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A RELICT NEOGENE CAENOGASTROPOD FAUNA
FROM NORTHERN SOUTH AMERICA

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ABSTRACT

A previously unknown relict Neogene gastropod fauna has been found to exist in shallow water near upwelling systems along northern Colombia and Venezuela. Forty-five relict caenogastropods of the families Turritellidae, Calyptraeidae, Naticidae, Cypraeidae, Cassidae, Ficidae, Muricidae, Columbellidae, Buccinidae, Fasciolariidae, Olividae, Mitridae, Volutomitridae, Volutidae, Marginellidae, Cancellariidae, Conidae, Terebridae, and Turridae, are redescribed and their Recent and fossil distributions outlined. Also reported from the upwelling areas are the paciphilic genera *Agladrillia, Aphera,* and *Truncaria,* and the relict Neogene genera *Conomitra, Panamurex* s.s., and *Paraborsonia.* Based on the unusual ecological conditions in which the relicts have been found to be living and on their paleozoogeography, the hydrographic and substrate parameters of the Neogene southern Caribbean are conjectured. A possible ecological barrier to tropical molluscivorous predation is proposed as an explanation for the existence of several thin-shelled, shallow water relict gastropods.

INTRODUCTION

To both the systematist and the zoogeographer, the Recent shallow water inner shelf (0–100 m) molluscan fauna of northern South America is an enigma. Although still poorly known and never completely surveyed, this area contains a remarkable fauna with an unusually high degree of endemism. Not only are many of the mollusks of the northern South American coastline restricted to that area, they also show few affinities with mollusks from the surrounding Caribbean region. The existence of this anomalous faunal pocket in the center of the Caribbean Molluscan Province has generated many unanswered questions about the origin of the tropical western Atlantic molluscan fauna and its relationship to other faunas around the world.

I first became interested in the northern South American mollusks during a series of collecting trips starting in 1974 and ending in 1979. During this time, I had several opportunities to work on Colombian and Venezuelan commercial shrimp boats and was able to sample a large number of previously unexplored offshore areas. Since the shrimp fleets are restricted to their own national territorial waters, the sample areas were limited to the Colombian and Venezuelan continental

shelves. Within this sampling area, however, a particularly interesting molluscan assemblage was encountered. As the shrimpers moved up the coast of Colombia toward the Guajira Peninsula, large numbers of unusual mollusks were taken with increasing regularity. The numbers of species seen in the net hauls reached maximum level in the area of the Golfo de Venezuela, Peninsula de Paraguaná, and Golfo de Triste, Venezuela. A rich molluscan fauna was encountered along this coast, containing a large proportion of previously unknown living species. Upon resumption of my research work at the University of Miami in 1976, I had the opportunity to work with the R/V Pillsbury expedition collections taken during cruises along the Colombian and Venezuelan coasts in 1966 and 1968. These extensive collections supported my findings and added several more anomalous mollusks to a rapidly growing species list.

The unexpectedly large number of species of mollusks of all classes from the area around the Golfo de Venezuela made it necessary to restrict the scope of my studies. The paper presented here deals only with the higher prosobranch gastropod families containing members with average adult shell lengths of over 15 mm. Even with this restriction, the caenogastropod families covered in,

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this study are still among the best indicators of the distribution of shallow water benthic assemblages. As highly specialized animals, they are often tightly restricted in their habitat preferences and, for this reason, are a powerful tool for determining zoogeographic patterns. These families are also well represented in the fossil record of the Caribbean region, and are excellent organisms for tracing the evolutionary trends in the western Atlantic.

When I began to analyze the material from my field work and that of the R/V Pillsbury collections, it became apparent that a considerable part of the Colombian and Venezuelan caenogastropods could not be assigned to any known Recent fauna. A review of the literature of the Caribbean fossil mollusks showed that these living gastropods were, in fact, previously unknown Miocene and Pliocene relicts. From the diversity of this relict fauna, it became evident that Plio-Pleistocene glacial sea level fluctuations and temperature changes failed to destroy completely all Neogene shallow water molluscan assemblages in the Caribbean region. As pointed out by myself (1976: 323-325) and Vermeij (1978: 231–237), the shallow water area along northern South America has acted as a refugium. The full extent and size of the fauna of this refugium, however, was previously unknown and greatly underestimated. The following description of an extant Neogene molluscan assemblage, together with a review of the literature on the Recent and fossil caenogastropods of northern South America, sheds more light on the spatial and temporal heterogeneity of the Recent tropical western Atlantic molluscan fauna.

MATERIALS AND METHODS

Collections studied

The specimens of the relict caenogastropods that form the framework of this study are part of four collections. The first of these comprised several hundred lots taken by myself while shore collecting and working on shrimp boats along the Colombian and Venezuelan coasts from 1974 to 1979. This collection was divided and deposited at the National Museum of Natural History, Smithsonian Institution, and in the Invertebrate Museum collection of the Rosenstiel School of Marine and Atmospheric Science, University of Miami.

The second was that of the R/V Elliott Pillsbury, taken as part of two oceanographic surveys of the southern Caribbean in 1966 and 1968 and is housed in the Invertebrate Museum of the Rosenstiel School. It represents several thousand lots of wet and dry, sorted and unsorted material.

The third collection used was that of the Universidad Simón Bolívar Marine Laboratory at Puerto Cabello, Venezuela, and was examined by me in March, 1979. This largely unsorted collection contains several hundred lots of caenogastropods, with most of the specimens coming from the shrimp trawlers that fish the adjacent Golfo de Triste. Dr. P. Penchaszadeh, Director of the laboratory, kindly donated a large number of specimens and these are now housed at the Smithsonian Institution along with my original study collection. Considering the small size of the collection, it contained a disproportionately large number of relict species. These specimens indicate the large size of the poorly-known Golfo de Triste relict pocket.

In March, 1979, I studied the extensive collection of fossil and Recent material of Dr. and Mrs. J. Gibson-Smith, of Caracas, Venezuela. Within this collection were housed several thousand lots of caenogastropods, including virtually complete collections of the gastropods of the Cabo Blanco, Mare, and Cantaure formations. The Gibson-Smiths kindly donated a number of important specimens which now reside in the Smithsonian Institution mollusk collection. Access to both this collection and that of the Universidad Simón Bolívar Marine Laboratory enabled me to compare Recent Golfo de Triste material with well-preserved fossils. Many of my initial species determinations came from these comparisons.

Collecting was limited to a depth range of 0–100 m. These depths incorporate, in an oceanographic sense, a shallow water range and encompass the range of my shore collecting, shrimp boat work, and the pertinent R/V Pillsbury stations. The R/V Pillsbury collections were taken with 10 and 40 foot otter trawls following one-half to one hour hauls. The stations are given in Appendix 1. The commercial shrimp boats working along northern South America use two 10 foot otter trawls much like those of the R/V Pillsbury, but usually haul them for three to six hours, running at about 1–2 knots. The collected material is then sorted on deck.

Shore collecting involved either beach collecting, as was done along the Colombian coast near Cartagena and Riohacha, or by

wading in shallow bays, such as Bahía Amuay on the Peninsula de Paraguaná, Venezuela (Petuch, 1976). This limited means of collecting was a result of the extremely turbid water conditions along this coast which, in turn, prevents skin or SCUBA diving.

Methods of analysis

For positive identification, the relicts were compared to fossil specimens either in the literature or in the Gibson-Smith collection. Particularly useful were the works of Jung (1965, 1969), Woodring (1959, 1964, 1970), and Weisbord (1962), all of which clearly illustrate and describe the fossil holotypes of many of the extant species. Pflug's 1969 study was the most valuable comparison work because of its illustrations of the lectotypes of Sowerby's Santo Domingo fossils. The relicts collected along the Colombian and Venezuelan coasts are illustrated here to permit comparison with the specimens, fossil and living, illustrated in other works.

Abbreviations used in this study include:

UMML—Invertebrate Museum Collection, Rosenstiel School of Marine and Atmospheric Science, University of Miami.
USNM—Collection of the Division of Mollusks, National Museum of Natural History, Smithsonian Institution.
P-000—R/V John Elliott Pillsbury station number.

LITERATURE ON THE SYSTEMATICS OF THE NORTHERN SOUTH AMERICAN CAENOGASTROPODS

Very little work has been done on the systematics of the Recent shallow water caenogastropod fauna of the Colombian and Venezuelan coasts. Dautzenberg (1900) was the first to publish on the molluscan fauna of this area, using material from the cruise on the yacht "Chazalie." Clench, in the *Johnsonia* series of monographs starting in 1941, published scattered records and single species descriptions for many caenogastropod families; particulary noteworthy were the works on the Conidae (1942, 1953), Muricidae (1945) (with Pérez Farfante) and (1959), Thaididae (1947), and Cassidae (1944). Most of his material came from private collectors who had visited

the area over the early decades of this century. Much of this material is deposited in the Museum of Comparative Zoology, Harvard University, and in the National Museum of Natural History and was Clench's primary source of southern Caribbean records during the war years of 1941–1945.

No compendium or species checklist was undertaken for the Colombian and Venezuelan coastlines until 1962 when Rehder published the first survey of the area in his study of the mollusks of Los Roques and La Orchila Islands off the coast of Venezuela. In large monographic revisions of muricid genera, Bullis (1964), E. Vokes (1967a, b, 1968, 1974, 1975) and Gertman (1969) included new species from Colombian and Venezuelan waters. The Cassidae of northeast Venezuela was outlined by Flores (1966) while Work (1969) continued Rehder's pioneer study by producing the first extensive checklist of the Los Roques molluscan fauna. This not only included a species list, as did Rehder's, but also covered aspects of the ecology and zoogeography of many of the species. The German biologists, Kaufmann & Götting (1970), working from the Instituto Colombo-Alemán at Santa Marta, Colombia, compiled the first species list of shallow water gastropods from the Colombian coast. This list is invaluable because of its excellent illustrations.

The 1970's saw an end to the incognita status of coastal northern South American waters. Bayer (1971) redescribed and illustrated several shallow water Colombian and Venezuelan muricids (pp. 151–169). The families Thaididae and Muricidae of the shallow waters of Venezuela were outlined in detail by Gonzalez & Flores (1972). In 1973, Flores (1973a, b) published two papers on the ecology and systematics of the family Littorinidae in Venezuela that clarified for the first time the morphologically conservative *Littorina ziczac* species complex. Also in 1973, J. Gibson-Smith outlined the living and fossil *Voluta* from the Venezuelan coast and described two new fossil species. The molluscan faunas of Isla Margarita, Isla Cubagua, and Isla Coche, Venezuela were surveyed by Princz (1973). His was the first work to correlate species assemblages with shallow water biotopes. J. Gibson-Smith & W. Gibson-Smith (1974) reviewed the Recent and fossil Venezuelan columbellids of the genus *Strombina* and described the second known living Atlantic species. Although outside the

scope of Venezuelan and Colombian waters, the species list published by Altena (1975) on the gastropods of Surinam is of particular interest to Caribbean workers. It not only illustrates the first known living Caribbean *Fusiturricula* but also describes and illustrates many gastropods from neighboring Venezuela and Colombia. The first compendium of Venezuelan mollusks, both fossil and living, was published by Tello in 1975. The caenogastropod section alone covers 132 pages and contains detailed species records and literature citations. The genus *Voluta* in Colombia was outlined in detail by von Cosel (1976), who also worked from the Instituto Colombo-Alemán, Santa Marta. He delineated a possible zoogeographic barrier near the mouth of the Rio Magdalena. Similarly, Vink (1977) described the Conidae of the *Conus cedonulli* species complex of the Southern Caribbean and described a new species endemic to the Santa Marta area. Based on the distributions of the various cone species, several zoogeographic barriers were also suggested. In 1979, I reviewed the relict cypraeid genus *Siphocypraea* and described a new Colombian-Venezuelan species. Following the examples of my predecessors, I incorporated into this study aspects of the ecology and zoogeography of the living siphocypraeas.

LITERATURE ON THE PALEONTOLOGY OF THE NORTHERN SOUTH AMERICAN CAENOGASTROPODS

In 1850, G. B. Sowerby I undertook the first review of the fossil gastropods of the Caribbean area. This landmark work described new species collected by Colonel Heneken in Santo Domingo. The tremendous diversity of the preglacial Caribbean region was further documented by Gabb (1860 and 1881) who described many new species from Costa Rica. In 1873 and 1875, he added more new taxa to Sowerby's original Santo Domingo species list. By far the most prolific of his contemporaries, R. J. L. Guppy published over forty works on Caribbean fossil mollusks between the years 1863 and 1911. Most noteworthy are his studies of the Jamaican fossils (1866 and 1873) and those of Trinidad (1909 and 1911). Maury (1912, 1917, and 1925) also described large numbers of new fossil gastropods from Santo Domingo and Trinidad.

These initial studies laid the groundwork for a rich literature, making the Caribbean Tertiary fossil gastropods one of the best-studied molluscan faunas in the New World. Following the works of Gabb, Olsson (1922 and 1942) further expanded on the fossils of Costa Rica and described many new Pliocene species. The apogee of early twentieth century paleontological studies was reached in Woodring's 1928 work on the Pliocene mollusks of the Bowden formation of Jamaica. Woodring's techniques and field experience culminated in his incomparable group of works on the Gatun formation of Panamá (1957, 1959, 1964, and 1970). Containing new species descriptions, faunal correlations, and paleoecological data, these five volumes together are the single most important contribution to the evolutionary history of the Caribbean mollusks. Although containing no new species descriptions, Pflug's 1961 study on the Santo Domingo caenogastropods is extremely important because of the illustrations of many unfigured lectotypes of Sowerby's species. Jung (1969), on the other hand, added to the faunal diversity of the Pliocene of Trinidad by describing many new caenogastropods. His works on the fossils of the poorly-known Peninsula de Paraguaná, Venezuela (1965), and Carriacou (1971) have facilitated the correlation of fossil assemblages from other areas of the Caribbean. The unusual Pliocene gastropod fauna of Ecuador was described in detail by Marks (1951) and Olsson (1964), as was that of the Isthmus of Tehuantepec, Mexico by Perrilliat-Montoya (1963). These works were particularly useful in the formation of my concept of provinciality in the preglacial Caribbean and in establishing provincial boundaries. Weisbord (1962) produced another large and important work on the upper Pliocene-Pleistocene gastropod faunas of northern Venezuela. This study described some of the youngest formations in the southern Caribbean and made it possible to correlate those faunas with the older assemblages outlined by Woodring and Olsson.

Besides the research on entire molluscan faunas, there are a number of important paleontological studies on specific southern Caribbean gastropod genera and families. Of particular importance to my work were the publications of Schilder (1939) and Ingram (1939, 1947a, b) on the Cypraeidae, Olsson (1965), J. Gibson-Smith (1976), and S. Hoerle & E. Vokes (1978) on the Volutidae, E. Vokes (1967a, b, 1968, 1970, 1974 and 1975) on the

Muricidae, J. Gibson-Smith & W. Gibson-Smith (1974) on the genus *Strombina*, and Hodson (1926) on the Turritellidae.

DISCUSSION

The Colombian-Venezuelan Neogene relict pocket represents the oldest known intact shallow water molluscan fauna in the western Atlantic. The Gulfs of Venezuela and Triste regions contain extant elements of several well-documented Neogene Caribbean fossil formations. Of the forty-five additional extant species reported in the following systematic section and shown here in Table 1, nineteen have also been found in the Bowden formation of Jamaica, fifteen in the Gurabo formation of Santo Domingo, seventeen in the Gatun formation of Panamá, four from the Grand Bay formation of Carriacou, and twelve from the Mare and Cabo Blanco formations of Venezuela. The widespread Neogene genera *Conomitra*, *Panamurex* s.s., and *Paraborsonia*, previously thought to have been extinct since preglacial times, have been found to be living components of the relict assemblage. The paciphilic genera *Agladrillia*, *Aphera*, and *Truncaria* are also present in the relict pocket and represent the first records of these taxa in the Recent Atlantic. The archaic genera *Fusiturricula*, *Siphocypraea*, *Strombina*, and *Subcancilla*, previously thought to be represented in the Caribbean by one or only a few species, have been found to be more diverse. These diversity trends, along with the presence of relict and paciphilic genera, emphasize the anachronistic aspect of the fauna and its closeness to the Recent Panamic Molluscan Province.

Table 1. Additional relict species from northern South America.

Turritellidae
1. *Turritella paraguanensis* F. Hodson, 1926

Calyptraeidae
2. *Crucibulum marense* Weisbord, 1962
3. *Crucibulum springvaleense* Rutsch, 1942

Naticidae
4. *Natica stenopa* Woodring, 1957

Cypraeidae
5. *Siphocypraea henekeni* (Sowerby, 1850)

Cassidae
6. *Morum dominguense* (Sowerby, 1850)
7. *Sconsia laevigata* (Sowerby, 1850)

TABLE 1 (Continued)

Ficidae
8. *Ficus pilsbryi* (B. Smith, 1970)

Muricidae
9. *Panamurex gatunensis* (Brown & Pilsbry, 1911)

Columbellidae
10. *Strombina caboblanquensis* Weisbord, 1962
11. *Strombina* sp.

Buccinidae
12. *Antillophos elegans* (Guppy, 1866)
13. *Truncaria* sp.

Fasciolariidae
14. *Latirus anapetes* Woodring, 1964
15. *Fusinus caboblanquensis* Weisbord, 1962
16. *Fusinus marensis* Weisbord, 1962

Olividae
17. *Ancilla venezuelana* Weisbord, 1962
18. *Ancilla* sp.
19. *Oliva schepmani* Weisbord, 1962

Mitridae
20. *Subcancilla illacidata* (Woodring, 1928)
21. *Subcancilla rhadina* (Woodring, 1928)
22. *Subcancilla venezuelana* (F. Hodson, 1931)

Volutomitridae
23. *Conomitra caribbeana* Weisbord, 1929
24. *Conomitra lehneri* Jung, 1971
25. *Conomitra* sp.

Volutidae
26. *Lyria* cf. *limata* S. Hoerle and E. Vokes, 1978

Marginellidae
27. *Persicula hodsoni* Weisbord, 1962

Cancellariidae
28. *Agatrix epomis* (Woodring, 1928)
29. *Aphera islacolonis* (Maury, 1917)

Conidae
30. *Conus consobrinus* Sowerby, 1850
31. *Conus planiliratus* Sowerby, 1850
32. *Conus symmetricus* Sowerby, 1850

Terebridae
33. *Strioterebrum bowdenensis* (Woodring, 1928)
34. *Strioterebrum gatunensis kugleri* (Rutsch, 1934)
35. *Strioterebrum ischna* (Woodring, 1928)
36. *Strioterebrum quadrispiralis* (Weisbord, 1962)
37. *Strioterebrum trispiralis* (Weisbord, 1962)

Turridae
38. *Polystira barretti* (Guppy, 1866)
39. *Agladrillia lassula* Jung, 1969
40. *Hindsiclava consors* (Sowerby, 1850)
41. *Fusiturricula acra* (Woodring, 1970)
42. *Fusiturricula humerosa* (Gabb, 1873)
43. *Fusiturricula iole* Woodring, 1928
44. *Fusiturricula jaquensis* (Sowerby, 1850)
45. *Paraborsonia varicosa* (Sowerby, 1850)

In Appendix 2, I give a list of known large caenogastropod species from the Golfo de Triste and Golfo de Venezuela areas, this being gleaned from the pertinent literature and personal communications and observations. Of the 97 known species listed in this appendix, 19 species, *Siphocypraea donmoorei, S. mus, Calotrophon velero, Phylonotus margaritensis, Murex donmoorei, Mazatlania aciculata, Strombina pumilio, Fusinus closter, Ancilla glabrata, A. tankervillei, Oliva oblonga, Olivella perplexa, Persicula tessellata, Prunum glans, P. pulchrum, Conus optabilis, C. undatus, Clathodrillia gibbosa,* and *Hindsiclava chazaliei,* are restricted to northern South America, and in particular, the Colombian-Venezuelan coasts. When the 45 additional relicts given in the systematic section are added to this species list, it can be seen that roughly 46% of the large caenogastropods are Neogene relicts confined to the soft bottom community of the upwelling areas. This percentage would be even larger if the allopatric intertidal components, such as the littorinids and thaidids, were removed.

The survival of the relict pocket into the Recent as an intact entity is probably a function of the substrate and hydrographic conditions that are unique to northern South America. As shown by Meyer (1977: 45–71), this area is influenced by four continuous wind-driven upwelling systems (Fig. 130) and contains cold, atypical Caribbean water. The substrate of the Gulf of Venezuela area is also atypical for the continental Caribbean, containing large amounts of coarse quartz sands (Schuchert, 1935: 652–653) and turbid water conditions due to erosion of the Pleistocene fluvially deposited coastline (Petuch, 1979: 221). The Peninsulas of the Guajira and Paraguaná, together the center of distribution of the relict fauna, are desert areas with little or no river input and few mangrove environments. Nutrient enrichment of coastal waters of this area, therefore, derives from the upwellings and not from terrigenous input.

The cold, turbid water and non-reef environment of the northern South American coast most probably acts as a physiological and ecological barrier to typical tropical Caribbean molluscivorous predators. This possible predation barrier may explain why such extremely thin-shelled relict species as *Turritella paraguanensis, Natica stenopa, Siphocypraea mus, Siphocypraea henekeni, Ficus pilsbryi, Ancilla venezuelana, Oliva schep-*

mani, Agatrix epomis and *Strioterebrum ischna,* can exist in abundance in shallow water within this region (Petuch, 1976: 322–325) but are not found elsewhere in the Caribbean area.

Extrapolating backwards through time, the atypical Caribbean environment of the Recent northern South American coast probably approximates what had been the typical shallow water marine environment of much of the Neogene southern Caribbean. This hypothesis seems defensible when considering that the fauna of the relict assemblage had once been widespread throughout the southern Caribbean, but is now found only in the geographically small area of the upwelling systems. Where tropical waters and carbonate substrate environments now predominate in the southern Caribbean, the Neogene fauna is extinct and replaced by a widespread post-Pleistocene-Holocene fauna. On the other hand, where the environment comprises turbid, nutrient-rich water with temperatures below 25°C and a substrate of silicoclastic sediments, a typical Neogene southern Caribbean gastropod assemblage is still extant (Vermeij, 1978: 231–236).

The northern South American Neogene environment and its accompanying relict fauna is geographically well-defined. In the west, the carbonate and coral reef environment of the San Blas Islands, Panamá, acts as an effective barrier to the Neogene shallow water relicts. In the east, the extensive brackish water estuary at the mouth of the Orinoco River also acts as an effective barrier, limiting most of the relict forms. Only *Fusiturricula jaquensis* and possibly *Sconsia laevigata* (as *S. nephele*) have been reported from outside these geographical and physiological boundaries. Offshore islands, such as the Netherlands Antilles, Las Aves, and Los Roques, all have extensive coral reef growth, lack continuous upwelling systems, and contain a more typical Caribbean-West Indian gastropod fauna. No Neogene relicts have yet been reported from any of these island groups or their associated carbonate environments.

Philosophically, the relict pocket poses an interesting question; how can the ancestors of a group of animals still exist and retain an intact community structure while being surrounded, contemporaneously, by communities made up of their descendants? This can be clearly seen by the following species pairs—one being the supposed direct ancestor now found only in the communities com-

prising the relict pocket, and the other being the wide-ranging Caribbean descendant; *Morum dominguense-Morum dennisoni, Sconsia laevigata-Sconsia striata, Latirus anapetes-Latirus angulatus, Oliva schepmani-Oliva reticularis, Lyria limata-Lyria beaui, Conus consobrinus-Conus cedonulli, Conus planiliratus-Conus atractus,* and *Hindsiclava consors-Hindsiclava alesidota.* These mollusks occur contemporaneously, although allopatrically, within the same faunal province.

In summary, evolution has been greatly slowed in the gastropod fauna found along northern Colombia and Venezuela. Conversely, faunas in other areas of the Caribbean have undergone extremely rapid speciation since the beginning of the Pleistocene. The concept of a heterochronous Caribbean Province implies several modes of provincial differentiation and development. The homochronous sister Panamic Province probably represents an area of more evenly distributed evolutionary pressures, with a nearly homogeneous fauna within its boundaries. The Caribbean, on the other hand, represents an area that was exposed to differential speciation and extinction pressures. This has manifested itself along the northern South American coast as an intact but spatially reduced Neogene relict pocket surronded by a large cortex of post-Pleistocene-derived species.

SYSTEMATIC SECTION

Descriptions of Neogene relict
Caenogastropods

As briefly outlined in the literature section, the first detailed analysis and discussion of the Gatunian relict pocket was done by J. Gibson-Smith & W. Gibson-Smith in 1979. They recognized two Pliocene archaeogastropods, *Tegula puntagordana* Weisbord, 1962 and *Parviturbo venezuelensis* Weisbord, 1962 as extant along the Venezuelan coast. In their discussion of Weisbord's Pliocene caenogastropod taxa (1979: 24, 26), the Gibson-Smiths recognized two more extant species, *Fasciolaria hollisteri* Weisbord, 1962 (*F. tulipa* Linnaeus, 1758 variety?) and *Oliva schepmani* Weisbord, 1962. They synonymized three others as forms of Recent species; *Fusinus caboblanquensis* Weisbord, 1962 as a form of *F. closter* (Philippi, 1851),

Ancilla venezuelana Weisbord, 1962 as *A. tankervillei* (Swainson, 1825), and *Persicula hodsoni* Weisbord, 1962 as *P. interruptolineata* (Megerle von Mühlfeld, 1816). I recognize the last three taxa of Weisbord as valid relict species. These, along with *Oliva schepmani, Crucibulum marense, Strombina caboblanquensis, Fusinus marensis, Strioterebrum quadrispiralis,* and *S. trispiralis,* bring to a total of twelve the number of fossil gastropods described by Weisbord that can be shown to be extant.

Besides the five relict caenogastropods discussed by the Gibson-Smiths, two other relicts have been reported in the recent literature. These are *Agatrix epomis* (Woodring, 1928), shown to be extant along Venezuela by Petit (1976), and *Fusiturricula jaquensis* (Sowerby, 1850), recognized as still living off Surinam by Abbott (1974). This last relict was described as a new species of *Knefastia* (a genus not found in the western Atlantic) by Princz (1980: 70–72). A number of other well-known northern South American caenogastropods, all described from Recent specimens, were also shown by Weisbord (1962) to have existed in the Venezuelan Pliocene assemblages, and as such, constitute relict species. These include *Siphocypraea donmoorei* Petuch, 1979 (as *S. henekeni* variety), *Murex donmoorei* Bullis, 1960 (as *M. recurvirostris*), *Calotrophon velero* (E. Vokes, 1970) (as *"Latirus" recticanalis*), *Ancilla tankervillei* (Swainson, 1825), *Mazatlania aciculata* (Lamarck, 1822), *Conus puncticulatus* Hwass, 1792 (as *C. jaspideus caboblanquensis*), and *Clathodrillia gibbosa* (Born, 1778). As shown by myself (1979), Bayer (1971), E. Vokes (1970), and Vermeij (1978: 231–235), these species are restricted to the northern coast of South America and fall within the ranges of the other known relict species.
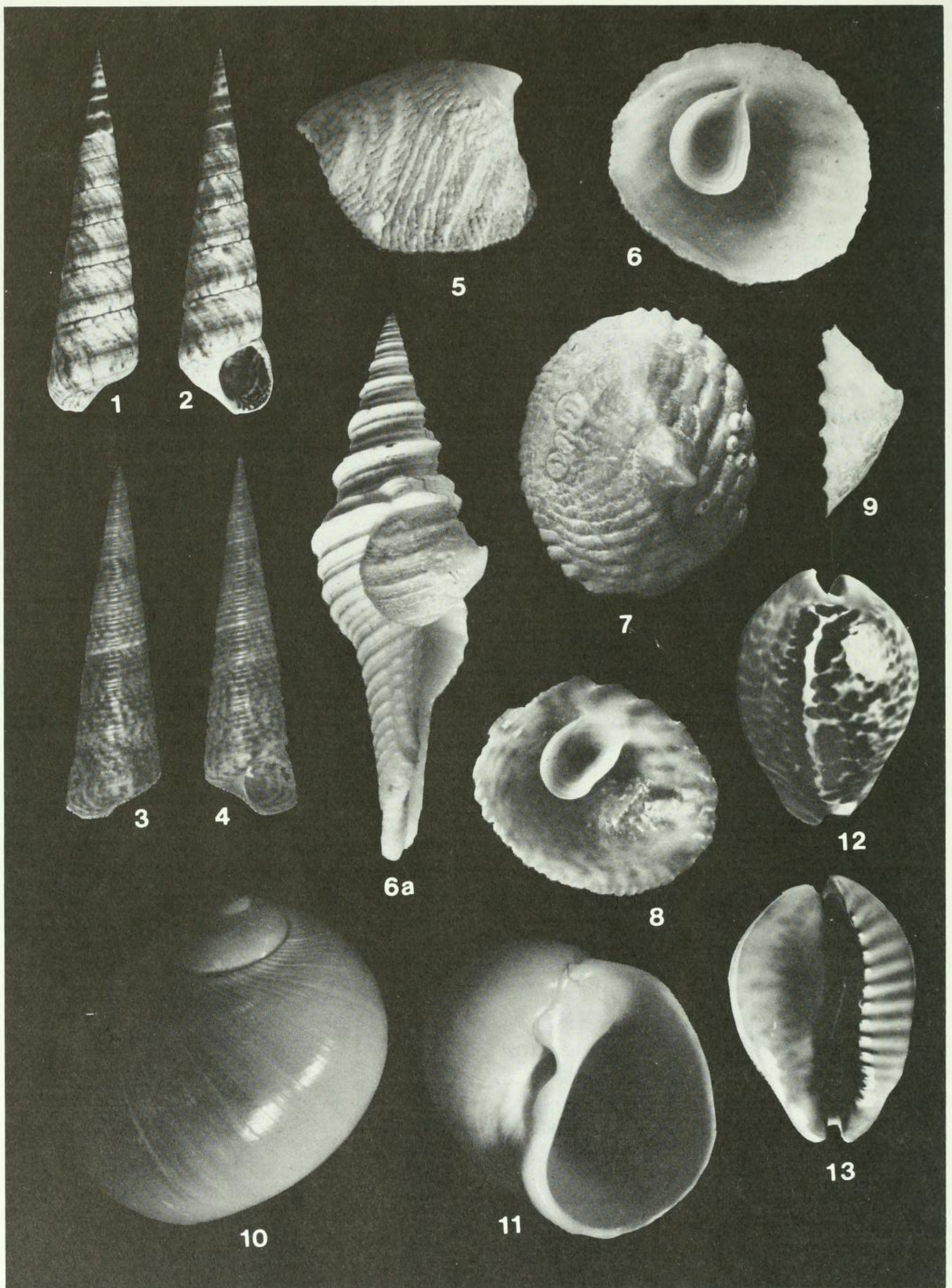
Adding to the preliminary works of Weisbord and the Gibson-Smiths, I herein redescribe several more previously unknown Neogene relict species.

Family Turritellidae
Genus *Turritella* Lamarck, 1799

1. *Turritella paraguanensis* Hodson, 1926
Figs. 1–2

Turritella variegata paraguanensis Hodson, 1926: 31, pl. 21, figs. 2, 7.

FIGS. 1–13. 1–2. *Turritella paraguanensis* Hodson: USNM 784451, L = 81 mm. 3–4. *Turritella variegata* (Linnaeus): P-712, L = 78 mm. 5–6. *Crucibulum marense* Weisbord: USNM 784452, L = 16 mm. 6a. *Crucibulum marense* attached to *Polystira barretti* shell. 7–9. *Crucibulum springvaleense* Rutsch: P-712, L = 18 mm. 10–11. *Natica stenopa* Woodring: USNM 784570, L = 29 mm. 12–13. *Siphocypraea mus* (Linnaeus): UMML 8278, L = 31 mm.

Turritella maiquetiana Weisbord, 1962: 146–150, pl. 11, figs. 1–16.

Material examined—5 specimens, lengths 75–85 mm, exposed at low tide, Amuay Bay, Paraguaná Peninsula, Estado Falcón, Venezuela, 21 March 1979, UMML 8276; 7 specimens, lengths 80–96 mm, same locality and date, USNM 784451.

Major citations—Redescribed in detail, with diagnosis, by Weisbord, 1962 (as *T. maiquetiana* n.sp.).

Additions to original description—Shell surface smooth, slightly shiny, with a silky texture; color variable, usually gray or bluish-gray with numerous fine revolving lines of black dots; some specimens deep blue-black; base color overlaid with intermittent vertical flammules of dark gray or black; dark specimens frequently with white or pale gray vertical flammules alternating with dark flammules.

Remarks—Although originally described as a subspecies of the Recent *T. variegata* (Linnaeus, 1758), *T. paraguanensis* is also a well-known member of Plio-Pleistocene assemblages throughout Venezuela (Weisbord, 1962: 146–147). Weisbord described (as *T. maiquetiana*) fossil specimens of *T. paraguanensis* from the Pliocene beds of the Playa Grande and Lower Mare formations. This description is important because of the emphasis on the form and structure of the early whorls and their use in separating *T. paraguanensis* from other known species.

Turritella paraguanensis belongs to a long and species-rich lineage that originated with the lower Miocene Venezuelan *T. berjadinensis* (Hodson, 1926, pl. 20, fig. 5) and the Miocene Colombian *T. cartagenensis* Pilsbry and Brown, 1917. In the Recent fauna, *T. paraguanensis* most closely resembles *T. banksi* Reeve, 1849 and *T. gonostoma* Valenciennes, 1832 from the Panamic Province. *Turritella variegata* (Figs. 3–4) is the only Atlantic species that shows any relationship to *T. paraguanensis*. The Venezuelan relict differs from *T. variegata* in being larger, by having a blue-gray ground color (like *T. gonostoma*), and by lacking the heavy spiral sculpturing of *T. variegata*. The shell outlines of the two species also differ consistently; that of *T. variegata* is straight-sided while *T. paraguanensis* is distinctly turreted due to the characteristically deeply impressed suture.

Fossil distribution—Playa Grande and Cabo Blanco formations, Venezuela.

Recent distribution—At present, known only from the Golfo de Venezuela, in shallow bays.

Family Calyptraeidae
Genus *Crucibulum* Schumacher, 1817

2. *Crucibulum (Dispotaea) marense*
Weisbord, 1962
Figs. 5–6a

Crucibulum (Dispotaea) marense Weisbord, 1962: 218, pl. 20, figs. 10, 11.

Material examined—Length 16 mm, width 15 mm, height 12 mm, attached to a living *Polystira barretti* trawled from 35 m depth off Cabo La Vela, Peninsula de Guajira, Colombia (12°10′N, 72°15′W), December, 1974, USNM 784452.

Additions to original description—Shell waxy, smooth; color uniform pale yellow-orange; internal cup translucent white.

Remarks—*Crucibulum marense* differs from most known Atlantic calyptraeids, both fossil and living, in having only a small portion of the margin of the internal cup adherent to the shell interior. In this respect, *C. marense* most closely resembles the Recent *C. personatum* Keen, 1958 from the Panamic Province. *Crucibulum waltonense* Gardner, 1947 from the Alum Bluff series of Florida and *C. ecuadorense* Olsson, 1932 from the Progreso formation of Ecuador are similar to *C. marense* in having the internal cup adherent to the shell interior; but their attachments are larger, often including over half of the margin of the internal cup.

The single living specimen of *C. marense* was found attached to the posterior columellar area, near the anal slit, of another relict species, *Polystira barretti* (Guppy, 1886). As can be seen in Fig. 5, the shell margin of *C. marense* corresponds perfectly to the body whorl of the *Polystira*. Interestingly enough, the unusual horizontally-arranged primary sculpture of *C. marense* also corresponds to the raised spiral cords on the body whorl of the turrid, and represents a xenomorphic growth pattern. Although the holotype of *C. marense* lacks the raised horizontal ribs of the Recent Colombian specimen, the structure of the protoconch, the shape and form of the internal cup, and the dichotomous fine surface are identical in both specimens. The presence of raised horizontal ribs appears to

be a response to living on the heavily sculp-
tured substrate of the turrid shell.

E. Vokes (in litt.) has suggested that this
and the following species may actually be
forms of *C. planum* Schumacher, a poorly-
known and "lost" species. Until the system-
atics of this complex group is better known
and since this shell is well-illustrated and de-
scribed in Weisbord's paper, I prefer to use
the taxon *C. marense* for the Venezuelan fos-
sil and living species.

Fossil distribution—Mare formation, Vene-
zuela.

Recent distribution—Known only from
35 m depth off the Peninsula de Guajira,
Colombia.

3. Crucibulum (Dispotaea) springvaleense
Rutsch, 1942
Figs. 7–9

Crucibulum springvaleense Rutsch, 1942:
138, pl. 4, fig. 8. Woodring, 1957: 83–84, pl.
19, figs. 8–10.

Material examined—Lengths 18 mm and
17 mm, P-712 (11°08′N, 63°18′W), 25 m
depth.

Major citations—Redescribed in detail, with
diagnosis, by Woodring, 1957.

Additions to original description—Shell
color pale yellow-tan to yellow-white with
radiating patches of reddish-brown dots and
flammules; color pattern readily visible on
both surfaces; internal cup translucent white,
one-third adherent to shell interior; external
surface with radiating raised ridges.

Remarks—The specimen illustrated here is
most probably a juvenile, as it is indistinguish-
able from the early stages of the fossil illus-
trated by Woodring (1957, pl. 19, figs. 8, 9).
Crucibulum springvaleense is similar to *C.
marense* but can be separated by having a
larger internal cup attachment and a different
color pattern. By having attached internal
cups, both *C. marense* and *C. springvaleense*
differ from the other northern South American
congener, *C. auricula* (Gmelin, 1791).

Fossil distribution—Springvale formation,
Trinidad; Turberá formation, Colombia; Gatun
formation, Costa Rica and Panamá.

Recent distribution—Known only from off
the Venezuelan coast, at depths of around
25 m.

Family Naticidae
Genus Natica Scopoli, 1777
Subgenus Naticarius Duméril, 1805

4. Natica stenopa Woodring, 1957
Figs. 10–11

Natica (Naticarius) stenopa Woodring, 1957:
85–86, pl. 20, figs. 4–6.

Material examined—Lengths 29 mm and
20 mm, trawled by commercial shrimp boats
from 35 m depth in Golfo de Triste, Venezuela
(11°42′N, 69°22.5′W), March, 1979, USNM
784570.

Additions to original description—Shell
pale cream-gray becoming gray on spire;
margin of suture white; interior of aperture
white with wide pale brown band.

Remarks—Although somewhat larger than
the fossil specimens illustrated by Woodring,
the two Recent specimens agree quite closely
with the illustrations of Woodring's types. The
specimen shown here has the characteristic
spire sculpture consisting of short, retractive
axial grooves that extend from the suture onto
the shoulder of later whorls.

Fossil distribution—Gatun formation,
Panamá.

Recent distribution—35 m depth in Golfo
de Triste, Venezuela.

Family Cypraeidae
Genus Siphocypraea Heilprin, 1886

The *Siphocypraea henekeni* species complex

The Tertiary South American and West
Indian *Siphocypraea* species complex has
been one of the more controversial groups in
Caribbean paleontological studies. As
abundant indicator organisms, members of
the genus are well-documented in the litera-
ture. During the last several decades, two dif-
ferent approaches have been taken by fossil
cypraeid workers, leading to two schools of
thought on speciation within the complex and
treatment of specific morphological char-
acters. One group, principally Maury (1925)
Schilder (1939), and Ingram (1939, 1940,
1947a, b), described several new species of
what appeared to be a close-knit complex
centered around the widespread *Sipho-
cypraea henekeni* (Sowerby, 1850). These
taxa were erected on what some workers

consider trivial, although consistent characters. The second group, including Woodring (1959), Pflug (1961), and Weisbord (1962), has argued that the species of Maury, Schilder, Ingram and others are to be considered intraspecific variants, or at best population variants, of a morphologically plastic *S. henekeni*.

Until 1979, only a single living species of the *S. henekeni* lineage, *S. mus* (Linnaeus, 1758), was known to exist. In that year, I described a second living species, *S. donmoorei*, from off the coasts of Colombia and Venezuela. It is now recognized that *S. donmoorei* is also present in the fossil record, as demonstrated by the specimen illustrated by Weisbord (1962, pl. 22, figs. 5, 6, as "*S. henekeni*"). In March of 1979, five specimens of another species of *Siphocypraea* were taken from off the Venezuelan coast. The anatomy of this *Siphocypraea* differed from the anatomies of the other two living species. The shell morphology of this third species compared very closely with specimens of *S. henekeni* illustrated by Woodring (1959, pl. 32, figs. 1, 4, 6, 9). It is now apparent that there are, in fact, three living species of *Siphocypraea*, with the five Venezuelan shells being representative of an extant population of the previously ubiquitous *S. henekeni*.

When the shell morphologies of *S. mus*, *S. donmoorei*, and *S. henekeni* are compared, no striking differences can be observed; this morphological conservatism is the principal reason why the shells of the three species had been confused for so long. When the living animals are compared, the three species can be easily separated. *Siphocypraea henekeni* has a uniformly bright orange-red animal, with long, unbranched mantle papillae (Fig. 129). The animal of *S. donmoorei* is white with only a few scattered patches of gray, while the mantle papillae are elongate and dendritic (Fig. 128). The gray and black-mottled *S. mus* has very reduced, wart-like papillae, these often being white or pale orange (Fig. 127).

Considering that the three extant *Siphocypraea* species have similar-looking shells but different animals, one has to view the supposed variants of *S. henekeni* in a different light. In all probability, the consistent morphologies seen in many of the fossil forms, such as the thickened dorsal callus of *S. lacrimula* (Maury, 1925) and the elongate

and flaring beaks of *S. projecta* (Ingram, 1947), represent full species characteristics and not merely variations within a single gene pool. Based on the biological evidence seen in the living species, I prefer to treat the taxa of Maury, Ingram, Schilder, etc., as full species and not as synonyms of *S. henekeni*. The anatomy and ecology of the well-known *S. mus* was outlined by Petuch (1979: 217–220). Since *S. donmoorei* is also a relict, it is included here to facilitate a comparison with the other two living species of *Siphocypraea*.

Siphocypraea donmoorei Petuch, 1979
Figs. 18–21

Cypraea (Muracypraea) henekeni, Weisbord, 1962 (non *C. henekeni* Sowerby, 1850), 236–238, pl. 22, figs. 5, 6.
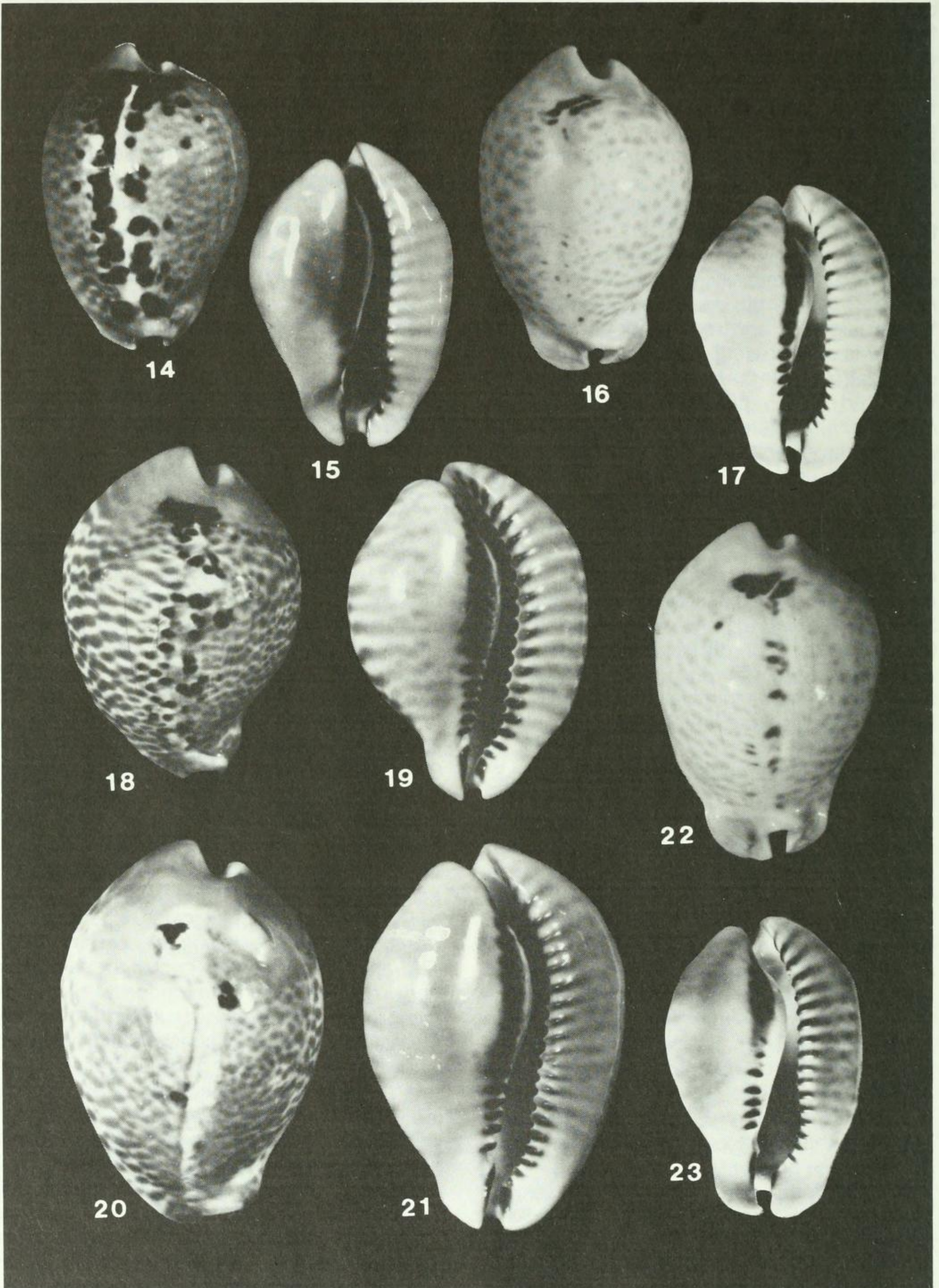*Siphocypraea donmoorei* Petuch, 1979: 216–225, pl. 1, figs. D-I.

Material examined—Holotype, USNM 770731, length 64 mm, 37 m depth off Cabo La Vela, Colombia (12°10'N, 72°15'W); length 55 mm, 39 m depth off Cartagena, Colombia (10°22'N, 75°47'W), UMML 8162; length 59 mm, 40 m depth in Golfo de Urabá, Colombia (8°38'N, 77°2'W), UMML 8161; length 55 mm, 30 m depth off Cartagena, Colombia, USNM 770732; length 60 mm, 37 m depth off Cabo La Vela, Colombia, USNM 784453.

Major citations—Detailed description of fossil specimens given by Weisbord, 1962 (as *C. henekeni* variety); living specimens described by Petuch, 1979.

Remarks—Morphologically, the shells of *S. donmoorei* and *S. henekeni* appear similar. The animals of the two species are, however, very different (as illustrated here). Upon closer examination, the shells of the two species do show some consistent differences, and these can be used in separating mixed lots of shells without the animals. The shell of *S. donmoorei* is larger than that of *S. henekeni* (67–75 mm average length as opposed to the 40–50 mm average length of *S. henekeni*), darker in color, and has a uniformly narrow, arcuate aperture. The labial and columellar dentition of *S. donmoorei* are coarser and more developed, but less numerous than the dentition of *S. henekeni*.

I had previously stated (Petuch, 1979: 224) that the cypraeid illustrated by Weisbord (1962, pl. 22, figs. 5, 6) probably represented

FIGS. 14–23. 14–15. *Siphocypraea mus* (Linnaeus): USNM 784454, L = 50 mm. 16–17. *Siphocypraea henekeni* (Sowerby): USNM 784455, L = 48 mm. 18–19. *Siphocypraea donmoorei* Petuch: USNM 770732, L = 55 mm. 20–21. *Siphocypraea donmoorei* Petuch (holotype): USNM 770731, L = 60 mm. 22–23. *Siphocypraea henekeni* (Sowerby): USNM 784455, L = 46 mm.

the ancestor of both *S. mus* and *S. donmoorei.* In March, 1979, I had the opportunity to study several similar specimens, taken from the same fossil deposits of Weisbord's, in the Gibson-Smith collection, Caracas, Venezuela. These fossil specimens are identical to living specimens of *S. donmoorei* taken from off the Guajira Peninsula of Colombia. Geologically, *S. donmoorei* is now known to range from the middle Pliocene to the Recent. The closely-related *S. mus* most probably represents a Pleistocene offshoot of the wide-ranging *S. donmoorei*; having become adapted to the *Thalassia*-based ecosystem of the Golfo de Venezuela region.

Fossil distribution—Mare and Playa Grande formations, Venezuela.

Recent distribution—Golfo de Urabá, along the Colombian coast and Peninsula de Guajira, into the Golfo de Venezuela off the Peninsula de Paraguaná, Venezuela, in depth ranging from 15–50 m.

5. *Siphocypraea henekeni* (Sowerby, 1850)
Figs. 16–17, 22–23

Cypraea henekeri Sowerby, 1850: 45, pl. 9, fig. 3.
Cypraea henekeni Gabb, 1873: 235. Emendation for *C. henekeri* Sowerby. Woodring, 1959: 194–196, pl. 31, figs. 6–10, pl. 32, figs. 1, 4, 6, 9. Pflug, 1961: 30–32. Petuch, 1979: 216–217, table 1. With discussion of Gabb's emendation.

Material examined—Lengths 48 mm and 46 mm, from 20 m depth in Golfo de Triste, Venezuela (11°42′N, 69°40′W), March, 1979, USNM 784455; length 37 mm, from 25 m depth off Punto Fijo, Golfo de Venezuela, Venezuela (11°52′, 70°22′W), March, 1979, USNM 784456; lengths 42 mm and 38 mm, from 20 m depth in Golfo de Venezuela, UMML 8277; preserved animals in mollusk collection of INTECMAR, Universidad Simón Bolívar, Caracas, Venezuela.

Major citations—Redescribed in detail, with synonymies, by Woodring, 1959 and Pflug, 1961.

Additions to original description—Color of dorsum pale bluish-white to light blue with numerous pale tan spots; spots distinctly separate and not coalescing; some specimens with pale brown bar-shaped markings along sides and dark brown or black patch on posterior and near apex; base of shell flattened, varying in color from dark tan to dark brown; pale dorsum color and dark base color meeting along flattened lateral margin; columellar and labial teeth dark chocolate brown; interior of aperture pale tan to yellow; dorsum of adult specimens with deeply incised central sulcus running from apex to anterior tip; beaks of adult specimens characteristically flaring, ear-like, greatly extended; living animal uniformly orange-red with elongate, simple mantle papillae.

Remarks—A comparison between the shell morphologies of *S. donmoorei* and *S. henekeni* is outlined in the previous species description. *Siphocypraea henekeni* differs from *S. mus* not only in coloration of the living animals and the structure of the mantle papillae but also in shell morphology. *Siphocypraea mus* has a darkly colored, inflated shell with weak labial dentition and poorly developed (and often absent) columellar dentition. The oddly-flattened, pale-colored shell of *S. henekeni* is in direct contrast, with the columellar dentition well developed and the labial dentition coarser and more numerous. Of the living *Siphocypraea*, the enlarged, flange-like beaks are unique to *S. henekeni*.

Fossil distribution—Bowden formation, Jamaica; Gurabo formation, Santo Domingo; Springvale formation, Trinidad; Cantaure and Punta Gavilán formations, Venezuela; Gatun formation, Panamá; Esmeralda formation, Ecuador; Gatun formation, Costa Rica.

Recent distribution—From Golfo de Venezuela to Golfo de Triste, Venezuela, at depths of 20–30 m.

Family Cassidae
Genus *Morum* Röding, 1798

6. *Morum (Oniscidia) dominguense* (Sowerby, 1850)
Figs. 24–25

Oniscia dominguensis Sowerby, 1850: 47, pl. 10, fig. 3.
Morum dominguense, Pilsbry, 1922: 363. Pflug, 1961: 37–38, pl. 7, figs. 9–12, pl. 8, figs. 1, 2, 5–7.
Morum dennisoni Bayer, 1971 (non Reeve, 1843): 140, fig. 16, lower two figures.

Material examined—Length 35 mm, P-772 (12°20.2′N, 71°55.1′W), 11 m depth.

Major citations—Redescribed in detail by Pflug, 1961, with illustration of lectotype (pl. 8, figs. 6, 7).
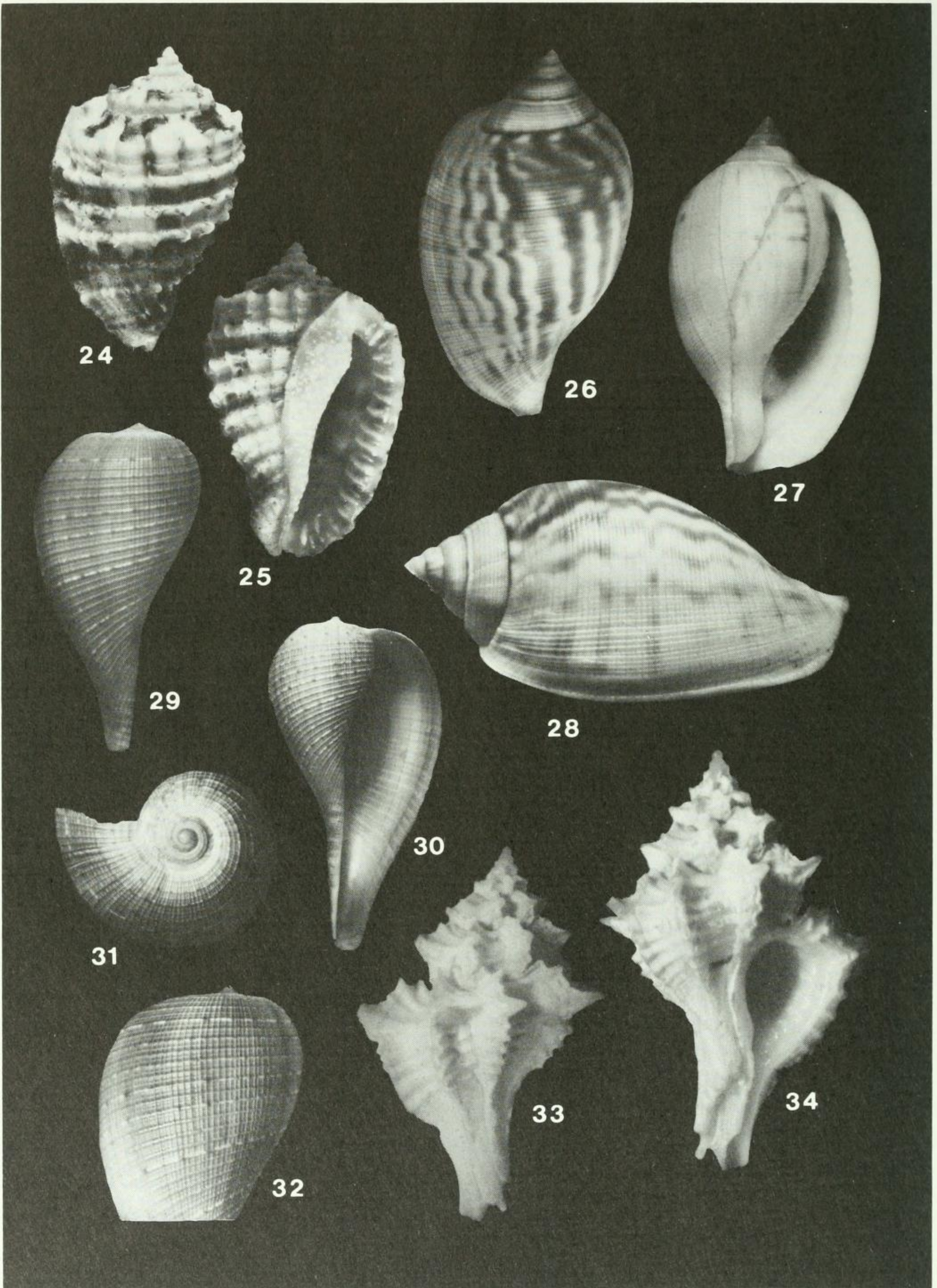
FIGS. 24–34. 24–25. *Morum dominguense* (Sowerby): P-772, L = 35 mm. 26–28. *Sconsia laevigata* (Sowerby): USNM 784457, L = 71 mm. 29–31. *Ficus pilsbryi* (B. Smith): USNM 784458, L = 76 mm. 32. *Ficus pilsbryi,* same specimen, showing detail of body whorl sculpture. 33–34. *Panamurex gatunensis* (Brown & Pilsbry): USNM 784571, L = 26 mm.

Additions to original descriptions—Shell color pinkish-white with scattered patches of bright pink; body whorl with two reddish-brown bands; spire with intermittent large reddish-brown patches; parietal shield salmon-pink with lavender border and white pustules; outer lip salmon-pink with numerous lavender-purple radiating bars; teeth of outer lip salmon-pink; interior of aperture white; protoconch and early whorls white.

Remarks—Bayer (1971, fig. 16, lower two figures) illustrated this species but considered it a variety of *Morum dennisoni* (Reeve). *Morum dominguense* differs from that species, however, in having a broader, tabulate spire, by having a smaller and less developed parietal shield, and by having larger and more developed labial teeth. The two species can also be differentiated by the colors of the parietal shields; *M. dennisoni* has a bright red-orange shield, while that of *M. dominguense* is a rich salmon-pink with lavender shadings.

Although the single known Recent specimen closely resembles the fossil illustrated by Pflug (pl. 8, figs. 1, 2) in both shape and sculpturing, it differs in having more varices per whorl (12 in the fossil, 16 in the Recent specimen). Otherwise, the fossil and living forms are virtually indistinguishable.

Fossil distribution—Gurabo formation, Santo Domingo; Bowden formation, Jamaica; Gatun formation of Costa Rica and Panamá.

Recent distribution—Known only from off the Peninsula de Guajira, Colombia, 11 m depth.

Genus *Sconsia* Gray, 1847

7. *Sconsia laevigata* (Sowerby, 1850)
Figs. 26–28

Cassidaria laevigata Sowerby, 1850: 47, pl. 10, fig. 2.
Sconsia laevigata, Maury, 1917: 275, pl. 19, fig. 2. Woodring, 1928: 309–310. Woodring, 1959: 201–202. Pflug, 1961: 36–37, pl. 7, figs. 1–8.
Sconsia striata Bayer, 1971 (non Lamarck, 1816): fig. 14, lower two figures.

Material examined—Length 71 mm, trawled by commercial shrimp boat, from 35 m depth off Cartagena, Colombia, December, 1976, USNM 784457; length 43 mm, P-353 (8°13.2'N, 76.5°0.1'W), 25 m depth; lengths 49 mm and 51 mm, P-361 (8°52'N, 76°37'W), 37 m depth; length 62 mm, P-362 (8°57'N, 76°34'W), 60 m depth; length 24 mm, P-367 (9°31'N, 75°50'W), 36 m depth; length 52 mm, P-756 (11°33.1'N, 69°12.6'W), 25 m depth; length 32 mm, P-760 (12°15.4'N, 69°57.5'W), 62 m depth.

Major citations—Redescribed by Pflug, 1961, with illustrations of the lectotype and a representative series (pl. 7, figs. 1–8).

Additions to original description—Shell color white with variable amount of red-brown mottling, usually in form of vertical flammules in zebra-like pattern; color pattern may vary from pure white to having 4–6 rows of brown checkers or alternating vertical flammules composed of coalesced checkered bands (as in Bayer, 1971: fig. 14, lower two figures); spire white, often with band of brown flammules; interior of aperture white; outer lip well developed, thickened; porcelaneous white.

Remarks—Bayer (1971, fig. 14, lower two specimens) illustrated a Recent specimen of *Sconsia laevigata* (P-353) but misidentified it as a variant of *S. striata*. *Sconsia laevigata* is a common species in offshore Colombian and Venezuelan waters and is morphologically consistent; a large series from all along this area shows little variation in form and color pattern. This consistency is also seen in the fossil record.

The Recent specimen illustrated here is identical to the fossil illustrated by Pflug (1961, pl. 7, figs. 1–4, 6). The characteristic cancellate sculpture on the outer lip of the fossil, a feature well-illustrated by Pflug (fig. 6), is the same as that of the Recent specimen (Fig. 28). The morphologically very similar *S. nephele* Bayer, 1971 from 18 m depth off Grenada may possibly be only a color morph of *S. laevigata*. This is substantiated by the fact that several of the specimens collected (P-363, P-760, P-362) had patterns composed of bands of alternating light and dark blocks which, in turn, were overlaid by a pattern of vertical flammules. These specimens act as intergrades between the zebra color morph illustrated here and the checkered *S. nephele*. E. Vokes (in litt.) has stated that a fossil specimen of *S. laevigata* examined by her under ultraviolet light revealed a color pattern like that of *S. nephele* or like that of the P-760 specimen of *S. laevigata*.

Fossil distribution—Bowden formation, Jamaica; Gurabo formation, Santo Domingo;

Gatun formation, Costa Rica and Panamá; Esmeraldas formation, Ecuador.

Recent distribution—From Golfo de Urabá, Colombia, along Colombian coast, into the Golfo de Venezuela, and to at least Isla Margarita, Venezuela, at depths of 15–16 m.

Family Ficidae
Genus *Ficus* Röding, 1798

8. *Ficus pilsbryi* (B. Smith, 1907)
Figs. 29–32

Pyrula pilsbryi B. Smith, 1907: 213–214, fig. 1. Maury, 1917: 277.
Ficus pilsbryi, Woodring, 1928: 313–314, pl. 20, fig. 9, pl. 21, figs. 1, 2.

Material examined—Lengths 82 mm, 76 mm, and 71 mm, trawled by commercial shrimp boats from 15 m depth off Punto Fijo, Golfo de Venezuela, March, 1979, USNM 784458; length 29 mm, P-709 (11°24.7′N, 62°40.5′W), 46 m depth; length 74 mm, P-712 (11°08.0′N, 63°18.0′W), 25 m depth; lengths 73 mm and 54 mm, P-767 (12°16.1′N, 71°03.3′W), 25 m depth; length 31 mm, P-772 (12°20.2′N, 71°55.1′W), 11 m depth.

Major citations—Redescribed, with diagnosis, by Woodring, 1928.

Additions to original description—Shell sculpture cancellate, consisting of strong primary spiral threads and one weak secondary thread between each pair of primary spiral threads; spiral sculpture intersected by strong axial threads equal to primary spiral threads (Fig. 32); color dark brownish-tan with scattered wide vertical bands of darker brown; strong axial threads with alternating white and brown dashes; weak secondary axial threads uniformly dark tan; spire white with white callus over last whorl; protoconch white; interior of aperture tan turning white towards lip.

Remarks—This is the first shallow water *Ficus* reported from the Recent southern Caribbean. Although *F. pilsbryi* bears some resemblance to the Carolinian *F. communis* (Say), the relict's brown color and characteristic cancellate sculpture make it readily separable from the Carolinian species.

The sculpture of the fossil specimen illustrated by Woodring (1928, pl. 20, fig. 9) is identical to that of the Recent Venezuelan specimens.

Fossil distribution—Bowden formation, Jamaica; Gurabo formation, Santo Domingo.

Recent distribution—Peninsula de Guajira, Colombia, into the Golfo de Venezuela, and to the Golfo de Triste, Venezuela, at depths of around 10–35 m.

Family Muricidae
Subfamily Muricinae Rafinesque, 1815
Genus *Panamurex* Woodring, 1959

9. *Panamurex gatunensis*
(Brown & Pilsbry, 1911)
Figs. 33–34

Murex (Phyllonotus) gatunensis Brown & Pilsbry, 1911: 354, pl. 26, fig. 2.
Paziella (Panamurex) gatunensis, Woodring, 1959: 217–218, pl. 35, figs. 6, 7, 10.

Material examined—Length 26 mm, trawled by commercial shrimp boats from 35 m depth in Golfo de Triste, Venezuela, November, 1977, USNM 784571.

Major citations—Redescribed in detail, with diagnosis and illustrations, by Woodring, 1959.

Additions to original description—Shell pure white, covered with a white chalky intritacalx.

Remarks—The single Recent specimen of *P. gatunensis* is very similar to the specimens figured by Woodring both in size and shell sculpture. Although also placed in *Panamurex* by E. Vokes (1971: 114), the sympatric Colombian-Venezuelan *Calotrophon velero* (Vokes, 1970) was shown not to belong to Woodring's genus by Radwin & D'Attilio (1976: 31–32). *Panamurex gatunensis,* therefore, is the first and only known living member of this once widespread group of muricids.

E. Vokes (in litt.) has suggested that my specimen represents a new species that is very close to *P. gatunensis.* The living Venezuelan specimen shown here, however, is identical in every way to a Gatun formation fossil specimen in the Vermeij collection at the University of Maryland. Since my living specimen is identical to the Panamanian fossil, in size, aperture shape, and having varical flanges, and since the morphological variation of the populations of *P. gatunensis,* both living and fossil, is not known, I prefer to retain the taxon *P. gatunensis* for the single living Venezuelan specimen.

Fossil distribution—Gatun formation, Panamá; Tuberá formation, Colombia.

Recent distribution—35 m depth in Golfo de Triste, Venezuela.

Family Columbellidae
Genus *Strombina* Mörch, 1852

10. *Strombina caboblanquensis*
Weisbord, 1962
Figs. 35–36

Strombina caboblanquensis Weisbord, 1962: 323–327, pl. 28, figs. 25–30, pl. 29, figs. 1–4. Gibson-Smith & Gibson-Smith, 1974: 24.

Material examined—7 specimens, lengths 15–20 mm, P-712 (11°08'N, 63°18'W), 25 m depth; 5 specimens, lengths 13–16 mm, P-721 (11°06.5'N, 64°22.5'W), 26 m depth; lengths 19 mm and 20 mm, trawled by commercial shrimp boat, 20 m depth in Golfo de Triste, Venezuela (11°42'N, 69°22.5'W), March 1979, USNM 784459.

Major citations— Expanded diagnosis given by J. Gibson-Smith & W. Gibson-Smith, 1974.

Additions to original description—Shell shiny, waxy; color bright yellow-ochre with scattered irregular white flammules; outer lip pure white; aperture and labial callus pure white; columellar callus yellow.

Remarks—As outlined by Weisbord (1962: 326) and Gibson-Smith & Gibson-Smith (1974: 53–54), *S. caboblanquensis* can be easily separated from its congener, *S. pumilio* (Reeve, 1859) (Figs. 37–38). The Recent Caribbean *S. pumilio* differs from *S. caboblanquensis* in being a broader, less turreted shell, with a lower spire and with the outer lip more developed and flaring. *Strombina caboblanquensis* has more and finer varices than does *S. pumilio,* a character that shows up well in Figs. 35 and 36. Although *S. pumilio* also has a diamond criss-cross pattern of lines on the body whorl, these are wider apart and are not as developed nor as deeply incised as those of *S. caboblanquensis.*

Strombina pumilio was previously thought to have been the only living Atlantic *Strombina.* In 1974, however, Gibson-Smith & Gibson-Smith described the second known living species, *S. francesae,* from Los Roques Islands, Venezuela. *Strombina cabo-*

blanquensis, although described as a fossil, has now been found to be extant along the Venezuelan coast, and represents the third living Atlantic *Strombina.* A possible fourth Atlantic species is presented here in the following description.

Fossil distribution—Mare formation and Maiquetia member of the Playa Grande formation, Venezuela.

Recent distribution—From the Peninsula de Paraguaná to the Golfo de Triste region, Venezuela, at depths of 15–40 m.

11. *Strombina* sp.
Figs. 39–40

Material examined—Length 15 mm, trawled by commercial shrimp boats from 35 m depth in Golfo de Triste, Venezuela, March, 1979, USNM 784572.

Description—Shell with 6 whorls, smooth, waxy; body whorl broad, laterally flattened; spire roughly ½ total shell length; body whorl with 10 evenly-spaced sharp-edged axial ribs; spire whorls with 10–12 ribs; color white with large yellow patch on dorsum and near aperture; spire and protoconch yellow; outer lip and labial dentition white; diamond criss-cross sculpture reduced, absent on axial ribs.

Remarks—This small *Strombina* most probably represents an undescribed species, sympatric with both *S. pumilio* and *S. caboblanquensis.* I have included it here in order to show that the *Strombina* fauna of northern South America is actualy larger than was originally assumed. Of the four known Atlantic species of *Strombina,* the new species is the smallest. It differs from the two mainland species in being squatter, having evenly-spaced smooth axial ribs over the entire dorsum, and in lacking the prominent dorsal hump seen in both *S. pumilio* and *S. caboblanquensis.*
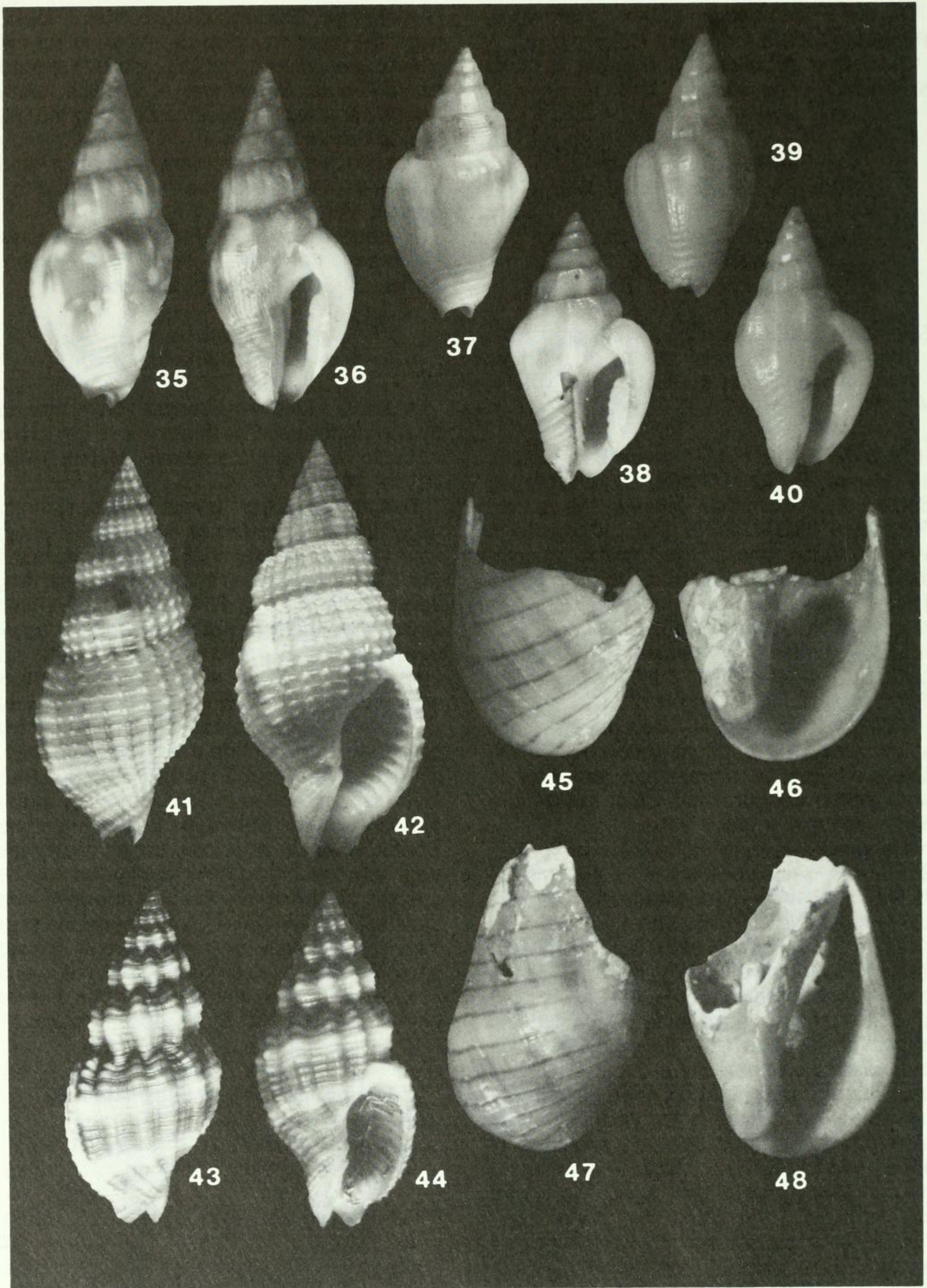
Family Buccinidae
Genus *Antillophos* Woodring, 1928

12. *Antillophos elegans* (Guppy, 1866)
Figs. 43–44

Phos elegans Guppy, 1866: 290, pl. 16, fig. 13. Maury, 1917: 250–251, pl. 40, fig. 10. Olsson, 1942: 88.

Tritiaria (Antillophos) elegans, Woodring, 1928: 262, pl. 16, fig. 1.

Antillophos elegans, Pflug, 1961: 46–47, pl. 11, figs. 1–3, 9, 10, 14, 16–19.

FIGS. 35–48. 35–36. *Strombina caboblanquensis* Weisbord: USNM 784459, L = 20 mm. 37–38. *Strombina pumilio* (Reeve): P-712, L = 16 mm. 39–40. *Strombina* sp.: USNM 784572, L = 15 mm. 41–42. *Antillophos candei* (d'Orbigny): P-712, L = 27 mm. 43–44. *Antillophos elegans* (Guppy): USNM 784460, L = 20 mm. 45–46. *Truncaria* sp.: P-734, fragment L = 22 mm. 47–48. *Truncaria* sp.: P-734, fragment L = 20 mm.

Material examined—Lengths 20 mm and 15 mm, trawled by commercial shrimp boats, from 35 m depth, Golfo de Triste, Venezuela, March, 1979, USNM 784460.

Major citations—Holotype and representative series illustrated by Pflug, 1961 (pl. 11, figs. 9, 10).

Additions to original description—Shell color pale tan with three wide reddish-brown bands, one on shoulder, one around midbody, one around base; body whorl near lip pure white; interior of aperture white; protoconch and early whorls pale tan.

Remarks—The two specimens from the Golfo de Triste firmly establish this well known and distinctive Pliocene fossil as a component of the Recent Venezuelan fauna. *Antillophos elegans* can be separated from the South American variety of the ubiquitous Caribbean *A. candei* (d'Orbigny) (Figs. 41–42) by its smaller size, by having strong, beaded axial costae instead of a cancellate sculpture, and by having a color pattern of three solid redbrown bands. The Recent specimen illustrated is indistinguishable from the fossils illustrated by Pflug (1961, pl. 11, figs. 1, 3, 14, 16), in shape, sculpturing, and size. *Antillophos elegans* is sympatric with *A. candei* in the Golfo de Triste.

Fossil distribution—Gurabo formation, Santo Domingo; Bowden formation, Jamaica; Springvale formation, Trinidad; Punta Gavilán formation, Venezuela; Limón and Gatun formations, Costa Rica.

Recent distribution—Known only from the Golfo de Triste, Venezuela, 35 m depth.

Genus *Truncaria* Adams & Reeve, 1848

13. *Truncaria* sp.
Figs. 45–48

Material examined—2 fragments, lengths 22 mm and 20 mm, P-734, 65 m depth off Cabo Cordera, Venezuela.

Description—Shell fragments smooth, pale cream colored, with fine brown revolving hairlines; sculptured with fine raised spiral striae.

Remarks—The two Cabo Cordera fragments constitute the first record of the paciphilic genus *Truncaria* in the Atlantic Ocean. Although these fragments represent a new Caribbean species, a formal description will have to wait until better material is collected. Enough of the body whorl is intact, however, to show that the new species is close to its Panamic cognate species, *Truncaria brun-*

neopicta (Dall, 1896). Both species have sculpturing of spiral striae and coloration of brown hairlines.

Family Fasciolariidae
Subfamily Fasciolariinae
Genus *Latirus* Montfort, 1810

14. *Latirus (Polygona) anapetes*
Woodring, 1964
Figs. 49–50

Latirus (Polygona) anapetes Woodring, 1964: 274, pl. 47, fig. 12. Jung, 1965: 539, pl. 73, fig. 1.

Material examined—Length 55 mm, P-708 (11°24.7'N, 62°40.5'W), 70 m depth; length 40 mm, P-736 (10°57'N, 65°52'W), 100 m depth; lengths 48 mm and 41 mm, P-718 (11°22.5'N, 64°08.6'W), 60 m depth.

Additions to original description—Shell color pale yellow-orange, darker on early whorls; interior of aperture white.

Remarks—The Recent specimen illustrated here is very similar to the fossil illustrated by Woodring (1964, pl. 47, fig. 12), especially so in that both have a widely-flaring umbilical region and a strongly constricted suture.

Fossil distribution—Chagres Sandstone, Gatun formation, Panamá.

Recent distribution—Off the Venezuelan coast, from the Peninsula de Paria to near Isla Margarita, 60–100 m depth.

Subfamily Fusininae Swainson, 1840
Genus *Fusinus* Rafinesque, 1815

15. *Fusinus caboblanquensis*
Weisbord, 1962
Figs. 51–52

Fusinus closter caboblanquensis Weisbord, 1962: 364–368, pl. 32, figs. 13, 14, pl. 33, figs. 1, 2. J. Gibson-Smith & W. Gibson-Smith, 1979: 26.

Material examined—Length 160 mm, trawled by commercial shrimp boats from 25 m depth in Golfo de Venezuela, off Punto Fijo, Peninsula de Paraguaná, Venezuela, May, 1976, USNM 784462; length 111 mm, same locality and date, UMML 8280.

Additions to original description—Shell color pale tan, becoming darker on siphonal canal; siphonal canal tipped with dark brown;
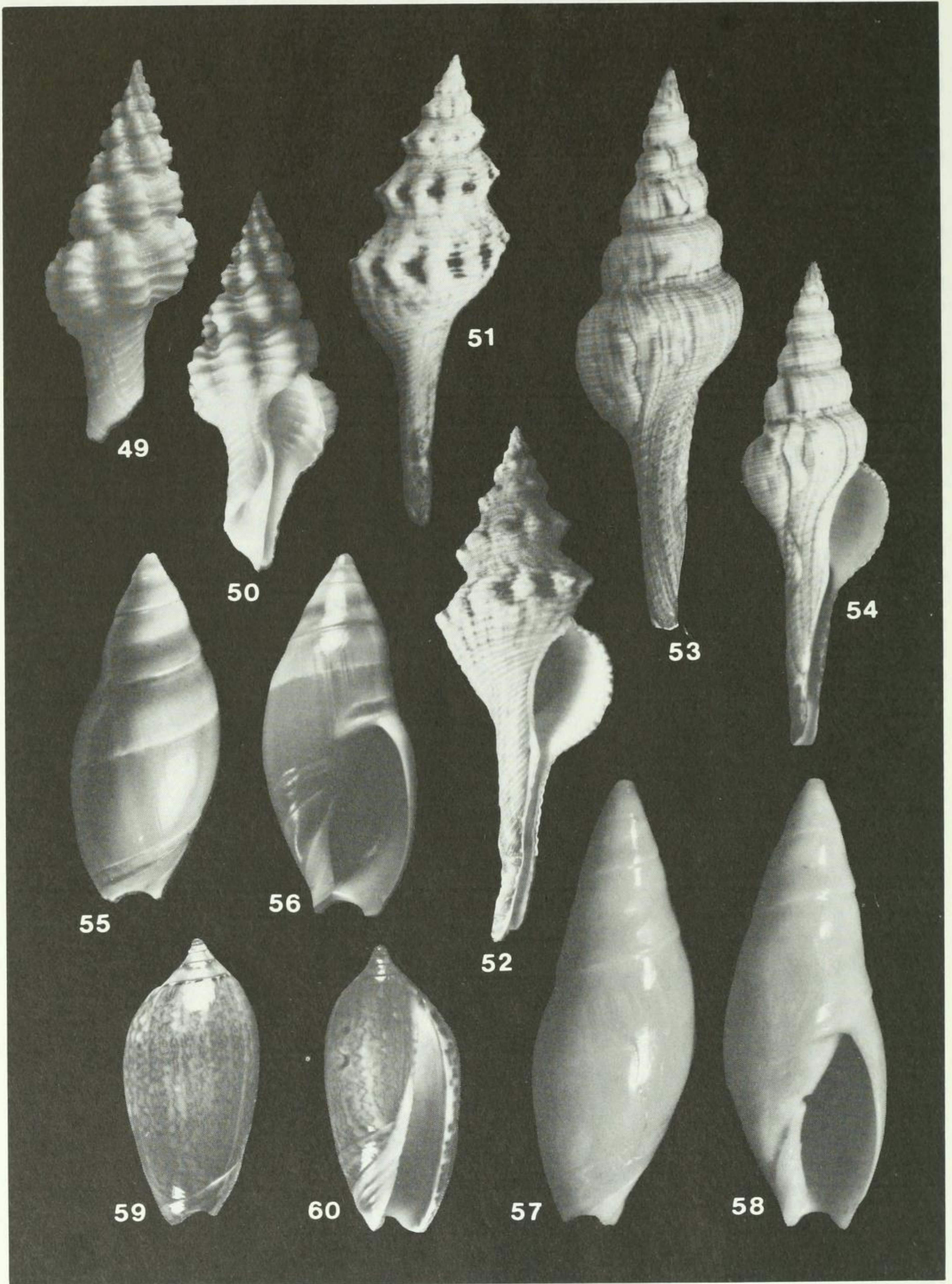
FIGS. 49–60. 49–50. *Latirus anapetes* Woodring: P-708, L = 55 mm. 51–52. *Fusinus caboblanquensis* Weisbord: USNM 784462, L = 160 mm. 53–54. *Fusinus marensis* Weisbord: 784463, L = 112 mm. 55–56. *Ancilla venezuelana* Weisbord: P-722, L = 30 mm. 57–58. *Ancilla* sp.: USNM 784573, L = 35 mm. 59–60. *Oliva schepmani* Weisbord: USNM 784464, L = 39 mm.

base color overlaid with scattered brown vertical lines and spots; prominent raised shoulder keel white on knobs, dark brown in depressions; interior of aperture and columella white; outer lip edged with dark brown dashes; protoconch and early whorls brown.

Remarks—Although described as a fossil subspecies of the Recent F. closter (Philippi, 1951), F. caboblanquensis can be separated from that species on the basis of having a well developed and darkly colored shoulder keel. Together, the sharp-angled keeled shoulder and the regularly spaced axial folds give the shell a decidedly knobbed appearance. The more slender, white F. closter from Isla Margarita and the Lesser Antilles not only lacks the shoulder keel of F. caboblanquensis but also does not seem to reach the shell length of the relict species. The two species are sympatric along part of the Venezuelan coast.

Fossil distribution—Mare and Playa Grande formations, Venezuela.

Recent distribution—Known from near Isla Margarita to the Golfo de Venezuela, 25 m depth.

16. Fusinus marensis Weisbord, 1962
Figs. 53–54

Fusinus marensis Weisbord, 1962: 262–264, pl. 32, figs. 11, 12.

Material examined—Length 112 mm, trawled by commercial shrimp boat, 20 m depth, in the Golfo de Venezuela off the Peninsula de Paraguaná, Venezuela, March, 1979, USNM 784463; lengths 53 mm and 50 mm, P-758 (11°42.4'N, 69°40'W), 16 m depth; lengths 36 mm and 27 mm, P-761 (11°52'N, 70°22'W), 35 m depth.

Additions to original description—Shell color tan, overlaid with numerous thin, dark brown vertical flammules; siphonal canal dark brown; protoconch and early whorls brown; columella and interior of aperture white; margin of lip and siphonal canal edged with purple.

Remarks—The holotype of F. marensis is a slender juvenile specimen only 50 mm in length. The specimen illustrated here is over twice that length and shows the bulbous, tabulate later whorls characteristic of this species. The early whorls and spiral sculpturing of the Recent specimens are otherwise indistinguishable from those of Weisbord's holotype.

Fossil distribution—Mare formation, Venezuela.

Recent distribution—Off the Venezuelan coast, from the Golfo de Venezuela to the Golfo de Triste, 15–35 m depth.

Family Olividae
Genus Ancilla Lamarck, 1799

17. Ancilla venezuelana Weisbord, 1962
Figs. 55–56

Ancilla (Eburna) venezuelana Weisbord, 1962: 393–395, pl. 36, figs. 5, 6. Gibson-Smith & Gibson-Smith, 1979: 26.

Material examined—Lengths 30 mm and 13 mm, P-722 (11°04'N, 64°44'W), 91 m depth; 2 fragments, lengths 21 mm and 20 mm, P-722; length 30 mm, P-734 (11°01.8'N, 65°34.2'W), 64 m depth.

Additions to original description—Shell color bright red-orange; spire and upper one-half to one-third of body whorl glazed over with yellow-orange enamel; enamel of subsutural area darker orange; fascicular area bipartite, dark orange on anterior half, paler orange on posterior half; protoconch and glazed early whorls pale yellow-orange; interior of aperture orange; operculum thin, corneous, yellow-brown.

Remarks—Although considered a synonym of the Recent A. tankervillei (Swainson, 1825) by Gibson-Smith & Gibson-Smith (1979: 26), A. venezuelana is a valid species. This relict has a more slender, fusiform shell, contrasting with the turreted outline of A. tankervillei. Ancilla venezuelana can also be distinguished from A. tankervillei by its smaller size, deep orange-red callus color and form and extent of the subsutural callus. The callus does not extend as far onto the body whorl as that seen in A. tankervillei. The extent of the subsutural nacre of A. venezuelana varies with individuals. One specimen (P-734) had a callus arrangement similar to the holotype illustrated by Weisbord (1962, pl. 36, figs. 5, 6), while the specimen here illustrated had a less extensive area of callus. This variability of nacre production is not seen in A. tankervillei.

Fossil distribution—Mare formation, Venezuela.

Recent distribution—Off the Venezuelan coast from the Golfo de Triste to Isla Margarita, in depths of 60–100 m.

18. *Ancilla* sp.
Figs. 57–58

Material examined—Length 35 mm, trawled by commercial shrimp boats from 35 m depth in Golfo de Triste, Venezuela, March, 1979, USNM 784573.

Description—Shell shiny, elongate; spire turreted, ½ of total shell length; color pale yellow-orange.

Remarks—Although similar to the sympatric *Ancilla venezuelana,* the single specimen shown here appears to represent a new species. I have included this new species with the other relicts in order to emphasize the unusual nature of the northern South American olivid fauna. Here, and nowhere else in the Atlantic Ocean, are five species of *Ancilla* all living in close proximity; *Ancilla venezuelana,* along with the new species, being restricted to the Golfo de Triste; *A. balteata* (Swainson, 1825) being endemic to neighboring Aruba; and *A. glabrata* (Linnaeus, 1758) and *A. tankervillei* being widespread along the entire coast. In the Golfo de Triste, the new species, *A. venezuelana, A. glabrata,* and *A. tankervillei* are all sympatric and the last three mentioned species are often brought up together in the same net haul.

Genus *Oliva* Hwass, 1789

19. *Oliva schepmani* Weisbord, 1962
Figs. 59–60

Oliva schepmani Weisbord, 1962: 370–374, pl. 33, figs. 5–13. Gibson-Smith & Gibson-Smith, 1979: 24.

Material examined—Length 39 mm, trawled by commercial shrimp boats, from 30 m depth, in the Golfo de Triste, Venezuela, March, 1979, USNM 784464; lengths 42 mm and 41 mm, same location, depth, and date, UMML 8281.

Additions to original description—Shell color dark greenish-gray mottled with pale brown; base color overlaid with numerous fine pale green triangular markings; body whorl with two faint bands of brown vertical lines, one anterior to mid-body line, one posterior; suture edged with band of alternating black and yellow dashes; spire with thin, pale purple callus; protoconch purplish-brown; interior of aperture pale purple becoming grayish-yellow toward edge of lip; columella lavender-purple; posterior edge of columella with deep purple

stain; anterior tip of fasciole with large, deep purple spot; interior of siphonal canal with thin, pale purple callus; protoconch purplish-brown; interior of aperture pale purple becoming grayish-yellow toward edge of lip; columella lavender-purple; posterior edge of columella with deep purple stain; anterior tip of fasciole with large, deep purple spot; interior of siphonal canal with purple stain; animal color pale yellow-orange to cream with numerous dark brown little flecks.

Remarks—Among the fossil Olividae, *O. schepmani* most closely resembles *O. couvana* Maury, 1925, from the Springvale formation of Trinidad. *Oliva couvana,* however, is a more slender shell, and differs from *O. schepmani* in having a higher spire. Of the Recent Olividae, the relict most closely resembles *O. julietta* Duclos, 1833 from the Panamic Province. That species has a larger shell and a completely different color pattern, with a yellow and green base color with prominent scattered black spots and white triangles. The Recent *O. fulgurator* Lamarck, 1810, endemic to Aruba, is similar to *O. schepmani* but differs in being more inflated, by having a white base color patterned with orange-red flammules and triangles, and by having a much larger protoconch in proportion to the shell size.

Fossil distribution—Mare, Playa Grande, and Abisinia formations, Venezuela.

Recent distribution—Known only from the Golfo de Triste, Venezuela.

Family Mitridae
## Genus *Subcancilla* Olsson & Harbison, 1953

20. *Subcancilla illacidata* (Woodring, 1928)
Figs. 63–65

Mitra (Tiara) henekeni illacidata Woodring, 1928; 243, pl. 14, fig. 13.

Material examined—Three specimens, lengths 15 mm, 17 mm, 18 mm, trawled by commercial shrimp boats from 35 m depth in Golfo de Triste, Venezuela, March, 1979, USNM 784574.

Additions to original descriptions—Shell color very pale yellow, some specimens with pale brown vertical flammules.

Remarks—*Subcancilla illacidata* resembles members of the widespread Mio-Pliocene *S. dariensis* (Brown & Pilsbry, 1911) complex but differs in having only three
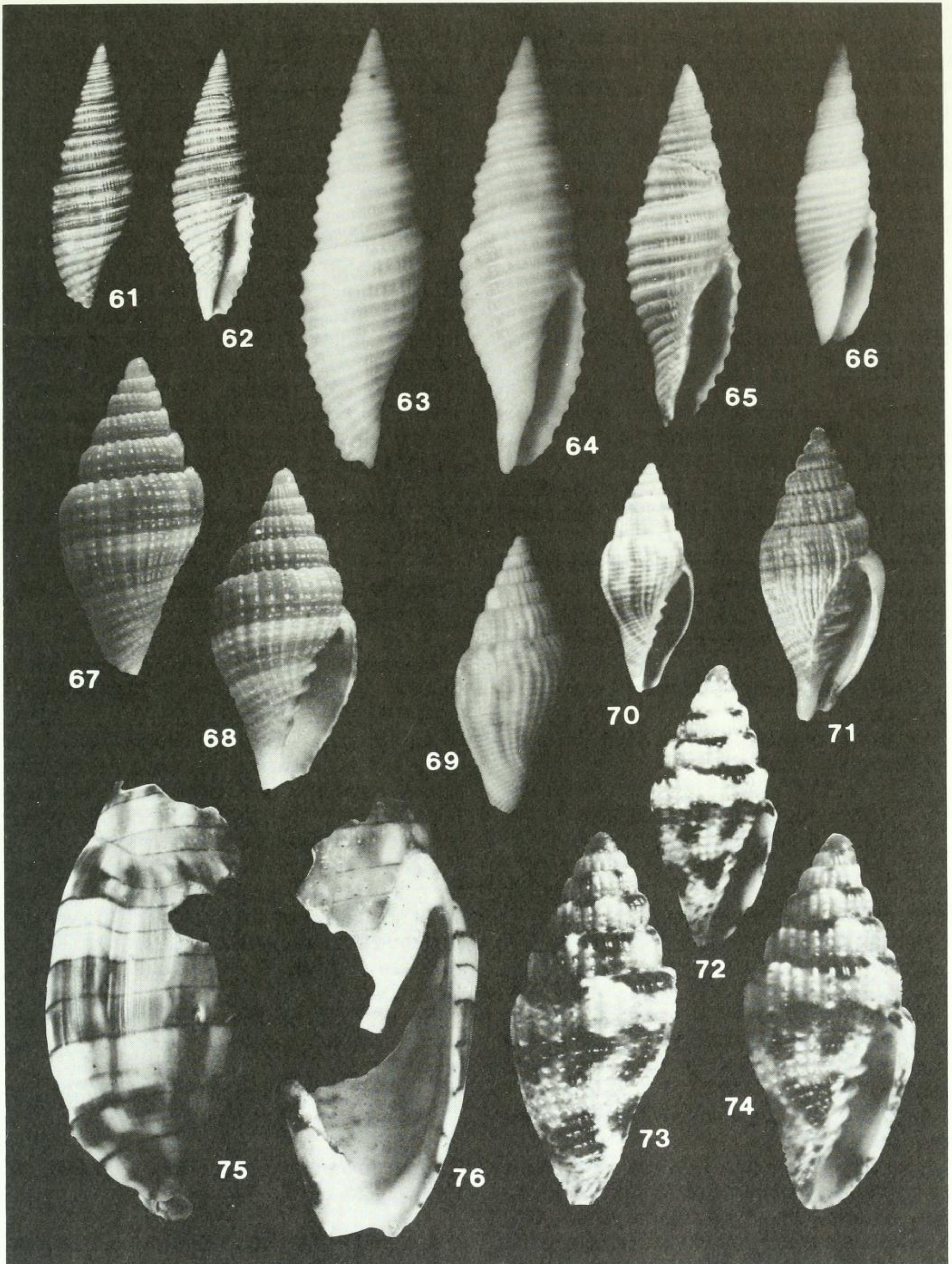
FIGS. 61–76. 61–62. *Subcancilla rhadina* (Woodring): P-749, L = 21 mm. 63–64. *Subcancilla illacidata* (Woodring): USNM 784574, L = 18 mm. 65. *Subcancilla illacidata* (Woodring): USNM 784574, L = 15 mm. 66. *Subcancilla venezuelana* (F. Hodson): USNM 784575, L = 24 mm. 67–68. *Conomitra caribbeana* Weisbord: P-722, L = 12 mm. 69–70. *Conomitra lehneri* Jung: UNSM 784576, L = 15 mm. 71. *Conomitra lehneri* Jung: USNM 784576, L = 14 mm. 72–74. *Conomitra* sp.: USNM 784577, L = 10 mm. 75–76. *Lyria* cf. *limata* S. Hoerle & E. Vokes: P-758, fragment, L = 72 mm.

columellar plications instead of the four seen in the *S. dariensis* complex. In the Recent fauna, *S. funiculata* from the Panamic Province shows a close relationship to this relict species.

Fossil distribution—Bowden formation, Jamaica.

Recent distribution—Known only from the Golfo de Triste, Venezuela, 59 m depth.

21. *Subcancilla rhadina* (Woodring, 1928)
Figs. 61–62

Mitra rhadina Woodring, 1928: 243–244, pl. 14, fig. 14.

Material examined—Three specimens, lengths 20 mm, 21 mm, and 29 mm, P-749 (10°37'N, 67°57.9'W), 59 m depth.

Additions to original description—Shell color pure white with raised light brown spiral cords.

Remarks—*Subcancilla rhadina* resembles the previous species but differs in being a more slender, high-spired shell, and in having more numerous and brown-colored spiral cords.

Fossil distribution—Bowden formation, Jamaica.

Recent distribution—35 m depth in Golfo de Triste, Venezuela.

22. *Subcancilla venezuelana* (F. Hodson, 1931)
Fig. 66

Mitra dariensis venezuelana F. Hodson in F. Hodson & H. K. Hodson, 1931: 42, pl. 20, figs. 6, 7.

Material examined—Two specimens, both lengths 24 mm, trawled by commercial shrimp boats from 35 m depth in Golfo de Triste, March, 1979, USNM 784575.

Additions to original description—Shell color pure white.

Remarks—The two Recent specimens agree closely with Hodson's figured specimen. As pointed out by Woodring (1964: 284), *S. venezuelana* is more closely related to the Miocene *S. longa* (Gabb, 1873) than to such members of the *S. henekeni* complex as *S. dariensis* or *S. colombiana* (Weisbord, 1929). The major differentiating characteristics that separate *S. venezuelana* from the *S. henekeni* complex are the more numerous spiral cords, higher spire, and attenuated body form.

Fossil distribution—Mio-Pliocene beds of Falcón State, Venezuela.

Recent distribution—35 m depth in Golfo de Triste, Venezuela.

Family Volutomitridae
Genus *Conomitra* Conrad, 1865

This genus was thought to have been extinct since the upper Miocene (Gardner, 1937: 420), and the following three species constitute the first records of the genus from the Recent Caribbean fauna. The Recent species assigned to this genus by Dall (1889: "*Conomitra*" *blakeana*, "*Conomitra*" *laevior*, and "*Conomitra*" *intermedia* have now been shown to be members of the genus *Microvoluta* (Abbott, 1974: 240–241).

23. *Conomitra caribbeana* Weisbord, 1929
Figs. 67–68

Conomitra caribbeana Weisbord, 1929: 48, pl. 6, figs. 14, 15.

Material examined—Two specimens, lengths 12 mm and 14 mm, P-722 (11°0.4'N, 64°44'W), 91 m depth.

Additions to original description—Shell color tan, with two narrow white bands, one above mid-body line, one below mid-body line; interior of aperture tan with white band; ptotoconch large, glassy, tan in color.

Remarks—*Conomitra caribbeana* differs from the following species by having fewer axial ribs per whorl and by lacking the vertical flammules characteristic of *C. lehneri*.

Fossil distribution—Tuberá formation, Colombia.

Recent distribution—Off Isla Margarita, Venezuela, 91 m depth.

24. *Conomitra lehneri* Jung, 1971
Figs. 69–71

Conomitra lehneri Jung, 1971: 200–201, pl. 14, figs. 12–16.

Material examined—Eleven specimens, lengths 12 mm to 18 mm, trawled by commercial shrimp boats from 35 m depth in Golfo de Triste, Venezuela, March, 1979, USNM 784576.

Additions to original description—Shell color white with numerous axial flammules and zigzags of tan; some specimens also encircled with two tan bands.

Remarks—The Recent specimens shown here closely resemble the fossil type series illustrated by Jung, having the same general body form and numerous thin axial ribs.

Fossil distribution—Grand Bay formation, Carriacou, Grenadines, Lesser Antilles.

Recent distribution—Golfo de Triste, Venezuela, 35 m depth.

25. Conomitra sp.
Figs. 72–74

Material examined—Length 10 mm, trawled by commercial shrimp boat in 35 m depth off Cabo La Vela, Peninsula de Guajira, Colombia, December, 1974, USNM 784577.

Shell description—Shiny, with 5 whorls; body with numerous fine axial ribs intersected with numerous spiral ribs, giving shell pustulose appearance; protoconch large, bulbous, composed of 2 whorls; columella with four plications; color pale tan with 2 bands of arrow-shaped dark brown flammules; shoulder with intermittent dark brown blotches; between dark shoulder blotches are small white patches; tan base color overlaid with pattern of spiral bands of small brown dots; protoconch brown; interior of aperture tan with two bands of dark brown.

Remarks—This small Conomitra is quite unlike its sympatric congeners and represents an undescribed species. The brown and white color markings readily separate the new species from both C. caribbeana and C. lehneri.

Family Volutidae
Subfamily Lyriinae Pilsbry & Olsson, 1954
Genus Lyria Gray, 1847

26. Lyria cf. limata S. Hoerle & E. Vokes, 1978
Figs. 75–76

Lyria limata S. Hoerle & E. Vokes, 1978: 111, pl. 1, figs. 4a, 4b, 5a, 5b.

Material examined—Fragment, length 72 mm, P-758 (11°42.4'N, 69°40'W), 16 m depth.

Additions to original description—Shell color pale yellowish-tan with three broad light brown bands, one on shoulder, one around mid-body, one at base in siphonal region; three bands darker when crossing axial costae; shoulder and mid-body bands overlaid by three dark brown continuous spiral stripes; basal band overlaid by five stripes; pale tan areas between bands with the three

dark brown spiral stripes; dark spiral stripes continue as sharp barbs on margin of outer lip; inner side of lip pale orange; columella pale yellow.

Remarks—Unfortunately, this giant Lyria is only known from the Recent as a single fragment, roughly one-third of the body whorl, a small portion of the columellar region, and a small section of the preceding whorl. The height and form of the missing spire can only be guessed at. Judging from the general shell contours of other species of Lyria, it would appear that a complete specimen of the Golfo de Triste Lyria would probably exceed 100 mm in length. Because of the incomplete condition, the specimen is referred with some reservation to Hoerle & Vokes' taxon.

The ultra-violet light photographs of the holotype of L. limata illustrated by Hoerle & Vokes (1978, pl. 1, figs. 5a, 5b) show a color pattern identical to that of the Venezuelan fragment. The contours of the outer lip and the arrangement and coloring of the axial costae of both the fossil holotype and the Recent fragment are also identical. The main difference between the fossil and Recent specimen is one of size; the entire holotype is only 38.8 mm in length while the fragment alone is 72 mm in length.

Of all the Recent northern South American relicts, L. limata is the only species to have been originally described from the northern Caribbean region (Chipola formation of Florida). Its disappearance from Florida Pliocene assemblages, its absence from Mio-Pliocene assemblages in the Gatunian region and its reappearance in the Recent along a small stretch of Venezuelan coastline is problematical.

Fossil distribution—Chipola formation, Florida.

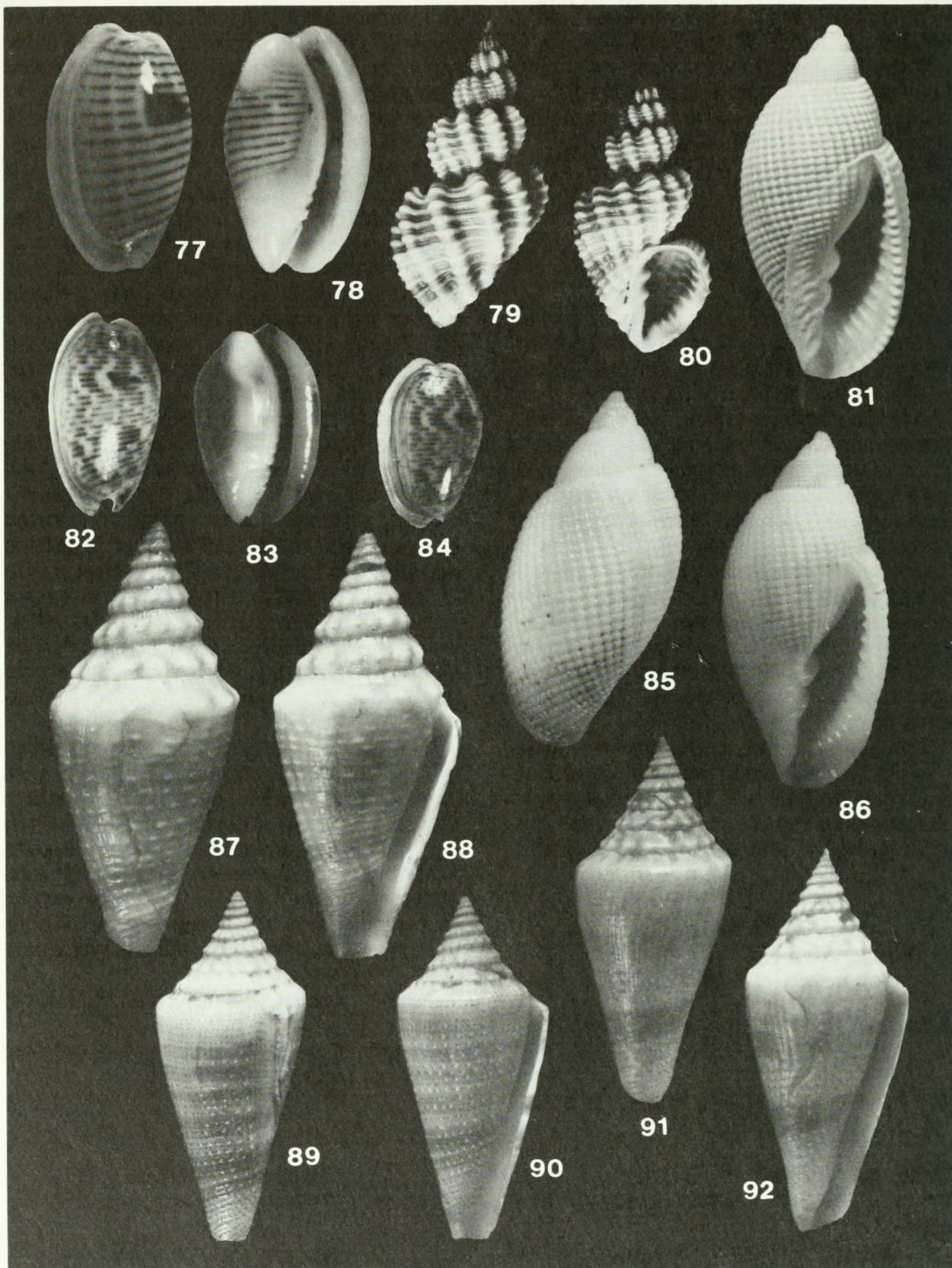Recent distribution—Known only from the Golfo de Triste, Venezuela.

Family Marginellidae
Genus Persicula Schumacher, 1817

27. Persicula (Rabicea) hodsoni
Weisbord, 1962
Figs. 77–78

Persicula (Rabicea) hodsoni Weisbord, 1962: 412–413, pl. 38, figs. 5–8.
Persicula interruptolineata J. Gibson-Smith & W. Gibson-Smith, 1979 (non Megerle von Mühlfeld, 1816): 26.

FIGS. 77–92. 77–78. *Persicula hodsoni* Weisbord: USNM 784466, L = 14 mm. 79–80. *Agatrix epomis* (Woodring): P-750, L = 16 mm. 81. *Aphera islacolonis* (Maury): USNM 784467, L = 10 mm, shell sculpture enhanced by coating with magnesium oxide. 82–83. *Persicula interruptolineata* (Megerle von Mühlfeld): USNM 784465, L = 12 mm. 84. *Persicula interruptolineata*: USNM 784465, L = 11 mm. 85–86. *Aphera islacolonis* (Maury): USNM 784467, L = 10 mm. 87–88. *Conus consobrinus* Sowerby: P-708, L = 28 mm. 89–90. *Conus consobrinus* Sowerby: P-734, L = 33 mm. 91–92. *Conus consobrinus* Sowerby: P-734, L = 42 mm.

Material examined—Length 14 mm, on beach, Adicora, Peninsula de Paraguaná, Venezuela, April, 1975, USNM 784466.

Additions to original description—Shell color cream-white overlaid with 15 dark red-brown stripes; callused outer lip and columellar region white; interior of aperture white; body whorl with large rectangular dark brown patch on dorsum, slightly posterior to midline.

Remarks—Although considered a synonym of *P. interruptolineata* (Megerle von Mühlfeld, 1816) by Gibson-Smith & Gibson-Smith (1979: 26), *P. hodsoni* is a valid species. Both marginellids occur sympatrically along the coast of the Peninsula de Paraguaná, although *P. interruptolineata* has a more extensive range throughout the southern Caribbean.

Persicula hodsoni can be separated from *P. interruptolineata* by its larger size and by its color pattern; fifteen red-brown stripes, broken a few times by vertical white bars, as opposed to the numerous rows of brown dots seen in *P. interruptolineata* (Figs. 82–84). This striped pattern is similar to that of *P. bandera* Coan & Roth, 1965 from the Panamic Province.

Fossil distribution—Mare and Abisinia formations, Venezuela.

Recent distribution—Along the Peninsula de Paraguaná, Venezuela.

Family Cancellariidae
Genus *Agatrix* Petit, 1967

28. *Agatrix epomis* (Woodring, 1928)
Figs. 79–80

Tribia epomis Woodring, 1928: 223, pl. 12, fig. 10.
Agatrix epomis, Petit, 1976: 38, pl. 1, fig. 3.

Material examined—Length 11 mm, P-717 (11°21′N, 64°10′W), 64 m depth; 6 specimens, 7–10 mm, P-718 (11°22.5′N, 64°8.6′W), 60 m depth; lengths 7 mm and 17 mm, P-721 (11°6.5′N, 64°22.5°W), 26 m depth; lengths 12 mm and 16 mm, P-750 (10°36.1′N, 68°12.2′W), 24 m depth.

Major citations—Living specimens recognized, described, and illustrated by Petit, 1976.

Remarks—After the discovery of living *Fusiturricula jaquensis* (Sowerby) (described by Altena, 1975), *A. epomis* was the second known living example of a supposedly-extinct

Gatunian species. The R/V Pillsbury specimens show that this relict is a relatively common member of the offshore Venezuelan molluscan assemblages.

Fossil distribution—Bowden formation, Jamaica.

Recent distribution—Along the Colombian and Venezuelan coasts, in depths of 24–64 m.

Genus *Aphera* H. & A. Adams, 1854
29. *Aphera islacolonis* (Maury, 1917)
Figs. 81, 85–86

Cancellaria islacolonis Maury, 1917: 65, pl. 10, figs. 12, 12a, 12b.
Cancellaria (Aphera) islacolonis, Olsson, 1922: 86, pl. 6, fig. 12.
Cancellaria ellipsis Pilsbry, 1922: 333–334, pl. 22, figs. 8, 9.
Aphera islacolonis, Woodring, 1970: 344, pl. 56, figs. 1, 2.

Material examined—Length 10 mm, trawled by commercial shrimp boats, from 35 m depth, in Golfo de Triste, Venezuela, March, 1979, USNM 784467.

Additions to original description—Shell color white; dorsum with single large light tan patch; interior of aperture white; Fig. 81 shows characteristic cancellate sculpture, enhanced by coating of magnesium oxide.

Remarks—The discovery of a living *Aphera* in the Atlantic demotes the genus from the rank of paciphile (Vermeij, 1978: 232, table 8.2)—in having a single Panamic species, *A. tessellata* (Sowerby, 1832), and a Caribbean species, *A. islacolonis*. The Recent specimen is very close to the fossils illustrated by Maury (1917, pl. 10, figs. 12a, 12b) and Olsson (1922, pl. 6, figs. 1, 2), but differs in having finer sculpture than the fossil illustrated by Woodring (1970, pl. 56, figs. 1, 2). This mutability of sculpture patterns is probably representative of ecophenotypic variation and not full species rank (Woodring, 1970: 344). The Golfo de Triste *Aphera* is identical in sculpture to *A. ellipsis* (Pilsbry, 1922: pl. 22, figs. 8, 9), which Pilsbry himself (p. 334) said may be only the juvenile of *A. islacolonis*.

Fossil distribution—Cercado and Gurabo formations, Santo Domingo; Gatun formation, Costa Rica and Panamá.

Recent distribution—Known only from the Golfo de Triste, Venezuela, 35 m depth.

Family Conidae
Genus *Conus* Linnaeus, 1758

30. *Conus consobrinus* Sowerby, 1850
Figs. 87–92

Conus consobrinus Sowerby, 1850: 45.
Woodring, 1928: 214–215, pl. 11, figs. 6, 7.
Pflug, 1961: 62, pl. 17, figs. 1–10.

Material examined—Lengths 42 mm and
33 mm, P-734 (11°1.8'N, 65°40.5'W), 65 m
depth; length 28 mm, P-708 (11°24.7'N,
62°40.5'W), 70 m depth; length 34 mm,
P-773 (12°17'N, 72°15'W), 62 m depth.
Major citations—Redescribed, with diag-
nosis, by Woodring, 1928; lectotype and type
series illustrated by Pflug, 1961, pl. 17, figs.
1–10.
Additions to original description—Shell
color pale salmon-pink with prominent wide
orange band just posterior to anterior tip; body
whorl with thin orange bands, varying from
one to four, posterior to mid-body line; base
color overlaid with numerous faint spiral rows
of tiny pale orange dots; spire salmon-pink
with scattered dark orange flammules; interior
of aperture pale orange; juvenile specimens
heavily pustulose, strongly coronated, and
biconic; adult specimens smoother, more
elongated, with shoulder of last whorl non-
coronate.
Remarks—This once-widespread Gatunian
indicator species is now restricted to deeper
water off the Colombian and Venezuelan
coasts. *Conus consobrinus* is so distinctive
that it cannot be confused with any other living
western Atlantic cone. This relict is related to
the Recent *C. cedonulli-mappa-aurantius*
species complex of the Lesser Antilles and
shallow water areas along the Colombian and
Venezuelan coasts. *Conus consobrinus* can
be separated from members of this complex
by its high, heavily coronated spire and by the
lack of the elaborate color patterns character-
istic of the *C. cedonulli* group.
The small specimen from P-708 (Figs. 87–
88) is similar to the fossil illustrated by Wood-
ring (1928, pl. 11, fig. 7), while the large spec-
imen from P-734 (Figs. 89–90) is virtually
identical to the fossil illustrated by Pflug (1961,
pl. 17, fig. 6).
Fossil distribution—Agueguexquite forma-
tion, Mexico; Gurabo formation, Santo
Domingo; Bowden formation, Jamaica; Grand
Bay formation, Carriacou; Gatun formation,
Costa Rica and Panamá.

Recent distribution—30–80 m depth off
Venezuela and northern Colombia.

31. *Conus planiliratus* Sowerby, 1850
Figs. 93–95

Conus planiliratus Sowerby, 1850: 44.
Olsson, 1922: 50, pl. 3, figs. 10, 13. Wood-
ring, 1928: 210–212, pl. 10, figs. 7–9, pl. 11,
figs. 1, 2.

Material examined—Lengths 27 mm and
21 mm, 25 m depth in Golfo de Triste, Vene-
zuela, trawled by commercial shrimpers,
March, 1979, USNM 784469.
Major citations—Redescribed in detail by
Woodring, 1928, with discussion of possible
species complex.
Additions to original descriptions—Shell
color white to salmon-pink, with two bands of
yellow maculations around mid-body; spire
with scattered small, brown, crescent-shaped
flammules; aperture white, periostracum thin,
smooth, translucent yellow.
Remarks—The four known Recent speci-
mens are indistinguishable from the fossil
specimens illustrated by Olsson (1922, pl. 3,
fig. 10) and Woodring (1928, pl. 10, figs. 7, 9).
The only Recent cone that bears any resem-
blance to *C. planiliratus* is *C. stimpsoni* Dall,
1902, from deep water off Florida, Georgia,
the Carolinas, and in the Gulf of Mexico.
Conus planiliratus differs from *C. stimpsoni* by
being a consistently more slender shell, by
having two bands of yellow maculations
around the mid-body, by having a heavily
sculptured spire, and by having numerous in-
cised spiral sulci on the body whorl. Woodring
(1970: 346) was correct in his prediction that
*C. planiliratus* could still be living in the Atlan-
tic.
Fossil distribution—Bowden formation,
Jamaica; Gurabo formation, Santo Domingo;
Gatun and Limón formations, Costa Rica.
Recent distribution—In the Golfo de Triste,
Venezuela, 35 m depth.

32. *Conus symmetricus* Sowerby, 1850
Figs. 96–97

Conus symmetricus Sowerby, 1850: 44, pl. 9,
fig. 1. Maury, 1917: 200, pl. 7, fig. 7. Wood-
ring, 1928: 204. Pflug, 1961: 63–64, pl. 18,
figs. 1–11. Woodring, 1970: 35–354.

Material examined—Length 37 mm, trawled
by commercial shrimp boats, 35 m depth, in
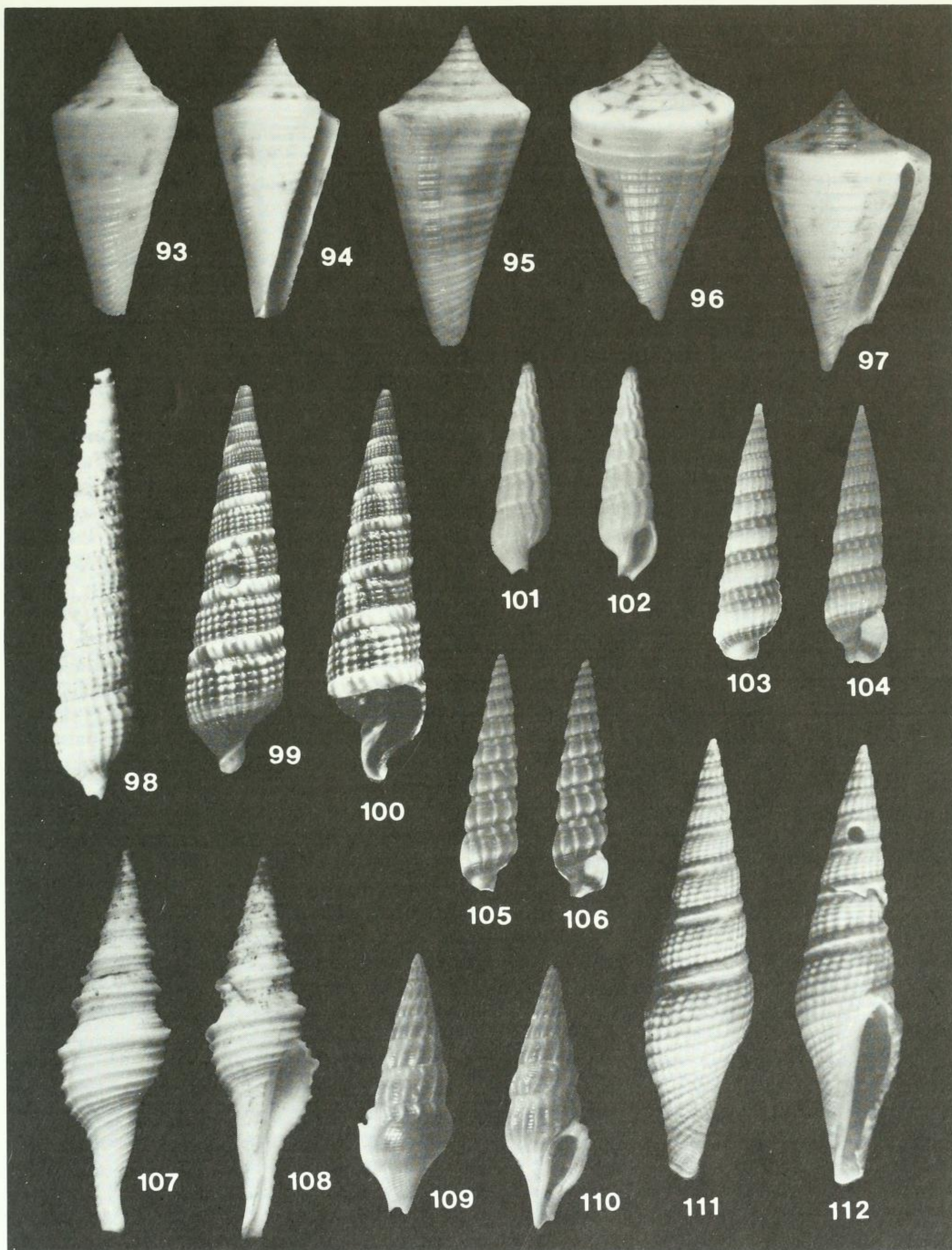
FIGS. 93–112. 93–94. *Conus planiliratus* Sowerby: USNM 784469, L = 21 mm. 95. *Conus planiliratus* Sowerby: USNM 784469, L = 27 mm. 96–97. *Conus symmetricus* Sowerby: USNM 784470, L = 37 mm. 98. *Strioterebrum bowdenensis* (Woodring): USNM 784578, L = 20 mm. 99–100. *Strioterebrum gatunense kugleri* (Rutsch): USNM 784471, L = 33 mm. 101–102. *Strioterebrum ischna* (Woodring): USNM 784579, L = 11 mm. 103–104. *Strioterebrum quadrispiralis* (Weisbord): USNM 784472, L = 13 mm. 105–106. *Strioterebrum trispiralis* (Weisbord): USNM 784473, L = 14 mm. 107–108. *Polystira barretti* (Guppy): USNM 784477, L = 63 mm. 109–110. *Agladrillia lassula* Jung: USNM 784474, L = 25 mm. 111–112. *Hindsiclava consors* (Sowerby): USNM 784476, L = 38 mm.

Golfo de Triste, Venezuela, March, 1970, USNM 784470.

Major citations—Lectotype and representative series illustrated by Pflug, 1961, pl. 18, figs. 4, 8, 11.

Additions to original description—Body whorl sculptured with 18 prominent, raised, pustulated spiral cords; spire sculpture with six incised spiral sulci; shell color pure white with small scattered pale orange-brown flammules; spire white with regularly-spaced, intermittent brown flammules; protoconch and early whorls pale orange; aperture white.

Remarks—The wide-shouldered and flat-spired aspects of *C. symmetricus* are unlike those of any other living cone. The Recent specimen shown here easily fits into the series illustrated by Pflug (1961, pl. 18, figs. 1–11), especially so in having spiral rows of raised pustules on the body whorl and in having a characteristically sculptured spire like that of Pflug's fig. 5 and as seen here in Fig. 96. One of the specimens of Pflug's series (fig. 6) is nearly identical to the Recent Venezuelan specimen.

Fossil distribution—Bowden formation, Jamaica; Gurabo formation, Santo Domingo; Gatun formation, Costa Rica and Panamá.

Family Terebridae
Genus *Strioterebrum* Sacco, 1891

33. *Strioterebrum bowdenensis* (Woodring, 1928)
Fig. 98

Terebra (Strioterebrum) bowdenensis Woodring, 1928: 138–139, pl. 3, figs. 3–8.

Material examined—Two specimens, lengths 20 mm and 22 mm, trawled by commercial shrimp boats from 35 m depth in Golfo de Triste, Venezuela, December, 1978, USNM 784578.

Additions to original description—Shell pure white.

Remarks—The two Recent specimens are indistinguishable from the type-series illustrated by Woodring, both in size and sculpturing.

Fossil distribution—Bowden formation, Jamaica.

Recent distribution—In Golfo de Triste, Venezuela, 35 m depth.

34. *Strioterebrum gatunensis kugleri* (Rutsch, 1934)
Figs. 99–100

Terebra (Strioterebrum) gatunensis kugleri Rutsch, 1934: 106–108, pl. 8, fig. 18, pl. 9, figs. 12, 13. Weisbord, 1962: 428–430, pl. 40, figs. 12, 13, pl. 45, figs. 24, 25.

Material examined—Lengths 33 mm and 32 mm, on beach, Crespo, Cartagena, Colombia, after storm, December, 1974, USNM 784471; length 24 mm, same locality and data, UMML 8282.

Major citations—Redescribed in detail, with diagnosis, by Weisbord, 1962.

Additions to original description—Shell color deep gray-brown with alternating flammules of dark brown; beaded junctions of axial cords and spiral ridges light tan; lower part of body whorl with white band; base of shell dark chocolate brown; subsutural collar white with alternating brown patches corresponding to brown flammules on body whorl; interior of aperture dark brown.

Remarks—Besides lack of color, the fossil specimen of *S. gatunensis kugleri* illustrated by Weisbord (1962, pl. 40, figs. 12, 13) is almost identical to the Recent specimen illustrated here. The color pattern of brown flammules and checkers and the distinctive sculpturing of raised beads readily separates *S. gatunensis kugleri* from any other known Recent Atlantic *Strioterebrum*.

The relict species is closest to *S. spiriferum* (Dall, 1895) from the Gurabo formation, Santo Domingo, and also *S. glaucum* (Hinds, 1844) from the Panamic Province. *Strioterebrum gatunensis kugleri* is well-represented in the fossil record of Venezuela.

Fossil distribution—Punta Gavilán, Mare, and Cabo Blanco formations, Venezuela.

Recent distribution—Known only from the Colombian coast near Cartagena but probably occurs elsewhere along the Colombian and Venezuelan coasts.

35. *Strioterebrum ischna* (Woodring, 1928)
Figs. 101–102

Terebra (Strioterebrum) ischna Woodring, 1928: 142, pl. 3, fig. 18, pl. 4, fig. 1.

Material examined—Five specimens, lengths 6–11 mm, on beach, Adícora, Penin-

sula de Paraguaná, Estado Falcón, Venezuela, December, 1974, USNM 784579.

Addition to original description—Shell color uniformly pale tan.

Remarks—The Recent specimens are identical to the fossil type-specimens illustrated by Woodring.

Fossil distribution—Bowden formation, Jamaica.

Recent distribution—North end of Peninsula de Paraguaná, Venezuela.

36. *Strioterebrum quadrispiralis*
(Weisbord, 1962)
Figs. 103–104

Terebra (Strioterebrum) quadrispiralis Weisbord, 1962: 431–432, pl. 41, figs. 1–4.

Material examined—Three specimens, lengths 11–13 mm, on beach, Adícora, Peninsula de Paraguaná, Venezuela, April, 1975, USNM 784472; length 11 mm, on beach, Punta Mangle, Isla Margarita, Venezuela, 1977, UMML 8282 (from Gibson-Smith collection).

Additions to original description—Shell color pale rose-white with darker band along suture; base of shell dark reddish-brown; interior of aperture white, dark reddish-brown in siphonal region; protoconch white.

Remarks—Along with the following species, this small terebrid resembles no other living Atlantic species. *Strioterebrum quadrispiralis* and *S. trispiralis* represent the last of a long lineage of small, beaded terebrids centered around the Middle Miocene *S. eleutheria* (Woodring, 1928) and *S. midiensis* (Olsson, 1922).

This and the following species may be population variants of an undescribed Bowden species (Woodring, 1928: pl. 3, figs. 13, 14). As such, they would represent true relict species. If they are distinct species that have long been endemic to the Venezuelan coast, however, they may only represent old, unchanged species inhabiting their original range and would not be considered true relicts. In either case, the existence of these two terebrids reinforces the archaic nature of the relict pocket.

Fossil distribution—Mare formation, Venezuela.

Recent distribution—From the Peninsula de Paraguaná to Isla Margarita, Venezuela, in shallow water.

37. *Strioterebrum trispiralis*
(Weisbord, 1962)
Figs. 105–106

Terebra (Strioterebrum) trispiralis Weisbord, 1962: 430–431, pl. 40, figs. 14, 15.

Material examined—Lengths 14 mm and 13 mm on beach, Adícora, Peninsula de Paraguaná, Venezuela, April, 1975, USNM 784473; 3 specimens, lengths 11–14 mm, on beach Punta Mangle, Isla Margarita, Venezuela, 1977, UMML 8283 (from Gibson-Smith collection).

Additions to original description—Shell color gray-brown, darker along suture; base dark purple-brown; interior of aperture white, purple in siphonal region.

Remarks—*Strioterebrum trispiralis* is closely related to the preceding species, and pending anatomical studies, may prove to be conspecific. The main difference between the two species is seen in the structure and form of the varices and varical nodes. In *S. trispiralis*, the varices are complete, forming costae that are intersected by two spiral sulci, giving the shell the characteristic tripartite form. In *S. quadrispiralis*, the varices are intersected by three sulci, giving the effect of four rows of raised beads.

Fossil distribution—Mare formation, Venezuela.

Recent distribution—From the Peninsula de Paraguaná to Isla Margarita, Venezuela, in shallow water.

Family Turridae
Subfamily Turrinae Swainson, 1875
Genus *Polystira* Woodring, 1928

38. *Polystira barretti* (Guppy, 1866)
Figs. 107–108

Pleurotoma barretti Guppy, 1866: 290, pl. 17, fig. 6.
Turris albida barretti, Maury, 1917: 214, pl. 8, fig. 5.
Polystira barretti, Woodring, 1928: 146, pl. 4, fig. 6. Pflug, 1961: 70–71, pl. 20, figs. 1, 4.

Material examined—Length 63 mm, trawled by commercial shrimp boat, 35 m depth, in Golfo de Triste, Venezuela, March, 1979, USNM 784477; length 72 mm, trawled by

commercial shrimp boat, 35 m depth, off Cabo La Vela, Peninsula de Guajira, Colombia, December, 1974 (with *Crucibulum marense* attached), USNM 784478; lengths 65 mm and 61 mm, P-712 (11°8'N, 63°18'W), 25 m depth.

Major citations—Redescribed in detail by Woodring, 1928; holotype illustrated by Pflug, 1961, pl. 20, figs. 1, 4).

Addition to original description—Shell pure white; periostracum thin, gray-green.

Remarks—The well-developed shoulder carina, seen in both fossil and Recent specimens, sets *P. barretti* aside from all other known Atlantic *Polystira* species. The Recent specimen illustrated here is similar to the illustration of the holotype in Pflug (1961).

Fossil distribution—Gurabo formation, Santo Domingo; Bowden formation, Jamaica.

Recent distribution—Off the Colombian and Venezuelan coasts, 20–40 m depth.

Subfamily Clavinae Powell, 1942
Genus *Agladrillia* Woodring, 1928

39. *Agladrillia lassula* Jung, 1969
Figs. 109–110

Agladrillia lassula Jung, 1969: 550–551, pl. 59, figs. 1–3.

Material examined—Length 25 mm, trawled by commercial shrimp boat, from 35 m depth, in Golfo de Triste, Venezuela, March, 1979, USNM 784474.

Additions to original description—Shell color pale tan with white axial costae; outer lip white; interior of aperture tan; early whorls pinkish-tan.

Remarks—The Recent specimen of *A. lassula* from the Golfo de Triste is very close to the fossil illustrated by Jung (1969, pl. 59, figs. 2, 3). The conspicuous lateral hump, which marks the termination of the axial costae and the beginning of the smooth dorsum, is a specific character seen in both fossil and Recent specimens. There are no known Recent species of *Agladrillia* that bear any resemblance to this rather aberrant turrid, and this is the first known Atlantic species of the formerly paciphilic genus.

Fossil distribution—Melajo Clay Member, Springvale formation, Trinidad.

Recent distribution—Known only from the Golfo de Triste, Venezuela.

Genus *Hindsiclava* Hertlein & Strong, 1955

40. *Hindsiclava consors* (Sowerby, 1850)
Figs. 111–112

Pleurotoma consors Sowerby, 1850: 50.
Turris (Crassispira) consors, Rutsch, 1934: 99, pl. 8, figs. 13–16.
Crassispira consors, Pflug, 1961: 67, pl. 19, figs. 4, 7, 10. Jung, 1965: 565, pl. 76, figs. 14, 15.
Crassispira (Hindsiclava) consors consors, Woodring, 1970: 378–380, pl. 58, figs. 1, 22.

Material examined—Length 38 mm, trawled by commercial shrimp boat, 35 m depth, in Golfo de Triste, Venezuela, March, 1979, USNM 784476.

Major citations—Lectotype illustrated by Pflug, 1961; detailed redescription and diagnosis by Woodring, 1970.

Additions to original description—Shell color pale yellow; subsutural band white.

Remarks—The Recent specimen illustrated here is nearly identical to the fossil lectotype illustrated by Pflug (1961, pl. 19, figs. 4, 10). The only other southern Caribbean *Hindsiclava* species that could be confused with *H. consors* is *H. chazaliei* (Dautzenberg, 1900) (Fig. 123) from off Surinam, Venezuela, and Colombia. The sympatric *H. chazaliei* differs from *H. consors* by having a lower spire and raised axial costae, and being dark brown in color.

Fossil distribution—Gurabo formation, Santo Domingo; Bowden formation, Jamaica; Springvale formation, Trinidad; Punta Gavilán formation, Venezuela; Limón formation, Costa Rica; Gatun formation, Costa Rica and Panamá.
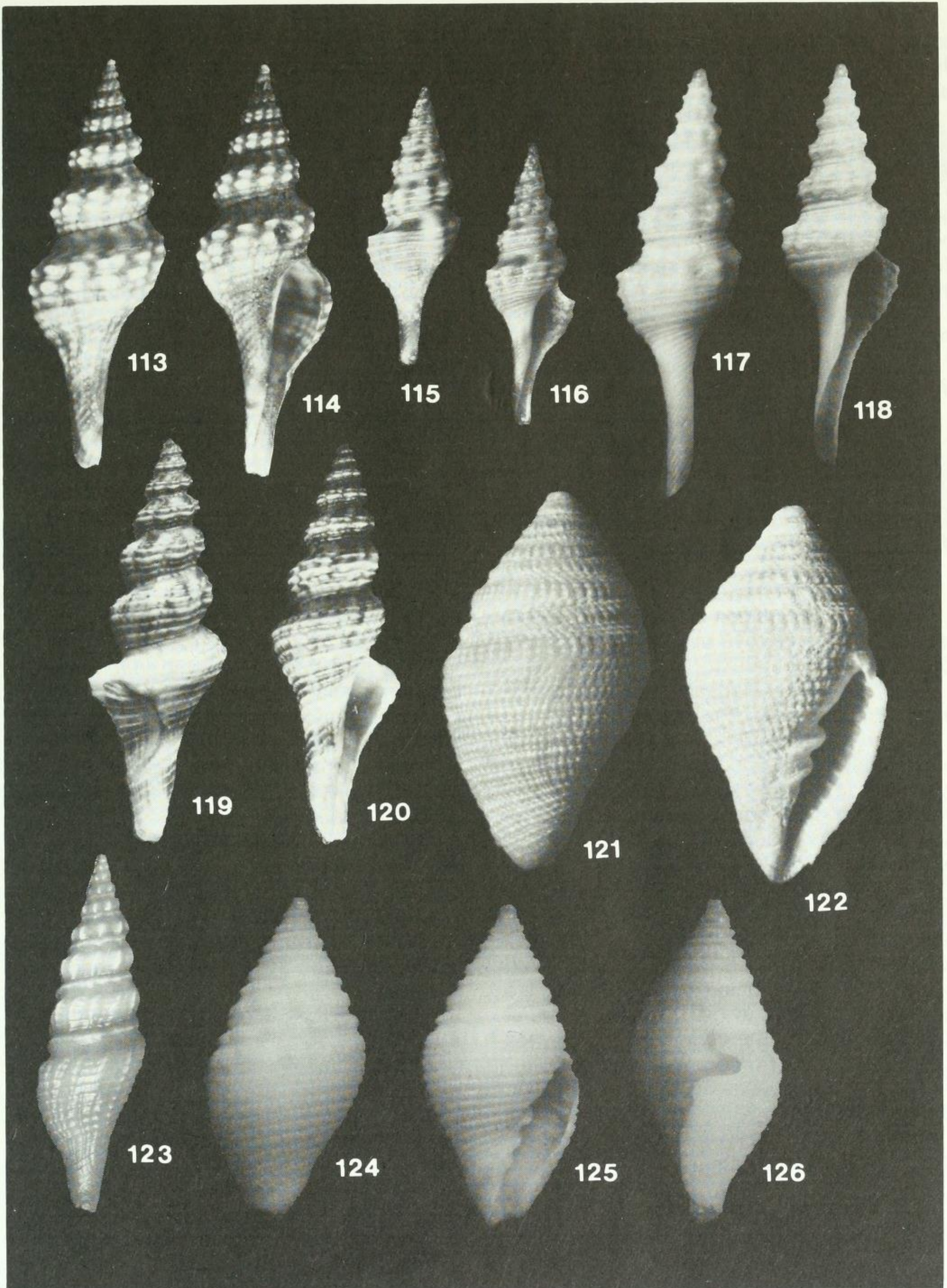
Recent distribution—Known only from the Golfo de Triste, Venezuela, 35 m depth.

Subfamily Turriculinae Powell, 1942
Genus *Fusiturricula* Woodring, 1928

41. *Fusiturricula acra* (Woodring, 1970)
Figs. 113–114

Pleurofusia acra Woodring, 1970: 367–368, pl. 57, fig. 8.

Material examined—Length 34 mm, P-727 (10°20'N, 65°2'W), 64 m depth.

FIGS. 113–126. 113–114. *Fusiturricula acra* (Woodring): P-727, L = 34 mm. 115–116. *Fusiturricula humerosa* (Gabb): P-737, L = 19 mm. 117–118. *Fusiturricula iole* Woodring: USNM 784580, L = 17 mm. 119–120. *Fusiturricula jaquensis* (Sowerby): USNM 784475, L = 46 mm. 121–122. *Paraborsonia varicosa* (Sowerby): USNM 784581, L = 16 mm. 123. *Hindsiclava chazaliei* (Dautzenberg): P-712, L = 33 mm. 124–126. *Paraborsonia varicosa* (Sowerby): USNM 784581, L = 15 mm.

Additions to original description—Shell color tan with numerous thin brown vertical flammules; subsutural nodes white, separated by brown patches.

Remarks—*Fusiturricula acra* can be separated from the other three living northern South American *Fusiturricula* species by having white subsutural shoulder nodes and noded spiral threads on the lower part of the body whorl. This last character was used by Woodring (1970: 368) to separate *F. acra* from its fossil congeners.

Fossil distribution—Gatun formation, Panamá.

Recent distribution—Near Isla Margarita, Venezuela, 64 m depth.

42. *Fusiturricula humerosa* (Gabb, 1873)
Figs. 115–116

Turris (Surcula) humerosa Gabb, 1873: 208.
Surcula humerosa, Pilsbry, 1922: 315–316, pl. 17, figs. 4, 5.

Material examined—Two specimens, lengths 15 mm and 19 mm, P-737 (10°44'N, 66°7'W), 65 m depth.

Major citations—Redescribed and illustrated with diagnosis by Pilsbry, 1922.

Addition to original description—Shell color pale tan with alternating lavender purple vertical flammules; raised spiral cords pale yellow; siphonal canal orange; interior of aperture tan; protoconch and early whorls orange.

Remarks—Although similar in size to the following species, *Fusiturricula humerosa* differs from *F. iole* in being a more colorful shell with a pattern of vertical purple flammules and by having a large, angled axial swelling on the dorsum of the last whorl. The specimens illustrated by Pilsbry closely resemble the specimen shown here.

Fossil distribution—Gurabo formation, Santo Domingo.

Recent distribution—Off Cabo Cordera, Venezuela, 65 m depth.

43. *Fusiturricula iole* Woodring, 1928
Figs. 117–118

Fusiturricula iole Woodring, 1928: 167, pl. 6, fig. 4.

Material examined—Two specimens, lengths 17 mm and 20 mm, trawled by commercial shrimp boats from 35 m depth in Golfo de Triste, Venezuela, March, 1979, USNM 784580.

Addition to original description—Shell pure white.

Remarks—*Fusiturricula iole* can be separated from both *F. acra* and *F. humerosa* by its smaller size, more angled shoulder, sharp shoulder coronations, and pure white color. The Recent specimen illustrated here is very close to the fossil holotype illustrated by Woodring.

Fossil distribution—Bowden formation, Jamaica.

Recent distribution—Golfo de Triste, Venezuela, 35 m depth.

44. *Fusiturricula jaquensis* (Sowerby, 1850)
Figs. 119–120

Pleurotoma jaquensis Sowerby, 1850: 51.
Knefastia jaquensis, Woodring, 1928: 167.
Fusiturricula jaquensis, Jung, 1965: 568, pl. 77, fig. 5. Abbott, 1974: 264, no. 2918. Altena, 1975: 62–63, pl. 4, figs. 8, 9.
Knefastia paulettae Princz, 1980: 71, fig. 1.

Material examined—Length 46 mm, trawled by commercial shrimp boats, 35 m depth, in Golfo de Triste, Venezuela, March, 1979, USNM 784475.

Major citations—Living specimens described by Altena, 1975 and Princz, 1980 (as *Knefastia paulettae*).

Remarks—*Fusiturricula jaquensis* was the first supposedly extinct Gatunian species to be recognized as part of the Recent molluscan fauna of northern South America. The specimen illustrated here is nearly identical to those illustrated by Altena (living) and Jung (fossil).

Fossil distribution—Bowden formation, Jamaica; Gurabo formation, Santo Domingo; Cantaure and Punta Gavilán formations, Venezuela.

Recent distribution—Surinam to Golfo de Triste, Venezuela, at depths of 35–100 m.

Subfamily Borsoninae Bellardi, 1875
Genus *Paraborsonia* Pilsbry, 1922

Like *Panamurex* and *Conomitra*, this endemic American genus was presumed to have died out at the end of the Miocene (Woodring, 1970: 373). The discovery of this distinctive relict genus further reinforces the archaic nature of the upwelling faunal pocket.

45. *Paraborsonia varicosa* (Sowerby, 1850)
Figs. 121–122, 124–126

Mitra varicosa Sowerby, 1850: 46.
Cordiera varicosa, Gabb, 1873: 270.
Borsonia (Paraborsonia) varicosa, Pilsbry,
   1922: 325–326, pl. 17, figs. 19–21.

Materials examined—Five specimens,
lengths 14 mm to 16 mm, trawled from 35 m
depth in Golfo de Triste by commercial shrimp
boats, March, 1979, USNM 784581.

Major citations—Diagnosis and illustra-
tions, especially of protoconch, by Pilsbry,
1922.

Additions to original description—Shell
color pale yellow with darker yellow crescent-
shaped flammules along shoulder; anterior tip
of columella dark yellow; interior of aperture
white.

Remarks—The Recent specimens of this
relict genus closely resemble the specimen of
Paraborsonia varicosa illustrated by Pilsbry.
Paraborsonia cantaurana Jung, 1965 from
the Cantaure formation of Venezuela is simi-
lar but differs in having a much higher spire,
approaching the genus *Scobinella. Parabor-
sonia laeta* Jung, 1971 from the Grand Bay
formation of Carriacou is also similar to the
relict but has a much more developed
shoulder carina.

Fossil distribution—Bowden formation,
Jamaica; Grand Bay formation, Carriacou;
Gurabo formation, Santo Domingo.

Recent distribution—Golfo de Triste,
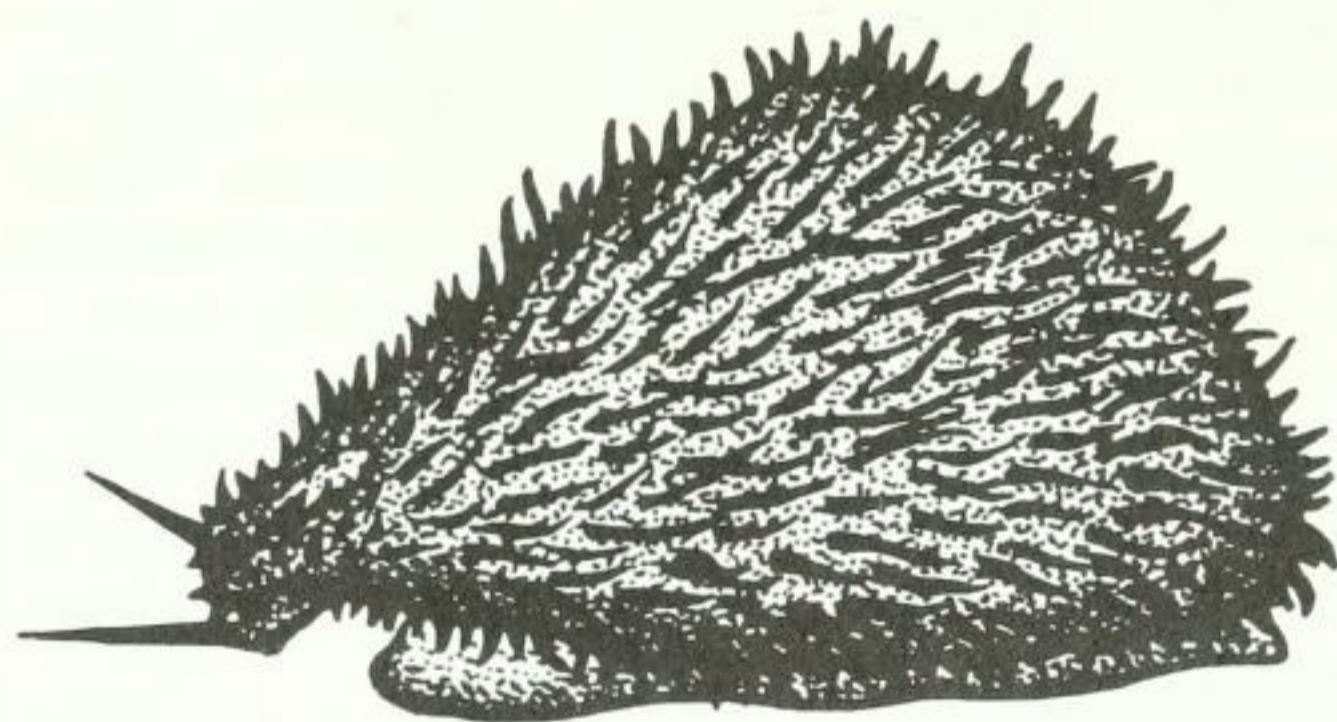Venezuela, 35 m depth.

ACKNOWLEDGEMENTS

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FIGS. 127–129. Living animals of the extant South-
ern Caribbean *Siphocypraea* spp., drawn from life:
127. *Siphocypraea mus* (Linnaeus). 128.
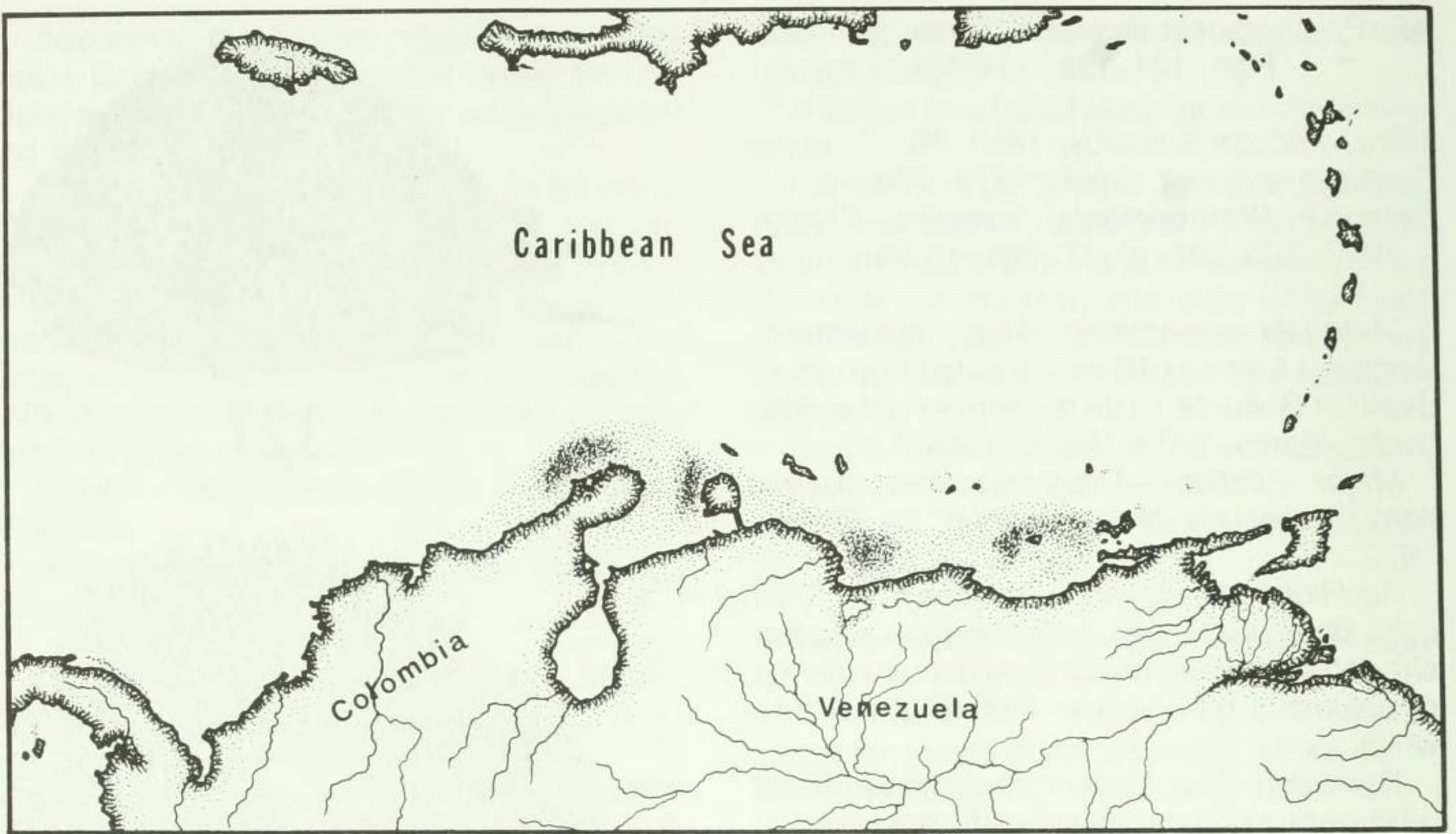*Siphocypraea donmoorei* Petuch. 129. *Sipho-
cypraea henekeni* (Sowerby).

FIG. 130. Map of Southern Caribbean, showing distribution of upwelling system along northern Colombian and Venezuelan coasts. Actual upwelling areas denoted by heavy stipling; areas influenced by upwellings denoted by light stipling. After Meyer (1977, fig. 1).

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APPENDIX 1. R/V John Elliott Pillsbury station data, arranged by area.

	Depth	Date (all July)
1. Golfo de Urabá, Colombia		1966
P-353 (8°13.2'N, 76°50.1'W)	30 m	11
P-361 (8°51.9'N, 76°37.2'W)	40 m	12
P-362 (8°57.5'N, 76°33.6'W)	72 m	12
2. Golfo de Morrosquillo, Colombia		
P-367 (9°31.3'N, 75°49.5'W)	40 m	13
3. Off Peninsula de Guajira, Colombia		
		1968
P-766 (12°14.3'N, 70°40.0'W)	64 m	28
P-767 (12°16.1'N, 71°03.3'W)	25 m	28
P-768 (12°33.4'N, 71°10.8'W)	65 m	28
P-772 (12°20.2'N, 71°55.1'W)	11 m	29
P-773 (12°17.0'N, 72°15.0'W)	62 m	29
4. Golfo de Venezuela, Venezuela		
P-759 (12°09.0'N, 69°57.5'W)	36 m	27
P-760 (12°15.4'N, 69°57.5'W)	62 m	27
P-761 (11°52.0'N, 70°22.0'W)	35 m	27
5. Golfo de Triste, Venezuela		
P-749 (10°37.0'N, 67°57.9'W)	59 m	25
P-750 (10°36.1'N, 68°12.6'W)	24 m	25
P-756 (11°33.1'N, 69°12.6°W)	30 m	27
P-758 (11°42.2'N, 69°40.0'W)	16 m	27
6. Off Cabo Cordera, Venezuela		
P-734 (11°01.8'N, 65°34.2'W)	65 m	22
P-736 (10°57.0'N, 65°52.0'W)	100 m	22
P-737 (10°44.0'N, 66°07.0'W)	65 m	22
7. Off Isla Margarita, Venezuela		
P-716 (11°29.0'N, 63°51.0'W)	63 m	20
P-717 (11°21.0'N, 64°10.0'W)	64 m	20
P-718 (11°22.5'N, 64°08.0'W)	60 m	20
P-721 (11°06.5'N, 64°22.5'W)	26 m	21
P-722 (11°04.0'N, 64°44.0'W)	91 m	21
P-723 (10°43.5'N, 64°16.0'W)	65 m	21
P-727 (10°20.0'N, 65°02.2'W)	64 m	21
P-728 (10°22.5'N, 65°23.0'W)	86 m	21
8. Off Peninsula de Paria, Venezuela		
P-708 (11°24.7'N, 62°40.5'W)	70 m	19
P-709 (11°08.8'N, 62°46.1'W)	46 m	19
P-712 (11°08.0'N, 63°18.0'W)	25 m	19

APPENDIX 2. List of known living caenogastropods from shallow water in the Golfo de Venezuela and Golfo de Triste, Venezuela. T = collected in Golfo de Triste; V = collected in Golfo de Venezuela; 1 = reported by Princz, 1980; 2 = records from R/V Pillsbury expedition material; 3 = reported by Vermeij (personal communication); 4 = reported by Gonzalez & Flores, 1972; 5 = personal observations; 6 = reported by Flores, 1973, a, b.

Littorinidae
   Littorina angulifera (Lamarck), T, 6
   Littorina cf. angustior Mörch, V, 3, 5
   Littorina flava King & Broderip, T, 5, 6
   Littorina lineata Orbigny, T, 6
   Littorina lineolata Orbigny, T, 6
   Littorina meleagris (Potiez & Michaud), T, V, 1, 5, 6
   Littorina nebulosa (Lamarck), T, V, 1, 5, 6
   Littorina tessellata Philippi, T, V, 1
   Littorina ziczac (Gmelin), T, V, 1, 3, 5, 6
   Nodilittorina tuberculata (Menke), T, V, 5, 6
   Tectarius muricatus (Linnaeus), T, V, 3, 5, 6

Architectonicidae
   Architectonica nobilis (Röding), T, V, 1, 2, 5

Turritellidae
   Turritella exoleta (Linnaeus), T, 2
   Turritella variegata (Linnaeus), T, V, 1, 2, 5

Cerithiidae
   Cerithium atratum (Born), T, V, 3, 5
   Cerithium eburneum Hwass, T, V, 3, 5

Planaxidae
   Planaxis nucleus (Hwass), T, V, 1, 3, 5

Epitoniidae
   Epitonium albidum (Orbigny), V, 1
   Epitonium lamellosum (Lamarck), T, V, 2, 5

Calyptraeidae
   Calyptraea centralis (Conrad), V, 1
   Crepidula cymbaeformis Conrad, V, 3
   Crepidula plana Say, V, 3
   Crucibulum auricula (Gmelin) V, 1

Strombidae
   Strombus gigas Linnaeus, T, V, 1, 5
   Strombus pugilis Linnaeus, T, V, 1, 2, 5
   Strombus raninus Gmelin, T, 5

Naticidae
   Polinices hepaticus (Röding), T, V, 2, 5
   Polinices lacteus (Guilding), T, V, 2, 5

Cypraeidae
   Cypraea cinerea Gmelin, T, V, 2, 5
   Cypraea spurca acicularis Gmelin, T, V, 2, 5
   Cypraea zebra Linnaeus, T, V, 2, 5
   Siphocypraea donmoorei Petuch, V, 5
   Siphocypraea mus (Linnaeus), V, 1, 3, 5

Cassidae
   Cassis madagascariensis Lamarck, V, 1
   Phalium granulatum (Born), T, V, 1, 2, 5

Cymatiidae
   Cymatium aquatile Reeve, T, 5
   Cymatium krebsi Mörch, V, 5
   Cymatium parthenopeum (von Salis), V, 5
   Cymatium pileare (Linnaeus), T, 5
   Distorsio clathrata (Lamarck), T, V, 1, 5
   Distorsio macgintyi Emerson & Puffer, V, 5

Tonnidae
   Tonna galea (Linnaeus), V, 1, 5

Bursidae
   Bursa bufo (Hwass), T, V, 2, 5

Muricidae
   Calotrophon velero (E. Vokes), T, V, 2, 5
   Chicoreus brevifrons (Lamarck), V, 1, 3, 4, 5
   Dermomurex pauperculus (C. B. Adams), V, 3
   Phyllonotus margaritensis (Abbott), V, 1, 3, 5
   Murex donmoorei Bullis, T, V, 2, 4, 5
   Murex messorius Sowerby, T, V, 1, 2, 4, 5

Thaididae
   Purpura patula (Linnaeus), T, 4, 5
   Thais coronatum (Lamarck), V, 5
   Thais deltoidea (Lamarck), T, 4, 5
   Thais haemastoma floridana Conrad, T, V, 1, 4
   Thais rustica (Lamarck), T, 4, 5
   Thais trinitatensis (Guppy), V, 5

Columbellidae
   Columbella cf. mercatoria (Linnaeus), T, V, 1, 3, 5
   Mazatlania aciculata (Lamarck), V, 3, 5
   Nitidella laevigata (Linnaeus), V, 3, 5
   Strombina pumilio (Reeve), T, V, 5

Buccinidae
   Antillophos candei (Orbigny), T, V, 2, 5
   Pisania lauta (Reeve), T, V, 1, 3, 5
   Pisania auritula (Link), T, V, 1, 3, 5

Nassariidae
   Nassarius vibex (Say), V, 3, 5
   Pallacera guadalupensis (Petit), V, 3, 5

Melongenidae
   Melongena melongena (Linnaeus), T, V, 1, 2, 3, 5

Fasciolariidae
   Latirus angulatus (Röding), T, V, 1, 2, 5
   Latirus infundibulum (Gmelin), T, V, 1, 2, 5
   Leucozonia nassa (Gmelin), V, 3, 5
   Fasciolaria cf. tulipa (Linnaeus), V, 1, 2, 3, 5
   Fusinus closter Philippi, V, 1, 2, 5

Turbinellidae
   Vasum muricatum (Born), V, 1, 3, 5

Olividae
   Ancilla glabrata (Linnaeus), T, V, 1, 2, 3, 5
   Ancilla tankervillei (Swainson), V, 2, 5
   Oliva oblonga Marrat, V, 5
   Oliva scripta Lamarck, V, 1, 2, 5
   Olivella perplexa Olsson, V, 1, 5
   Olivella verreauxi (Duclos), T, V, 1, 3, 5

Volutidae
  Voluta musica Linnaeus, V, 3, 5

Marginellidae
  Persicula interruptolineata (Megerle von Mühl-feld), V, 1, 5
  Persicula tessellata (Lamarck), V, 2, 5
  Prunum glans (Menke), V, 2, 5
  Prunum marginatum (Born), T, V, 1, 2, 5
  Prunum prunum (Gmelin), V, 5
  Prunum pulchrum (Gray), V, 2, 5

Cancellariidae
  Cancellaria reticulata (Linnaeus), T, V, 2, 5

Conidae
  Conus centurio Born, T, V, 2, 5

Conus daucus Hwass, V, 5
Conus mappa Lightfoot, T, V, 5
Conus optabilis A. Adams, V, 2, 5
Conus puncticulatus Hwass, T, V, 1, 3, 5
Conus spurius Gmelin, T, V, 1, 2, 5
Conus undatus Kiener, V, 2, 5

Terebridae
  Hastula salleana (Deshayes), T, V, 1, 3, 5
  Paraterebra taurina (Solander), V, 1, 5

Turridae
  Clathodrillia gibbosa (Born), V, 5
  Hindsiclava chazaliei (Dautzenberg), V, 2, 5
  Polystira barretti (Guppy) (as "*P. albida*"), T, V, 1, 2, 5