
1926. Part 2 (B), pp. 80-99, pls. 16-17.
1926. Part 3 (C), pp. 100-149, pls. 18-23.
1926. Part 4 (D), pp. 150-184, pls. 24-28.
1928. Part 5 (E), pp. 185-249, pls. 29-36.
1937. Part 6 (F), pp. 250-435, pls. 37-48.
1944. Part 7 (G), pp. 436-491, pls. 49-51.
1947. Part 8 (H), pp. 492-656, pls. 52-62.
1950. Part 9 (I), pp. 657-709 (Index to Chapters A-H).

1943-1948. *Mollusca from the Miocene and lower Pliocene of Virginia and North Carolina.* U.S. Geol. Sur., Prof. Paper 199 A-B, pp. 1-310, pls. 1-38.
1943. Part 1 (A), pp. 1-178, pls. 1-23.
1948. Part 2 (B), pp. 179-310, pls. 24-38.

Gardner, J. A., and Aldrich, T. H.

1919. *Mollusca from the upper Miocene of South Carolina with descriptions of new species.* Acad. Nat. Sci. Philadelphia, Proc., vol. 71, pp. 17-53, pls. 1-4.

Grant, U. S., and Gale, H. R.

1931. *Catalogue of the marine Pliocene and Pleistocene Mollusca of California and adjacent regions.* San Diego Soc. Nat. Hist., Mem., vol. 1, pp. 1-1036, pls. 1-32, 5 text figs., 3 tables, diagrams A-D.

Guppy, R. J. L.

1864. *On later Tertiary deposits at Matura on the east coast of Trinidad.* Sci. Assoc. Trinidad, Trans. for 1864, pp. 33-43. Reprinted by Harris, G. D., 1921, Bull. Amer. Paleont., vol. 8, No. 35, pp. 13-23.

1866a. *On the Tertiary Mollusca of Jamaica.* Quart. Jour. Geol. Soc. London, vol. 22, pp. 281-295, pls. 16-18.

1866b. *On the relations of the Tertiary formations of the West Indies.* Quart. Jour. Geol. Soc. London, vol. 22, pp. 570-590, pl. 26.

1867. *On the Tertiary fossils of the West Indies with especial reference to the classification of the Kainozoic rocks of Trinidad.* Sci. Assoc. Trinidad, Proc., pt. 3, pp. 145-176. Reprinted by Harris, G. D., 1921, Bull. Amer. Paleont., vol. 8, No. 35, pp. 24-55.

1873a. *On some new Tertiary fossils from Jamaica.* Sci. Assoc. Trinidad, Proc., vol. 2, pp. 72-88. Reprinted by Harris, G. D., 1921, Bull. Amer. Paleont., vol. 8, No. 35, pp. 56-72.

1873b. *On new species of bivalve Molluska found at Cumaná, Venezuela.* Sci. Assoc. Trinidad, Proc., vol. 2, pp. 90-92, pl. 3. Reprinted by Harris, G. D., 1921, Bull. Amer. Paleont., vol. 8, No. 35, pp. 73-75, pl. 1.

1874. *On the West Indian Tertiary fossils.* Geol. Mag., new ser., decade 2, vol. 1, pp. 404-411, 434-446, pls. 16-18.

1876. *On the Miocene fossils of Haiti.* Quart. Jour. Geol. Soc. London, vol. 32, pp. 516-532, pls. 28-29.

1882. *On the Recent and Tertiary species of Leda and Nucula found in the West Indies: with notices of Westindian shells.* Sci. Assoc. Trinidad, Proc., vol. 2, No. 4, pt. 12, pp. 168-180, pl. 7. Reprinted by Harris, G. D., 1921, Bull. Amer. Paleont., vol. 8, No. 35, pp. 89-101, pl. 5.

Guppy, R. J. L., and Dall, W. H.

1896. *Descriptions of Tertiary fossils from the Antillean region.* U.S. Nat. Mus., Proc., vol. 19, No. 1110, pp. 303-331, pls. 27-30.

Hanley, S.

1844. *Descriptions of new species of Tellina, collected by H. Cuming.* Zool. Soc. London, Proc., pt. 12, pp. 59-64, 68-72, 140-144, 146-149, 164-166.

1845a. *Descriptions of six new species of Donax, in the collection of Hugh Cuming, Esq.* Zool. Soc. London, Proc., pt. 13, pp. 14-16.

1845b. *A description of new species of Ostreae, in the collection of H. Cuming. Esq.* Zool. Soc. London, Proc., pt. 13, pp. 105-107.

Hanna, G. D., and Strong, A. M.

1949. *West American mollusks of the genus Conus.* California Acad. Sci., Proc., 4th ser., vol. 26, No. 9, pp. 247-322, pls. 5-10, 4 figs.

Harrington, H. J.

1962. *Paleogeographic development of South America.* Amer. Assoc. Petr. Geol., Bull., vol. 46, No. 10, pp. 1773-1814, 34 figs.

Harris, G. D.

1895. *Neocene Mollusca of Texas.* Bull. Amer. Paleont., vol. 1, No. 3, pp. 1-32, pls. 1-4.

1921. *A reprint of the more inaccessible paleontological writings of Robert John Lechmere Guppy.* Bull. Amer. Paleont., vol. 8, No. 35, pp. 1-198, pls. 1-10.

Heilprin, A.

1887. *Explorations on the west coast of Florida and in the Okeechobee wilderness.* Wagner Free Inst. Sci. Philadelphia, Trans., vol. 1, pp. 1-134, pls. 1-19. Reprint, Palaeont. Amer., vol. 4, No. 33, pp. 363-506, pls. 54-74, 1964.

Henderson, J. B.

1920. *A monograph of the East American scaphopod mollusks.* U.S. Nat. Mus., Bull. 111, pp. 1-177, pls. 1-20.

Hertlein, L. G., and Strong, A. M.

1940-1951. *Eastern Pacific expeditions of the New York Zoological Society. Mollusks from the west coast of Mexico and Central America. Pts. I-X.* Zoologica, New York Zool. Soc.
1940. Pt. 1, vol. 25, pt. 4, pp. 369-430, pls. 1-2.
1943. Pt. 2, vol. 28, pt. 3, pp. 149-168, pl. 1.
1946. Pt. 3, vol. 31, pt. 2, pp. 53-76, pl. 1.
1946. Pt. 4, vol. 31, pt. 3, pp. 93-120, pl. 1.
1947. Pt. 5, vol. 31, pt. 4, pp. 129-150, pl. 1.
1948. Pt. 6, vol. 33, pt. 4, pp. 163-198, pls. 1-2.
1949. Pt. 7, vol. 34, pt. 2, pp. 63-97, pl. 1.
1949. Pt. 8, vol. 34, pt. 4, pp. 239-258, pl. 1.
1950. Pt. 9, vol. 35, pt. 4, pp. 217-252, pls. 1-2.
1951. Pt. 10, vol. 36, pt. 2, pp. 67-120, pls. 1-11.

1948. *Note on West American species of Condylocardia.* Nautilus, vol. 61, No. 3, p. 106.

1955. *Marine mollusks collected during the "Askoy" Expedition to Panama, Colombia, and Ecuador in 1941.* Amer. Mus. Nat. Hist., Bull., vol. 107, art. 2, pp. 159-318, pls. 1-3.

Hodson, F.

1926. *Venezuelan and Caribbean Turritellas.* Bull. Amer. Paleont., vol. 11, No. 45, pp. 1-50, pls. 1-30.

Hodson, F., Hodson, H. K., and Harris, G. D.
1927. *Some Venezuelan and Caribbean mollusks.* Bull. Amer. Paleont., vol. 13, No. 49, pp. 1-160, pls. 1-40.

Hodson, F., and Hodson, H. K.
1931a. *Some Venezuelan mollusks.* Bull. Amer. Paleont., vol. 16, No. 59, pp. 1-94, pls. 1-24.
1931b. *Some Venezuelan mollusks. Pt. 2.* Bull. Amer. Paleont., vol. 16, No. 60, pp. 1-38, pls. 1-12.

Hubbard, B.
1920. *Tertiary Mollusca from the Lares District, Porto Rico.* New York Acad. Sci., Scientific Survey of Porto Rico and the Virgin Islands, vol. 3, pt. 2, pp. 79-164, pls. 10-25.

Jung, P.
1964. *Bemerkungen zur Abgrenzung von Spezies der Natica-Canrena-Gruppe.* Verhandl. Naturf. Ges. Basel, Bd. 75, Nr. 1, pp. 133-139, 5 text figs., 2 tables.
1965. *Miocene Mollusca from the Paraguaná Peninsula, Venezuela.* Bull. Amer. Paleont., vol. 49, No. 223, pp. 387-652, pls. 50-79, 3 text figs., 3 tables.

Keen, A. M.
1944. *Catalogue and revision of the gastropod subfamily Typhinae.* Jour. Paleont., vol. 18, No. 1, pp. 50-72, 20 text figs.
1958. *Sea shells of tropical west America.* Stanford Univ. Press, 624 pp., 10 color plates, 1709 figs.
1960. *New Phyllonotus from the eastern Pacific.* Nautilus, vol. 73, No. 3, pp. 103-109, pl. 10.
1961. *A proposed reclassification of the gastropod family Vermetidae.* Bull. Brit. Mus. (Nat. Hist.), Zool., vol. 7, No. 3, pp. 183-213, pls. 54-55.
1966. *West American mollusk types at the British Museum (Natural History). III. Alcide d'Orbigny's South American collection.* Veliger, vol. 9, No. 1, pp. 1-7, pl. 1.

Kennard, A. S., Salisbury, A. E., and Woodward, B. B.
1931. *The types of Lamarck's genera of shells as selected by J. G. Children in 1823.* Smithsonian Misc. Coll., vol. 82, No. 17, pp. 1-40.

Kosuge, S.
1966. *The family Triphoridae and its systematic position.* Malacologia, vol. 4, No. 2, pp. 297-324, pl. 1, text figs. 1-36.

Kugler, H. G.
1936. *Summary digest of geology of Trinidad.* Amer. Assoc. Petr. Geol., Bull., vol. 20, No. 11, pp. 1439-1453, 2 figs.
1953. *Jurassic to Recent sedimentary environments in Trinidad.* Assoc. Suisse Géol. Ing. Pétrole, Bull., vol. 20, No. 59, pp. 27-60, 2 text figs.

Lamy, E.
1907. *Révision des Arca vivants du Muséum d'Histoire Naturelle de Paris.* Jour. Conchyl., vol. 55 (ser. 4, vol. 9), No. 1, pp. 1-111, pl. 1; No. 3, pp. 199-307, pl. 3.

Lea, H. C.
1846. *Description of some new fossil shells from the Tertiary of Petersburg, Virginia.* Amer. Philos. Soc., Trans., new ser., vol. 9, pp. 229-274, pls. 34-37.

Lowe, H. N.
1932. *On four new species of Epitonium from western Central America.* Nautilus, vol. 45, No. 4, pp. 113-115, pl. 9.
1935. *New marine Mollusca from west Mexico, together with a list of shells collected at Punta Peñasco, Sonora, Mexico.* San Diego Soc. Nat. Hist., Trans., vol. 8, No. 6, pp. 15-34, pls. 1-4.

MacNeil, F. S.
1938. *Species and genera of Tertiary Noetinae.* U.S. Geol. Sur., Prof. Paper 189-A, pp. 1-49, pls. 1-6, 2 figs.
Mansfield, W. C.
1925. *Miocene gastropods and scaphopods from Trinidad.* U.S. Nat. Mus., Proc., vol. 66, art. 22, pp. 1-65, pls. 1-10.
1930. *Miocene gastropods and scaphopods of the Choctawhatchee Formation of Florida.* Florida State Geol. Sur., Bull. No. 3, pp. 1-185, pls. 1-21.
1932a. *Miocene pelecypods of the Choctawhatchee Formation of Florida.* Florida State Geol. Sur., Bull. No. 8, pp. 1-140, pls. 1-34.
1932b. *Pliocene fossils from limestone in southern Florida.* U.S. Geol. Sur., Prof. Paper 170-D, pp. 43-56, pls. 14-18.
1936. *Stratigraphic significance of Miocene, Pliocene and Pleistocene Pectinidae in the southeastern United States.* Jour. Paleont., vol. 10, No. 3, pp. 168-192, pls. 22-23.
1937. *Mollusks of the Tampa and Suwannee limestones of Florida.* State of Florida Dept. Conserv., Geol. Bull. No. 15, pp. 1-282, pls. 1-21.
Marks, J. G.
1951. *Miocene stratigraphy and paleontology of southwestern Ecuador.* Bull. Amer. Paleont., vol. 33, No. 139, pp. 1-162, pls. 1-9.
Maury, C. J.
1912. *A contribution to the paleontology of Trinidad.* Acad. Nat. Sci. Philadelphia, Jour., ser. 2, vol. 15, pp. 25-112, pls. 5-13.
1917. *Santo Domingo type sections and fossils. Pt. I.* Bull. Amer. Paleont., vol. 5, No. 29, pp. 1-251, pls. 1-39.
1920. *Tertiary Mollusca from Porto Rico.* New York Acad. Sci., Scientific Survey of Porto Rico and the Virgin Islands, vol. 3, pt. 1, pp. 1-77, pls. 1-9.
1922. *The Recent Arcas of the Panamic Province.* Palaeont. Amer., vol. 1, No. 4, pp. 1-46, pls. 1-3.
1925. *A further contribution to the paleontology of Trinidad (Miocene horizons).* Bull. Amer. Paleont., vol. 10, No. 42, pp. 1-250, pls. 1-43.
1925a. *Fosseis Terciarios do Brasil.* Serv. Geol. e Min. Brasil, Mon., vol. 4, pp. 1-665, pls. 1-24.
McGinty, T. L.
1945. *Description of a new Teinostoma.* Nautilus, vol. 58, No. 4, pp. 142-143.
McLean, R. A.
1951. *The Pelecypoda or bivalve mollusks of Porto Rico and the Virgin Islands.* New York Acad. Sci., Scientific Survey of Porto Rico and the Virgin Islands, vol. 17, pt. 1, pp. 1-183, pls. 1-26.
Merriam, C. W.
1941. *Fossil Turritellas from the Pacific Coast region of North America.* Univ. California Publ., Bull. Dept. Geol. Sci., vol. 26, No. 1, pp. 1-214, pls. 1-41, 19 figs.
Moore, E. J.
1962. *Conrad's Cenozoic fossil marine mollusk type specimens at the Academy of Natural Sciences of Philadelphia.* Acad. Nat. Sci. Philadelphia, Proc., vol. 114, No. 2, pp. 23-120.
Morrison, J. P. E.
1949. *Notes on the Florida species of Bursa.* Amer. Malac. Union, News Bull. and Annual Reports, pp. 10-13.
Morton, J. E.
1953. *Vermicularia and the turritellids.* Malac. Soc. London, Proc., vol. 30, pp. 80-86, figs. 1-3.

Nelson, E. T.

1870. *On the molluscan fauna of the later Tertiary of Peru.* Connecticut Acad. Arts and Sci., Trans., vol. 2, pt. 1, pp. 186-206, pls. 6-7.

Nygren, W. E.

1950. *Bolivar geosyncline of northwestern South America.* Amer. Assoc. Petr. Geol., Bull., vol. 34, No. 10, pp. 1998-2006, 3 figs.

Olsson, A. A.

1922. *The Miocene of northern Costa Rica, with notes on its general stratigraphic relations.* Bull. Amer. Paleont., vol. 9, No. 39, pp. 1-168, pls. 1-32.

1932. *Contributions to the Tertiary paleontology of northern Peru. Part 5. The Peruvian Miocene.* Bull. Amer. Paleont., vol. 19, No. 68, pp. 1-272, pls. 1-24.

1942. *Tertiary and Quaternary fossils from the Burica Peninsula of Panama and Costa Rica.* Bull. Amer. Paleont., vol. 27, No. 106, pp. 1-106, pls. 1-12.

1956. *Studies on the genus Olivella.* Acad. Nat. Sci. Philadelphia, Proc., vol. 108, pp. 155-225, pls. 8-16, 23 text figs.

1961. *Molluscs of the tropical eastern Pacific. Particularly from the southern half of the Panamic-Pacific faunal province (Panama to Peru). Panamic-Pacific Pelecypoda.* Paleont. Research Inst., pp. 1-574, pls. 1-86.

1964. *Neogene mollusks from northwestern Ecuador.* Paleont. Research Inst., Ithaca, N.Y., pp. 1-256, pls. 1-38.

1967. *Some Tertiary mollusks from South Florida and the Caribbean.* Paleont. Research Inst., Ithaca, N.Y., pp. 1-61, pls. 1-9.

Olsson, A. A., and Harbison, A.

1953. *Pliocene Mollusca of southern Florida, with special reference to those from North Saint Petersburg. With special chapters on Turridae by William G. Fargo, and Vitrinellidae and freshwater mollusks by Henry A. Pilsbry.* Acad. Nat. Sci. Philadelphia, Mon. No. 8, pp. 1-458, pls. 1-65, text figs. 1-2, 2 maps.

Olsson, A. A., and McGinty, T. L.

1958. *Recent marine mollusks from the Caribbean coast of Panama with the description of some new genera and species.* Bull. Amer. Paleont., vol. 39, No. 177, pp. 1-58, pls. 1-5.

Olsson, A. A., and Petit, R. E.

1964. *Some Neogene Mollusca from Florida and the Carolinas.* Bull. Amer. Paleont., vol. 47, No. 217, pp. 509-574, pls. 77-83.

d'Orbigny, A.

1842. *Histoire physique, politique et naturelle de l'Ile de Cuba par D. Ramon de La Sagra.* Atlas, pls. 1-28.

1845. *Historia fisica, politica y natural de la Isla de Cuba por D. Ramon de La Sagra.* Segunda parte. Historia natural, vol. 5, Moluscos, pp. 1-376.

Palmer, K. V. W.

1927-1929. *The Veneridae of Eastern America, Cenozoic and Recent.* Paleont. Amer., vol. 1, No. 5, pp. 209-522, 1927; pls. 32-76, 1929.

1958. *Type specimens of marine Mollusca described by P. P. Carpenter from the West Coast (San Diego to British Columbia).* Geol. Soc. Amer., Memoir 76, pp. 1-374, pls. 1-35.

Perrilliat Montoya, Maria del Carmen

1963. *Moluscos de la formación Agueguexquite (Mioceno medio) del Istmo de Tehuantepec, Mexico.* Paleontologia Mexicana, No. 14, pp. 1-45, pls. 1-6, 1 table.

Petit de la Saussaye, S.
1852. *Description de coquilles nouvelles.* Jour. Conchyl., vol. 3, pp. 51-59, pl. 2, figs. 1-4, 8, 9, 11.
Pflug, H. D.
1961. *Mollusken aus dem Tertiär von Santo Domingo.* Acta Humboldtiana, ser. geol. et palaeont., No. 1, pp. 1-107, pls. 1-26, 1 text fig.
Philippi, R. A.
1851. *Centuria quarta testaceorum novorum.* Ztschr. Malakozoologie, vol. 8, No. 4, pp. 49-64.
Pilsbry, H. A.
1897. *New species of molluscs from Uruguay.* Acad. Nat. Sci. Philadelphia, Proc., vol. 49, pp. 290-298, pls. 6-7.
1922. *Revision of W. M. Gabb's Tertiary Mollusca of Santo Domingo.* Acad. Nat. Sci. Philadelphia, Proc., vol. 73, pp. 305-435, pls. 16-47, text figs. 1-48.
1931. *The Miocene and Recent Mollusca of Panama Bay.* Acad. Nat. Sci. Philadelphia, Proc., vol. 83, pp. 427-440, pl. 41, 5 text figs.
Pilsbry, H. A., and Johnson, C. W.
1917. *New Mollusca of the Santo Domingan Oligocene.* Acad. Nat. Sci. Philadelphia, Proc., vol. 69, pp. 150-202.
Pilsbry, H. A., and Lowe, H. N.
1932. *West Mexican and Central American mollusks collected by H. N. Lowe 1929-1931.* Acad. Nat. Sci. Philadelphia, Proc., vol. 84, pp. 33-144, pls. 1-17.
Pilsbry, H. A., and Harbison, A.
1933. *Notes on the Miocene of southern New Jersey.* Acad. Nat. Sci. Philadelphia, Proc., vol. 85, pp. 107-120, pls. 3-5.
Pilsbry, H. A., and Olsson, A. A.
1941. *A Pliocene fauna from western Ecuador.* Acad. Nat. Sci. Philadelphia, Proc., vol. 93, pp. 1-79, pls. 1-19, 2 text figs.
1945. *Vitrinellidae and similar gastropods of the Panamic Province. I.* Acad. Nat. Sci. Philadelphia, Proc., vol. 97, pp. 249-278, pls. 22-30.
Pilsbry, H. A., and McGinty, T. L.
1945a. *Cyclostrematidae and Vitrinellidae of Florida. 1.* Nautilus, vol. 59, No. 1, pp. 1-13, pls. 1-2.
1945b. *"Cyclostrematidae" and Vitrinellidae of Florida. 2.* Nautilus, vol. 59, No. 2, pp. 52-59, pl. 6.
1950. *Vitrinellidae of Florida. Part 5.* Nautilus, vol. 63, No. 3, pp. 85-87, pl. 5, figs. 6, 7.
Radwin, G. E.
The systematic position of Glyptaesopus Pilsbry and Olsson 1941. In press.
Ravenel, E.
1861. *Descriptions of new Recent shells from the coast of South Carolina.* Acad. Nat. Sci. Philadelphia, Proc., vol. 13, pp. 41-44.
Recluz, C.
1852. *Description de coquilles nouvelles.* Jour. Conchyl., vol. 3, pp. 249-256, pl. 10.
Rehder, Harald
1967. *Valid zoological names in the Portland Catalogue.* U.S. Nat. Mus., Proc., vol. 121, No. 3579, 51 pp.
Reinhart, P. W.
1935. *Classification of the pelecypod family Arcidae.* Mus. Roy. Hist. Nat. Belgique, Bull., vol. 11, No. 13, pp. 1-68, pls. 1-5.
1937. *Three new species of the pelecypod family Arcidae from the Pliocene of California.* Jour. Paleont., vol. 11, No. 3, pp. 181-185, pl. 28.

1943. *Mesozoic and Cenozoic Arcidae from the Pacific slope of North America.* Geol. Soc. Amer., Special Paper No. 47, pp. i-xi + 1-117, pls. 1-15.

Robertson, R.

1957. *A study of Cantharus multangulus (Philippi), with notes on Cantharus and Pseudoneptunea (Gastropoda: Buccinidae).* Notulae Naturae, Acad. Nat. Sci. Philadelphia, No. 300, pp. 1-10, figs. 1-19.

Rutsch, R. F.

1934. *Die Gastropoden aus dem Neogen der Punta Gavilán in Nord-Venezuela.* Abhandl. Schweiz. Palaeont. Ges., Bde. 54-55, pp. 1-169, pls. 1-9, 20 text figs.

1942. *Die Mollusken der Springvale-Schichten (Obermiocaen) von Trinidad (Britisch-West-Indien).* Verhandl. Naturf. Ges. Basel, Bd. 54, pp. 96-182, pls. 3-9, text figs. 1-2.

Say, T.

1822. *Account of some of the marine shells of the United States.* Acad. Nat. Sci. Philadelphia, Jour., 1st ser., vol. 2, pt. 2, pp. 221-248, 257-276, 302-325.

1824. *An account of some of the fossil shells of Maryland.* Acad. Nat. Sci. Philadelphia, Jour., 1st ser., vol. 4, pt. 1, pp. 124-155, pls. 7-13.

1826. *Descriptions of marine shells recently discovered on the coast of the United States.* Acad. Nat. Sci. Philadelphia, Jour., 1st ser., vol. 5, pt. 2, pp. 207-221.

Sherborn, C. D., and Prout, L. B.

1912. *Note on the date of publication of the works of Jacob Huebner on the Lepidoptera.* Ann. Mag. Nat. Hist., ser. 8, vol. 9, pp. 175-180.

Shuttleworth, R. J.

1856. *Description de nouvelles espèces.* Jour. Conchyl., vol. 5, pp. 168-175.

Smith, M.

1936a. *New Tertiary shells from Florida.* Nautilus, vol. 49, No. 4, pp. 135-139, pl. 9.

1936b. *New Tertiary shells from Florida.* Nautilus, vol. 50, No. 1, pp. 20-22, pl. 9 (of vol. 49).

Sowerby, G. B., I.

1832. *Characters of new species of Mollusca and Conchifera, collected by Mr. Cuming.* Comm. Sci. and Corr. Zool. Soc. London, Proc., pt. 2, pp. 113-120.

1833-1834. *Characters of new species of Mollusca and Conchifera, collected by Mr. Cuming.* Zool. Soc. London, Proc., pt. 1, pp. 16-22, 34-38, 70-74, 1833; pp. 134-139, 1834.

1835. *Characters of and observations on new genera and species of Mollusca and Conchifera collected by Mr. Cuming.* Zool. Soc. London, Proc., pt. 3, pp. 4-7, 21-23, 49-51, 84-85, 109-110.

Sowerby, G. B., I., and Powys, W. L.

1835. *Characters of new species of shells collected by Mr. Cuming.* Zool. Soc. London, Proc., pt. 3, pp. 93-96.

Sowerby, G. B., II.

1850. *Descriptions of new species of fossil shells found by J. S. Heniker [sic], Esq.* Quart. Jour. Geol. Soc. London, vol. 6, pp. 44-53, pls. 9-10.

Spieker, E. M.

1922. *The paleontology of the Zorritos Formation of the north Peruvian oil fields.* The Johns Hopkins Univ., Studies in Geol., No. 3, pp. 1-196, pls. 1-10.

Staadt, J. L.
1956. *Observations on the subgeneric classification of Calliostoma.* Jour. Conchyl., vol. 96, pp. 119-120.

Stenzel, H. B.
1947. *Nomenclatural synopsis of supraspecific groups of the family Ostreidae (Pelecypoda, Mollusca).* Jour. Paleont., vol. 21, No. 2, pp. 165-185.

Stenzel, H. B., Krause, E. K., and Twining, J. T.
1957. *Pelecypoda from the type locality of the Stone City beds (middle Eocene) of Texas.* Univ. Texas Publ. No. 5704, pp. 1-237, pls. 1-22, text figs. 1-31, tables 1-4.

Stingley, D. V.
1952. *Crepidula maculosa Conrad.* Nautilus, vol. 65, No. 3, pp. 83-85, pl. 2, figs. 7-10.

Stirton, R. A.
1950. *Late Cenozoic avenues of dispersal for terrestrial animals between North America and South America.* (Abstract). Geol. Soc. Amer., Bull., vol. 61, No. 12, pt. 2, pp. 1541-1542.

Stoliczka, F.
1871. *Cretaceous fauna of southern India. The Pelecypoda, with a review of all known genera of this class, fossil and Recent.* Palaeontologia Indica, vol. 3, pp. xii + 537, pls. 1-50.

Strong, A. M.
1938. *New species of West American shells.* California Acad. Sci., Proc., ser. 4, vol. 23, No. 14, pp. 203-216, pls. 15-16.

Thiele, J.
1910. *Molluskenfauna Westindiens.* Zool. Jahrbücher, Suppl. 11, Heft 2, pp. 109-132, pl. 9.

Tomlin, J. R. le B.
1929. *The Mollusca of the "St. George" expedition. (II.) The West Indies.* Jour. Conch., vol. 18, No. 11, pp. 307-310.

Toula, F.
1909. *Eine jungtertiäre Fauna von Gatun am Panama-Kanal.* Jahrb. Kaiserl.-Königl. Geol. Reichsanstalt, Bd. 58, Heft 4, pp. 673-760, pls. 25-28, text figs. 1-15.
1911. *Die jungtertiäre Fauna von Gatun am Panamakanal. II.* Jahrb. Kaiserl.-Königl. Geol. Reichsanstalt, Bd 61, pp. 487-530, pls. 30-31.

Trechmann, C. T.
1935. *The geology and fossils of Carriacou, West Indies.* Geol. Mag., vol. 72, No. 858, pp. 528-555, pls. 20-22.

Turner, R. D.
1954. *The family Pholadidae in the Western Atlantic and the Eastern Pacific. Part 1. Pholadinae.* Johnsonia, vol. 3, No. 33, pp. 1-63, pls. 1-34.
1956. *The Eastern Pacific marine mollusks described by C. B. Adams.* Occas. Papers on Mollusks, vol. 2, No. 20, pp. 21-135, pls. 5-20.

Van Winkle, K.
1923. *Foraminifera and a small molluscan fauna from Costa Rica.* Bull. Amer. Paleont., vol. 10, No. 40, pp. 1-18, pls. 1-2.

Vokes, E. H.
1964. *The genus Turbinella (Mollusca, Gastropoda) in the New World.* Tulane Stud. Geol., vol. 2, No. 2, pp. 39-68, pls. 1-3, 1 text fig.
1965. *Cenozoic Muricidae of the Western Atlantic region. Part 2. Chicoreus s.str. and Chicoreus (Siratus).* Tulane Stud. Geol., vol. 3, No. 4, pp. 181-204, pls. 1-3, text figs. 1-2.

Vokes, H. E.

1938. *Upper Miocene Mollusca from Springvale, Trinidad, British West Indies.* Amer. Mus. Novitates, No. 988, pp. 1-28, figs. 1-29.

Warmke, G. L., and Abbott, R. T.

1961. *Caribbean seashells.* Livingstone Publishing Company, Narberth, Pennsylvania, pp. x + 348, pls. 1-44, text figs. 1-34, maps 1-19.

Weisbord, N. E.

1929. *Miocene Mollusca of northern Colombia.* Bull. Amer. Paleont., vol. 14, No. 54, pp. 1-57, pls. 1-9.

1962. *Late Cenozoic gastropods from northern Venezuela.* Bull. Amer. Paleont., vol. 42, No. 193, pp. 1-672, pls. 1-48.

1964. *Late Cenozoic pelecypods from northern Venezuela.* Bull. Amer. Paleont., vol. 45, No. 204, pp. 1-564, pls. 1-59.

Whitmore, F. C., and Stewart, R. H.

1965. *Miocene mammals and Central American seaways.* Science, vol. 148, No. 3667, pp. 180-185, 2 figs.

Woodring, W. P.

1925. *Miocene molluscs from Bowden, Jamaica. Pelecypods and scaphopods.* Carnegie Inst. Washington, Publ. No. 366, pp. 1-222, pls. 1-28.

1928. *Miocene molluscs from Bowden, Jamaica. Pt. 2. Gastropods and discussion of results.* Carnegie Inst. Washington, Publ. No. 385, pp. 1-564, pls. 1-40, text figs. 1-3.

1957. *Geology and paleontology of Canal Zone and adjoining parts of Panama. Geology and description of Tertiary mollusks (gastropods: Trochidae to Turritellidae).* U.S. Geol. Sur., Prof. Paper 306-A, pp. 1-145, pls. 1-23, text figs. 1-4.

1957a. *Muracypraea, new subgenus of Cypraea.* Nautilus, vol. 70, No. 3, pp. 88-90.

1958. *Springvaleia, a late Miocene Xenophora-like turritellid from Trinidad.* Bull. Amer. Paleont., vol. 38, No. 169, pp. 163-174, pl. 17.

1959. *Geology and paleontology of Canal Zone and adjoining parts of Panama. Description of Tertiary mollusks (gastropods: Vermetidae to Thaididae).* U.S. Geol. Sur., Prof. Paper 306-B, pp. 147-239, pls. 24-38.

1964. *Geology and paleontology of Canal Zone and adjoining parts of Panama. Description of Tertiary mollusks (gastropods: Columbellidae to Volutidae).* U.S. Geol. Sur., Prof. Paper 306-C, pp. 241-297, pls. 39-47, table 1.

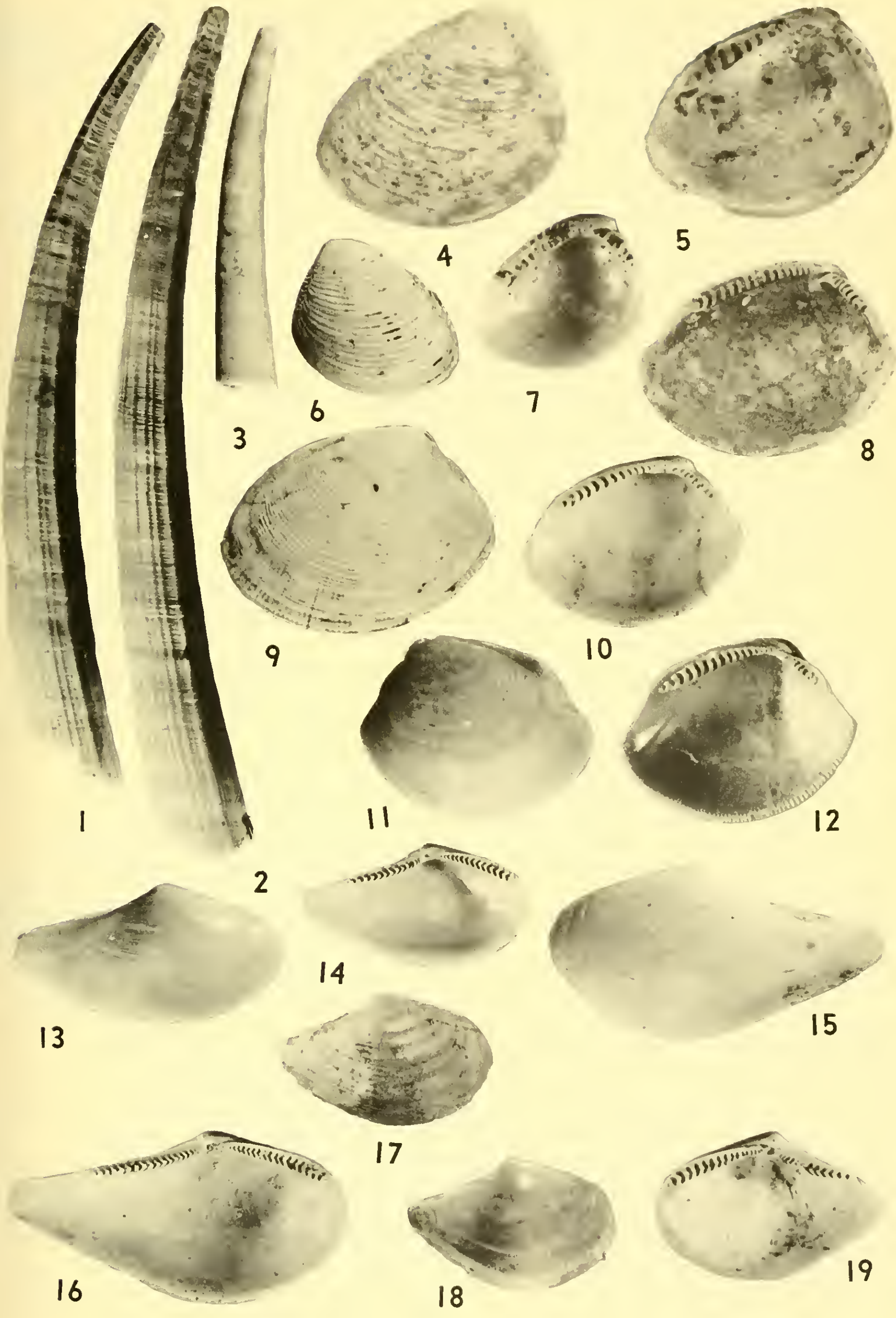
1966. *The Panama land bridge as a sea barrier.* Amer. Philos. Soc., Proc., vol. 110, No. 6, pp. 425-133, figs. 1-3, tables 1-6.

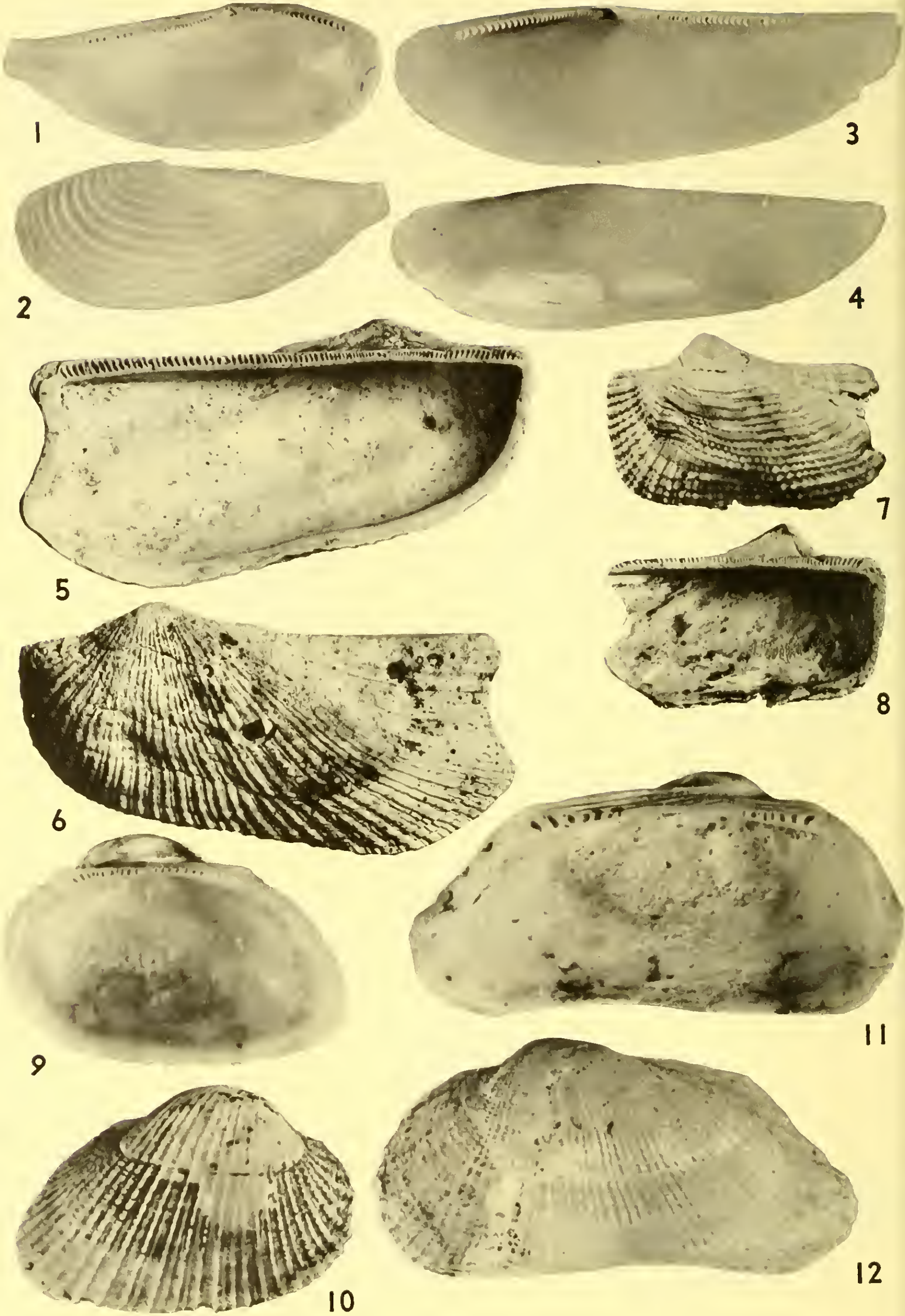
PLATES

If not otherwise specified the number accompanying each specimen refers to the catalogue of the Naturhistorisches Museum Basel (G includes Pelecypoda and Scaphopoda, H Gastropoda).

EXPLANATION OF PLATE 13

Figure		Page
1,2.	**Dentalium (Dentalium) divulgatum,** n. sp. .... 1. Holotype. Length 33.5 mm, max. diameter 3.8 mm. Locality PJ 285 No. G 12718. 2. Paratype. Length 37.5 mm, max. diameter 4.1 mm. Locality PJ 285. No. G 12719.	313
3.	**Dentalium (Graptacme) cf. amaliense** Henderson .... Length 10.1 mm, max. diameter 1.6 mm. Locality JS 67. No. G 12748.	315
4-7.	**Nucula (Lamellinucula) vieta** Guppy .... 4. Lectotype. Length 3.1 mm, height 3.1 mm. Matura, coll. Guppy. USNM 115562. 5. Paralectotype. Length 3.3 mm, height 3.0 mm. Matura, coll. Guppy. USNM 645368. 6,7. Length 4.9 mm, height 4.1 mm. Locality JS 67. No. G 12708.	316
8-12.	**Nucula (Lamellinucula) baccata** Guppy .... 8. Lectotype. Length 7.0 mm, height 5.3 mm. Matura, coll. Guppy. USNM 115561. 9. Length 7.9 mm, height 6.0 mm. Locality JS 67. No. G 12710. 10. Length 6.2 mm, height 4.6 mm. Locality JS 67. No. G 12711. 11,12. Length 6.6 mm, height 5.1 mm. Locality K 9817. No. G 12717.	317
13-16.	**Nuculana (Saccella) ludificans,** n. sp. .... 13. Holotype. Length 7.4 mm, height 3.7 mm. Locality PJ 285. No. G 12677. 14. Paratype. Length 6.3 mm, height 3.6 mm. Locality PJ 285. No. G 12676. 15. Paratype. Length 9.3 mm, height 5.1 mm. Locality PJ 212. No. G 12684 16. Paratype. Length 9.6 mm, height 5.0 mm. Locality PJ 212. No. G 12683.	319
17-19.	**Nuculana (Saccella) perlepida** (Guppy) .... 17. Lectotype. Length 6.0 mm, height 3.8 mm. Matura, coll. Guppy. USNM 115557. 18. Length 5.9 mm, height 3.8 mm. Locality JS 67. No. G 12682. 19. Length 6.3 mm, height 4.2 mm. Locality RR 230. No. G 12681.	320

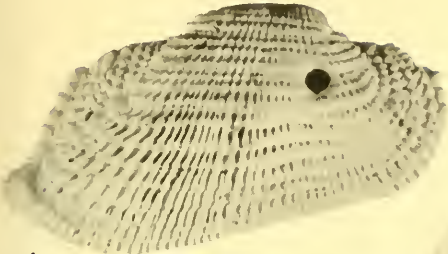


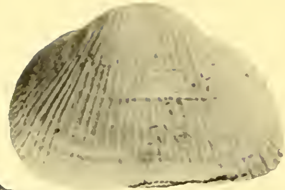

1
3
2
4
5
7
8
6
11
9
12
10

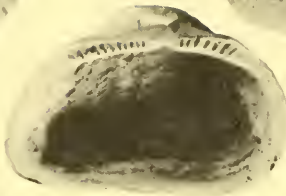
EXPLANATION OF PLATE 14

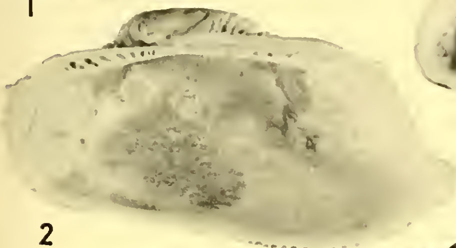
Figure		Page
1,2.	**Calorhadia (Calorhadia) solivaga,** n. sp. Holotype. Length 17.0 mm, height 6.5 mm. Locality PJ 285. No. G 12678.	322
3,4.	**Adrana perprotracta** (Dall) ? 3. Length 23.1 mm, height 7.2 mm. Locality PJ 285. No. G 12679. 4. Length 22.4 mm, height 6.7 mm. Locality PJ 285. No. G 12680.	323
5,6.	**Arca (Arca) zebra zebra** (Swainson) Length 45.5 mm, height 22.8 mm. Locality RR 230. No. G 12744.	325
7,8.	**Arca (Arca) imbricata imbricata** Bruguière Length 25.3 mm, height 17.0 mm. Locality RR 230. No. G 12750.	326
9,10.	**Barbatia (Fugleria ?) millifila latrinidadis** Maury Length 15.7 mm, height 10.5 mm. Locality RR 230. No. G 12867	328
11,12.	**Barbatia (Barbatia) candida** (Helbling) Length 22.3 mm, height 11.3 mm. Locality RR 230. No. G 12866.	327

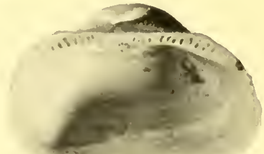
EXPLANATION OF PLATE 15

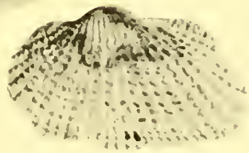

1

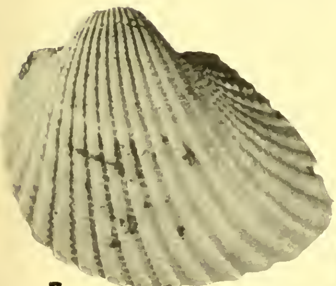

3


4

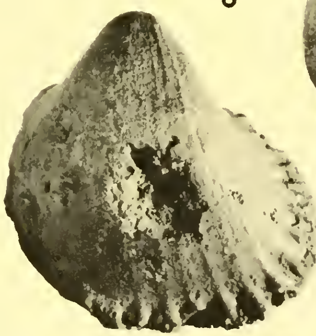

2

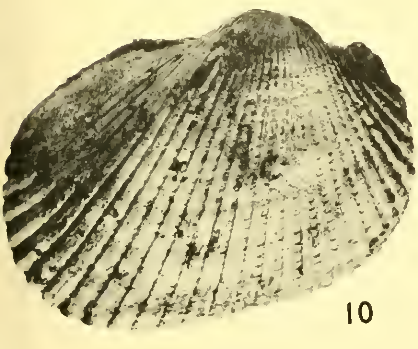

5

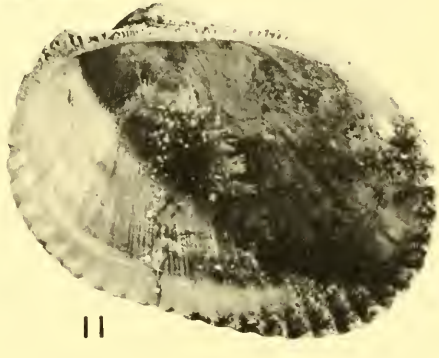

6

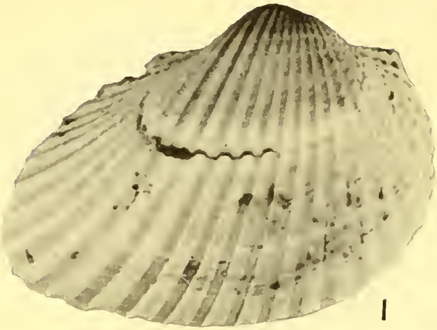

7


9

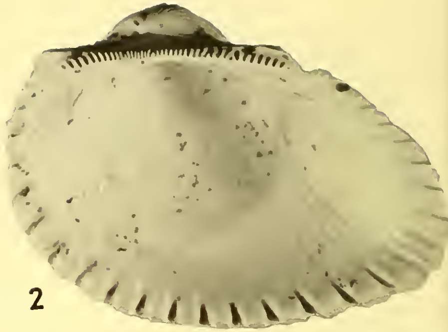

8


10

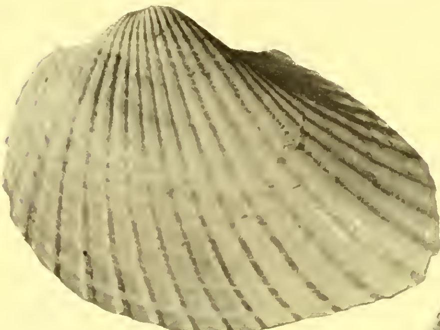

11



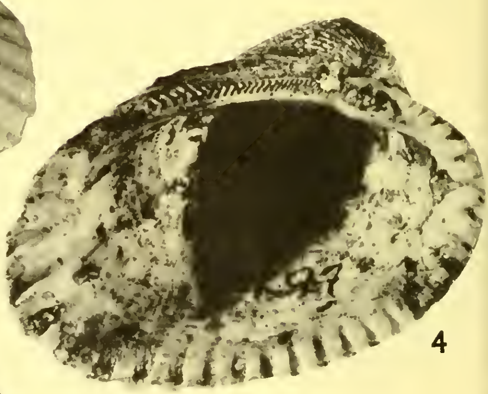
1



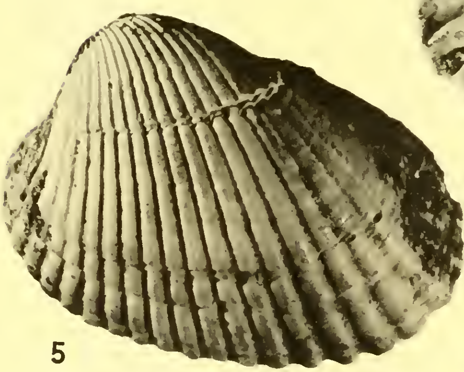
2



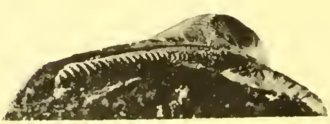
3



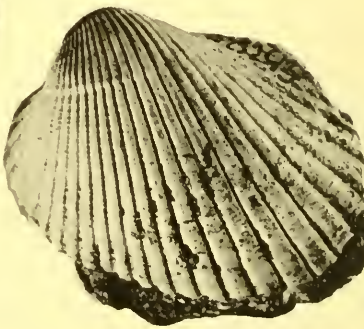
4



5



6

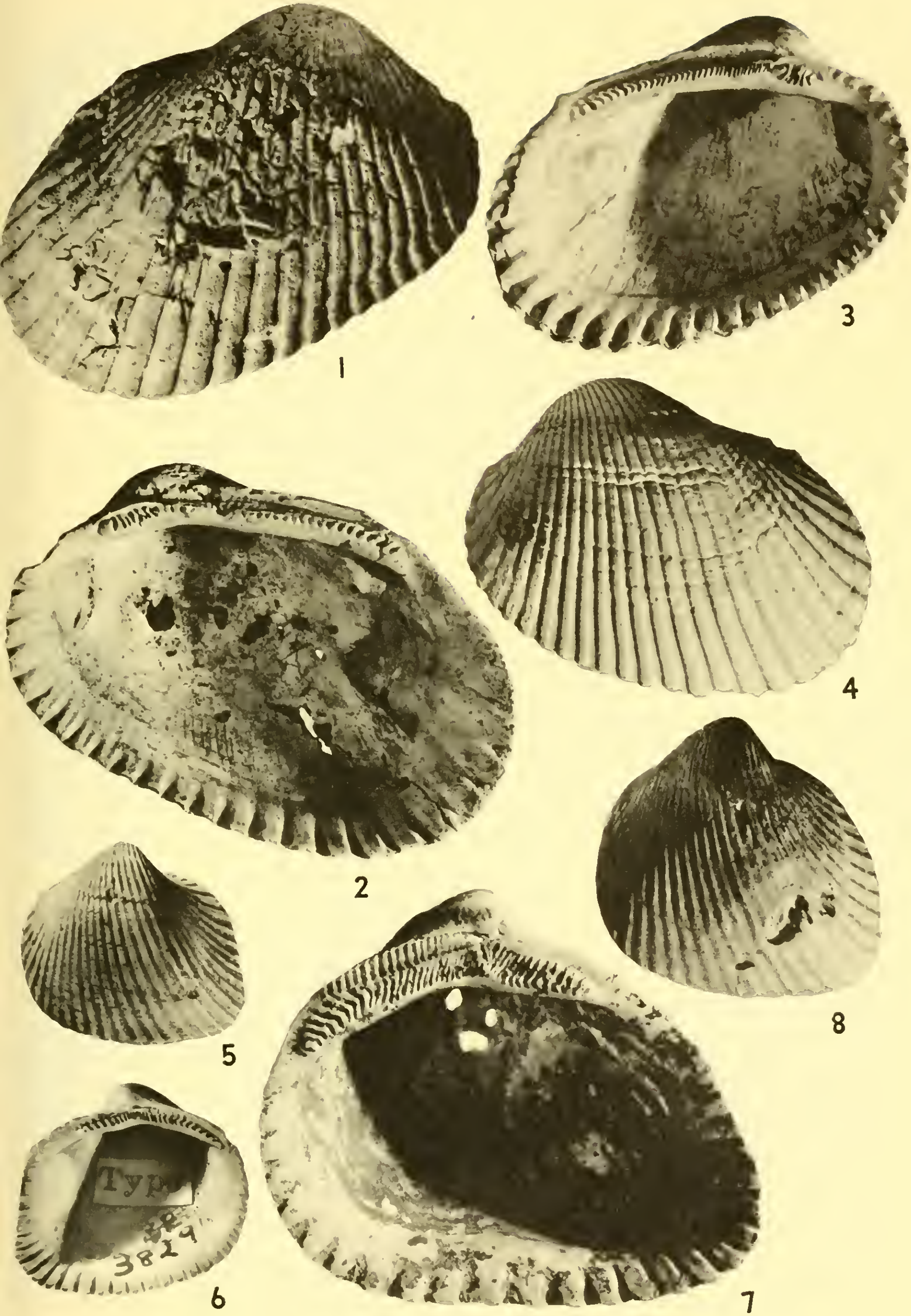


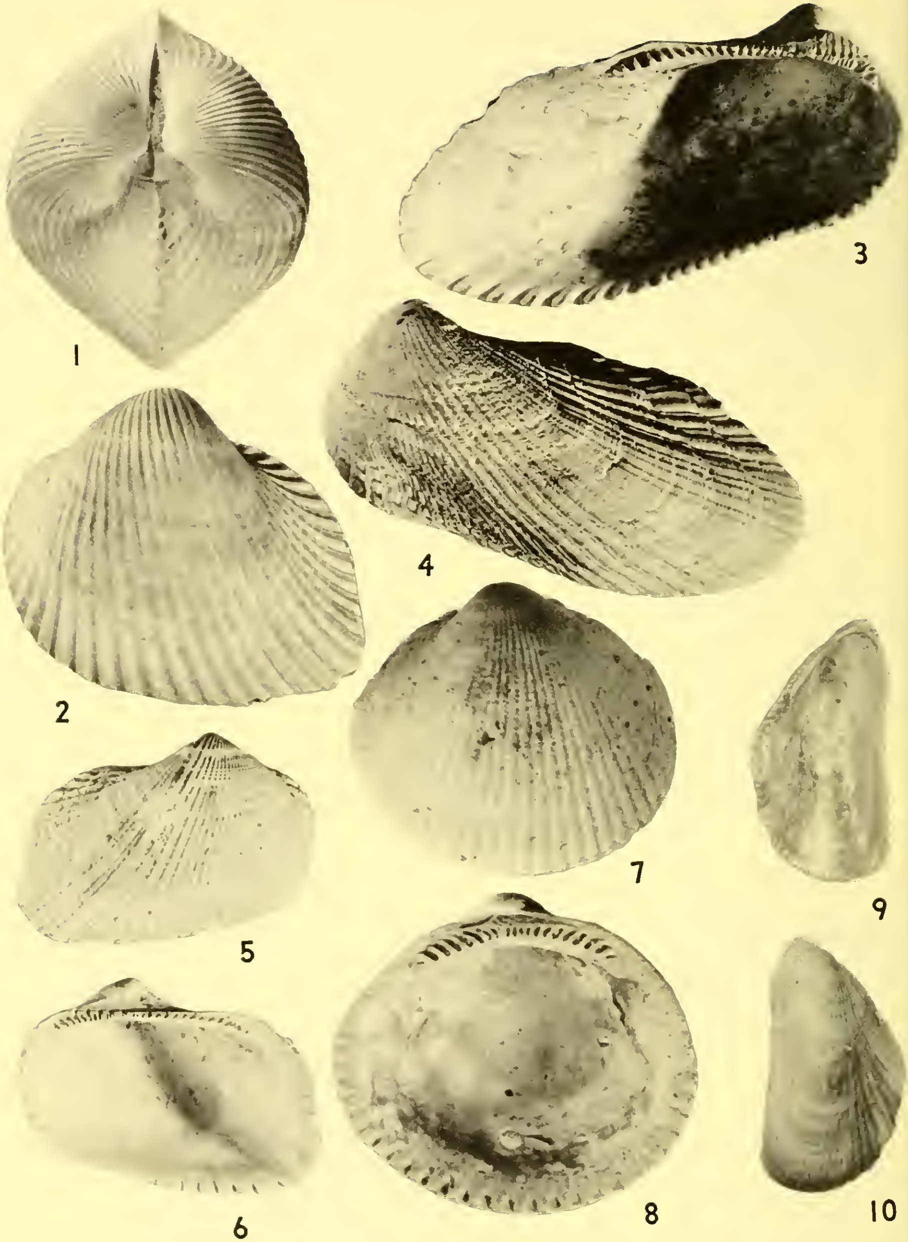
7

EXPLANATION OF PLATE 16

EXPLANATION OF PLATE 17

Figure		Page
1-4.	**Lunarca billingsiana** (Maury)	336
	1,2. Length 34.8 mm, height 23.1 mm. Locality RR 230. No. G 12910. 3,4. Length 28.6 mm, height 20.3 mm. Locality PJ 212. No. G 12914.	
5-8.	**Noetia (Noetia) sheldoniana** (Maury)	338
	5,6. Holotype. Length 15.0 mm, height 13.5 mm. Locality: on coast 1000 feet west of Brighton pier near Pitch Lake, Trinidad. Cornell Univ., Paleont. Museum, No. 38296. 7. Length 33.3 mm, height 27.3 mm. Locality RR 230. No. G 12916. 8. Length 19.8 mm, height 18.9 mm. Locality RR 230. No. G 12917.	

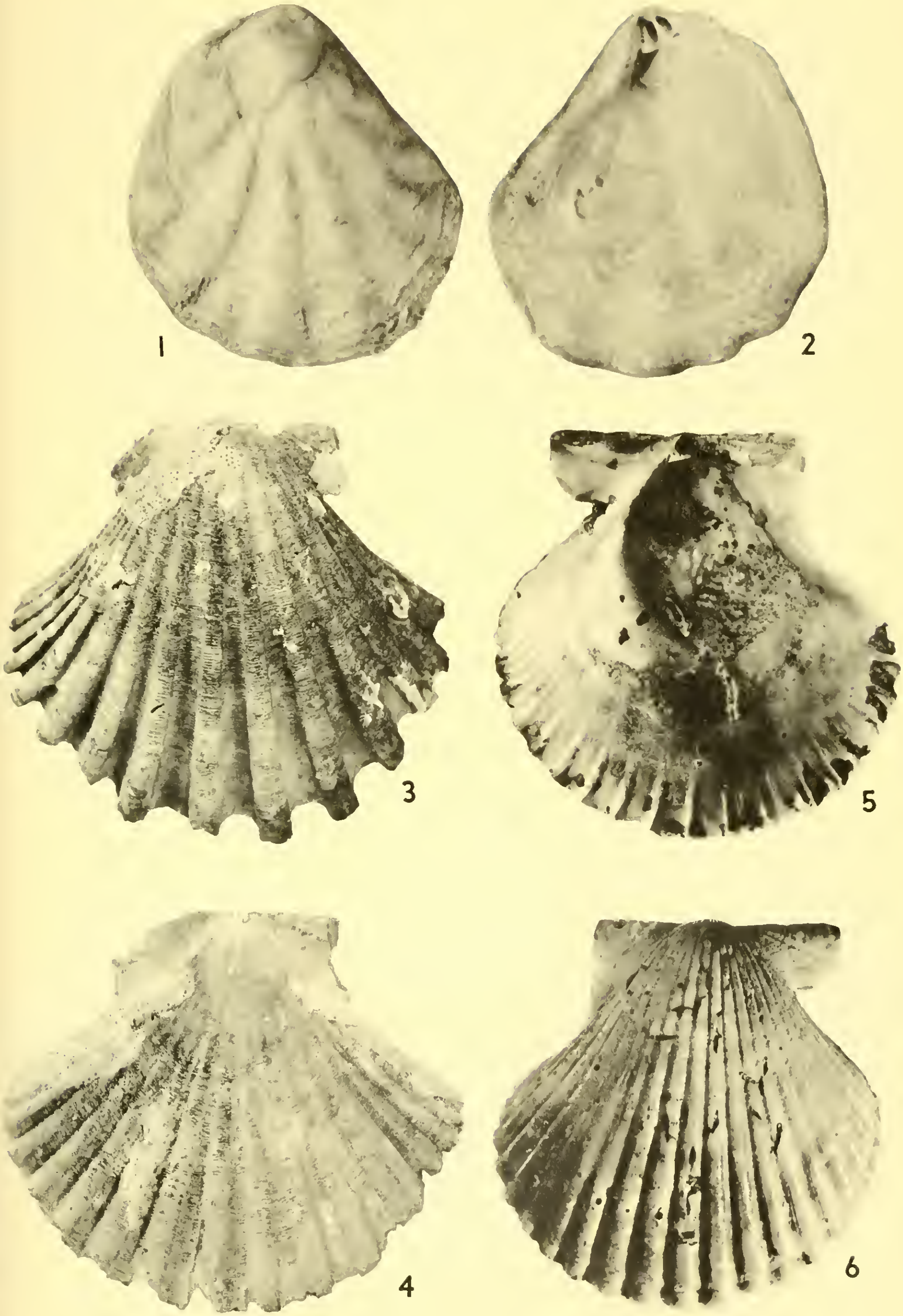

1
3
4
2
8
5
Typ
3819
6
7

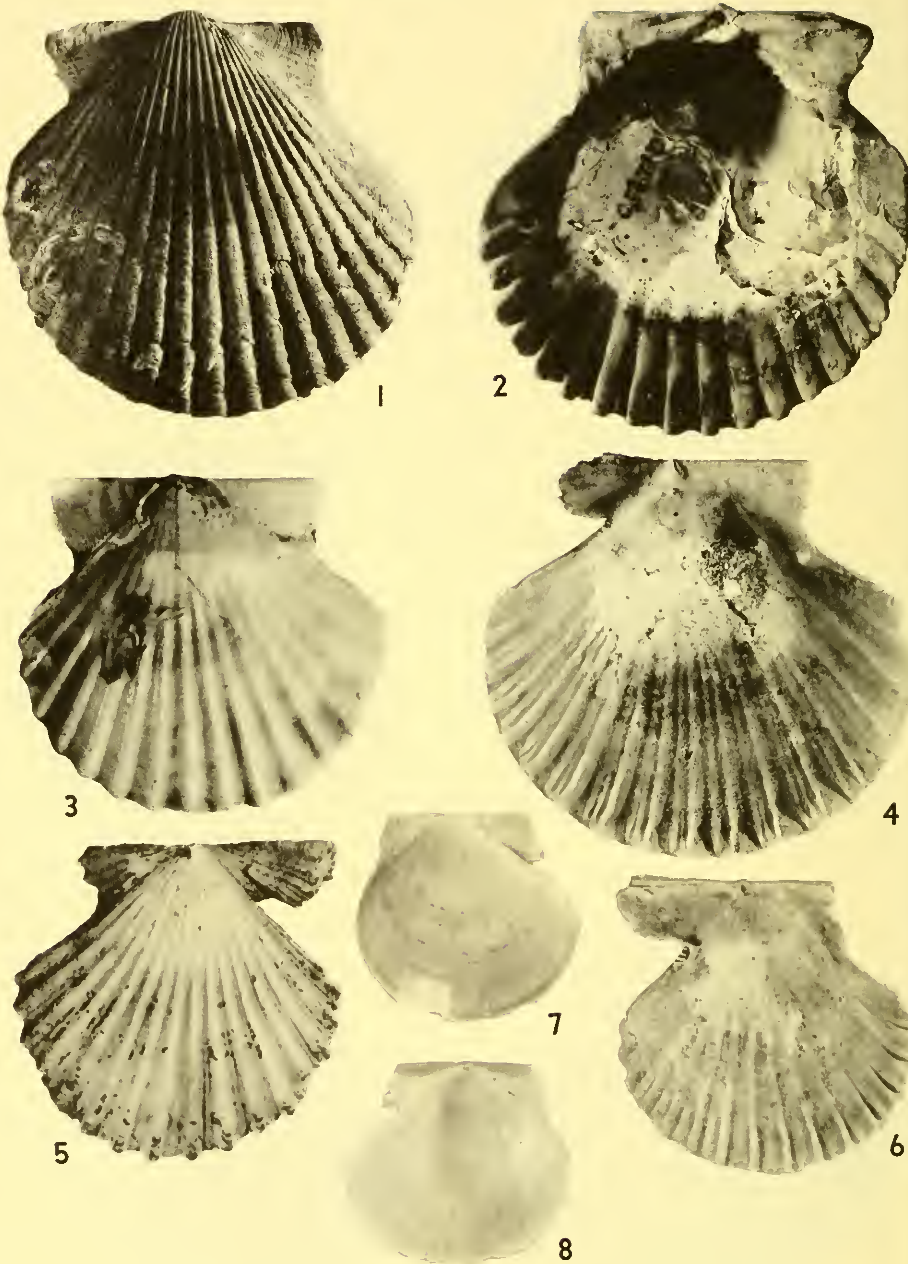

1
2
3
4
5
6
7
8
9
10

EXPLANATION OF PLATE 18

EXPLANATION OF PLATE 19

Figure		Page
1,2.	**Plicatula gibbosa** Lamarck Length 15.2 mm, height 16.5 mm. Locality RR 230. No. G 12943.	343
3,4.	**Pecten (Pecten) archon** Maury 3. Length 43.2 mm, height 40.1 mm. USGS locality 18634. USNM 645326. 4. Length 41.3 mm, height 35.7 mm. USGS locality 18634. USNM 645327.	344
5,6.	**Aequipecten (Plagioctenium)** cf. **gibbus** (Linné) Length 27.0 mm, height 26.7 mm. Locality RR 230. No. G 12949.	345


1
2
3
5
4
6


1
2
3
4
5
6
7
8

EXPLANATION OF PLATE 20

Figure Page

1,2. **Aequipecten (Plagioctenium) demiurgus** (Dall) 345
Length 55.1 mm, height 53.7 mm. Locality RR 291. No. G 12950.

3,4. **Aequipecten (Plagioctenium) maturensis** (Maury) 346
3. Length 24.8 mm, height 22.4 mm. Locality RR 230. No. G 12959. 4. Length 28.5 mm, height 26.0 mm. Locality RR 230. No. G 12960.

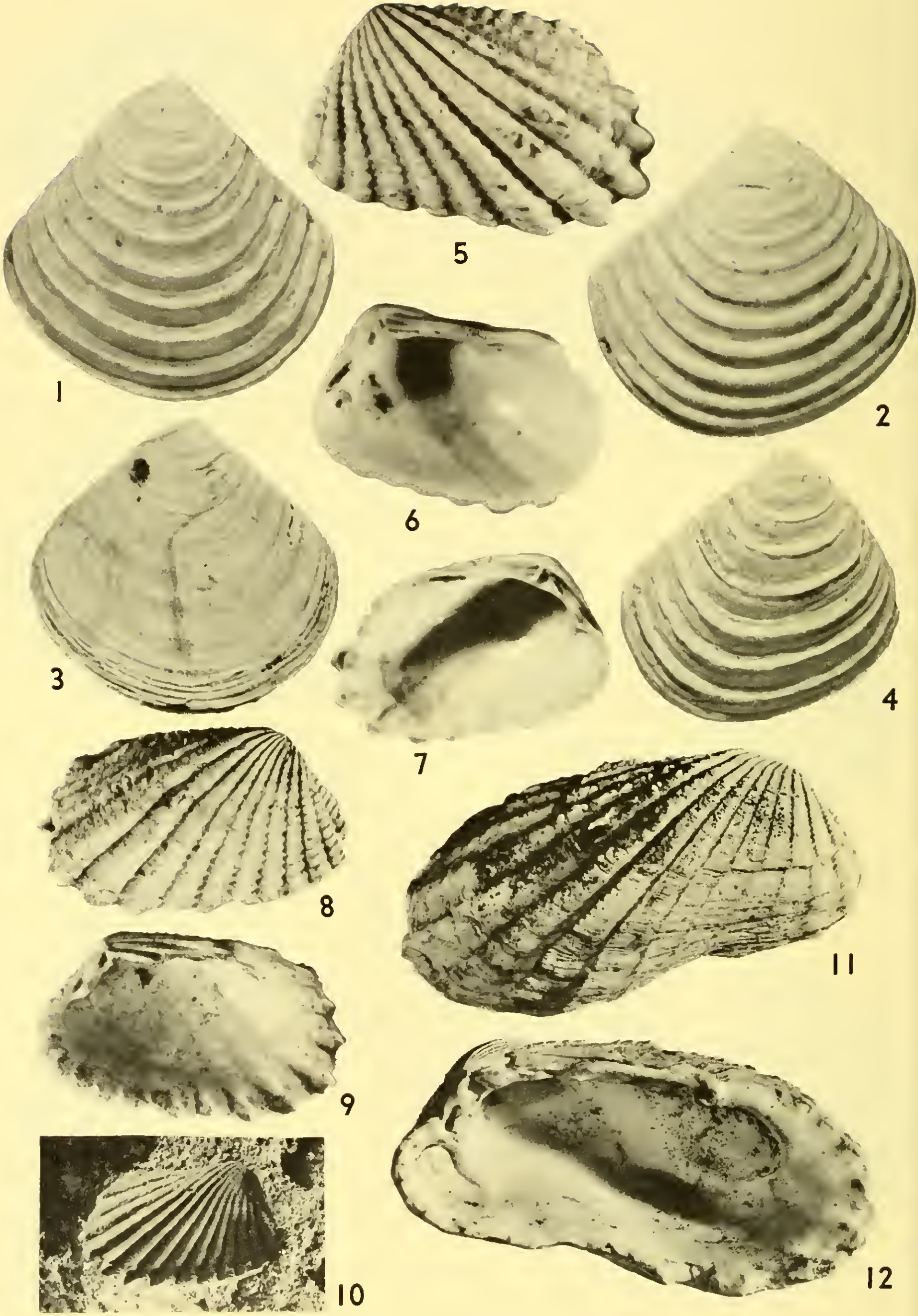
5,6. **Aequipecten (Plagioctenium) rutamensis,** n. sp. 347
5. Holotype. Length 14.7 mm, height 14.5 mm. Locality RR 230. No. G 12961. 6. Paratype. Length 13.1 mm, height 12.9 mm. Locality RR 230. No. G 12962.

7,8. **Cyclopecten** species 348
Length 3.0 mm, height 2.8 mm. Locality K 9817. No. G 12966.

EXPLANATION OF PLATE 21

Figure		Page
1-4.	**Eucrassatella trinitaria** (Maury) 1,2. Length 56.3 mm, height 34.0 mm. USGS locality 18634. USNM 645325. 3,4. Length 19.0 mm, height 12.7. Locality Hutch 51. No. G 13005.	351
5.	**Lopha messor** (Maury) Length 54.4 mm. Locality Hutch 51. No. G 12974.	349
6.	**Anomia simplex** d'Orbigny Length 16.0 mm, height 15.3 mm. Locality RR 230. No. G 12796.	350
7.	**Crassostrea** cf. **virginica** (Gmelin) Length 84.0 mm. Locality RR 230. No. G 12967.	349


18634
1
2
3
4
5
6
7

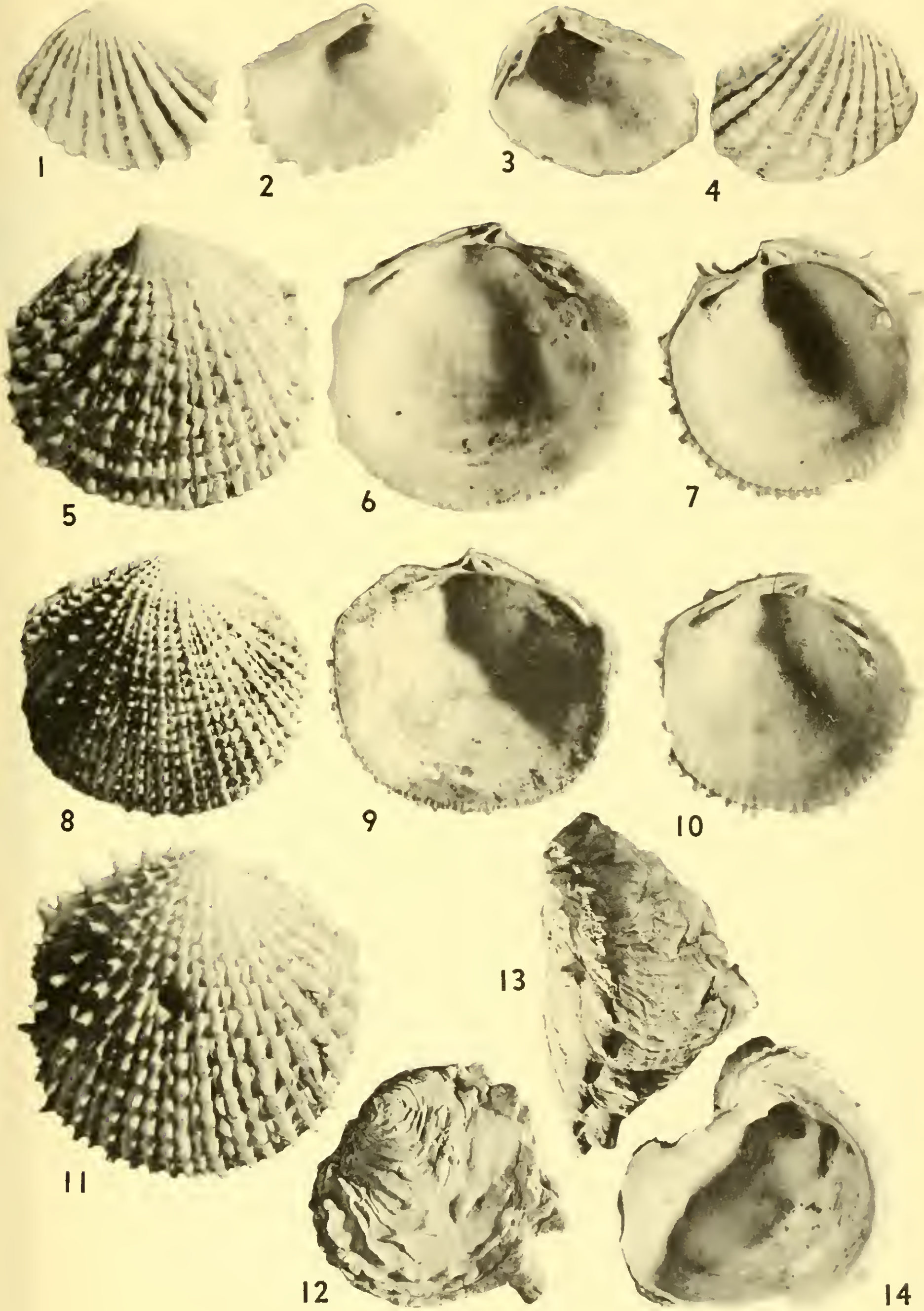

5
1
2
6
3
4
7
8
11
9
12
10

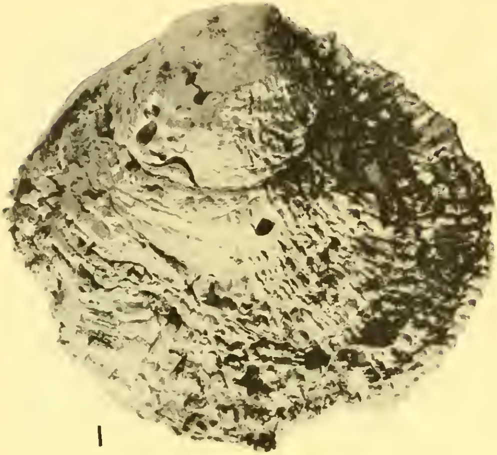
EXPLANATION OF PLATE 22

Figure		Page
1,2.	**Crassinella martinicensis** (d'Orbigny) 1. Length 4.5 mm, height 4.4 mm. Locality JS 67. No. G 12990. 2. Length 4.4 mm, height 4.2 mm. Locality JS 67. No. G 12991.	352
3,4.	**Crassinella guppyi** (Dall) 3. Length 4.2 mm, height 3.9 mm. Locality PJ 285. No. G 12996. 4. Length 3.7 mm, height 3.8 mm. Locality PJ 285. No. G 12997.	354
5-7.	**Carditamera (Carditamera) guppyi** (Dall) 5. Length 4.8 mm, height 2.8 mm. Locality JS 67. No. G 13007. 6. Length 4.0 mm, height 2.7 mm. Locality RR 230. No. G 13009. 7. Length 3.8 mm, height 2.4 mm. Locality K 10924. No. G 13008.	356
8,9.	**Carditamera (Carditamera)** species Length 8.3 mm, height 4.9 mm. Locality K 9816. No. G 13014.	357
10.	**Carditamera virginiae** (Maury) Lectotype. Length 13.5 mm, height 7.7 mm. Locality: milepost 49¾ (new mileposts!) of the Southern Main Road of Trinidad, just south of the Pitch Lake (= USGS station 21782). Paleont. Museum, Cornell Univ., unnumbered.	357
11,12.	**Carditamera (Byssomera)** aff. **affinis** (Sowerby) Length 32.4 mm, height 15.5 mm. Locality K 8399. No. G 13015.	357

EXPLANATION OF PLATE 23

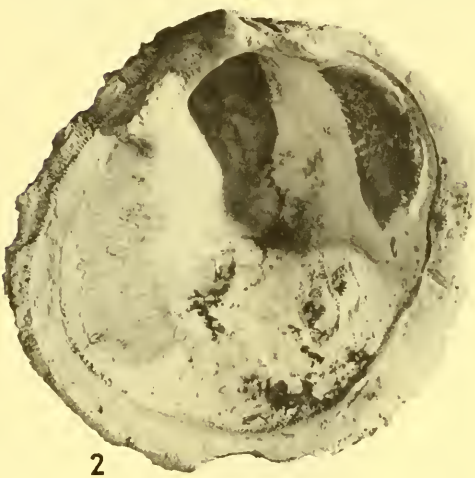
Figure		Page
1-4.	**Condylocardia guppyi** (Maury) .... 1,2. Length 2.8 mm, height 2.1 mm. Locality JS 67. No. G 13016. 3,4. Length 2.8 mm, height 2.1 mm. Locality RR 230. No. G 13017.	358
5-11.	**Lucina (Lucinisca) roigi** (Maury) .... 5,6. Length 11.0 mm, height 9.8 mm. Locality RR 230. No. G 13020. 7. Length 9.6 mm, height 8.9 mm. Locality PJ 285. No. G 13025. 8,9. Length 10.2 mm, height 9.4 mm. Locality K 1429. No. G 13024. 10. Length 9.3 mm, height 8.3 mm. Locality PJ 285. No. G 13026. 11. Length 12.1 mm, height 11.8 mm. Locality PJ 285. No. G 13027.	360
12-14.	**Pseudochama** aff. **caloosana** (Dall) .... 12. Length 16.4 mm, height 17.5 mm. Locality RR 230. No. G 13046. 13. Length 19.5 mm, height 23.0 mm. Locality RR 230. No. G 13047. 14. Length 18.0 mm, height 19.7 mm. Locality RR 230. No. G 13048.	362


1
2
3
4
5
6
7
8
9
10
11
12
13
14

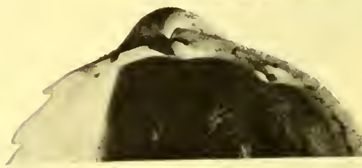


1

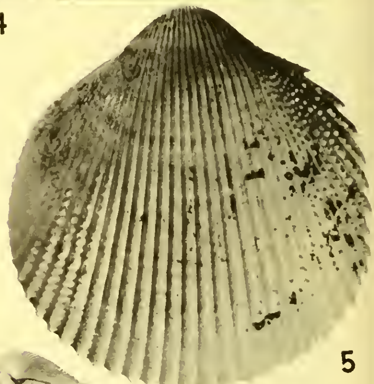
3



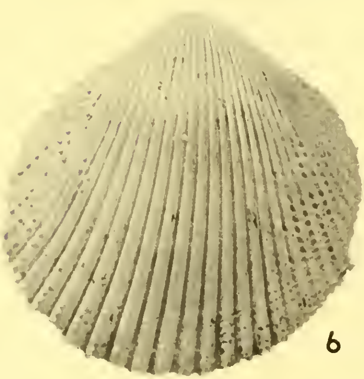
2



4



5



6

7

Explanation of Plate 24

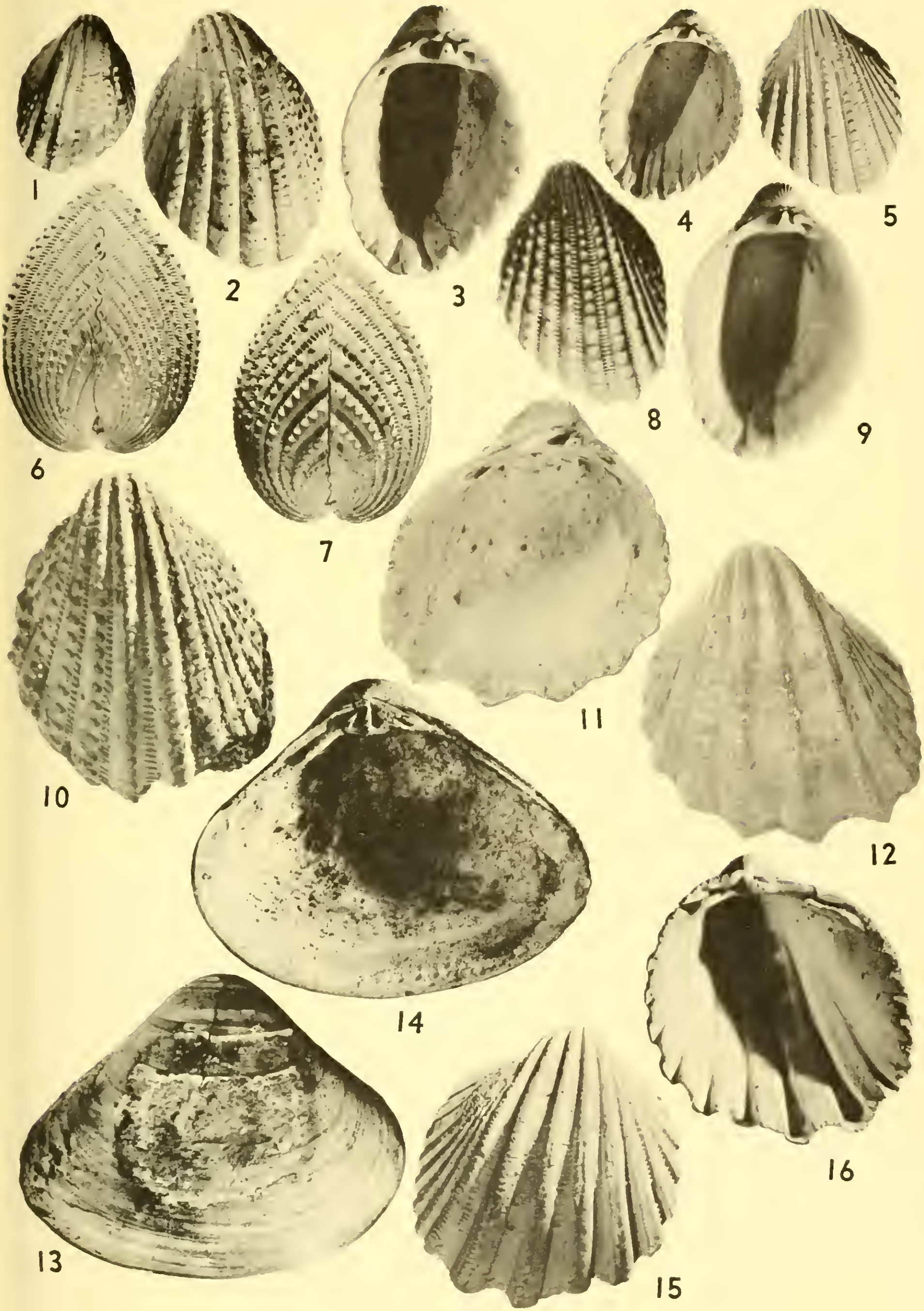
Figure | Page

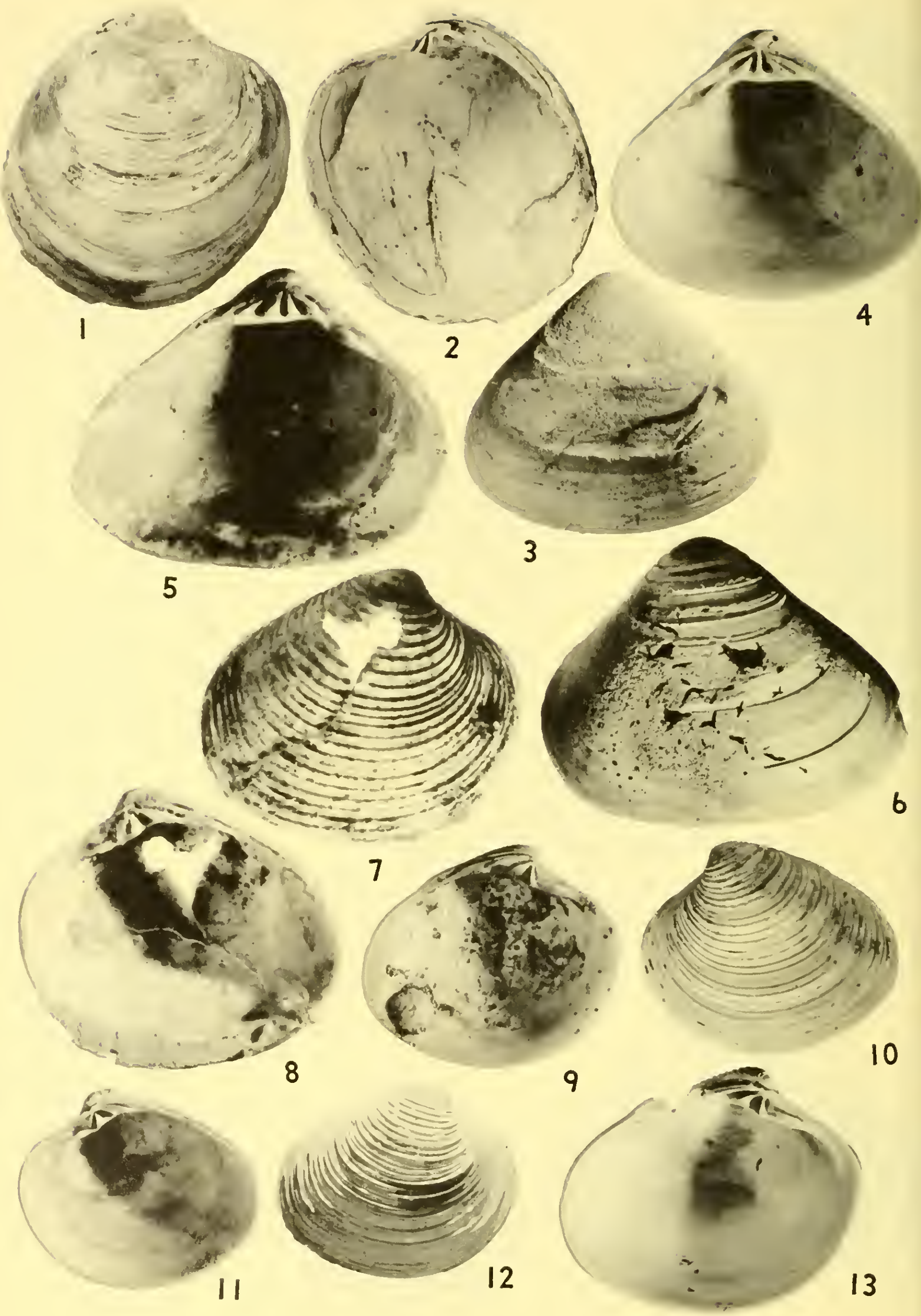
1,2. **Chama cf. macerophylla** Gmelin 362
Length 33.5 mm, height 30.0 mm. Locality PJ 212. No. G 13049.

3-7. **Trachycardium (Dallocardia) sanctidavidis** (Maury) 363
3. Length 27.3 mm, height 28.2 mm. Locality RR 230. No. G 13055. 4. Length 25.5 mm, height 26.3 mm. Locality JS 67. No. G 13057. 5. Length 25.2 mm, height 26.5 mm. Locality RR 230. No. G 13056. 6,7. Length 28.9 mm, height 29.6 mm. USGS locality 18411. USNM 645338.

EXPLANATION OF PLATE 25

Figure		Page
1-10.	**Trigoniocardia (Trigoniocardia) maturensis** (Dall) ... 1. Length 8.8 mm, height 10.4 mm. Locality RR 230. No. G 13061. 2,3. Length 12.5 mm, height 18.2 mm. Locality RR 230. No. G 13062. 4,5. Length 10.1 mm, height 12.7 mm. Locality K 1429. No. G 13066. 6,7. Convexity (2 valves) 13.8 mm, height 19.1 mm. Locality PJ 285. No. G 13063. 8. Length 11.7 mm, height 17.3 mm. Locality PJ 285. No. G 13064. 9. Length 12.6 mm, height 18.7 mm. Locality KR 11862. No. G 13065. 10. Lectotype of *T. carolinae* (Maury). Length 8.7 mm, height 11.4 mm. Locality: on coast 1000 feet west of Brighton pier near Pitch Lake, Trinidad. Cornell Univ., Paleont. Museum, unnumbered.	365
11,12.	**Trigoniocardia (Trigoniocardia) melajoensis,** n. sp. ... Holotype. Length 10.0 mm, height 10.6 mm. USGS locality 18411. USNM 645354.	366
13,14.	**Tivela (Tivela) austeniana** (Maury) ... Lectotype. Length 27.0 mm, height 21.3 mm. Locality: on coast 1000 feet west of Brighton pier near Pitch Lake, Trinidad. Cornell Univ., Paleont. Museum, unnumbered.	372
15,16.	**Trigoniocardia (Trigoniocardia)** cf. **caboblanquensis** Weisbord Length 9.7 mm, height 10.0 mm. Locality RR 120. No. G 13077.	367


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16

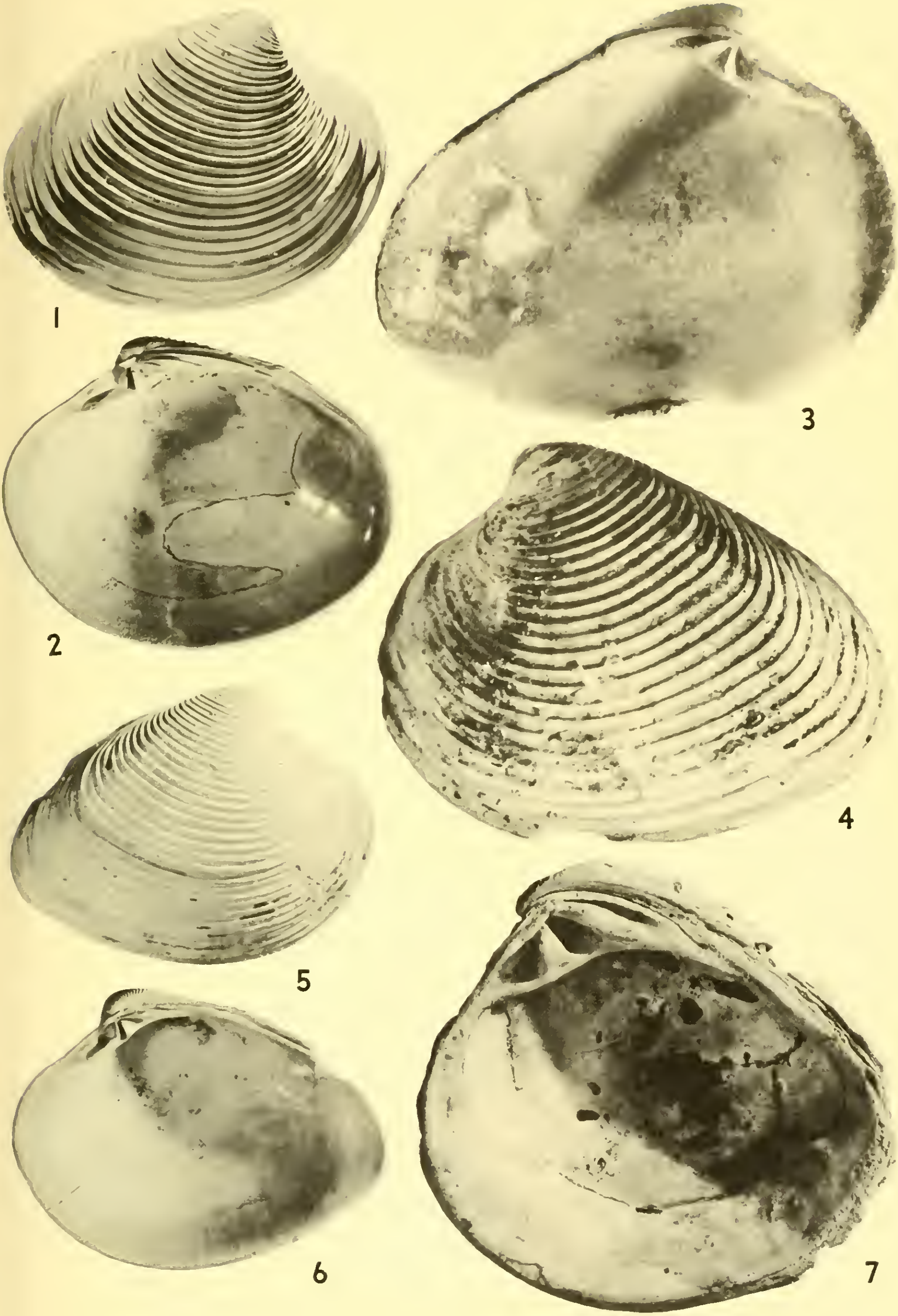

1
2
4
5
3
7
6
8
9
10
11
12
13

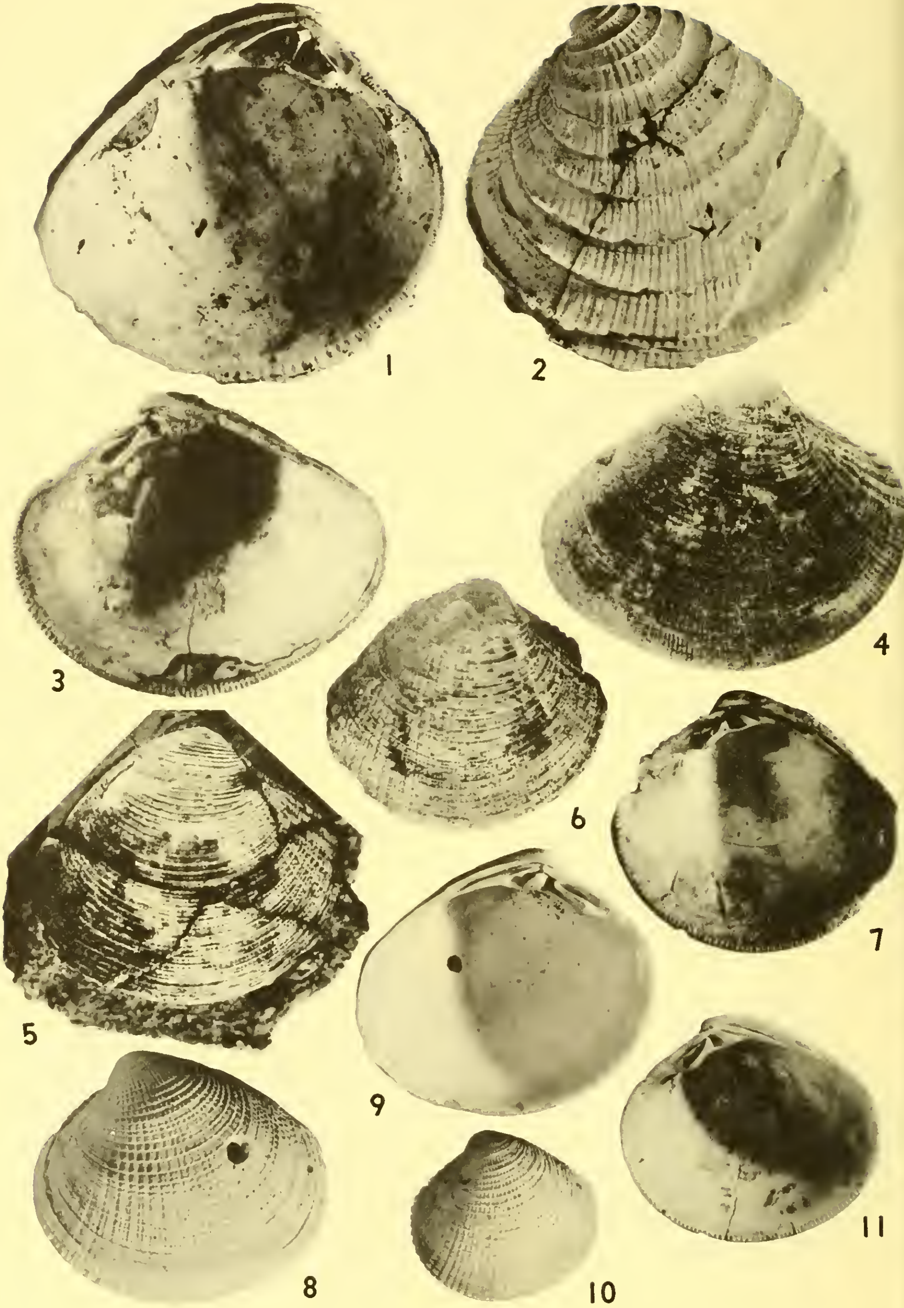
EXPLANATION OF PLATE 26

Figure		Page
1,2.	**Cyclinella** aff. **tenuis** (Recluz) .... Length 24.2 mm, height 23.1 mm. USGS locality 20432a. USNM 645339.	372
3-6.	**Tivela (Tivela) austeniana** (Maury) .... 3,4. Length 21.0 mm, height 17.6 mm. Locality RR 230. No. G 13086. 5,6. Length 25.0 mm, height 19.8 mm. Locality RR 230. No. G 13085.	372
7-13.	**Pitar (Lamelliconcha) circinatus** (Born) .... 7,8. Specimen figured by Maury (1912, pl. 9, figs. 12, 13). Length 10.7 mm, height 9.6 mm. Locality: on coast 1000 feet west of Brighton pier near Pitch Lake, Trinidad. Cornell Univ., Paleont. Museum, unnumbered. 9,10. Length 17.2 mm, height 14.2 mm. Locality RR 230. No. G 13092. 11,12. Length 16.1 mm, height 13.2 mm. Locality K 1429. No. G 13098. 13. Length 20.1 mm, height 16.3 mm. Locality Hutch 51. No. G 13099.	374

EXPLANATION OF PLATE 27

Figure		Page
1,2.	**Pitar (Lamelliconcha) circinatus** (Born) ... Length 26.2 mm, height 20.5 mm. Locality Hutch 47. No. G 13100.	374
3-6.	**Pitar (Lamelliconcha) labreanus** (Maury) ... 3,4. Holotype. Length 17.3 mm, height 13.5 mm. Locality: on coast 1000 feet west of Brighton pier near Pitch Lake, Trinidad. Cornell Univ., Paleont. Museum, unnumbered. 5,6. Length 24.8 mm, height 18.5 mm. Locality Hutch 51. No. G 13250.	375
7.	**Chione (Chione) cancellata** (Linné) ... Length 31.7 mm, height 30.1 mm. Locality RR 230. No. G 13258.	376


1
2
3
4
5
6
7


1
2
3
4
6
5
7
9
8
10
11

EXPLANATION OF PLATE 28

Figure Page

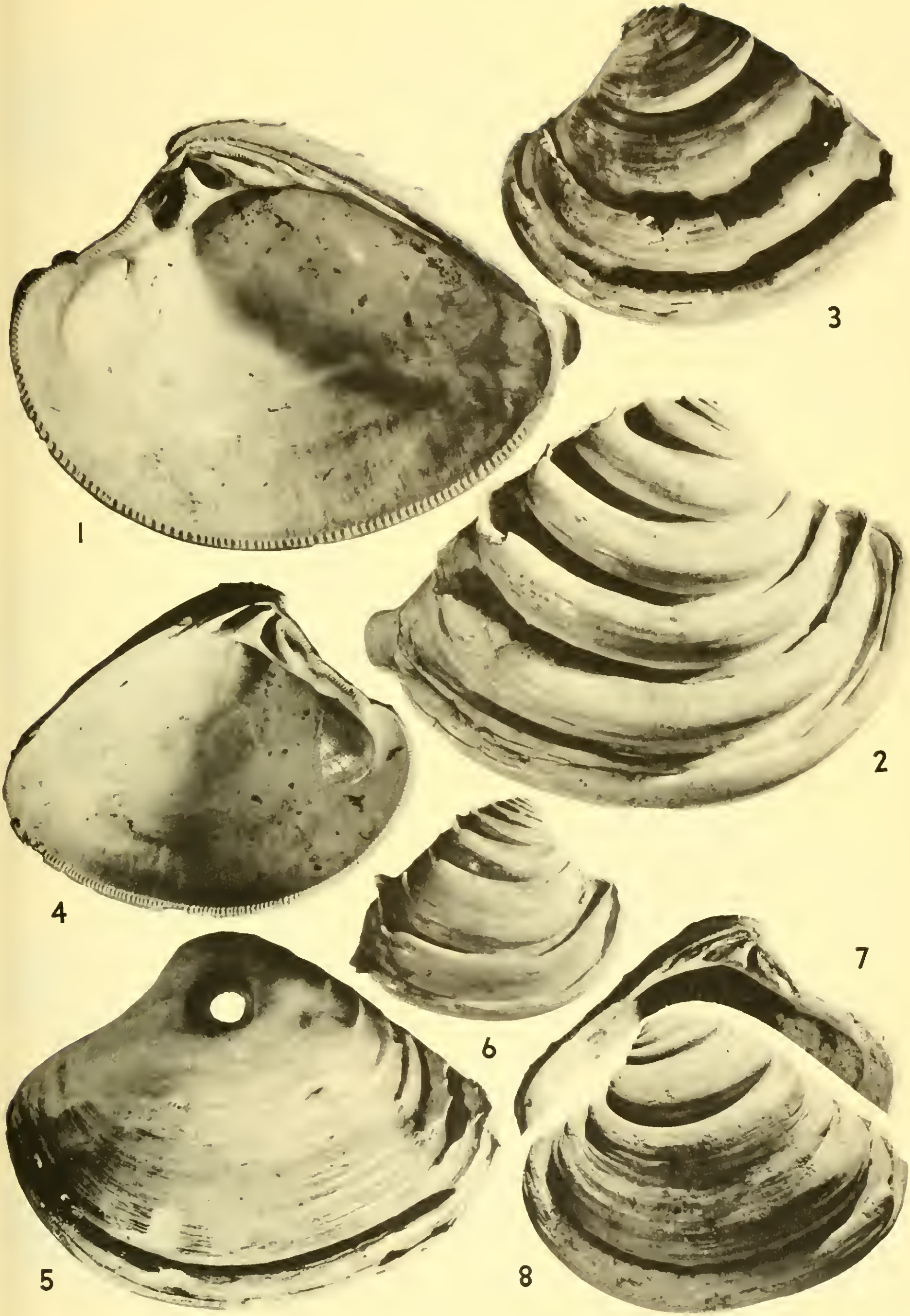
1,2. **Chione (Chione) cancellata** (Linné) 376
Length 27.2 mm, height 24.8 mm. Locality RR 230. No. G 13257.

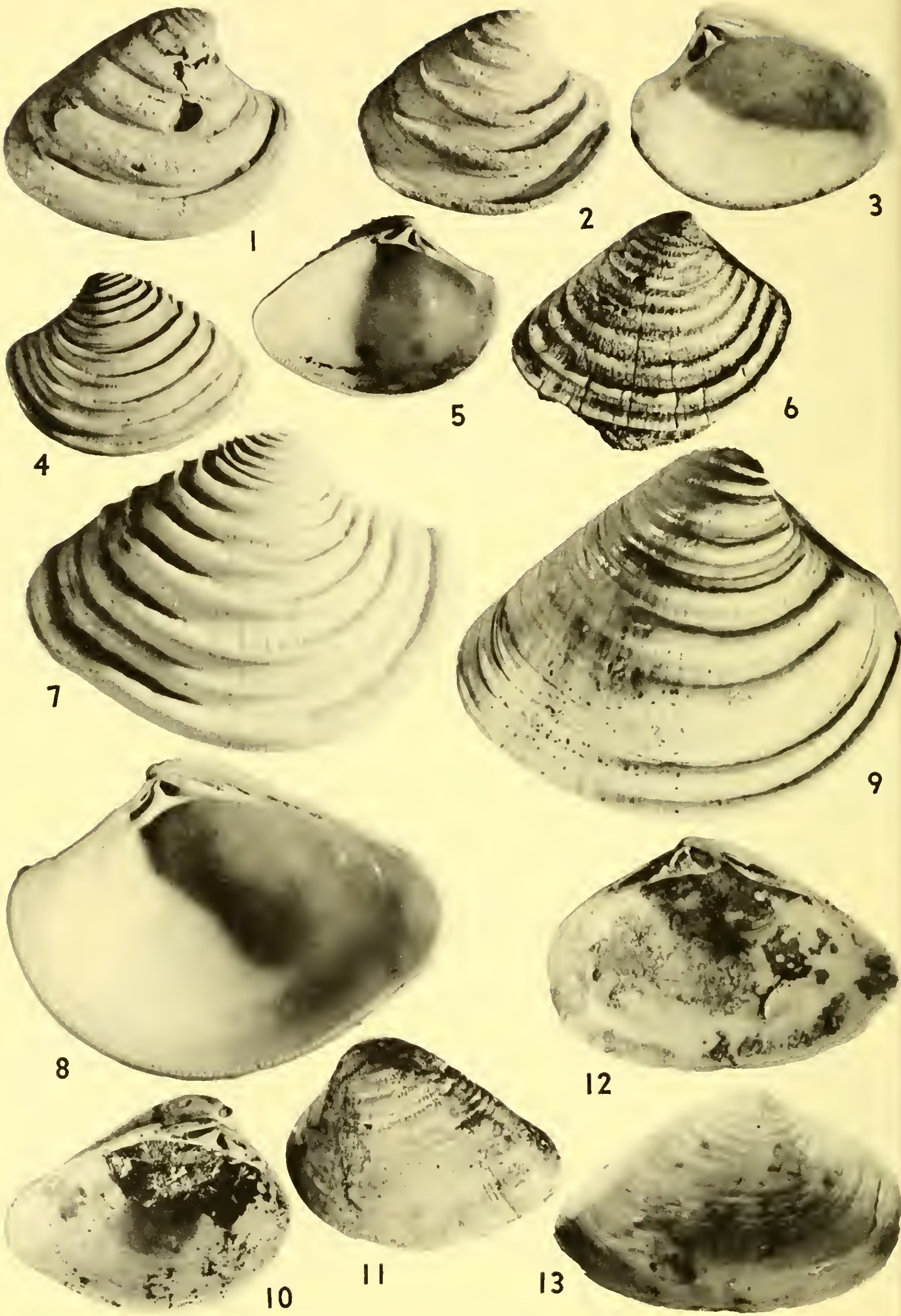
3-11. **Chione (Nioche) veatchiana** Maury 377
3,4. Lectotype of *C. veatchiana.* Length 25.1 mm, height 20.2 mm. Locality: on coast 1000 feet west of Brighton pier near Pitch Lake, Trinidad. Cornell Univ., Paleont. Museum, No. 33504. 5. Lectotype of *C. dalliana.* Length 20.5 mm, height 18.0 mm. Locality: on coast 1000 feet west of Brighton pier near Pitch Lake, Trinidad. Cornell Univ., Paleont. Museum, No. 33495. 6,7. Lectotype of *C. guppyana.* Length 19.1 mm, height 17.2 mm. Locality: on coast 700 feet east of Brighton pier near Pitch Lake, Trinidad. Cornell Univ., Paleont. Museum, unnumbered. 8,9. Length 20.0 mm, height 17.3 mm. Locality RR 230. No. G 12769. 10. Length 12.6 mm, height 11.5 mm. Locality K 12255. No. G 12792. 11. Length 17.0 mm, height 15.0 mm. Locality JS 67. No. G 12788.

EXPLANATION OF PLATE 29

Figure Page

1-8. **Chione (Lirophora) caroniana** Maury 379
1,2. Length 39.0 mm, height 29.1 mm. Locality EL 1810. No. G 13265. 3,4. Length 27.9 mm, height 22.6 mm. Locality Hutch 51. No. G 13266. 5. Length 34.3 mm, height 26.2 mm. Locality RR 291. No. G 13277. 6. Length 18.2 mm, height 15.0 mm. Locality PJ 285. No. G 13267. 7,8. Length 26.3 mm, height 21.1 mm. Locality RR 291. No. G 13276.


1
2
3
4
5
6
7
8



Explanation of Plate 30

Figure Page

1-3. **Chione (Lirophora)** species 380
1. Length 20.0 mm, height 15.6 mm. Locality JS 67. No. G 13263. 2,3. Length 17.6 mm, height 13.8 mm. Locality RR 230. No. G 13264.

4-9. **Chione (Lirophora) sanctidavidis** Maury 381
4,5. Length 17.0 mm, height 12.4 mm. Locality K 12255. No. G 12794. 6. Length 19.5 mm, height 15.0 mm. Locality RR 230. No. G 13278. 7,8. Length 15.7 mm, height 11.6 mm. Locality K 12255. No. G 12814. 9. Length 16.1 mm, height 13.2 mm. Locality K 9813. No. G 13279.

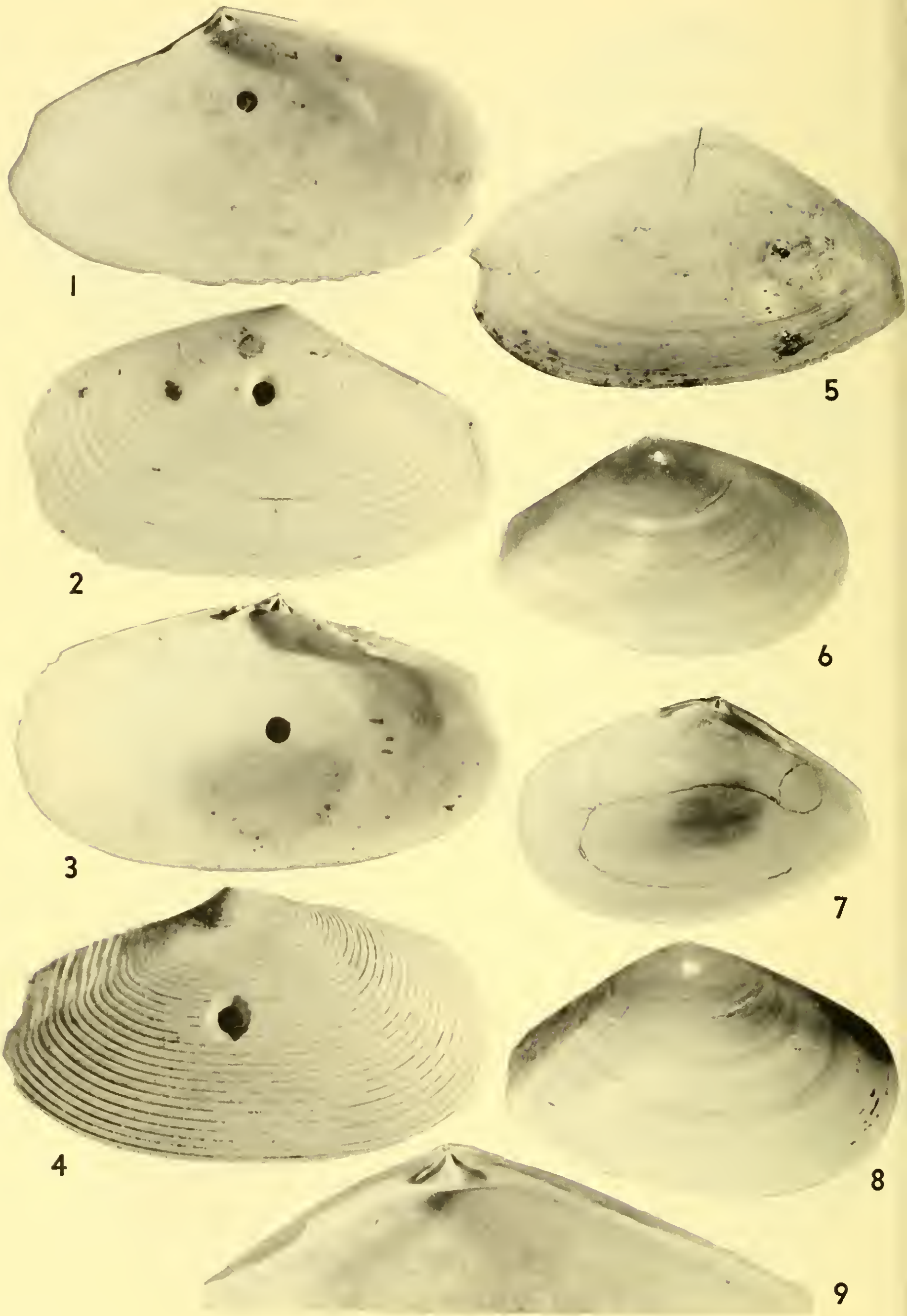
10,11. **Anomalocardia brasiliana** (Gmelin) 382
Length 19.2 mm, height 15.0 mm. Locality JS 67. No. G 13081.

12,13. **Mactra (Micromactra)** cf. **maracaibensis** H. K. Hodson 383
Length 23.9 mm, height 15.7 mm. Locality RR 230. No. G 13288.

EXPLANATION OF PLATE 31

Figure		Page
1,2.	**Mactra (Micromactra)** cf. **maracaibensis** H. K. Hodson Length 26.7 mm, height 17.6 mm. Locality EL 1810. No. G 13289.	383
3-5.	**Mulinia** species 3. Length 14.5 mm, height 12.2 mm. Locality RR 230. No. G 13286. 4. Length 25.3 mm, height 23.4 mm. Locality RR 230. No. G 13285. 5. Length 13.0 mm, height 11.0 mm. Locality RR 230. No. G 13287.	383
6-9.	**Moerella (Moerella) elinguis,** n. sp. 6,7. Holotype. Length 10.8 mm, height 6.3 mm. Locality KR 11862. No. G 13327. 8. Paratype. Length 10.9 mm, height 6.8 mm. Locality KR 11862. No. G 13328. 9. Paratype. Length 13.4 mm, height 8.0 mm. Locality K 12255. No. G 13329.	384

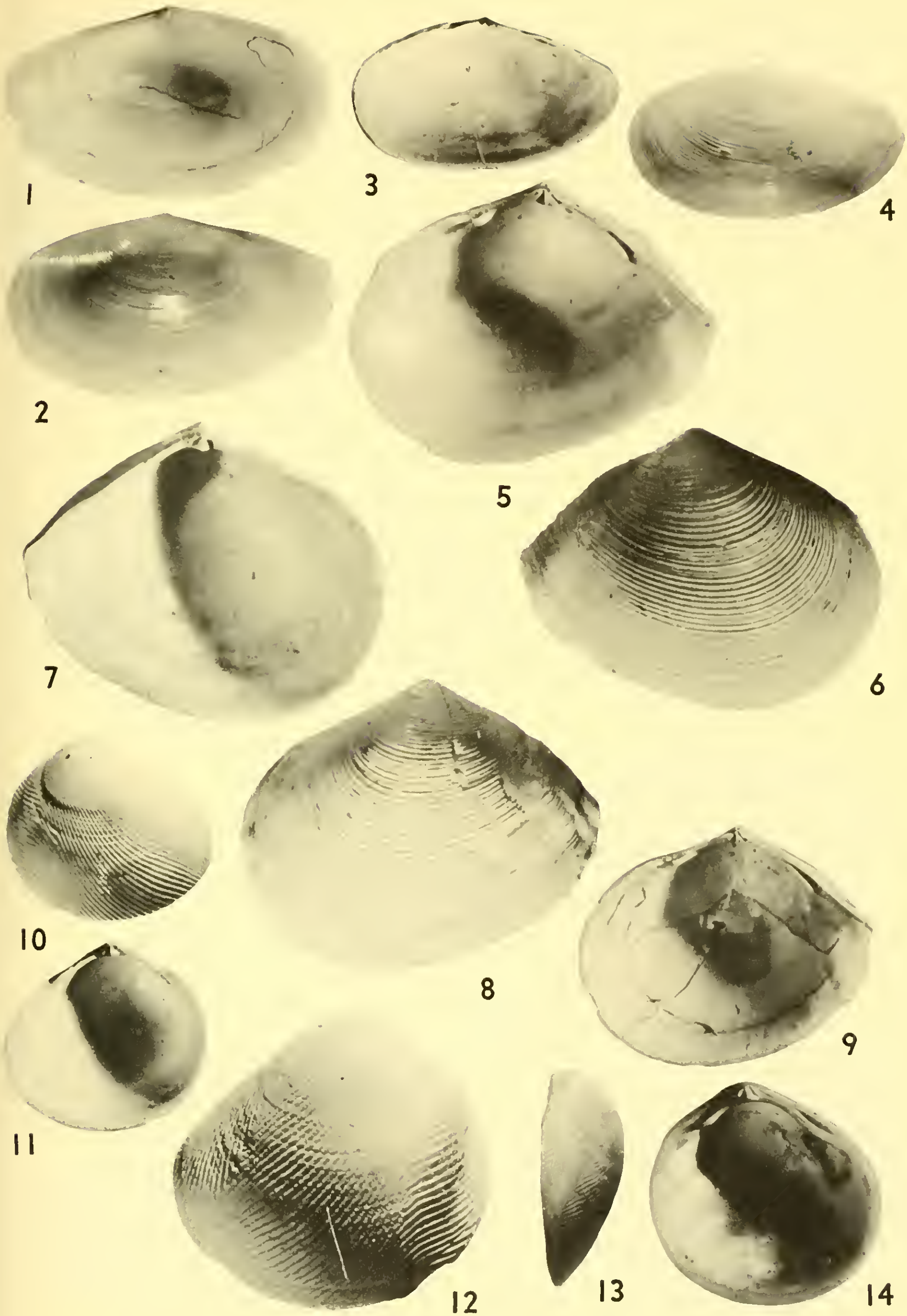

1
3
2
6
4
7
8
5
9

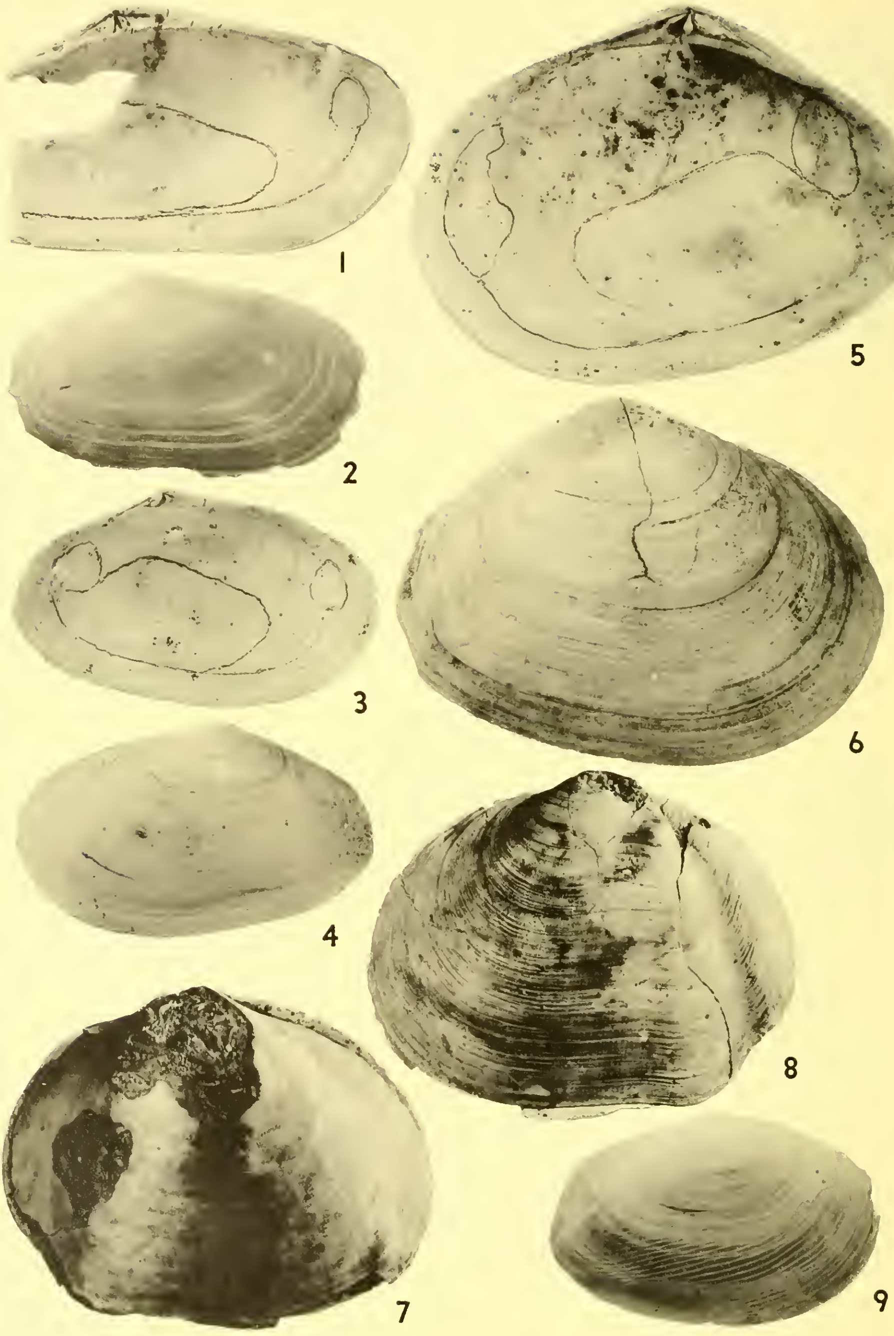

1
2
3
4
5
6
7
8
9

Explanation of Plate 32

Figure		Page
1-5.	**Eurytellina punicea** (Born) ? 1,2. Immature specimen. Length 16.2 mm, height 9.3 mm. Locality K 12255. No. G 12845. 3,4. Immature specimen. Length 16.7 mm, height 9.5 mm. Locality K 12013. No. G 12850. 5. Length 34.4 mm, height 21.0 mm. USGS locality 20432. USNM 645337.	385
6-9.	**Eurytellina melajoensis.** n. sp. 6,7. Holotype. Length 23.8 mm, height 15.0 mm. Locality PJ 285. No. G 13310. 8. Paratype. Length 26.3 mm, height 17.1 mm. Locality PJ 285. No. G 13312. 9. Paratype. Hinge. 7.5x. No. G 13311.	386

EXPLANATION OF PLATE 33


1
2
3
4
5
6
7
8
9
10
11
12
13
14


1
2
3
4
5
6
7
8
9

EXPLANATION OF PLATE 34

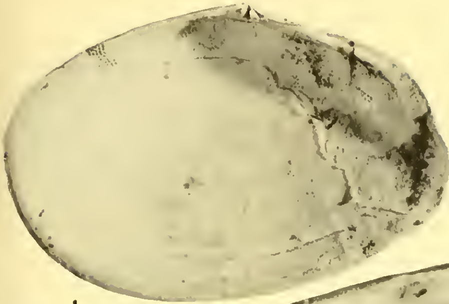
EXPLANATION OF PLATE 35

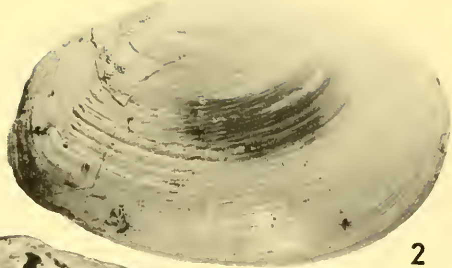
Figure | Page

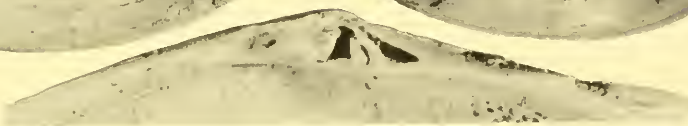
1-3. **Temnoconcha** aff. **brasiliana** (Dall) 395
1,2. Length 29.6 mm, height 19.4 mm. Locality PJ 212. No. G 13308. 3. Hinge of same specimen as figures 1 and 2; 7.5x.

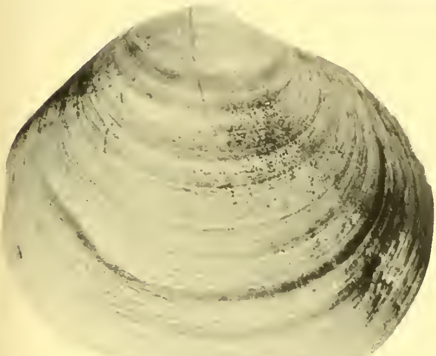
4,5. **Semele proficua** (Pulteney) 396
Length 29.2 mm, height 25.0 mm. Locality RR 230. No. G 13299.

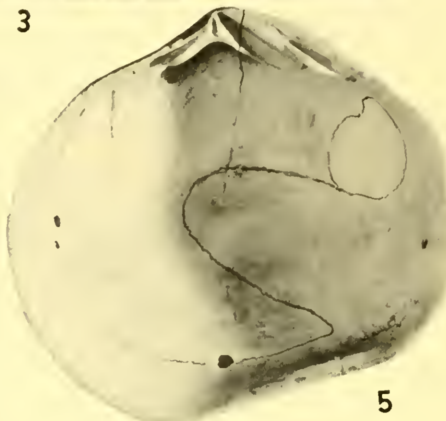
6,7. **Semele purpurascens** (Gmelin) 396
Length 31.3 mm, height 27.3 mm. Locality RR 230. No. G 13298.

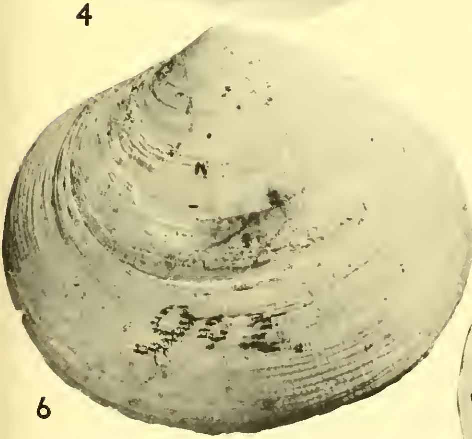

1

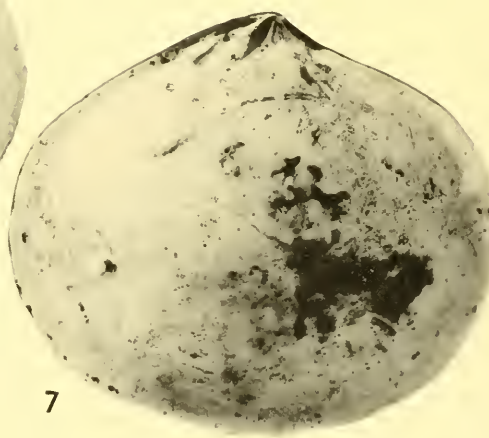

2

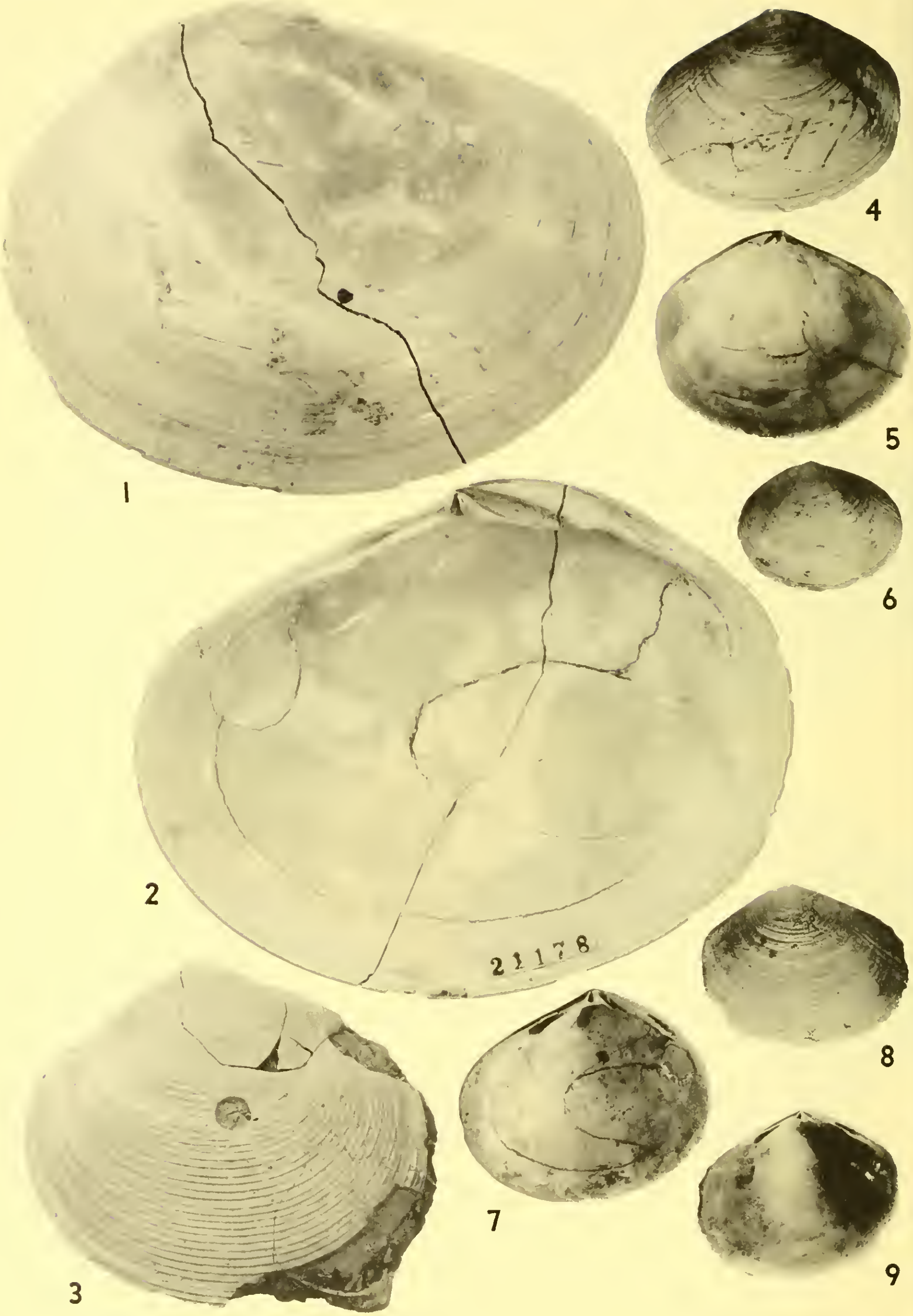

3


4


5


6


7


4
5
1
6
2
21178
8
7
3
9

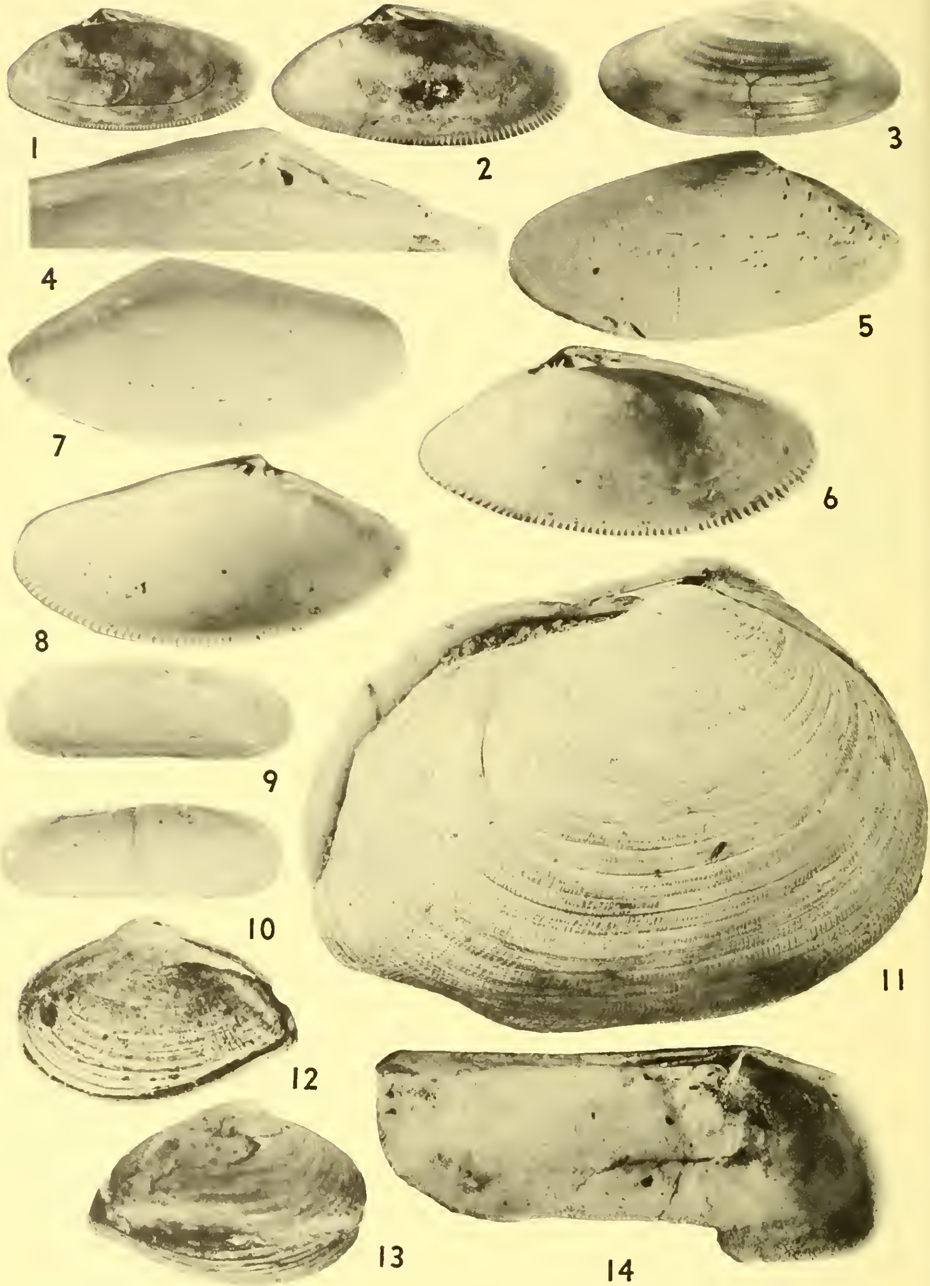
EXPLANATION OF PLATE 36

Figure		Page
1,2.	**Semele laevis costaricensis** Olsson Length 61.4 mm, height 46.6 mm. USGS locality 21178. USNM 645324.	397
3.	**Semele claytoni couvensis** Maury Length 37.7 mm, height 32.9 mm. USGS locality 18411. USNM 645329.	398
4-9.	**Semele aff. anteriocosta** Vokes 4,5. Length 17.4 mm, height 14.1 mm. Locality RR 230. No. G 13303. 6. Length 11.2 mm, height 8.9 mm. Locality K 1429. No. G 12842. 7. Length 17.0 mm, height 14.2 mm. Locality RR 230. No. G 13302. 8,9. Length 14.0 mm, height 11.3 mm. Locality KR 1182. No. G 13301.	398

EXPLANATION OF PLATE 37

Figure		Page
1-3.	**Abra** cf. **aequalis** (Say) .... 1. Length 9.7 mm, height 9.0 mm. Locality K 8399. No. G 12849. 2,3. Length 10.0 mm, height 9.6 mm. Locality K 1429. No. G 13306.	399
4-6.	**Cumingia galbensis,** n. sp. .... 4,5. Holotype. Length 13.5 mm, height 11.4 mm. USGS locality 20432. USNM 645355. 6. Paratype. Length 13.2 mm, height 10.7 mm. USGS locality 20432. USNM 645356.	400
7,8.	**Donax striatus** Linné ? .... Length 20.2 mm, height 12.6 mm. Locality RR 230. No. G 14055.	401
9.	**Donax fabagelloides** Guppy .... Holotype. Length 20.5 mm, height 9.7 mm. Matura, coll. Guppy. USNM 115654.	402
10,11.	**Donax (Machaerodonax ?)** species .... Length 16.6 mm. USGS locality 19860. USNM 645349.	404


1
2
3
7
4
8
5
9
10
6
11

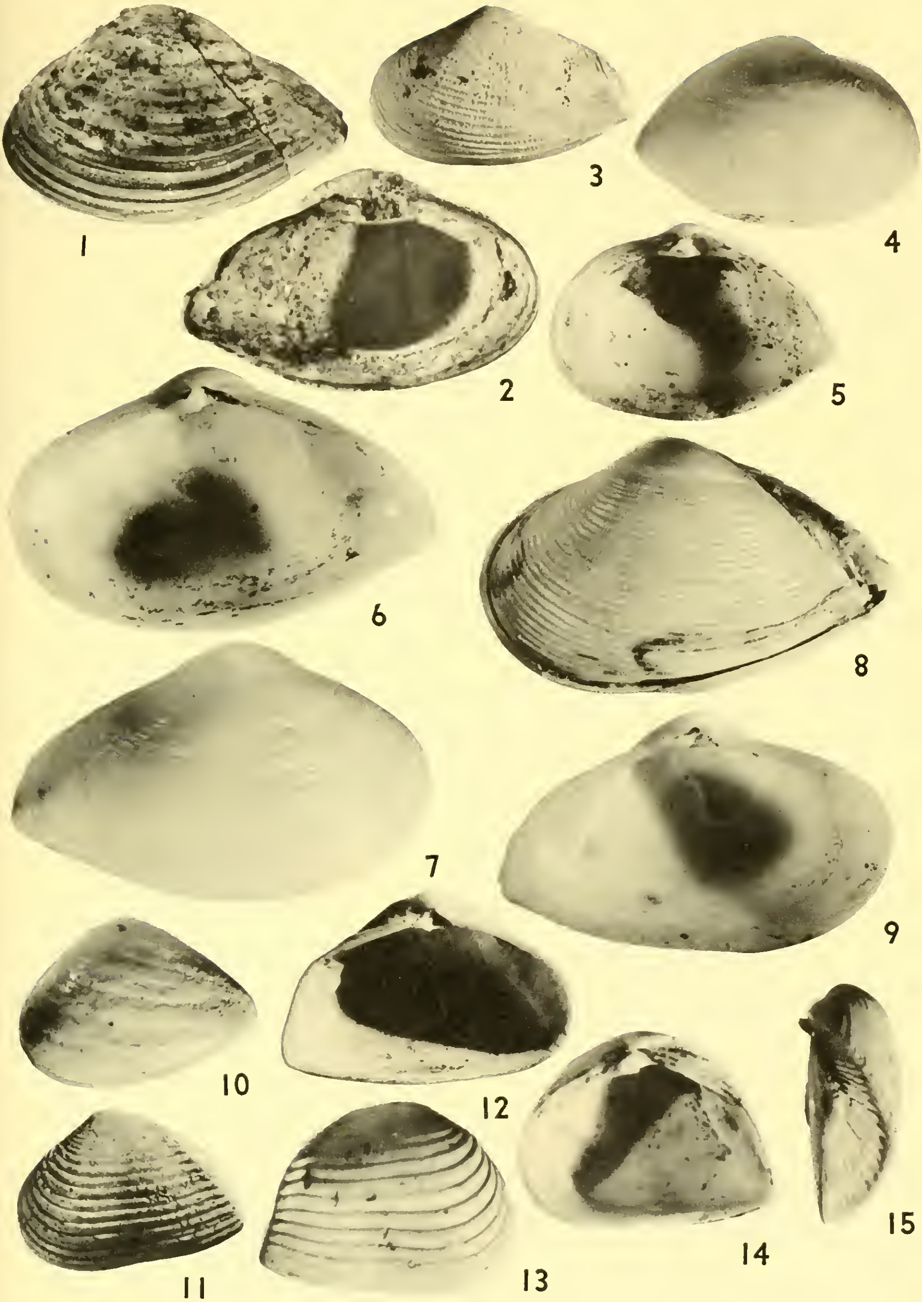

1
2
3
4
5
7
6
8
9
10
11
12
13
14

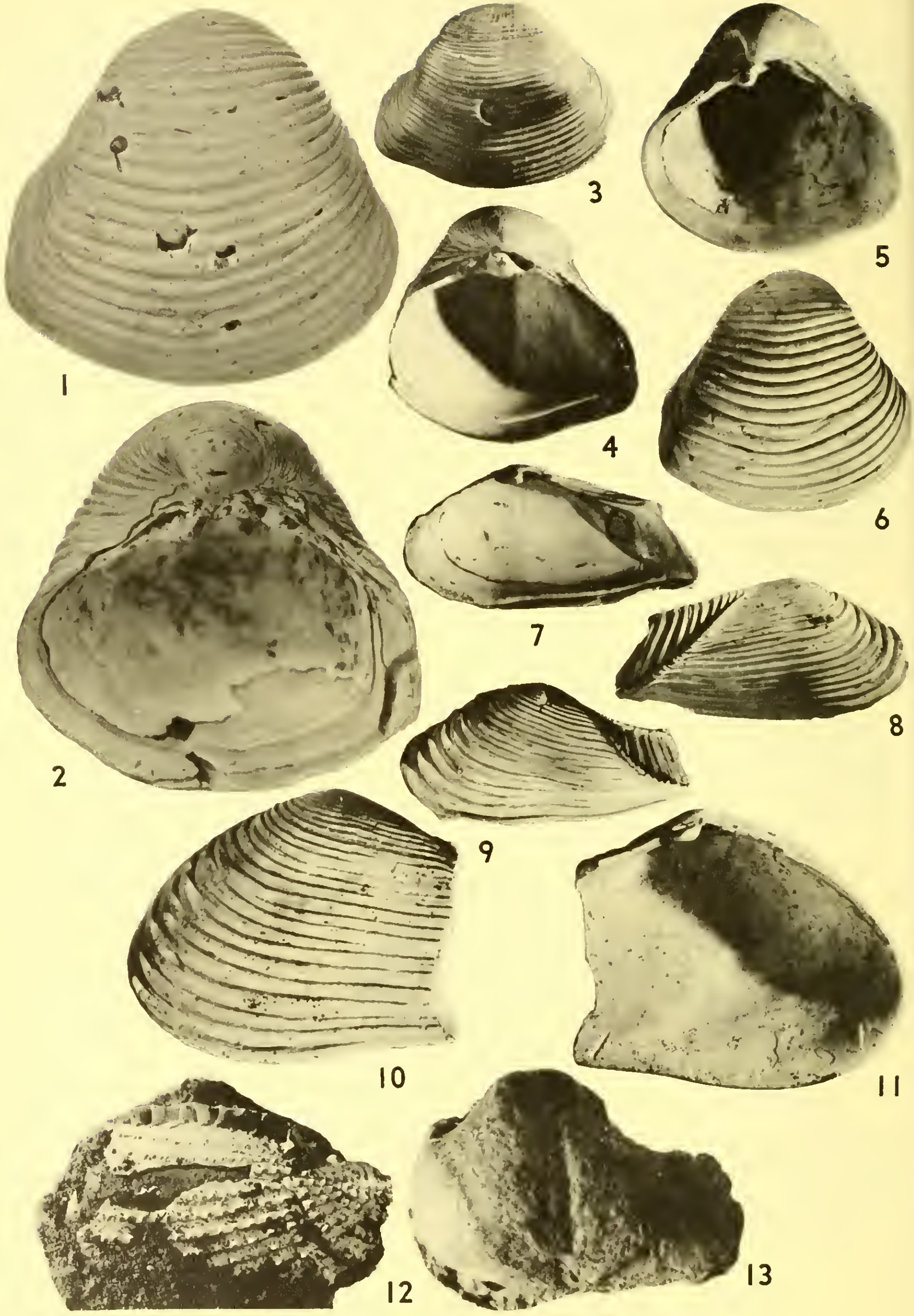
EXPLANATION OF PLATE 38

Figure		Page
1-4.	**Donax fabagelloides** Guppy 1. Length 16.3 mm, height 8.1 mm. Locality JS 67. No. G 13291. 2. Length 20.0 mm, height 9.1 mm. Locality RR 230. No. G 13292. 3 Length 20.1 mm, height 9.2 mm. Locality RR 230. No. G 13294. 4. Hinge. 7.5x. Locality RR 230. No. G 13293.	402
5-8.	**Donax brightonensis,** n. sp. 5,6. Holotype. Length 13.2 mm, height 6.1 mm. Locality RR 120. No. G 12861. 7,8. Paratype. Length 13.3 mm, height 6.3 mm. Locality K 12255. No. G 12855.	403
9,10.	**Tagelus (Mesopleura)** cf. **divisus** (Spengler) Length 22.8 mm, height 8.0 mm. USGS locality 20434. USNM 645336.	405
11.	**Pleiorytis caroniana** (Maury) Length 57.8 mm, height 45.6 mm. USGS locality 18634. USNM 645323.	406
12,13.	**Caryocorbula (Caryocorbula) helenae** (Maury) Lectotype. Length 7.3 mm, height 5.0 mm. Locality: on coast 1000 feet west of Brighton pier near Pitch Lake, Trinidad. Cornell Univ., Paleont. Museum, No. 33497.	407
14.	**Solen (Solena) obliquus** Spengler Length 34.6 mm, height 14.2 mm. Locality JS 67. No. G 14002.	407

EXPLANATION OF PLATE 39

Figure		Page
1-5.	**Caryocorbula (Caryocorbula) helenae** (Maury) 1,2. Lectotype of *C. smithiana*. Length 9.3 mm. height 5.8 mm. Locality: on coast 1000 feet west of Brighton pier near Pitch Lake, Trinidad. Cornell Univ., Paleont. Museum, No. 33509. 3. Length 9.7 mm, height 5.8 mm. Locality K 1429. No. G 14016. 4,5. Length 10.0 mm, height 6.9 mm. Locality K 12255. No. G 14017.	407
6-9.	**Caryocorbula (Caryocorbula) helenae** (Maury)? 6,7. Length 14.8 mm, height 9.2 mm. Locality PJ 285. No. G 14018. 8. Length 14.9 mm, height 9.1 mm. Locality PJ 285. No. G 14019. 9. Length 13.3 mm, height 8.2 mm. Locality PJ 285. No. G 14020.	408
10.	**Caryocorbula (Caryocorbula)** species Length 8.5 mm, height 6.2 mm. Locality JS 67. No. G 14021.	409
11-15.	**Juliacorbula aequivalvis** (Philippi) 11. Length 8.0 mm. height 5.6 mm. Locality JS 67. No. G 14009. 12. Length 10.3 mm, height 6.8 mm. Locality RR 230. No. G 14010. 13-15. Length 8.6 mm, height 6.7 mm. Locality RR 230. No. G 14011.	410


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15


1
2
3
4
5
6
7
8
9
10
11
12
13

EXPLANATION OF PLATE 40

Figure Page

1,2. **Notocorbula islatrinitatis** (Maury) ... 411
Length 13.6 mm, height 13.2 mm. USGS locality 18634. USNM 645353.

3,4. **Notocorbula** species ... 412
3. Length 8.7 mm, height 6.7 mm. Locality PJ 285. No. G 14045.
4. Length 9.0 mm, height 8.3 mm. Locality PJ 285. No. G 14046.

5,6. **Notocorbula** aff. **disparilis** (d'Orbigny) ... 412
Length 9.3 mm, height 8.8 mm. Locality JS 67. No. G 14040.

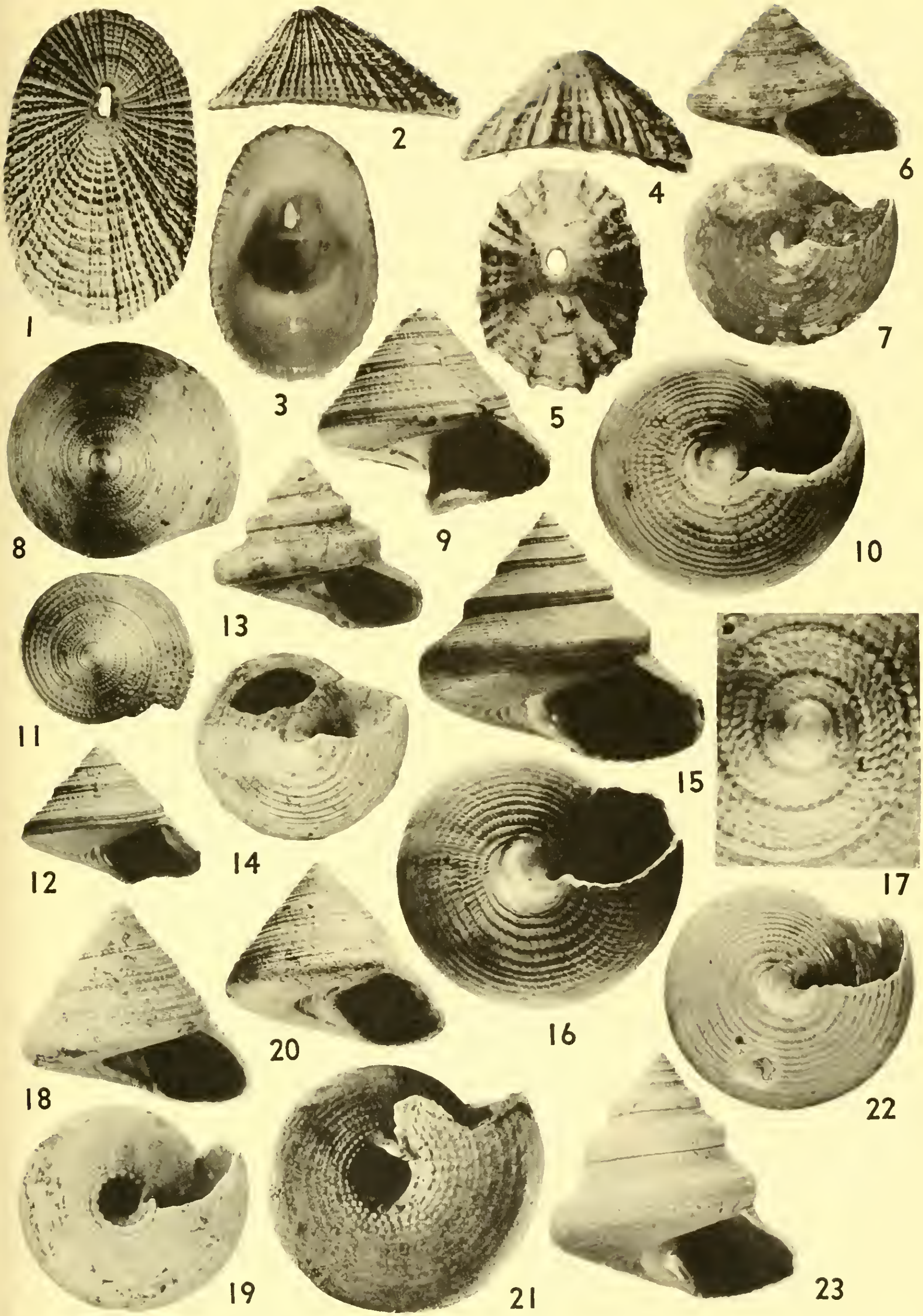
7-9. **Tenuicorbula melajoensis,** n. sp. ... 413
7,8. Holotype. Length 20.0 mm, height 9.6 mm. Locality Hutch 51. No. G 14047. 9. Paratype. Length 19.7 mm, height 9.7 mm. Locality Hutch 51. No. G 14048.

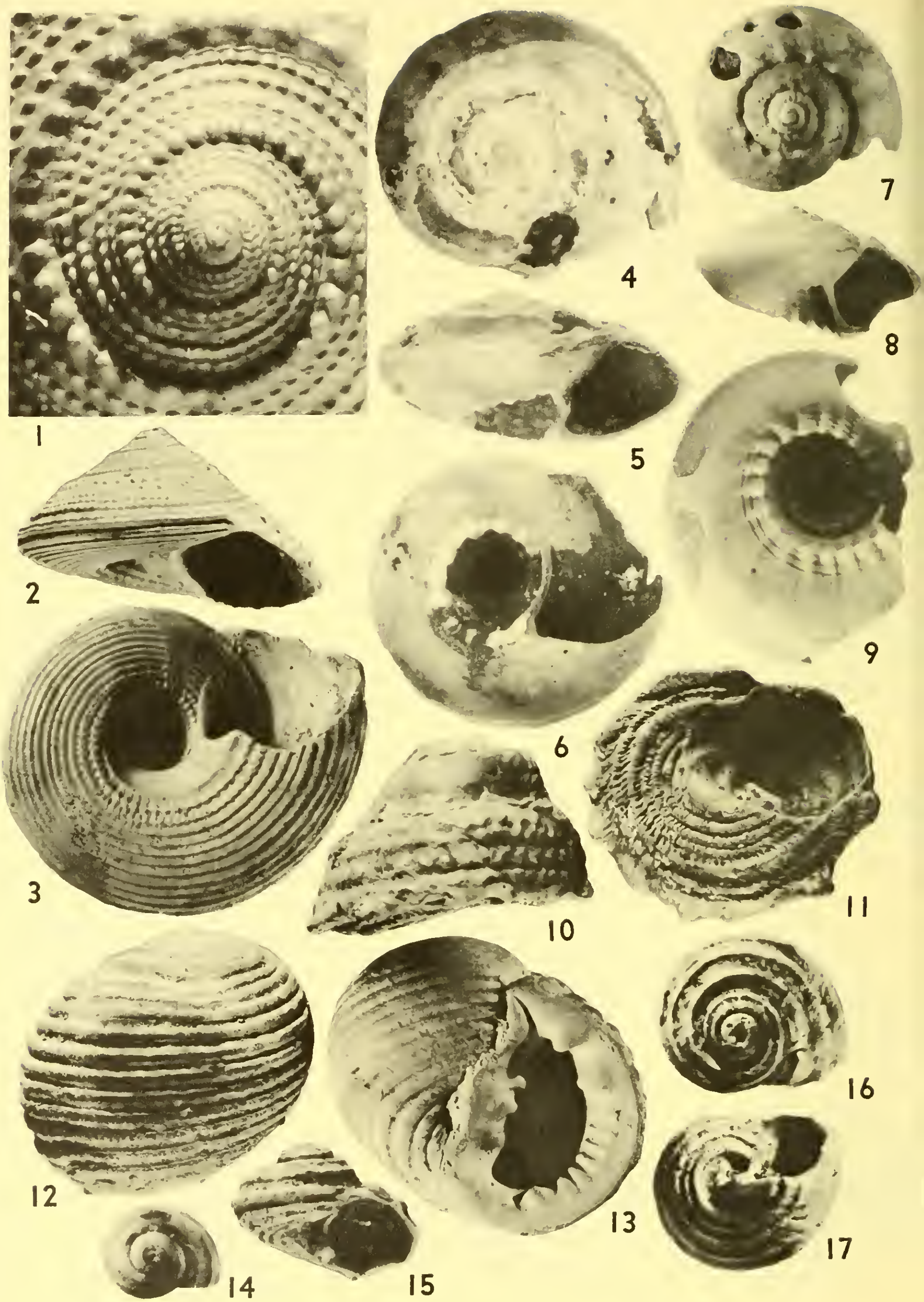
10,11. **Tenuicorbula** aff. **melajoensis,** n. sp. ... 414
Length 12.0 mm, height 9.7 mm. Locality PJ 302. No. G 14052.

12. **Pholas mackiana** Maury ... 414
Lectotype. Length of fragment 22.5 mm. Locality: on coast 700 feet east of Brighton pier near Pitch Lake, Trinidad. Cornell Univ., Paleont. Museum, unnumbered.

13. **Martesia oligocenica** Maury ... 415
Syntype. Length 11.5 mm, height 8.1 mm. Locality: milepost 49¾ (new mileposts !) of the Southern Main Road of Trinidad, just south of the Pitch Lake (= USGS locality 21782). Cornell Univ., Paleont. Museum, unnumbered.

EXPLANATION OF PLATE 41


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23



EXPLANATION OF PLATE 42

Figure		Page
1-3.	**Calliostoma olssoni** Maury 1. Apical view. 10x. Locality PJ 285. No. H 14583. 2. Height 9.9 mm, diameter 16.7 mm. Locality Hutch 51. No. H 14584. 3. Diameter 19.9 mm. Locality RR 230. No. H 14582.	421
4-9.	**Microgaza oblita,** n. sp. 4-6. Holotype. Height 2.1 mm, max. diameter 4.2 mm. Matura, coll. Guppy. USNM 645185. 7,8. Paratype. Height 1.9 mm, diameter 3.2 mm. Locality RR 230. No. H 14597. 9. Paratype. Diameter 4.3 mm. Locality JS 67. No. H 14596.	422
10,11.	**Astraea (Astralium)** cf. **brevispina** (Lamarck) Height 11.3 mm, diameter 15.7 mm. Locality RR 230. No. H 14627.	423
12,13.	**Nerita (Nerita) exuvioides** Trechmann ? Height 24.3 mm, diameter 27.0 mm. Locality Hutch 51. No. H 14630.	424
14-17.	**Parviturbo maturensis,** n. sp. 14. Paratype. Diameter 1.7 mm. Locality PJ 302. No. H 14626. 15-17. Holotype. Height 2.0 mm, diameter 2.9 mm. Locality PJ 302. No. H 14625.	424

EXPLANATION OF PLATE 43

Figure Page

1-3. **Neritina (Vitta) cf. virginea** (Linné) 425
1,2. Height 10.7 mm, diameter 10.0 mm. Locality Hutch 51. No. H 14631. 3. Height 10.2 mm, diameter 10.5 mm. Locality RR 230. No. H 14632.

4-6. **Teinostoma (Pseudorotella) spretum,** n. sp. 427
Holotype. Height 1.5 mm, diameter 2.3 mm. Locality KR 11862. No. H 14607.

7-9. **Teinostoma (Pseudorotella) nugax,** n. sp. 427
Holotype. Height 0.6 mm, diameter 1.6 mm. Locality KR 11862. No. H 14599.

10-17. **Teinostoma (Aepystoma) caroniense** Maury 428
10-12. Height 3.1 mm, diameter 5.4 mm. Locality EL 1810. No. H 14603. 13,14. Immature specimen. Diameter 1.8 mm. Locality KR 11862. No. H 14610. 15-17. Height 1.9 mm, diameter 2.8 mm. Locality PJ 212. No. H 14615.

18-20. **Teinostoma (Aepystoma) melajoense,** n. sp. 429
Holotype. Height 1.8 mm, diameter 2.4 mm. Locality PJ 285. No. H 14611.

21-23. **Cochliolepis pluscula,** n. sp. 430
Holotype. Height 0.8 mm, diameter 1.6 mm. Locality PJ 285. No. H 14617.

24-26. **Cyclostremiscus (Ponocyclus) pentagonus** (Gabb) 431
Height 1.2 mm, diameter 2.5 mm. Locality KR 11862. No. H 14619.

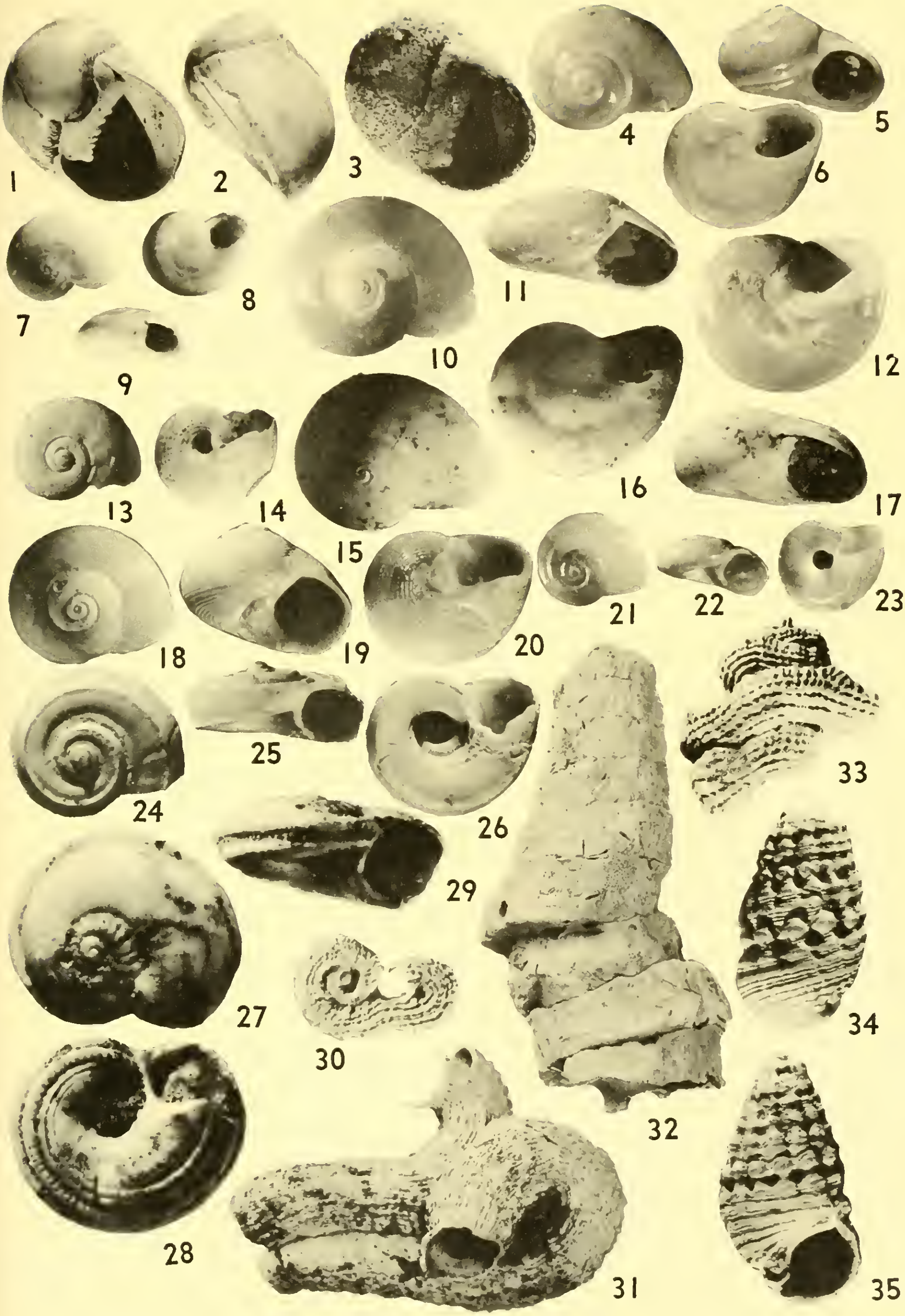
27-29. **Solariorbis** (subgenus ?) **marginatus** (Guppy) 432
Height 0.8 mm, diameter 1.6 mm. Locality PJ 302. No. H 15345.

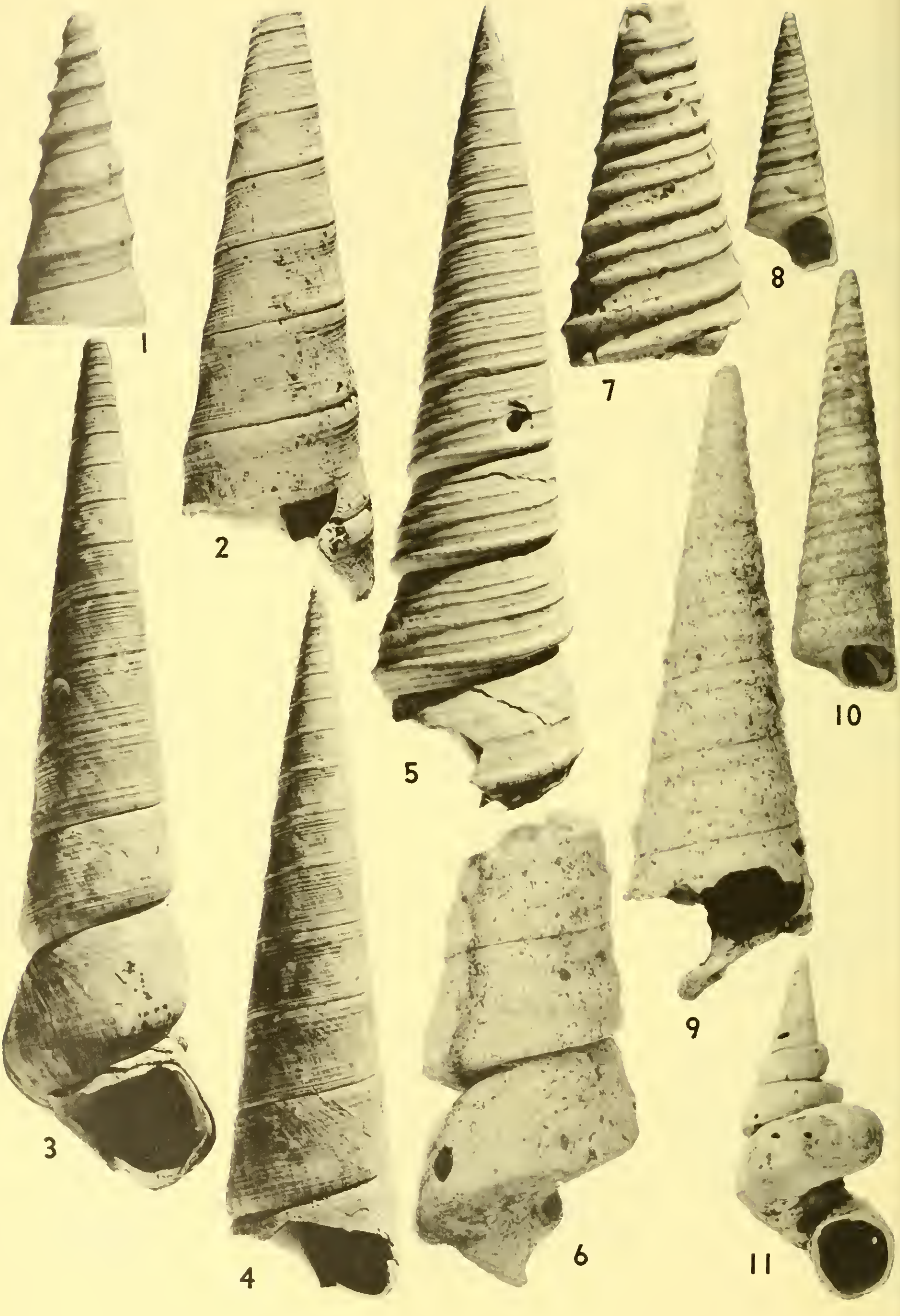
30,31. **Serpulorbis decussatus** (Gmelin) 444
30. Length 4.4 mm. Locality PJ 212. No. H 14680. 31. Length 18.1 mm. USGS locality 18204. USNM 645350.

32. **Petaloconchus sculpturatus alcimus** Mansfield 444
Height 43.8 mm. USGS locality 18634. USNM 645330.

33. **Petaloconchus cf. floridanus** Olsson and Harbison 445
Greatest dimension 9.1 mm. Locality JS 67. No. H 14684.

34,35. **Batillaria** species 446
34. Height 7.6 mm, diameter 4.3 mm. Locality K 9813. No. H 14686. 35. Height 8.4 mm, diameter 4.2 mm. Locality K 9813. No. H 14687.

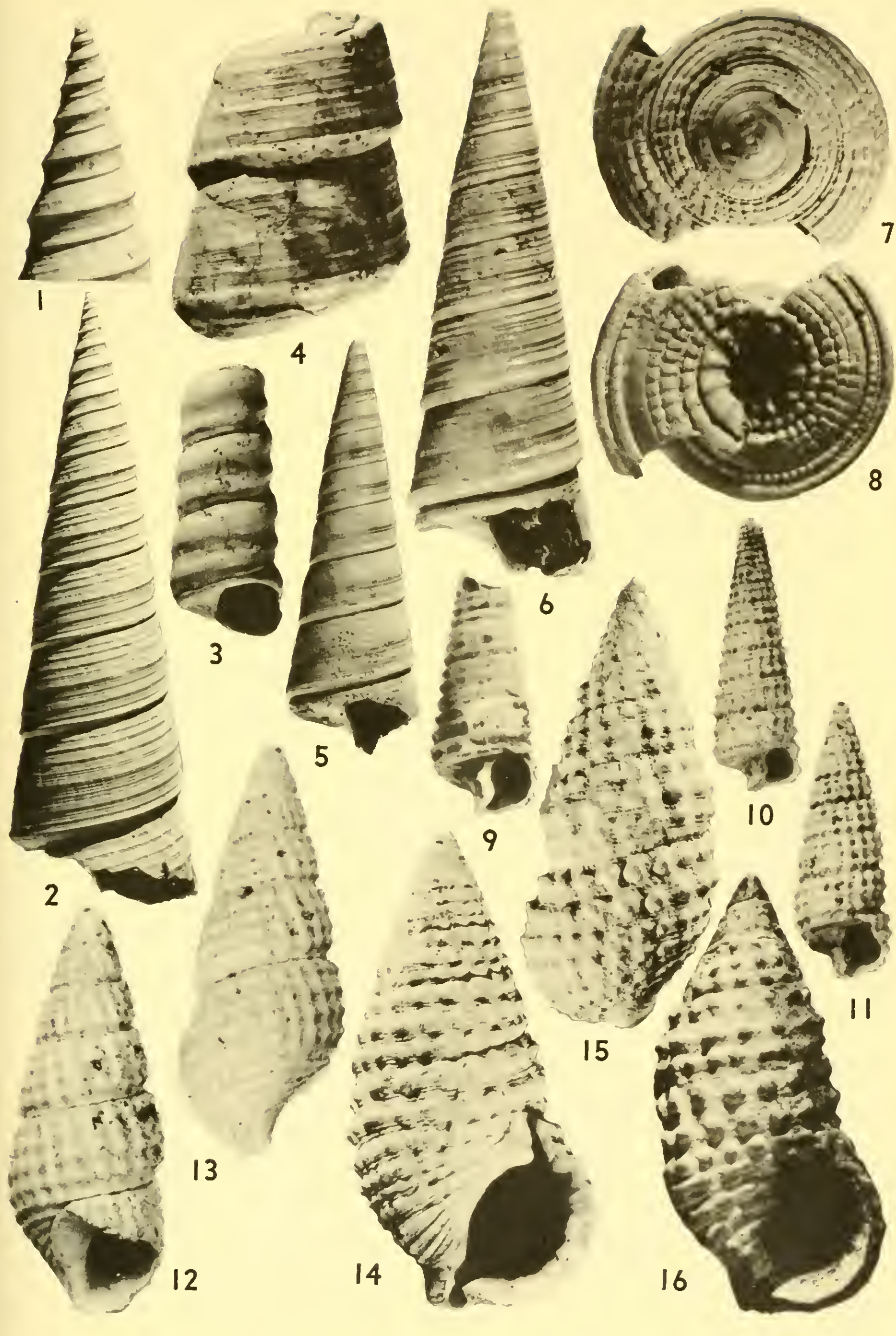

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35

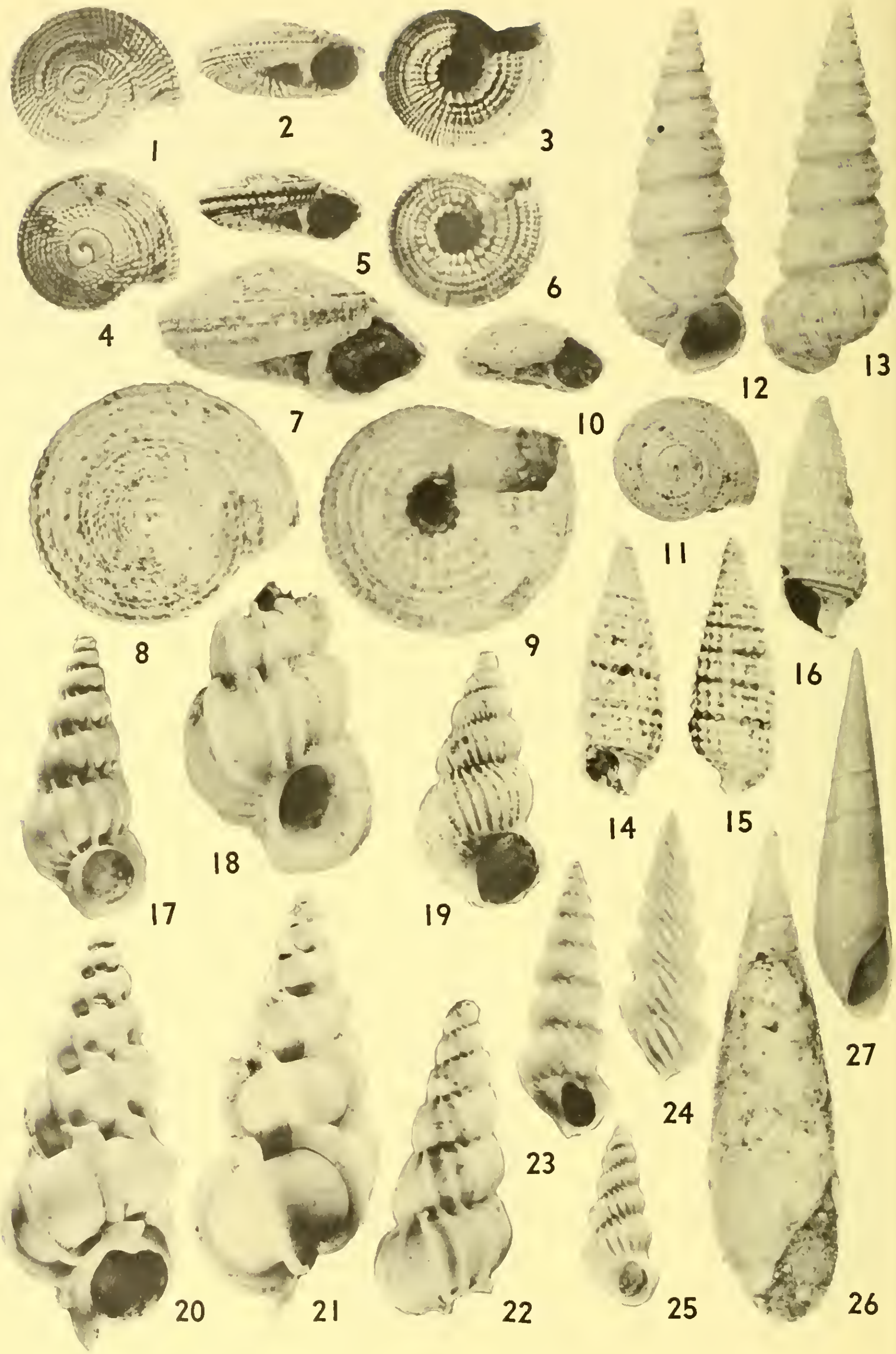

1
2
3
4
5
6
7
8
9
10
11

Explanation of Plate 44

EXPLANATION OF PLATE 45

Figure		Page
1,2.	**Turritella (Broderiptella) planigyrata** Guppy 1. Apex of same specimen as figure 2; 5x. 2. Height 43.1 mm, diameter 13.1 mm. Locality PJ 285. No. H 14656.	437
3.	**Turritella (Bactrospira)** species Height 19.1 mm, diameter 7.9 mm. Locality RR 230. No. H 14669.	440
4-6.	**Turritella (Broderiptella)** aff. **planigyrata** Guppy 4. Height 23.2 mm, diameter 17.0 mm. Locality RR 230. No. H 14666. 5. Height 28.1 mm, diameter 9.2 mm. Locality RR 230. No. H 14664. 6. Height 32.4 mm, diameter 10.5 mm. Locality RR 230. No. H 14665.	439
7,8.	**Architectonica (Architectonica) nobilis nobilis** Röding Height 9.5 mm, diameter 17.8 mm. Locality RR 230. No. H 14638.	452
9.	**Seila** cf. **adamsi** (H. C. Lea) Height 3.5 mm, diameter 1.7 mm. USGS locality 19860. USNM 645369.	451
10.	**Cerithiopsis** (subgenus ?) **emersoni** (C. B. Adams) Height 7.8 mm, diameter 2.9 mm. USGS locality 19860. USNM 645363.	450
11.	**Cerithiopsis (Cerithiopsis)** species Height 4.0 mm, diameter 1.5 mm. USGS locality 19860. USNM 645370.	449
12,13.	**Bittium (Bittiolum) fretense,** n. sp. Holotype. Height 5.6 mm, diameter 2.0 mm. USGS locality 10991. USNM 645372.	448
14-16.	**Cerithium** (subgenus ?) **harrisi** Maury 14. Height 22.0 mm, diameter 11.1 mm. Locality K 12255. No. H 14691. 15. Height 20.7 mm, diameter 9.1 mm. Locality K 12255. No. H 14690. 16. Lectotype. Height 15.2 mm, diameter 7.5 mm. Locality: on coast 700 feet east of Brighton pier near Pitch Lake, Trinidad. Cornell Univ., Paleont. Museum, unnumbered.	447


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27

EXPLANATION OF PLATE 46

Figure Page

1-3. **Architectonica (Pseudotorinia) melajoensis,** n. sp. 453
Holotype. Height 2.0 mm, diameter 4.8 mm. Locality PJ 285. No. H 14640.

4-6. **Architectonica (Pseudotorinia) guppyi,** n. sp. 454
Holotype. Height 2.0 mm, diameter 4.2 mm. Locality JS 67. No. H 14641.

7-9. **Architectonica (Pseudotorinia) cf. semidecussata** (Guppy) 456
Height 4.2 mm, diameter 7.2 mm. USGS locality 10991. USNM 645361.

10,11. **Architectonica (Pseudotorinia) semidecussata** (Guppy) 455
Holotype. Height 2.1 mm, diameter 4.0 mm. Matura, coll. Guppy. USNM 115468.

12,13. **Mathilda** species A 456
Height 10.2 mm, diameter 3.9 mm. USGS locality 18411. USNM 645362.

14-16. **Triphora guttata** (Guppy) 458
14,15. Height 3.6 mm, diameter 1.3 mm. USGS locality 10991. USNM 645371. 16. Holotype. Height 3.1 mm, diameter 1.3 mm. Matura, coll. Guppy. USNM 115458.

17. **Epitonium (Epitonium) albidum** (d'Orbigny) 459
Height 9.7 mm, diameter 4.4 mm. Locality RR 230. No. H 14697.

18. **Epitonium (Epitonium) humphreysi** (Kiener) ? 460
Height 10.0 mm, diameter 6.3 mm. USGS locality 10991. USNM 645357.

19. **Epitonium (Asperiscala) cf. multistriatum** (Say) 461
Height 5.9 mm, diameter 3.0 mm. Locality RR 230. No. H 15048.

20,21. **Epitonium (Epitonium) maturense,** n. sp. 460
Holotype. Height 18.9 mm, diameter 8.1 mm. Locality RR 230. No. H 15040.

22. **Epitonium (Asperiscala) cf. candeanum** (d'Orbigny) 462
Height 5.4 mm, diameter 2.3 mm. Locality PJ 302. No. H 15049.

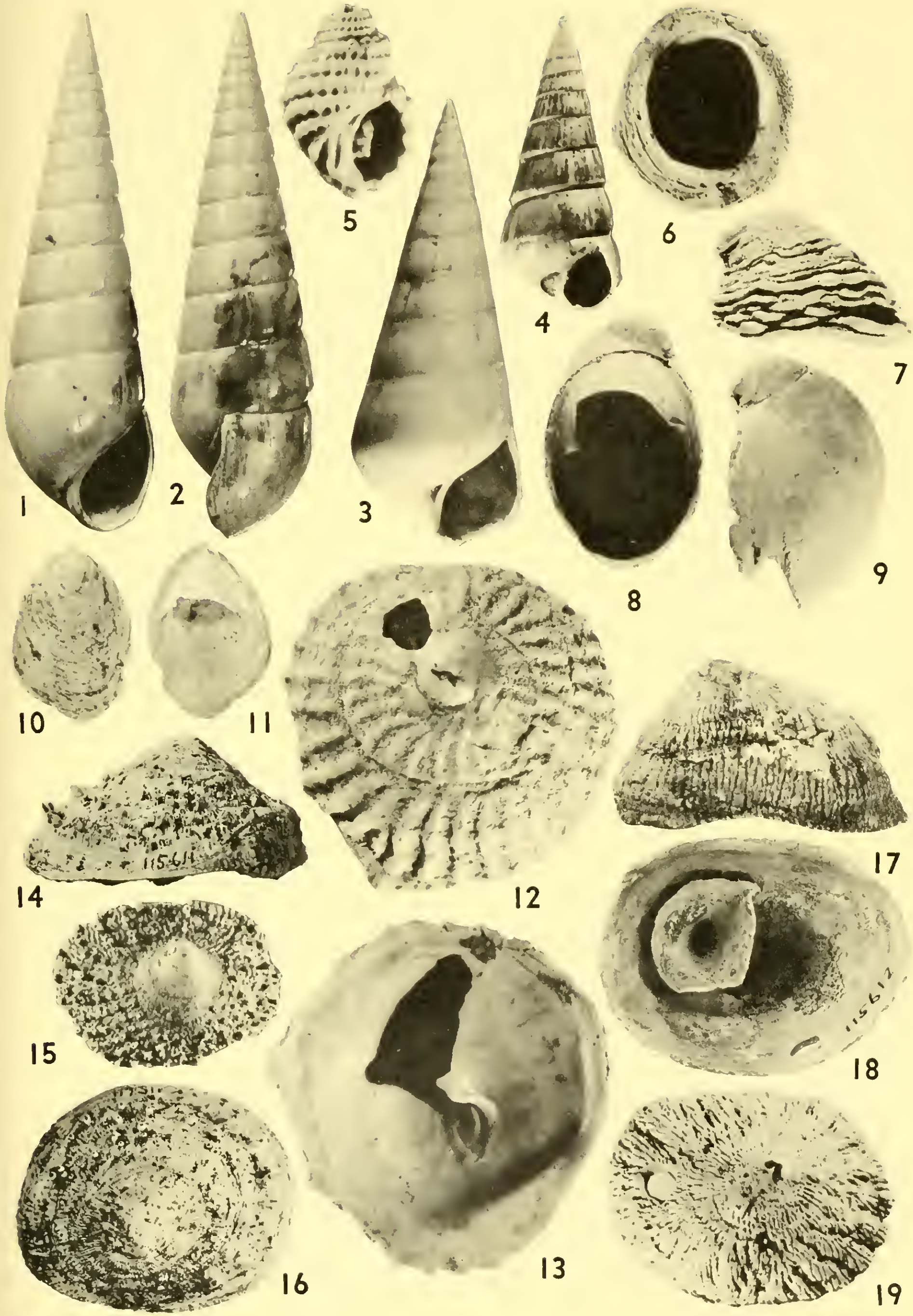
23-25. **Epitonium (Asperiscala) rohri,** n. sp. 462
23,24. Holotype. Height 4.8 mm, diameter 1.6 mm. Locality PJ 285. No. H 15042. 25. Paratype. Height 3.0 mm, diameter 1.4 mm. Locality KR 11862. No. H 15043.

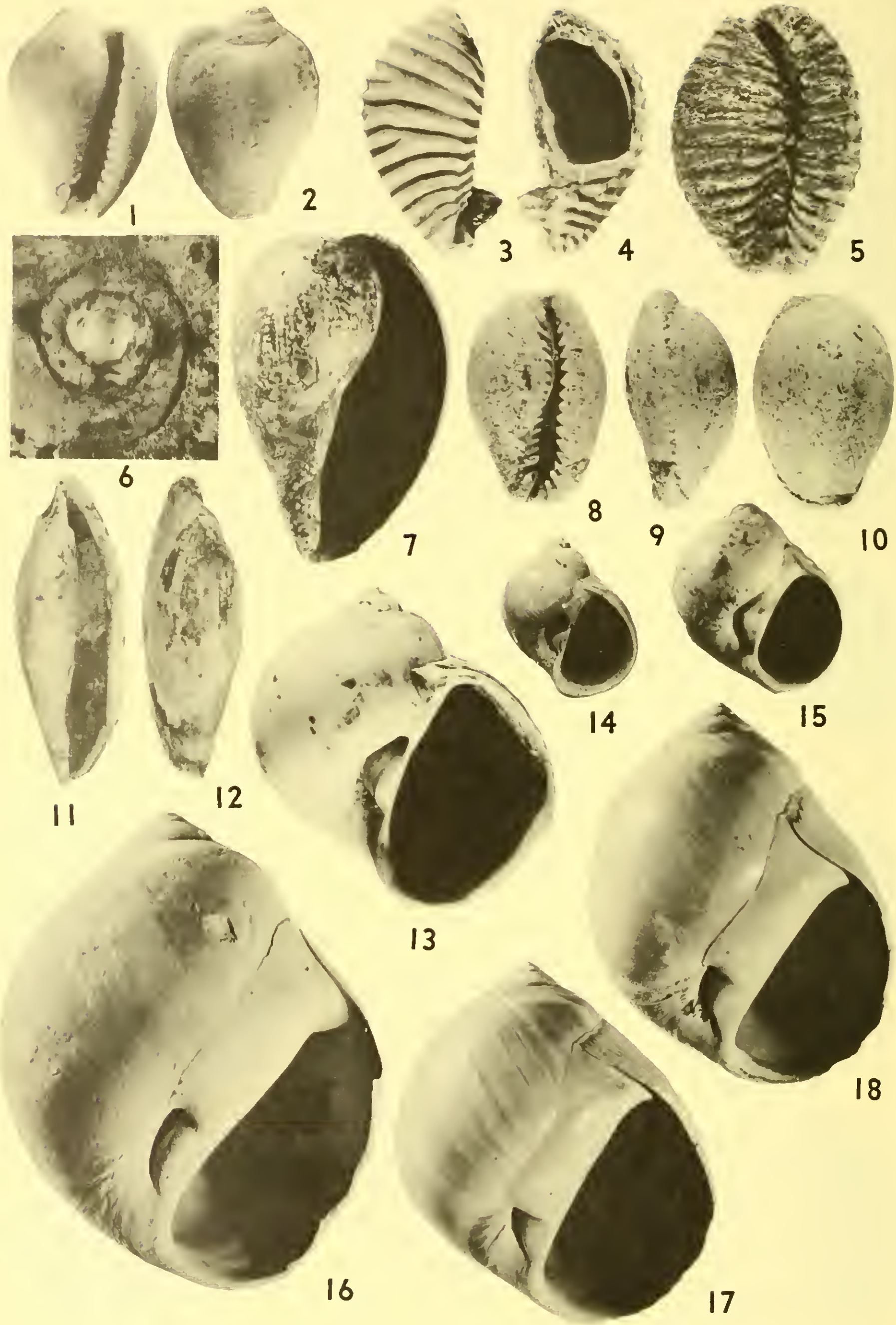
26. **Eulima clavata** (Guppy) 464
Lectotype. Height 6.7 mm, diameter 1.7 mm. Matura, coll. Guppy. USNM 115443.

27. **Eulima** species A 464
Height 10.2 mm, diameter 2.3 mm. USGS locality 21178. USNM 645360.

EXPLANATION OF PLATE 47

Figure		Page
1,2.	**Balcis egregia** (Guppy) Height 49.5 mm, diameter 14.4 mm. USGS locality 18634. USNM 645328.	465
3,4.	**Niso grandis** Gabb ? 3. Height 15.7 mm, diameter 6.3 mm. Locality PJ 285. No. H 15058. 4. Height 10.0 mm, diameter 4.1 mm. Locality PJ 285. No. H 15059.	466
5.	**Fossarus (Iselica) anomalus** (C. B. Adams) ? Height 2.8 mm, diameter 1.8 mm. Locality PJ 302. No. H 15066.	468
6,7.	**Hipponix** cf. **antiquatus** (Linné) Height 9.0 mm, diameter 14.4 mm. Locality RR 230. No. H 15068.	469
8,9.	**Crepidula (Crepidula)** cf. **maculosa** Conrad Length 23.5 mm, width 14.0 mm. Locality Hutch 51. No. H 15100.	470
10,11.	**Crepidula plana** Say Height 14.7 mm, width 9.8 mm. USGS locality 18634. USNM 645343.	470
12,13.	**Trochita radians** (Lamarck) Height 9.2 mm, diameter 24.6 mm. Locality RR 230. No. H 15082.	473
14-16.	**Crucibulum (Crucibulum) piliferum** Guppy 14,16. Lectotype. Height 10.8 mm, diameter 23.0 mm. Matura, coll. Guppy. USNM 115611. 15. Diameter 7.8 mm. Locality JS 67. No. H 15086.	475
17-19.	**Crucibulum (Crucibulum) subsutum** Guppy 17,18. Lectotype. Height 12.7 mm, diameter 24.0 mm. Matura, coll. Guppy. USNM 115612.	474


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19

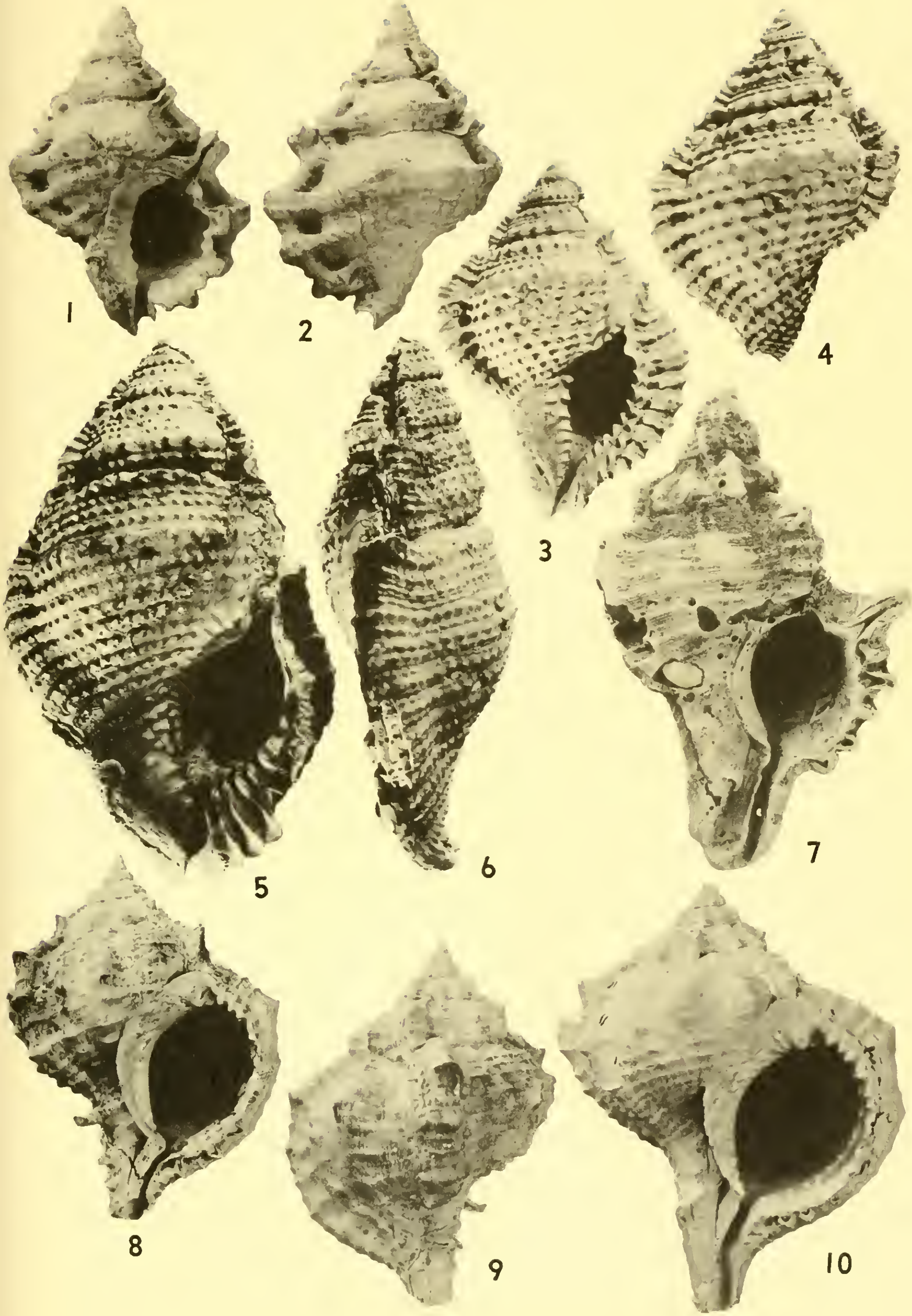


EXPLANATION OF PLATE 48

Figure		Page
1,2.	**Erato maugeriae** Gray Height 5.5 mm, diameter 4.1 mm. Locality RR 230. No. H 15107.	476
3-5.	**Trivia (Pusula) radians orientalis** (Schilder) 3,4. Holotype. Length 17.1 mm. Matura. No. H 11228. 5. Paratype. Height 18.7 mm, width 13.2 mm. Matura. No. H 11229.	477
6,7.	**Cypraea** species 6. Apical view of same specimen as figure 7; 5x. 7. Height 29.8 mm, diameter 20.6 mm. Locality RR 230. No. H 15111.	478
8-10.	**Cypraea (Erosaria) aliena** (Schilder) Holotype. Height 15.0 mm, diameter 9.7 mm. Matura. No. H 11263.	479
11,12.	**Neosimnia** cf. **uniplicata** (G. B. Sowerby II) Height 10.2 mm, diameter 4.9 mm. USGS locality 18204. USNM 645358.	479
13,14.	**Natica (Naticarius)** aff. **canrena** (Linné) 13. Height 22.5 mm, diameter 21.0 mm. Locality K 12255. No. H 15124. 14. Height 12.4 mm, diameter 10.3 mm. USGS locality 18634. USNM 645344.	481
15.	**Tectonatica pusilla** (Say) Height 4.2 mm, diameter 3.8 mm. Locality JS 67. No. H 15133.	482
16-18.	**Polinices stanislasmeunieri** Maury 16. Height 43.5 mm, diameter 36.0 mm. Locality Hutch 51. No. H 15145. 17. Height 33.8 mm, diameter, 29.2 mm. Locality PJ 285. No. H 15146. 18. Height 36.2 mm, diameter 27.7 mm. Locality PJ 285. No. H 15147.	483

EXPLANATION OF PLATE 49

Figure		Page
1,2.	**Bursa (Bursa)** aff. **thomae** (d'Orbigny) .... Height 26.5 mm, diameter 19.1 mm. USGS locality 18634. USNM 645345.	486
3-6.	**Bursa (Marsupina) bufo** (Bruguière) .... 3,4. Height 25.2 mm, width 17.8 mm. Locality RR 230. No. H 15151. 5,6. Height 75 mm, width 45 mm. Locality RR 230. No. H 15150.	487
7.	**Murex (Chicoreus)** cf. **brevifrons** Lamarck .... Height 46.3 mm. USGS locality 21778. USNM 645333.	491
8-10.	**Murex (Murex) chrysostoma** G. B. Sowerby I .... 8,9. Height 35.4 mm, diameter 26.1 mm. USGS locality 18411. USNM 645332. 10. Height 41.5 mm, diameter 34.0 mm. USGS locality 18634. USNM 645331.	489


1
2
3
4
5
6
7
8
9
10


1
2
3
4
5
6
7
8
9
10
11
12
13

EXPLANATION OF PLATE 50

Figure Page

1-4. **Eupleura lehneri,** n. sp. 491
1,2. Holotype. Height 27.0 mm, width 19.6 mm. USGS locality 21178. USNM 645346. 3. Paratype. Height 23.6 mm, width 16.2 mm. Locality PJ 285. No. H 15159. 4. Paratype. Height 12.1 mm, width 8.8 mm. Locality PJ 285. No. H 15160.

5,6. **Typhis (Typhinellus)** cf. **quadratus** Hinds 493
Height 16.2 mm, width 9.3 mm. Locality JS 67. No. H 15161.

7-9. **Calothrophon** (?) **hutchisoni,** n. sp. 494
7. Paratype. Height 15.6 mm, diameter 9.0 mm. USGS locality 18399. USNM 645495. 8,9. Holotype. Height 16.6 mm, diameter 9.4 mm. USGS locality 21178. USNM 645494.

10-13. **Risomurex galbensis,** n. sp. 495
10. Paratype. Height 14.7 mm, diameter 8.7 mm. USGS locality 10991. USNM 645366. 11. Paratype. Protoconch; 10x. USGS locality 21778. USNM 645374. 12,13. Holotype. Height 13.8 mm, diameter 7.7 mm. USGS locality 10991. USNM 645367.

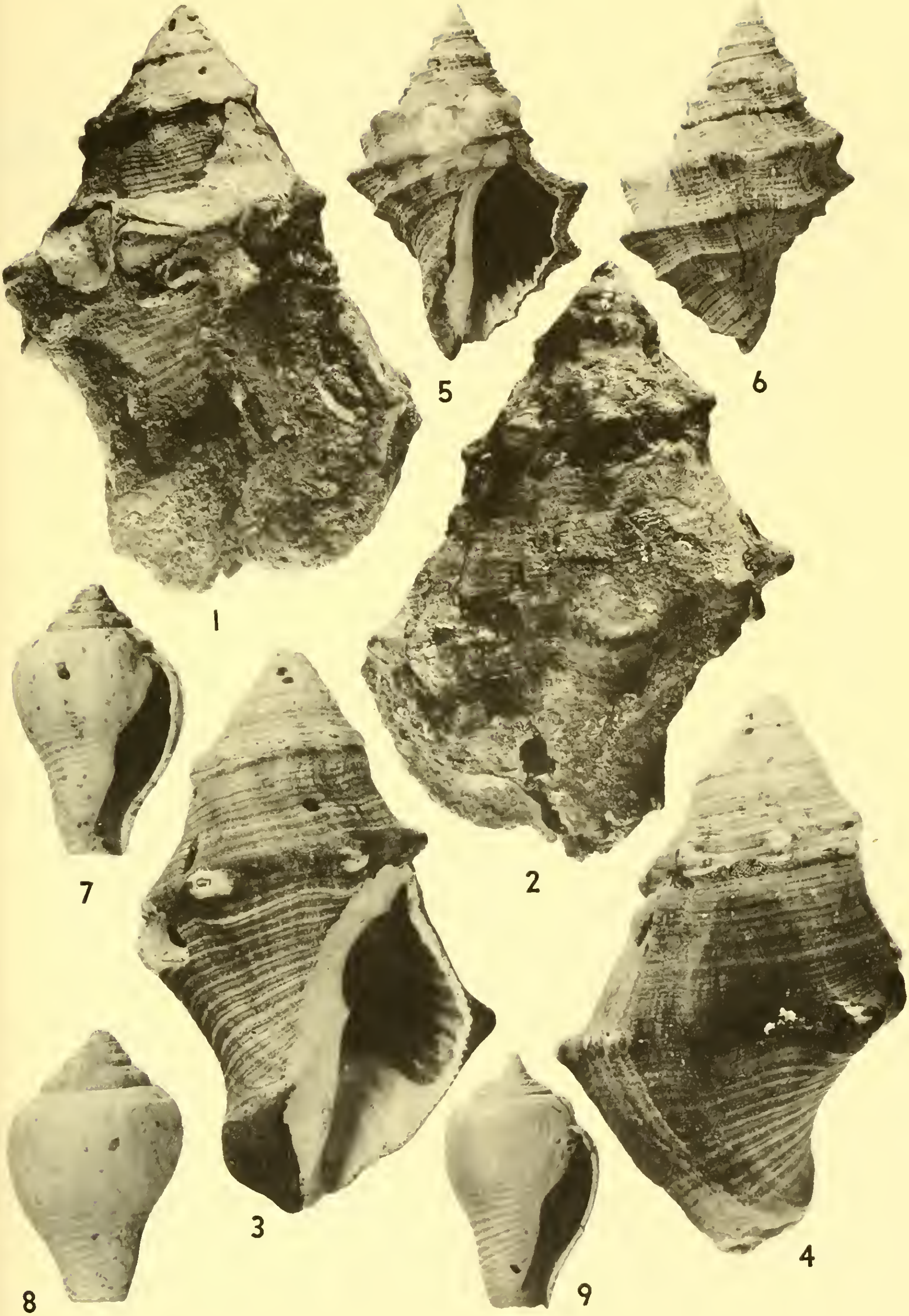
EXPLANATION OF PLATE 51

Figure Page

1-4. **Cymia brightoniana** Maury 497
1,2. Holotype. Height 55.0 mm, width 39.2 mm. Locality: on coast 700 feet east of Brighton pier near Pitch Lake, Trinidad. Cornell Univ., Paleont. Museum, No. 33609. 3,4. Height 53.5 mm, diameter 33.6 mm. USGS locality 20432a. USNM 645334.

5,6. **Thais (Stramonita)** species A 497
Height 28.0 mm, diameter 18.5 mm. USGS locality 18634. USNM 645347.

7-9. **Parametaria prototypus** (Guppy) 499
7,8. Holotype. Height 12.2 mm, diameter 7.8 mm. Guppy's Savanetta (Caroni Series). USNM 115593. 9. Height 11.4 mm, diameter 6.6 mm. USGS locality 18634. USNM 645352.

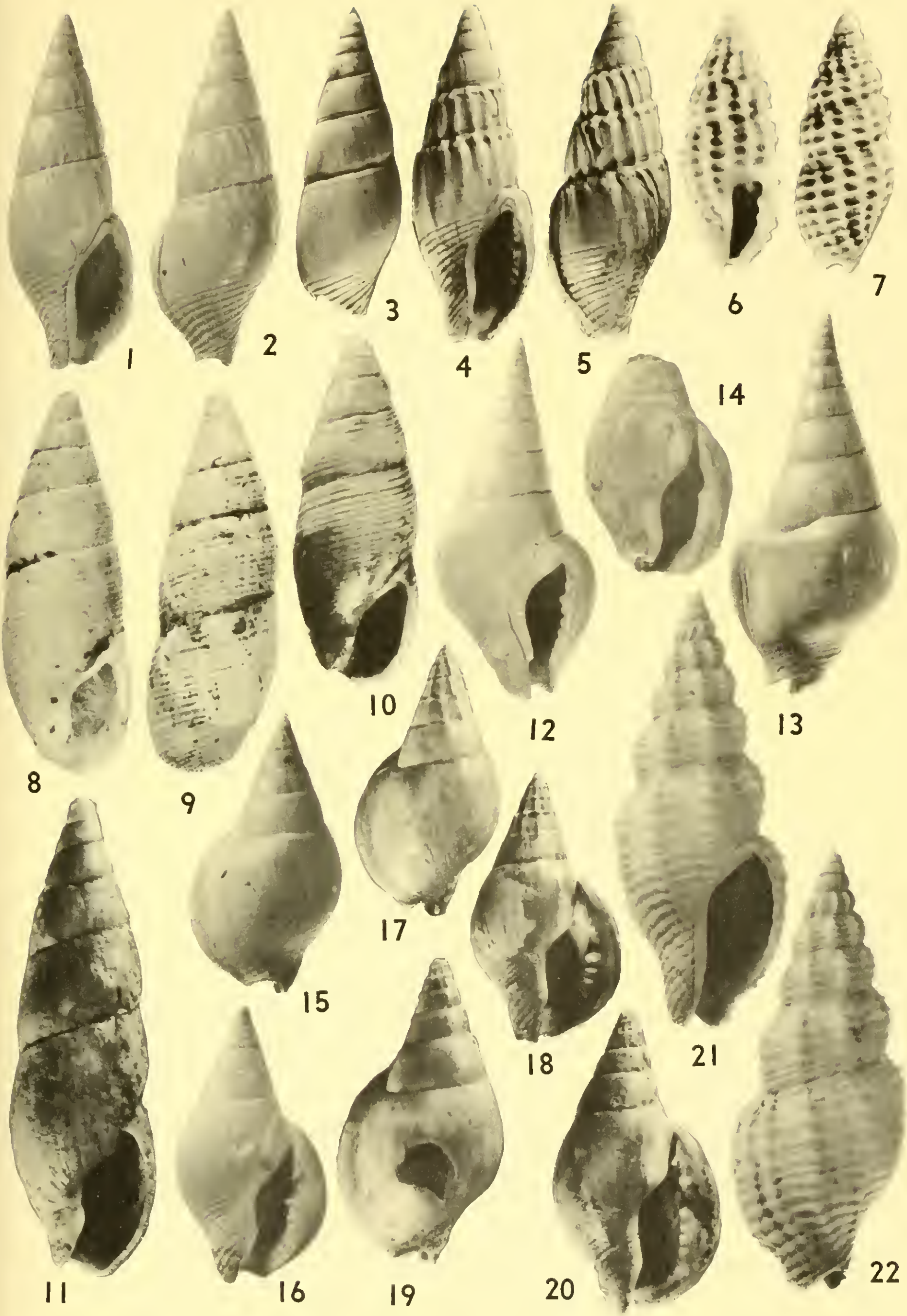

1
2
3
4
5
6
7
8
9

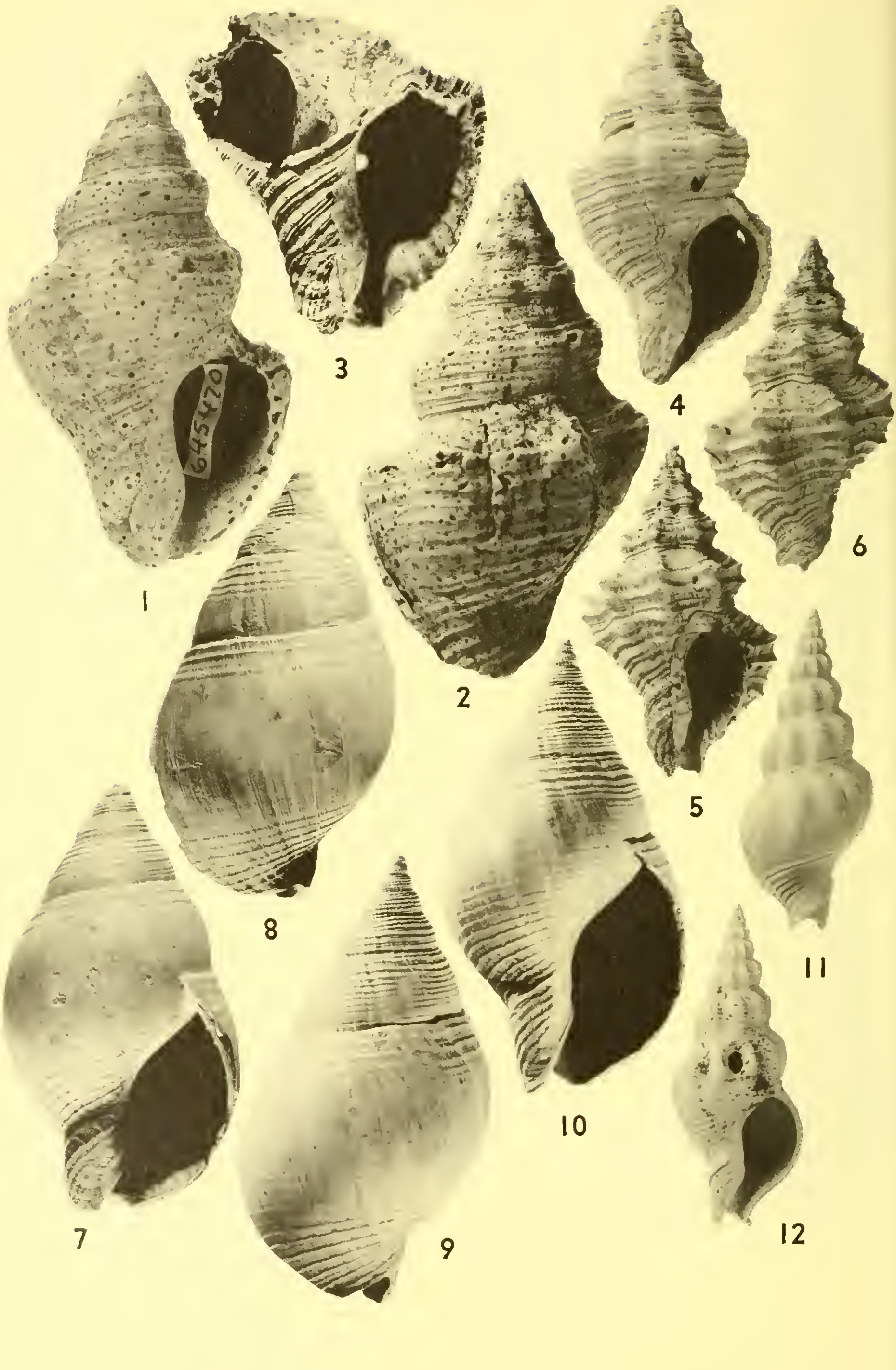

1
2
5
7
8
3
4
6
9
10
11

EXPLANATION OF PLATE 52

Figure		Page
1,2.	**Parametaria prototypus** (Guppy) .... Height 23.5 mm, diameter 14.3 mm. USGS locality 18634. USNM 645351.	499
3-6.	**Parametaria rutschi,** n. sp. .... 3,4. Holotype. Height 22.2 mm, diameter 15.0 mm. Locality RR 230. No. H 15171. 5,6. Paratype. Height 16.3 mm, diameter 10.5 mm. Locality RR 230. No. H 15172.	500
7-10.	**Anachis (Anachis) asphaltoda** (Maury) .... 7,8. Syntype. Height 14.7 mm, diameter 6.9 mm. Locality: on coast 700 feet east of Brighton pier near Pitch Lake, Trinidad. Cornell Univ., Paleont. Museum, No. 33511. 9,10. Height 15.2 mm, diameter 6.8 mm. Locality K 12255. No. H 15176.	501
11.	**Anachis (Costoanachis) obesa** (C. B. Adams) .... Height 5.0 mm, diameter 2.7 mm. Locality PJ 212. No. H 15174.	503

EXPLANATION OF PLATE 53


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22

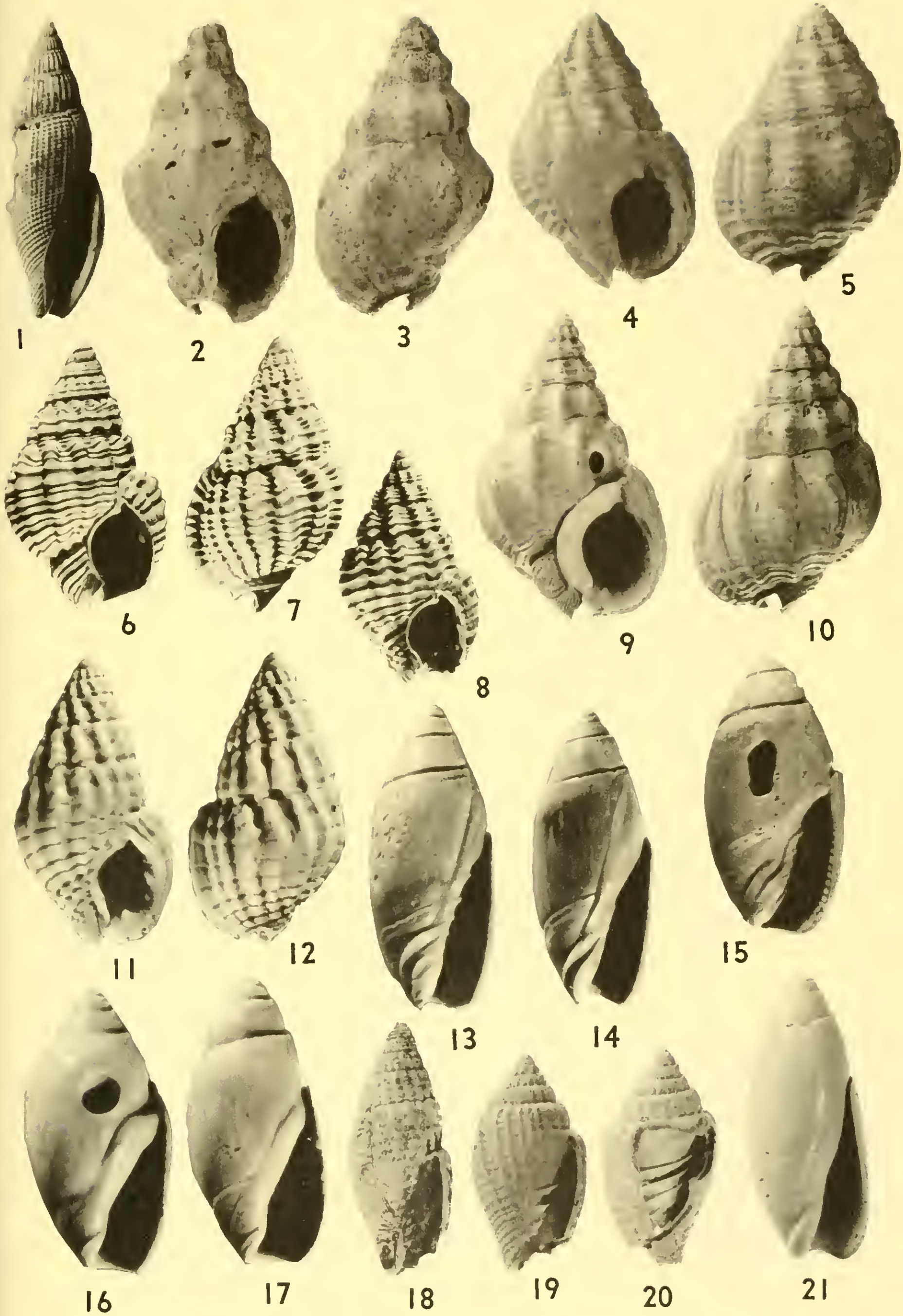

645470
3
4
6
1
2
5
11
8
10
7
9
12

EXPLANATION OF PLATE 54

Figure		Page
1-4.	**Buccinid indet**	511
	1,2. Height 46.2 mm, diameter 25.6 mm. USGS locality 10991. USNM 645470. 3. Height 32.0 mm, diameter 28.1 mm. Locality K 12255. No. H 15203. 4. Height 35.0 mm, diameter 18.2 mm. USGS locality 20432. USNM 645471.	
5,6.	**Cantharus** (subgenus ?) species A	512
	Height 30.4 mm, diameter 17.6 mm. USGS locality 18634. USNM 645472.	
7-10.	**Calophos rohri** (Rutsch)	514
	7,8. Height 41.2 mm, diameter 22.4 mm. Locality Hutch 51. No. H 15215. 9,10. Height 43.0 mm, diameter 23.3 mm. Locality EL 1810. No. H 15216.	
11,12.	**Metaphos** (?) species	515
	Height 25.3 mm, diameter 10.0 mm. USGS locality 21778. USNM 645482.	

EXPLANATION OF PLATE 55

Figure		Page
1.	**Metula** aff. **cancellata** Gabb Height 23.1 mm, diameter 7.5 mm. USGS locality 21178. USNM 645483.	515
2,3.	**Pallacera** species A Height 23.4 mm, diameter 13.2 mm. USGS locality 18411. USNM 645484.	516
4,5.	**Nassarius (Phrontis) vibex** (Say) Height 9.5 mm, diameter 6.1 mm. USGS locality 10991. USNM 645504.	517
6-8.	**Nassarius (Uzita) trinitatensis,** n. sp. 6,7. Holotype. Height 9.3 mm, diameter 5.3 mm. Locality PJ 285. No. H 15221. 8. Paratype. Height 8.1 mm, diameter 4.8 mm. Locality PJ 285. No. H 15222.	518
9,10.	**Nassarius (Uzita)** species A Height 13.7 mm, diameter 8.1 mm. USGS locality 18411. USNM 645496.	519
11,12.	**Nassarius** (subgenus ?) **galbanus,** n. sp. Holotype. Height 7.7 mm, diameter 4.1 mm. Locality K 1429. No. H 15235.	520
13.	**Olivella (Olivella)** species Height 6.9 mm, diameter 3.0 mm. Locality RR 230. No. H 15249.	526
14.	**Olivella (Dactylidia)** aff. **mutica** (Say) Height 8.4 mm, diameter 3.3 mm. Locality PJ 285. No. H 15258.	527
15.	**Olivella (Niteoliva)** cf. **verreauxi** (Ducros) Height 7.7 mm, diameter 4.0 mm. Locality RR 230. No. H 15250.	527
16,17.	**Olivella (Minioliva) fundarugata** Weisbord 16. Height 3.8 mm, diameter 2.2 mm. Locality KR 11862. No. H 15259. 17. Height 4.0 mm, diameter 2.0 mm. Locality KR 11862. No. H 15260.	528
18.	**Scabricola nodulosa** (Gmelin) Height 20.0 mm, diameter 7.8 mm. USGS locality 19860. USNM 645485.	531
19,20.	**Conomitra** species A Height 16.9 mm, diameter 8.6 mm. USGS locality 18411. USNM 645486.	532
21.	**Jaspidella sanctidominici** (Maury) Height 12.7 mm, diameter 5.0 mm. USGS locality 18411. USNM 645497.	526


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21

EXPLANATION OF PLATE 56

Figure		Page
1,2.	**Melongena melongena** (Linné) Height 38.3 mm. USGS locality 20432. USNM 645473.	521
3.	**Fusinus** species Height 44.0 mm, diameter 15.3 mm. USGS locality 18411. USNM 645474.	523
4-6.	**Fasciolaria (Pleuroploca) turamensis,** n. sp. 4,5. Holotype. Height 56.3 mm, diameter 28.5 mm. Locality RR 230. No. H 15243. 6. Paratype. Height 50.4 mm, diameter 29.0 mm. Locality RR 230. No. H 15244.	522
7.	**Oliva trinidadensis** Maury Lectotype. Height 14.2 mm, diameter 7.8 mm. Locality: milepost 49 3/4 (new mileposts!) of the Southern Main Road of Trinidad, just south of the Pitch Lake (= USGS locality 21782). Cornell Univ., Paleont. Museum, unnumbered.	525
8.	**Oliva (Oliva) couvana** Maury Height 47.3 mm, diameter 19.3 mm. USGS locality 18634. USNM 645475.	525

EXPLANATION OF PLATE 57

Figure Page

1-4. **Prunum (Prunum) dallianum** (Maury) 533
1,2. Lectotype. Height 20.3 mm, diameter 13.2 mm. Locality: on coast 1000 feet west of Brighton pier near Pitch Lake, Trinidad. Cornell Univ., Paleont. Museum, unnumbered. 3,4. Paralectotype. Height 21.6 mm, diameter 13.1 mm. Locality: on coast 1000 feet west of Brighton pier near Pitch Lake, Trinidad. Cornell Univ., Paleont. Museum, unnumbered.

5,6. **Prunum (Egouena) springvalense** (Maury) 534
Height 34.4 mm, diameter 20.4 mm. USGS locality 18634. USNM 645476.

7,8. **Bullata maiae** (Maury) 538
Height 66.1 mm, diameter 36.0 mm. USGS locality 20429: 1700 feet southwest of Philippine Estate, Savaneta River area, Trinidad. USNM 645469.

9,10. **Prunum (Egouena) calypsonis** (Maury) 534
Height 22.6 mm, diameter 12.5 mm. USGS locality 18634. USNM 645487.

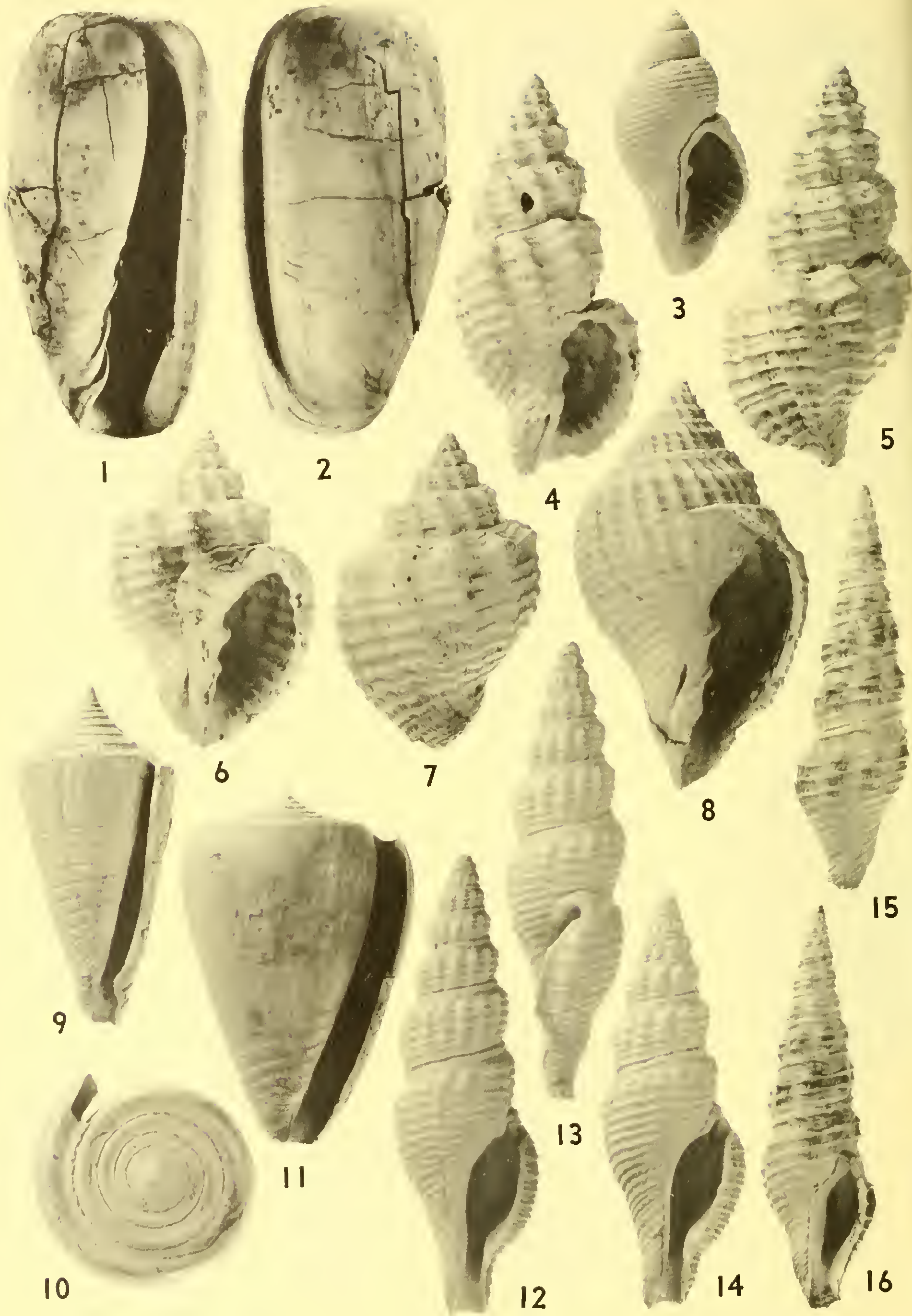
11,12. **Persicula (Rabicea) cf. interruptolineata** (Megerle von Mühlfeld) 537
11. Height 13.6 mm, diameter 10.7 mm. Locality RR 230. No. H 15277. 12. Height 10.8 mm, diameter 7.8 mm. Locality RR 230. No. H 15278.

13-15. **Persicula (Rabicea) couviana** (Maury) 536
13. Height 15.8 mm, diameter 11.0 mm. USGS locality 18634. USNM 645489. 14,15. Height 13.1 mm, diameter 9.0 mm. USGS locality 18634. USNM 645488.

16. **Volvarina** (?) species B 535
Height 14.0 mm, diameter 7.1 mm. USGS locality 20432. USNM 645491.

17. **Volvarina** (?) species A 536
Height 15.8 mm, diameter 7.7 mm. USGS locality 18634. USNM 645490.


1
2
3
4
5
7
9
10
11
13
6
8
15
14
12
16
17

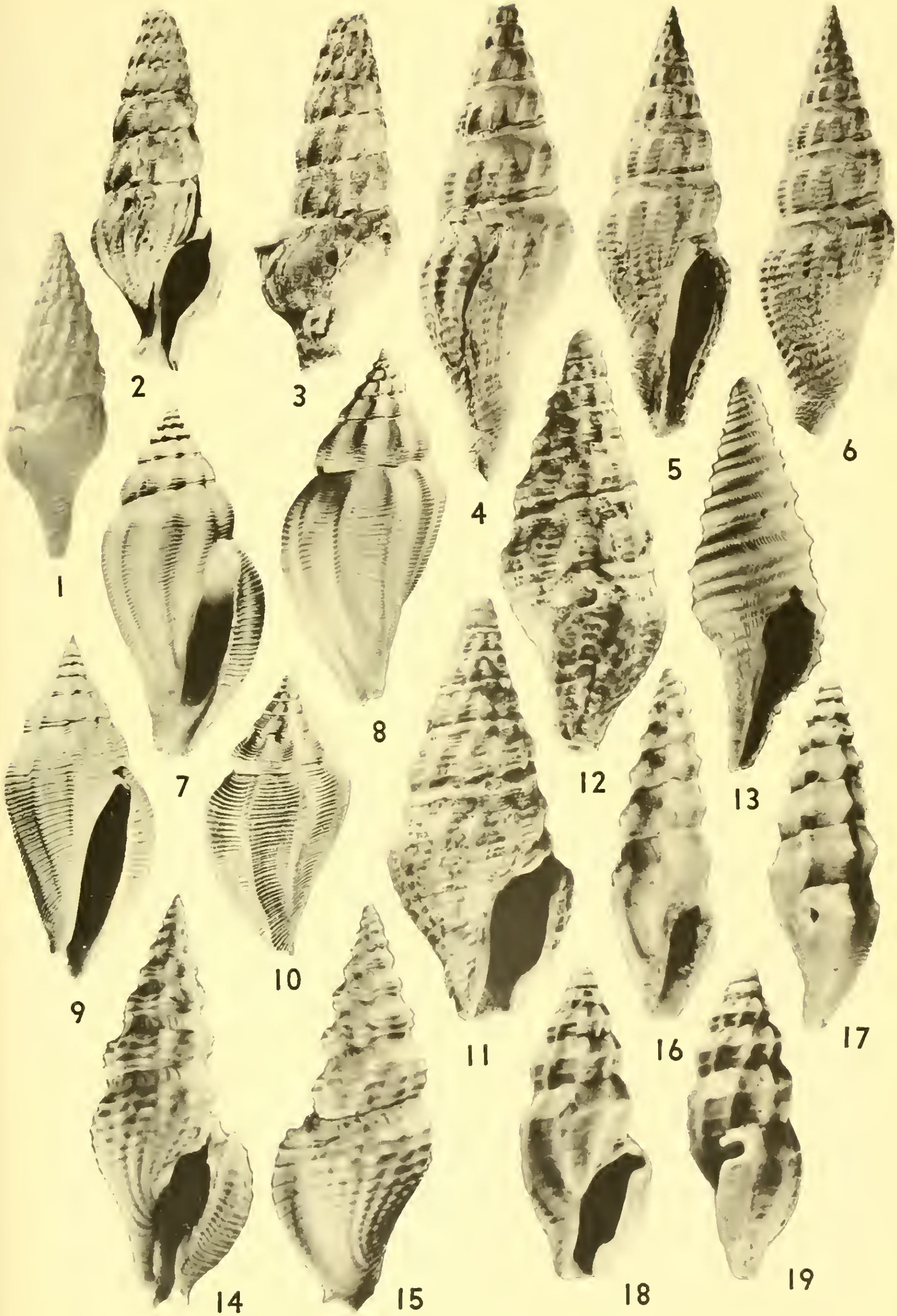


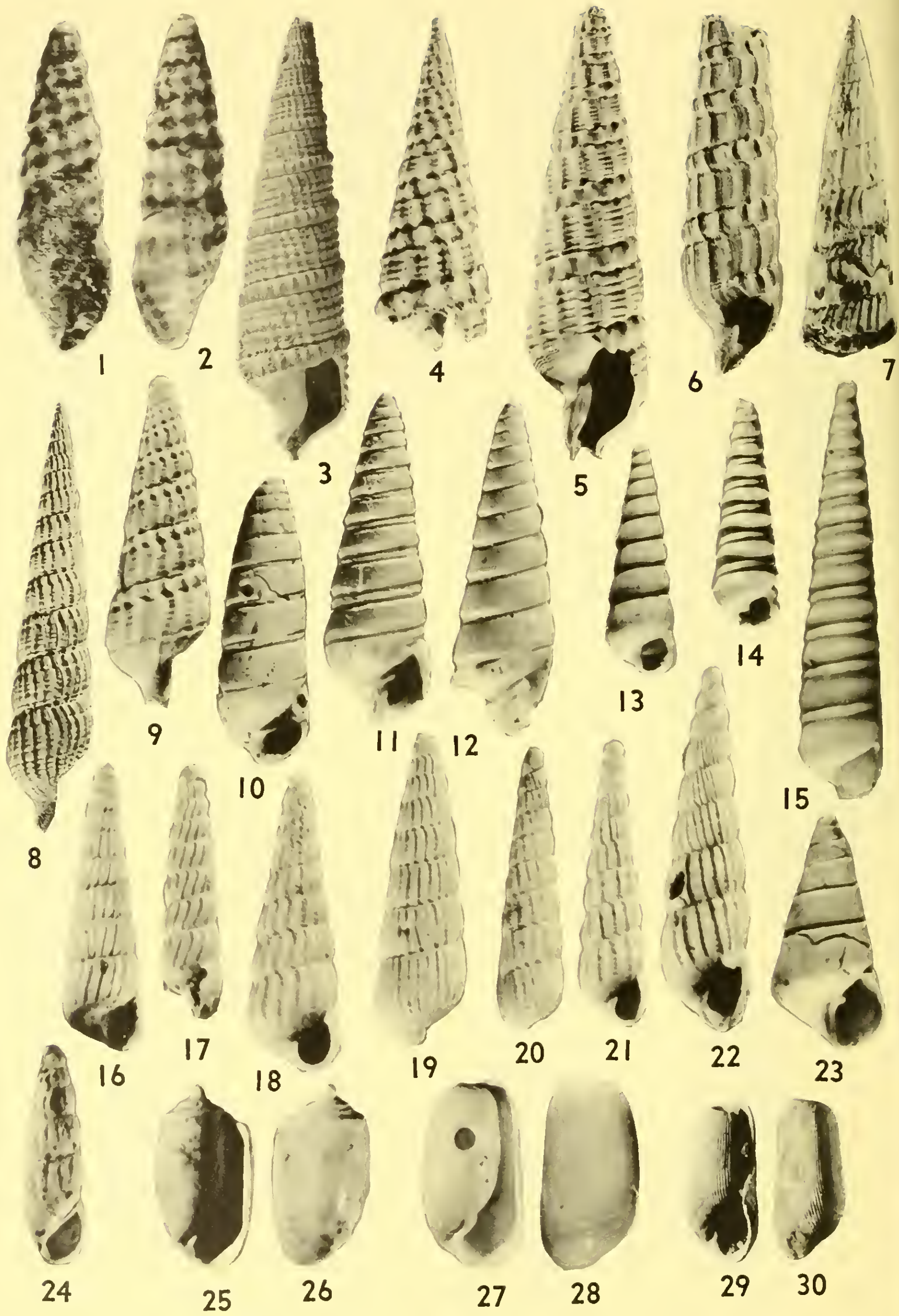
EXPLANATION OF PLATE 58

Figure		Page
1,2.	**Bullata maturensis,** n. sp. Holotype. Height 40.0 mm, diameter 19.5 mm. Locality RR 230. No. H 15270.	538
3.	**Cancellaria (Charcolleria)** species Height 20.6 mm, diameter 10.1 mm. USGS locality 18634. USNM 645492.	542
4,5.	**Cancellaria (Narona) semota,** n. sp. Holotype. Height 17.7 mm, diameter 8.0 mm. USGS locality 21178. USNM 645498.	541
6,7.	**Cancellaria (Euclia) montserratensis** Maury Height 28.5 mm, diameter 18.4 mm. USGS locality 18634. USNM 645477.	539
8.	**Cancellaria (Euclia)** cf. **codazzii** Anderson Height 37.2 mm, diameter 21.3 mm. USGS locality 21178. USNM 645478.	541
9.	**Conus springvaleensis** Mansfield Height 30.4 mm, diameter 14.3 mm. USGS locality 18634. USNM 645479.	544
10,11.	**Conus couvaensis** Vokes Height 31.7 mm, diameter 21.0 mm. USGS locality 18634. USNM 645480.	545
12-14.	**Miraclathurella ralla,** n. sp. 12,13. Holotype. Height 15.6 mm, diameter 4.8 mm. USGS locality 18399. USNM 645505. 14. Paratype. Height 14.1 mm, diameter 5.0 mm. USGS locality 21178. USNM 645506.	556
15,16.	**Carinodrillia meraca,** n. sp. Holotype. Height 17.8 mm, diameter 5.0 mm. USGS locality 21178. USNM 645499.	547

Explanation of Plate 59

Figure		Page
1-3.	**Agladrillia** (?) **lassula,** n. sp. 1. Paratype. Height 14.4 mm, diameter 4.3 mm. USGS locality 21178. USNM 645500. 2,3. Holotype. Height 16.4 mm, diameter 6.5 mm. Locality Hutch 47. No. H 15311.	550
4.	**Crassispira (Crassispira)** cf. **caroniana** (Maury) Height 44.0 mm, diameter 13.7 mm. Locality PJ 285. No. H 15316.	548
5,6.	**Crassispira (Crassispira) faceta,** n. sp. Holotype. Height 39.5 mm, diameter 12.2 mm. Locality RR 230. No. H 15317.	548
7-10.	**Lepicythara disclusa,** n. sp. 7,8. Holotype. Height 16.0 mm, diameter 7.1 mm. Locality PJ 285. No. H 15291. 9. Paratype. Height 15.3 mm, diameter 7.2 mm. Locality PJ 285. No. H 15292. 10. Paratype. Height 12.7 mm, diameter 6.7 mm. Locality PJ 285. No. H 15293.	551
11,12.	**Crassispira (Crassispirella) ritanida** (Mansfield) Height 9.6 mm, diameter 4.2 mm. Locality RR 230. No. H 15301.	549
13.	**Polystira** species B Height 8.9 mm, diameter 3.4 mm. Locality PJ 285. No. H 15321.	546
14,15.	**Glyphostoma sculptile,** n. sp. Holotype. Height 14.0 mm, diameter 5.4 mm. Locality EL 1810. No. H 15304.	557
16,17.	**Ithycythara hilaris,** n. sp. Holotype. Height 5.9 mm, diameter 2.0 mm. Locality PJ 285. No. H 15294.	553
18,19.	**Adelocythara** (?) **micropleura** (Guppy) Height 5.2 mm, diameter 2.2 mm. Locality JS 67. No. H 15297.	554


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30

Explanation of Plate 60

Figure		Page
1,2.	**Glyptaesopus** species Height 5.5 mm, diameter 1.6 mm. Locality JS 67. No. H 15395.	555
3.	**Strioterebrum** cf. **gatunense** (Toula) Height 40.1 mm, diameter 10.6 mm. USGS locality 18634. USNM 645481.	558
4-6.	**Strioterebrum** aff. **laevifasciola** (Maury) 4. Height 11.4 mm, diameter 4.2 mm. Locality EL 1810. No. H 15326. 5. Height 20.5 mm, diameter 5.6 mm. Locality PJ 285. No. H 15327. 6. Height 16.4 mm, diameter 4.4 mm. Locality PJ 285. No. H 15334.	558
7.	**Hastula** aff. **hastata** (Gmelin) Height 15.2 mm, diameter 4.3 mm. Locality RR 230. No. H 15283.	561
8,9.	**Strioterebrum** aff. **baculiforme** (Pilsbry and Johnson) 8. Height 19.6 mm, diameter 3.8 mm. Locality PJ 285. No. H 15338. 9. Height 5.5 mm, diameter 1.7 mm. Locality PJ 285. No. H 15339.	560
10.	**Pyramidella** (Longchaeus ?) species A Height 10.0 mm, diameter 3.2 mm. Locality RR 230. No. H 15346.	561
11.	**Pyramidella (Callolongchaeus)** aff. **jamaicensis** Dall Height 7.6 mm, diameter 2.4 mm. Locality PJ 285. No. H 15347.	562
12.	**Pyramidella (Callolongchaeus)** cf. **diademata** Maury Height 5.5 mm, diameter 1.8 mm. Locality PJ 285. No. H 15353.	563
13.	**Eulimella (Eulimella)** species A Height 3.1 mm, diameter 0.9 mm. Locality KR 11862. No. H 15358.	564
14,15.	**Eulimella (Ebalina) mitis,** n. sp. 14. Paratype. Height 3.1 mm, diameter 0.8 mm. Locality PJ 285. No. H 15363. 15. Holotype. Height 5.6 mm, diameter 1.1 mm. Locality PJ 285. No. H 15362.	565
16,17.	**Turbonilla** species A 16. Height 3.9 mm, diameter 1.0 mm. Locality RR 230. No. H 15366. 17. Height 3.4 mm, diameter 0.8 mm. Locality RR 230. No. H 15367.	566
18.	**Turbonilla** species B Height 4.0 mm, diameter 1.3 mm. Locality EL 1810. No. H 15374.	567
19.	**Turbonilla** species C Height 7.0 mm, diameter 2.1 mm. Locality JS 67. No. H 15378.	567
20,21.	**Turbonilla** species D 20. Height 3.8 mm, diameter 0.9 mm. Locality KR 11862. No. H 15382. 21. Height 3.9 mm, diameter 0.8 mm. Locality PJ 285. No. H 15383.	567
22.	**Turbonilla** species E Height 5.0 mm, diameter 1.2 mm. Locality PJ 285. No. H 15388.	568
23.	**Odostomia canaliculata** C. B. Adams ? Height 3.2 mm, diameter 1.6 mm. Locality RR 230. No. H 15355.	568
24.	**Odostomia (Salassia ?)** species Height 3.0 mm, diameter 0.8 mm. Locality RR 230. No. H 15365.	569
25,26.	**Acteocina canaliculata** (Say) ? Height 2.4 mm, diameter 1.3 mm. Locality PJ 302. No. H 14551.	570
27,28.	**Cylichnella altera,** n. sp. Holotype. Height 2.6 mm, diameter 1.4 mm. Locality KR 11862. No. H 14550.	571
29,30.	**Sulcoretusa** aff. **sulcata** (d'Orbigny) Height 2.2 mm, diameter 1.0 mm. Locality PJ 285. No. H 14558.	572

Index of genera and species.

D

U

V