

CENOZOIC MURICIDAE OF THE WESTERN ATLANTIC REGION  
PART X – THE SUBFAMILY MURICOPSINAEEMILY H. VOKES  
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## CONTENTS

	Page
I. ABSTRACT . . . . .	49
II. INTRODUCTION . . . . .	49
III. ACKNOWLEDGMENTS . . . . .	50
IV. SYSTEMATIC DESCRIPTIONS . . . . .	51
V. LOCALITY DATA . . . . .	148
VI. LITERATURE CITED . . . . .	153
VII. APPENDIX I: Alphabetical list of species . . . . .	157
VIII. APPENDIX II: Stratigraphical list of species . . . . .	159

## I. ABSTRACT

The muricid subfamily Muricopsinae includes a total of 88 named taxa, of which 74 are considered valid. This number includes 12 new species described herein, from either fossil or living material in the western Atlantic. There are ten genus-groups recognized: six genera and four subgenera, with a maximum of 20 to a minimum of one species included in each. New species described include three from the Early Miocene Chipola Formation: *Muricopsis* (*Muricopsis*) *shirleyae*, ?*Murexsul nanissimus*, and *Murexiella* (*Murexiella*) *parvula*. There are four Recent species: *Muricopsis* (*Muricopsis*) *josei* and *Muricopsis* (*Muricopsis*) *marcusi*, both from Brazil; *Muricopsis* (*Muricopsis*) *perexigua*, from the Caribbean and the Bahama Islands; and *Favartia* (*Favartia*) *barbarae*, from off Yucatan, Mexico. The other new species are: *Murexsul comptulus*, Waccamaw Formation, South Carolina; *Murexsul amphilogos*, Moín Formation, Costa Rica; *Murexiella* (*Murexiella*) *petuchi*, Pinecrest beds, Florida; *Murexiella* (*Murexiella*) *stephensae*, (?)Tamiami Formation, Florida; and *Favartia* (*Caribiella*) *carmenae*, (?)Medias Aguas Formation, Veracruz, Mexico. An additional nine forms are cited only as "sp.," making a total of 83 taxa treated systematically in this report.

## II. INTRODUCTION

The subfamily Muricopsinae is among the most recently recognized groups within the family Muricidae. In 1971, at a meeting of the Western Society of Malacologists, I presented a paper (Vokes, 1971b) on the geologic history of the family Muricidae, in which I concluded that in the subfamily Muricinae there are three distinct lineages: one, the *Paziella-Poirieria-Pterynotus* branch; two, the *Hexaplex-Murex-Chicoreus* branch; and three, the *Murexiella-Murexsul* branch. All three go back to the beginning of the Tertiary, with numerous species in each group being present in Eocene strata world-wide.

At the same meeting Radwin and D'Attilio (1971) presented a systematic arrangement of the entire superfamily Muricea, separating the various species into subfamilies based upon the shell, the operculum, and, especially, the radula. In this arrangement they retained two branches of my subfamily Muricinae (the *Paziella* "clan" and the *Hexaplex* "clan," as I termed them), both of which have a flat rachidian tooth, in the subfamily Muricinae, but the third (the *Murexiella-Murexsul* "clan") they placed into a new subfamily based primarily upon the presence of a very different three-dimensional rachidian tooth (see Radwin and D'Attilio, 1971, figs. 21, 22, 23).



Having already noted that each of the three groups has been extant for approximately the same length of geologic time, and considering the evidence of the markedly different radular types, I immediately accepted the new subfamily Muricopsinae.

This group is not as large in numbers of species, or genera, as the other two branches. However, the species are widespread throughout the world both in the geologic record and in the Recent fauna. In previous publications on western Atlantic members of Muricidae, most generic groups now placed in the subfamily Muricopsinae have been monographed, but not all. Furthermore, some were done originally as early as 1968, before the "explosion" of new species reported in recent years. Thus, it is appropriate that a study be undertaken encompassing all the western Atlantic species of the subfamily.

The previous studies, listed in the systematic order used in the present paper, are as follows:

*Muricopsis* s.s. – never done.

*Muricopsis* (*Risomurex*) – Vokes and Houart, 1986

*Murexsul* – Vokes, 1968

*Acanthotrophon* – Vokes, 1980

*Murexiella* s.s. – Vokes, 1968

*Murexiella* (*Subpterynotus*) – Vokes, 1968

*Homalocantha* – Vokes, 1968 (as species of *Murexiella*)

*Favartia* s.s. – never done

*Favartia* (*Caribiella*) – never done

*Favartia* (*Pygmaepteris*) – Vokes and D'Attilio, 1980

In the present study a total of 83 species is treated. These are divided rather evenly between fossil and Recent forms. The numbers of species in each genus-group occurring only as fossils compared with those occurring only in Recent faunas, and those occurring both fossil and Recent, are presented in Table 1.

I have attempted to make synonymies for fossil species as complete as possible. However, for Recent species generally the citations are only to references where the form was illustrated. Unless the citation notably extends the range or affects the nomenclature it is not included. For many of these common western Atlantic species a "complete" synonymy would include a great many references to simple faunal lists.

### III. ACKNOWLEDGMENTS

Some of the work in this paper was done as long ago as my doctoral dissertation (1967) and, as a result, over the years there have been a very large number of persons who have provided assistance in the form of specimens for study (both as loans and as outright gifts), information, and photographs. In particular, workers at several institutions have been extremely helpful, both lending type material and providing information on type specimens. These would include the United States National Museum of Natural History (M.G. Harasewych, Raye Germon, Thomas R. Waller, Warren Blow), the Academy of Natural Sciences of Philadelphia (Robert Robertson, Gary Rosenberg, David G. Robinson,

TABLE 1. DISTRIBUTION OF WESTERN ATLANTIC SPECIES OF MURICOPSINAE BY GENUS-GROUP

Genus	Fossil only	Fossil and Recent	Recent only	Total
<i>Muricopsis</i>	6	1	7	14
<i>Risomurex</i>	3	2	5	10
<i>Murexsul</i>	6	1	2	9
<i>Acanthotrophon</i>	2	1	1	4
<i>Murexiella</i>	11	6	3	20
<i>Subpterynotus</i>	1	0	0	1
<i>Homalocantha</i>	3	0	0	3
<i>Favartia</i>	2	3	6	11
<i>Caribiella</i>	1	0	1	2
<i>Pygmaepteris</i>	2	1	6	9
Total	37	15	31	83



Nancy W. Rulon, Doree Bardes), the Museum of Comparative Zoology, Harvard University (Kenneth J. Boss, Fred Collier), Carnegie Museum of Natural History (John E. Rawlins), Florida Museum of Natural History (Roger W. Portell), Florida Dept. of Natural Resources (William G. Lyons), Museu Oceanográfico, Rio Grande do Sul (E.C. Rios), Muséum National d'Histoire Naturelle, Paris (Philippe Bouchet, Virginie Heros), and the Naturhistorisches Museum, Basel, Switzerland (Peter Jung).

A large number of individuals generously have provided me with specimens for figuring, for use as types, and general comparative material. First among these would have to be Susan B. Stephens (Sanibel, Florida), the late Barbara Steger (Tampa, Florida), and Kevan and Linda Sunderland (Sunrise, Florida). But close behind comes a virtual army of collectors (both professional and amateur) who I am listing in alphabetical order; all have been extremely helpful in this study. They are: Jose and Marcus Coltro (São Paulo, Brazil); David T. Dockery III (Mississippi Department of Environmental Quality); Paul Drez (Albuquerque, New Mexico); James Ernest (Balboa, Panama); Jose Espinosa (Havana, Cuba); Emilio Garcia (Lafayette, Louisiana); Mr. and Mrs. Jack Gibson Smith (Surrey, England); David Hargreave (Kalamazoo, Michigan); the late Shirley E. Hoerle (West Palm Beach, Florida); Roland Houart (Landen, Belgium); Susan Khan (New Port Richey, Florida); Maria del Carmen Perrilliat (Instituto de Geología, UNAM, Mexico); Edward J. Petuch (Florida Atlantic University, Boca Raton); Gary W. Schmelz (Naples, Florida); Donald R. Shaskey (Redlands, California); Judith Terry Smith (Palo Alto, California); Danker Vink (formerly of Curaçao, Netherlands Antilles); John S. Waldrop (Lake Wales, Florida); Druid Wilson (Lake Wales, Florida); and the late Eugenia I. Wright (Phoenix, Arizona). If I have omitted anyone, I apologize.

Finally, Hubert C. Skinner took on the monumental task of editing the manuscript, thereby earning my undying gratitude.

Abbreviations for Repository Institutions:  
ANSP – Academy of Natural Sciences,  
Philadelphia, Pennsylvania, USA

CMNH – Carnegie Museum of Natural History, Pittsburgh, Pennsylvania, USA  
IRSNB – Institut Royal des Sciences Naturelle, Bruxelles, Belgium  
MCZ – Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, USA  
MNHN – Muséum National de Histoire Naturelle, Paris, France  
MORG – Museu Oceanográfico, Rio Grande, Rio Grande do Sul, Brazil  
NMB – Naturhistorisches Museum, Basel, Switzerland  
PRI – Paleontological Research Institution, Ithaca, New York, USA  
SDNHM – San Diego Natural History Museum, San Diego, California, USA  
UF – Museum of Natural History, University of Florida, Gainesville, Florida, USA  
USNM – U. S. National Museum of Natural History, Washington, DC, USA

#### IV. SYSTEMATIC PALEONTOLOGY

Family MURICIDAE Rafinesque, 1815

Subfamily MURICOPSINAE

Radwin and D'Attilio, 1971

Genus MURICOPSIS

Bucquoy and Dautzenberg, 1882

Subgenus MURICOPSIS ss.

*Muricidea* "Swainson" of authors, *not* of Swainson, 1841.

Type species: *Murex hexagonus* Lamarck, 1816, by "subsequent designation," Jousseaume, 1880.

*Muricopsis* BUCQUOY and DAUTZENBERG in BUCQUOY, DAUTZENBERG, and DOLLFUS, 1882, Moll. Mar. Roussilon, v. 1, p. 19.

Type species: *Murex blainvillei* Payraudeau, 1826, by original designation.

*Discussion:* The name "*Muricidea*" was used for this group for many years after the name *Muricopsis* was proposed for those shells typified by *Murex blainvillei*. The genus *Muricidea* was proposed originally by Swainson with the type species *Murex magellanicus* Gmelin, 1791, thereby creating a synonym of the genus *Trophon* Montfort, 1810, the type species of which is also *M. magellanicus* (= *Buccinum geversianum* Pallas, 1774). This type designation was ignored by subsequent writers and the type, by "consensus," was taken to be



*Murex hexagonus* Lamarck, 1816 (non *Murex hexagonus* Gmelin, 1791). In much of the literature until as recently as 1953 (M. Smith) the name *Muricidea* was employed for shells that we would refer to *Muricopsis*.

The gender of the generic name *Muricopsis* has been the subject of debate. The problem is that the suffix “-opsis,” meaning “having the appearance of, like” is derived from the Greek noun “opsis, opseos,” meaning “look, appearance, face.” According to Roland Brown (1954, p. 483), the historic spokesman for scientific nomenclature: “Generic terms ending with the noun *opsis* are feminine; but those in which *opsis* is adjectival may, in practice be masculine, feminine, or neuter, in accord with the genders of the governing name.” Hence, as *Murex* is masculine, the derivative name *Muricopsis* – “with the appearance of, or looking like a *Murex*” would be considered masculine, as it generally has been treated by those few authors who have considered the taxon as a genus and not just a subgenus of the masculine *Murex* (e.g., Cossmann, 1903; Radwin and D’Attilio, 1976; Vokes and Houart, 1986).

However, Brown goes on to add: “The many current exceptions...emphasize the need for a guiding principle.” The *Code of Zoological Nomenclature* (Third Edition, 1985) has, indeed, settled this matter in Article 30(a), which states that the gender of a Latin or Greek word is that given in a standard Latin or Greek dictionary. Among the examples given is the termination -*opsis*, which they note is feminine. Therefore, the names in this study have been emended accordingly.

The genus *Muricopsis* is characterized by a marked biconic shape, the posterior edge of the aperture falling almost exactly on the mid-point of the height of the shell. There are five or six strong denticles on the inner side of the outer lip and, in the type species and the geologically older New World species, there are two strong denticles on the anterior portion of the columellar lip. However, in the younger New World species, these are commonly either reduced or lacking. The spiral ribs number three to five and give rise to short, pointed spines where they cross the varices, which are about seven in number. All of the Recent species are much alike whether they are in the Mediterranean, the western At-

lantic, or the eastern or western Pacific. The oldest known species definitely referable to the genus *Muricopsis* s.s. is *M. vistaensis* Givens and Kennedy (1976, p. 969, pl. 3, figs. 1-6), from the Eocene of California.

In the western Atlantic the oldest known species referable to *Muricopsis* s.s. is the Late Oligocene *M. scabrosa* (Dall), described from the Tampa Limestone. In the Oligocene of the Old World the oldest known species is *Murex pereger* Beyrich, 1854. In the Miocene of France and Germany there is another species that has been cited as “*Murex cristatus* Brocchi” (e.g., Hörnes, 1856, pl. 25, fig. 6) but which is not that species. True *Murex cristatus* Brocchi, 1814, is common in the Plio-Pleistocene of Italy and doubtless gave rise to the Recent *Murex blainvillei*, type of the genus. There is a question as to the specific distinctness of *M. cristatus* and *M. blainvillei*, as was discussed in a previous paper (Vokes and Houart, 1986, p. 85). On the whole, the fossil shells are larger (often 35-40 mm in height) and the Recent ones smaller (maximum height 25 mm). Comparison of other features, such as the protoconch, does not reveal any distinguishing characteristic and it was concluded that the two probably represent a single cline, which is changing through time. But given the fact the the name “*blainvillei*” is so entrenched in the literature, it would be unwise to synonymize the two names without better biological evidence than we presently have.

On the western coast of tropical America there are six species of *Muricopsis* living today. One of these, *M. armata* (A. Adams, 1854), is the Pacific cognate of the widespread Pliocene to Recent western Atlantic *M. oxytata*. Another, *M. jaliscoensis* Radwin and D’Attilio, 1970, is very like the Caribbean *M. huberti* Radwin and D’Attilio, 1976. The eastern Pacific species *M. pauxilla* (A. Adams, 1854) is most similar to *M. perexigua*, n. sp., described herein. The recently named eastern Pacific *M. skoglundae* Myers, Hertz, and D’Attilio, 1993, is remarkably similar to the also recently named Bahamian *M. zylmanae* Petch, 1993. But the other two, *M. tulensis* Radwin and D’Attilio, 1976, and *M. zeteki* Hertlein and Strong, 1951, are unlike any known Atlantic form, the latter having columellar plications more akin to a species of



*Vasum* than to any known members of the Muricopsinae.

All of these Pacific species (except for *M. skoglundae*, which like its Atlantic cognate, is dredged from deeper water) are found intertidally under rocks, presumably having made the shift from a coralline habitat to a rocky one as changing environmental conditions demanded.

MURICOPSIS (MURICOPSIS) SCABROSA (Dall)

Plate 1, figure 1

*Tritonalia scabrosa* DALL, 1915, U.S. Natl. Mus., Bull. 90, p. 77, pl. 5, fig. 15.

"*Tritonalia*" *scabrosa* Dall. MANSFIELD, 1937, Florida Geol. Surv., Bull. 15, p. 135.

[*Muricopsis*] *scabrosa* (Dall). VOKES, 1971, Bulls. Amer. Paleontology, v. 61, no. 268, p. 95.

*Description*: "Shell small, elevated, scabrous, of about 5 whorls beside the (decollate) nucleus; suture appressed, indistinct, flexuous; spire rather acute; axial sculpture of 7 rather stout rounded ribs extending from suture to canal, and of numerous more or less minutely scaly incremental lines covering the surface; spiral sculpture on the spire of 2 prominent duplex threads, slightly swollen where they cross the ribs and more or less minutely imbricate; on the body of the last whorl 5, and on the canal 3 similar spirals tending to become more or less spinose or bluntly pointed on the ribs at the shoulder; between these are numerous finer imbricate threads with wider interspaces; the whorl slopes to the shoulder from the suture; aperture with the outer lip thickened and crenulated by the spiral sculpture, internally with 5 short rather distant denticles; body and pillar with a thin wash of callus, the spiral sculpture on the canal under the enamel is perceptible; canal open, short, recurved." (Dall, 1915)

*Holotype*: USNM 166101; height 22.0 mm, diameter 12.0 mm.

*Type locality*: Tampa Limestone; Ballast Point, Tampa Bay, Hillsborough County, Florida.

*Occurrence*: Tampa Limestone, Florida.

*Figured specimen*: USNM 166101 (holotype).

*Discussion*: *Muricopsis scabrosa* is the earliest western Atlantic species referable to the genus *Muricopsis* s.s. It has the typical two columellar denticles, characteristic of most of the members of the genus *Muricopsis*. Presumably this is what Dall meant when he said: "The spiral sculpture on the canal under the enamel is perceptible."

The species is known only from the type locality and is rare there. Mansfield (1937,

p. 135) did not make any comment upon the species but only quoted Dall's original reference. Dall (1915, p. 77) referred the form to the genus *Tritonalia* noting, "This might almost equally well be referred to *Muricidea* [i.e., *Muricopsis*], but it has the surface of *Tritonalia*." By this one can only assume he was referring to the axial growth lines, which give the shell its scabrous surface.

MURICOPSIS (MURICOPSIS) SHIRLEYAE

Vokes, n. sp.

Plate 1, figures 2, 3

*Description*: Shell biconic, seven teleoconch whorls in adult, plus protoconch of one and one-half smooth, bulbous whorls, ending at small recurved varix. Spiral ornamentation on first teleoconch whorl of one cord at mid-point and one at suture; that at shoulder initially weak but becoming stronger by second teleoconch whorl, and that at mid-point diminishing. Third and succeeding spire whorls marked by two major cords, one at shoulder and one at suture, with a secondary cord between them. On body whorl, in addition, two stronger cords near base of body whorl, each of the four alternating with a secondary cord. On siphonal canal one major cord near distal end, with three secondary cords between it and the major cord at base of body whorl. In some larger specimens tertiary threads developed between each of the primary and secondary cords, resulting in typical muricid pattern of first-, third-, second-, third-, first-order spiral ornamentation. Axial ornamentation on first teleoconch whorl of eight or nine small flanges with open loop at shoulder; on second or third whorl varices gradually becoming more complex, and developing a short sharp spine at shoulder. All later whorls with six or seven varices per whorl, composed of multiple layers of shelly material, with small sharp, open spines developed at intersection of spiral cords, size of spine proportional to size of cord; that at shoulder the largest. Varices approximately aligned with those of preceding whorls, forming a more or less straight line up the spire. Suture extremely appressed. Aperture oval, posterior end extended into an adapically directed anal notch; inner lip smooth, appressed at posterior end, standing free along anterior portion. Some specimens with two faint denticles at anterior end of columellar lip, but lacking in most. Inner side of outer lip with six equisized denticles, located between major spiral cords. Siphonal canal short, recurved at distal end, succession of terminations giving rise to a small umbilicus.

*Holotype*: USNM 645621; height 14.6 mm, diameter 9.0 mm.



*Type locality:* TU 547, Chipola Formation; west bank of Chipola River, about 2000 ft. above Fourmile Creek (SW 1/4 Sec. 29, T1N, R9W), Calhoun County, Florida.

*Etymology of name:* In memory of the late Shirley E. Hoerle (Mrs. Robert C. Hoerle), West Palm Beach, Florida, excellent amateur paleontologist, dear friend, and collector of the holotype specimen.

*Occurrence:* Chipola Formation, Florida.

*Figured specimens:* Fig. 2, USNM 645621 (holotype). Fig. 3, USNM 482014 (paratype); height 7.3 mm, diameter 4.5 mm; locality TU 819. Additional localities: TU 555, 1048, 1196.

*Discussion:* This new species is similar to the younger Dominican species *M. praepauxilla* but differs in having a more compressed outline with four major spiral cords in contrast to the three of *M. praepauxilla* and, as a result, six apertural denticles in place of the five in *M. praepauxilla*. Neither has the "typical" *Muricopsis* columellar denticles but given the overall morphology of the shells there is no reason not to include them in this genus. The new species is most nearly akin to the Pliocene to Recent *M. oxytata*, especially the more squamose specimens, but differs in the more compressed outline.

All of the localities from which this new species has been taken are in the more coralline facies of the Chipola Formation, especially the two "coral-reef" localities on the Chipola River (TU 547, 555). The other localities are all on Farley Creek, also a more coralline facies. No specimens have been taken from the lime-mud facies on Tenmile Creek or the upper Chipola River.

#### MURICOPSIS (*MURICOPSIS*) species

##### Plate 1, figures 5, 6

*Muricopsis* species cf. *M. praepauxillus* (Maury). VOKES, 1989, *Bulls. Amer. Paleontology*, v. 97, no. 332, p. 68, pl. 8, figure 4 (said to be X 3 but is X 4).

*Occurrence:* Baitoa Formation, Dominican Republic. Chipola Formation, Florida.

*Figured specimens:* Fig. 5, USNM 482015; height 26.2 mm, diameter 13.2 mm; locality: TU 951. Fig. 6, NMB H 17186; height 15.0 mm, diameter 7.3 mm; locality: NMB 16943, Río Yaque del Norte just downstream from Boca de los Ríos, Dominican Republic. Additional locality: TU 830.

*Discussion:* In the Dominican report (Vokes, 1989, pl. 8, fig. 4) I figured a battered specimen from the Baitoa Forma-

### PLATE 1

Figures	Page
1. <i>Muricopsis (Muricopsis) scabrosa</i> (Dall) . . . . .	53
(X 2 1/2) USNM 166101 (holotype); height 22.0 mm, diameter 12.0 mm.	
Locality: Ballast Point, Tampa Bay, Florida. Tampa Limestone.	
2, 3. <i>Muricopsis (Muricopsis) shirleyae</i> Vokes, n. sp. . . . .	53
2. (X 4) USNM 645621 (holotype); height 14.6 mm, diameter 9.0 mm.	
Locality: TU 547, Chipola River, Florida. Chipola Formation.	
3. (X 8) USNM 482014 (paratype); height 7.3 mm, diameter 4.5 mm.	
Locality: TU 819, Farley Creek, Florida. Chipola Formation.	
4. <i>Muricopsis (Muricopsis) praepauxilla</i> (Maury) . . . . .	56
(X 4) USNM 323896; height 13.2 mm, diameter 7.3 mm.	
Locality: TU 1215, Río Gurabo, Dominican Republic. Gurabo Formation.	
5, 6. <i>Muricopsis (Muricopsis) species</i> . . . . .	53
5. (X 2) USNM 482015; height 26.2 mm, diameter 13.2 mm.	
Locality: TU 951, Tenmile Creek, Florida. Chipola Formation.	
6. (X 3) NMB H 17186; height 15.0 mm, diameter 7.3 mm.	
Locality: NMB 16943, Río Yaque del Norte, Dominican Republic. Baitoa Formation.	
7. <i>Muricopsis (Muricopsis) quisqueyensis</i> Vokes . . . . .	56
(X 4) USNM 365148 (paratype B); height 13.2 mm, diameter 7.4 mm.	
Locality: TU 1215, Río Gurabo, Dominican Republic. Gurabo Formation.	
8. <i>Muricopsis (Muricopsis) sp. cf. quisqueyensis</i> Vokes . . . . .	57
(X 4) USNM 482016; height (incomplete) 11.1 mm, diameter 7.0 mm.	
Locality: TU 954. Pueblo Nuevo, Costa Rica. Moín Formation.	



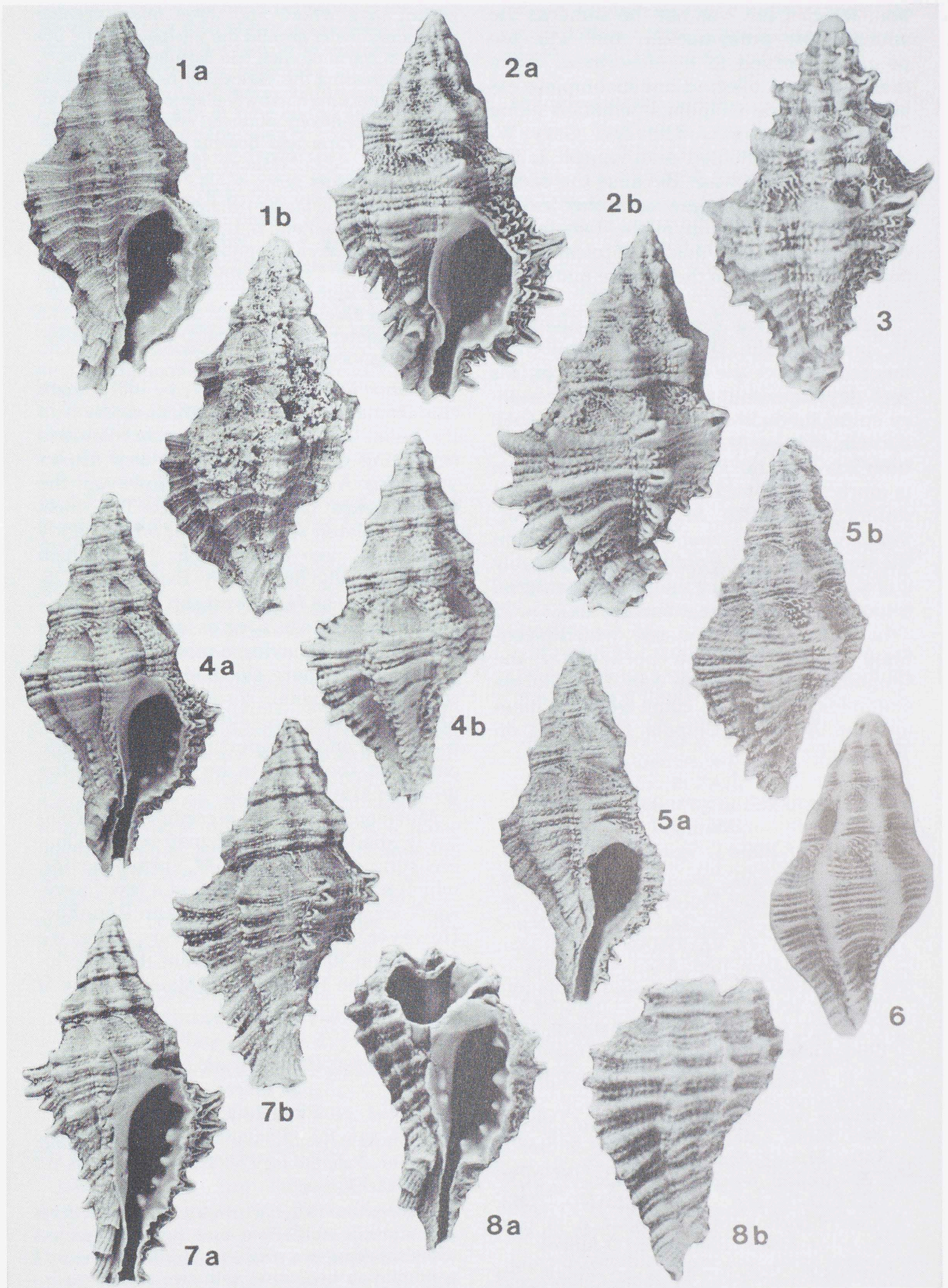


PLATE 1



tion, which I felt was not the same as the younger *M. praepauxilla*, but was too poorly preserved to be described. Since then we have collected one incomplete example from the Chipola Formation along Tenmile Creek (TU 830) and Gary W. Schmelz has collected another (pl. 1, fig. 5), only slightly better. Because the occurrence of these specimens is another indication of the correlation of the two formations, it was deemed desirable to call attention to the form even though the material is less than optimum.

Although of the same general shape as *M. praepauxilla*, these older shells are larger and have the major spiral cords less well developed but with stronger secondary spiral threads covering the entire shell surface, where *M. praepauxilla* is essentially bare. In the latter character this form is more similar to *M. oxytata*; however, it differs from both *M. oxytata* and *M. praepauxilla* in having eight denticles on the inner side of the outer lip. Presumably it is a new species but the present material is too poor to describe at this time.

In contrast to *M. shirleyae*, which is confined to the coralline portions of the Chipola Formation, the only two Florida examples of this form come from the lime-mud of the basal Chipola Formation on Tenmile Creek.

MURICOPSIS (MURICOPSIS) PRAEPAUXILLA  
(Maury)

Plate 1, figure 4

*Murex (Phyllonotus) praepauxillus* MAURY, 1917, *Bulls. Amer. Paleontology*, v. 5, no. 29, p. 103(276), pl. 16(42), fig. 11; VAUGHAN and WOODRING in VAUGHAN *et al.*, 1921, *Geol. Surv. Dom. Rep., Mem.*, v. 1, p. 141.

Not *Muricopsis praepauxillus* (Maury). VOKES, 1984, *Shells and Sea Life*, v. 16, no. 11, p. 214; DE JONG and COOMANS, 1988, *Stud. Fauna Curaçao, Caribbean Islands*, v. 49, p. 74, pl. 37, fig. 402 [= *M. warreni* Petuch].

*Muricopsis praepauxillus* (Maury). VOKES, 1989, *Bulls. Amer. Paleontology*, v. 97, no. 332, p. 67, pl. 8, figs. 2 (holotype), 3.

Not *Muricopsis praepauxilla* (Maury). SUNDERLAND and SUNDERLAND, 1993, *Amer. Conchologist*, v. 21, no. 4, p. 15, text-fig. [= *M. huberti* Radwin and D'Attilio].

*Description*: "Shell with seven whorls, the first two [one and one-half] smooth, nuclear, later whorls with low crenate varices, six [five to

seven] to a whorl, and three main, crenate ridges revolving around the periphery. The uppermost spiral of each trio carinates the whorl, and on crossing the varices forms short, hollow spines; aperture narrowly elliptical; canal open, somewhat reflexed; outer lip edged by the final fimbriated varix and bearing within five well-marked denticles." (Maury, 1917)

*Holotype*: PRI 28755; height 12.5 mm [not 16 mm as stated by Maury], diameter 7.2 mm.

*Type locality*: Zone D, Gurabo Formation; Río Gurabo, Dominican Republic (= TU 1215).

*Occurrence*: Cercado and Gurabo formations, Dominican Republic.

*Figured specimen*: USNM 323896; height 13.2 mm, diameter 7.3 mm; locality TU 1215. Additional localities: TU 1227A, 1422.

*Discussion*: Maury (1917, p. 103) named this Dominican species "*praepauxillus*" in the belief that it was most closely related to the living eastern Pacific species *Murex pauxillus* A. Adams, 1854. However, the resemblance is only generic. The most closely related species is that one recently named *M. warreni* Petuch, 1993, which was originally figured by Humfrey (1975, pl. 16, fig. 1) as *Muricopsis* sp. from Jamaica. Both of these species differ from the typical form in having a more pronounced constriction where the body whorl meets the siphonal canal, resembling species of *Murexsul*. Nevertheless, the surface ornamentation and the apertural denticles indicate that they are to be referred to the group of *Muricopsis* s.s.

*Muricopsis warreni* is confined to a relatively shallow (4.5 to 12 meters) coralline environment, as was *M. praepauxilla*, which has only been taken at a few "coral-reef" localities in the Dominican Republic. However, the species is not rare there; we have over 70 specimens from the type locality on the Río Gurabo (Maury's Zone D = TU 1215).

MURICOPSIS (MURICOPSIS) QUISQUEYENSIS  
Vokes

Plate 1, figure 7

*Muricopsis quisqueyensis* VOKES, 1989, *Bulls. Amer. Paleontology*, v. 97, no. 332, p. 68, pl. 8, figs. 7-9.

*Description*: "Shell with six teleoconch whorls and a protoconch of one-and-one-half rounded whorls, ending in a small, sharp varix. Spiral ornamentation beginning with two strong cords, numerous smaller threads gradually added, covering the entire surface of the shell including



the major cords; the latter persisting to the body whorl, where a total of five major cords are developed, plus another two on the siphonal canal. Axial ornamentation beginning on first teleoconch whorl with seven or eight small varices, increasing to eight or nine on the adult whorls. Where spiral ornamentation crosses varices, short, sharp spines produced, their size relative to the size of the spiral cord; in addition, shell surface shagreened by the intersection of numerous axial growth lines and spiral threads. Aperture elongate-oval, inner lip appressed at posterior end and slightly free-standing at anterior end, two small denticles on anterior half. Inside of outer lip with five strong denticles, corresponding to spaces between the spiral cords; that one just anterior to shoulder cord much the largest. Siphonal canal short, broad." (Vokes, 1989)

*Holotype*: USNM 365146; height 14.5 mm, diameter 7.0 mm.

*Type locality*: TU 1215, Gurabo Formation; Río Gurabo, bluffs on both sides from the ford on the Los Quemados-Sabaneta road, upstream to approximately 1 km above the ford, Dominican Republic.

*Occurrence*: Gurabo Formation, Dominican Republic.

*Figured specimen*: USNM 365148 (paratype B); height 13.2 mm, diameter 7.4 mm; locality TU 1215. Additional localities: TU 1227A, 1250.

*Discussion*: Occurring with *M. praepauxilla* are specimens of another species of *Muricopsis*, *M. quisqueyensis*. This second species in many ways is more similar to the West American *M. pauxilla* than its namesake. From the more abundant *M. praepauxilla*, it differs in having a more biconic outline, with the siphonal canal less well demarcated from the body whorl. It also has five major spiral cords on the body whorl in contrast to the three of *M. praepauxilla*.

MURICOPSIS (MURICOPSIS) sp. cf.

*M. QUISQUEYENSIS* Vokes

Plate 1, figure 8

*Occurrence*: Agueguexquite Formation, Mexico; Moín Formation, Costa Rica.

*Figured specimen*: USNM 482016; height (incomplete) 11.1 mm, diameter 7.0 mm; locality: TU 954. Additional locality: TU 638.

*Discussion*: In the Tulane Collections from the Agueguexquite Formation, Veracruz, Mexico, and the Moín Formation, Costa Rica, there are two incomplete specimens of a species that is most nearly like the Dominican *M. quisqueyensis*, but dif-

fers in having stronger spiral cords. Because both specimens are lacking the early whorls, it will not be described herein.

MURICOPSIS (MURICOPSIS) OXYTATA (Smith)

Plate 2, figures 1-6

Plate 3, figures 1-5

Plate 4, figure 4

*Murex hexagonus* LAMARCK, 1816, Tableau Encycl. Méth. (Vers), v. 3, pl. 418, fig. 3; Le Liste, p. 5; LAMARCK, 1822, Anim. sans Vert., v. 7, p. 169; KIENER, 1842, Coq. Viv., v. 7, *Murex*, p. 96, pl. 8, fig. 3; REEVE, 1845, Conch. Icon., v. 3, *Murex*, pl. 27, fig. 120; SOWERBY, 1879, Thes. Conch., v. 4, *Murex*, pl. 24, fig. 257 (*non Murex hexagonus* Gmelin, 1791).

*Murex hexagonus oxytata* M. SMITH, 1938, Nautilus, v. 51, no. 3, p. 89, pl. 6, fig. 6.

*Muricidea hexagonus* (Lamarck). M. SMITH, 1939, Illus. Cat. Recent Species Rock Shells, p. 11, pl. 6, fig. 3 (SMITH, 1953, *ibid.*)

*Muricopsis hexagonus* (Lamarck). OLSSON and HARBISON, 1953, Acad. Nat. Sci. Phila., Mon. 8, p. 247, pl. 37, fig. 4 (including *M. hexagonus oxytata* in synonymy); ABBOTT, 1954, Amer. Seashells, p. 209, pl. 25h.

*Muricopsis oxytata/oxytatus* (Smith). ABBOTT, 1958, Acad. Nat. Sci. Phila., Mon. 11, p. 63; OLSSON and MCGINTY, 1958, Bulls. Amer. Paleontology, v. 39, no. 177, p. 15; WARMKE and ABBOTT, 1961, Caribbean Sea Shells, p. 106, pl. 19e; ABBOTT, 1974, Amer. Seashells (ed. 2), p. 197, fig. 1957; HUMFREY, 1975, Sea Shells of the West Indies, p. 137, pl. 16, fig. 2; FAIR, 1976, The Murex Book, p. 64, pl. 17, fig. 226; RADWIN and D'ATTILIO, 1976, Murex Shells of the World, p. 169, pl. 27, fig. 5; KAICHER, 1980, Card Catalogue World-wide Shells, pack 25, Muricidae – Part V, no. 2552; ABBOTT and DANCE, 1982, Compendium Seashells, p. 144, color fig.; VOKES and VOKES, 1983, Mesoamer. Ecol. Inst., Mon. 1 (MARI Publ. 54), p. 24, pl. 12, fig. 14; VOKES, 1984, Shells and Sea Life, v. 16, no. 11, p. 214, back cover color photo; VOKES, 1988, Tulane Stud. Geol. Paleont., v. 21, no. 1, p. 34, pl. 4, figs. 9, 10; DE JONG and COOMANS, 1988, Stud. Fauna Curaçao, Caribbean Islands, v. 49, p. 74; SUNDERLAND and SUNDERLAND, 1993, Amer. Conchologist, v. 21, no. 4, p. 15, text-fig.

*Muricopsis lyonsi* PETUCH, 1986, Jour. Coastal Resh., v. 2, no. 4, p. 404, pl. 4, figs. 12, 13; PETUCH, 1988, Neogene Hist. Trop. Amer. Moll., pl. 17, fig. 11 (holotype).

*Description*: "Sculpture fine, spiny processes sharp; shell inclined to be rather slender when compared with West Indian recent examples



which are more rudely sculptured. The new subspecies appear [*sic*] to agree with living specimens from the Florida east coast and which may also bear the same name." (Smith, 1938)

*Holotype*: Said by Smith to be in Museum of Comparative Zoology, but not found (Fred Collier, 1993, personal communication); height 22 mm (*fide* Smith, 1938).

*Type locality*: Caloosahatchee Formation; Clewiston, Hendry County, Florida.

*Occurrence*: Esmeraldas Beds, Ecuador; Pinecrest Beds [= Fruitville Formation], Tamiami, Caloosahatchee, and Bermont formations, Florida; Tubará Group, Colombia; Moín Formation, Costa Rica; Recent, western Atlantic, Florida to Veracruz, Mexico, Panama and Costa Rica, northern South American.

*Figured specimens*: PLATE 2. Fig. 1, USNM 645623; height 35.0 mm, diameter 17.5 mm; locality TU 797. Fig. 2, USNM 482017, height 30.0 mm, diameter 13.5 mm; locality TU 541. Fig. 3, USNM 418051; height 19.3 mm, diameter 9.0 mm; locality TU 726. Fig. 4, USNM 482018; height 23.3 mm, diameter 12.7 mm; locality TU 1240. Fig. 5, USNM 482019; height 18.0 mm, diameter 10.1 mm; locality TU 1240. Fig. 6, USNM 880000; height 18.3 mm, diameter 12.6 mm; locality, off Portobelo, Panama. PLATE 3. Fig. 1, USNM 880001; height 27.5 mm, diameter 15.5 mm; locality, off Palm Beach, Florida, 30 meters. Fig. 2, USNM 880002; height 11.6 mm, diameter 7.5 mm; locality, off Palm Beach, Florida, 30 meters. Fig. 3, USNM 880003; height 36.6 mm, diameter 20.0 mm (including spines); locality, off Dania, Florida, 21 meters. Fig. 4, USNM 880004; height 26.0 mm, diameter 15.7 mm; locality, Caribe Point, Roatan, Bay Islands, Honduras, 1 meter. Fig. 5, USNM 880005; height 11.5 mm, diameter 7.5 mm; locality, Caribe Point, Roatan, Bay Islands, Honduras, 1 meter. PLATE 4. Fig. 4, USNM 880006; height 36.1 mm,

diameter 22.8 mm (including spines); locality, Lago Enriquillo, Dominican Republic, Holocene. Additional localities: TU 202, 203, 523, 527, 529B, 536, 767, 933, 954, 978, 988, 991, 1000, 1175, 1239, 1307, 1490, 1493.

*Discussion*: The name *Murex hexagonus* Lamarck is preoccupied by that of Gmelin, 1791, and the next available name is *M. oxytata* Smith, 1938. Although named as a subspecies, the distinction is not valid (Abbott, 1958, p 63).

As was discussed earlier (Vokes, 1988, p. 34), although some authors have spelled the name "*oxytatus*" in agreement with the (presumable masculine) genus *Muricopsis*, the name "*oxytata*" is a noun, meaning "spiny daddy," presumably a reflection of Smith's belief that this form was ancestral to the living *M. hexagona*.

The species is widespread in the Pliocene-Pleistocene of southern Florida. It also occurs in the Moín Formation of Costa Rica and the Tubará Group of northern Colombia, both of Pleistocene age. In addition to these western Atlantic occurrences, it has been collected in the Pliocene Esmeraldas beds of northwestern Ecuador (Vokes, 1988, pl. 4, fig. 9), one of the few species in common between the western Atlantic and eastern Pacific muricid faunas.

Although most specimens of *M. oxytata* are relatively smooth between the major spiral cords (pl. 2, figs. 1, 6; pl. 3, figs. 1-5), this is not always the case. Some specimens are extremely squamose (pl. 2, figs. 2-5). Some have high spires (pl. 2, figs. 1-3), others have low spires (pl. 2, fig. 6; pl. 3, figs. 1, 4). Some have short or no spines (pl.

## PLATE 2

Figures	Page
1-6. <i>Muricopsis (Muricopsis) oxytata</i> (M. Smith) . . . . .	57
1. (X 2) USNM 645623; height 36.0 mm, diameter 17.5 mm. Locality: TU 797, "Alligator Alley," Florida. Tamiami Formation.	
2. (X 2) USNM 482017, height 30.0 mm, diameter 13.5 mm. Locality: TU 541, Miami Canal, Florida (?) Caloosahatchee Formation.	
3. (X 3) USNM 418051; height 19.3 mm, diameter 9.0 mm. Locality: TU 726, Caloosahatchee River, Florida. Caloosahatchee Formation.	
4. (X 2) USNM 482018; height 23.3 mm, diameter 12.7 mm. Locality: TU 1240, Los Corales, Costa Rica. Moín Formation.	
5. (X 3) USNM 482019; height 18.0 mm, diameter 10.1 mm. Locality: TU 1240, Los Corales, Costa Rica. Moín Formation.	
6. (X 3) USNM 880000; height 18.3 mm, diameter 12.6 mm. Locality: off Portobelo, Panama. Recent.	



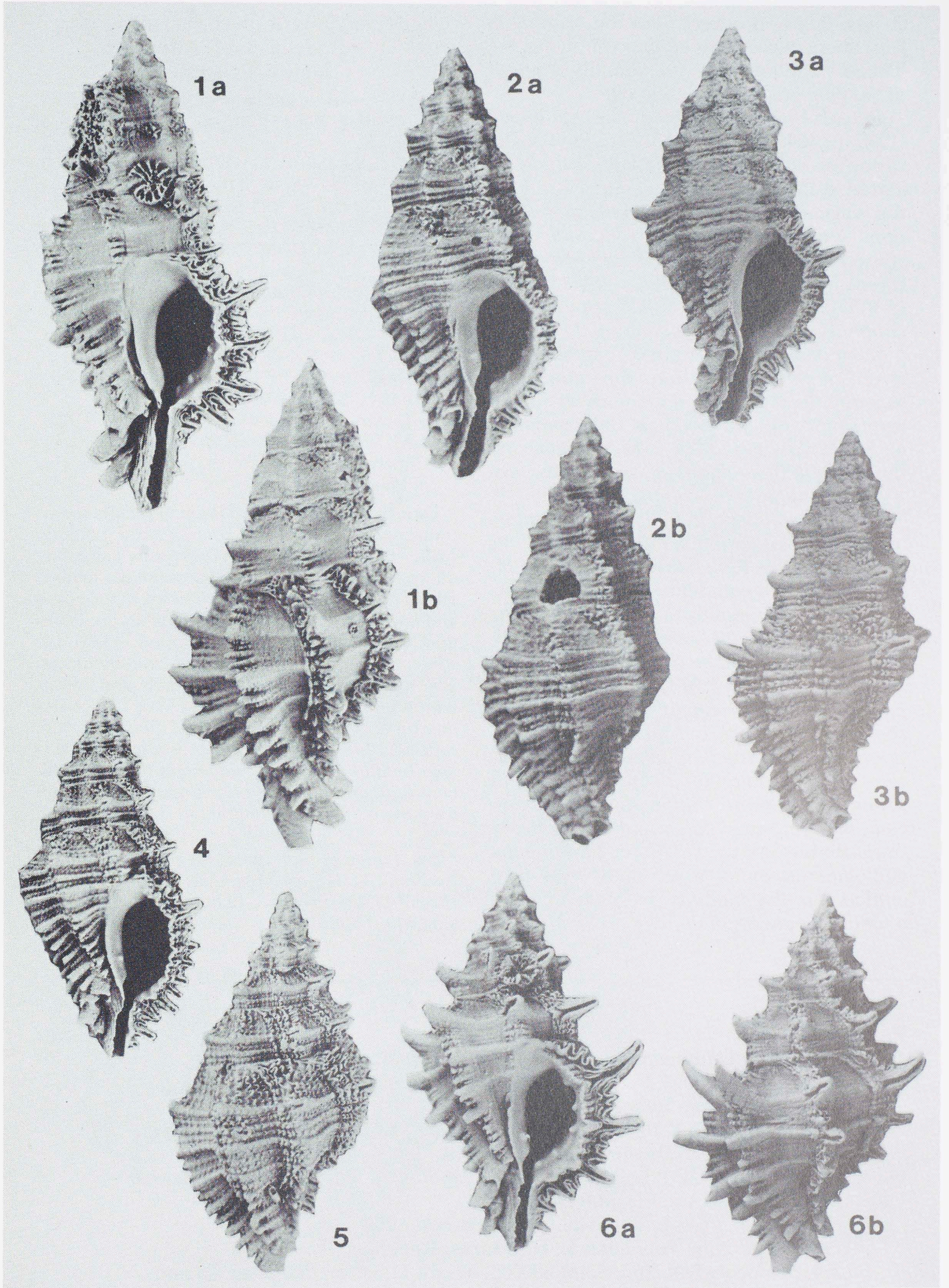


PLATE 2



2, figs. 2-5) and others, like the original illustration, have long spines (pl. 4, fig. 4). These variations are presumably a result of varying ecologic conditions.

Petuch has described *Muricopsis lyonsi* (1986, p. 404, pl. 4, figs. 12, 13) from the Pliocene of southeastern Florida, which he stated differs from *M. oxytata* in lacking the varical spines. In the Tulane Collections we have a number of these short-spined forms (pl. 2, fig. 2) from several different localities, including the type locality (= TU 1493) and they would appear to be simply ecologic variants.

If, indeed, the length of spines is a specific character, then the name *M. oxytata* must be applied to the short-spined form (pl. 2, fig. 3 is a typical Caloosahatchee Formation specimen of *M. oxytata*) and the long-spined Recent specimens are without a name.

The morphology of *M. oxytata* is intermediate between true *Muricopsis*, as typified by the Mediterranean species *M. blainvillei* (Payraudeau) and the genus *Murexsul*. For example, most specimens of *M. oxytata* do not have columellar denticles, but some do (see pl. 2, figs. 2, 4, 6; pl. 3, fig. 1). Ponder (1972, p. 238) has proposed that *Muricopsis* and *Murexsul* should be synonymized because the differences between the two forms are not sufficient to distinguish them. Species such as *M. oxytata* tend to reinforce such a proposal, and yet, most species are readily distinguishable. As the two lines have a long geologic history of separation, it is concluded that the modern resemblances are a result of convergence.

#### MURICOPSIS (MURICOPSIS) HUBERTI

Radwin and D'Attilio

Plate 5, figures 1-4

[?] *Muricopsis oxytatus* (Smith). WORK, 1969, Bull. Mar. Sci., v. 19, no. 3, p. 667 (?not of Smith).

*Muricopsis huberti* RADWIN and D'ATTILIO, 1976, Murex Shells of the World, p. 232, text-figs. 182 (shell), 183 (radula); VOKES, 1984, Shells and Sea Life, v. 16, no. 11, p. 214; DE JONG and COOMANS, 1988, Stud. Fauna Curaçao, Caribbean Islands, v. 49, p. 74, pl. 37, fig. 403; VOKES, 1989, Bulls. Amer. Paleontology, v. 97, no. 332, p. 68; SUNDERLAND and SUNDERLAND, 1993, Amer. Conchologist, v. 21, no. 4, p. 15, text-fig.

*Muricopsis duffyi* PETUCH, 1992, La Conchiglia, Ann. 23, no. 262, p. 5, fig. 2.

*Muricopsis praepauxilla* (Maury). SUNDERLAND and SUNDERLAND, 1993, Amer. Conchologist, v. 21, no. 4, p. 15, text-fig. (not of Maury).

*Description*: "The shell is small for the genus (maximum length 14.8 mm\*) and stoutly fusiform. The spire is high and acute, consisting of five weakly shouldered postnuclear whorls and a protoconch of undetermined nature [one and one-half rounded whorls]. The suture is distinct where the shell is not eroded. The body whorl is comparatively short and broadly fusoid. The aperture is moderately small and ovate, with a narrow, shallow anal sulcus. The outer apertural lip is briefly erect and finely serrate, reflecting the outer shell sculpture; its inner surface bears five equal-sized moderately prominent denticles, the posteriormost slightly set off from the others. The columellar lip is adherent,

\*This is obviously an error, for paratypes in the Academy of Natural Sciences of Philadelphia (ANSP 332226) measure 19.5 mm and 18.5 mm in length [= height].

#### PLATE 3

Figures	Page
1-5. <i>Muricopsis (Muricopsis) oxytata</i> (M. Smith) . . . . .	57
1. (X 2) USNM 880001; height 27.5 mm, diameter 15.5 mm. Locality: off Palm Beach, Florida. Recent.	
2. (X 4; protoconch X 10) USNM 880002; height 11.6 mm, diameter 7.5 mm. Locality: off Palm Beach, Florida. Recent.	
3. (X 2) USNM 880003; height 36.6 mm, diameter 20.0 mm (including spines). Locality: off Dania, Florida. Recent.	
4. (X 2) USNM 880004; height 26.0 mm, diameter 15.7 mm. Locality: Roatan, Bay Islands, Honduras. Recent.	
5. (X 4; protoconch X 10) USNM 880005; height 11.5 mm, diameter 7.5 mm. Locality: Roatan, Bay Islands, Honduras. Recent.	



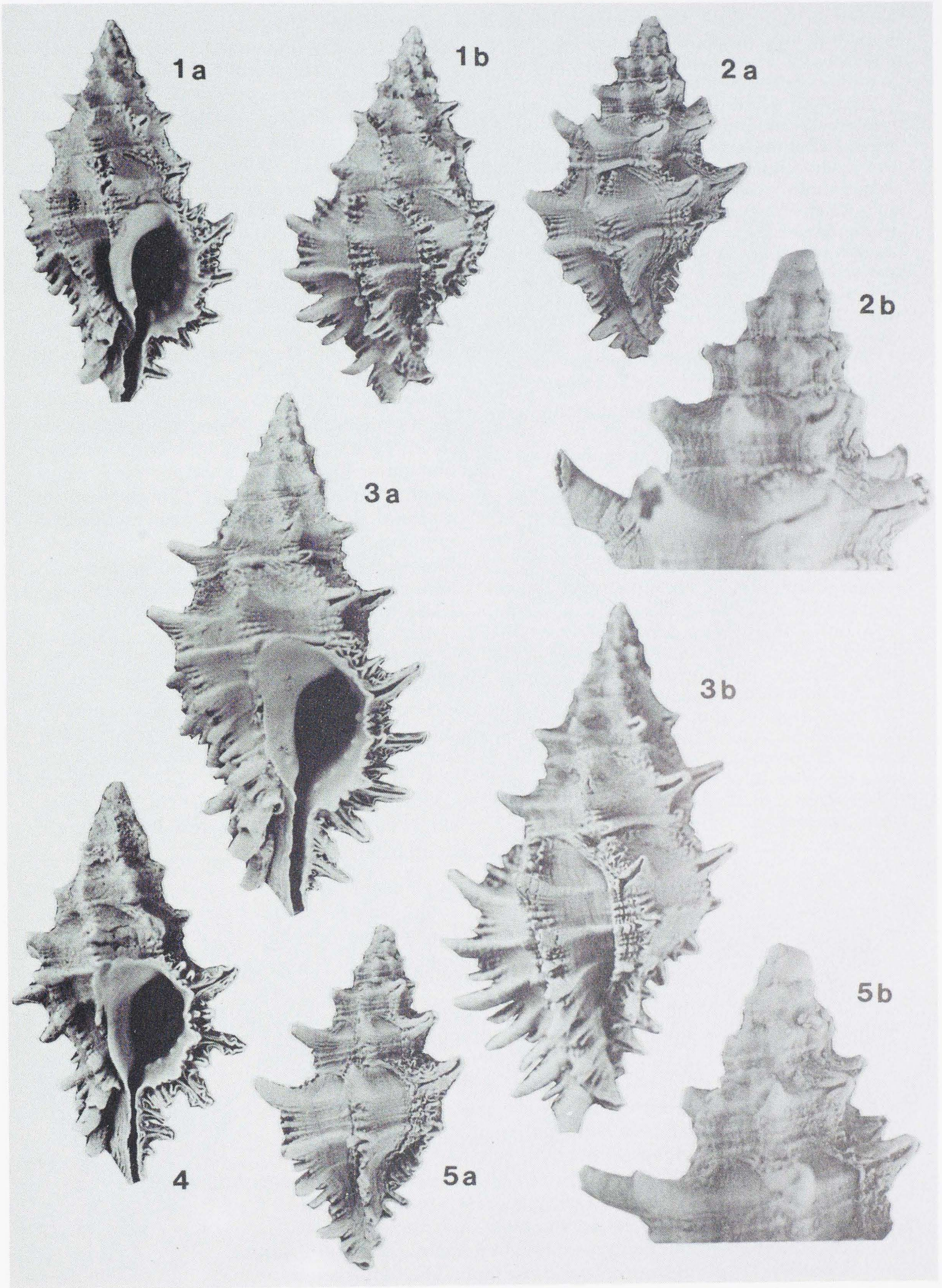


PLATE 3



except at its extreme anterior end, where it bears two low, small oblique pustules. The siphonal canal is very broad and short, and tends to be more or less bent to the left.

"The body whorl bears five or six low, sharp-crested varices, these aligned obliquely up the spire. All but the last-formed varix are comparatively featureless, and the last one or two are developed into weak flanges with three or four very short, sharp spines at the margin. Spiral sculpture consists of five major cords; a slightly weaker one on the shoulder, three on the body, and one on the canal. In addition there are one or two minor threads between each two major cords. The varices are very broad-based, the intervarical spaces very narrow.

"Shell color is white. The aperture is porcelaneous white." (Radwin and D'Attilio, 1976)

*Holotype*: SDMNH 63078; height 14.2 mm, diameter 7.4 mm.

*Type locality*: West side of Grenada, West Indies, 4.5 meters.

*Occurrence*: Recent only, Lesser Antilles to Curaçao (de Jong and Coomans, 1988, p. 74) and Panama (Sunderland and Sunderland, 1993, p. 15).

*Figured specimens*: Fig. 1, USNM 880007; height 18.6 mm, diameter 10.5 mm; locality, Antigua, British West Indies, 5 meters. Fig. 2, Vink Collection; height 13.2 mm, diameter 6.4 mm; locality, Curaçao, Netherlands Antilles, 0.5 meter. Fig. 3, USNM 880008; height 20.0 mm, diameter 11.1 mm; locality, Los Roques Archipelago, Venezuela, 2-3 meters. Fig. 4, CMNH 47340 (holotype - *Muricopsis duffyi* Petuch); height 21.4 mm, diameter 11.2 mm; locality, Noronqui [?Moronqui], Los Roques Archipelago, Venezuela, 2 meters.

*Discussion*: Most specimens of this species are badly lime-encrusted, but a juvenile in the collection of Danker Vink (pl. 5, fig. 2) shows the species to have typical *Muricopsis* surface ornamentation, with three major spiral cords (see Sunderland and Sunderland, 1993, p. 15, text-fig.). The overall shape is relatively low-spired compared to other members of the genus. Although compared by the original authors to the Dominican *M. praepauxilla*, the form differs in the shorter siphonal canal and more expanded body whorl. The protoconch, although similar, is larger in *M. huberti* than in *M. praepauxilla* (0.8 mm in diameter vs. 0.6 mm in the fossil species).

Petuch (1992, p. 5) recently has named *M. duffyi*, which he stated is most similar to *M. huberti*, differing in having a more elongated shell with a wider and more sloping subsutural area. Comparison of material of both "species" fails to disclose any noticeable difference in the two forms. Most specimens are heavily encrusted with lime (pl. 5, fig. 4), indicating a particular environmental situation.

Work (1969, p. 667) reported specimens of "*M. oxytatus*" from the Los Roques Islands, Venezuela. I have not seen his material, but given the locality it is possible that what he had was *M. huberti*. I have not seen any specimens of *M. oxytata* from Los Roques; however, de Jong and Coomans (1988, p. 74) report "*M. oxytatus*" as "rather common" in the Netherlands

#### PLATE 4

Figures	Page
1-3. <i>Muricopsis (Muricopsis) zylmanae</i> Petuch . . . . .	66
1. (X 2) CMNH 47379 (holotype); height 32.0 mm, diameter 18.5 mm (including spines). Locality: Great Isaacs Cay, Bahama Islands. Recent.	
2. (X 1 1/2) Sunderland Collection (paratype); height 46.1 mm; diameter 34.0 mm (including spines). Locality: Cay Sal Bank, Bahama Islands, Recent.	
3. (X 2) Stephens Collection; height 26.7 mm, diameter 17.2 mm (including spines). Locality: Cay Sal Bank, Bahama Islands. Recent.	
4. <i>Muricopsis (Muricopsis) oxytata</i> (Smith) . . . . .	57
(X 1 1/2) USNM 880006; height 36.1 mm, diameter 22.8 mm (including spines). Locality: Lago Enriquillo, Dominican Republic. Holocene.	
5, 6. <i>Muricopsis (Muricopsis) perexigua</i> Vokes, n. sp . . . . .	68
5. (X 8) ANSP 374072 (holotype); height 6.2 mm, diameter 3.7 mm. Locality: Grand Bahama Island, Bahama Islands. Recent.	
6. (X 8) ANSP 397690 (paratype); height 5.8 mm, diameter 3.3 mm. Locality: same as holotype.	



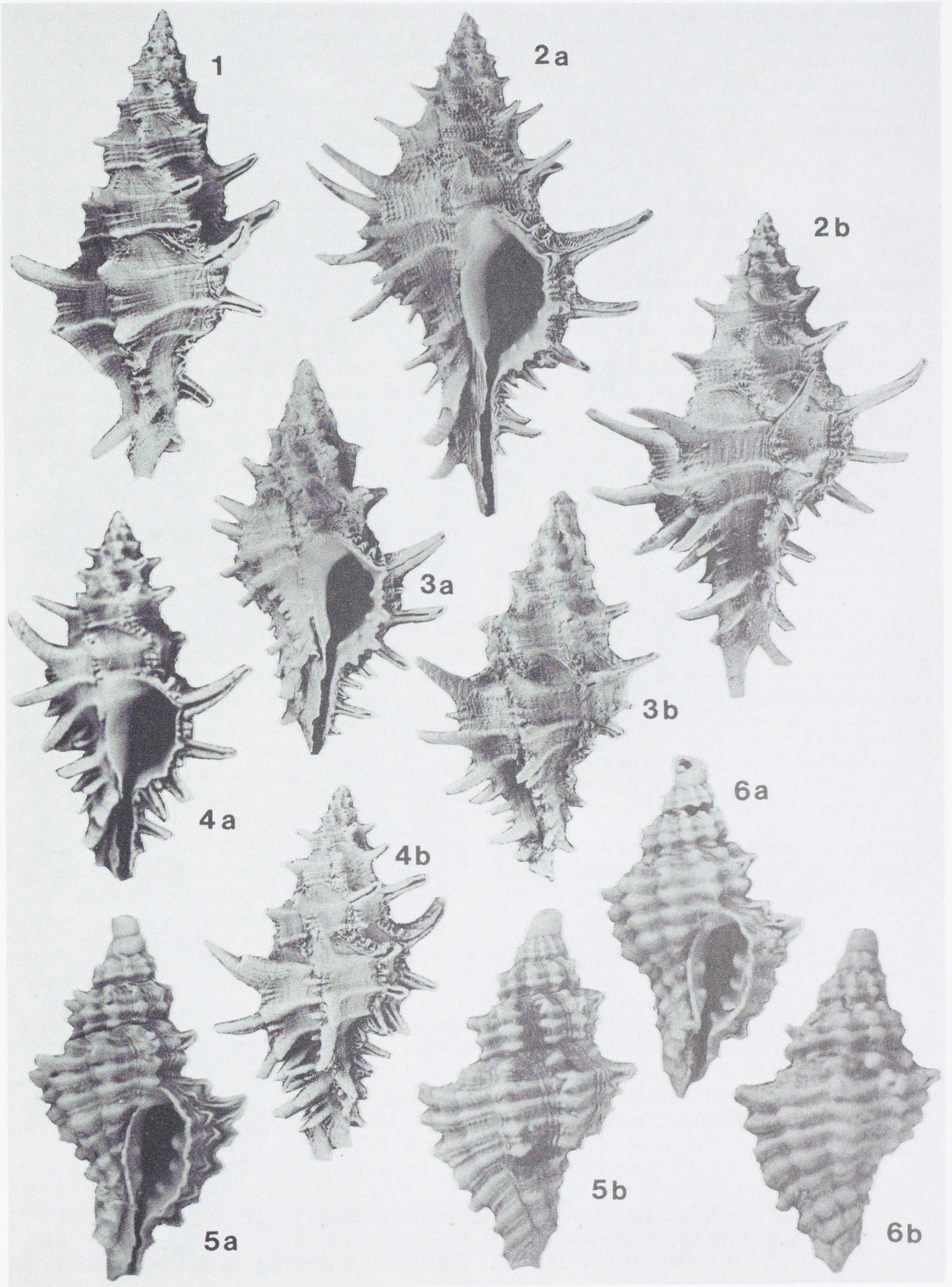


PLATE 4



Antilles. As they also figure a typical specimen of *M. huberti* (1988, p. 74, pl. 37, fig. 403), which, as they note, "looks as being covered with chalk," it is assumed that *M. oxytata* is correctly identified, even though unfigured.

MURICOPSIS (MURICOPSIS) WARRENI  
Petuch

Plate 5, figure 5

*Muricopsis* sp. HUMFREY, 1975, Sea Shells of the West Indies, p. 137, pl. 16, fig. 1.

*Muricopsis praepauxillus* (Maury). VOKES, 1984, Shells and Sea Life, v. 16, no. 11, p. 214; DE JONG and COOMANS, 1988, Stud. Fauna Curaçao, Caribbean Islands, v. 49, p. 74, pl. 37, fig. 402 (not of Maury).

*Muricopsis warreni* PETUCH, 1993, La Conchiglia, Ann. 25, no. 266, p. 55, figs. 8, 9; SUNDERLAND and SUNDERLAND, 1993, Amer. Conchologist, v. 21, no. 4, p. 14, text-fig. (paratype)

*Description*: "Shell small for genus, biconic, with sharply-angled shoulder; whorls with 6 thin, bladelike varices; intervarical areas smooth, waxy; each varix of body whorl with 3 large, prominent spiral cords that circumscribe entire body whorl; smaller secondary spines sometimes present between large primary varical spines; siphonal varices with one large spine and numerous tiny secondary spines; aperture proportionally large; inner edge of lip with 5 large toothlike denticles; shell color bright rosy-pink with 3 revolving white bands, corresponding to large spiral cords; dark brown bands present between large white cords, producing central area of alternating brown and white bands; brown band along shoulder detached at each varix, producing large dark brown patch at each

shoulder spine and at each spire spine; siphonal canal bright pink, with one third brown band; aperture and parietal area intense rosy-pink." (Petuch, 1993)

*Holotype*: CMNH 47381; height 16.6 mm, diameter 9.5 mm.

*Type locality*: Montego Bay, Jamaica, 20 meters.

*Occurrence*: Recent only, Jamaica to Curaçao (de Jong and Coomans, 1988, p. 74) and Grenada (Sunderland Collection).

*Figured specimen*: USNM 880009; height 14.5 mm, diameter 8.0 mm; locality, west of Montego Bay, north coast of Jamaica, 24 meters.

*Discussion*: As discussed previously (Vokes, 1989, p. 68), it is this species, originally figured by Humfrey (1975, pl. 16, fig. 1) from Ocho Rios, Jamaica, that is the modern analog of the Dominican *M. praepauxilla*. The living species is always associated with coral reefs and is invariably encrusted with a heavy coating of lime, making the details of sculpture hard to see. It is readily distinguished from all other species of *Muricopsis* by its distinctive black and white striped shell, with a striking pink aperture (pl. 5, fig. 5a, shows the color pattern of the stripes but unfortunately not the lovely pink aperture).

De Jong and Coomans (1988, p. 74, pl. 37, fig. 402) have illustrated as *M. praepauxilla* one of two specimens they have from Curaçao that appear to be the same as the Jamaican species. In particular, the authors note that the outside of the shell is white "except for brown spots on the last quarter of the main whorl between the spiral ridges and the varices." The only species that has these brown spots is *M. war-*

PLATE 5

Figures	Page
1-4. <i>Muricopsis (Muricopsis) huberti</i> Radwin and D'Attilio . . . . .	60
1. (X 3) USNM 880007; height 18.6 mm, diameter 10.5 mm. Locality: Antigua, British West Indies. Recent.	
2. (X 4; protoconch X 10) Vink Collection; height 13.2 mm, diameter 6.4 mm. Locality: Curaçao, Netherlands Antilles. Recent.	
3. (X 3) USNM 880008; height 20.0 mm, diameter 11.1 mm. Locality: Los Roques Archipelago, Venezuela. Recent.	
4. (X 3) CMNH 47340 (holotype – <i>Muricopsis duffyi</i> Petuch); height 21.4 mm, diameter 11.2 mm. Locality: Los Roques Archipelago, Venezuela. Recent.	
5. <i>Muricopsis (Muricopsis) warreni</i> Petuch . . . . .	64
(X 4) USNM 880009; height 14.5 mm, diameter 8.0 mm (fig. 5a not whitened, to show color pattern). Locality: west of Montego Bay, Jamaica. Recent.	



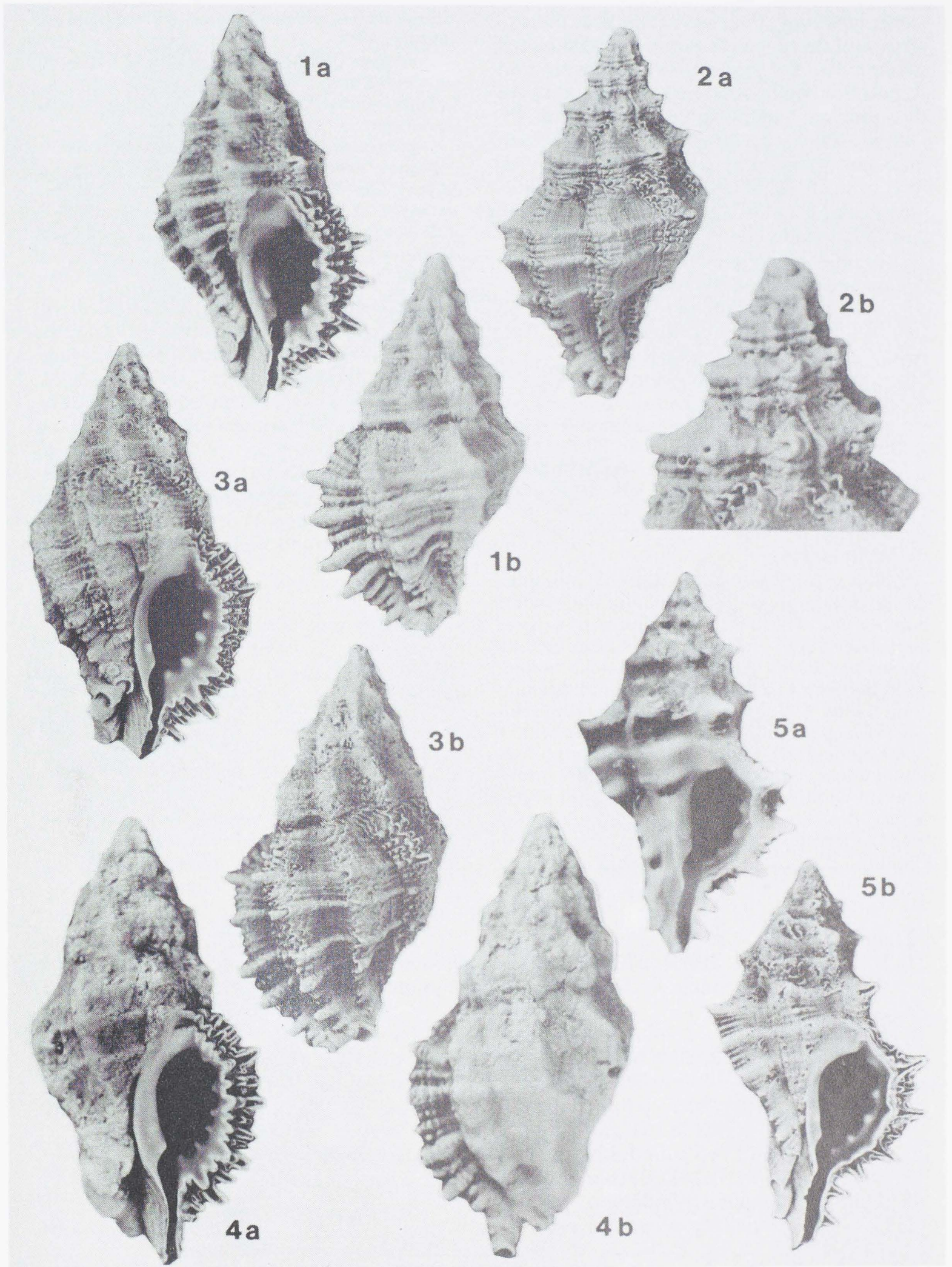


PLATE 5



*reni*; however, they also note that the aperture of these specimens is "porcelaneous white." In the collection of Kevan and Linda Sunderland, Sunrise, Florida, there is a similar appearing specimen from Ft. Jeudy, Grenada, taken in 1 meter, which also has a white aperture but is unquestionably *M. warreni*. Perhaps the pink-apertured shells are a local ecophenotypic variant in Jamaica.

MURICOPSIS (MURICOPSIS) SUNDERLANDI

Petuch

Plate 6, figures 1, 2

*Muricopsis sunderlandi* PETUCH, 1987, New Caribbean Moll. Faunas, p. 53, pl. 9, figs. 3-5; SUNDERLAND, 1987, Amer. Conchologist, v. 15, no. 4, p. 3 (plus color painting on cover by John Timmerman); KAICHER, 1991, Card Catalogue World-wide Shells, pack 59, Muricidae - Part VI, no. 6065 (holotype); SUNDERLAND and SUNDERLAND, 1993, Amer. Conchologist, v. 21, no. 4, p. 14, text-fig. (paratype).

*Description*: "Shell stocky, inflated, with spire lower than average for the genus, shell with 6 varices per whorl; varices extremely ornate, with body whorl varices having 4 long, tubular spines per varix; 1 or 2 small scale-like projections between 4 large spines; varices on siphonal canal with 2 large spines and several small spines in between; spire whorl varices with 1 large spine and 3 small spines per varix; shell color bright red-orange with single thin, white band around mid-body; siphonal canal white; intervarical areas smooth, with 4 large cords; mid-body cord corresponds to white band; col-

umella white; interior of aperture red-orange." (Petuch, 1987)

*Holotype*: USNM 859848; height 12.6 mm, diameter 8.8 mm.

*Type locality*: Cay Sal Bank, Bahama Islands, 10 meters.

*Occurrence*: Recent only, Bahama Islands.

*Figured specimens*: Fig. 1, USNM 859848 (holotype). Fig. 2, USNM 880010; height 22.7 mm, diameter 15.1 mm (including spines); locality, R/V *Silver Bay Station 3495*, south of Long Island, Bahama Islands, 100-200 fathoms [183-366 meters].

*Discussion*: Sunderland (1987, p. 3) reported finding this species in water depths of 18 meters to as much as 43 meters, deeper than the usual habitat of *M. oxytata*, to which it is closely related. The larger figured specimen (pl. 6, fig. 2) came from even deeper water, but was a dead shell that clearly had moved down-slope. According to Sunderland, the species is a member of a poorly known deep-water reef fauna, which includes numerous unique species.

MURICOPSIS (MURICOPSIS) ZYLMAEAE

Petuch

Plate 4, figures 1-3

*Muricopsis zylmaeae* PETUCH, 1993, La Conchiglia, Ann. 25, no. 266, p. 55, figs. 10, 11; SUNDERLAND and SUNDERLAND, 1993, Amer. Conchologist, v. 21, no. 4, p. 15, text-fig. (paratype).

*Description*: "Shell elongated, slender, with very protracted, elevated spire; shoulder ill-de-

PLATE 6

Figures	Page
1, 2. <i>Muricopsis (Muricopsis) sunderlandi</i> Petuch . . . . .	66
1. (X 4; protoconch X 10) USNM 859848 (holotype); height 12.6 mm, diameter 8.8 mm. Locality: Cay Sal Bank, Bahama Islands. Recent.	
2. (X 3) USNM 880010; height 22.7 mm, diameter 15.1 mm (including spines). Locality: R/V <i>Silver Bay Station 3495</i> , Bahama Islands. Recent.	
3, 4. <i>Muricopsis (Muricopsis) marcusii</i> Vokes, n. sp . . . . .	70
3. (X 2 1/4) MORG 31.961 (holotype); height 29.7 mm, diameter 16.3 mm. Locality: Cabra Island, Ilhabela, São Paulo, Brazil. Recent.	
4. (X 2 1/4) MORG 31.962 (paratype); height 27.2 mm, diameter 15.0 mm. Locality: same as holotype.	
5, 6. <i>Muricopsis (Muricopsis) josei</i> Vokes, n. sp . . . . .	69
5. (X 2 1/2) MORG 31.963 (holotype); height 21.5 mm, diameter 12.9 mm. Locality: Guarapari, Espírito Santo, Brazil. Recent.	
6. (X 5) MORG 31.964 (paratype); height 9.6 mm, diameter 4.8 mm. Locality: same as holotype.	



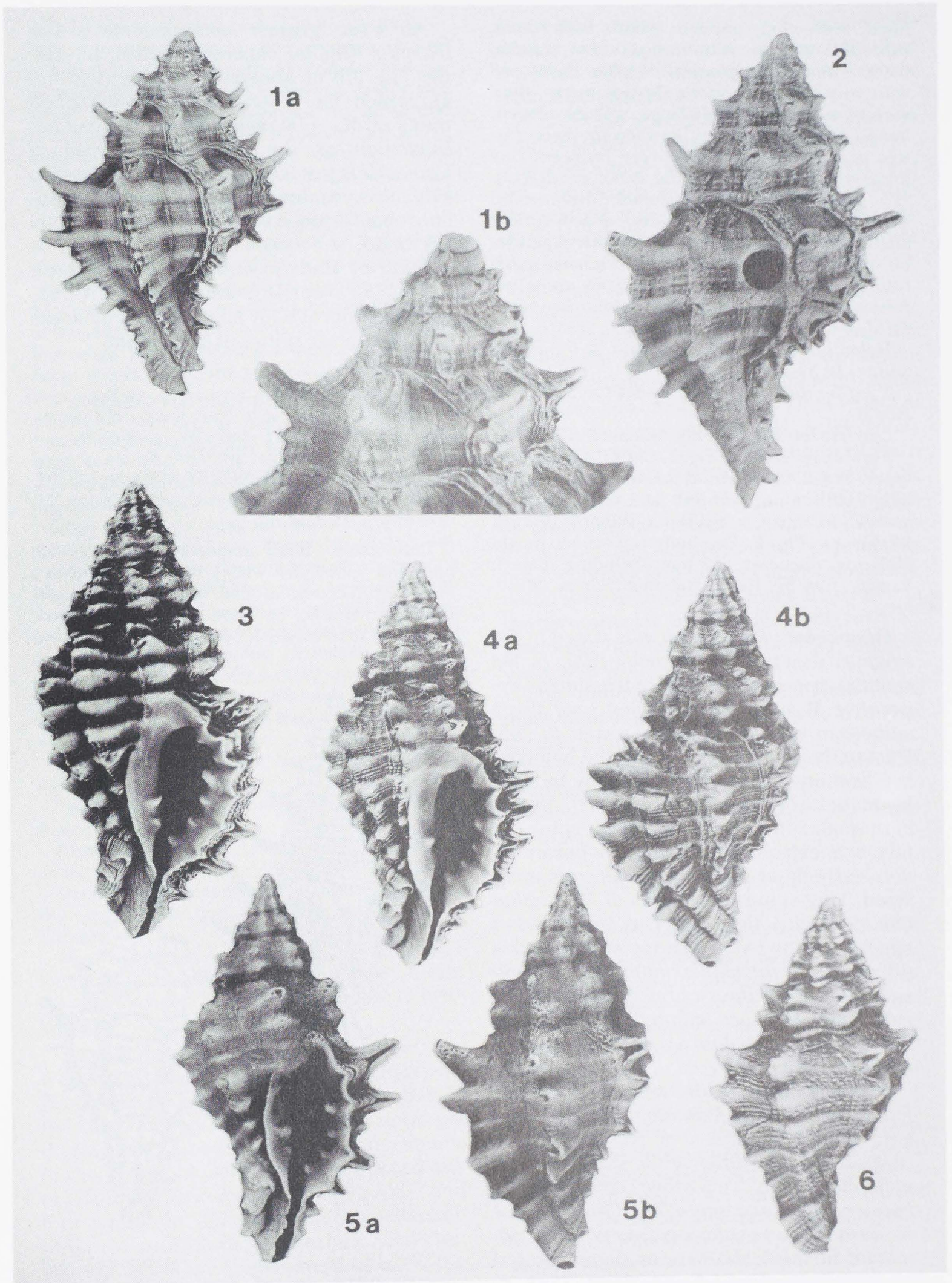


PLATE 6



finer, somewhat rounded; whorls with 6 thin, blade-like varices; intervarical areas smooth, without scales or spinelets, weakly sculptured with very faint, fine spiral threads; body whorl varices with 3 extremely large, well developed, needle-like spines; areas between spines on varices ornamented with few very reduced, tiny knob-like spinelets; siphonal canal proportionally very long, well-developed, ornamented with single large, needle-like spine; varices aligned in curved rows, producing spiral pattern on spire; spire, body whorl, and siphonal canal colored golden-tan with darker tan areas between varices; spines colored bright rose-pink; tip of siphonal canal pink." (Petuch, 1993)

*Holotype*: CMNH 47379; height 32.0 mm, diameter 18.5 mm.

*Type locality*: Off Great Isaacs Cay, Bahama Islands.

*Occurrence*: Recent only, Bahama Islands.

*Figured specimens*: Fig. 1, CMNH 47379 (holotype). Fig. 2, Sunderland Collection (paratype); height 46.1 mm, diameter 34.0 mm (including spines); locality, Cay Sal Bank, Bahama Islands, 24 meters. Fig. 3, Stephens Collection; height 26.7 mm, diameter 17.2 mm (including spines); locality, Cay Sal Bank, Bahama Islands, 24 meters.

*Discussion*: Although it was stated in the original description (Petuch, 1993, p. 56) that this species differs from the similar appearing *M. oxytata* in having only three spines on each body whorl varix, in contrast to the four of *M. oxytata*, the holotype is a broken specimen and, as may be seen in the better paratype (pl. 4, fig. 2), *M. zylmanae* also has a smaller fourth spine. In fact, it is extremely difficult to separate juvenile shells of *M. zylmanae* from similar sized, long-spined examples of *M. oxytata* (compare pl. 4, figs. 3, 4). But, in fully adult specimens the overall shape of the shell is different. *Muricopsis oxytata* has the typical *Muricopsis*-like biconic outline and *M. zylmanae* has an inflated body whorl sharply constricted into a narrow siphonal canal.

Although the varical spines are extremely long in *M. zylmanae*, there are also long-spined examples of *M. oxytata*, so that only in the fully adult shell is this a valid distinction. To further complicate the picture, there are long-spined examples of *M. oxytata* that occur together with *M. zylmanae* in the Bahamas, as demonstrated by Sunderland and Sunderland (1993, p. 15, text-fig.).

An even greater complication is Lamarck's original illustration (1816, pl. 418, figs. 3a, 3b) of *Murex hexagonus* (text-fig. 1), which more nearly resembles specimens of *M. zylmanae* than of *M. oxytata*. Inasmuch as the name *M. hexagonus* Lamarck is preoccupied by that of Gmelin, 1791, this creates no nomenclatorial problem, but it does cause one to wonder. Likewise, the specimen illustrated as *M. oxytata* by Radwin and D'Attilio (1976, pl. 27, fig. 5), from Guantanamo Bay, Cuba, has the general body shape of *M. zylmanae* but the shorter spines of *M. oxytata*.

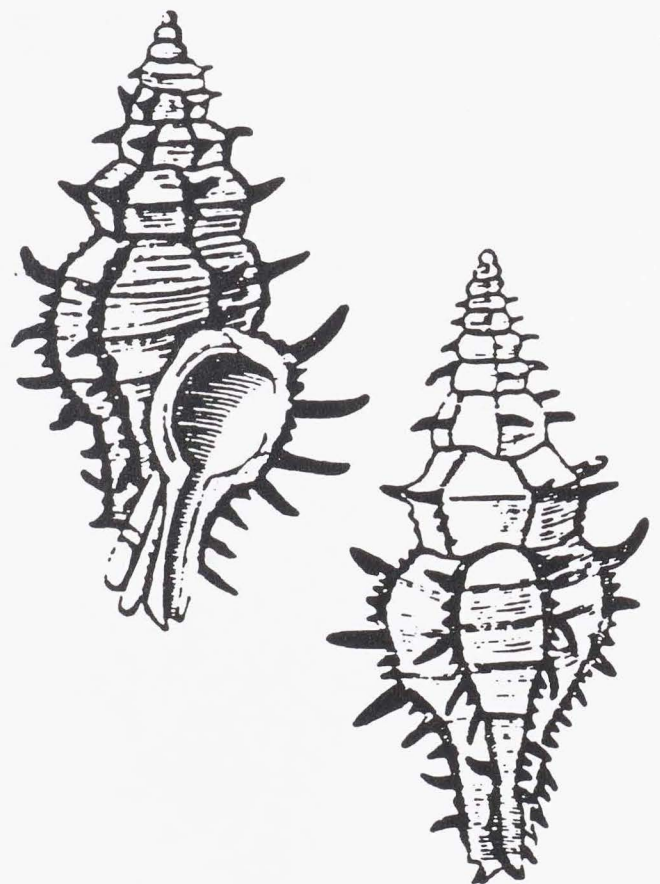
#### MURICOPSIS (MURICOPSIS) PEREXIGUA

Vokes, n. sp.

Plate 4, figures 5, 6

*Pygmaepterys* sp. SUNDERLAND and SUNDERLAND, 1993, Amer. Conchologist, v. 21, no. 4, p. 15, text-fig.

*Description*: Shell angulately biconic, with only four teleoconch whorls in largest specimen seen. Protoconch of one and one-half high, tabulate whorls, sometimes slightly keeled; transition to teleoconch not marked by varix but



Text-figure 1. *Murex hexagonus* Lamarck, 1816, pl. 418, figs. 3a, 3b (X 1 1/2; original illustration 38.5 mm).



only by onset of spiral and axial ornamentation. Spiral ornamentation on first teleoconch whorl of two flattened cords, one at shoulder and one at midpoint of whorl. On second teleoconch whorl another cord developed on subsutural ramp, and on third whorl a fourth cord added between suture and median cord. On body whorl a total of eight major cords: one on subsutural ramp; two on siphonal canal; and five on body portion of whorl, with the one at the shoulder strongest. Secondary cords irregularly placed between major cords. Axial ornamentation on first teleoconch whorl of approximately 12 strap-like ridges, gradually becoming noded at intersection of spiral cords. Ridges increasing in strength and decreasing in number to eight on body whorl. On third teleoconch whorl small sharp spines appearing at intersection of axial ridges and spiral cord at shoulder; at intersection of other spirals only nodes present. Apertural varix with several layers of shell material and small open spines at intersection of each spiral cord, not visible on older varices (axial ridges) except at shoulder. Suture impressed. Aperture elongate-oval. Inner lip slightly appressed in posterior portion, free-standing along anterior portion, with two or three denticles on anterior half. On inner side of outer lip four denticles developed anterior to shoulder cord, the one nearest to shoulder strongest. Siphonal canal short, only slightly recurved at distal end. Shell color pink or white with apex pink; brown blotches at base of body whorl and on shoulder ramp between axial ridges.

*Holotype*: ANSP 374072; height 6.2 mm, diameter 3.7 mm.

*Type locality*: Grand Bahama Island, Bahama Islands.

*Etymology of name*: *perexigua* (Latin) - very small.

*Occurrence*: Recent only, known only from the type locality and Utila, Bay Islands, Honduras.

*Figured specimens*: Fig. 5, ANSP 374072 (holotype). Fig. 6, ANSP 397690 (paratype); height 5.8 mm, diameter 3.3 mm; locality same as holotype.

*Discussion*: This, the smallest species of western Atlantic *Muricopsis* (the Panamic *M. tulensis* Radwin and D'Attilio, 1976, is the same size, maximum height 7 mm) yet discovered, is based upon four specimens in the Worsfold Collection at the Academy of Natural Sciences, Philadelphia, and four additional specimens in the collection of Kevan and Linda Sunderland, Sunrise, Florida. All of the specimens are small; the largest (in the Sunderland Collection) measures only 7.0 mm in height. No example

seen has more than four teleoconch whorls, although one would suspect that the shell would ultimately have five or six teleoconch whorls.

A paratype specimen of this new species was referred to *Pygmaepterys* by Sunderland and Sunderland (1993, p. 15, text-fig.) but that group is characterized by wing-like (rather than spinose) varices and the shell surface is covered by an elaborate filigree of axial growth lines crossed by spiral threads (see pls. 25, 26).

*Muricopsis perexigua* perhaps most nearly resembles the Panamic *M. pauxilla* (A. Adams, 1854), especially in the nature of the angulate protoconch; although it has a protoconch more nearly like that of another Panamic species, *M. jaliscoensis* Radwin and D'Attilio, 1970 (compare Radwin and D'Attilio, 1976, text-figs. 107 [*M. jaliscoensis*] and 108 [*M. pauxilla*]). From *M. pauxilla*, the new species differs in having a much less scabrous shell, which lacks the secondary and tertiary spiral ornamentation seen in the Pacific form. The color of the two species is also different with *M. pauxilla* having a conspicuously marked black and white striped shell.

The only Atlantic species that bears more than a generic similarity to this new species is another new species, *M. josei*, named below from the coast of Brazil. The Brazilian shell is larger, with less pronounced spiral ornamentation and fewer varices per whorl.

#### MURICOPSIS (MURICOPSIS) JOSEI

Vokes, n. sp.

Plate 6, figures 5, 6

*Description*: Shell weakly biconic, with seven teleoconch whorls; protoconch of one and one-half smooth, bulbous whorls, ending at a small varix. Spiral ornamentation on early teleoconch whorls of two cords, visible only at intersection of axial ridges. On body whorl five major spiral cords, plus two on siphonal canal; very faint secondary threads covering entire surface of shell, both between and on top of major spiral cords. Axial ornamentation of nine narrow ridges on first teleoconch whorl, diminishing to six on third and all successive whorls. Where crossed by spiral cords, initially raised nodes present, but by third whorl, small open spines developed at each intersection. On body whorl only two anterior and two posterior major spiral cords with spines, the median cord lacking spines. An addi-



tional two rows of spines on siphonal canal. Suture slightly appressed. Aperture elongate-oval, inner lip smooth, free-standing almost entire length, appressed only at posteriormost portion. On anterior portion, two strong, elongate denticles, corresponding to the two spiral cords on siphonal canal. Inner side of outer lip with five denticles: three anteriormost relatively small; the fourth from anterior end much the strongest; the fifth, or posteriormost, slightly less so. Margin of outer lip scalloped in accordance with the varical spines. Siphonal canal short, recurved at distal end. Shell color tan, with varical spines a bit darker in some specimens. Aperture white. Operculum elongate, unguiculate, with terminal nucleus.

*Holotype*: MORG 31.963; height 21.5 mm, diameter 12.9 mm.

*Type locality*: Guarapari, Espírito Santo, Brazil, 10-15 meters, under dead coral.

*Etymology of name*: In honor of Jose Coltro, half of a pair of extraordinary collectors, the brothers Coltro of São Paulo, Brazil, who provided the type material.

*Occurrence*: Recent only, known only from northern Brazil.

*Figured specimens*: Fig. 5, MORG 31.963 (holotype). Fig. 6, MORG 31.964 (paratype); height 9.6 mm, diameter 4.8 mm; locality same as holotype.

*Discussion*: In recent years a number of new and interesting muricid species have been collected from the coast of Brazil by Jose and Marcus Coltro. Among them are two new species of *Muricopsis*. The two species are similar but differ in that the more northern of the two, collected at Guarapari, Espírito Santo, is smaller, lighter in color, and has six rather than eight varices, as does the southern form.

In overall appearance, *M. josei* most nearly resembles *M. quisqueyensis*, from the Gurabo Formation, Dominican Republic. The shell is almost smooth between the varices, each of which bears four short, blunt spines. There is a single non-spinose spiral cord, located between the anterior and posterior pairs of major spines. The aperture is like that of *M. blainvillei*, with two strong denticles on the columellar lip, which is somewhat more expanded than other American members of the genus.

The type lot consists of 11 specimens, the largest of which measures 26 mm in height; ten of these are from the type locality, where they were collected by the Coltro brothers on and under dead corals, in 10-15 meters depth. The eleventh is an unfi-

gured paratype in the collections of the Museu Oceanográfico, Rio Grande do Sul (MORG 23.284), from Parcel dos Paredes, Abrolhos Archipelago, also taken on coral.

#### MURICOPSIS (MURICOPSIS) MARCUSI

Vokes, n. sp.

Plate 6, figures 3, 4

*Description*: Shell with seven teleoconch whorls; protoconch unknown. Spiral ornamentation on early teleoconch whorls of two cords; by second or third teleoconch whorl, a third added on shoulder ramp. On body whorl six major spiral cords, plus two on siphonal canal; secondary threads covering entire surface of shell between major spiral cords. Axial ornamentation of nine narrow ridges on first teleoconch whorl, diminishing to eight on third and all successive whorls. Where crossed by spiral cords, initially raised nodes present, gradually becoming more produced and by fourth or fifth teleoconch whorl small open spines on adaper-tural side of all nodes, becoming larger with each successive whorl. Axial ridges becoming varices, formed by multiple layers of shelly material. Suture slightly impressed. Aperture elongate-oval, inner lip smooth, free-standing almost entire length, appressed only at posteriormost portion. On anterior portion, two strong, elongate denticles, not corresponding to spiral cords on siphonal canal. Inner side of outer lip with five denticles: three anteriormost relatively small; the fourth from anterior end much the strongest; the fifth, or posteriormost, slightly less so. Margin of outer lip scalloped in accordance with the varical spines. Siphonal canal short, recurved at distal end. Shell color brown, with varical spines darker brown. Aperture white, with margin rimmed in brown. Operculum elongate, unguiculate, with terminal nucleus.

*Holotype*: MORG 31.961; height 29.7 mm, diameter 16.3 mm.

*Type locality*: Cabra Island, Ilhabela, São Paulo, Brazil, 5-7 meters, under stones.

*Etymology of name*: In honor of Marcus Coltro, the other half of that pair of remarkable Brazilian collectors, the brothers Coltro of São Paulo.

*Occurrence*: Recent only, known only northern Brazil.

*Figured specimens*: Fig. 3, MORG 31.961 (holotype). Fig. 4, MORG 31.962 (paratype); height 27.2 mm, diameter 15.0 mm; locality same as holotype.

*Discussion*: Because of its larger size and dark brown color this new species has a superficial resemblance to *Muricopsis* (*Risomurex*) *necocheana* (Pilsbry, 1900), whose range does overlap that of the new



species. However, *M. marcusii* has spinose varices in contrast to the rounded axial ridges seen in *M. (R.) necocheana*.

The new species more closely resembles the Mediterranean type of the genus (*M. blainvillei*) than any other American species. From the latter, *M. marcusii* may be distinguished by the non-scabrous surface, marked by six major spiral cords, with only faint secondary threads between them, where in *M. blainvillei* there is a more prominent secondary cord flanked by tertiary threads on either side, between each pair of major cords. As with *M. josei*, the aperture is like that of *M. blainvillei*, with strong denticles on the expanded columellar lip.

The type lot consists of nine specimens, the largest of which measures 28.5 mm in height. Eight of these were collected at the type locality, under rocks in 5-7 meters. The ninth is an unfigured paratype in the collections of the Museu Oceanográfico, Rio Grande do Sul (MORG 23.739), Ilha São Sebastião, São Paulo, taken intertidally from rocks.

#### Subgenus RISOMUREX Olsson and McGinty, 1958

*Risomurex* OLSSON and MCGINTY, 1958,  
Bulls. Amer. Paleontology, v. 39, no. 177, p.  
40.

Type species: *Ricinula deformis* Reeve, 1846,  
ICZN Opinion 1623 (1991).

*Discussion:* The subgenus *Risomurex* has been monographed by Vokes and Houart (1986) and there is little new information to be added. Therefore, the synonymies of the species below are abbreviated to include only the more important references. The reader is referred to this previous study for more discussion on the various species.

The type species of this taxon was originally designated by the authors as *Engina schrammi* Crosse, 1863; however, the shell that they illustrated for the type is not Crosse's species but one named earlier as *Ricinula deformis* Reeve, 1846. At the time of the Vokes and Houart study, the type designation was in a state of confusion and Kemperman and Coomans had applied to the *International Commission on Zoological Nomenclature* to have their newly de-

scribed *Risomurex mosquitensis* designated as the type species.

Vokes and Houart (1986, 1989) expressed the opinion that *R. mosquitensis* is a subjective synonym of *R. deformis* and a better course of action would be to declare the latter as type, inasmuch as, at that time, it was believed that *Engina schrammi* was a subjective synonym of *R. rosea* (Reeve, 1846).

Although a second specimen of *R. schrammi* has been discovered (Houart, 1990), indicating that the form is a valid species, the fact that it was *Ricinula deformis* which Olsson and McGinty had in mind when they originally proposed the taxon caused the Commission to vote to designate the latter species as type of *Risomurex* Olsson and McGinty, 1958 (ICZN Opinion 1623, March, 1991).

Members of the subgenus *Risomurex* are differentiated from *Muricopsis* s.s. by the lack of true varices, instead having the shells marked by strong axial ridges. These, when crossed by the spiral cords, form more or less pronounced nodules. In many species there is a keeled protoconch, but this is not invariable and is not considered to be a subgeneric characteristic.

At the time of the Vokes and Houart paper (1986) species of *Risomurex* were known only from the Atlantic Ocean, both eastern and western sides. Since that time, however, two species have been described from the northwestern Indian Ocean: *Muricopsis omanensis* Smythe and Oliver (1986, p. 181, pls. 18, 19) and *M. chiarae* Bozzetti (1991, p. 44, figs. 4, 5; which may be synonymous with *M. omanensis*), from off Somalia. These non-Atlantic species of *Risomurex* bear a strong resemblance to the South American species, *M. (R.) withrowi*, having seven axial ridges and a light brown shell with darker brown lines topping the spiral cords. The geologic connection between these two very disjunct occurrences is not known.

#### MURICOPSIS (RISOMUREX) ASPINOSA (Meyer) Plate 7, figures 1, 2

*Murex simplex* Aldrich var. *aspinosus* MEYER,  
1886, Alabama Geol. Surv., Bull. 1, pt. 2, p.  
74, pl. 2, fig. 21.

[*Urosalpinx*] *aspinosa* (Meyer). DALL, 1890,  
Wagner Free Inst. Sci., Trans, v. 3, pt. 1, p.



147; COSSMANN, 1903, Essais Paléoconch. Comp., v. 5, p. 50.

[*Poirieria (Panamurex)*] *aspinosus* (Meyer). VOKES, 1964, Malacologia, v. 2, no. 1, p. 18.

?*Urosalpinx aspinosus* (Meyer). MACNEIL and DOCKERY, 1984, Mississippi Dept. Nat. Res., Bur. Geol., Bull. 124, p. 127, pl. 5, figs. 6 (holotype), 7, 8.

*Description*: "Ovate; whorls convex, with obtuse, transverse ribs – seven on the body whorl; covered by elevated, sharp, distinct, revolving lines, which on the older whorls alternate with faint ones; canal nearly straight; outer lip thickened, crenulate within; callus of inner lip with three obtuse teeth." (Meyer, 1886)

*Holotype*: USNM 644592; height 12.4 mm, diameter 6.5 mm.

*Type locality*: Red Bluff, Chickasawhay River, Wayne County, Mississippi (= TU 1288).

*Occurrence*: Red Bluff Formation, Mississippi.

*Figured specimens*: Fig. 1, USNM 645622; height 17.8 mm, diameter 9.0 mm; locality TU 226. Fig. 2, USNM 482020; height 13.0 mm, diameter 6.3 mm; locality, Mississippi Geol. Surv. 35a, Chickasawhay River, Wayne County, Mississippi. Additional locality: TU 642.

*Discussion*: *Muricopsis aspinosa* previously was assigned (Vokes, 1964, p. 18) to *Poirieria (Panamurex)* on the basis of the labral and columellar denticulations\*, but subsequent work has indicated that this placement is erroneous. The apertural denticles, the high spire, and short siphonal canal, plus the lack of varical spines suggests that *Risomurex* is a better assignment. However, even this is a compromise. The main reason to place *M. aspinosa* herein is the similarity to *M. crassicosta* (Benoist), which follows, rather than a strong resemblance to the later members of the subgenus.

Although the species is known only from the vicinity of the type locality along the Chickasawhay River, it is not rare there, we have numerous specimens in the Tulane Collections and MacNeil and Dockery reported it from three additional localities in the same general area (USGS 2633, 5263, MGS 40).

MacNeil and Dockery (1984, p. 127) stated that the nature of the complete pro-

toconch is not known; however, one example subsequently collected by Dockery at Mississippi Geological Survey locality 35a (Red Bluff Formation) shows the species to have a typical "primitive" muricid protoconch of four smooth, conical whorls (see pl. 7, fig. 2). Inasmuch as the Miocene *M. crassicosta* has the more advanced type of protoconch with one and one-half bulbous whorls, it is assumed that the keeled protoconch of the modern species is an even more advanced development. This is consistent with the fact that not all species in the subgenus have a keeled protoconch, and it is not considered a subgeneric character.

*Muricopsis aspinosa* was originally named as a variety of the Vicksburg species *Poirieria (Panamurex) macneili* Vokes [new name for *Murex simplex* Aldrich non Philippi] but, as Dall (1890, p. 147) pointed out, the two forms are not closely related.

MURICOPSIS (RISOMUREX) CRASSICOSTA  
(Benoist)

Plate 7, figure 3

*Jania crassicosta* BENOIST, 1873, Cat. Saucats, p. 349.

*Muricopsis crassicosta* (Benoist). COSSMANN and PEYROT, 1923, Linn. Soc. Bordeaux, Actes, v. 75, p. 142, pl. 15, fig. 5 (said also to be fig. 6, but not found).

*Muricopsis (Risomurex) crassicosta* (Benoist). VOKES and HOUART, 1986, Tulane Stud. Geol. Paleont., v. 19, no. 2, p. 84, pl. 3, figs. 6, 7.

*Description*: "Shell large for the subgenus, to 21 mm in height; solid and heavy. Aperture ovate and narrow; columellar lip with two elongate nodes anteriorly; anal notch moderately deep; outer apertural lip crenulate, five strong denticles on the inner side, the second being the strongest. Spire high; protoconch of one and one-half rounded whorls; eight or nine slightly angulate postnuclear whorls. Suture impressed, undulated by axial ridges. Body whorl with eight heavy, low axial ridges, crossed by eight or nine spiral cords: one on the shoulder, five or six on the body, and two on the siphonal canal; between each pair of major cords two fine squamose threads. At the intersection of the spiral cords and axial ridges low, elongate nodes developed; spiral cords forming five or six short spines on apertural varix. Siphonal canal open, short, wide and slightly recurved dorsally." (Vokes and Houart, 1986)

*Neotype*: Cossmann Collection, Dept. de

\*MacNeil and Dockery (1984, p. 127) note that in this species the "columellar denticles are irregular in both shape and number (2 to 5)" but most specimens have three such denticles.



Paléontologie, Université Paris (VI); height 21 mm, diameter 10 mm (*fide* Cossmann and Peyrot, 1923, p. 143).

*Type locality*: Saucats (about 25 km south of Bordeaux), France.

*Occurrence*: Chipola Formation, Florida; Cantaure Formation, Venezuela; Burdigalian, France.

*Figured specimen*: USNM 377395; height 16.0 mm, diameter 8.5 mm; locality TU 555. Additional localities: TU 547, 830, 951, 1048; NMB 17515, 17516.

*Discussion*: This, the oldest species unquestionably referable to the subgenus *Risomurex*, occurs in the Chipola Formation of Florida and the correlative Cantaure Formation of Venezuela, as well as in the Burdigalian beds near Saucats, France. The shell is marked by eight rounded axial ridges crossed by eight or nine spiral cords, which, under ultraviolet light, show a color pattern of darker lines topping them (see Vokes and Houart, 1986, pl. 3, fig. 7b). The protoconch is not keeled, as are most of the later species, and this is assumed to be a less advanced character.

The species has not been reported previously from the Cantaure Formation, but in the Gibson Smith Collection, now at the Naturhistorisches Museum, Basel, Switzerland, there are several specimens from Casa Cantaure, Paraguaná Peninsula, Venezuela (= TU 1269).

MURICOPSIS (RISOMUREX) GALBENSIS (Jung)  
Plate 7, figure 4

*Risomurex galbensis* JUNG, 1969, *Bulls. Amer. Paleontology*, v. 55, no. 247, p. 495, pl. 50, figs. 10-13.

*Muricopsis (Risomurex) galbensis* (Jung).  
VOKES and HOUART, 1986, *Tulane Stud. Geol. Paleont.*, v. 19, no. 2, p. 83, pl. 2, fig. 6.

*Description*: "Small, stout. Protoconch consists of a little less than 1 1/2 smooth whorls. It is strongly keeled and flattened above forming a depression at the apex. Postnuclear whorls about five. Early sculpture consists of axials (about 10 on first sculptured whorl) and two spirals form beads at the intersections. On subsequent whorls the axials become much stronger, and the upper spiral forms a shoulder with acute nodes, where the axials cross. On the second or third sculptured whorl another spiral appears close to the lower suture which is noded as well. Spaces between spirals ornamented by several fine spirals. Body whorl with six to seven noded spirals and eight axials, the last

ones being varix-like. Unworn specimens show undulating, somewhat lamellar growth lines. Outer lip thick, with five denticles on inner surface. Inner lip with two inconspicuous lirae on lower part. Anterior canal short. Siphonal fasciole inconspicuous." (Jung, 1969)

*Holotype*: USNM 645367; height 13.8 mm, diameter 7.7 mm.

*Type locality*: Courbaril Sand Member, Morne l'Enfer Formation; Pt. Courbaril, Trinidad.

*Occurrence*: Morne l'Enfer Formation, Trinidad.

*Figured specimen*: USNM 645367 (holotype).

*Discussion*: *Muricopsis (Risomurex) galbensis* is a common species in the Early Pliocene Courbaril Sand Member of the Morne l'Enfer Formation of Trinidad (Jung, 1969, p. 495) but it has not been reported elsewhere.

MURICOPSIS (RISOMUREX) GILBERTHARRISI  
(Weisbord)  
Plate 7, figure 5

*Drupa (Morula) gilbertharrisi* WEISBORD, 1962, *Bulls. Amer. Paleontology*, v. 42, no. 193, p. 295, pl. 26, figs. 12-14.

*Muricopsis (Risomurex) gilbertharrisi* (Weisbord). VOKES, 1984, *Shells and Sea Life*, v. 16, no. 11, p. 214; VOKES and HOUART, 1986, *Tulane Stud. Geol. Paleont.*, v. 19, no. 2, p. 78, pl. 3, figs. 1-3.

*Muricopsis gilbertharrisi* (Weisbord). SUNDERLAND and SUNDERLAND, 1993, *Amer. Conchologist*, v. 21, no. 4, p. 14, text-fig.

*Description*: "Shell of medium size, slenderly biconical, the spire acuminate, a little shorter than the body. Whorls 8 1/2 in all, the smooth nucleus composed of 1-1/2 of them. Initial turn of the nucleus somewhat globose and a little inclined, the last spirally carinate, the carina starting at the top of the whorl and descending obliquely to the conch where it is then at the middle of the whorl. The nucleus is defined from the conch by a narrow axial groove on the forward side of which the sculpture of the shell begins. First three post-nuclear whorls slightly convex, bearing strong nodulose evenly spaced axial costae and three plain spiral cords separated by equal interspaces, the cords connecting the nodules and passing across them in diminished strength. Remaining whorls moderately convex, with 12 equal tuberculate axial folds, each fold with three tubercles, the tubercles becoming progressively more elongate spirally on the lower portion of the shell, the right half of each tubercle a little more attenuated than the left, the drawn and somewhat sunken ends tending to join those of the adjacent tubercles. Between



each row of tubercles there are two or three raised spiral threads or cords, the threads crenulated, beaded, or rendered scabrous by the numerous fine axial lamellae which traverse the surface. Body whorl with two to four raised spirals between each row of tubercles, the top and bottom ones in the interspace lying immediately adjacent to the row of tubercles; where the spiral thread is present, and this is generally the case, it lies about midway between the other two, and is slightly larger; where four spiral cords are present the middle two are about equal and are larger than the ones above and below. Sutures fine. Anterior fasciole prominent, convex, marked with 8 to 10 strong cords crossed by 6 vaulted growth incrementals. Be-

tween the fasciole and the inner lip there is an umbilicus-like depression. Aperture lenticular. Outer lip thickened behind by an axial fold larger than the ones on the dorsum, the forward side of the fold built up with vaulted axial lamellae. Rim of outer lip frilled or closely scalloped. Interior of outer lip armed with five rounded denticles, the uppermost bordering the posterior canal; the topmost of the four remaining denticles is the largest of all and is situated a little above the middle of the lip; the three denticles are subequal in size, the lowest one lying near the entrance to the siphonal canal. Inner lip with a white callus, adherent on the parietal wall but the distal edge detached and sheath-like below. Columella with three raised welts, the upper-

## PLATE 7

Figures	Page
1, 2. <i>Muricopsis (Risomurex) aspinosa</i> (Meyer) . . . . .	71
1. (X 3) USNM 645622; height 17.8 mm, diameter 9.0 mm. Locality: TU 226, Chickasawhay River, Mississippi. Red Bluff Formation.	
2. (X 10) USNM 482020; height 13.0 mm, diameter 6.3 mm. Locality: Mississippi Geol. Surv. 35a, Chickasawhay River, Mississippi. Red Bluff Formation.	
3. <i>Muricopsis (Risomurex) crassicosta</i> (Benoist) . . . . .	72
(X 3) USNM 377395; height 16.0 mm, diameter 8.5 mm. Locality: TU 555, Chipola River, Florida. Chipola Formation.	
4. <i>Muricopsis (Risomurex) galbensis</i> (Jung) . . . . .	73
(X 3 1/2) USNM 645367 (holotype); height 13.8 mm, diameter 7.7 mm. Locality: Pt. Courbaril, Trinidad. Courbaril Sand Member, Morne l'Enfer Formation.	
5. <i>Muricopsis (Risomurex) gilbertharrisi</i> (Weisbord) . . . . .	73
(X 2 1/2) PRI 26205 (holotype); height 20.5 mm, diameter 9.9 mm. Locality: Quebrada Mare Abajo, Cabo Blanco, Venezuela. Mare Formation.	
6, 7. <i>Muricopsis (Risomurex) deformis</i> (Reeve) . . . . .	76
6. (X 3 1/2) USNM 820638; height 14.7 mm, diameter 8.7 mm. Locality: TU R-109, Bahia de las Minas, Panama. Recent.	
7. (X 4) USNM 482021; height 11.1 mm, diameter 6.6 mm. Locality: TU 1489, Los Corales, Costa Rica. Moín Formation.	
8. <i>Muricopsis (Risomurex) schrammi</i> (Crosse) . . . . .	77
(X 5) MNHN (holotype); height 8.8 mm, diameter 5.5 mm (fig. 8a not whitened, to show color pattern). Locality: Guadeloupe, French Antilles. Recent.	
9. <i>Muricopsis (Risomurex) rosea</i> (Reeve) . . . . .	78
(X 4) Robinson Collection; height 11.5 mm, diameter 6.4 mm. Locality: Punta Rucia, Dominican Republic. Recent.	
10. <i>Muricopsis (Risomurex) caribbaea</i> (Bartsch and Rehder) . . . . .	78
(X 6) USNM 472617 (holotype); height 8.3 mm, diameter 4.0 mm. Locality: "Old Providence Island" (= Isla de Providencia, Colombia). Recent.	
11. <i>Muricopsis (Risomurex) withrowi</i> Vokes and Houart . . . . .	79
(X 2 1/2) IRSNB I.G. 26,738/407 (paratype); height 19.5 mm, diameter 10.0 mm. Locality: off Riohacha, Colombia. Recent.	
12. <i>Muricopsis (?Risomurex) necocheana</i> (Pilsbry) . . . . .	80
(X 3) Vokes Collection; height 19.4 mm, diameter 9.8 mm. Locality: Cabo Frio, Brazil. Recent.	



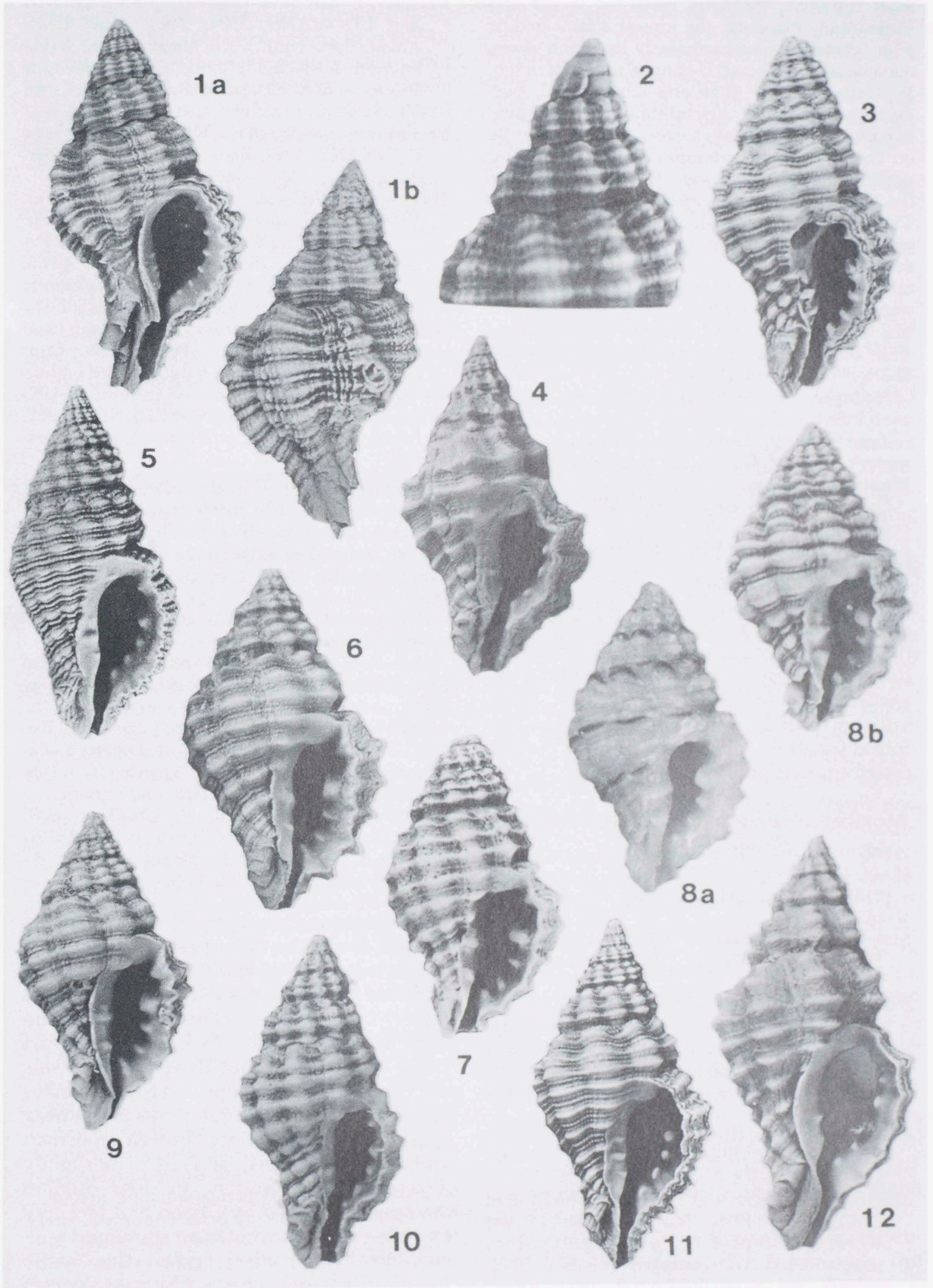


PLATE 7



most roundish, the next, close by, larger and horizontally elongate, the lowest a faint fold or plica. Anterior canal relatively long and deep, excavated into a small U-shaped terminal notch. Posterior canal shallow and fairly broad, bordered below on the parietal side by a thickening of callus which partially covers the last tubercle on the spiral cord extending across the upper portion of the parietal wall. The ground color of the surface and of the aperture is pure white. The tubercles of the ultimate and penultimate whorls are light brown. On the 2 whorls above the penultima, the upper and lower rows of tubercles are brown, the middle one glassy white. On the next whorl above, the tubercles are brown only on the topmost row, and above that the whorls are wholly of an off-white shade." (Weisbord, 1962)

*Holotype*: PRI 26205; height 20.5 mm, diameter 9.9 mm.

*Type locality*: Mare Formation; stream 100 meters west of Quebrada Mare Abajo, Cabo Blanco, Venezuela.

*Occurrence*: Mare Formation, Venezuela; Recent, eastern Venezuela.

*Figured specimen*: PRI 26205 (holotype).

*Discussion*: Although described from the Late Pliocene Mare Formation, this species has been discovered living along the coast of Venezuela today. It is found in the same general area as the similar *M. withrowi*, which occurs to the east, west, and north of it, but nowhere are the two found together. The reason for this curious distribution is not known.

MURICOPSIS (RISOMUREX) DEFORMIS (Reeve)  
Plate 7, figures 6, 7

*Ricinula deformis* REEVE, 1846 [plate dated "1856" in error], *Conch. Icon.*, v. 3, *Ricinula*, pl. 6, fig. 44.

*Sistrum ferrugineum* [sic] *rubidum* DALL, 1889, *Harvard Mus. Comp. Zool.*, *Bull.*, v. 18, p. 217.

*Risomurex schrammi* (Crosse). OLSSON and MCGINTY, 1958, *Bull. Amer. Paleontology*, v. 39, no. 177, p. 41, pl. 2, fig. 2; KAICHER, 1979, *Card Catalogue World-wide Shells*, pack 20, *Muricidae - Part IV*, no. 2010 (*not of Crosse*).

*Risomurex roseus* (Reeve). WARMKE and AB-BOTT, 1961, *Caribbean Seashells*, p. 106, pl. 19b (*not of Reeve*).

*Muricopsis schrammi* (Crosse). RADWIN and D'ATTILIO, 1976, *Murex Shells of the World*, p. 171, pl. 2, fig. 1, text-fig. 111 (worn protoconch), 112 (radula); [?] SUNDERLAND and SUNDERLAND, 1993, *Amer. Conchologist*, v. 21, no. 4, p. 14, text-fig. (*not of Crosse*).

*Risomurex deformis* (Reeve). KEMPERMAN and COOMANS, 1984, *Zool. Mus. Univ. Amsterdam, Bull.*, v. 10, no. 1, p. 5, fig. 5 (holotype); KAICHER, 1991, *Card Catalogue World-wide Shells*, pack 59, *Muricidae - Part VI*, no. 6066.

*Risomurex mosquitensis* KEMPERMAN and COOMANS, 1984, *Zool. Mus. Univ. Amsterdam, Bull.*, v. 10, no. 1, p. 1, figs. 3, 4.

*Muricopsis (Risomurex) deformis* (Reeve). VOKES, 1984, *Shells and Sea Life*, v. 16, no. 11, p. 214; VOKES and HOUART, 1986, *Tulane Stud. Geol. Paleont.*, v. 19, no. 2, p. 66, pl. 2, figs. 1-5 (fig. 1, holotype - *R. deformis*; fig. 4, holotype - *S. rubidum* Dall; fig. 5, holotype - *R. mosquitensis* Kemperman and Coomans); HOUART, 1990, *Amer. Conchologist*, v. 18, no. 1, p. 8, fig. 5 (color plate).

*Murex (Risomurex) deformis* (Reeve). SUNDERLAND and SUNDERLAND, 1993, *Amer. Conchologist*, v. 21, no. 4, p. 14, text-fig.

*Description*: "Shell ovate, attenuated at the base, spire peculiarly shortened; longitudinally plicated, transversely nodosely ridged, lip thickened; transverse ridges and interstices alternately reddish yellow and brown." (Reeve, 1846)

*Holotype*: BMNH 196872; height 8.8 mm, diameter 5.8 mm.

*Type locality*: TU R-366, Punta Cahuita, Costa Rica (designated by Vokes and Houart, 1986, p. 66).

*Occurrence*: Moín Formation, Costa Rica; Recent, Caribbean Sea from Cuba, eastern Yucatan, along the coast of central America from Bay Islands, Honduras to Costa Rica and Panama.

*Figured specimens*: Fig. 6, USNM 820638; height 14.7 mm, diameter 8.7 mm; locality TU R-109. Fig. 7, USNM 482021; height 11.1 mm, diameter 6.6 mm; locality TU 1489.

*Discussion*: It is ironic that the species named *Ricinula deformis* Reeve should have been completely overlooked by workers for 140 years only to be "rediscovered" by two different sets of workers almost simultaneously. Vokes and Houart (1986) determined that Reeve's name was the correct one to be applied to the species figured as type of the subgenus *Risomurex* by Olsson and McGinty, but Kemperman and Coomans (1984) arrived at a slightly different interpretation. In their opinion the species figured by Olsson and McGinty as type of *Risomurex* is an unnamed species to which they gave the name *Risomurex mosquitensis*. This new species they believed to be similar to *R. deformis* but not the same. All of the relevant mate-



rial was figured in Vokes and Houart (1986, pl. 2, figs. 1-5) and there seems little doubt that the "*R. schrammi*" of Olsson and McGinty is the same as *Ricinula deformis* Reeve, *Sistrum rubidum* Dall, and *Risomurex mosquitensis* Kemperman and Coomans.

The species *M.(R.) deformis* has not been reported previously as fossil but, in an unpublished dissertation, Robinson (1991, p. 402, pl. 17, fig. 9) figured a specimen from the Pleistocene Moín Formation of Costa Rica (refigured here, pl. 7, fig. 7). As Robinson noted, this is a common species in shallow water under coral rubble along the coast of Panama and Costa Rica today.

MURICOPSIS (RISOMUREX) SCHRAMMI  
(Crosse)

Plate 7, figure 8

*Engina schrammi* CROSSE, 1863, Jour. de Conchyl., v. 11, p. 82, pl. 1, fig. 7.

Not *Risomurex schrammi* (Crosse). OLSSON and MCGINTY, 1958, Bulls. Amer. Paleontology, v. 39, no. 177, p. 41, pl. 2, figs. 2, 2a [= *M. deformis* (Reeve)].

*Risomurex schrammi* (Crosse). KEMPERMAN and COOMANS, 1984, Zool. Mus. Univ. Amsterdam, Bull., v. 10, no. 1, p. 3, figs. 6 (holotype), 7 (J. de C., v. 11, pl. 1, fig. 7).

*Muricopsis (Risomurex) schrammi* (Crosse). VOKES and HOUART, 1986, Tulane Stud. Geol. Paleont., v. 19, no. 2, p. 76, pl. 1, fig. 1 (holotype); HOUART, 1990, Amer. Conchologist, v. 18, no. 1, p. 8, figs. 1, 2 (holotype; color plate).

Not *Risomurex schrammi* (Crosse) KAICHER, 1991, Card Catalogue World-wide Shells, pack 59, Muricidae - Part VI, no. 2010/6053 [= *M. withrowi* Vokes and Houart].

Not *Muricopsis schrammi* (Crosse). SUNDERLAND and SUNDERLAND, 1993, Amer. Conchologist, v. 21, no. 4, p. 14, text-fig. [? = *M. deformis* (Reeve)].

*Description*: "Coquille imperforée, épaisse, subglobuleuse, atténuée aux deux extrémités et de couleur rose. Les tours de spire, au nombre de cinq, sont légèrement convexes, munis de côtes longitudinales obtuses, et ornés transversalement de nombreuses et élégantes lignes de nodulations: une seule de ces lignes, placée près de la suture, est d'un brun noirâtre très-intense: sur le dernier tour les lignes transverses, d'un brun noirâtre, sont au nombre de trois, l'une près de la suture, la seconde vers la partie médiane du tour, la troisième plus près de la base. La columelle est ridée et comme plissée, le

bord droit épais et armé de quatre dents, dont l'une (la plus rapprochée du point d'insertion) est plus grosse que les autres. L'ouverture est, à peu près, droite, resserrée par les dents marginales, et par suite étroite: son intérieur est d'un rose violacé. La base de la coquille est canaliculée et sensiblement prolongée." (Crosse, 1863)

*Holotype*: Coll. Jour. de Conchyl., MNHN, Paris; height 8.8 mm, diameter 5.5 mm.

*Type locality*: Guadeloupe, French Antilles.

*Occurrence*: Recent, French Antilles only, so far as known.

*Figured specimen*: Holotype.

*Discussion*: At the time this species was discussed previously (Vokes and Houart, 1986, p. 76), the holotype was the only known example; therefore, we concluded it probably was a faded, aberrant specimen of the more widespread *M. rosea* (Reeve). However, since that time a second example has been discovered and figured by Houart (1990, fig. 1). Thus, *M.(R.) schrammi* seems to be a valid species, which differs from *M.(R.) rosea*, primarily in its more inflated outline and its color pattern, which consists of a light colored shell with three dark spiral lines, one at the suture, one at the periphery, and one at the base of the body whorl.

As was discussed at length in the Vokes and Houart work, the name "*schrammi*" was erroneously applied to another species of *Risomurex* and was named as the type of the genus *Risomurex* by Olsson and McGinty (1958, p. 41, pl. 2, figs. 2, 2a). Subsequent authors have followed their determination and so the species correctly denominated *M. deformis* (Reeve) is frequently cited in the literature under the name "*schrammi*" (e.g., Abbott, 1974, p. 184; Radwin and D'Attilio, 1976, p. 171, pl. 2, fig. 1). Most recently Sunderland and Sunderland (1993, p. 14, text-fig) have figured as *Muricopsis schrammi*, a specimen from Samaná, Dominican Republic. Examination of several specimens of this form in the Sunderland Collection shows that it is probably no more than an atypical color variant of *M. deformis*, the more typical form of which they also figure on the same page.

Because of the confusion over the identity of the type species of *Risomurex*, the *International Commission on Zoological Nomenclature* has declared *Ricinula deformis* Reeve, 1846, to be the type species of



*Risomurex* (ICZN Opinion 1623, March, 1991).

MURICOPSIS (*RISOMUREX*) ROSEA (Reeve)  
Plate 7, figure 9

*Ricinula rosea* REEVE, 1846 [plate dated "1856" in error], *Conch Icon.*, v. 3, *Ricinula*, pl. 6, fig. 46.

*Risomurex roseus* (Reeve). OLSSON and MCGINTY, 1958, *Bulls. Amer. Paleontology*, v. 39, no. 177, p. 41; HUMFREY, 1975, *Sea Shells of the West Indies*, p. 139, pl. 16, fig. 11; KAICHER, 1979, *Card Catalogue Worldwide Shells*, pack 20, *Muricidae - Part IV*, no. 1996; KEMPERMAN and COOMANS, 1984, *Zool. Mus. Univ. Amsterdam, Bull.*, v. 10, no. 1, p. 5, fig. 8 (syntype); SARASÚA and ESPINOSA, 1984, *Poeyana*, no. 273, p. 4, fig. 2A; DE JONG and COOMANS, 1988, *Stud. Fauna Curaçao, Caribbean Islands*, v. 49, p. 75.

Not *Risomurex roseus* (Reeve). WARMKE and ABBOTT, 1961, *Caribbean Seashells*, p. 106, pl. 19b [= *M. deformis* (Reeve)].

*Muricopsis roseus* (Reeve) RADWIN and D'ATTILIO, 1976, *Murex Shells of the World*, p. 170, pl. 2, fig. 5, text-fig. 109 (protoconch), not text-fig. 110 [radula of (?) *Trachypollia nodulosa* (Adams)].

*Morula rosea* (Reeve) CERNOHORSKY, 1978, *Rec. Auckland Inst. Mus.*, v. 15, p. 76, fig. 23 (syntype).

*Risomurex rutilus* (Reeve). VOKES and VOKES, 1983, *Mesoamer. Ecol. Inst., Mon.* 1 (MARI Publ. 54), p. 24 (not of Reeve).

*Muricopsis (Risomurex) roseus* (Reeve). VOKES, 1984, *Shells and Sea Life*, v. 16, no. 11, p. 214; VOKES and HOUART, 1986, *Tulane Stud. Geol. Paleont.*, v. 19, no. 2, p. 68, pl. 1, figs. 5-9 (fig. 5, lectotype; fig. 6, paralectotype); HOUART, 1990, *Amer. Conchologist*, v. 18, no. 1, p. 8, fig. 3 (color plate); SUNDERLAND and SUNDERLAND, 1993, *Amer. Conchologist*, v. 21, no. 4, p. 14, text-fig.

*Description*: "Shell ovate, produced at the base, spire peculiarly shortened; whorls longitudinally nodosely ribbed, lip thickened, aperture small; rose-colour, zoned with brown." (Reeve, 1846)

*Lectotype*: BMNH 1968458 (designated by Vokes and Houart, 1986, p. 72); height 11.1 mm, diameter 6.4 mm.

*Type locality*: "Island of Masbate" [Philippine Islands]; St. Thomas, Virgin Islands (designated by Kemperman and Coomans, 1984, p. 5).

*Occurrence*: Recent only, throughout the Antilles to northern coast of South America.

*Figured specimen*: Robinson Collection; height 11.5 mm, diameter 6.4 mm; locality,

Punta Rucia, Prov. Puerto Plata, Dominican Republic.

*Discussion*: As discussed in Vokes and Houart (1986, p. 72) this species has been plagued with mistakes beginning with Reeve (1846), who cited it as coming from the Philippine Islands (and who also put the wrong date on the plate). Although less common than *M. deformis* and *M. caribbaea*, the species is widespread throughout the Antilles. There are no records from the mainland of North America or Central America, but a form believed to be a local color variant has been taken off northern South America.

MURICOPSIS (*RISOMUREX*) CARIBBAEA  
(Bartsch and Rehder)  
Plate 7, figure 10

*Fusus muricoides* C.B. ADAMS, 1845, *Boston Soc. Nat. Hist., Proc.*, v. 2, p. 3; CLENCH and TURNER, 1950, *Occ. Papers Moll., Harvard Univ.*, v. 1, no. 15, p. 313, pl. 39, fig. 9 (holotype) (*non Fusus muricoides* Deshayes, 1835.)

*Tritonalia (Ocinebrina) caribbaea* BARTSCH and REHDER, 1939, *Smithsonian Misc. Coll.*, v. 98, no. 10, p. 7, pl. 1, fig. 1.

*Ocenebra (Ocinebrina) muricoides* (Adams). ABBOTT, 1954, *Nautilus*, v. 68, no. 2, p. 44, pl. 2, fig. 2 (holotype - *T. caribbaea*).

*Risomurex muricoides* (Adams). OLSSON and MCGINTY, 1958, *Bulls. Amer. Paleontology*, v. 39, no. 177, p. 41, pl. 2, fig. 1; HUMFREY, 1975, *Sea Shells of the West Indies*, p. 140, pl. 16, fig. 9; RADWIN and D'ATTILIO, 1976, *Murex Shells of the World*, p. 168, pl. 2, fig. 3; KEMPERMAN and COOMANS, 1984, *Zool. Mus. Univ. Amsterdam, Bull.*, v. 10, no. 1, p. 3, fig. 9; SARASÚA and ESPINOSA, 1984, *Poeyana*, no. 273, p. 4, fig. 2B.

*Ocenebra (Risomurex) muricoides* (Adams). ABBOTT, 1974, *Amer. Seashells (ed. 2)*, p. 184, fig. 1922.

*Risomurex caribbaeus* (Bartsch and Rehder). VOKES and VOKES, 1983, *Mesoamer. Ecol. Inst., Mon.* 1 (MARI Publ. 54), p. 24, pl. 12, fig. 4 (holotype - *F. muricoides* Adams); DE JONG and COOMANS, 1988, *Stud. Fauna Curaçao, Caribbean Islands*, v. 49, p. 75.

*Muricopsis (Risomurex) caribbaeus* (Bartsch and Rehder). VOKES, 1984, *Shells and Sea Life*, v. 16, no. 11, p. 214; VOKES and HOUART, 1986, *Tulane Stud. Geol. Paleont.*, v. 19, no. 2, p. 77, pl. 2, figs. 7-9 (fig. 7 = holotype - *F. muricoides* Adams, fig. 8 = holotype - *T. caribbaea*, fig. 9 = TU R-389; figs. 8 and 9 misnumbered); SUNDERLAND and



SUNDERLAND, 1993, Amer. Conchologist, v. 21, no. 4, p. 14, text-fig.

*Description*: "Shell small, very elongate-ovate, brown, with the spiral zone of tubercles above and below the peripheral keel and the 3 median columellar cords white. Aperture brown within with the external white bands marking the peristome; the denticles within the outer lip are also white. Nuclear whorls eroded. Postnuclear whorls marked by broad low axial ribs, of which 9 are present on the last turn; strong incremental lines also cross the whorls. The spiral sculpture consists of 3 very strong keels, which grow consecutively stronger from the first at the summit anteriorly. These cords pass across the intercostal spaces and the axial ribs, rendering these nodulose at their intersection. The nodules have their long axis coinciding with the spiral sculpture. Lesser spiral threads mark the spiral cords and the spaces between them. Suture moderately strongly constricted. Periphery with a spiral cord as strong as those posterior to it and similarly marked. Base short, well rounded with a heavy nodulose spiral cord on its middle and the finer sculpture noted for the spire. Columella long, somewhat twisted and marked by 2 slender spiral threads near its insertion, followed by 3 heavier cords, then a series of finer, more closely approximated threads near its tip. All this spiral sculpture is rendered roughened by incremental lines. Aperture decidedly channeled anteriorly; outer lip thick, marked at the edge by incremental lines bearing 5 denticles within the edge in the expanded portion of the aperture; inner lip appressed to the columella in its posterior half, free on the anterior part. Parietal wall glazed with a thin callus except near the outer lip where it develops into a low hump." (Bartsch and Rehder, 1939)

*Holotype*: USNM 472617; height 8.3 mm, diameter 4.0 mm.

*Type locality*: "Old Providence Island, Caribbean Sea" (= Isla de Providencia, Colombia).

*Occurrence*: Recent only, from Florida Keys throughout the Antilles and coast of Central America. Only occurrence in northern South America, from Isla La Tortuga (Vokes and Houart, 1986, p. 78).

*Figured specimen*: USNM 472617 (holotype).

*Discussion*: As noted in Vokes and Houart (1986, p. 77) workers have recognized that "*Tritonalia*" *caribbaea* is a junior synonym of *Fusus muricoides* C.B. Adams since Abbott's 1954 paper. What was not realized until Cernohorsky (1978, p. 78) called attention to it is the fact that *Fusus muricoides* Adams, 1845, is pre-occupied by *F. muricoides* Deshayes, 1835, a French Eocene species. Thus, *M.(R.)*

*caribbaea* becomes the valid name for this well known and widely distributed species.

It should be noted that in Vokes and Houart the illustrations of the holotype of *Tritonalia caribbaea* and another specimen from the Dominican Republic (1986, pl. 2, figs. 8 and 9) are reversed.

MURICOPSIS (RISOMUREX) WITHROWI  
Vokes and Houart  
Plate 7, figure 11

*Morula didyma* (Schwengel). ABBOTT, 1974, Amer. Seashells (ed. 2), p. 177 (in part), fig. 1873 (not of Schwengel).

*Muricopsis (Risomurex)* n. sp. VOKES, 1984, Shells and Sea Life, v. 16, no. 11, p. 214.

*Muricopsis (Risomurex) withrowi* VOKES and HOUART, 1986, Tulane Stud. Geol. Paleont., v. 19, no. 2, p. 78, pl. 3, figs. 4, 5; HOUART, 1990, Amer. Conchologist, v. 18, no. 1, p. 8, fig. 4 (color plate); SUNDERLAND and SUNDERLAND, 1993, Amer. Conchologist, v. 21, no. 4, p. 15, text-fig.

*Risomurex withrowi* (Vokes and Houart). DE JONG and COOMANS, 1988, Stud. Fauna Curaçao, Caribbean Islands, v. 49, p. 75, pl. 37, fig. 404; KAICHER, 1991, Card Catalogue World-wide Shells, pack 59, Muricidae - Part VI, without number.

*Risomurex schrammi* (Crosse). KAICHER, 1991, Card Catalogue World-wide Shells, pack 59, Muricidae - Part VI, no. 2010/6053 (not of Crosse).

*Description*: "Shell large for the subgenus, to 20 mm in height; solid and fusiform. Aperture ovate; columellar lip with two or three small denticles, reflecting the nodulose sculpture of the shell; adherent above and erect on about three-fourths of its anterior part; outer apertural lip crenulated, with five strong denticles on its inner side, the strongest being the second posterior one; anal notch deep and narrow. Spire high and acute; protoconch of one and one-half keeled whorls; six convex, slightly angulate postnuclear whorls. Suture impressed and slightly undulating. Body whorl with seven to nine low, broad axial ridges; no other axial sculpture except growth lamellae. Spiral sculpture consisting of eight major cords, more apparent and darker colored on the axial ribs, giving a nodulose appearance to the shell, and distributed as follows: one on the shoulder; five on the body; and two on the siphonal canal; two or three somewhat squamose threads intercalated between each pair of major spiral cords. Siphonal canal short, open, very slightly recurved dorsally at the tip. Color mauve or orange to light brown, or almost black with darker-colored spots where the spiral cords cross the ribs;



aperture white, edged by pink." (Vokes and Houart, 1986)

*Holotype*: USNM 779868; height 16.3 mm, diameter 9.0 mm.

*Type locality*: Curaçao, Netherlands Antilles.

*Occurrence*: Recent only, northern South America, from Colombia to Trinidad and Tobago.

*Figured specimen*: IRSNB I.G. 26,738/407 (paratype); height 19.5 mm, diameter 10.0 mm; locality, off Riohacha, Colombia.

*Discussion*: *Muricopsis (Risomurex) withrowi* is closely related to *M.(R.) gilbertharrisi*, which occurs in the same general northern South America region. However, as far as known, the ranges of the two species do not overlap. Described as a Pliocene fossil from Venezuela, *M. gilbertharrisi* lives today in a restricted area of eastern Venezuela and Isla de Margarita. The two forms are similar in appearance, with *M. gilbertharrisi* differing from *M. withrowi* in having a more narrow, elongated shell with more numerous axial ribs. The two may be ecologic variants of the same species but I have seen no intergrading examples.

MURICOPSIS (?RISOMUREX) NECOCHEANA  
(Pilsbry)

Plate 7, figure 12

*Sistrum nicocheanum [sic]* PILSBRY, 1900, *Nautilus*, v. 14, no. 1, p. 3.

*Sistrum inglorium* (Crosse). IHERING, 1907, *An. Mus. Nac. Buenos Aires*, v. 14 (ser. 3, v. 7), p. 447, with *S. nicocheanum [sic]* in synonymy (not of Crosse).

*Drupa (Drupa) nicocheana* (Pilsbry). CARCELLES, 1944, *Rev. Mus. La Plata (n.s.)*, Sect. Zool., v. 3, p. 251, pl. 2, figs. 27, 29; CAMACHO, 1966, *Paleontografia Bonaerense*, fasc. 3, p. 134, pl. 16, fig. 11 (after Carcelles).

*Morula nicocheana* (Pilsbry). RIOS, 1970, *Coastal Brazilian Seashells*, p. 81, pl. 24; RIOS, 1975, *Brazilian Marine Moll. Icon.*, p. 92, pl. 27, fig. 381.

*Muricopsis nicocheanus* (Pilsbry). RADWIN and D'ATTILIO, 1976, *Murex Shells of the World*, p. 169, pl. 23, fig. 12.

*Muricopsis nicocheanus* (Pilsbry). RIOS, 1985, *Seashells of Brazil*, p. 84, pl. 30, fig. 369.

*Muricopsis (?Risomurex) nicocheanus* (Pilsbry). VOKES and HOUART, 1986, *Tulane Stud. Geol. Paleont.*, v. 19, no. 2, p. 84, pl. 2, fig. 10.

*Muricopsis (Risomurex) nicocheanus* (Pilsbry). HOUART, 1991, *Nautilus*, v. 105, no. 1, p. 31, text-fig. 11 (protoconch).

*Muricopsis nicocheana* (Pilsbry). SUNDERLAND and SUNDERLAND, 1993, *Amer. Conchologist*, v. 21, no. 4, p. 15, text-fig.

*Description*: "Shell imperforate or rimate, fusiform, thick and strong, brownish flesh-colored, the spiral lirae brown. Sculpture of strong, rounded, longitudinal waves equal to their intervals, 8 or 7 in number on the last whorl; these waves crossed by rather strong spiral cords, which widen into transversely oblong low tubercles upon the summits of the waves. Between these cords there are several spiral threads in most or all of the intervals. Whorls about 5 1/2, convex, the last one with concave outlines below, produced in a rather long anterior canal. Aperture oval, flesh-colored within; peristome thick or beveled, armed with six subequal teeth within; columellar margin angular at the origin of the anterior canal, bearing a single small transverse fold above the angle; canal rather straight and long for this genus." (Pilsbry, 1900)

*Lectotype*: ANSP 72640 (designated by Vokes and Houart, 1986, p. 84); height 21.5 mm, diameter 11.0 mm.

*Type locality*: "Nicochea" [= Necochea], Argentina.

*Occurrence*: Holocene and Recent, Espírito Santo, Brazil, to Bahia Blanca, Argentina.

*Figured specimen*: Vokes Collection; height 19.4 mm, diameter 9.8 mm; locality, Cabo Frio, Brazil.

*Discussion*: This temperate species is included only provisionally with *Risomurex* as there are certain differences in the nature of the labral denticles and in the non-keeled protoconch. However, the non-varicose shell is more similar to *Risomurex* than to *Muricopsis* s.s., and for this reason it is included in *Risomurex*.

Genus MUREXSUL Iredale, 1915

*Murexsul* IREDALE, 1915, *New Zealand Inst., Trans. and Proc.*, v. 47, p. 471.

Type species: *Murex octogonus* Quoy and Gaimard, 1833, by original designation.

*Discussion*: Ponder (1972, p. 237) has questioned whether the taxa *Murexsul* and *Muricopsis* are separable. The differences between the two groups are more a matter of degree than any striking divergence. The type species of the two groups are completely distinctive but there are certain species that lie between the two.

However, the extreme development of the apertural denticles in typical species of



*Muricopsis*, and its subgenus *Risomurex*, is adequate to separate the two groups. I willingly grant that the group of *Muricopsis oxytata*, with its secondary loss of the apertural denticles, is a problem and that there are spinose species of *Muricopsis* (e.g., *M. zylmanae*) that could be placed equally well in either genus, but for the majority of the forms the similarities cause no difficulties. *Murexsul* possibly could be considered a subgenus of *Muricopsis* but, as both groups go back to the Eocene in essentially unchanged morphology, there is little reason to unite them.

When I monographed the genus *Murexsul* (1968, p. 87) there was but a single fossil species, and no living ones, in the western Atlantic. Since that time several additional species have been added to the group, so that today the genus is known to be widely represented in both the western Atlantic and the eastern Pacific.

#### MUREXSUL species

##### Plate 8, figure 1

*Occurrence:* Bashi Marl Member, Hatchitigbee Formation, Alabama.

*Figured specimen:* USNM 482022; height 5.5 mm, diameter 3.8 mm; locality TU 87.

*Discussion:* From the Early Eocene Bashi Marl, near Butler, Alabama, we have collected a single juvenile specimen that represents the earliest known occurrence of the genus *Murexsul* in the New World. Although the specimen is clearly immature and has no apertural lip, its presence is worthy of note.

#### (?)MUREXSUL NANISSIMUS Vokes, n. sp.

##### Plate 8, figures 2-5

*Description:* Shell small (maximum height under 10 mm), six teleoconch whorls and a protoconch of one and one-half smooth, bulbous whorls, ending at a small straight varix. Spiral ornamentation on earliest teleoconch whorls of two strong rounded cords; by third teleoconch whorl a third slightly weaker cord added on shoulder ramp. By fourth teleoconch whorl spiral cords becoming lower and on body whorl five major cords, only slightly raised, alternating with secondary cords and tertiary threads. Axial ornamentation on first three teleoconch whorls of nine to ten small lamellar varices, marked by open spinelets at intersection of spiral cords. On fourth and successive whorls varices gradually decreasing to seven or eight per whorl and be-

coming only low rounded ridges. Surface made scabrous by intersection of numerous axial growth lamellae and spiral ornamentation. Suture impressed, undulated by axial ridges. Aperture elongate-oval; inner lip narrow, smooth, free-standing in anterior portion, slightly appressed in posterior portion. Inner side of outer lip with six elongate denticles, the posteriormost slightly larger, forming a weak, adapically-directed, anal notch. Siphonal canal short, broad, recurved at distal end.

*Holotype:* USNM 482023; height 8.6 mm, diameter 4.5 mm.

*Type locality:* TU 825, Chipola Formation; Farley Creek, at abandoned mill about 1/2 mile west of bridge of Florida Highway 275 (SW 1/4 Sec. 21, T1N, R9W), Calhoun County, Florida.

*Etymology of the name:* *nana* (Latin) - a dwarf; + *issimus* (superlative), for the small size of the species.

*Occurrence:* Chipola Formation, Florida.

*Figured specimens:* Fig. 2, USNM 482023 (holotype). Fig. 3, USNM 482024 (paratype A); height 7.0 mm, diameter 3.5 mm; locality TU 825. Fig. 4, USNM 482025 (paratype B); height 6.6 mm, diameter 3.3 mm; locality TU 825. Fig. 5, USNM 482026 (paratype C); height 5.2 mm, diameter 3.0 mm; locality TU 825. Additional localities: TU 459, 548, 555, 818-827, 999, 1048, 1049.

*Discussion:* This small species (maximum height under 10 mm) is found throughout the eastern portion of the Chipola Formation, although the bulk of the specimens occur in the calcarenite facies along Farley Creek. Placement in the genus *Murexsul* is somewhat problematic. The early whorls have the typical laminar varices of the genus (see pl. 8, fig. 5) but then as the shell grows larger these disappear and are replaced by rounded axial ridges. The early and later whorls are so different in appearance that they look like different species, but in an adult shell with well-preserved juvenile whorls (pl. 8, fig. 2) the change can be seen.

There is some resemblance to members of the subgenus *Muricopsis* (*Risomurex*) but the apertural denticles are not at all similar. Thus, this strange form is placed in *Murexsul*. There is no other species with which it may be compared and none with which it might be confused.

#### MUREXSUL MIMICUS Vokes

##### Plate 8, figure 6

*Murexsul mimicus* VOKES, 1989, *Bulls. Amer. Paleontology*, v. 97, no. 332, p. 70, pl. 8, fig. 5.



*Description:* "Shell with seven teleoconch whorls and a protoconch of one-and-one-half smooth, bulbous whorls. Spiral ornamentation beginning with three small cords on earliest post-nuclear whorls, one at the shoulder, one just posterior to the suture, and a third between these. The three continue, with that at the shoulder becoming strongest, and with numerous smaller threads intercalated, up to the body whorl. On body whorl, spiral ornamentation of four orders of magnitude: four major cords, three as above, plus one at base of body whorl; between each pair of major cords, sets of alternating larger and smaller intermediate threads; same pattern continued on siphonal canal. Axial ornamentation on earliest whorls of nine or 10 narrow flange-like varices, decreasing to six on each adult whorl; the later varices consisting of multiple laminae, forming short spines where the four major spiral cords cross, that at the shoulder slightly larger. In addition, surface shagreened by intersection of spiral threads and numerous axial growth lines. Aperture ovate, inner lip smooth, slightly appressed at posterior end, free-standing at anterior end; inner side of outer lip with five or six weak elongate denticles. Siphonal canal moderately long, narrow, slightly recurved at distal end, former terminations of canal forming a slight umbilicus." (Vokes, 1989)

*Holotype:* USNM 365145; height 20.1 mm, diameter 11.5 mm.

*Type locality:* TU 1215, Gurabo Formation; Río Gurabo, bluffs on both sides from the ford on the Los Quemados-Sabaneta road, upstream

to approximately 1 km above the ford, Dominican Republic.

*Occurrence:* Gurabo Formation, Dominican Republic.

*Figured specimen:* USNM 365145 (holotype).

*Discussion:* Species such as *M. mimicus* cause difficulties in distinguishing between *Murexsul* and *Muricopsis*. There is a very strong resemblance between *M. mimicus* and the sympatric *Muricopsis praepauxilla*; however, the latter is an atypical member of the genus *Muricopsis*, with the body whorl more distinctly demarcated from the siphonal canal than in the typically biconic shell of most species of *Muricopsis*.

Known only from a single coral-reef locality in the Gurabo Formation, this species is most closely related to the slightly younger *M. thalmani*, from the Agueguequite Formation, Mexico. From the latter, *M. mimicus* differs in having a more inflated body whorl and a larger size.

#### MUREXSUL THALMANI (Vokes)

##### Plate 8, figure 7

*Hexaplex (Murexsul) thalmani* VOKES, 1968, Tulane Stud. Geol., v. 6, no. 3, p. 106, pl. 3, fig. 2.

*Description:* "Nuclear whorls unknown [one and one-half smooth whorls]; six post-nuclear whorls in holotype. Spiral sculpture on early

### PLATE 8

Figures	Page
1. <i>Murexsul</i> species . . . . . (X 10) USNM 482022; height 5.5 mm, diameter 3.8 mm. Locality: TU 87, Butler, Alabama. Bashi Marl.	81
2-5. (?) <i>Murexsul nanissimus</i> Vokes, n. sp . . . . .	81
2. (X 6) USNM 482023 (holotype); height 8.6 mm, diameter 4.5 mm.	
3. (X 8) USNM 482024 (paratype A); height 7.0 mm, diameter 3.5 mm.	
4. (X 8) USNM 482025 (paratype B); height 6.6 mm, diameter 3.3 mm.	
5. (X 8) USNM 482026 (paratype C); height 5.2 mm, diameter 3.0 mm. Locality of all: TU 825, Farley Creek, Florida. Chipola Formation.	
6. <i>Murexsul mimicus</i> Vokes . . . . .	81
(X 2 1/2) USNM 365145 (holotype); height 20.1 mm, diameter 11.5 mm. Locality: TU 1215, Río Gurabo, Dominican Republic. Gurabo Formation.	
7. <i>Murexsul thalmani</i> (Vokes) . . . . .	82
(X 3) USNM 482027; height 16.4 mm, diameter 8.9 mm. Locality: TU 1046, Veracruz, Mexico. Agueguequite Formation.	
8, 9. <i>Murexsul comptulus</i> Vokes, n. sp . . . . .	84
8. (X 5) USNM 482028 (holotype); height 10.7 mm, diameter 5.5 mm. Locality: TU 558, Crescent Beach, South Carolina. Waccamaw Formation.	
9. (X 10) USNM 482029 (paratype); height 9.4 mm, diameter 4.3 mm. Locality: same as holotype.	



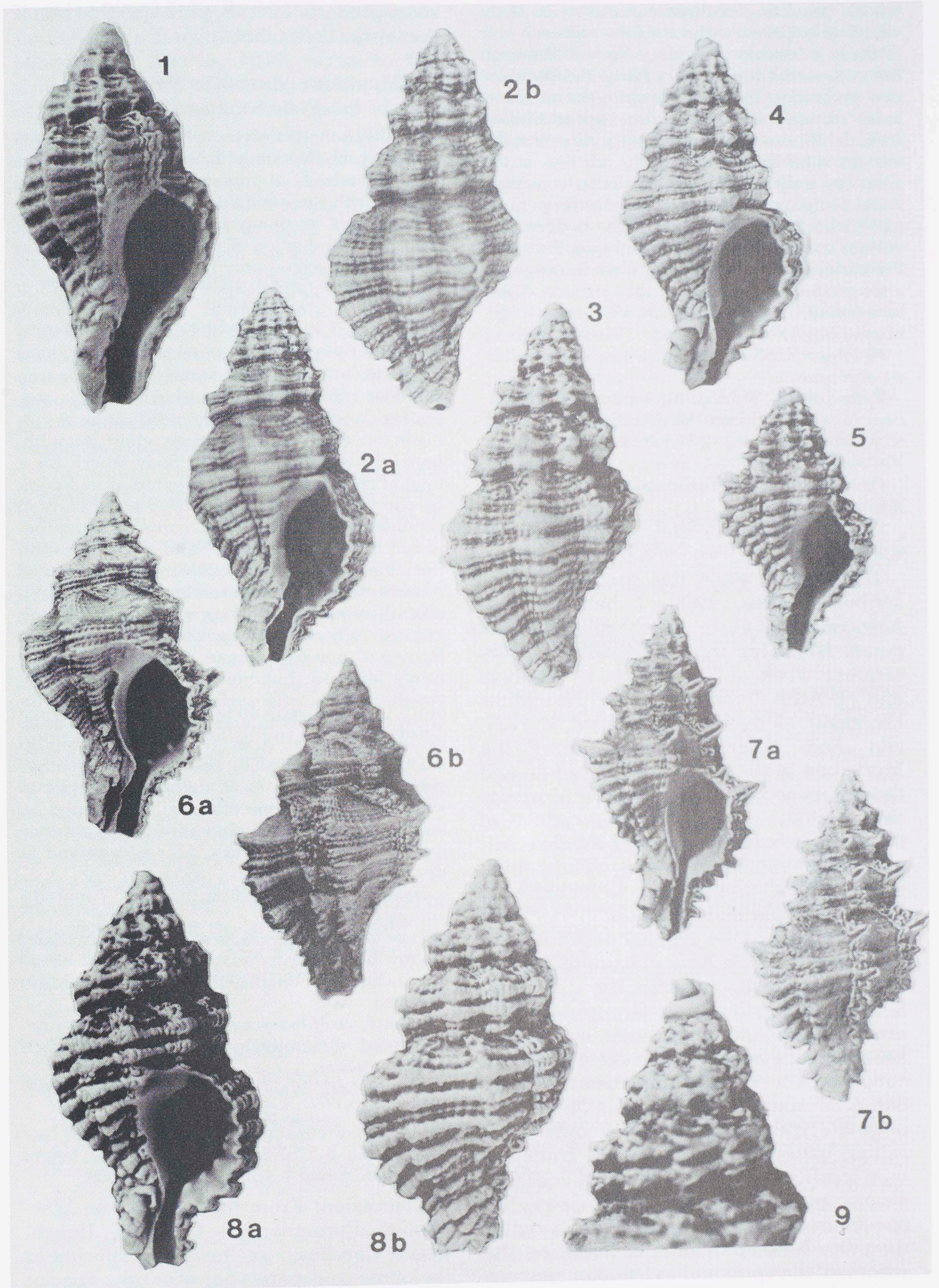


PLATE 8



whorls consisting of three equal ribs; on body whorl three primary ribs and between each pair of these a weaker secondary thread. Between the suture and the primary rib at the shoulder two secondary threads; between the anterior-most rib and the pillar also two secondary threads. Where the three primary ribs cross the varices small spines are produced, that at the shoulder only slightly larger than the others. Axial sculpture of eight varices on the penultimate whorl and six varices on the body whorl; varices composed of multiple laminae. Between the varices numerous axial growth lines, giving a shagreened texture to the shell surface. Aperture small, oval; columellar wall smooth. Siphonal canal short, recurved." (Vokes, 1968)

*Holotype*: USNM 645890; height 13.5 mm, diameter 6.0 mm.

*Type locality*: TU 638, Agueguexquite Formation; Mexico Highway 180, 14 miles [28 km] east of junction with side road into Coatzacoalcos, Veracruz, Mexico.

*Occurrence*: Agueguexquite Formation, Mexico.

*Figured specimen*: USNM 482027; height 16.4 mm, diameter 8.9 mm; locality TU 1046.

*Discussion*: When this species was described (Vokes, 1968), I believed that *Murexsul* was more closely related to the genus *Hexaplex* than it actually is. Subsequent work on the radula by Radwin and D'Attilio showed that the genus *Murexsul*, along with *Muricopsis*, *Murexiella* and others, differed from the Muricinae in the nature of the radula and they proposed the new subfamily Muricopsinae (1971, p. 64, fig. 21, radula of *Murexiella radwini*, showing the three-dimensional rachidian tooth). Thus, it is clear that the resemblance to *Hexaplex* is the result of parallel evolution.

At the time of the original description of *M. thalmani*, the Agueguexquite Formation was correlated with the Choctawhatchee Formation (now Group) of northern Florida, and both were considered Late Miocene in age. The correlation is still considered correct, but both units are now dated as Middle Pliocene (N. 20). In the original type lot there were only four, rather battered, specimens all from the type locality. Since then we have collected several more examples but only one (the specimen figured in pl. 8, fig. 7) is better than the holotype. Most are lacking the whorls of the spire and as this damage is so consistent one wonders if there was not

some predator (a crab, perhaps) that bit off the tops of these shells.

#### MUREXSUL COMPTULUS Vokes, n. sp.

##### Plate 8, figures 8, 9

*Description*: Holotype with five teleoconch whorls (probably six in fully adult shell); tabulate protoconch of one and one-half smooth whorls, with a marked keel beginning at posterior edge and gradually moving to mid-point of whorl by termination of protoconch. Change to teleoconch marked only by onset of spiral and axial ornamentation. Spiral ornamentation initially of one strong cord at mid-point, resulting from continuation of protoconch keel, with a second strong cord at shoulder; one weaker cord adjacent to anterior suture and another on shoulder ramp. With increasing whorls, a second weak cord added on shoulder ramp, resulting in five cords on penultimate whorl. An additional three strong cords on body whorl, for a total of six strong cords, separated at mid-point by one weak cord, with a second weak cord on shoulder ramp. Two weak cords in space between base of body whorl and siphonal canal, the latter with two additional strong cords. Axial ornamentation of about ten lamellar varices on all early whorls, decreasing to seven on fifth teleoconch whorl. With increasing size, varices formed of multiple laminae, giving rise to elaborately filigreed, but non-spinose, varices. Between varices entire surface shagreened by intersection of growth lamellae and spiral cords. Suture impressed. Aperture rounded, inner lip smooth, appressed along entire length. On inner side of outer lip six small denticles, anterior to shoulder cord. Margin of outer lip scalloped by spiral cords and somewhat patulous in anterior half. Siphonal canal short, broad, recurved at distal end.

*Holotype*: USNM 482028; height 10.7 mm, diameter 5.5 mm.

*Type locality*: TU 558, Waccamaw Formation; borrow pits at north end of Crescent Beach Airport, Crescent Beach, Horry County, South Carolina.

*Etymology of name*: *comptulus* (Latin) – ornamented (diminutive), in reference to surface ornamentation.

*Occurrence*: Waccamaw Formation, South Carolina.

*Figured specimens*: Fig. 8, USNM 482028 (holotype). Fig. 9, USNM 482029 (paratype); height 9.4 mm, diameter 4.3 mm; locality TU 558.

*Discussion*: From the beds of the Waccamaw Formation at Crescent Beach, South Carolina, we have two specimens (holotype and paratype) of a new species that cannot be compared with any New



World form. However, it is remarkably similar to the Recent Australian *Murexsul planiliratus* (Reeve, 1845), even to the strange keeled protoconch, which is most reminiscent of that normally seen in species of *Risomurex*. Both are relatively small species, an example of the Australian shell with only five teleoconch whorls is approximately the same size as the American one; the addition of a sixth teleoconch whorl to the Australian shell gives a height of about 17 mm, which is probably the size of a fully adult specimen of *M. comptulus*. Likewise, the overall outline of the shells is nearly the same at five whorls; the addition of a sixth whorl makes the Australian shell appear much more rotund. We do not know what the addition of one more whorl would do to the American shell.

The difference between the two species is primarily in the pattern of spiral cords, which in the Australian species are 15 in number (on the body whorl) and all of the same strength, in contrast to the pattern of (from posterior to anterior) one weak, three strong, one weak, three strong, two weak, two strong (total 12) seen in the American species. D'Attilio and Myers (1986, figs. 14-16) have given excellent illustrations of the protoconch and ornamentation in *M. planiliratus*. How these two disjunct species are related is a mystery. Presumably both go back to some unrecognized Eocene ancestor.

The surface ornamentation generated by the axial growth lines, leading to a series of overlapping scallops on each spiral cord, superficially resembles species of *Coralliophila*, but the protoconch (see pl. 8, fig. 9) indicates that the species is a member of the Muricopsinae.

MUREXSUL HARASEWYCHI Petuch  
Plate 9, figures 1, 2

*Murexsul harasewychi* PETUCH, 1987, New Caribbean Moll. Faunas, p. 100, pl. 21, figs. 11, 12; PETUCH, 1988, Neogene Hist. Trop. Amer. Moll., p. 156, pl. 34, fig. 16 (holotype); KAICHER, 1991, Card Catalogue Worldwide Shells, pack 59, Muricidae - Part VI, no. 6075 (holotype).

*Description*: "Shell small for genus, thin, fragile, very elongated and fusiform, with high elevated spire; siphonal canal long, roughly one-third total length; 6 varices per whorl, shoulder sharply angled; body whorl sculptured with 5

large, fimbriated cords; area between suture and shoulder without large cords but with numerous fine spiral threads; shoulder of each varix with 1 small, bifurcated spine; 5 spiral cords overlap onto varices, producing low, fimbriated knobs; varices on siphonal canal with 2 short spines; aperture round-oval, with raised peristome; inner edge of lip without denticles; shell color two-toned, with body whorl and spire being yellow-orange and with siphonal canal being brown; early whorls, protoconch, and tips of shoulder spines pale reddish-brown; interior of aperture and peristome white." (Petuch, 1987)

*Holotype*: USNM 859845; height 14.7 mm, diameter 7.7 mm.

*Type locality*: Off Cabo de La Vela, Guajira Peninsula, Colombia, 35 meters.

*Occurrence*: Moín Formation, Costa Rica; Recent, northern South America.

*Figured specimens*: Fig. 1, USNM 859845 (holotype). Fig. 2, USNM 482030; height 13.6 mm, diameter 7.4 mm; locality TU 1240.

*Discussion*: Named from the living fauna off northern South America; there is a single specimen of *M. harasewychi* from the Moín Formation, Costa Rica.

MUREXSUL AMPHILOGOS Vokes, n. sp.  
Plate 9, figure 3

*Description*: Shell with seven teleoconch whorls and a protoconch of one and one-half smooth, bulbous whorls, ending at a small recurved varix. Spiral ornamentation on first teleoconch whorl of two narrow cords, one at midpoint and one immediately adjacent to anterior suture. By third teleoconch whorl a third strong cord appearing at shoulder, plus intercalary threads between the three major spiral cords. On body whorl five major cords, with a small thread between each pair, two smaller cords in area between base of body whorl and siphonal canal, and on the latter another two strong cords. Axial ornamentation of eight laminar varices on all early whorls, decreasing to six on adult body whorl. Shoulder marked by long, sharp, open spines; on body whorl other major cords also marked by spines, that one immediately anterior to shoulder spine and that one at base of body whorl slightly smaller than the other three. With increasing size, varices becoming multiple layers of shell material, elaborately frilled by intersection of spiral cords and threads. Shell surface between varices shagreened by intersection of numerous growth lamellae and spiral ornamentation; especially on shoulder ramp with several threads made visible only by scalloping of growth lamellae. Suture impressed, crossed by growth lamellae. Aperture elongate-oval; inner lip smooth, free-



standing in anterior portion, appressed in posterior portion. Inner side of outer lip with about eight faint denticles. Siphonal canal long, recurved at distal end.

*Holotype*: USNM 482031; height 20.3 mm, diameter 10.4 mm.

*Type locality*: TU 1239, Moín Formation; hill cut above Standard Fruit Co. box factory at Pueblo Nuevo (same as TU 954 but stratigraphically about 15 meters higher – above the coral horizon), about 2 km west of Puerto Limon, Costa Rica.

*Etymology of name*: *amphilogos* (Greek) – questionable, doubtful.

*Occurrence*: Moín Formation, Costa Rica.

*Figured specimen*: USNM 482031 (holotype).

*Discussion*: Placement of this new species in the genus *Murexsul* is certainly a compromise, once again raising doubt about the generic distinctness of *Muricopsis* and *Murexsul*. The resemblance to some specimens of *Muricopsis oxytata* is striking. And yet, the nature of the aperture, with only weak denticles on the inner side of the outer lip and a completely smooth columellar lip indicates placement in *Murexsul*.

This choice is further strengthened by the fact that the species to which *M. amphilogos* bears the strongest resemblance is the New Zealand type species of the genus, *M. octogonus* (Quoy and Gaimard, 1833). In that species there are five major spiral cords, alternating with five secondary cords. In many specimens the difference in strength between the primary and

secondary cords is so little as to give the appearance of ten equal cords, but other specimens have the two sets well differentiated (compare Radwin and D'Attilio, 1976, pl. 26, fig. 7 [the ten equal cords form] and fig. 6 [the five strong cords form]). It is the latter specimens that have the strongest resemblance to the Costa Rican species, which has five strong cords alternating with very faint secondary threads. The major difference between the two species is the size: *M. amphilogos* is about half the size of *M. octogonus*, with seven whorls in a shell of 20 mm height; a New Zealand shell with seven whorls measures over 40 mm in height.

#### MUREXSUL EMIPOWLUSI (Abbott)

##### Plate 9, figures 4, 5

*Ocenebra (Ocinebrina) emipowlusi* ABBOTT, 1954, *Nautilus*, v. 68, no. 2, p. 41, pl. 2, fig. 3; ABBOTT, 1974, *Amer. Seashells* (ed. 2), p. 184, fig. 1924.

?*Ocinebrina emipowlusi* (Abbott). RADWIN and D'ATTILIO, 1976, *Murex Shells of the World*, p. 126, pl. 21, fig. 9, text-fig. 77 (protoconch).

*Ocenebra emipowlusi* Abbott. FAIR, 1976, *The Murex Book*, p. 40, pl. 21, fig. 317 (holotype).

*Murexsul emipowlusi* (Abbott). VOKES, 1984, *Shells and Sea Life*, v. 16, no. 11, p. 214.

*Murexsul* (or *Muricopsis?*) *emipowlusi* (Abbott). SUNDERLAND and SUNDERLAND, 1993, *Amer. Conchologist*, v. 21, no. 4, p. 14, text-fig.

#### PLATE 9

Figures	Page
1, 2. <i>Murexsul harasewychi</i> Petuch . . . . .	85
1. (X 4) USNM 859845 (holotype); height 14.7 mm, diameter 7.7 mm. Locality: off Guajira Peninsula, Colombia. Recent.	
2. (X 4) USNM 482030; height 13.6 mm, diameter 7.4 mm. Locality: TU 1240, Los Corales, Costa Rica. Moín Formation.	
3. <i>Murexsul amphilogos</i> Vokes, n. sp . . . . .	85
(X 3) USNM 482031 (holotype); height 20.3 mm, diameter 10.4 mm. Locality: TU 1239, Pueblo Nuevo, Costa Rica. Moín Formation.	
4, 5. <i>Murexsul emipowlusi</i> (Abbott) . . . . .	86
4. (X 6) USNM 880011; height 6.8 mm, diameter 3.9 mm. Locality: TU 977, Mississippi River Delta, Louisiana. Holocene.	
5. (X 6) USNM 880012; height 9.0 mm, diameter 5.1 mm. Locality: off Egmont Pass, Florida. Recent.	
6. <i>Murexsul</i> species . . . . .	88
(X 9) MNHN; height 5.2 mm, diameter 3.2 mm. Locality: R/V <i>Marion-Dufresne</i> Station DC 35, off Vitória, Espírito Santo, Brazil. Recent. (Photographs courtesy of R. Houart)	



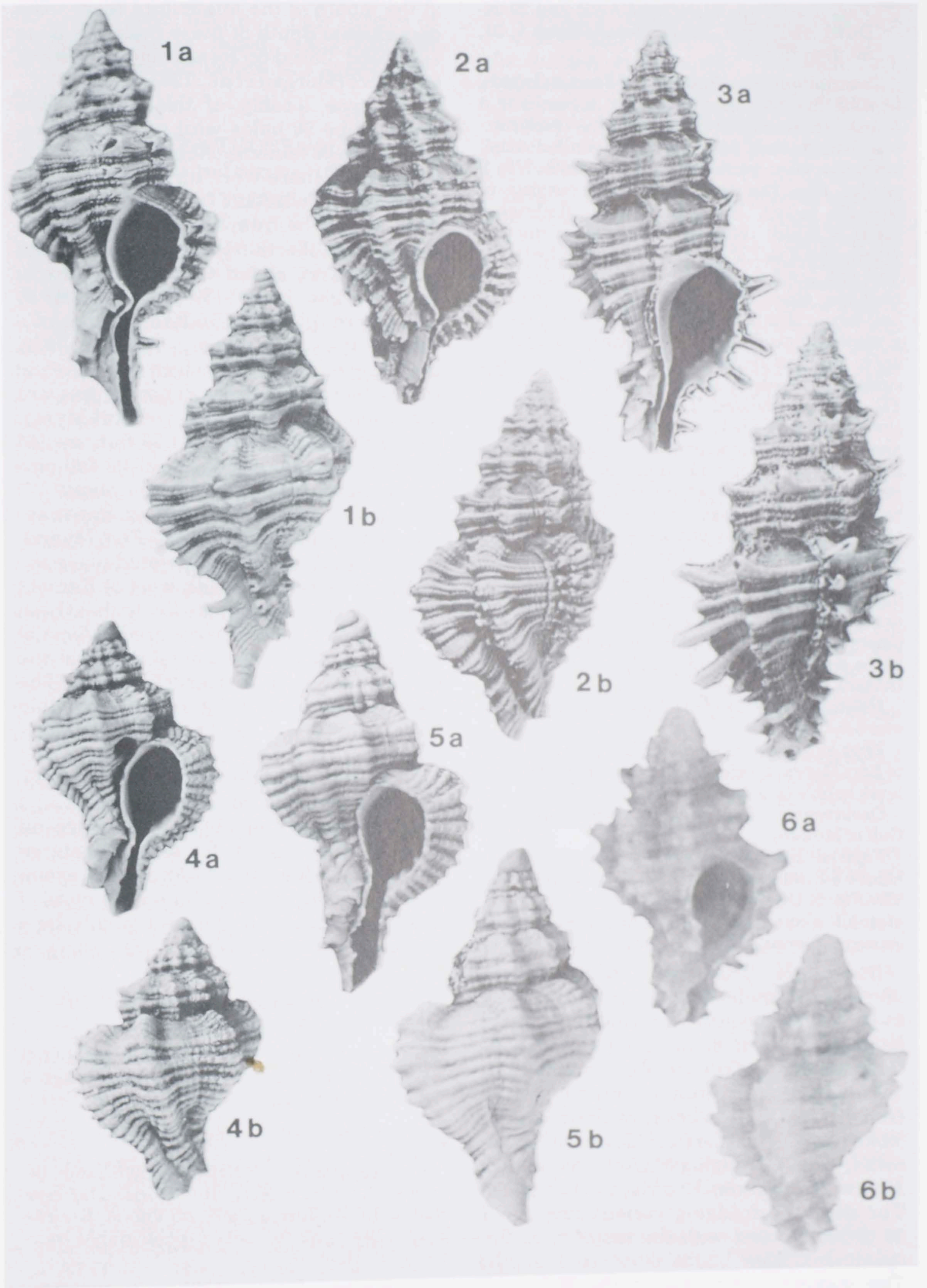


PLATE 9



[?] *Favartia* (?) sp. SUNDERLAND and SUNDERLAND, 1993, Amer. Conchologist, v. 21, no. 4, p. 15, text-fig.

*Description:* "Small, from 7 to 8 mm in length, broadly fusiform, and somewhat resembling a *Favartia*; color white throughout; 3 1/2 post-nuclear whorls; last whorl with 6 rounded axial, varix-like ribs; penultimate whorl with 7 to 8 similar ribs; the spiral sculpture consists of strongly raised, squarish, slightly fimbriated cords of which there are 17 to 20 on the last whorl, and 4 to 7 showing on the apical whorls. The one [and one-half] nuclear whorl is pronounced, glossy-white and bearing on the first half turn a strong, smooth spiral, carina, which gives the nucleus an obliquely carinate appearance; last half or third of nucleus without the carina [see Radwin and D'Attilio, 1976, text-fig. 77], and succeeded abruptly by the well-sculptured post-nuclear whorls. Aperture oval, almost complete and somewhat spout-like, with a thin, sharp inner and outer lip. No anal fasciole present. Inside of outer lip with 5 or 6 weak, elongate, glossy-white teeth of spiral origin. Outer lip slightly crenulate. Siphonal canal well developed, and almost closed along its length, except for a narrow slit. To its left are the ends of 3 or 4 earlier siphonal canals which overlap each other, one inserted in the other. Operculum horny, light-brown, oval, narrowed at the siphonal end, and unguulate in structure." (Abbott, 1954)

*Holotype:* USNM 613881; height 8.0 mm, diameter 5.0 mm.

*Type locality:* Dredged 90 miles [145 km] west of Fort Myers, Florida, in (?)90 fathoms [165 meters]; rubble bottom.

*Occurrence:* Holocene, Louisiana; Recent, Gulf of Mexico.

*Figured specimens:* Fig. 4, USNM 880011; height 6.8 mm, diameter 3.9 mm; locality TU 977. Fig. 5, USNM 880012; height 9.0 mm, diameter 5.1 mm; locality, off Egmont Pass, Hillsborough County, Florida, (?)220 meters.

*Discussion:* This small species (maximum height under 10 mm) is most similar to the more recently described *Murexsul harasewychi* Petuch, differing from the latter in having weaker spiral ornamentation.

Although apparently confined to the Gulf of Mexico, it is not rare there. In the Vokes Collection there are dozens of specimens, from dredgings made by James Moore, Bradenton, Florida, in the 1960's. The depth of dredging varied from about 50 to 120 meters, with the majority of the specimens from about 60 meters depth. The species is common in the Holocene fauna of locality TU 977, "Mud-Lump 90,"

at the mouth of the Mississippi River. The depositional depth of these beds has been estimated, based on foraminifera, at about 60 meters (Morgan *et al.*, 1963, p. 41).

The type locality of this species was stated to be 90 miles west of Fort Myers, Florida, in 90 fathoms (Abbott, 1954, p. 42). In addition, there were three paratypes in the Steger Collection (now in my collection), said to be from the same locality. In the Steger Collection there is another lot of six specimens, stated to be from west of Egmont Pass, in 120-130 fathoms (one figured here, pl. 9, fig. 5). Examination of a bathymetric map (*e.g.*, AAPG, 1970, Bathymetric Maps, Eastern Continental USA) shows that these depth figures are unreliable. At 90 miles west of Fort Myers, the depth is approximately 35 fathoms [64 meters]. The closest depth of 90 fathoms [165 meters] to Fort Myers is about 130 miles to the west (the 100 fathom line is approximately 140 miles west of Fort Myers). Depths of 120-130 fathoms would place the Steger lot about 110 miles west of Egmont Pass. Therefore, it seems likely that these recorded depths were measured in *feet* not fathoms, and that the actual depth at the type locality is 90 feet or 27 meters. The specimen on plate 9, figure 5, then would have come from 120-130 *feet* or 37-40 meters depth.

Sunderland and Sunderland (1993, p. 15, text-fig) have illustrated as *Favartia* sp., a specimen from the Moore dredgings off Egmont Key. Except for the elongate siphonal canal the shell is identical to examples of *M. emipowlusi*, and on the basis of this single specimen, it is assumed to be a pathologic example.

#### MUREXSUL species

##### Plate 9, figure 6

*Muricopsis* (?*Murexsul*) species HOUART, 1991, Nautilus, v. 105, no. 1, p. 31, text-figs. 8 (protoconch), 30, 31 (shell).

*Occurrence:* Recent only, off southeastern Brazil.

*Figured specimen:* MNHN; height 5.2 mm, diameter 3.2 mm; locality, R/V *Marion-Dufresne* Station DC 35, Jaseur Bank, off Vitória, Espírito Santo, Brazil, 82-105 meters (photographs courtesy of R. Houart).

*Discussion:* Houart (1991, p. 31, text-figs. 30, 31; refigured here pl. 9, fig. 6) has fi-



gured a juvenile specimen (maximum size 5.2 mm) of what may be a new species of *Murexsul*. As he noted, adult material must be collected before this species can be described.

### Genus ACANTHOTROPHON

Hertlein and Strong, 1951

*Acanthotrophon* HERTLEIN and STRONG, 1951, *Zoologica*, v. 36, pt. 5, p. 86.

Type species: *Trophon* (*Acanthotrophon*) *sorenseni* Hertlein and Strong, 1951, by original designation.

*Discussion:* *Acanthotrophon* originally was proposed as a subgenus of *Trophon* but in 1978 Radwin and D'Attilio demonstrated that the radula indicates placement in the subfamily Muricopsinae. Although the type species does resemble the typically unornamented species of the trophonine genus *Pagodula* Monterosato, 1884 (type species: *Murex vaginatus* Cristofori and Jan, 1832), most of the other species assigned to *Acanthotrophon* have more strongly ornamented shells and their resemblance to the genus *Murexsul* is more pronounced.

This genus is found principally along the coast of tropical western America from the Gulf of California to Ecuador. Due to confusion with superficially similar species of the muricine genus *Attiliosa* Emerson, 1968, the muricopsine genus *Acanthotrophon* was not recognized in the western Atlantic until Radwin and D'Attilio's work (1978) when two species were placed into this genus, namely *A. striatus* and a misidentified younger species, previously included in *A. striatus*, but later named *A. striatoides* Vokes, 1980.

#### ACANTHOTROPHON STRIATUS (Gabb)

Plate 10, figure 1

*Muricidea striata* GABB, 1873, *Amer. Phil. Soc., Trans.*, (N.S.), v. 15, p. 203; PILSBRY, 1922, *Acad. Nat. Sci. Phila., Proc.*, v. 73, p. 354, pl. 28, fig. 7 (holotype).

*Attiliosa striata* (Gabb). VOKES, 1976, *Tulane Stud. Geol. Paleont.*, v. 12, no. 3, p. 111 (in part, Dominican Republic references only), pl. 7, fig. 1 only (figs. 2-9 = *A. striatoides* Vokes), text-fig. 2 (holotype).

*Acanthotrophon striatus* (Gabb). RADWIN and D'ATTILIO, 1978, *Tulane Stud. Geol. Paleont.*, v. 14, no. 3, p. 132 (in part, not figs. 1, 1a, 2 = *A. striatoides*); VOKES, 1980, *Vel-*

*iger*, v. 23, no. 1, p. 10, text-figs. 1 (holotype), 2; VOKES, 1989, *Bulls. Amer. Paleontology*, v. 97, no. 332, p. 72, pl. 6, figs. 6-8.

Not *Attiliosa striata* (Gabb). KAICHER, 1979, *Catalogue World-wide Shells*, pack 20, Muricidae - Part IV, no. 2005; SUNDERLAND and SUNDERLAND, 1993, *Amer. Conchologist*, v. 21, no. 4, p. 15, text-fig. [= *A. striatoides* Vokes].

*Description:* "Spire elevated about equal to the aperture; whorls eight, including the nucleus; angulated. Body whorl sloping nearly straight above, convex below, the angle constricted in advance. Surface ornamented by seven large ribs on the widest part of the whorls, which become obsolete above and below. Crossing these below the angle are half a dozen linear ribs with broad smooth interspaces. These latter ribs are well developed where they cross the others, but are much smaller in the concave spaces. Mouth subovate, constricted in advance. Incrustation of the inner lip heavy, smooth, and with a projecting free edge; outer lip faintly striate internally. Canal twisted, with a broad imperforate umbilicus." (Gabb, 1873)

*Holotype:* ANSP 3249; height 12.3 mm, diameter 7.0 mm.

*Type locality:* TU 1227A, Gurabo Formation; Arroyo Zalaya, which crosses the road from Jánico to Santiago de los Caballeros, 11 km south of the bridge over the Río Yaque del Norte at Santiago, Dominican Republic (restricted by Vokes, 1989, p. 73).

*Occurrence:* Gurabo Formation, Dominican Republic.

*Figured specimen:* USNM 323898; height 14.2 mm, diameter 12.5 mm (including spines); locality TU 1215. Additional localities: TU 1210, 1211, 1219, 1227A, 1292, 1296, 1453A.

*Discussion:* When I treated the species *Muricidea striata* Gabb (Vokes, 1976, p. 111) only the single holotype specimen was known. Since that time, we have collected many more specimens of Gabb's species in the Dominican Republic. My original placement in the muricine genus *Attiliosa* is not correct, nor is the inclusion in this species of younger specimens from fossil and Recent localities throughout the Gulf of Mexico region. Beautifully preserved examples from Costa Rica, referable to the same species as these latter specimens, demonstrated that they are distinct. In 1980, this form was designated *Acanthotrophon striatoides* Vokes.

True *Acanthotrophon striatus*, which is confined to the Early Pliocene Gurabo Formation of the Dominican Republic, differs from the younger *A. striatoides* in



being smaller (our largest specimen is no more than 15 mm in height) and more inflated.

ACANTHOTROPHON STRIATOIDES Vokes  
Plate 10, figures 2-4

*Muricidea philippiana* DALL, 1889, Harvard Mus. Comp. Zool., Bull., v. 18, p. 213 (in part, references to Key West specimen only).

*Coralliophila philippiana* (Dall). M. SMITH, 1939, Illus. Cat. Recent Species Rock Shells, p. 33, pl. 20, fig. 20 (Dall's Key West specimen) (SMITH, 1953, *ibid.*).

*Attiliosa philippiana* (Dall). S. HOERLE, 1970, Tulane Stud. Geol. Paleont., v. 8, no. 2, p. 63; RADWIN and D'ATTILIO, 1976, Murex Shells of the World, p. 26, pl. 3, fig. 10; KAICHER, 1980, Catalogue World-wide Shells, pack 25, Muricidae - Part V, no. 2005/2574 (of Dall, in part only).

*Poirieria pazi* (Crosse). RIOS, 1975, Brazilian Marine Moll. Icon., p. 86, pl. 24, fig. 350 (*not* of Crosse).

*Attiliosa striata* (Gabb). VOKES, 1976, Tulane Stud. Geol. Paleont., v. 12, no. 3, p. 111 (in part), pl. 7, figs. 2-9, pl. 8, figs. 1-8; KAICHER, 1979, Catalogue World-wide Shells, pack 20, Muricidae - Part IV, no. 2005; SUNDERLAND and SUNDERLAND, 1993, Amer. Conchologist, v. 21, no. 4, p. 15, text-fig. (*not* of Gabb).

*Acanthotrophon striatus* (Gabb). RADWIN and D'ATTILIO, 1978, Tulane Stud. Geol. Paleont., v. 14, no. 3, p. 131, text-figs. 1, 2 (*not* of Gabb).

*Acanthotrophon striatoides* VOKES, 1980, Veliger, v. 23, no. 1, p. 13, text-figs. 3-9 [note that figures 6 and 7 are reversed; the explanation

for fig. 6 refers to fig. 7, and *vice versa*]; KAICHER, 1980, Catalogue World-wide Shells, pack 25, Muricidae -- Part V, no. 2569; VOKES, 1984, Shells and Sea Life, v. 16, no. 11, p. 214, pl. 2, fig. 18.

*Description*: "Seven post-nuclear whorls in adult, plus a protoconch of 2 1/2 bulbous turns. Spiral ornamentation beginning abruptly with 2 small sharp cords, most pronounced on first 2 whorls, gradually fading to become a single faint ridge connecting shoulder spines. On body whorl from 3 to 7 cords, with usually 3 of these stronger, separated by a space from another cord at base of body-whorl, usually very strong (but not always); an additional 1 or 2 smaller cords on the extended siphonal canal. Axial ornamentation beginning with 7 to 9 small nodes, gradually becoming spinose varices with sharp spines where spiral cords cross these varices, their strength relative to that of the cord, shoulder spine always the longest. Surface scabrous; in some, where the axial growth lines cross the spiral cords, smaller spinelets. Suture undulating, subsutural ramp unornamented except for faint recurved growth lines reflecting the anal notch. Aperture oval, outer lip flaring at posterior end and bearing within about 8 lirations. Inner lip appressed at posterior end, standing free at anterior end; smooth except for a series of small denticles of variable number, strength, and shape, at extreme anterior end. Siphonal canal moderately long, slightly recurved at distal end; moderate to large umbilical opening formed by series of previous terminations of the canal." (Vokes, 1980)

*Holotype*: USNM 298656; height 21.3 mm, diameter 14.0 mm.

*Type locality*: TU 1240, Moín Formation; Barrio Los Corales, hilltop at end of road that passes

PLATE 10

Figures	Page
1. <i>Acanthotrophon striatus</i> (Gabb) . . . . .	89
(X 3) USNM 323898; height 14.2 mm, diameter 12.5 mm (including spines). Locality: TU 1215, Río Gurabo, Dominican Republic. Gurabo Formation.	
2-4. <i>Acanthotrophon striatoides</i> Vokes . . . . .	90
2. (X 2 1/2) USNM 298656 (holotype); height 21.3 mm, diameter 14.0 mm. Locality: TU 1240, Los Corales, Costa Rica. Moín Formation.	
3. (X 2) USNM 482032; height 26.9 mm, diameter 16.3 mm. Locality: Capelleti Brothers Pits, Florida. Bermont Formation.	
4. (X 2 1/2) USNM 880013; height 22.5 mm, diameter 12.5 mm. Locality: Espírito Santo, Brazil. Recent.	
5. <i>Acanthotrophon ascensus</i> (Vokes) . . . . .	92
(X 4) USNM 482033; height 14.1 mm, diameter 7.7 mm. Locality: TU 1240, Los Corales, Costa Rica. Moín Formation.	
6. <i>Acanthotrophon</i> sp. cf. <i>A. ascensus</i> (Vokes) . . . . .	93
(X 4) MCZ "7305;" height 14.0 mm, diameter 10.0 mm. Locality: Unknown. Recent.	



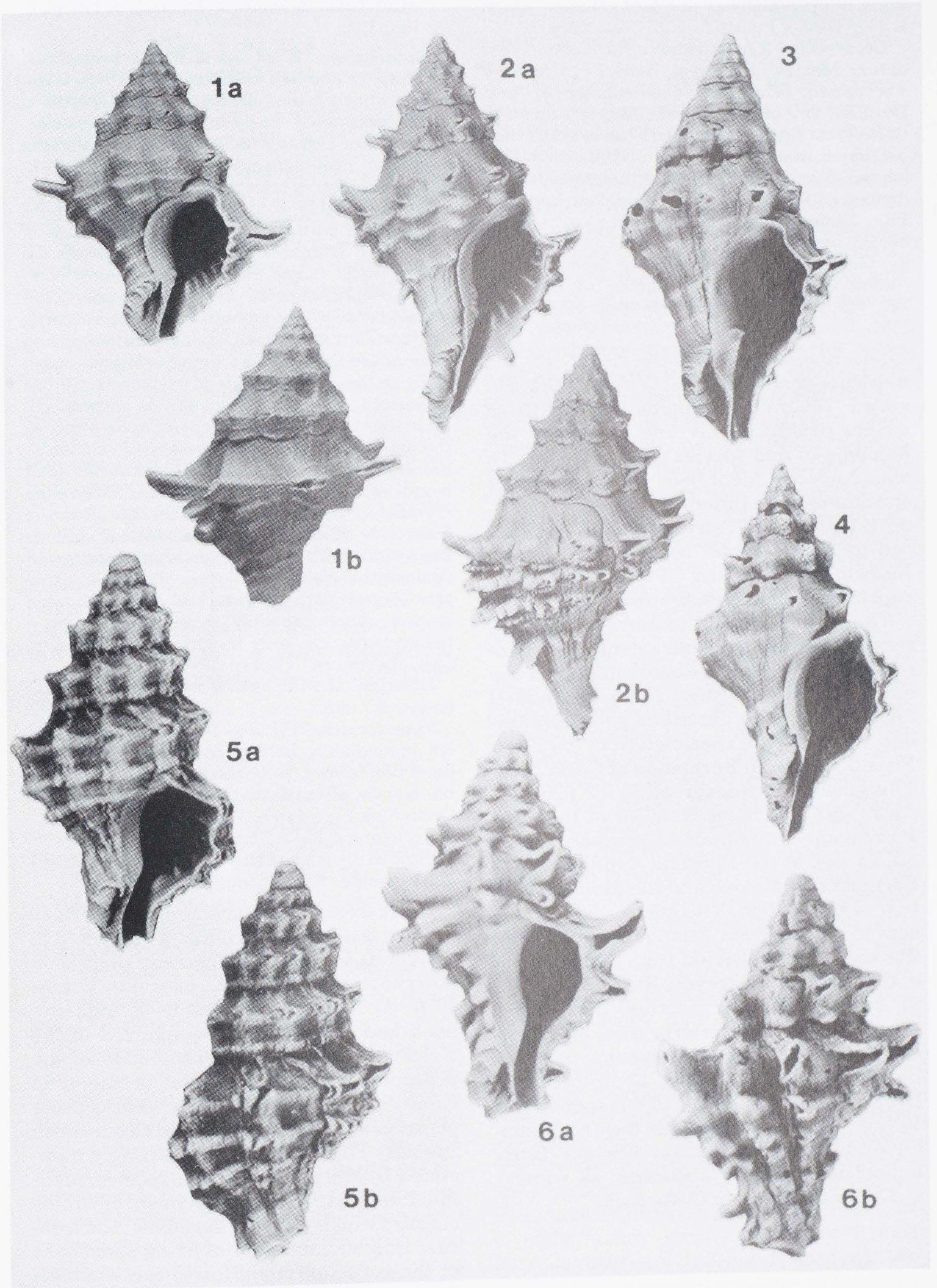


PLATE 10



Standard Fruit Company box factory, 1.8 km north of main highway at Pueblo Nuevo, which is 2 km west of Puerto Limón, Costa Rica.

*Occurrence:* Agueguexquite Formation, Veracruz, Mexico; Pinecrest Beds [= Fruitville Formation], Tamiami, Caloosahatchee, and Bermont formations, Florida; Moín Formation, Costa Rica; Recent, southern Florida to Brazil.

*Figured specimens:* Fig. 2, USNM 298656 (holotype). Fig. 3, USNM 482032; height 26.9 mm, diameter 16.3 mm; locality, Capelleti Brothers Pits, Dade County, Florida. Fig. 4, USNM 880013; height 22.5 mm, diameter 12.5 mm; locality, Guarapari Channel, Espírito Santo, Brazil. Additional localities: TU localities 201, 638, 726, 727, 759, 933, 954, 991, 1000, 1046, 1177, 1307, 1536.

*Discussion:* In my treatment of the muricine genus *Attiliosa* (Vokes, 1976), I figured several specimens as "*Attiliosa striata* (Gabb)." Only one specimen, the holotype of that species (1976, pl. 7, fig. 1), was correctly identified; *all* of the other specimens are a different species. Further, none (including *A. striata*) should be referred to *Attiliosa* but, as demonstrated by Radwin and D'Attilio (1978), to the muricopsine genus *Acanthotrophon*.

Therefore, in 1980, to correct these errors I reviewed the entire genus *Acanthotrophon*, which is predominantly from the eastern Pacific region. The misidentified "*A. striata*" were described as *A. striatoides*, with the type specimen from the Early Pleistocene Moín Formation of Costa Rica. This species is widespread in the fossil record, with examples from all of the Pliocene-Pleistocene formations of southern Florida, as well as the Pliocene Agueguexquite Formation of Mexico and the Moín Formation of Costa Rica. The species is still present in the western Atlantic, with most of the specimens collected from the southern end of Florida. However, Rios (1975, p. 86, pl. 24, fig. 350) has recorded the species (under the name *Poirieria pazi*) off northern Brazil, and several specimens have been taken at Guarapari, Espírito Santo, Brazil, that are referable to this species (pl. 10, fig. 4). Presumably this disjunct distribution today is a reflection of wider distribution during the Pleistocene, as witnessed by its presence in Costa Rica.

*Calotrophon ascensus* VOKES, 1976, Tulane Stud. Geol. Paleont., v. 12, no. 3, p. 110, pl. 6, figs. 1, 2.

*Description:* "Shell small, with a protoconch of one and one-half bulbous whorls; five teleoconch whorls in the type material (possibly six in adult specimens). Early ornamentation consisting of ten or eleven small loop-like spines on the first two post-nuclear whorls, decreasing to seven or eight on later whorls. Spiral ornamentation not visible except on body whorl, where three major cords encircle the central portion of the whorl, with two minor cords between the anteriormost major cord and the constriction into the siphonal canal. Only a single poorly developed cord on the siphonal canal. Spiral cords made scabrous by small axial growth lines, and also where the spirals cross the varices, especially on the apertural side of each varix. Suture impressed, subsutural area almost perpendicular to the suture, giving a stepped appearance to the spire, which is greatly extended relative to the entire shell. Spire about one-half the total length of the shell. Aperture oval, outer edge crenulated by the three strong spiral cords; inner side of outer lip bearing five or six lirations. Inner lip smooth, polished, appressed against the columellar wall. Siphonal canal short, recurved at the distal end, forming a small fasciole. Shell probably covered in life by a heavy intritacalx, only fragments preserved on fossil specimens." (Vokes, 1976)

*Holotype:* USNM 240679; height 14.7 mm, diameter 8.7 mm.

*Type locality:* TU 954, Moín Formation; hill cut immediately behind Standard Fruit Company box factory, just west of cemetery at Pueblo Nuevo, about 2 km west of Puerto Limón, Costa Rica.

*Occurrence:* Moín Formation, Costa Rica.

*Figured specimen:* USNM 482033; height 14.1 mm, diameter 7.7 mm; locality TU 1240.

*Discussion:* The placement of this small species is a puzzle. Originally I placed it in the genus *Calotrophon*, because of its similarity to the living form *C. andrewsi* Vokes, 1976. At that time the genus *Acanthotrophon* had not yet been recognized in the western Atlantic. With recognition of the presence of *Acanthotrophon* in the area came realization that this muricopsine genus is a better place for the Costa Rican species. This assignment is strongly influenced by the discovery of a species, identified here as *Acanthotrophon* sp. cf. *A. ascensus*, which closely resembles *A. ascensus*. Only examination of living specimens of these two puzzling forms can establish the correct generic assignment.



ACANTHOTROPHON sp. cf. A. ASCENSUS  
(Vokes)

Plate 10, figure 6

*Occurrence:* Recent only, unknown locality, presumably Caribbean Sea.

*Figured specimen:* MCZ "7305;" height 14.0 mm, diameter 10.0 mm; locality unknown.

*Discussion:* As noted in the previous part of this series (Vokes, 1992, p. 50) the specimen in the box supposedly containing the holotype of *Poirieria* (*Panamurex*) *carnicolor* (Clench and Pérez Farfante, 1945) is not that specimen, nor even the same genus. Search of the molluscan collections in the Museum of Comparative Zoology, Harvard University, did not locate the misplaced holotype, so we are presented with two questions - what has become of the holotype of *P. (P.) carnicolor* and where did the specimen shown here (pl. 10, fig. 6) actually come from.

This mystery specimen is placed in the genus *Acanthotrophon*, although lacking a complete aperture makes this somewhat dubious. Without an entire specimen and no locality, there is no justification for describing the species, but it is figured here to call attention to this form, hoping that someone will recognize specimens in other collections.

Genus MUREXIELLA Clench and  
Pérez Farfante, 1945

Subgenus MUREXIELLA s.s.

*Murexiella* CLENCH and PÉREZ FARFANTE, 1945, *Johnsonia*, v. 1, no. 17, p. 49.

Type species: *Murex hidalgoi* Crosse, 1869, by original designation.

*Minnimurex* WOOLACOTT, 1957, *Roy. Soc. New South Wales, Proc.*, (1955-1956), p. 115.

Type species: *Minnimurex phantom* Woolacott, 1957, by original designation.

*Discussion:* The genus *Murexiella* was treated previously together with the superficially similar muricine genus *Hexaplex* in Part IV of this series (Vokes, 1968, p. 106). Only subsequently did work on the radulae indicate that the similarities - approximately six foliate varices in both - are the result of convergence rather than close relationship. The principal conchological difference, which becomes more obvious when the radular differences are recognized, is the nature of the aperture, with

an almost entire, rounded aperture in *Murexiella*, as opposed to *Hexaplex* in which the outer lip opens into the varical spines.

Certain authors (Ponder, 1972; Houart, 1991) have suggested that *Murexiella* should be placed in synonymy with the closely related genus *Favartia* Jousseaume, 1880. This is a comfortable solution to the placement of certain Indo-Pacific species that do not fit unequivocally into one genus or the other. Even in the western Atlantic there are species that are problematical, such as *Favartia barbarae*, n. sp. (see below).

Nevertheless, the reasons for not making this move are to me more compelling. Foremost, is the fact that *Murexiella* is geologically older. If it were possible to place *Favartia* in synonymy with *Murexiella*, I would agree, for the latter certainly is derived from the former. But the rules of nomenclature do not permit this. In addition, I consider *Subpterynotus* to be allied with *Murexiella*, and subgeneric status seems desirable. However, I would have difficulty placing *Subpterynotus* within the genus *Favartia*.

Morphologically, although the type species of *Murexiella* and *Favartia* differ greatly, other species are more similar. In general, *Favartia* is a "chunky" shell, with varices comprised of rounded ridges, and the digitations do not extend beyond the edge of the ridge. The siphonal canal is short and, in some species, even tubular. In general, the height of the spire is equal to, or even greater than, the length of the siphonal canal. Conversely, in *Murexiella* the varices are elaborately spinose, with long recurved processes extending past the varical webbing in many species. The siphonal canal is elongate and commonly decorated with two or three rows of spines.

The genus *Murexiella* extends back to the early Paleogene geologic record with species that are little different from those still living today. As a result, the genus is world-wide tropical and all of the species are "maddenly" similar. All have a variable number of varices, ranging from four to eight in any given species; and most have brownish color bands circling the subsutural region and the base of the body whorl.



On both the Atlantic and Pacific sides of tropical America the species may be divided into three groups: the typical form with very long straight spines; those with recurved spines, including members of the *M. macgintyi* complex; and those with short, straight spines, including members of the *M. glypta* complex.

Although there is almost no fossil record from the eastern Pacific [with the exception of *Murexiella lappa* (Broderip, 1833), known from the Early Pliocene Esmeraldas Beds; see Vokes, 1988, p. 37] there are 13 living species. It is curious that most of the species from the eastern Pacific, for which the protoconch is known, have multiwhorl protoconchs (from two and one-half to three and one-half whorls). Conversely, in the western Atlantic, most of the species, excluding *M. levicula* and *M. puntagordanum*, have the more "advanced" protoconch of one and one half whorls. The implications, in terms of phylogenetic relationships, are totally conjectural and we may be seeing no more than an ultimate example of parallelism.\*

In an earlier study (Vokes, 1968), two species were referred to *Murexiella* that I now refer to *Homalocantha*. These are "*Murex*" *crispangula* Heilprin, 1886, and *Murexiella calhounensis* Vokes, 1968, from the Late Oligocene and Early Miocene fossil record, respectively. They are treated below with that genus.

Most species of *Murexiella* were discussed at length in this same work and much of the information given previously will not be repeated. The reader is referred there for additional data. For those species treated systematically in Part IV (Vokes, 1968) only abbreviated synonymies are included.

\*Previously (Vokes, 1984), I have given a list of supposed cognate species, but since that time a number of new species have been named and other taxa have been redefined. Specifically, what I named in 1970 as *Murexiella keenae* has been determined to be true *M. humilis*, and what I believed to be *M. humilis* is *M. norrisi* (Reeve) (see D'Attilio and Myers, 1987). The holotype of *Murex minuscula* Smith, 1947, now in the collections of the Florida State Museum of Natural History, is only an unusual color variant of *Murexiella lappa* (Broderip, 1833). The type of *Murex radicans* Hinds, 1845, is the same species as *Murex exiguus* Broderip, 1833.

MUREXIELLA (MUREXIELLA) MANTELLI  
(Conrad)

Plate 11, figure 1

*Murex mantelli* CONRAD, 1834, Acad. Nat. Sci. Phila., Jour., v. 7, p. 154; CONRAD, 1865, Amer. Jour. Conch., v. 1, no. 3, p. 210, pl. 20, fig. 11.

*Murex conradi* D'ORBIGNY, 1850, Prodrome Paléontologie, v. 2, p. 364. Unnecessary new name for *Murex mantelli* Conrad.

*Murex (Phyllonotus, Sect. Favartia) mantelli* Conrad. PALMER, 1937, Bulls. Amer. Paleontology, v. 7, no. 32, p. 269, pl. 35, figs. 13, 15-17; pl. 84, fig. 10 (holotype).

*Murexiella (Murexiella) mantelli* (Conrad). VOKES, 1968, Tulane Stud. Geol., v. 6, no. 3, p. 107, pl. 5, fig. 1 (holotype).

*Description*: "Shell subfusiform, body whorl inflated; with six angular varices, crossed by prominent equidistant lines, expanding on the varices, and terminating in very short, foliated, obtuse spines; between the lines is a fine stria; fine longitudinal striae passing over the spiral lines; spire short; aperture ovate; channel nearly closed; beak larger than the spire, reflected." (Conrad, 1834)

*Holotype*: ANSP 14231; height 26.0 mm, diameter 19.0 mm.

*Type locality*: Gosport Sand; Claiborne Bluff, Alabama River, Monroe County, Alabama (= TU 78).

*Occurrence*: Gosport Sand, Alabama.

*Figured specimen*: ANSP 14231 (holotype). Additional locality: TU 78.

*Discussion*: This species remains rare and known only from the type locality. As noted earlier (Vokes, 1968, p. 107), *M. mantelli* is surprisingly similar to living species of the genus.

MUREXIELLA (MUREXIELLA) VAUGHANI  
MacNeil in MacNeil and Dockery

Plate 11, figure 2

*Murexiella (Murexiella) sp.* VOKES, 1968, Tulane Stud. Geol., v. 6, no. 3, p. 107, pl. 5, fig. 2.

*Murexiella (Murexiella) vaughani*. MACNEIL in MACNEIL and DOCKERY, 1984, Mississippi Dept. Nat. Res., Bur. Geol., Bull. 124, p. 124, pl. 5, fig. 9.

*Description*: "Shell small, spire moderately low; spire whorls made bicarinate by two heavy straight sided spiral ribs, body whorl with four spiral ribs, ribs with median cleft; varices moderately flaring, back side entire, front side with a bundle of about six frilled growth lamellae, each progressively lower but not noticeably down-curved; shoulder with a moderately strong upward projecting hollow spine; inner lip



narrowly attached to parietal wall, detached below; canal set at a moderate angle; no umbilicus but with a weak chink.

"The protoconch is not well preserved, but it appears to consist of about two whorls and to form a short, narrow, slightly tilted cone." (MacNeil and Dockery, 1984)

*Holotype*: USNM 498089; height (incomplete) 10.8 mm, diameter 8.0 mm.

*Type locality*: USGS 5263, Red Bluff Formation; Chickasawhay River, one mile below Shubuta, Wayne County, Mississippi (= TU 1288).

*Occurrence*: Red Bluff Formation, Mississippi.

*Figured specimen*: USGS 498089 (holotype). Additional locality: TU 226.

*Discussion*: *Murexiella vaughani*, named from the type locality of the Red Bluff Formation by MacNeil and Dockery (1984, p. 124), is the first species to show the median groove in the spiral cords, which becomes so characteristic of later species of the genus.

MUREXIELLA (MUREXIELLA) SHILOHENSIS  
(Heilprin)

Plate 11, figure 3

*Murex shilohensis* HEILPRIN, 1888, Acad. Nat. Sci. Phila., Proc., v. 39, p. 404; WHITFIELD, 1894, U.S. Geol. Surv., Mon. 24, p. 97, pl. 17, fig. 1 (holotype).

*Muricidea shilohensis* (Heilprin). MARTIN, 1904, Maryland Geol. Surv., Miocene, p. 202, pl. 51, figs. 4-6; RICHARDS and HARBISON, 1942, Acad. Nat. Sci. Phila., Proc., v. 94, p. 211, pl. 19, fig. 11 (holotype).

*Murexiella (Murexiella) shilohensis* (Heilprin). VOKES, 1968, Tulane Stud. Geol., v. 6, no. 3, p. 110, pl. 6, figs. 3 (holotype), 4 (not fig. 2 = *M. parvula*, n. sp.).

*Murexiella shilohensis* (Heilprin). PETUCH, 1993, Nautilus, v. 106, no. 4, p. 170.

*Description*: "Whorls about seven, angular, flattened on the shoulder, which is crossed diagonally by the variceal ridges; varices about eight on the body-whorl, sub-equal, spinosely elevated on the shoulder angulation, and crossed by four sub-equal revolving ridges, which appear double on the crests of the varices; only two such ridges on the whorls above the body-whorl.

"Aperture somewhat more than half the length of the shell, key-hole shaped, with the canal broadly deflected." (Heilprin, 1888)

*Holotype*: ANSP 4081; height 18 mm, diameter 10 mm.

*Type locality*: Kirkwood Formation; Ayres' pits, near Shiloh, Cumberland County, New Jersey.

*Occurrence*: Kirkwood Formation, New Jersey; Calvert Formation, Maryland; Pinecrest Beds [= Fruitville Formation], Jackson Bluff Formation, Caloosahatchee Formation, Florida; Waccamaw Formation, South Carolina.

*Figured specimen*: Stephens Collection; height 18.7 mm, diameter 9.3 mm; locality TU 991. Additional localities: TU 60, 79, 200, 202, 203, 519, 520, 525, 527, 539B, 558, 726, 728, 729, 736, 753, 755, 767, 768, 770, 797, 933, 1000, 1044, 1493, 1512, 1524, 1536.

*Discussion*: This species was described from the marl pits at Shiloh, New Jersey. An effort was made to re-collect this famous locality but today the pits are long abandoned and small ponds mark the region where the marl pits were once located. No shell material is visible anywhere in the area.

The beds at Shiloh have been considered to be of Middle Miocene age but, in a recent paper, Sugarman *et al.* (1993) date the shell bed ("Shiloh Marl") that crops out in the Kirkwood Formation at approximately 20 million years. This would make the fauna of Early Burdigalian age, in contrast to the Chipola Formation, which is considered to be approximately 16 ma, or Late Burdigalian in age.

Although rare in the more northern portions of the Atlantic Coastal Plain, *M. shilohensis* is widespread in the Plio-Pleistocene of Florida and South Carolina. It occurs in some numbers in the Pinecrest Beds [= Fruitville Formation] of southern Florida, especially at localities TU 729 and TU 1000. It also is abundant in the Jackson Bluff Formation (TU 60) of northern Florida. It is less common in the Caloosahatchee Formation, although the figured specimen (pl. 11, fig. 3), the largest specimen seen, is from that unit. It also occurs in the correlative Waccamaw Formation of South Carolina (TU 558). But, it is not recorded from the Bermont Formation nor does it occur in the Recent fauna of the western Atlantic.

The type specimen of *M. shilohensis* is poorly preserved but there seems little question it is the same as the more common occurrences in southern Florida. If *M. shilohensis* was an inhabitant of cooler water, this would account for its presence in the Jackson Bluff and Pinecrest formations in southern Florida - but this does not explain its presence in some numbers in the more tropical Caloosahatchee and



Waccamaw formations. Perhaps the species was able to change its ecologic requirements through time.

As noted in the original discussion (Vokes, 1968, p. 112) of *M. shilohensis*, there is a similar form in the Chipola Formation. Much additional material of both the Chipola species and true *M. shilohensis* shows the two species to be distinct and the Chipola form is named *M. parvula* herein.

MUREXIELLA (MUREXIELLA) PARVULA

Vokes, n. sp.

Plate 11, figures 4, 5

*Murexiella (Murexiella) shilohensis* (Heilprin).

VOKES, 1968, Tulane Stud. Geol., v. 6, no. 3, p. 110 (in part, Chipola specimens only), pl. 6, fig. 2 only (not of Heilprin).

*Description:* Shell small (maximum height under 12 mm) with five teleoconch whorls and protoconch of one and one-half relatively large, smooth, bulbous whorls, ending at a small straight varix. Spiral ornamentation on first teleoconch whorl of a single cord placed near anterior suture; on second teleoconch whorl a second strong cord developed at shoulder. Two cords on all whorls up to body whorl, the latter with five strong cords and one additional cord on siphonal canal. Between major cords numer-

ous faint spiral threads, made visible primarily by the scalloping of growth lamellae. Axial ornamentation on first teleoconch whorl of eight lamellar varices, lapping well onto the smooth protoconch. Subsequent whorls with from seven to nine varices on each, gradually becoming elaborately filigreed by multiple layers of shelly material, scalloped by spiral ornamentation. On the second teleoconch whorl strong, adapically-directed spines at intersection of shoulder cord and varices; a second weaker spine at intersection of sutural cord and varices. On body whorl long sharp, abaperturally-directed spines at each major cord, that at shoulder recurved apically as well. Suture impressed. Aperture ovate; inner lip smooth, free-standing in anterior portion, appressed in posterior portion; no anal notch. Inner side of outer lip smooth, margin crenulated by major spiral cords. Siphonal canal moderately long, strongly reflected, a series of spurs at former terminations, giving rise to a small fasciole.

*Holotype:* USNM 482034; height 9.8 mm, diameter 6.4 mm.

*Type locality:* TU 820, Chipola Formation; Farley Creek, at bridge of Florida Highway 275 (SW 1/4 Sec. 21, T1N, R9W), Calhoun County, Florida.

*Etymology of name:* *parvulus* (Latin) – little (diminutive).

*Occurrence:* Chipola Formation, Florida.

*Figured specimens:* Fig. 4, USNM 482034 (ho-

PLATE 11

Figures	Page
1. <i>Murexiella (Murexiella) mantelli</i> (Conrad) . . . . .	94
(X 2) ANSP 14231 (holotype); height 26.0 mm, diameter 19.0 mm.	
Locality: Claiborne Bluff, Alabama (= TU 78). Gosport Sand.	
2. <i>Murexiella (Murexiella) vughani</i> MacNeil in MacNeil and Dockery . . . . .	94
(X 4) USNM 498089 (holotype); height (incomplete) 10.8 mm, diameter 8.0 mm.	
Locality: USGS 5263, Chickasawhay River, Mississippi (= TU 1288). Red Bluff Formation.	
3. <i>Murexiella (Murexiella) shilohensis</i> (Heilprin) . . . . .	95
(X 3) Stephens Collection; height 18.7 mm, diameter 9.3 mm.	
Locality: TU 991, La Belle, Florida. Caloosahatchee Formation.	
4, 5. <i>Murexiella (Murexiella) parvula</i> Vokes, n. sp . . . . .	96
4. (X 5) USNM 482034 (holotype); height 9.8 mm, diameter 6.4 mm.	
Locality: TU 820, Farley Creek, Florida. Chipola Formation.	
5. (X 5) USNM 645892 (paratype); height 11.5 mm, diameter 7.5 mm.	
Locality: TU 825, Farley Creek, Florida. Chipola Formation.	
6-8. <i>Murexiella (Murexiella) hidalgoi</i> (Crosse) . . . . .	102
6. (X 3) USNM 323900; height 18.3 mm, diameter 11.4 mm.	
Locality: TU 1211, Río Gurabo, Dominican Republic. Gurabo Formation.	
7. (X 3) USNM 482035; height 21.9 mm, diameter 13.5 mm.	
Locality: TU 729, Kissimmee River, Florida. Pinecrest Beds.	
8. (X 3) USNM 482036; height 18.7 mm, diameter 12.8 mm.	
Locality: TU 1240, Los Corales, Costa Rica. Moín Formation.	



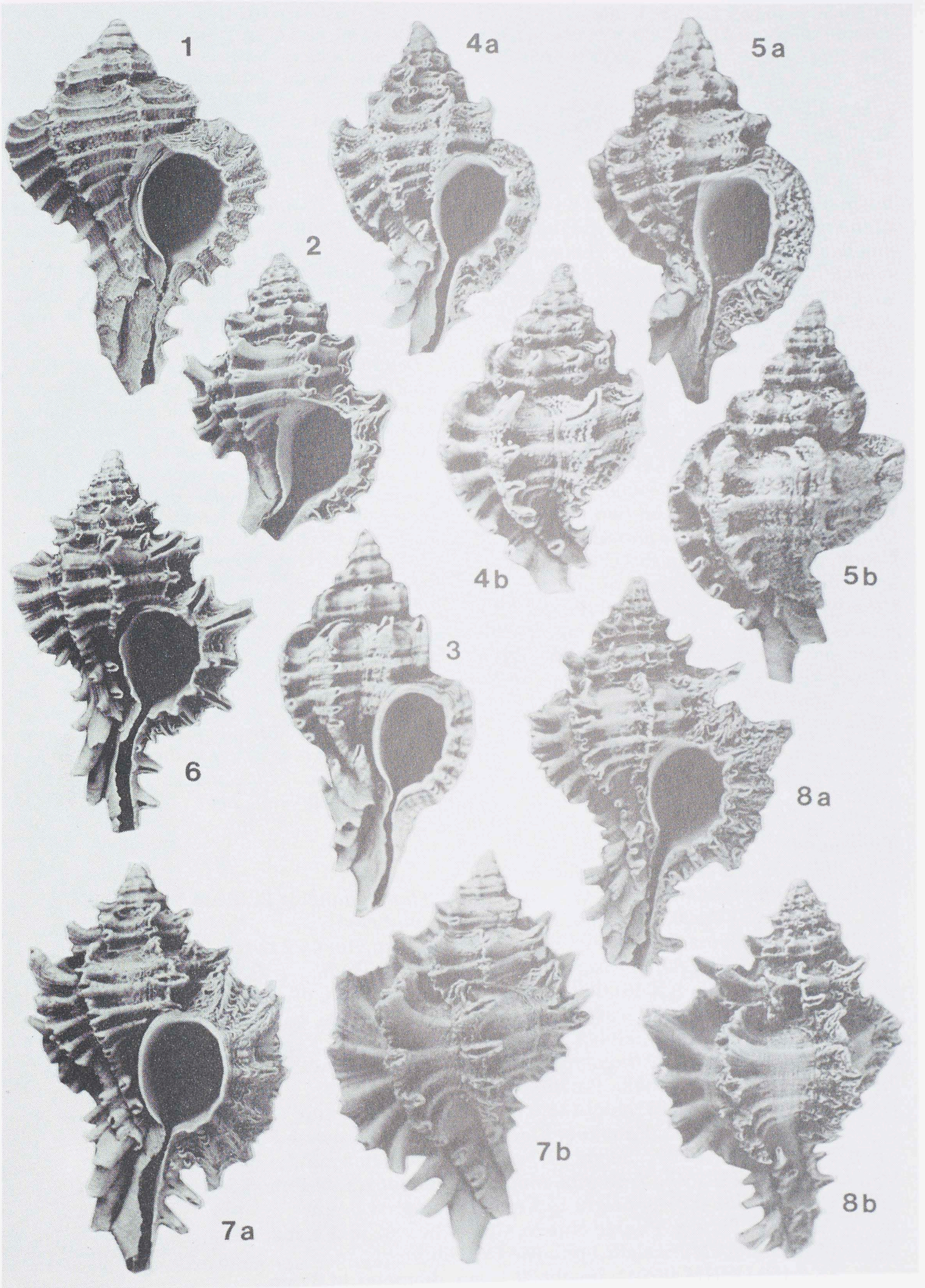


PLATE 11



lotype). Fig. 5, USNM 645892 (paratype); height 11.5 mm, diameter 7.5 mm; locality TU 825. Additional localities: TU 457, 458, 459, 546, 547, 548, 554, 555, 818-821, 824, 827, 950, 998, 999, 1048, 1049, 1196.

*Discussion:* As noted above, the Chipola specimen figured as *M. shilohensis* (Vokes, 1968, pl. 6, fig. 2) is not that species but is new and is named here; the previously figured shell is selected as a paratype of the new species. The holotype, although smaller, is better preserved. This new species differs from the similar *M. shilohensis* in being more inflated, with a shorter, more recurved siphonal canal. The siphonal canal has but a single spine on each varix, in contrast to the two spines of *M. shilohensis*.

From the lengthy list of localities (above), it is obvious that this species is widely distributed in the Chipola Formation; however, at most localities it is represented by only one or two specimens. Only at localities TU 819 and 825, on Farley Creek, and TU 554, on the Chipola River, are there any numbers of specimens. Clearly this species preferred the calcarenite facies of the Farley Creek area to the more silty facies found in the western part of the formation.

MUREXIELLA (MUREXIELLA) FACETA (Vokes)  
Plate 12, figures 1-3

*Murex shilohensis* var. *burnsi* WHITFIELD, 1894 (post-March), U.S. Geol. Surv., Mon. 24, p. 98, pl. 17, fig. 2 (*non Murex burnsii* Aldrich, January, 1894).

*Muricidea burnsi* (Whitfield). RICHARDS and HARBISON, 1942, Acad. Nat. Sci. Phila., Proc., v. 94, p. 212, pl. 19, fig. 10 (holotype).

*Murex (Murexiella) macgintyi facetus* VOKES, 1963, Tulane Stud. Geol., v. 1, no. 4, p. 157, pl. 2, fig. 4.

*Murexiella (Murexiella) macgintyi faceta* (Vokes). VOKES, 1968, Tulane Stud. Geol., v. 6, no. 3, p. 113, pl. 7, figs. 1, 2.

*Not Murexiella fasciatus [sic]* (Vokes). SUNDERLAND and SUNDERLAND, 1992, Amer. Conchologist, v. 20, no. 3, p. 14, text-fig. [= *M. hilli* Petuch].

*Description:* "Shell moderate in size, body whorl greatly inflated. Nucleus of 1 1/2 smooth, rounded whorls; six post-nuclear whorls in the adult. Spiral sculpture consists of sharply raised ribs, two in number on the early whorls, five on the body whorl. Axial sculpture consists of five to seven varices; where the spiral ribs cross the varices long, recurved, foliaceous, open spines are produced. In addition, one spine is formed where no rib is present between the suture and the shoulder, and two spines are produced on the extended siphonal canal. The intervarical space is patterned with microscopic spiral lirae and growth lines which give a reticulate surface. The varices are formed of finely laminate layers, creating a complex webbing between the spines. Aperture sub-circular; labium completely free, erect, and smooth; the outer lip bearing six grooves corresponding to the varical spines.

PLATE 12

Figures	Page
1-3. <i>Murexiella (Murexiella) faceta</i> (Vokes) . . . . .	98
1. (X 2) USNM 644376 (holotype); height 24.0 mm, diameter 18.0 mm. Locality: TU 520, Brighton, Florida. Pinecrest Beds.	
2. (X 3) Stephens Collection; height 15.5 mm, diameter 11.2 mm. Locality: TU 1000, Sarasota, Florida. Pinecrest Beds.	
3. (X 8; protoconch X 10) USNM 482037; height 6.5 mm, diameter 5.5 mm. Locality: TU 1000, Sarasota, Florida. Pinecrest Beds.	
4-7. <i>Murexiella (Murexiella) edwardpauli</i> Petuch . . . . .	113
4. (X 3) USNM 860529 (holotype); height 15.2 mm, diameter 9.3 mm. Locality: off Portobelo, Panama. Recent.	
5. (X 3) USNM 482038; height 18.0 mm, diameter 10.0 mm. Locality: TU 1023, Pahokee, Florida. (?)Caloosahatchee Formation.	
6. (X 3) USNM 482039; height 17.7 mm, diameter 10.8 mm. Locality: TU 1046, Veracruz, Mexico. Agueguexquite Formation.	
7. (X 3) USNM 482040; height 14.8 mm, diameter 8.7 mm. Locality: TU 954, Pueblo Nuevo, Costa Rica. Moín Formation.	
8. <i>Murexiella (Murexiella) graceae</i> (McGinty) . . . . .	115
(X 2 1/2) USNM 482041; height 20.1 mm, diameter 14.3 mm. Locality: TU 725, North New River Canal, Florida. Bermont Formation.	



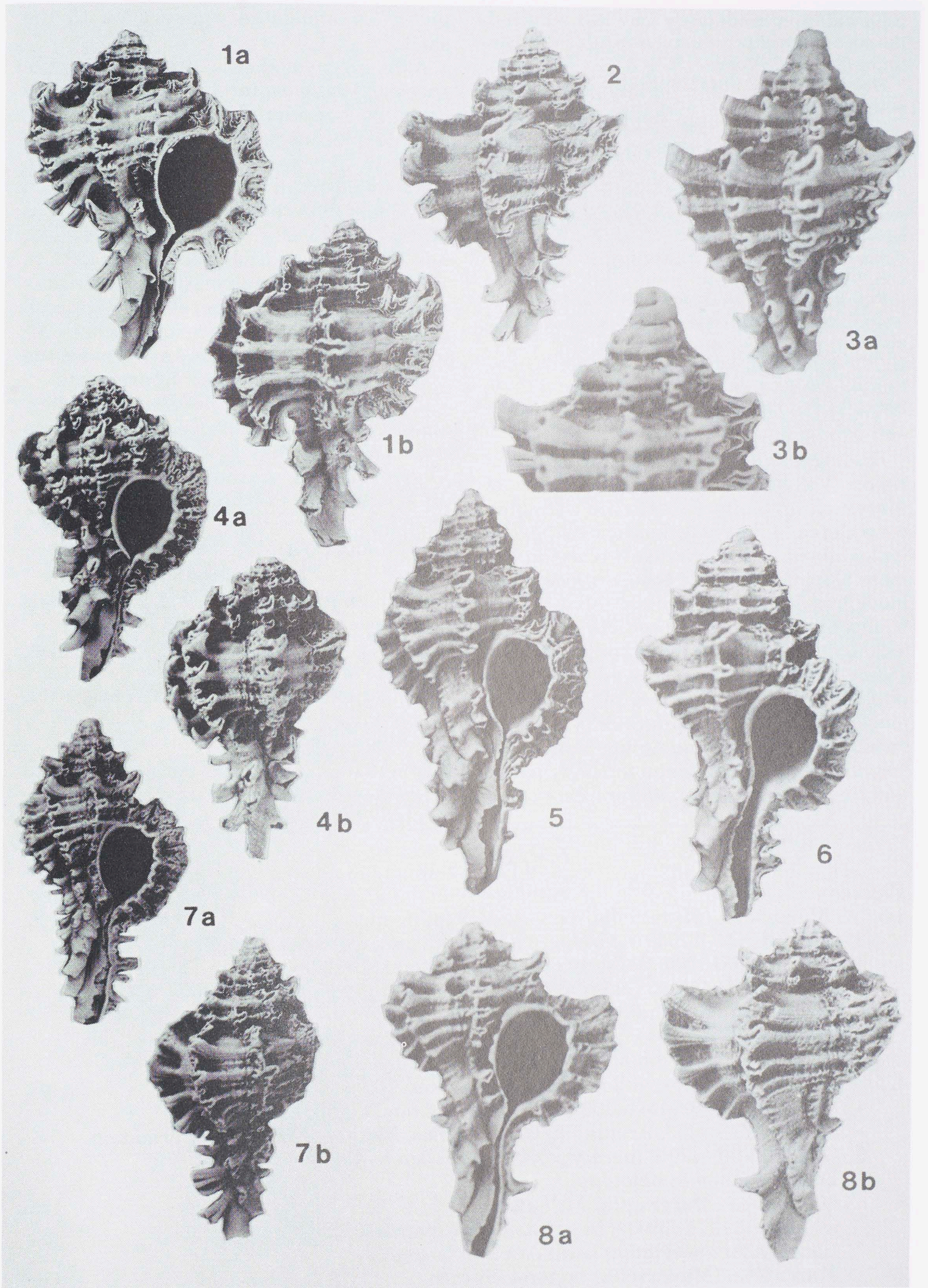


PLATE 12



Siphonal canal moderately long and recurved, the succession of previous canals forming an anterior fasciole." (Vokes, 1963)

*Holotype*: USNM 644376; height 24.0 mm, diameter 18.0 mm.

*Type locality*: TU 520, Pinecrest Beds [= Fruitville Formation]; canal 0.9 mile east of Brighton, Highlands County, Florida.

*Occurrence*: Kirkwood Formation, New Jersey; Duplin Formation, North Carolina; Jackson Bluff Formation, Pinecrest Beds [= Fruitville Formation]; Florida; Agueguexquite Formation, Veracruz, Mexico.

*Figured specimens*: Fig. 1, USNM 644376 (holotype). Fig. 2, Stephens Collection; height 15.5 mm, diameter 11.2 mm; locality TU 1000. Fig. 3, USNM 482037; height 6.5 mm, diameter 5.5 mm; locality TU 1000. Additional localities: TU 60, 200, 523, 525, 638, 729, 730, 736, 756, 796, 1493, 1524.

*Discussion*: As noted in the Dominican report (Vokes, 1989, p. 65), the presence of *Murexiella macgintyi* s.s. in the Late Miocene Cercado Formation indicates that the typical form of the species evolved in the more tropical waters of the Caribbean and moved into southern Florida only with the warmer waters of the Plio-Pleistocene Caloosahatchee Formation. In southern Florida during the earlier Pliocene the form present is that one named *M. macgintyi faceta* (Vokes), which differs in its more inflated body whorl and lower spire; the "pinched portion" between the body whorl and the siphonal canal is more extended,

giving an elongated appearance to the shell.

Although named as a stratigraphic subspecies of *M. macgintyi*, this form equally could be considered a subspecies of *M. graceae* (McGinty), to which it is closely related. Recent work by Sugarman *et al.* (1993) indicates the age of the Kirkwood Formation (where *M. faceta* also occurs, as *Murex shilohensis* var. *burnsi* Whitfield, non *M. burnsii* Aldrich; see Vokes, 1963, p. 157) is Early Burdigalian, much older than previously believed. Therefore, it is possible that *M. faceta* is ancestral to both *M. macgintyi* and *M. graceae*. In any case, the subspecific designation is inappropriate.

The Recent species found in the Netherlands Antilles off the coast of northern South America has been referred to *M. faceta* but its correct designation is *Murexiella hilli* Petuch, 1987.

#### MUREXIELLA (MUREXIELLA) species

##### Plate 16, figure 9

*Favartia* sp. PERRILLIAT, 1972, Paleontología Mexicana, no. 32, p. 81, pl. 40, figs. 3, 4.

*Occurrence*: (?)Medias Aguas Formation, Veracruz, Mexico.

*Figured specimen*: USNM 645987; height 10.3 mm, diameter 6.4 mm; locality USGS 23737, Santa Rosa, Veracruz, Mexico.

*Discussion*: From the beds near Santa Rosa (now Istal), Veracruz, Mexico, there

#### PLATE 13

Figures	Page
1-3. <i>Murexiella (Murexiella) petuchi</i> Vokes, n. sp . . . . .	106
1. (X 4) USNM 482042 (holotype); height 13.2 mm, diameter 8.2 mm. Locality: TU 1000, Sarasota, Florida. Pinecrest Beds.	
2. (X 4) USNM 482043 (paratype A); height 10.6 mm, diameter 6.4 mm. Locality: same as holotype.	
3. (X 10) USNM 482044 (paratype B); height 5.8 mm, diameter 3.7 mm. Locality: same as holotype.	
4, 5. <i>Murexiella (Murexiella) stephensae</i> Vokes, n. sp . . . . .	107
4. (X 3) USNM 482045 (holotype); height 18.6 mm, diameter 11.3 mm. Locality: TU 1493, Arvida Pit, Coral Gables, Florida. (?)Tamiami Formation.	
5. (X 3) USNM 482046 (paratype); height 16.0 mm, diameter 9.9 mm. Locality: same as holotype.	
6. <i>Murexiella (Murexiella) hilli</i> Petuch . . . . .	115
(X 1 1/2) USNM 838034; height 35.4 mm, diameter 22.8 mm. Locality: Aruba, Netherlands Antilles. Recent.	
7. <i>Murexiella (Murexiella) taylorae</i> Petuch . . . . .	116
(X 2 1/2) USNM 838033; height 21.6 mm, diameter 14.8 mm. Locality: off Cape San Blas, Florida. Recent.	



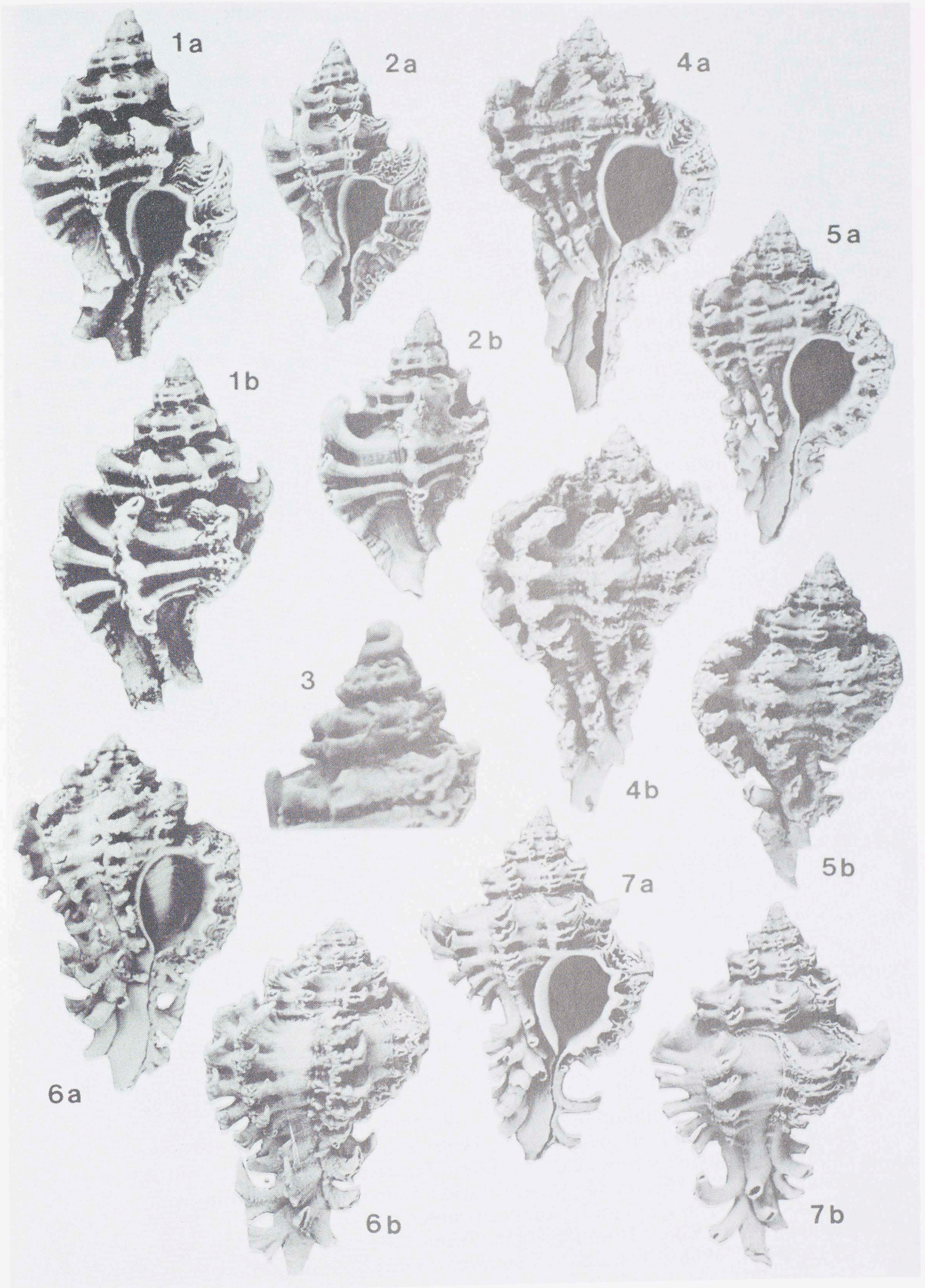


PLATE 13



is a single juvenile specimen that Perrilliat (1972, p. 81, pl. 40, figs. 3, 4) cited only as "*Favartia* sp." In the Dominican Republic report (Vokes, 1989, p. 64), I referred this specimen to *Murexiella hidalgoi* (Crosse). This assignment was based upon Perrilliat's illustration, but once I examined the actual specimen I realized this was incorrect. However, I cannot assign it to any other known species.

The species resembles *M. glypta*, but is smaller and the spiral cords are more flattened. It has a stronger resemblance to Recent examples of *M. glypta*, which tend to have the ribs more flattened than the older examples from the Caloosahatchee and Bermont formations, where the spiral cords are more elevated and scabrous than in the living representatives.

The age of the beds at Perrilliat's locality, stated to be 3 km northeast of Santa Rosa (now Istal), Veracruz, is not established, but nearby outcrops have been dated by Dr. W. H. Akers (personal communication, 1979) as Neogene Zone N. 17, and it is assumed that this specimen is from the same Medias Aguas Formation of Late Miocene age. [See below under *Favartia* (*Caribiella*) *carmenae*, n. sp., for further discussion of this unusual locality.]

As the sole example is a juvenile, this species will not be named, but it cannot be assigned to a described species and it is presumed to be new.

MUREXIELLA (MUREXIELLA) HIDALGOI  
(Crosse)

Plate 11, figures 6-8

*Murex hidalgoi* CROSSE, 1869, Jour. de Conchyl., v. 17, p. 408; CROSSE, *ibid.*, v. 19, p. 68, pl. 1, fig. 4.

*Murex* (*Murexiella*) *hidalgoi* Crosse. CLENCH and PÉREZ FARFANTE, 1945, Johnsonia, v. 1, no. 17, p. 50, pl. 26, figs. 1-4; ABBOTT, 1954, Amer. Seashells, p. 203, text-fig. 45a; ABBOTT, 1974, Amer. Seashells (ed. 2), p. 174, text-fig. 1842.

*Murexiella* (*Murexiella*) *hidalgoi* (Crosse). VOKES, 1968, Tulane Stud. Geol., v. 6, no. 3, p. 119; VOKES, 1989, Bulls. Amer. Paleontology, v. 97, no. 332, p. 64, pl. 8, fig. 1.

*Murexiella hidalgoi* (Crosse). KAICHER, 1973, Card Catalogue World-wide Shells, pack 2, Muricidae - Part I, no. 135; RIOS, 1975, Brazilian Marine Moll. Icon., p. 86, pl. 24, fig. 352; RADWIN and D'ATTILIO, 1976, Murex Shells of the World, p. 157, pl. 25, fig. 8, text-fig. 99 (radula); FAIR, 1976, The Murex Book, p. 48, pl. 19, fig. 266; ABBOTT and DANCE, 1982, Compendium Seashells, p. 143, color fig.; VOKES, 1984, Shells and Sea Life, v. 16, no. 11, p. 212, pl. 2, fig. 2; RIOS, 1985, Seashells of Brazil, p. 85, pl. 30, fig. 374; SUNDERLAND and SUNDERLAND, 1992, Amer. Conchologist, v. 20, no. 3, p. 14, text-fig.

*Favartia* (*Murexiella*) *hidalgoi* (Crosse). HOUART, 1991, Nautilus, v. 105, no. 1, p. 32.

*Description*: "T. brevissime, parum crassa sed solidula, paululum translucida, unicolor, albida; spira sat elongata; sutura profunde impressa; anfr. 7 1/2-8 sexvaricosi, primi subangulati, vix aut non spinosi, antepenultimus et penultimus varicibus in spinas longiusculas, excavatas desinentibus instructi, costis 2 validis spiraliter muniti, ultimus spiram superans (::22:14), transversim costis 5 validis minutissime squamosis, versus marginem externum in spinas totidem desinentibus et costulis minoribus, in interstitiis sitis, separatis impressus, et spinis quin-

PLATE 14

Figures

	Page
1-7. <i>Murexiella</i> ( <i>Murexiella</i> ) <i>macgintyi</i> (Smith) . . . . .	104
1. (X 3) USNM 482047; height 18.5 mm, diameter 12.9 mm. Locality: TU 1512, Arcadia, Florida. Caloosahatchee Formation.	
2. (X 4) NMB H 17004; height 10.3 mm, diameter 6.3 mm. Locality: NMB 16842, Río Cana, Dominican Republic. Cercado Formation.	
3. (X 4) NMB H 17467; height (incomplete) 12.1 mm, diameter 9.1 mm. Locality: NMB 17531, Punta Gavilán, Venezuela. Punta Gavilán Formation.	
4. (X 2) Stephens Collection; height 25.5 mm, diameter 16.6 mm. Locality: TU 770, Kissimmee River, Florida. Caloosahatchee Formation.	
5. (X 3) USNM 880014; height 16.3 mm, diameter 11.8 mm. Locality: Great Abaco Island, Bahama Islands. Recent.	
6. (X 1 1/2) USNM 482048; height 37.4 mm, diameter 23.3 mm. Locality: TU 1536, Star Ranch Pit, Florida. Bermont Formation.	
7. (X 1 1/2) USNM 880015; height 39.3 mm, diameter 26.4 mm. Locality: Salvador, Bahia, Brazil. Recent.	



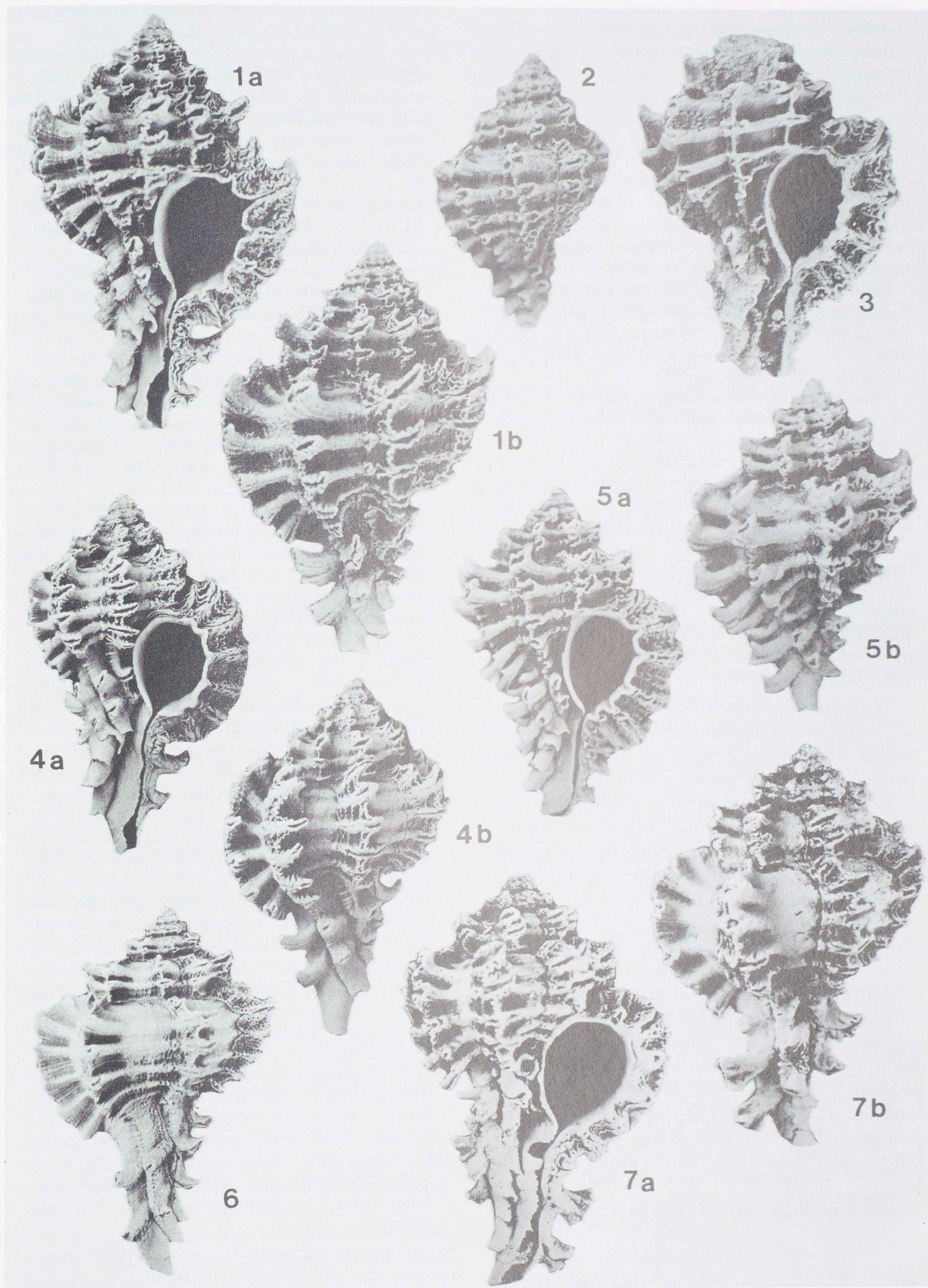


PLATE 14



queseriatim dispositis et varicibus correspondentibus ornatus, serie prima spinarum subincurva, majore, e costa suturae magis vicina oriunda; apertura ovata, parva, subintegra, intus laevigata, alba, in canalem longiusculum, fere clausum, subrecurvum, utrinque sat breviter spinosulum desinens; perist. albidum, subcontinuum, margine columellari laevigato, subarcuato, leviter prominulo, externo ad limbum subundoso, mox extus, occursu varicis, in alam aperturae latitudinem superantem, et in interstitiis spinarum lineis undosis elegantissime sculptam producto." (Crosse, 1869)

*Holotype*: Collection of Patricio Paz of Madrid (Clench and Pérez Farfante, 1945, p. 51), now in the Madrid Museum (Dance, 1966, p. 297); height 36 mm, diameter (including spines) 27 mm (*fide* Crosse, 1869, p. 409).

*Type locality*: Guadeloupe, Lesser Antilles (restricted by Clench and Pérez Farfante, 1945, p. 51).

*Occurrence*: Gurabo Formation, Dominican Republic; Pinecrest Beds [= Fruitville Formation], Florida; Moín Formation, Costa Rica; Recent, Gulf of Mexico to southern Brazil.

*Figured specimens*: Fig. 6, USNM 323900; height 18.3 mm, diameter 11.4 mm; locality TU 1211. Fig. 7, USNM 482035; height 21.9 mm, diameter 13.5 mm; locality TU 729. Fig. 8, USNM 482036; height 18.7 mm, diameter 12.8 mm; locality TU 1240. Additional localities: TU 954, 1219, 1240, 1277, 1307, 1412.

*Discussion*: Today *Murexiella hidalgoi* is restricted to moderately deep water, living at depths ranging from 140 to 360 meters (Clench and Pérez Farfante, 1945, p. 51), but most abundant at about 200 meters. This is contrary to the fossil occurrences, where the species has been taken in the shallower facies of the Gurabo Formation, Dominican Republic, the Pinecrest Beds [= Fruitville Formation] along the Kissimmee Canal (TU 729), and the Moín Formation, Costa Rica.

Although Radwin and D'Attilio (1976, p. 157) state that this species has a protoconch of two and one half whorls, all examples I have seen have the usual one and one half whorls. In some specimens. the external ornamentation decorticates from the early teleoconch whorls giving the impression of additional smooth nuclear whorls.

MUREXIELLA (MUREXIELLA) MACGINTYI  
(M. Smith)

Plate 14, figures 1-7

*Murex macgintyi* M. SMITH, 1938, Nautilus, v. 51, no. 3, p. 88, pl. 6, fig. 11.

*Tritonalia mcgintyi* [*sic*] (Smith). M. SMITH,

1939, Illus. Cat. Recent Species Rock Shells, p. 16, pl. 12, fig. 20 (SMITH, 1953, *ibid.*).

*Murex (Favartia) macgintyi* Smith. CLENCH and PÉREZ FARFANTE, 1945, Johnsonia, v. 1, no. 17, p. 52, pl. 27, figs. 1-4; OLSSON and HARBISON, 1953, Acad. Nat. Sci. Phila., Mon. 8, p. 246, pl. 36, fig. 5; RIOS, 1970, Coastal Brazilian Seashells, p. 79, pl. 22.

*Murex cellulosus leviculus* Dall. WARMKE and ABBOTT, 1961, Caribbean Seashells, p. 106, pl. 19h (*not of* Dall).

*Murex (Murexiella) macgintyi* Smith. VOKES, 1963, Tulane Stud. Geol., v. 1, no. 4, p. 157; ABBOTT, 1974, Amer. Seashells (ed. 2), p. 175, text-fig. 1846.

*Murexiella (Murexiella) macgintyi* (Smith). VOKES, 1968, Tulane Stud. Geol., v. 6, no. 3, p. 112, pl. 7, fig. 3 (*holotype*); VOKES, 1984, Shells and Sea Life, v. 16, no. 11, p. 212, pl. 2, fig. 6; VOKES, 1989, Bulls. Amer. Paleontology, v. 97, no. 332, p. 64, pl. 8, fig. 11.

*Not Murexiella macgintyi* (Smith). KAICHER, 1973, Card Catalogue World-wide Shells, pack 2, Muricidae - Part I, no. 110 [= *M. hilli* Petuch].

*Murexiella macgintyi* (Smith). RIOS, 1975, Brazilian Marine Moll. Icon., p. 86, pl. 25, fig. 353; RADWIN and D'ATTILIO, 1976, Murex Shells of the World, p. 159 (in part), pl. 25, fig. 11 (*not fig. 10 = M. taylorae* Petuch), text-fig. 100 (*protoconch*); FAIR, 1976, The Murex Book, p. 55, pl. 20, fig. 278 (*holotype*, *not M. laurae* Vokes, as stated), *not pl. 19, fig. 272 (= holotype M. laurae)*; ABBOTT and DANCE, 1982, Compendium Seashells, p. 143 (in part), *not color fig. (= M. hilli* Petuch); VOKES, 1984, Shells and Sea Life, v. 16, no. 11, p. 212, pl. 2, fig. 6; RIOS, 1985, Seashells of Brazil, p. 85, pl. 30, fig. 375; [?] WARD and BLACKWELDER, 1987, Smithsonian Cont. Paleobiology, no. 61, p. 173, pl. 39, figs. 3, 4; DE JONG and COOMANS, 1988, Stud. Fauna Curaçao, Caribbean Islands, v. 49, p. 73 (in part, Aruba specimens = *M. hilli* Petuch); KAICHER, 1991, Card Catalogue World-wide Shells, pack 59, Muricidae - Part VI, no. 6077 (*holotype*).

*Murex (Favartia) cellulosus* Conrad. HUMFREY, 1975, Sea Shells of the West Indies, p. 136, pl. 16, fig. 4 (*not of* Conrad).

*Murexiella leonardhilli* PETUCH, 1987, New Caribbean Moll. Faunas, p. 141, pl. 28, figs. 5, 6; SUNDERLAND and SUNDERLAND, 1992, Amer. Conchologist, v. 20, no. 3, p. 14, text-fig.

*Description*: "Whorls five, plus smooth shining nucleus of about two [one and one-half] whorls, suture impressed; about seven spiral raised ridges with slightly branching terminations which are recurved, hollow inside near the



tips, aperture moderately large, oval in shape; canal slightly oblique, partially closed, recurved at terminus.

"This species is allied to *M. glyptus* Smith. One very characteristic feature is the pinched appearance of the posterior portion of the body whorl. Beyond this pinched portion is a pair of axial ridges which are somewhat separated from the others." (Smith, 1938)

*Holotype*: UF 28981; height 20.7 mm, diameter 18.0 mm.

*Type locality*: Caloosahatchee Formation; Clewiston, Hendry County, Florida.

*Occurrence*: Cercado and Gurabo formations, Dominican Republic; Punta Gavilán Formation, Venezuela; Caloosahatchee and (?)Bermont formations, Florida; Waccamaw Formation, South Carolina; (?)James City Formation, North Carolina; Recent, Bahama Islands to Brazil.

*Figured specimens*: Fig. 1, USNM 482047; height 18.5 mm, diameter 12.9 mm; locality TU 1512. Fig. 2, NMB H 17004; height 10.3 mm, diameter 4.3 mm; locality NMB 16842. Fig. 3, NMB H 17467; height 12.1 mm (incomplete), diameter 9.1 mm; locality NMB 17531. Fig. 4, Stephens Collection; height 25.5 mm, diameter 16.6 mm; locality TU 770. Fig. 5, USNM 880014, height 16.3 mm, diameter 11.8 mm; locality, Elbow Cay, Great Abaco Island, Bahama Islands. Fig. 6, USNM 482048; height 37.4 mm, diameter 23.3 mm; locality TU 1536. Fig. 7, USNM 880015; height 39.3 mm, diameter 26.4 mm, locality, Salvador, Bahia, Brazil, 20 meters. Additional localities: TU 68, 79, 202, 203, 519, 523, 527, 528, 529B, 536, 539B, 541, 558, 579, 726, 753, 767, 768, 770, 797, 870, 982, 991, 1227A, 1230, 1358.

*Discussion*: Described from the Late Pliocene-Early Pleistocene Caloosahatchee Formation of southern Florida, *Murexiella macgintyi* is found living today in calcareous localities from the Bahamas to Brazil. There are a number of similar members of the genus that have been confused with *M. macgintyi* in the literature. Among these is the larger and more massive *M. hilli* Petuch, which lives along the northern coast of South America; the smaller, more widely shouldered *M. taylorae* Petuch, which is confined to the western coast of Florida; and the more elongate *M. edwardpauli* Petuch, described from the Atlantic coast of Panama but also present in older beds of Florida, Mexico, and Costa Rica.

The form of this species found along the coast of Brazil from Pará to Bahia has been named *M. leonardhilli* Petuch (1987, p. 141, pl. 28, figs. 5, 6) but other than larger size, there is little reason to separate

this southern occurrence as a geographic subspecies. The only discernible difference between the southern specimens and the northern *M. macgintyi*, which is found from the Bahamas to Cuba and the Virgin Islands, is the presence in the Brazilian form of a small spine in the "pinched portion" of the varices between the body whorl and the siphonal canal. Typical *M. macgintyi* from the Caloosahatchee Formation has a marked "pinched portion" but in some Recent examples from the Bahamas (pl. 14, fig. 5) and Florida, a small spine is present in this area. In the Brazilian specimens this spine is more prominent. Compared with the similarities, these differences are insignificant and the two forms are synonymous.

True *M. macgintyi* occurs in the Late Miocene-Early Pliocene Cercado and Gurabo formations of the Dominican Republic (Vokes, 1989, p. 64, pl. 8, fig. 11; refigured here pl. 14, fig. 2) but it does not appear in Florida until the Late Pliocene. In the earlier beds of the Pinecrest Beds [= Fruitville Formation] the form present is the larger, more inflated *M. faceta* (Vokes), which also occurs in the Agueguexquite Formation of Mexico. This may be a reflection of cooler water in the Gulf of Mexico prior to the closing of the Isthmus of Panama. I assume that *M. macgintyi* evolved in the more tropical portions of the Caribbean and moved into Florida only when the temperature increased in the Late Pliocene. In the collections of the Naturhistorisches Museum, Basel, there are several examples of typical *M. macgintyi*, from the Punta Gavilán Formation of Venezuela (pl. 14, fig. 3), correlative with the Pinecrest and Agueguexquite formations.

Although *M. macgintyi* occurs both living and in the Caloosahatchee Formation, we have not taken a single specimen from the Bermont Formation. But one specimen has been collected by Mr. John Waldrop, at locality TU 1536 (Star Ranch Pit, 11 miles south of South Bay, Palm Beach County, Florida), which appears to be the largest known fossil example of *M. macgintyi* (pl. 14, fig. 6).

At Star Ranch the pit has reached deeper beds than other pits in the area (e.g., localities TU 727, 751) and the majority of the spoil at this site can be referred to



the Caloosahatchee Formation or to the Pinecrest Beds. But there is a moderate amount of Bermont material also. The fossils from these three units may be separated by the "whiter" color of the Bermont specimens, in contrast to a more creamy color of the Caloosahatchee and Pinecrest fossils.

When collecting, by the color one can easily determine which unit was reached by the particular dragline. Mr. Waldrop states that the specimen figured here is from the Bermont Formation; the pure white color corroborates that claim. This extraordinarily large specimen is not a typical Caloosahatchee example of *M. macgintyi*. Normally, they are no more than 25 mm in height (a single specimen from locality TU 991, in the collection of Mrs. Susan Stephens, measures 36 mm). This shell, presumably from the Bermont, is similar to the large Brazilian form named *M. leonardhilli* Petuch (pl. 14, fig. 7).

Ward and Blackwelder (1987, p. 173, pl. 39, figs. 3, 4) have figured a specimen from the James City Formation at the Lee Creek Mine, North Carolina, as *Murexiella macgintyi*. Their specimen (USNM 204069) is not a typical example of the species, as the intervarical areas are smoother and the varices less frondose than *M. macgintyi*. However, there is no other form to which it is closer. It may be an ecologic variant due to the slightly cooler habitat; or, it may prove to be a new species.

#### MUREXIELLA (MUREXIELLA) PETUCHI

Vokes, n. sp.

Plate 13, figures 1-3

*Description:* Shell small (maximum height about 13 mm) with five teleoconch whorls; protoconch of one and one-half smooth, tabulate whorls with a rounded keel beginning at posterior tip but gradually moving to mid-point, then dying out before reaching small terminal varix. Spiral ornamentation on first teleoconch whorl of a single cord placed near anterior suture; on second teleoconch whorl a second strong cord developed at shoulder. Two cords on all whorls up to body whorl, the latter with four strong cords. Axial ornamentation on first teleoconch whorl of seven small lamellar varices, decreasing to five or six on body whorl. Varices gradually becoming increasingly complex by addition of multiple layers of shelly material, scalloped by spiral ornamentation. By second teleoconch whorl strong, adapically-directed spines de-

veloped at intersection of shoulder cord and varices with another weaker spine at intersection of sutural cord and varices. On body whorl long sharp, abaperturally-directed spines at each major cord, that at shoulder recurved apically as well. Varical faces marked by a series of grooves formed in the multiple layers at each major spiral, between these grooves elaborate webbing formed by the layers. Shell surface between the varices almost smooth, marked only by major spiral cords and a few growth lamellae. Shell smooth on anterior portion of body whorl, the only indication of spiral ornamentation on siphonal canal seen on edge of varices with one moderately large spine, flanked by a smaller spine on either side. Suture impressed. Aperture ovate; inner lip smooth, free-standing in anterior portion, appressed in posterior portion; no anal notch. Inner side of outer lip with six small denticles, margin crenulated by major spiral cords. Siphonal canal moderately long, strongly reflected, a series of spurs at former terminations, giving rise to a small fasciole.

*Holotype:* USNM 482042; height 13.2 mm, diameter 8.2 mm.

*Type locality:* TU 1000, Pinecrest Beds [= Fruitville Formation]; APAC pits at east end of 17th St., about 8 miles east of U.S. Highway 301 (now northwest corner of Fruitville Rd. exit, I-75) at Sarasota (T36S, R19E), Sarasota County, Florida.

*Etymology of name:* In honor of Edward J. Petuch, Florida Atlantic University, Boca Raton, Florida, for his on-going work on the southern Florida fossil mollusks.

*Occurrence:* Pinecrest Beds [= Fruitville Formation], Florida.

*Figured specimens:* Fig. 1, USNM 482042 (holotype). Fig. 2, USNM 482043 (paratype A); height 10.6 mm, diameter 6.4 mm; locality TU 1000. Fig. 3, USNM 482044 (paratype B); height 5.8 mm, diameter 3.7 mm; locality TU 1000. Additional locality: TU 1524.

*Discussion:* At TU 1000, the well-known locality at Sarasota, Florida, there are rare specimens (12 in the Tulane Collections) of a small species of *Murexiella* that is readily distinguished from all of its congeners by the flaring varices, smooth body whorl, and the keeled protoconch. It most nearly resembles the Recent eastern Pacific *M. laurae* Vokes, 1970; however, the latter has a multiwhorl protoconch, five major spiral cords on the body whorl, and stronger spines on the siphonal canal. In addition, in the adult *M. laurae* the spiral cords disappear and the shell surface is essentially smooth between the varices.

Of all of the species of *Murexiella*, *M. petuchi* is unique in its keeled protoconch,



similar to that seen in species of *Risomurex* (see Radwin and D'Attilio, 1976, text-fig. 109). Like other members of the "*M. glypta* complex" (especially *M. puntagordanum*), this species has several small denticles on the inner side of the outer lip, giving somewhat the aspect of a species of *Pygmaep-terys*. Nevertheless, the shell ornamentation, with long recurved varical spines and a smooth shell surface, is more similar to *Murexiella* and this is the best placement for this admittedly intermediate form.

The type specimen is the largest seen and it was collected by Ms. Susan Khan, New Port Richey, Florida, who requested that the species be named in honor of Dr. Petuch, a sentiment I heartily endorse.

MUREXIELLA (MUREXIELLA) STEPHENSÆ

Vokes, n. sp.

Plate 13, figures 4, 5

*Description:* Shell with five teleoconch whorls; protoconch and earliest ornamentation missing in all specimens of type lot. Spiral ornamentation on second teleoconch whorl of two strong cords, one at shoulder, one near anterior suture. Two cords on all whorls up to body whorl, the latter with five strong cords and two to three additional cords on siphonal canal. Axial ornamentation on each teleoconch whorl of eight to ten varices, gradually increasing in size and complexity by addition of multiple layers of shelly material; the latter filigreed between the major cords. By second teleoconch whorl strong, adapically-directed spines developed at intersection of shoulder cord and varices with another weaker spine at intersection of sutural cord and varices. On body whorl long, elaborately ramose, abaperturally recurved spines at each major cord, plus one smaller spine on shoulder ramp where no spiral cord exists. Except for major spiral cords shell surface smooth between varices. Suture impressed. Aperture ovate; inner lip smooth, free-standing in anterior portion, appressed in posterior portion; no anal notch. Inner side of outer lip smooth, margin crenulated by major spiral cords. Siphonal canal relatively long, recurved at distal end giving rise to a series of spurs at former terminations.

*Holotype:* USNM 482045; height 18.6 mm, diameter 11.3 mm.

*Type locality:* TU 1493, (?)Tamiami Formation; Arvida Pit, on Bird Road (= W. 40th St.), approximately 5 miles west of Florida Turnpike, on west side of Coral Gables, Dade County, Florida.

*Etymology of name:* In honor of Susan B. Stephens (Mrs. John Stephens), Sanibel, Flori-

da, for her continued generosity in providing specimens for study, including the type material for this new species.

*Occurrence:* (?)Tamiami Formation, Florida.

*Figured specimens:* Fig. 4, USNM 482045 (holotype). Fig. 5, USNM 482046 (paratype); height 16.0 mm, diameter 9.9 mm; locality TU 1493.

*Discussion:* This new species has much the aspect of *M. macgintyi* but differs in that the spines are greatly extended past the edge of the varices. These digitations are strongly recurved, almost touching the shell whorl, and extremely ramose. At present, the form is known only from the type locality, which is a more reefal environment than the typical *M. macgintyi* habitat. It may be only an ecologic variant but the material on hand seems to be consistently different.

The type lot of this new species consists of eight specimens (of these, five were collected by Mrs. Stephens; three by Edward J. Petuch), all from the type locality. In addition to the figured types, there are now four paratypes in my collection, the largest of which measures 24.5 mm in height. There are two additional paratypes in Mrs. Stephens' collection, one 18.5 mm in height, the other 17.2 mm in height.

The species closest to *M. stephensae* is the Aruba endemic form *M. hilli*. They differ in size, the smaller *M. stephensae*, with six teleoconch whorls, is little more than one-half the size of *M. hilli* (24 mm vs. 40 mm in height). The spiral cords in the intervarical areas are stronger in *M. stephensae* and the varical spines are shorter but more ramose. *Murexiella stephensae* and not *M. faceta* is the presumed ancestor of *M. hilli*.

The formational name to be applied to the Bird Road beds is questionable. The locality was first reported by Petuch (1986, p. 392), who noted that the locality is a Pliocene reef-tract, which he considered part of an ancient atoll-like structure. Everyone agrees that the fossils from the Bird Road locality are the same age as those from the familiar "Pinecrest Beds" of western Florida; but, whether all Late Pliocene molluscan faunas in southern Florida should be referred to the "Pinecrest Beds" is less certain.

Meeder (1990, fig. 3) has placed the Pinecrest-age reefal beds of western Florida in the Tamiami Formation. If Petuch is cor-



rect in including the reef-tracts on either side of the peninsula in one continuous reefal structure, then the eastern reef and the western reef are essentially one lithologic unit. This seems reasonable for the east, south, and west parts of the region, parallel to the present coastline, although not the northern part, which Petuch also included and for which there is absolutely no paleontological evidence. Thus, I am considering the Bird Road locality to be a part of the Tamiami Formation of Meeder (1990)\*, if not of Mansfield (1939).

The faunas of these eastern and western reefs, although closely related to the Pinecrest fauna, do have certain differences.

\*This is almost certainly a misnomer, for the name "Tamiami," as used by Meeder was a generic term for the entire "Pinecrest-Buckingham-Tamiami" facies group. In its type area, the Tamiami (named for the Tamiami Trail, now U.S. Highway 41) was described as a "hard, porous, non-oolitic limestone with inclusions of clear quartz grains. The cavities were originally occupied by the tests of organisms, mainly mollusks." (Mansfield, 1931, p. 43). The only fauna still present is those calcitic organisms, such as oysters, echinoids, and pectens that have withstood leaching. Obviously this is not the reefal facies but the platform enclosed by the reef. The specimens from Bird Road, such as *M. stephensae*, are encrusted with a hard calcareous matrix bearing large clear quartz grains, but the aragonitic shells are still present, in contrast to Mansfield's description.

For example, at localities in the western reef-tract (TU 1174, 1175, 1177) we have no examples of *Murexiella shilohensis* or *M. faceta*, both of which are common at most typical "Pinecrest" localities.

MUREXIELLA (MUREXIELLA) LEVICULA  
(Dall)

Plate 16, figures 1-3

*Ocenebra (Favartia) (cellulosa var.?) levicula*  
DALL, 1889, Harvard Mus. Comp. Zool.,  
Bull., v. 18, p. 211, pl. 16, fig. 1 [as *Ocenebra*  
(*Favartia*) *cellulosa* Conrad, young].

Not *Tritonalia cellulosa levicula* (Dall). SMITH,  
1939, Illus. Cat. Recent Species Rock Shells,  
p. 16, pl. 13, fig. 8 (SMITH, 1953, *ibid.*) [= *M.*  
*glypta* (Smith)].

Not *Murex [Favartia] cellulosa leviculus*  
(Dall). CLENCH and PÉREZ FARFANTE,  
1945, Johnsonia, v. 1, no. 17, p. 56, pl. 28,  
figs. 1-3 [= *M. glypta* (Smith)].

*Murex (Favartia) cellulosa* Conrad. ABBOTT,  
1954, Amer. Seashells, p. 204 (in part), fig.  
45b (= Dall, 1889, pl. 16, fig. 1) (not of Con-  
rad).

Not *Murex (Favartia) cellulosa leviculus*  
(Dall). ABBOTT, 1954, Amer. Seashells, p.  
205, pl. 25j [= *M. glypta*; same figure as  
Clench and Pérez Farfante, 1945, pl. 28, fig.  
1].

Not *Murex cellulosa leviculus* Dall. WARMKE  
and ABBOTT, 1961, Caribbean Seashells, p.  
106, pl. 19h [= *M. macgintyi* (Smith)].

*Murexiella (Murexiella) levicula* (Dall).  
VOKES, 1968, Tulane Stud. Geol., v. 6, no.  
3, p. 119, pl. 7, fig. 7 (lectotype).

*Murex leviculus* (Dall). PORTER and WOLFE,  
1971, Jour. de Conchyl., v. 109, p. 96.

PLATE 15

Figures

	Page
1-7. <i>Murexiella (Murexiella) glypta</i> (Smith) . . . . .	112
1. (X 2 1/2) USNM 482049; height 21.5 mm, diameter 13.0 mm. Locality: TU 767, Caloosahatchee River, Florida. (?) Caloosahatchee Formation.	
2. (X 3) USNM 645895; height 17.0 mm, diameter 9.5 mm. Locality: TU 580, North New River Canal, Florida. Bermont Formation.	
3. (X 2 1/2) USNM 482050; height 21.5 mm, diameter 13.8 mm. Locality: TU 1240, Los Corales, Costa Rica. Moín Formation.	
4. (X 3) USNM 880016; height 17.0 mm, diameter 9.4 mm. Locality: Buzios Island, São Paulo, Brazil. Recent.	
5. (X 4) USNM 838037; height 12.0 mm, diameter 7.0 mm. Locality: TU R-99, off Quintana Roo, Mexico. Recent.	
6. (X 6; protoconch X 10) USNM 838041; height 8.2 mm, diameter 5.0 mm. Locality: TU R-99, off Quintana Roo, Mexico. Recent.	
7. (X 6) USNM 780652 (holotype - <i>Murexiella iemanja</i> Petuch); height 7.9 mm, diameter 4.9 mm. Locality: Abrolhos Archipelago, Brazil. Recent.	



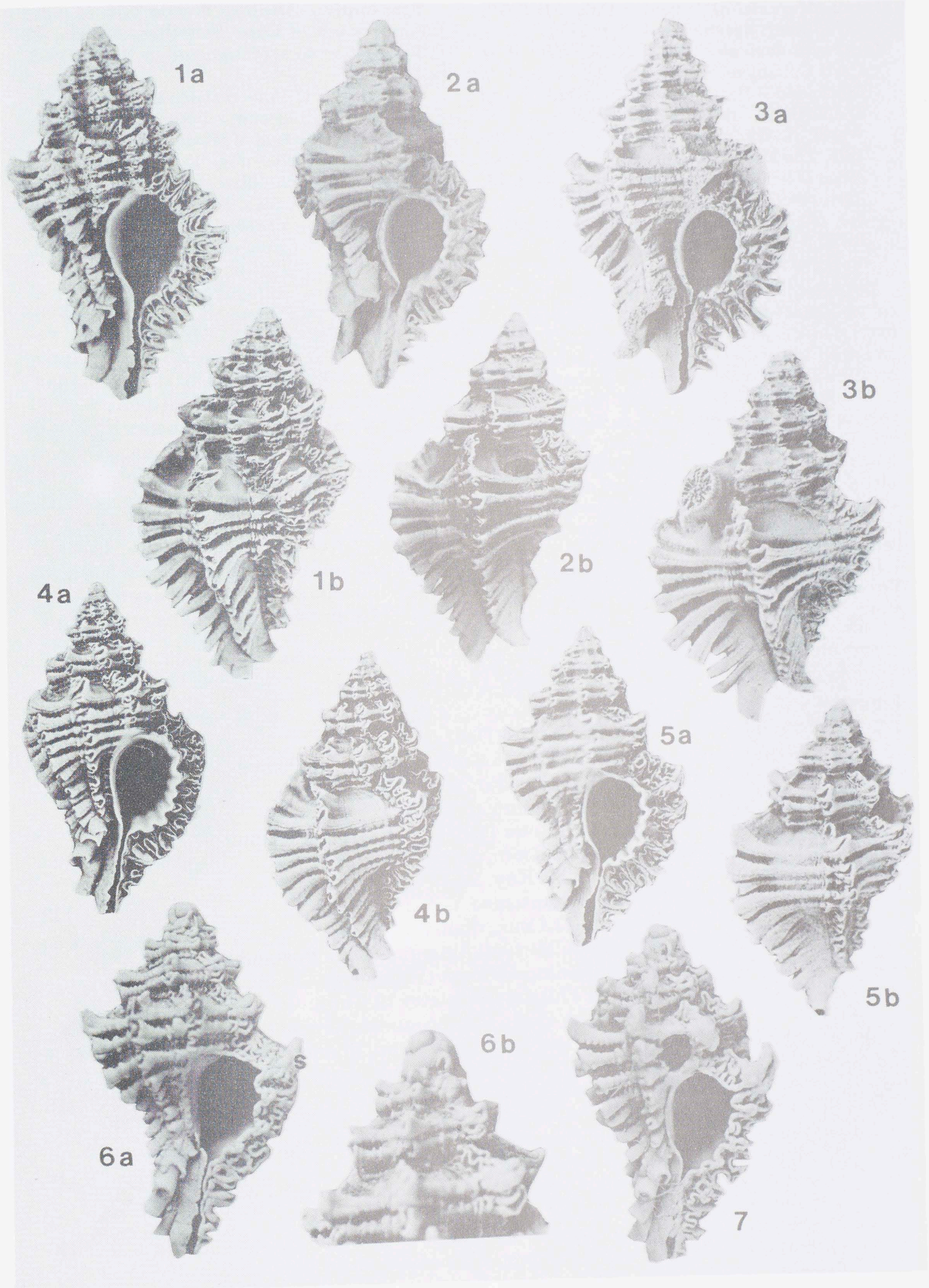


PLATE 15



*Murex (Murexiella) leviculus* Dall. ABBOTT, 1974, Amer. Seashells (ed. 2), p. 175.

*Murexiella levicula* (Dall). KAICHER, 1974, Card Catalogue World-wide Shells, pack 6, Muricidae - Part II, no. 563; RADWIN and D'ATTILIO, 1976, Murex Shells of the World, p. 159 (in part), pl. 26, fig. 10; FAIR, 1976, The Murex Book, p. 54, pl. 19, figs. 268, 268a, 273 (lectotype, after Vokes); VOKES, 1984, Shells and Sea Life, v. 16, no. 11, p. 212, pl. 2, fig. 4; SUNDERLAND and SUNDERLAND, 1992, Amer. Conchologist, v. 20, no. 3, p. 14, text-fig.

*Description*: "This form differs from the typical *cellulosa* in being somewhat smaller and more slender, with one less varix on the average and with the varices thinner, somewhat more branched, and each forming a sharp-edged rather than a broadish rounded ridge. The revolving ribs are feebler, and in nearly all the specimens entirely obsolete over most of the space between the varices on the last whorl. This gives the shell a very different aspect, but a tendency to such a condition is seen in some specimens of *cellulosa* and other apparently allied species." (Dall, 1889)

*Lectotype*: USNM 93271 (designated by Vokes, 1968, p. 119); height 18 mm, diameter 10 mm.

*Type locality*: Albatross Station 2372, 60 miles [97 km] south of Cape San Blas, Florida, 27 fathoms [49 meters] (designated by Vokes, 1968, p. 119).

*Occurrence*: (?) Pinecrest Beds [= Fruitville Formation]; Holocene, Louisiana; Recent, North Carolina to Gulf of Mexico.

*Figured specimens*: Fig. 1, Stephens Collection; height 16.6 mm, diameter 10.0 mm; locality TU 1000. Fig. 2, USNM 838039; height 5.3 mm, diameter 3.4 mm; locality TU 977. Fig. 3, USNM 838040; height 16.8 mm, diameter 9.7 mm; locality TU R-42.

*Discussion*: As discussed earlier (Vokes, 1968, p. 119), *Murexiella levicula* repeatedly has been confused with *M. glypta* (Smith), which is only generically similar. Even though it was shown (*ibid.*, p. 117) that *M. levicula* has a protoconch of four conical whorls and *M. glypta* has one and one-half bulbous whorls (compare pl. 16, fig. 2, and pl. 15, fig. 6), Radwin and D'Attilio (1976, p. 159) placed *M. glypta* in synonymy with *M. levicula*. The shell has spiral ribs until the fifth teleoconch whorl, where it becomes smooth between the varices. Thus, juvenile specimens may be mis-

## PLATE 16

Figures	Page
1-3. <i>Murexiella (Murexiella) levicula</i> (Dall) . . . . .	108
1. (X 3) Stephens Collection; height 16.6 mm, diameter 10.0 mm. Locality: TU 1000, Sarasota, Florida. Pinecrest Beds.	
2. (X 10) USNM 838039; height 5.3 mm, diameter 3.4 mm. Locality: TU 977, Mississippi River Delta, Louisiana. Holocene.	
3. (X 3) USNM 838040; height 16.8 mm, diameter 9.7 mm. Locality: TU R-42, Anna Maria Key, Florida. Recent.	
4. <i>Murexiella (Murexiella) veracruzana</i> Vokes . . . . .	112
(X 3) USNM 482051; height 13.1 mm, diameter 7.8 mm. Locality: TU 1046, Veracruz, Mexico. Agueguexquite Formation.	
5, 6. <i>Murexiella (Murexiella) puntagordanam</i> (Weisbord) . . . . .	114
5. (X 3) NMB H 17469; height 17.9 mm, diameter 10.0 mm. Locality: Playa Grande, Dist. Federal, Venezuela. Recent.	
6. (X 10) NMB H 17470; height (incomplete) 4.5 mm, diameter (incomplete) 3.5 mm. Locality: Farallon Sentinela, Venezuela. Recent.	
7. <i>Murexiella (Murexiella) petiti</i> Vokes . . . . .	115
(X 2 1/2) USNM 645893 (holotype); height 21.0 mm, diameter 15.0 mm. Locality: TU 558, Crescent Beach, South Carolina. Waccamaw Formation.	
8. <i>Murexiella (Murexiella) kalafuti</i> Petuch . . . . .	116
(X 3) Sunderland Collection; height 15.4 mm, diameter 9.8 mm. Locality: off Key West, Florida. Recent.	
9. <i>Murexiella (Murexiella) species</i> . . . . .	100
(X 4) USNM 645987; height 10.3 mm, diameter 6.4 mm. Locality: USGS 23737, Santa Rosa, Veracruz, Mexico. (?)Medias Aguas Formation.	



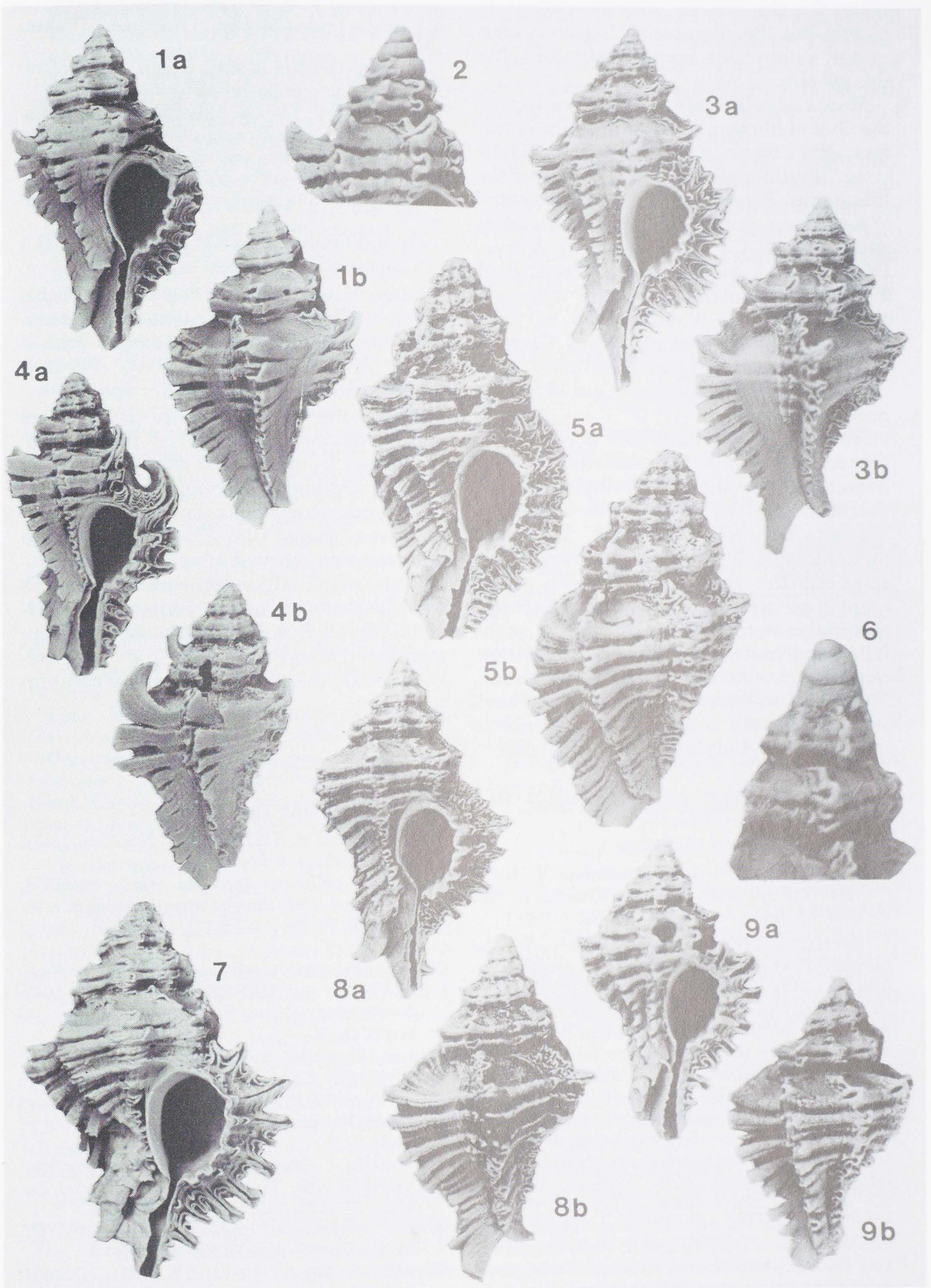


PLATE 16



taken for the similar, strongly ribbed *M. glypta*, but the protoconch (which is commonly preserved) immediately identifies this species.

*Murexiella levicula* is most abundant in the Gulf of Mexico, in depths of 20 to 70 meters; for example, it is common in the Holocene "Mudlump-90" fauna (TU 977) off the Mississippi River delta, in beds estimated to have been deposited in 60 meters (Morgan *et al.*, 1963, p. 41). Previously (Vokes, 1968, p. 119) I questioned Dall's record off the North Carolina coast, but more recently Porter and Wolfe (1971, p. 96) have recorded the species off North Carolina and numerous examples have been taken by the scallop boats working out of St. Augustine, Florida.

Although *M. levicula* has not been reported as fossil, in the collection of Mrs. Susan B. Stephens, Sanibel, Florida, there is a single example (pl. 16, fig. 1) from Sarasota, Florida (TU 1000). However, material from this locality is primarily from spoil and the precise stratigraphic placement is uncertain. Although most Sarasota material is from the Pinecrest Beds, at the APAC pit both Caloosahatchee and Ber- mont formations are present (see Vokes, 1992, p. 2 for further discussion). Provisionally, we will assign this occurrence to the Pinecrest Beds but this is not certain.

MUREXIELLA (MUREXIELLA) VERACRUZANA  
Vokes

Plate 16, figure 4

*Murexiella (Murexiella) veracruzana* VOKES,  
1968, Tulane Stud. Geol., v. 6, no. 3, p. 116,  
pl. 5, fig. 5.

*Description*: "Nature of early whorls and total number of whorls not known. Axial ornamentation on body whorl consisting of five sharp, straight varices. Spiral ornamentation on body whorl of five flattened ribs marked by a strong median groove in each. Where the spiral ribs cross the varices, small open spines produced which are noticeably square in cross-section; spines connected by a laminated webbing. One small spine between shoulder spine and suture with no corresponding spiral rib; shoulder spine larger than all other spines. Varices extending the length of the anterior canal and bearing small spinelets but no trace of spiral ornamentation on canal. Aperture small, oval, almost entire. Outer lip with five crenulations corresponding to the five major varical spines. Inner lip smooth, standing free from columellar wall. Si-

phonal canal long, straight, probably recurved at extreme tip but broken in holotype." (Vokes, 1968)

*Holotype*: USNM 645894; height (incomplete) 12.7 mm, diameter (incomplete) 7.0 mm.

*Type locality*: TU 638, Agueguexquite Formation; quarry on south side of Mexico Highway 180, 14 miles [28 km] east of junction with side road into Coatzacoalcos, Veracruz, Mexico.

*Occurrence*: Agueguexquite Formation, Mexico.

*Figured specimen*: USNM 482051; height 13.1 mm, diameter 7.8 mm; locality TU 1046.

*Discussion*: Since the description of this species from the Agueguexquite Formation (now dated as mid-Pliocene rather than Upper Miocene) we have collected several additional fragmentary specimens. Only the one figured here (pl. 16, fig. 4) is nearly complete. This species may be distinguished from all other similar forms by the very flattened nature of the spiral ornamentation, which looks almost as though it had been "ironed" flat. The shoulder spine is extremely recurved adapically.

Originally, I suggested that this species was the ancestor of the younger *Murexiella levicula*. But, if the Sarasota specimen mentioned above is, in fact, from the Pinecrest Beds, the two species were contemporary.

MUREXIELLA (MUREXIELLA) GLYPTA  
(Smith)

Plate 15, figures 1-7

*Murex glyptus* M. SMITH, 1938, Nautilus, v. 51,  
no. 3, p. 89, pl. 6, fig. 10.

*Tritonalia cellulosa levicula* (Dall). SMITH,  
1939, Illus. Cat. Recent Species Rock Shells,  
p. 16, pl. 13, fig. 8 (SMITH, 1953, *ibid.*) (*not of*  
Dall).

*Murex [Favartia] cellulosus leviculus* Dall.  
CLENCH and PÉREZ FARFANTE, 1945,  
Johnsonia, v. 1, no. 17, p. 56, pl. 28, figs. 1-3  
(*not of* Dall).

*Murex (Favartia) cellulosus leviculus* (Dall).  
ABBOTT, 1954, Amer. Seashells, p. 205 (in  
part), pl. 25, fig. j (same figure as Clench and  
Pérez Farfante, 1945, pl. 28, fig. 1) (*not of*  
Dall).

*Murexiella (Murexiella) glypta* (Smith).  
VOKES, 1968, Tulane Stud. Geol., v. 6, no.  
3, p. 117, pl. 7, figs. 4 (holotype), 5.

*Murex (Murexiella) glyptus* Smith. ABBOTT,  
1974, Amer. Seashells (ed. 2), p. 174.

*Murexiella glypta* (Smith). KAICHER, 1974,  
Card Catalogue World-wide Shells, pack 6,  
Muricidae - Part II, no. 554; RIOS, 1975,



Brazilian Marine Moll. Icon., p. 86, pl. 24, fig. 351; RADWIN and D'ATTILIO, 1976, Murex Shells of the World, p. 159 (in synonymy with *M. levicula*); FAIR, 1976, The Murex Book, p. 46, pl. 20, fig. 277 (holotype, after Vokes); VOKES, 1984, Shells and Sea Life, v. 16, no. 11, p. 212, pl. 2, fig. 8; RIOS, 1985, Seashells of Brazil, p. 85, pl. 30, fig. 373.

*Murexiella iemanja* PETUCH, 1979, Biol. Soc. Washington, Proc., v. 92, no. 3, p. 518, figs. 1-I, 1-J; PETUCH, 1987, New Caribbean Moll. Faunas, p. 140, pl. 16, figs. 4, 5 (holotype); KAICHER, 1980, Card Catalogue Worldwide Shells, pack 25, Muricidae - Part V, no. 2595; PETUCH, 1988, Neogene Hist. Trop. Amer. Moll., p. 163, pl. 39, figs. 16, 17 (holotype).

*Favartia (Murexiella) glypta* (Smith). HOUART, 1991, Nautilus, v. 105, no. 1, p. 32.

*Description*: "Nucleus of holotype imperfect, whorls about seven; suture well impressed; spiral sculpture consisting upon the body whorl of about twelve rounded ribs, arranged arc shaped from axial rib to rib, often marked with a division line in the center, the major termination of the axial sculpture turned backward from the direction of growth, openings beneath away from the recurved points. The eight axial eminences are sharp and largely formed by foliated processes. Aperture small, oval in shape; canal slightly oblique, almost closed." (Smith, 1938)

*Holotype*: UF 1311; height 25.3 mm, diameter 14.0 mm.

*Type locality*: Caloosahatchee Formation; Clewiston, Hendry County, Florida.

*Occurrence*: Caloosahatchee and Bermont formations, Florida; Waccamaw Formation, South Carolina; Moín Formation, Costa Rica; Recent, from Gulf of Mexico to São Paulo, Brazil.

*Figured specimens*: Fig. 1, USNM 482049; height 21.5 mm, diameter 13.0 mm; locality TU 767. Fig. 2, USNM 645895; height 17.0 mm, diameter 9.5 mm; locality TU 580. Fig. 3, USNM 482050; height 21.5 mm, diameter 13.8 mm; locality TU 1240. Fig. 4, USNM 880016; height 17.0 mm, diameter 9.4 mm; locality, Buzios Island, São Paulo, Brazil. Fig. 5, USNM 838037; height 12.0 mm, diameter 7.0 mm; locality TU R-99. Fig. 6, USNM 838041; height 8.2 mm, diameter 5.0 mm; locality TU R-99. Fig. 7, USNM 780652 (holotype - *Murexiella iemanja* Petuch); height 7.9 mm, diameter 4.9 mm; locality, Abrolhos Archipelago, Brazil. Additional localities: TU 529B, 536, 558, 727, 759, 803, 991.

*Discussion*: *Murexiella glypta* is, as most species of the genus, extremely variable. The varices range in number from four to eight, with a resulting change in the appearance of the shell (compare pl. 15, figs. 2, 3 with four varices to fig. 1 with eight

varices). This variability may have caused Houart (1991, p. 32) to consider the specimen from the Bermont Formation (figured previously by Vokes, 1968, pl. 7, fig. 5; refigured here, pl. 15, fig. 2) an example of *Favartia cellulosa* (Conrad).

Originally, the species was known only from the Recent fauna, Gulf of Mexico, but additional specimens have extended the range to northern South America, where this species also was named *Murexiella iemanja* Petuch, as noted by Rios (1985, p. 85).

MUREXIELLA (MUREXIELLA) EDWARDPAULI  
Petuch

Plate 12, figures 4-7

*Murexiella edwardpauli* PETUCH, 1990, Nautilus, v. 104, no. 2, p. 62, figs. 6, 7.

*Description*: "Shell small for genus, thin, delicate, with globose, inflated body; 6 varices per whorl, varices thin, with 6 large, recurved spines; intervarical areas ornamented with 6 large spiral cords; intervarical cords and varices minutely squamose; siphonal canal proportionally very elongated; ornamented with 3 large, flattened spines per siphonal varix; shell consistently pinkish-tan colored with 2 darker tan bands, one around shoulder and one around midbody; shoulder of body whorl slightly angled; aperture proportionally large, oval in shape." (Petuch, 1990)

*Holotype*: USNM 860529; height 15.2 mm, diameter 9.3 mm.

*Type locality*: Off Portobelo, Panama, 50 meters.

*Occurrence*: Agueguexquite Formation, Mexico; (?) Caloosahatchee Formation, Florida; Moín Formation; Costa Rica; Recent, Panama.

*Figured specimens*: Fig. 4, USNM 860529 (holotype). Fig. 5, USNM 482038; height 18.0 mm, diameter 10.0 mm; locality TU 1023. Fig. 6, USNM 482039; height 17.7 mm, diameter 10.8 mm; locality TU 1046. Fig. 7, USNM 482040; height 14.8 mm, diameter 8.7 mm; locality TU 954.

*Discussion*: This species from the Atlantic coast of Panama has a marked similarity to *M. macgintyi* but differs in having a longer siphonal canal. Several specimens from different geological formations, ranging in age back to the mid-Pliocene Agueguexquite Formation, Veracruz, Mexico, have this same morphology. Whether they are variations of typical *M. macgintyi* is not certain but the differences appear to be consistent.



MUREXIELLA (MUREXIELLA) PUNTAGORDANUM  
(Weisbord)

Plate 16, figures 5, 6

*Murex (Favartia) puntagordanum* WEISBORD, 1962, *Bull. Amer. Paleontology*, v. 42, no. 193, p. 292, pl. 26, figs. 7, 8.

*Murexiella (Murexiella) puntagordanum* (Weisbord). VOKES, 1968, *Tulane Stud. Geol.*, v. 6, no. 3, p. 118.

*Description*: "Shell small, with a little over five whorls, including the nucleus. Nucleus smooth, consisting of about 1 1/4 [2 1/2] whorls, the tip loosely coiled and somewhat immersed, the last turn narrow and rounded. Post-nuclear whorls shouldered, the sculpture consisting of axial folds which later develop into varices, and spiral riblets, of which there are three to five on the whorls of the spire. On the body whorl there are six high narrow varices and seven or eight strong, elevated, flat-topped primary spiral ribs separated by deep interspaces in either side of which there is a spiral thread close to the primary rib. On the whorls of the spire, the spiral riblets are narrow and tend to bifurcate on the crests of the axial folds and varices. On the ramp above the shoulder, spiral lineations are wanting or obsolescent throughout although the varices continue across the ramp to the suture. All of the six axials on the body whorl are true varices, and these are built up by incremental growth laminae into short spines whose tips are bent backward, the spines being channeled below the tip with the hollows open toward the aperture. These spines or pointed arches are produced on the narrow crest of the varices at the crossing or intercept of the spiral primary rib, and thus there are as many spines as there are spiral ribs on each varix. Surface of shell traversed with growth lamellae and it is these which, by incrementation at the varix, produce the 'cellular' structure or spines. Aperture asymmetrically oval, the entrance to the siphonal canal wide, the posterior outlet covered over by the callus of the parietal shield. Outer lip with about seven denticles along the inner margin, the varix rising from the rim. Previous siphonal canal prominent, convex, bordered by an unbilicate [*sic*] depression. Present siphonal canal broken at the anterior end, but is probably relatively short." (Weisbord, 1962)

*Holotype*: PRI 26202; height (incomplete) 13.0 mm, diameter 8.0 mm.

*Type locality*: "Playa Grande Formation" [= Mare Formation]; north flank of Punta Gorda anticline, Cabo Blanco, Dist. Federal, Venezuela.

*Occurrence*: Mare Formation, Venezuela; Recent, Venezuela.

*Figured specimens*: Fig. 5, NMB H 17469; height 17.9 mm, diameter 10.0 mm; locality, Playa Grande, Dist. Federal, Venezuela. Fig. 6,

NMB H 17470; height (incomplete) 4.5 mm, diameter (incomplete) 3.5 mm; locality, Farallon Sentinela, Venezuela, 15 meters.

*Discussion*: Weisbord described this species from the Maiquetia Member of the Playa Grande Formation, of Late Miocene or Early Pliocene age. Mr. and Mrs. Jack Gibson Smith, formerly of Caracas, who have done much work on the stratigraphy of the coastal area of Venezuela, in a discussion of the Mare Formation (1979, p. 24), noted that at Punta Gorda there are two fossiliferous beds separated by 20 feet of barren conglomerate. The lower one was assigned by Weisbord (1957, p. 14) to the Maiquetia Member of the Playa Grande Formation (his loc. W-23, type locality for *M. puntagordanum*); the upper one he assigned to the Mare Formation. However, as the Gibson Smiths have observed, the beds can be traced westward along the strike into the type area of the Mare Formation (Quebrada Mare Abajo); thus, W-23 also is part of the Mare Formation.

In a letter, Mr. Gibson Smith (October, 1993) writes "at Punta Gorda the sequence pertains entirely to the Mare Formation and consists of a conglomeratic, near-shore facies, with a *Lithothamnium* bioherm near the base at road level and three intercalated shell beds above. The sequence is capped by the unconformably overlying Abisinia Fm. The Maiquetia Member element described by Weisbord has not been recognized."

Weisbord considered the Playa Grande Formation to be Late Miocene or Early Pliocene in age and the "overlying" Mare Formation to be probably Late Pliocene. Based on planktic foraminifera the age of the Playa Grande has been revised upward to the Pleistocene. Gibson Smith believes (1976, p. 4; personal communication, October, 1993) that the Mare Formation actually *underlies* the Playa Grande but, nevertheless, is Late Pliocene, based upon the occurrence of *Globorotalia tosaensis tenuithec*a Blow.

As previously discussed (Vokes, 1968, p. 118), the holotype of *M. puntagordanum* is so poorly preserved that little could be determined from it. However, there are several well-preserved specimens from the Recent fauna off the coast of Venezuela in the Gibson Smith Collection at the



Naturhistorisches Museum, Basel, one of which is figured here (pl. 16, fig. 5). These specimens do have a marked resemblance to *M. glypta* but a juvenile example of the species, collected by Mr. Gibson Smith, shows a protoconch of two and one-half whorls (pl. 16, fig. 6). The shoulder is more rounded in *M. puntagordanum*, with the maximum diameter at the mid-line of the whorl, in contrast to the more triangular outline of the whorl in *M. glypta*. Although the shells of the two species are similar in appearance, they are distinct species.

MUREXIELLA (MUREXIELLA) GRACEAE  
(McGinty)

Plate 12, figure 8

*Tritonalia graceae* MCGINTY, 1940, Nautilus, v. 53, no. 3, p. 84, pl. 10, fig. 2.

*Murexiella (Murexiella) graceae* (McGinty).  
VOKES, 1968, Tulane Stud. Geol., v. 6, no. 3, p. 118, pl. 7, fig. 6.

*Description*: "Shell small, spire low, about 5 whorls (nucleus lost), suture appressed, indistinct; whorls shouldered; about 7 foliated ribs or varices; ribs spined, stronger and some recurved on the crown; double row of basal spines in the siphonal region; aperture truncate-oval; canal straight, longer than the aperture." (McGinty, 1940)

*Holotype*: UF 23197; height 21.5 mm, diameter 16.0 mm.

*Type locality*: Bermont Formation; Belle Glade, Palm Beach County, Florida (= TU 201).

*Occurrence*: Bermont Formation, Florida.

*Figured specimen*: USNM 482041; height 20.1 mm, diameter 14.3 mm; locality TU 725. Additional localities: TU 727, 751, 1536.

*Discussion*: The Pleistocene *M. graceae* is the immediate ancestor of the Recent *M. taylorae* Petuch. In the younger species the spire is a bit higher and the shell becomes smooth between the varices at a slightly earlier stage; the shell generally has a less scabrous appearance.

MUREXIELLA (MUREXIELLA) PETITI  
Vokes

Plate 16, figure 7

*Murexiella (Murexiella) petiti* VOKES, 1968, Tulane Stud. Geol., v. 6, no. 3, p. 116, pl. 5, fig. 3.

*Description*: "Shell markedly biconic; six whorls in the holotype, nucleus lacking. Spiral ornamentation consisting of two strong ribs on each of the spire whorls and five such ribs on the body whorl, becoming almost obsolete in the in-

tervarical areas of the adult shell. In addition, on the body whorl a few small threads irregularly placed. Axial ornamentation of small equal varices, seven to each turn. Where the spiral ribs cross the varices, small foliaceous open spines are produced, five major spines on the body whorl and two more on the siphonal canal; between the shoulder spine and the suture two smaller spines developed, although no corresponding spiral ribs appear in the intervarical areas. Spines connected by a laminar webbing. Aperture round, almost entire; outer lip slightly crenulated by infolding into apertural spines; inner lip smooth and standing well forward from the columellar wall. Siphonal canal short, recurved, almost closed over by a thin plate, but remaining open by a narrow slit." (Vokes, 1968)

*Holotype*: USNM 645893; height 21.0 mm, diameter 15.0 mm.

*Type locality*: TU 558, Waccamaw Formation; borrow pits, north end of Crescent Beach Airport, Crescent Beach, Horry County, South Carolina.

*Occurrence*: Waccamaw Formation, South Carolina.

*Figured specimen*: USNM 645893 (holotype).

*Discussion*: No additional material has been recovered of *M. petiti* and nothing can be added to the description. Previously, it was suggested that this new species might be ancestral to *M. levicula*, which is also smooth between the varices. But, as noted above, we now have a specimen of *M. levicula* from the APAC quarry at Sarasota, probably older but certainly as old as the Waccamaw specimen.

In overall outline *M. petiti* is most closely related to the Recent *M. kalafuti* Petuch, also marked by a biconic outline, but the younger species has strong spiral cords where *M. petiti* is almost smooth between the varices of the body whorl.

MUREXIELLA (MUREXIELLA) HILLI Petuch  
Plate 13, figure 6

*Murexiella macgintyi* (Smith). KAICHER, 1973, Card Catalogue World-wide Shells, pack 2, Muricidae - Part I, no. 110; ABBOTT and DANCE, 1982, Compendium Seashells, p. 143, color fig.; DE JONG and COOMANS, 1988, Stud. Fauna Curaçao, Caribbean Islands, v. 49, p. 73 (in part) (*not* of Smith).

*Murexiella* n. sp. FAIR, 1976, The Murex Book, pl. 20, figs. 275, 275a; VOKES, 1984, Shells and Sea Life, v. 16, no. 11, p. 212, back cover color photograph.

*Murexiella hilli* PETUCH, 1987, New Caribbean Moll. Faunas, p. 99, pl. 17, figs. 6, 7; KAICHER, 1991, Card Catalogue World-



wide Shells, pack 59, Muricidae – Part VI, no. 6100 (holotype).

*Murexiella fasciatus [sic]* (Vokes). SUNDERLAND and SUNDERLAND, 1992, Amer. Conchologist, v. 20, no. 3, p. 14, text-fig. [not *M. faceta* (Vokes)].

*Description*: “Shell large for genus, globose, with inflated whorls and rounded shoulders; spire moderately elevated; siphonal canal long, straight; aperture large in proportion to shell size, oval; 8 recurved varices per whorl; body whorl ornamented with 5 large, fimbriated cords between varices; large, recurved, fimbriated spine on varix where intersected by cord; subsutural area flattened, producing stepped spire; spire whorls with 2 fimbriated cords; siphonal canal with 3 large, fimbriated and branching curved spines; 2 smaller spines between 3 siphonal spines; siphonal spines curved posteriorward; color varying from white to pink, salmon (holotype), lavender and dark brown; brown band around subsutural area; siphonal canal generally white.” (Petuch, 1987)

*Holotype*: USNM 869842; height 34 mm, diameter 22 mm.

*Type locality*: Malmok, Aruba Island, Netherlands Antilles, on mussel beds at low tide.

*Occurrence*: Recent only, Aruba, Netherlands Antilles.

*Figured specimen*: USNM 838034; height 35.4 mm, diameter 22.8 mm; locality, north coast of Aruba, 1 meter, on barnacles.

*Discussion*: Although closely related to *M. macgintyi*, this species differs in being more elaborately spinose. As the author notes, the siphonal canal bears three spines in addition to two smaller spines in the “pinched portion” between the body whorl, and the siphonal canal. The individual spines are extremely elongated and adaperturally recurved. In spite of the overall similarity to *M. macgintyi*, I believe this to be a valid, though very localized, species.

#### MUREXIELLA (MUREXIELLA) TAYLORAE

Petuch

Plate 13, figure 7

*Murexiella* n. sp. FAIR, 1976, The Murex Book, pl. 20, figs. 274, 274a; VOKES, 1984, Shells and Sea Life, v. 16, no. 11, p. 212, pl. 2, fig. 10.

*Murexiella taylorae* PETUCH, 1987, New Caribbean Moll. Faunas, p. 26, pl. 10, figs. 8, 9; PETUCH, 1988, Neogene Hist. Trop. Amer. Moll., p. 153, pl. 31, fig. 7 (holotype); KAICHER, 1991, Card Catalogue Worldwide Shells, pack 59, Muricidae – Part VI, no. 6080 (holotype); SUNDERLAND and

SUNDERLAND, 1992, Amer. Conchologist, v. 20, no. 3, p. 14, text-fig.

*Description*: “Shell small for genus, with oval body, elevated spire, and long siphonal canal; 7 varices per whorl; varices with 6 large, strongly-recurved spines; intervarical areas with 6 large fimbriated cords; siphonal canal with 2 large, recurved spines; last spines of siphonal canal greatly recurved, almost touching varical spines; shoulder sharply angled; spire whorls tabulate; shell color rosy-tan with dark rose spots in pits at the base of each varix; siphonal canal pinkish-rose; interior of aperture pinkish-rose.” (Petuch, 1987)

*Holotype*: USNM 859844; height 16.0 mm; diameter 6.4 mm.

*Type locality*: Off Cedar Key, Florida, trawled in 200 meters.

*Occurrence*: Recent only, Gulf of Mexico.

*Figured specimen*: USNM 838033; height 21.6 mm, diameter 14.8 mm; locality, west of Cape San Blas, Florida, 182 meters [“100 fathoms”].

*Discussion*: As Petuch noted in his description, this species differs from *M. graceae* “in being smaller, more globose in shape, and having a proportionally higher spire” (Petuch, 1987, p. 26).

#### MUREXIELLA (MUREXIELLA) KALAFUTI

Petuch

Plate 16, figure 8

*Murexiella kalafuti* PETUCH, 1987, New Caribbean Moll. Faunas, p. 14, pl. 1, figs. 7, 8; KAICHER, 1991, Card Catalogue Worldwide Shells, pack 59, Muricidae – Part VI, no. 6007 (holotype); SUNDERLAND and SUNDERLAND, 1992, Amer. Conchologist, v. 20, no. 3, p. 14, text-fig.

*Description*: “Shell small for genus, fusiform, with elevated spire; 6 varices per whorl; shoulder sharp-angled; body whorl with 5 large cords; cords end in thick, blunt spines, at intersection with varix; cords minutely fimbriated; varices heavily fimbriated; shell grayish-white with 2 wide, dark brown bands, one around mid-body and one around siphonal canal; suture marked with row of intermittent brown patches; siphonal canal with 2 large cords, producing 2 large spines at intersection with varix; aperture ovate, large in proportion to shell size; dark mid-body band showing through in aperture.” (Petuch, 1987)

*Holotype*: USNM 859810; height 16.0 mm, diameter (including spines) 10.0 mm.

*Type locality*: 50 km south of Apalachicola, Florida, 150 meters.

*Occurrence*: Recent only, western and southern Florida.

*Figured specimen*: Sunderland Collection;



height 15.4 mm, diameter 9.8 mm; locality, lobster traps off Key West, Florida, 24 meters.

*Discussion:* Although there is a strong resemblance between *M. kalafuti* and *M. glypta*, the two species may be distinguished by the more biconic shape of *M. kalafuti*, and by the lack of a secondary cord, which is present at the periphery of

*M. glypta*, between the major cords. As Petuch notes (1987, p. 15), the color pattern of *M. kalafuti* is most like the eastern Pacific *M. vittata* (Broderip, 1833). However, the number of varices (six in *M. kalafuti* vs. eight in *M. glypta*, according to Petuch, *ibid.*) is not a valid character for separation, as all species of *Murexiella* have a variable number of varices.

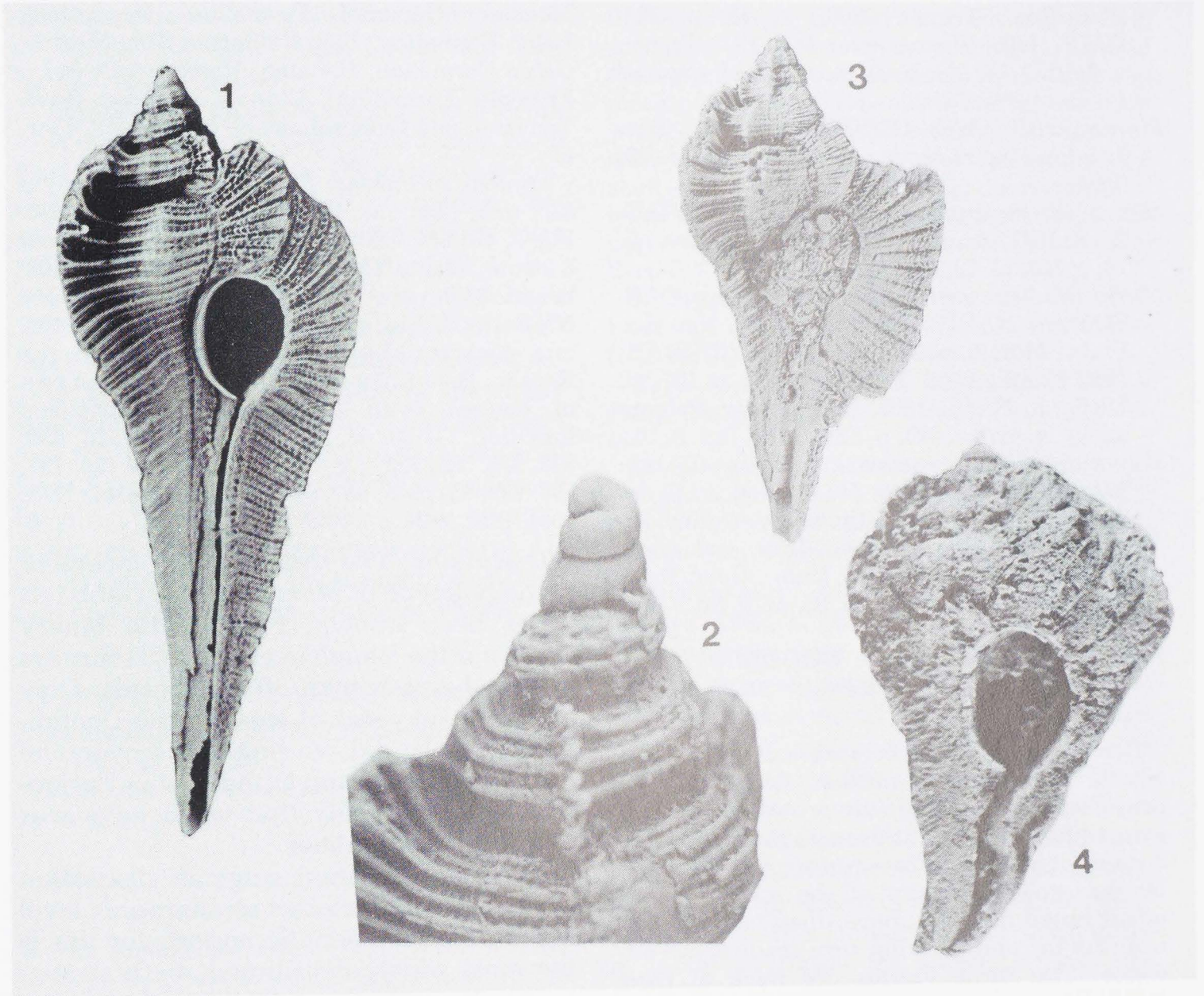


PLATE 17

- | Figures   | Page |
|---|------|
| 1-4. <i>Murexiella (Subpterynotus) textilis</i> (Gabb) . . . . .  | 118  |
| 1. (X 2 1/2) UF 47821; height 32.7 mm, diameter 12.4 mm.<br>Locality: TU 1000, Sarasota, Florida. Pinecrest Beds.                     |      |
| 2. (X 10) USNM 482052; height 13.5 mm, diameter 6.3 mm.<br>Locality: TU 1000, Sarasota, Florida. Pinecrest Beds.                      |      |
| 3. (X 1 1/2) NMB H 17468; height 39.0 mm, diameter 20.4 mm.<br>Locality: NMB 17530, Carrizal, Venezuela. Caujaro Formation.           |      |
| 4. (X 1 1/2) USNM 482063; height 40.0 mm, diameter 25.4 mm.<br>Locality: Santa Rosalia, Baja California Sur, Mexico. Boleo Formation. |      |



## Subgenus SUBPTERYNOTUS

Olsson and Harbison, 1953

*Subpterynotus* OLSSON and HARBISON, 1953, Acad. Nat. Sci. Phila., Mon. 8, p. 246.Type species: *Murex textilis* Gabb, 1873, by original designation.MUREXIELLA (SUBPTERYNOTUS) TEXTILIS  
(Gabb)

Plate 17, figures 1-4

*Murex (Pteronotus) textilis* GABB, 1873, Amer. Phil. Soc., Trans., (N.S.) v. 15, p. 202; DALL, 1890, Wagner Free Inst. Sci., Trans., v. 3, pt. 1, p. 142, pl. 9, fig. 4 (on pl. expl. as *Pteronotus textilis*).*Murex textilis* Gabb. GUPPY, 1876, Geol. Soc. London, Quart. Jour., v. 32, p. 522, pl. 29, fig. 1.*Murex (Pteropurpura) textilis* (Gabb). PILSBRY, 1922, Acad. Nat. Sci. Phila., Proc., v. 73, p. 353, pl. 28, fig. 4 (holotype).*Murex (Subpterynotus) textilis* (Gabb). OLSSON and HARBISON, 1953, Acad. Nat. Sci. Phila., Mon. 8, p. 247, pl. 36, fig. 7; DUBAR, 1958, Florida Geol. Surv., Bull. 40, p. 197, pl. 11, fig. 8; JUNG, 1965, Bulls. Amer. Paleontology, v. 49, no. 223, p. 521, pl. 69, figs. 8, 10.*Murexiella (Subpterynotus) textilis* (Gabb). VOKES, 1968, Tulane Stud. Geol., v. 6, no. 3, p. 120, pl. 8, figs. 1 (holotype)-3; VOKES 1974, Malac. Soc. Australia, Jour., v. 3, no. 1, p. 10, pl. 2, fig. 3; VOKES, Bulls. Amer. Paleontology, v. 97, no. 332, p. 65, pl. 9, fig. 1 (holotype).*Pteronotus textilis* (Gabb). WOODRING, 1970, U.S. Geol. Surv., Prof. Paper 306-E, p. 433, pl. 63, figs. 18, 19.

**Description:** "Shell compressed triangular; whorls eight, the first nuclear, the next three cancellate and showing little or no trace of varices, which show themselves on the next (fifth) distinctly for the first time, suture deep, caused by the great convexity of the whorls. Body whorl broad and flat above, then very convex near the top and tapering very gradually in advance. The three varices are thick at their bases, broad, acute and slightly recurved on the margin. Between each pair of varices there is one large prominent node, placed longitudinally, too broad to be called a rib. The entire surface is covered by about a dozen revolving ribs, except on the faces of the varices, where corresponding grooves take their places. Crossing these, the lines of growth are developed into minute erect plates, placed at equal distances and arching over all the ribs and intermediate, alternating lines, so as to produce under a lens, the effect of a lace, or loosely woven web. Aperture small, ovate; inner lip acute; outer lip faintly grooved internally; canal

about twice as long as mouth and nearly, or entirely arched over." (Gabb, 1973)

**Holotype:** ANSP 3257; height 30.5 mm, diameter 16.0 mm.**Type locality:** TU 1364, Baitoa Formation; Boca de los Ríos, below the waterfall in Arroyo Hondo, which enters Río Yaque del Norte from the east, just below the confluence with the Río Bao, downstream from Baitoa, Dominican Republic (restricted by Vokes, 1989, p. 66).**Occurrence:** Baitoa Formation, Dominican Republic; Cantaure Formation and Mataruca Member, Caujarao Formation, Venezuela; Boleo Formation, Baja California Sur, Mexico; Gatun Formation, Panama; Pinecrest Beds [= Fruitville Formation], Chipola, Jackson Bluff, Tamiami, and Caloosahatchee formations, Florida.**Figured specimens:** Fig. 1, UF 47821; height 32.7 mm, diameter 12.4 mm; locality TU 1000. Fig. 2, USNM 482052; height 13.5 mm, diameter 6.3 mm; locality TU 1000. Fig. 3, NMB H 17468; height 39.0 mm, diameter 20.4 mm; locality NMB 17530. Fig. 4, USNM 482063; height 40.0 mm, diameter 25.4 mm; locality, north of Santa Rosalia, Baja California Sur, Mexico (latex cast of natural mold in limestone). Additional localities: TU 60, 68, 79, 202, 203, 519, 520, 536, 546, 579, 583, 726, 728-730, 745, 755, 767-770, 797, 830, 939, 951, 975, 987, 991, 998, 1023, 1044, 1175, 1364, 1512, 1524.**Discussion:** The stratigraphic placement of the holotype of *Murex textilis* Gabb has never been known. Neither the Maury (1917) nor the Vaughan *et al.* (1921) surveys collected a specimen of the species. Only after several years of work in the Dominican Republic did we finally discover one incomplete specimen in the Baitoa Formation, from a locality that we believe was one of Gabb's localities.

As noted in my original discussion (Vokes, 1968), the exact stratigraphic level is not of great scientific import, for this is the most widely distributed, both stratigraphically and geographically, of any species in the entire subfamily. In 1968 I figured a specimen from the Chipola Formation (Vokes, 1968, pl. 8, fig. 3) and we now have a total of six specimens from this formation. Most are small but Paul Drez, Albuquerque, New Mexico, collected one specimen at locality TU 951 that measures 41 mm in height. Jung (1965, pl. 69, figs. 8, 10) figured it from the correlative Early Miocene Cantaure Formation, Venezuela.

The species occurs in some numbers in the Plio-Pleistocene Pinecrest Beds [=



Fruitville Formation], and the Jackson Bluff, Tamiami, and Caloosahatchee formations of Florida. Woodring (1970, pl. 63, figs. 18, 19) figured it from the Gatun Formation, Panama. In the Gibson Smith Collection at the Naturhistorisches Museum, Basel, there is an example from the Mataruca Member, Caujaro Formation, Venezuela (pl. 17, fig. 3). The most unexpected occurrence is a specimen collected by James and Judith Terry Smith, from the Late Miocene Boleo Formation, north of Santa Rosalia, Baja California Sur, Mexico (pl. 17, fig. 4).

Though recorded as fossil from Florida to Venezuela and Baja California, from Early Miocene to Late Pliocene, the species disappeared leaving no modern descendant. The only living forms are "*Murex*" *exquisitus* Sowerby, 1904, believed to be from South Africa (Houart, 1980) and the distantly related "*Murex*" *tatei* Verco, 1895, from southern Australia.

In 1968 I noted that none of the many specimens in our collections had the nuclear whorls preserved. Finally, in material from Sarasota, Florida (TU 1000), collected by Mrs. Susan B. Stephens, one juvenile with well preserved nuclear whorls (pl. 17, fig. 2) shows that the protoconch consists of two and one-half large, bulbous whorls.

#### Genus HOMALOCANTHA Mörch, 1852

*Homalocantha* MÖRCH, 1852, Cat. Conch. Yoldi., pt. 1, p. 95.

Type species: *Murex scorpio* Linnaeus, 1758, by monotypy.

#### HOMALOCANTHA CRISPANGULA (Heilprin)

Plate 18, figure 1

*Murex larvaecosta* HEILPRIN, 1886, Wagner Free Inst. Sci., Trans., v. 1, p. 106, pl. 15, fig. 37.

*Murex crispangula* HEILPRIN, 1886, Wagner Free Inst. Sci., Trans., v. 1, p. 107, pl. 15, fig. 38.

*Chicoreus larvaecosta* (Heilprin). DALL, 1915, U.S. Natl. Mus., Bull. 90, p. 75.

*Chicoreus crispangula* (Heilprin). DALL, 1915, U.S. Natl. Mus., Bull. 90, p. 75, pl. 5, fig. 14.

*Murex (Chicoreus) larvaecosta* Heilprin. MANSFIELD, 1937, Florida Geol. Surv., Bull. 15, p. 129, pl. 5, fig. 9.

*Murex (Chicoreus) crispangula* Heilprin. MANSFIELD, 1937, Florida Geol. Surv., Bull. 15, p. 130.

*Murexiella (Murexiella) crispangula* (Heilprin). VOKES, 1968, Tulane Stud. Geol., v. 6, no. 3, p. 107, pl. 6, fig. 1.

*Murexiella crispangula* (Heilprin). VOKES, 1985, Malac. Soc. Australia, Jour., v. 7, nos. 1-2, p. 68, pl. 1, fig. 6.

*Homalocantha crispangula* (Heilprin). VOKES, 1989, Bulls. Amer. Paleontology, v. 97, no. 332, p. 67.

*Description*: "Shell strongly angulated, markedly rugose; spire elevated, of about five volutions; varices six (on the body whorl), sharp, deflected obliquely toward the base of the shell; surface of shell very strongly lined, the lines of three series, primary, secondary, and tertiary; those of the first series about ten on the body whorl, very prominently elevated on the varices, becoming spinose toward the base of the shell and on the apertural varix; aperture slightly exceeding one-half the length of shell, the very narrowly-contracted canal gently deflected." (Heilprin, 1886)

*Holotype*: Wagner Free Institute Sci. 867; height 1.6 inches [40.6 mm], diameter 0.7 inches [17.8 mm] (*fide* Heilprin, 1886, p. 107).

*Type locality*: Tampa Limestone; Ballast Point, Tampa Bay, Hillsborough County, Florida.

*Occurrence*: Tampa Limestone, Florida.

*Figured specimen*: USNM 214442; height 42.5 mm, diameter 24.0 mm; locality, Ballast Point, Tampa Bay, Hillsborough County, Florida.

*Discussion*: As discussed previously (Vokes, 1968, p. 108), the two forms named *Murex larvaecosta* and *Murex crispangula* by Heilprin represent the same species, and as "first reviser" I selected the name "*crispangula*" as more descriptive of the taxon, placing it in the genus *Murexiella*.

At the same time, I noted a close relationship between the two Florida species, *M. crispangula* and *M. calhounensis*, and the living eastern Pacific species referred to the genus *Homalocantha*. With more material available for study, it now appears that *Homalocantha* is older than originally believed and these western Atlantic species are *bona fide* members of *Homalocantha*.

#### HOMALOCANTHA CALHOUNESIS (Vokes)

Plate 18, figures 2-4

*Murexiella (Murexiella) calhounensis* VOKES, 1968, Tulane Stud. Geol., v. 6, no. 3, p. 110, pl. 5, fig. 4.

*Homalocantha calhounensis* (Vokes). VOKES, 1989, Bulls. Amer. Paleontology, v. 97, no. 332, p. 67.



*Description:* "Early whorls of holotype worn but embryonic shell apparently 1 1/2 smooth bulbous whorls, five post-nuclear whorls. Spiral sculpture on early whorls of two strong ribs alternating with three secondary riblets; on body whorl five strong spiral ribs with two more on extended siphonal canal. Between each pair of major spirals a single secondary riblet flanked by a tertiary thread on either side. Axial ornamentation on first post-nuclear whorl consisting of about ten small varices, reduced to eight on second post-nuclear whorl and to seven on each succeeding whorl. Where each spiral element crosses the varices pointed spines produced, proportional to the rank of the spiral rib; that spine at the shoulder only slightly stronger than the others. Numerous small axial growth lines crossing the spiral ornamentations give a scabrous appearance to entire shell surface. Aperture broken but probably round and almost entire; siphonal canal long and straight, not recurved at distal end." (Vokes, 1968)

*Holotype:* USNM 645891; height 31.9 mm, diameter 17.7 mm.

*Type locality:* TU 555, Chipola Formation; east bank of Chipola River about 1000 ft. above the mouth of Fourmile Creek (SW 1/4, Sec. 29, T1N, R9W), Calhoun County, Florida.

*Occurrence:* Chipola Formation, Florida.

*Figured specimens:* Fig. 2, USNM 482053; height 44.1 mm, diameter 23.0 mm; locality TU 547. Fig. 3, USNM 645891 (holotype). Fig. 4, USNM 482054; height (incomplete) 19.7 mm, diameter 18.8 mm; locality TU 830. Additional locality: TU 818.

*Discussion:* When described, the aperture of *H. calhounensis* was not known, but additional material shows it as typical of the group, almost circular, with an entire margin. The siphonal canal is more elongate than previously supposed, and in

some examples the varical spines become extremely long (see pl. 18, fig. 4). Although described as *Murexiella*, the almost disjunct nature of the whorls, and especially the smooth "pad" at the posterior end of the columellar lip, indicates placement in the closely related genus *Homalocantha*.

The entire specimen shown in pl. 18, figure 2 was collected by Mr. Paul Drez, Albuquerque, New Mexico, who generously gave the specimen to me for study and illustration.

#### HOMALOCANTHA species

##### Plate 18, figure 5

*Homalocantha* species. VOKES, 1989, *Bulls. Amer. Paleontology*, v. 97, no. 332, p. 66, pl. 8, fig. 10.

*Figured specimen:* USNM 323899; height (incomplete) 15.4 mm, diameter (incomplete) 10.9 mm; locality TU 1249.

*Discussion:* From a small outcrop of middle Miocene age sediments in the southern Dominican Republic we have collected a single incomplete example of an unusual species of *Homalocantha*. It most nearly resembles the Indo-Pacific *H. zamboi* (Burch and Burch, 1960) but the specimen is too incomplete to do more than report its occurrence. However, the presence of a form with this morphology should be noted.

#### Genus FAVARTIA Jousseau, 1880

##### Subgenus FAVARTIA s.s.

*Favartia* JOUSSEAUME, 1880, *Le Naturaliste*, Année 2, no. 42, p. 335.

### PLATE 18

Figures	Page
1. <i>Homalocantha crispangula</i> (Heilprin) . . . . .	119
(X 1 1/2) USNM 214442; height 42.5 mm, diameter 24.0 mm. Locality: Tampa Bay, Florida. Tampa Limestone.	
2-4. <i>Homalocantha calhounensis</i> (Vokes) . . . . .	119
2. (X 1 1/2) USNM 482053; height 44.1 mm, diameter 23.0 mm. Locality: TU 547, Chipola River, Florida. Chipola Formation.	
3. (X 1 1/2) USNM 645891 (holotype); height 31.9 mm, diameter 17.7 mm. Locality: TU 555, Chipola River, Florida. Chipola Formation.	
4. (X 2) USNM 482054; height (incomplete) 19.7 mm, diameter 18.8 mm. Locality: TU 830, Tenmile Creek, Florida. Chipola Formation.	
5. <i>Homalocantha</i> species . . . . .	120
(X 3) USNM 323899; height (incomplete) 15.4 mm, diameter (incomplete) 10.9 mm. Locality: TU 1249, San Cristobal, Dominican Republic. Unknown formation.	



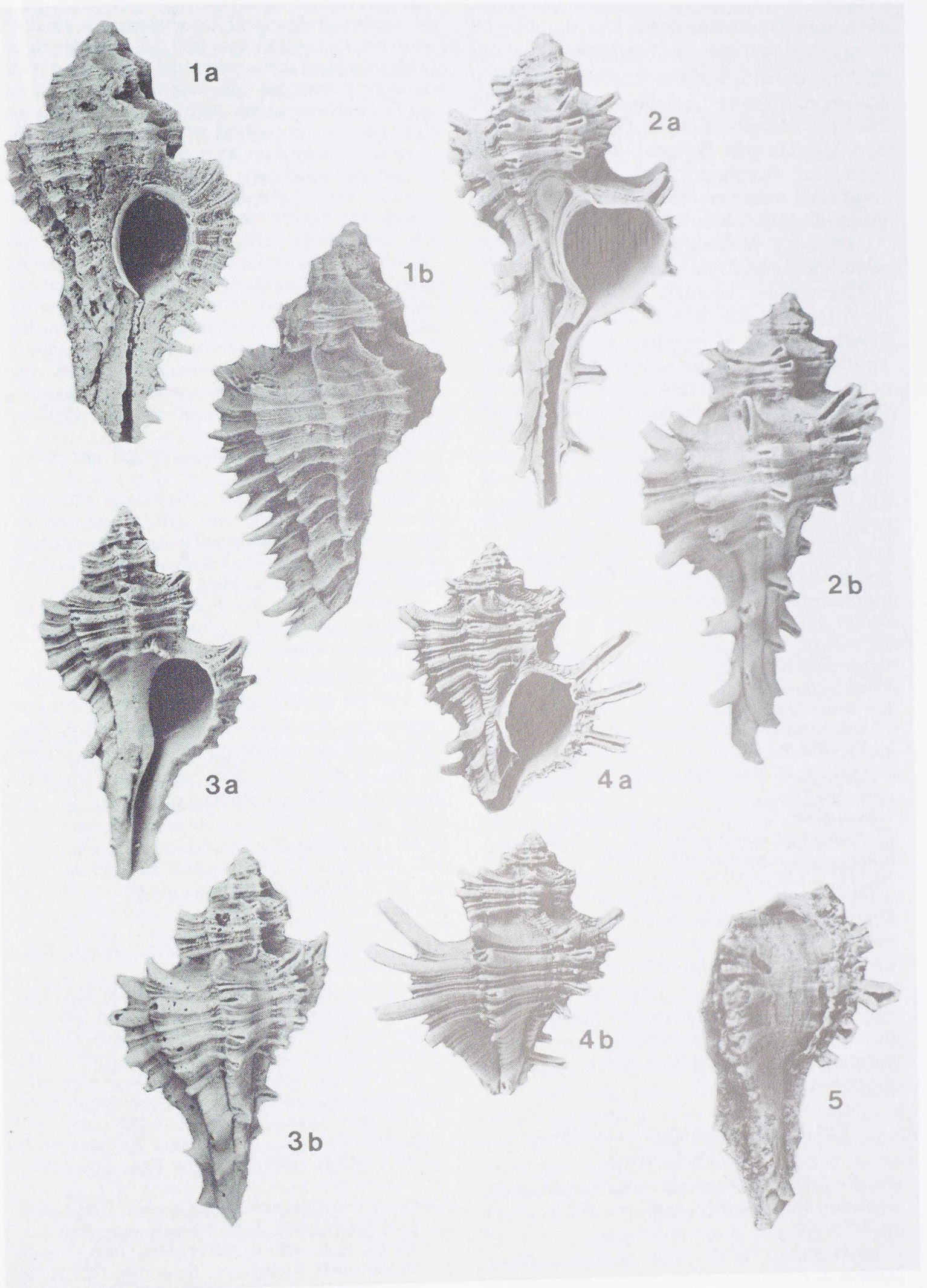


PLATE 18



Type species: *Murex breviculus* Sowerby, 1841, by original designation.

*Discussion:* In the Mio-Pliocene of Europe there are three named species of *Favartia*: "*Murex*" *suboblongus* d'Orbigny, 1852 (= *Murex oblongus* Grateloup, 1833, non *M. oblongus* Brocchi, 1814); "*Murex*" *kostejana* Boettger, 1901, and "*Murex*" *peyroti* Montanaro, 1935. Considering the variability of the species of this genus in America it is probable that all three represent a single biologic species.

The earliest records of this European form (pl. 19, fig. 3) are from the middle Miocene beds of France, Italy, Austria, and Hungary. It persists through the Pliocene in Italy but then disappears. Presumably, *Favartia cyclostoma* (Sowerby, 1841) (pl. 21, fig. 6) and other similar Indo-Pacific species are its living descendants. The New World species *F. cellulosa* and *F. nuceus* presumably also are descended from this ancestral form, as it has characters in common with both: the overall outline in *F. cellulosa* and the filigreed ornamentation in *F. nuceus*.

FAVARTIA (FAVARTIA) species  
Plate 19, figure 1

*Favartia (Favartia) species.* VOKES, 1989, *Bulls. Amer. Paleontology*, v. 97, no. 332, p. 71, pl. 8, fig. 13.

*Occurrence:* Cercado and Gurabo formations; Dominican Republic.

*Figured specimen:* USNM 323902; height 6.4 mm, diameter 3.9 mm; locality TU 1230. Additional locality: TU 1227A.

*Discussion:* In our collections from the Dominican Republic there are two immature specimens (one each from TU 1230 and TU 1227A), which are totally unlike any other species of *Favartia*. As both specimens are juveniles the species was not named, but as the oldest occurrence of the genus in the New World, it is important to record this form.

FAVARTIA (FAVARTIA) ZALAYA Vokes  
Plate 19, figure 2

*Favartia (Favartia) zalaya* VOKES, 1989, *Bulls. Amer. Paleontology*, v. 97, no. 332, p. 70, pl. 8, fig. 12.

*Description:* "Shell with five post-nuclear whorls and a protoconch of one-and-one-half smooth, bulbous turns. Spiral ornamentation in-

itially of two strong cords, gradually developing a median groove and intercalating a smaller cord between each major pair; adult body whorl with six strong flattened cords, alternating with weaker threads; an additional two strong cords on the siphonal canal. Axial ornamentation on first post-nuclear whorl of 10 small laminae, gradually diminishing in number but increasing in strength; adult body whorl ornamented by six rounded varices. Apertural face of the varices covered by minute laminae, looping outward on the spiral cords, giving a scabrous appearance to the shell. Spire high, approximately 60% of total height; suture undulated by varices but not impressed. Aperture rounded; outer lip bearing several weak, paired, lirations within; inner lip smooth, free-standing in advance of the aperture. Siphonal canal broad, very short, recurved at distal end; umbilicus formed by scale-like terminations of former canals." (Vokes, 1989)

*Holotype:* USNM 323901; height 8.0 mm, diameter 4.6 mm.

*Type locality:* TU 1227A, Gurabo Formation; Arroyo Zalaya, which crosses the road to Jánico from Santiago de los Caballeros, 11 km south of the bridge over the Río Yaque del Norte at Santiago, Dominican Republic.

*Occurrence:* Gurabo Formation, Dominican Republic.

*Figured specimen:* USNM 323901 (holotype).

*Discussion:* As discussed in the description of this small species, it is presumed ancestral to the Recent *F. minirosea* (Abbott), and demonstrates the development of that rather atypical species from the more typical *Favartia* morphotype.

FAVARTIA (FAVARTIA) CELLULOSA  
(Conrad)

Plate 20, figures 1-7

Plate 21, figures 1-5

*Murex cellulosa* CONRAD, 1846, *Acad. Nat. Sci. Phila., Proc.*, v. 3, p. 25.

*Murex jamaicensis* G.B. SOWERBY, II, 1879, *Thes. Conch.*, v. 4, *Murex*, pl. 23, fig. 223.

*Ocinebra (Favartia) cellulosa* (Conrad). DALL, 1889, *Harvard Mus. Comp. Zool., Bull.*, v. 18, p. 210 only, not pl. 16, fig. 1 [= *Murexiella levicula* (Dall)]; DALL, 1890, *Wagner Free Inst. Sci., Trans.*, v. 3, pt. 1, p. 150.

*Ocinebra (Favartia) (intermedia Adams var.?) alta* DALL, 1890, *Wagner Free Inst. Sci., Trans.*, v. 3, pt. 1, p. 150.

*Murex (Favartia) cellulosus* Conrad. DALL and SIMPSON, 1901, *U.S. Fish Comm., Bull.*, v. 20, pt. 1, p. 408; COSSMANN, 1903, *Essais Paléoconch. Comp.*, v. 5, p. 30; CLENCH and PÉREZ FARFANTE, 1945, *Johnsonia*, v. 1, no. 17, p. 53, pl. 27, figs. 5-8; OLSSON



and HARBISON, 1953, Acad. Nat. Sci. Phila., Mon. 8, p. 245, pl. 36, figs. 6, 6a; ABBOTT, 1954, Amer. Seashells, p. 204 (in part), not fig. 45b [= *Murexiella levicula* (Dall)]; PERRY and SCHWENGEL, 1955, Marine Shells West Coast Florida, p. 155, pl. 31, fig. 217; WARMKE and ABBOTT, 1961, Caribbean Seashells, p. 106, fig. 19f; RADWIN and WELLS, 1968, Bull. Mar. Sci., v. 18, no. 1, p. 72, text-figs. 4 (radula), 17 (borehole), and 20-F (shell); RIOS, 1970, Coastal Brazilian Seashells, p. 79; HUMFREY, 1975, Sea Shells of the West Indies, p. 136 (in part), not pl. 16, fig. 4 [= *Murexiella macgintyi* (Smith)].

*Ocinebra (intermedia) Adams var.?) alta* Dall. SCHUCHERT *et al.*, 1905, U.S. Natl. Mus., Bull. 53, p. 449.

*Tritonalia cellulosa* (Conrad). M. SMITH, 1939, Illus. Cat. Recent Species Rock Shells, p. 16, pl. 12, fig. 16 (SMITH, 1953, *ibid.*); PERRY, 1940, Bulls. Amer. Paleontology, v. 26, no. 95, p. 143, pl. 31, fig. 217; GARDNER, 1948, U.S. Geol. Surv., Prof. Paper 199, p. 219, pl. 29, fig. 16.

*Tritonalia nuceus* (Mörch). M. SMITH, 1939, Illus. Cat. Recent Species Rock Shells, p. 16, pl. 12, fig. 19 (SMITH, 1953, *ibid.*) (not of Mörch).

*Murex (Favartia) cellulosa nuceus* Mörch. RIOS, 1970, Coastal Brazilian Seashells, p. 79, pl. 21; HUMFREY, 1975, Sea Shells of the West Indies, p. 136 (in part), pl. 16, fig. 5 (not of Mörch).

*Favartia cellulosa* (Conrad). ABBOTT, 1974, Amer. Seashells (ed. 2), p. 187 (in part), not fig. 1953 [= *F. nuceus* (Mörch)]; KAICHER, 1974, Card Catalogue World-wide Shells, pack 6, Muricidae - Part II, no. 516; RIOS, 1975, Brazilian Marine Moll. Icon., p. 86, pl. 25, fig. 355; RADWIN and D'ATTILIO, 1976, Murex Shells of the World, p. 146, pl. 24, figs. 4, 5 only [fig. 6 = *F. nuceus*]; FAIR, 1976, The Murex Book, p. 30, pl. 20, fig. 298; ABBOTT and DANCE, 1982, Compendium Seashells, p. 144 (in part), not color fig. [= *F. nuceus*]; RIOS, 1985, Seashells of Brazil, p. 85, pl. 30, fig. 272 (lower fig. only; upper fig. = *F. nuceus*); VOKES, 1985, Conch. Amer., Bull., v. 13, no. 2, p. 32, pl. 3, figs. 27, 28; PETUCH, 1988, Neogene Hist. Trop. Amer. Moll., p. 152, pl. 29, fig. 8; DE JONG and COOMANS, 1988, Stud. Fauna Curaçao, Caribbean Islands, v. 49, p. 73 (including *F. nuceus* in synonymy); HOUART, 1991, Nautilus, v. 105, no. 1, p. 31.

*Favartia (Favartia) cellulosa* (Conrad). VOKES, 1984, Shells and Sea Life, v. 16, no. 11, p. 214.

*Description*: "Short-fusiform, with large, prominent revolving lines or costae, the inter-

stices with transverse wrinkled lines, largest on the varices, and giving the shell a cellular aspect; beak much curved; color cinereous; aperture small, obovate, purplish within." (Conrad, 1846)

*Holotype*: Not found (not at ANSP, Nancy W. Rulon, letter, 1970).

*Type locality*: Tampa Bay, Hillsborough County, Florida.

*Occurrence*: Duplin Formation, North Carolina (*vide* Gardner, 1948, p. 219); Waccamaw Formation, South Carolina; Pinecrest Beds [= Fruitville Formation], Tamiami, Caloosahatchee, and Bermont formations, Florida; Holocene, Louisiana; Recent, from Bermuda to Espírito Santo, Brazil.

*Figured specimens*: PLATE 20. Fig. 1, USNM 482056; height 21.9 mm, diameter 12.6 mm; locality TU 1000. Fig. 2, USNM 482057; height 20.2 mm, diameter 12.3 mm; locality TU 1000. Fig. 3, USNM 112180 (lectotype - *Ocinebra alta* Dall); height 17.4 mm, diameter 10.0 mm; locality, Ft. Denaud, Lee County, Florida (= TU 203). Fig. 4, USNM 112178 (paralectotype - *Ocinebra alta* Dall); height 24.6 mm, diameter 12.3 mm; locality, Shell Creek, Charlotte County, Florida (= TU 539B). Fig. 5, USNM 482058; height 21.7 mm, diameter 12.0 mm; locality TU 974. Fig. 6, USNM 482059; height 18.8 mm, diameter 12.0 mm; locality TU 523. Fig. 7, USNM 482060; height 16.5 mm, diameter 10.5 mm; locality TU 803. PLATE 21. Fig. 1, USNM 880020; height 21.0 mm, diameter 12.8 mm; locality, Johns Pass, Pinellas County, Florida, 50 meters. Fig. 2, USNM 880021; height 15.3 mm, diameter 9.0 mm; locality, Johns Pass, Pinellas County, Florida, 50 meters. Fig. 3, USNM 880022; height 17.3 mm, diameter 9.7 mm; locality, Tea Table Key, Monroe County, Florida. Fig. 4, USNM 880023; height 21.2 mm, diameter 14.5 mm; locality TU 977. Fig. 5, USNM 880024; height (incomplete) 15.5 mm, diameter 10.5 mm; locality TU 977. Additional localities: TU 68, 201, 202, 203, 529A, 529B, 536, 539A, 539B, 558, 580, 726, 727, 759, 767, 768, 791, 797, 816, 933, 975, 978, 991, 1175, 1177, 1491, 1512, 1524.

*Discussion*: *Favartia cellulosa* first appears in the mid-Pliocene beds of southern Florida: in the Tamiami facies (localities TU 1175, 1177) and in the Pinecrest Beds (TU 797, 933, 1000, 1491, 1524). The mid-Pliocene form is very like the living shell (pl. 20, figs. 1, 2), but a different morphotype appears at many localities in the Caloosahatchee Formation. This latter form, more elongate than the typical species, was given the name "*Ocinebra*" *alta* by Dall (1890, p. 150).

It is evident from the treatment accorded "*Ocinebra*" *cellulosa*, *levicula*, *intermedia*,



and *alta* by Dall (1889, pp. 210-211; 1890, p. 150) that he did not understand the group. As noted above under the genus *Murexiella*, there is a marked degree of similarity between *Favartia* and *Murexiella* (where *levicula* is now placed) but one certainly has no difficulty distinguishing the two species. Likewise, there is a strong similarity between *Favartia* s.s. and the subgenus *Caribiella* (where *intermedia* [i.e., *alveata*] is now placed) but, again, the species are easily separable.

There is an additional problem with "*Ocinebra*" *alta*, as Schuchert *et al.*, (1905, p. 449) evidently selected the wrong specimen for a lectotype of the species. In the type lot of "*Ocinebra*" *alta*, at the U.S. National Museum, there are three adult specimens and ten juveniles. One of these specimens (USNM 112178, from Shell Creek, pl. 20, fig. 4) matches the dimensions cited by Dall in his table of comparison between *cellulosa*, *intermedia*, and *alta* (1890, p. 150). In my opinion, this specimen should have been selected as lectotype. But, instead, a different shell (USNM 112180, from Ft. Denaud, pl. 20, fig. 3) was selected by Schuchert *et al.* as the lectotype. This specimen does not even have an elongated form but is a typical *F. cellulosa*.

In general, the Pliocene examples of *F. cellulosa* are more elongate than the living ones. But, in the Recent fauna there are tall specimens and short specimens, fat ones and thin ones, examples with five varices and those with as many as eight varices. Some are rounded (pl. 21, fig. 3), some elaborately varixed (pl. 21, fig. 4). In truth, there are so many variations in the living fauna, commonly occurring at the same locality, that neither the fossil nor the Recent variations are worthy of separation.

This, the most widespread of the American *Favartia* species, ranges from Bermuda (Castle Harbour, Bermuda) to Florida and the Gulf of Mexico, Dominican Republic (TU R-360, R-423), Puerto Rico (TU R 326), and St. Croix (TU R-318) to Brazil. Rios (1970, p. 79; 1975, p. 86) records occurrences as far south as Rio Grande do Norte and Houart (1991, p. 31) extends the range to Espírito Santo. I have no knowledge of specimens from Central America or northern South America.

The depth of occurrence also is wide ranging. Most specimens are taken intertidally on mussel beds; but there are examples dredged from 50 meters at Johns Pass (west of St. Petersburg), Florida (pl. 21, figs. 1, 2), and we have beautiful speci-

## PLATE 19

Figures	Page
1. <i>Favartia (Favartia)</i> species . . . . .	122
(X 7) USNM 323902; height 6.4 mm, diameter 3.9 mm. Locality: TU 1230, Río Cana, Dominican Republic. Cercado Formation.	
2. <i>Favartia (Favartia) zalaya</i> Vokes . . . . .	122
(X 6) USNM 323901 (holotype); height 8.0 mm, diameter 4.6 mm. Locality: TU 1227A, Arroyo Zalaya, Dominican Republic. Gurabo Formation.	
3. <i>Favartia (Favartia) suboblonga</i> (d'Orbigny) . . . . .	122
(X 3) NMB H 17471; height 15.8 mm, diameter 10.0 mm. Locality: Pontlevoy, France. Helvetian.	
4. <i>Favartia (Favartia) micromeris</i> Dall . . . . .	128
(X 6) USNM 482055; height 7.3 mm, diameter 4.6 mm. Locality: TU 529B, Caloosahatchee River, Florida. Caloosahatchee Formation.	
5-7. <i>Favartia (Favartia) minirosea</i> (Abbott) . . . . .	128
5. (X 6) USNM 880017; height 7.3 mm, diameter 4.0 mm. Locality: TU R-99, off Quintana Roo, Mexico. Recent.	
6. (X 6) USNM 880018; height 9.0 mm, diameter 5.4 mm. Locality: off Cedar Key, Florida. Recent.	
7. (X 6) USNM 880019; height 7.1 mm, diameter 4.0 mm. Locality: off Egmont Key, Florida. Recent.	



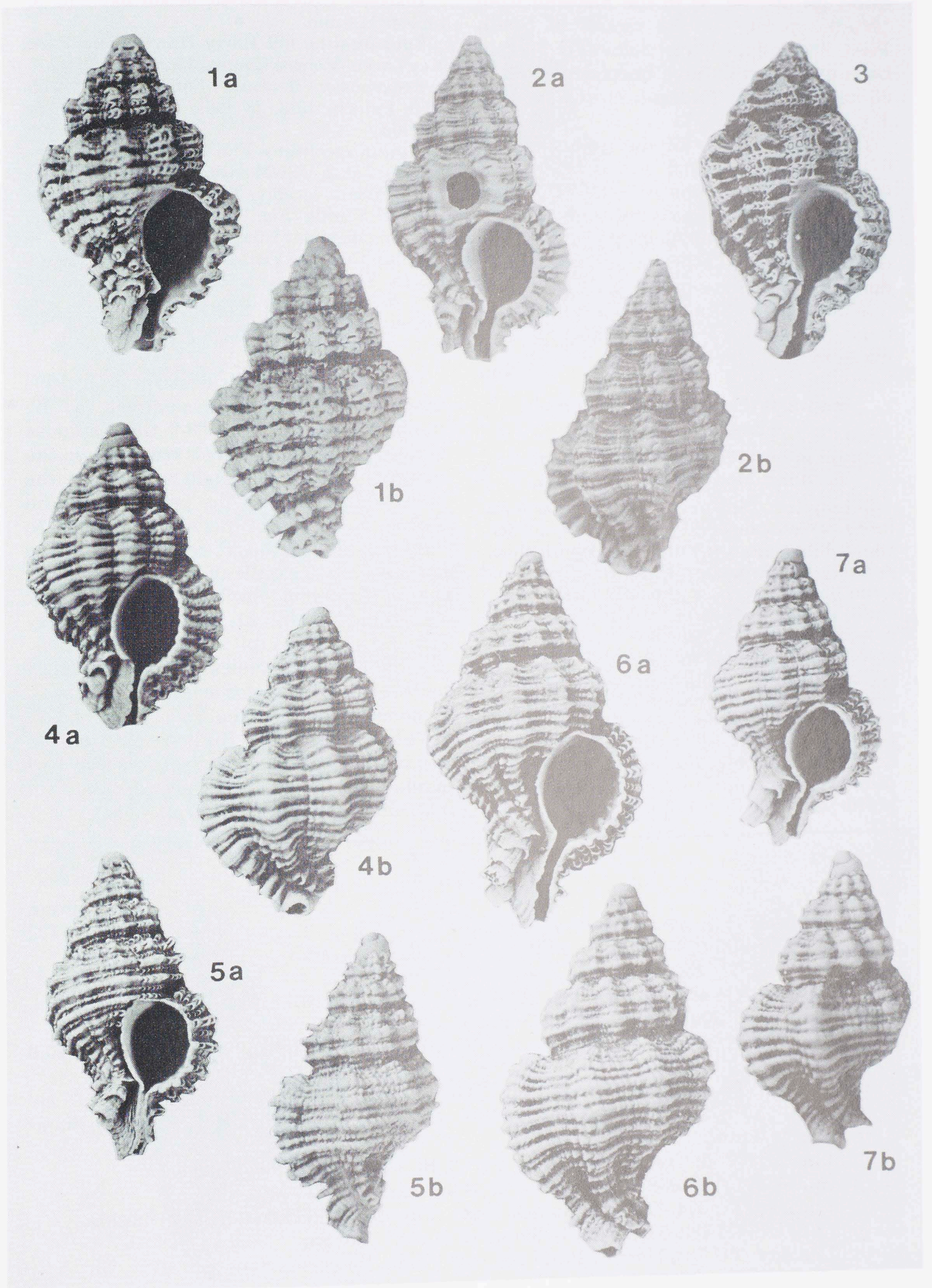


PLATE 19



mens (pl. 21, fig. 4) in the material from "Mudlump 90," at the mouth of South Pass, Mississippi River delta (TU 977), in beds estimated to have been deposited in 60 meters depth (Morgan *et al.*, 1963, p. 41).

In my Catalogue of the genus *Murex* (Vokes, 1971a, p. 99) I placed *Murex solidus* Adams, 1853 (*non* Anton, 1839), from West Africa, in synonymy with *F. cellulosa*, based on the Sowerby illustration (1879, pl. 24, fig. 246). However, examination of Adams's type in the British Museum (Natural History) shows the former species to be the same as *F. burnayi* Houart, 1981, from the Cape Verde Islands.

FAVARTIA (FAVARTIA) PACEI Petuch  
Plate 23, figures 1-4

*Favartia pacei* PETUCH, 1988, Neogene Hist. Trop. Amer. Moll., p. 152, pl. 29, figs. 6, 7.

*Description*: "Shell stocky, biconic in form, broad across shoulder; spire elevated, turriculate; 8-9 thin, spinose varices per whorl; shoulder very sharply angled, single large, recurved spine on each varix at shoulder angle, giving shell vaselike appearance; body whorl ornamented with 6-8 heavily fimbriated spiral cords; cords intersect varices, producing small, recurved spine at each juncture; siphonal canal very short, poorly developed, with 2-3 heavily fimbriated spiral cords, shell color white with 2 large brown blotches showing through fimbriations behind each varix; interior of aperture pale whitish-cream with 2 rows of large, dark brown patches." (Petuch, 1988)

*Holotype*: USNM 859940; height 16.2 mm, diameter 11.8 mm.

*Type locality*: Off Harry Harris State Park, Key Largo, Monroe County, Florida.

*Occurrence*: Bermont Formation, Florida (*vide* Petuch, 1988, p. 155); Recent, southern Florida.

*Figured specimens*: Fig. 1, USNM 859940 (holotype). Fig. 2, USNM 880028; height 16.0, diameter 10.6 mm; locality, Tea Table Key, Monroe County, Florida. Fig. 3, USNM 880029; height 12.3 mm, diameter 9.0 mm; locality, Johns Pass, Pinellas County, Florida, 50 meters. Fig. 4, USNM 880030; height 12.8 mm, diameter 9.2 mm; locality, Stirup Key, Marathon, Monroe County, Florida.

*Discussion*: Petuch's description for this species is somewhat misleading, as he states the species has "8-9 thin, spinose varices per whorl." This is true only in the holotype, which has eight varices on the body whorl, nine on the penultimate and earlier whorls. Most specimens have six to eight varices, as does *F. cellulosa*. The two species are very difficult to distinguish and commonly occur together, for example at Tea Table Key (pl. 21, fig. 3 and pl. 23, fig. 2) and Johns Pass (pl. 21, figs. 1, 2, and pl. 23, fig. 3). Nevertheless, the differences between the two forms are consistent, with *F. pacei* more biconical in outline and *F. cellulosa* more oval. Both species live on the mussel beds and the presence of two similar species in an apparently identical environment remains unexplained.

PLATE 20

Figures

Page

- |  |     |
|--|-----|
| 1-7. <i>Favartia (Favartia) cellulosa</i> (Conrad) . . . . .   | 122 |
| 1. (X 3) USNM 482056; height 21.9 mm, diameter 12.6 mm.<br>Locality: TU 1000, Sarasota, Florida. Pinecrest Beds.   |     |
| 2. (X 3) USNM 482057; height 20.2 mm, diameter 12.3 mm.<br>Locality: TU 1000, Sarasota, Florida. Pinecrest Beds.   |     |
| 3. (X 3) USNM 112180 (lectotype - <i>Ocinebra alta</i> Dall); height 17.4 mm, diameter 10.0 mm.<br>Locality: Ft. Denaud, Florida (= TU 203). Caloosahatchee Formation.           |     |
| 4. (X 2 1/2) USNM 112178 (paralectotype - <i>Ocinebra alta</i> Dall); height 24.6 mm, diameter 12.3 mm.<br>Locality: Shell Creek, Florida (= TU 539B). Caloosahatchee Formation. |     |
| 5. (X 3) USNM 482058; height 21.7 mm, diameter 12.0 mm.<br>Locality: TU 974, Caloosahatchee River, Florida. Caloosahatchee Formation.  |     |
| 6. (X 3) USNM 482059; height 18.8 mm, diameter 12.0 mm.<br>Locality: TU 523, Harney Pond Canal, Florida. Pinecrest Beds.   |     |
| 7. (X 3) USNM 482060; height 16.5 mm, diameter 10.5 mm.<br>Locality: TU 803, Caloosahatchee River, Florida. Bermont Formation.   |     |



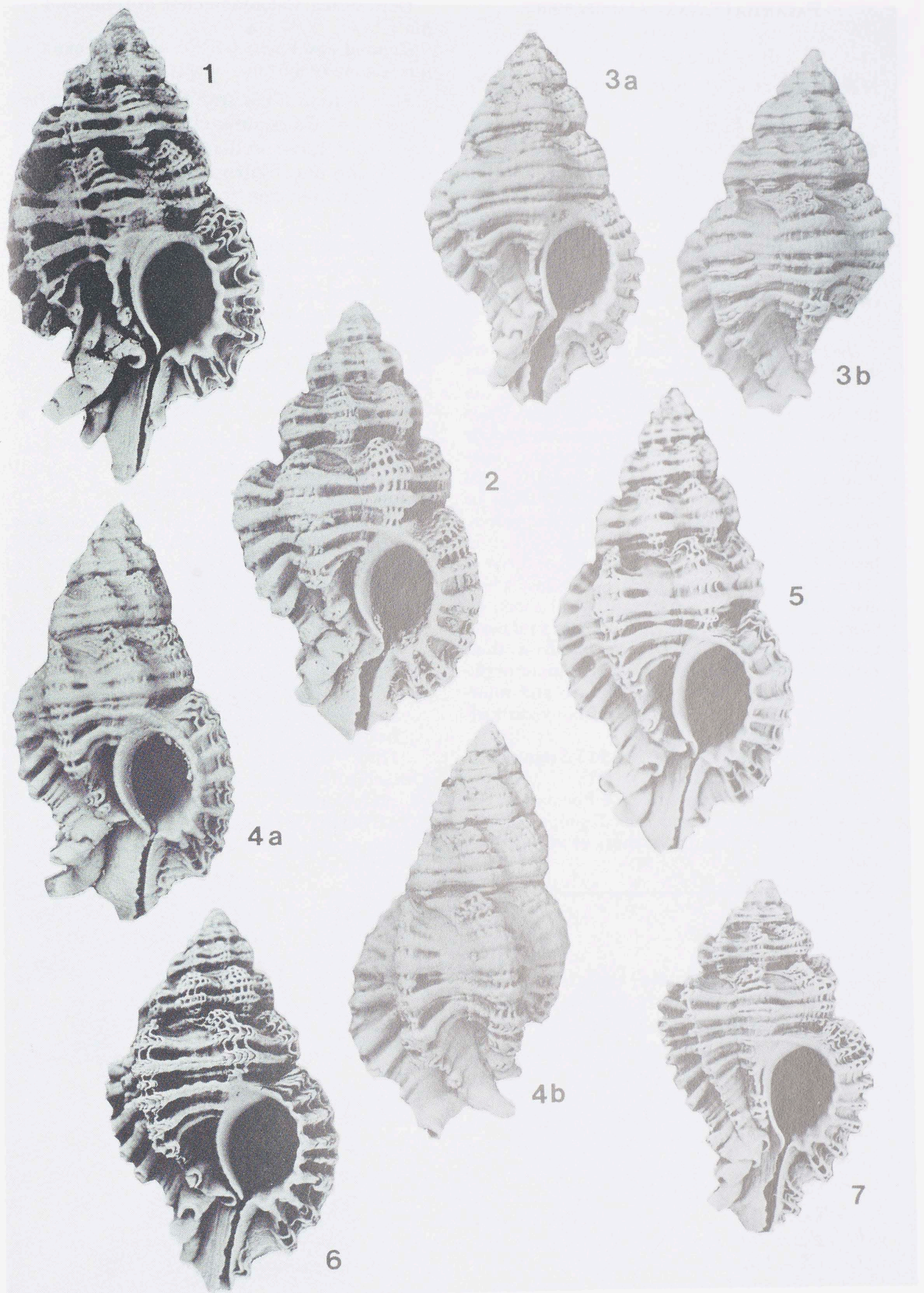


PLATE 20



FAVARTIA (FAVARTIA) MICROMERIS  
(Dall)

Plate 19, fig. 4

*Murex* (*Chicoreus*?) *micromeris* DALL, 1890, Wagner Free Inst. Sci., Trans., v. 3, pt. 1, p. 141, pl. 12, fig. 12.

*Murex* (*Phyllonotus*) *micromeris* Dall. DALL and SIMPSON, 1901, U.S. Fish Comm., Bull., v. 20, pt. 1, p. 408 (in part), not pl. 53, fig. 17 [= *F. minirosea* (Abbott)].

*Murex* (*Favartia*) *micromeris* Dall. COSSMANN, 1903, Essais Paléoconch. Comp., v. 5, p. 30.

*Ocenebra* (*Ocinebrina*) *micromeris* (Dall). ABBOTT, 1954, Nautilus, v. 68, no. 2, p. 43.

*Description*: "Shell small, compact, with one and a half smooth nuclear and four subsequent sculptured whorls; transverse sculpture of (on the last whorl eight) rounded ribs continuous over the shell, with wider interspaces, and by incremental lines of which the edges are sometimes squamose, especially on the spirals; spiral sculpture of strong, elevated, granulose or slightly scaly threads with equal interspaces, strongest near the periphery and weaker in front of the suture; these number from three to six on the earlier whorls and on the last whorl are increased by intercalation; canal short, almost closed in front, with prominently squamose fasciole; aperture subcircular, with a thin, raised margin, smooth-edged on the inner or pillar-lip, crenulated by the sculpture and internally lirate on the opposite side; suture distinct, not channeled." (Dall, 1890)

*Holotype*: USNM 112164; height 7.5 mm, diameter 4.3 mm (*vide* Dall, 1890, p. 141).

*Type locality*: Caloosahatchee Formation; Caloosahatchee River, near Fort Thompson, Hendry County, Florida (Schuchert *et al.*, 1905, p. 420).

*Occurrence*: Caloosahatchee Formation, Florida.

*Figured specimen*: USNM 482055; height 7.3 mm, diameter 4.6 mm; locality TU 529B.

*Discussion*: This small species described from the Caloosahatchee Formation is rare. We have collected just two specimens, the one figured here (pl. 19, fig. 4), and a smaller one from the same locality (TU 529B).

Originally, Dall combined the Caloosahatchee species with a similar Recent form that, subsequently, was named *Ocenebra* (*Ocinebrina*) *minirosea*. It is this latter species that Dall and Simpson figured (1901, pl. 53, fig. 17) from the Recent fauna of Puerto Rico.

FAVARTIA (FAVARTIA) MINIROSEA  
(Abbott)

Plate 19, figures 5-7

*Murex coccineus* A. ADAMS, 1854, Zool. Soc. London, Proc., pt. 21 (1853), p. 72; TRYON, 1880, Man. Conch., v. 2, p. 130, pl. 38, fig. 463; FAIR, 1976, p. 32, text-fig. 60 (after Tryon) (*non Murex coccineus* Lesson, 1844).

*Murex* (*Chicoreus*?) *micromeris* DALL, 1890, Wagner Free Inst. Sci., Trans., v. 3, pt. 1, p. 141 (in part), not pl. 12, fig. 12.

*Murex* (*Phyllonotus*) *micromeris* Dall. DALL and SIMPSON, 1901, U.S. Fish Comm., Bull., v. 20, pt. 1, p. 408 (in part), pl. 53, fig. 17.

*Ocenebra* (*Ocinebrina*) *minirosea* ABBOTT, 1954, Nautilus, v. 68, no. 2, p. 43, pl. 2, fig. 1; ABBOTT, 1974, Amer. Seashells (ed. 2), p. 184, text-fig. 1923 (after Dall and Simpson, 1901).

PLATE 21

Figures	Page
1-5. <i>Favartia</i> ( <i>Favartia</i> ) <i>cellulosa</i> (Conrad) . . . . .	122
1. (X 3) USNM 880020; height 21.0 mm, diameter 12.8 mm. Locality: Johns Pass, Florida. Recent.	
2. (X 3) USNM 880021; height 15.3 mm, diameter 9.0 mm. Locality: Johns Pass, Florida. Recent.	
3. (X 3) USNM 880022; height 17.3 mm, diameter 9.7 mm. Locality: Tea Table Key, Florida. Recent.	
4. (X 2 1/2) USNM 880023; height 21.2 mm, diameter 14.5 mm. Locality: TU 977, Mississippi River Delta, Louisiana. Holocene.	
5. (X 10) USNM 880024; height (incomplete) 15.5 mm, diameter 10.5 mm. Locality: TU 977, Mississippi River Delta, Louisiana. Holocene.	
6. <i>Favartia</i> ( <i>Favartia</i> ) <i>cyclostoma</i> (Sowerby) . . . . .	122
(X 4) Natal Museum H 1325; height 11.8 mm, diameter 7.8 mm. Locality: Conducia Bay, Mozambique. Recent.	



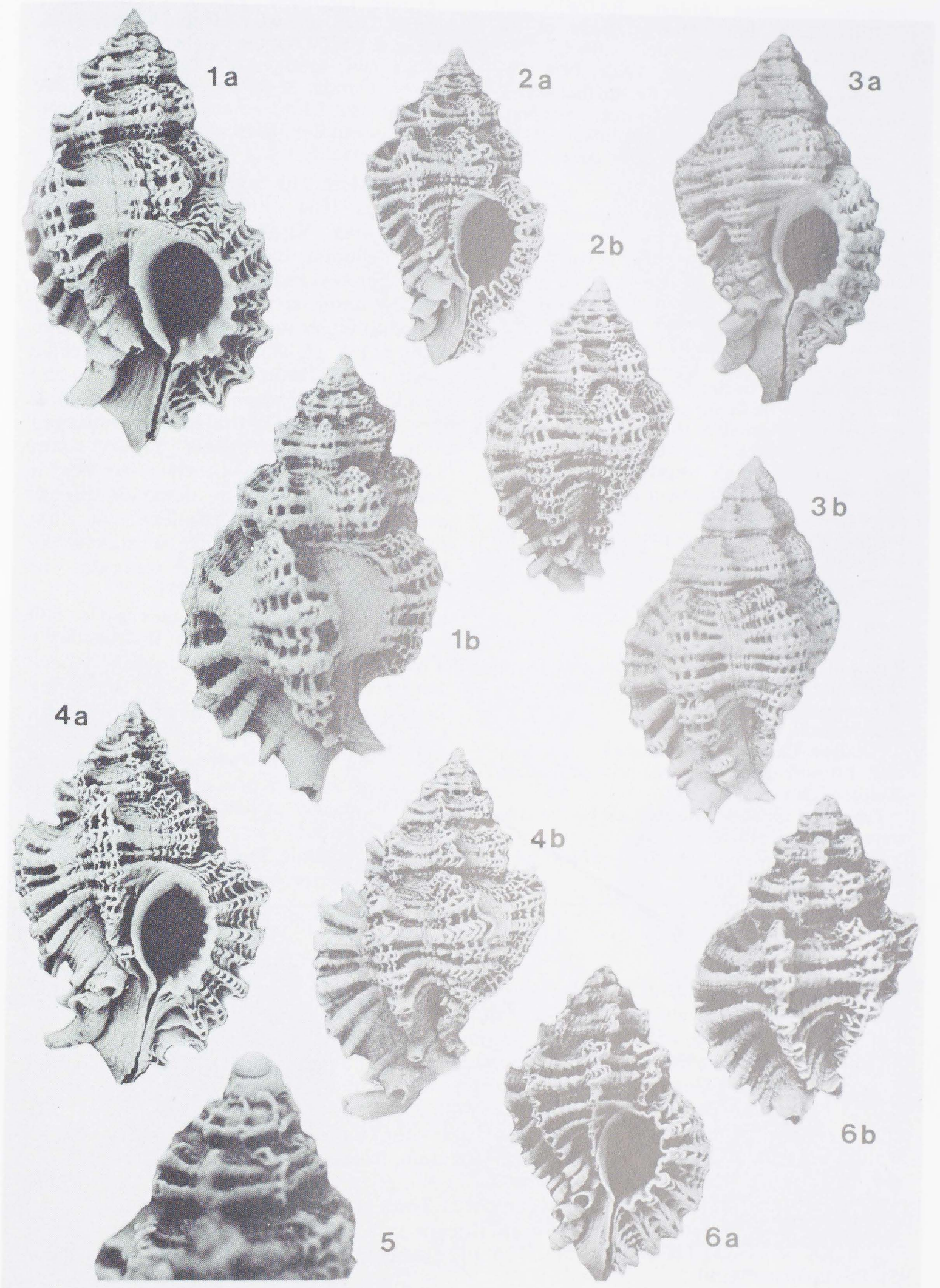


PLATE 21



*Favartia minirosea* (Abbott). RADWIN and D'ATTILIO, 1976, Murex Shells of the World, p. 151, pl. 29, fig. 16.

*Ocenebra minirosea* Abbott. FAIR, 1976, The Murex Book, p. 59, pl. 21, fig. 326 (holotype).

*Favartia (Favartia) minirosea* (Abbott). VOKES, 1984, Shells and Sea Life, v. 16, no. 11, p. 214; VOKES, 1989, Bulls. Amer. Paleontology, v. 97, no. 332, p. 71.

*Description*: "Small, from 5 to 7 mm in length, elongate-fusiform; color all pink or yellowish tan with a pink or brownish pink aperture; 4 1/2 postnuclear whorls; last whorl with 7 to 9 rounded, axial ribs, the last of which forms a thickened varix; penultimate whorl with 9 to 11 similar ribs; spiral sculpturing consists of strongly raised, squarish cords which are crossed by distinct, crowded fimbriations. The latter are inclined to be fluted and raised into minute spine-like projections in the region of the axial ribs. The lowest cord, just above the ends of the former siphonal canals, bears 5 to 7 large, fluted scales. Last whorl with about 10 of these major spiral cords, but one or two much smaller fimbriated threads may occur between them. Nucleus with one smooth, glossy, pink or whitish whorl. Aperture oval; peristome almost complete and somewhat spout-like, with a thin, sharp inner and outer lip. Inside of outer lip with 5 or 6 weak, elongate teeth. Outer lip crenulate. Siphonal canal well developed, and almost closed along its length, except for a narrow slit. The ends of 3 or 4 siphonal canals show at the left." (Abbott, 1954)

*Holotype*: USNM 103380; height 7.5 mm, diameter 4.0 mm (specimen figured by Dall and Simpson, 1901).

*Type locality*: Jamaica, dredged by the *Albatross*, no station record.

*Occurrence*: Recent only, Gulf of Mexico and Greater Antilles.

*Figured specimens*: Fig. 5, USNM 880017; height 7.3 mm, diameter 4.0 mm; locality TU R-99. Fig. 6, USNM 880018; height 9.0 mm, diameter 5.4 mm; locality, off Cedar Key, Levy County, Florida, 30-35 meters. Fig. 7, USNM 880019; height 7.1 mm, diameter 4.0 mm; locality, off Egmont Key, Hillsborough County, Florida, 62 meters.

*Discussion*: The taxon *Murex coccineus* A. Adams, 1854, although described from St. Thomas, Virgin Islands, has never been included in the western Atlantic fauna, for two reasons: it was not figured and the name is pre-occupied. The only author to illustrate the species was Tryon (1880, p. 130, pl. 38, fig. 463), who figured a specimen that he said had been sent to him from the original locality. His illustration is very misleading, as the shell is enlarged three times (in the text Tryon states "Length, .3 inch"), but the size bar is placed so that it appears alongside the adjacent illustration. Therefore, at first glance, it appears to be a species of *Murexiella*, perhaps *M. levicula*, as suggested by Fair (1976, p. 32).

Fortunately, Tryon's material is still available in the collections of the Academy of Natural Sciences of Philadelphia, where there are two lots (ANSP 36207 [including the figured specimen, height 7.7 mm], ANSP 36186; collected by Swift), all of which are *F. minirosea*. As the name *Murex coccineus* is preoccupied, this identification is only of historic interest, but it should be noted.

Although Dall included the Caloosahatchee *F. micromeris* and the Recent *F.*

## PLATE 22

Figures	Page
1, 2. <i>Favartia (Favartia) nuceus</i> (Mörch) . . . . .	132
1. (X 2) Bullis Collection; height 27.8 mm, diameter 17.5 mm. Locality: Oregon Station 5679, off Guajira Peninsula, Colombia. Recent.	
2. (X 3) USNM 880025; height 15.4 mm, diameter 10.9 mm. Locality: off Guajira Peninsula, Colombia. Recent.	
3. <i>Favartia (Favartia) incisa</i> (Broderip) . . . . .	134
(X 2) USNM 880026; height 23.5 mm, diameter 14.1 mm. Locality: TU R-188, Venado Island, Panama. Recent.	
4-6. <i>Favartia (Favartia) lindae</i> Petuch . . . . .	134
4. (X 5) USNM 859805 (holotype); height 11.2 mm, diameter 6.0 mm. Locality: off Apalachicola, Florida. Recent.	
5. (X 3) USNM 880027, height 16.2 mm, diameter 9.0 mm (not whitened, to show color pattern). Locality: Sanibel, Florida. Recent.	
6. (X 5; protoconch X 10) USNM 482061; height 8.5 mm, diameter 5.4 mm. Locality: TU 978, South Bay, Florida. Bermont Formation.	



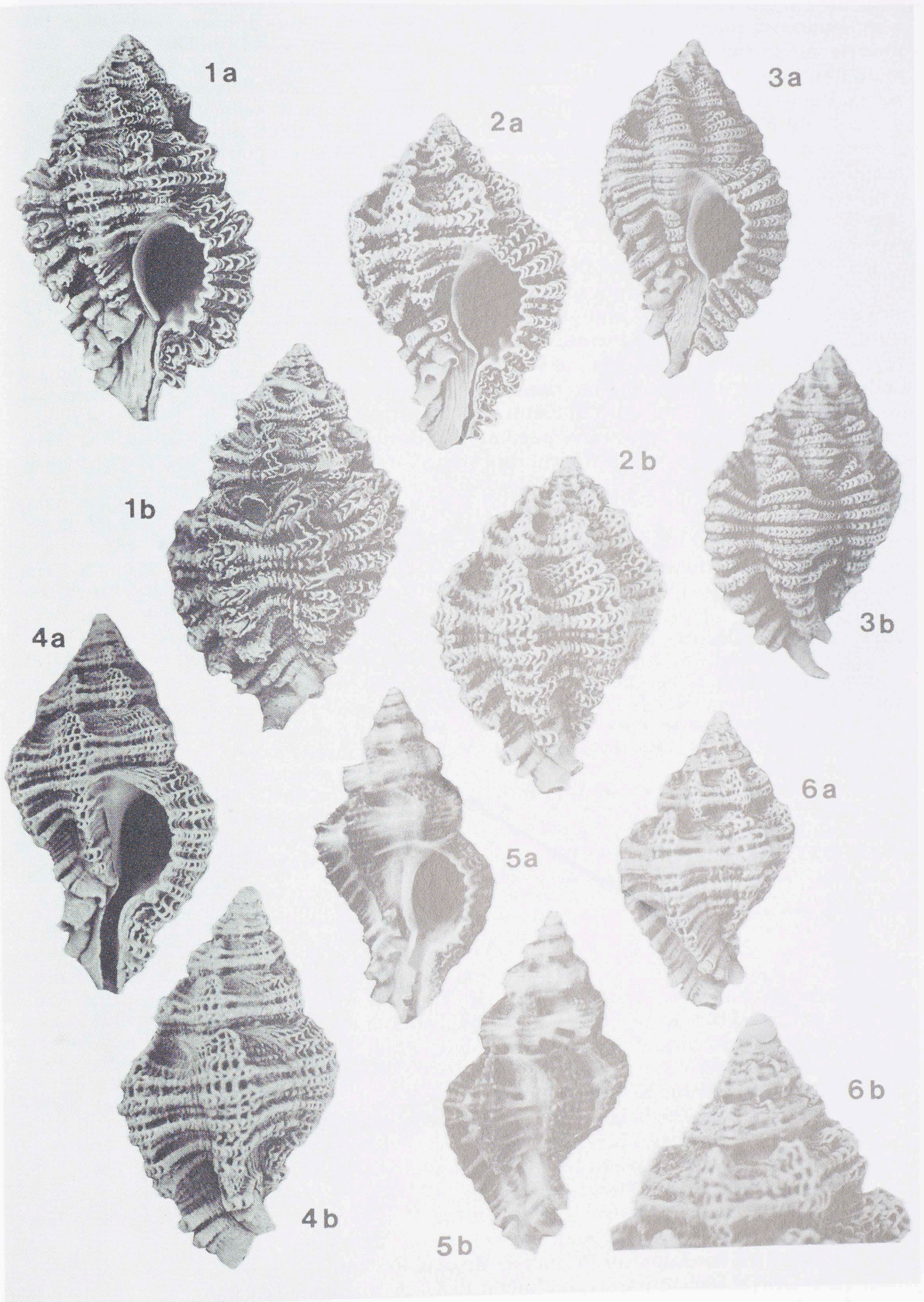


PLATE 22



*minirosea* in the same species, and Abbott, who separated them, considered *F. micromeris* ancestral to *F. minirosea*, it is more likely that the Dominican species, *F. zalaya* Vokes (pl. 19, fig. 2), is the ancestor of the living *F. minirosea*. All three share generic similarity and small size (maximum height under 10 mm) but *F. zalaya* and *F. minirosea* are both relatively elongate compared to the almost globular *F. micromeris*.

Also, it is probable that the Dominican and the Recent species share a somewhat deeper habitat. Radwin and D'Attilio (1976, p. 151) record *F. minirosea* from depths of 50 to 100 meters and in the Vokes Collection there are specimens ranging from 30 to 110 meters, averaging 67 meters. *Favartia micromeris* also may have been a deeper species, explaining its extreme rarity in the shallow-water Caloosahatchee Formation.

FAVARTIA (FAVARTIA) NUCEUS (Mörch)

Plate 22, figures 1, 2

*Murex nuceus* MÖRCH, 1850, Cat. Conch. Kierulf, p. 31, pl. 1, fig. 9.

*Murex (Ocinebra) nuceus* (Mörch). TRYON, 1880, Man. Conch., v. 2 (Muricinae, Purpurinae), p. 122, pl. 37, fig. 429.

Not *Tritonalia nuceus* (Mörch). SMITH, 1939, Illus. Cat. Recent Species Rock Shells, p. 16, pl. 12, fig. 19 (SMITH, 1953, *ibid.*) [= *F. cellulosa* (Conrad)].

*Murex (Favartia) cellulosus nuceus* Mörch. CLENCH and PÉREZ FARFANTE, 1945, *Johnsonia*, v. 1, no. 17, p. 54, pl. 28, figs. 4-6; ABBOTT, 1954, Amer. Seashells, p. 205, pl. 25, fig. i (same figure as Clench and Pérez

Farfante, 1945, pl. 28, fig. 5); WARMKE and ABBOTT, 1961, Caribbean Seashells, p. 106, text-fig. 19g; BULLIS, 1964, Tulane Stud. Zoology, v. 11, no. 4, p. 107; RIOS, 1970, Coastal Brazilian Seashells, p. 79 (in part), not pl. 21 [= *F. cellulosa* (Conrad)]; HUMFREY, 1975, Sea Shells of the West Indies, p. 136 (in part), not pl. 16, fig. 5 [= *F. cellulosa* (Conrad)].

*Favartia cellulosa* (Conrad). ABBOTT, 1974, Amer. Seashells (ed. 2), p. 187 (in part), fig. 1953 (same figure as 1954, pl. 25, fig. i); RADWIN and D'ATTILIO, 1976, Murex Shells of the World, p. 146 (in part), pl. 24, fig. 6 [not figs. 4, 5 = *F. cellulosa* (Conrad)]; ABBOTT and DANCE, 1982, Compendium Seashells, p. 144 (in part), color fig.; RIOS, 1985, Brazilian Marine Moll. Icon. p. 85, pl. 25, fig. 372 (upper fig. only; lower fig = *F. cellulosa*) (not of Conrad).

*Favartia nuceus* (Mörch). KAICHER, 1974, Card Catalogue World-wide Shells, pack 6, Muricidae - Part II, no. 562.

*Favartia cellulosa nuceus* (Mörch). RIOS, 1975, Brazilian Marine Moll. Icon., p. 87, pl. 25, fig. 356.

*Favartia nucea* (Mörch). FAIR, 1976, The Murex Book, p. 62, pl. 20, fig. 294 (Vokes photo).

*Favartia (Favartia) nucea* (Mörch). VOKES, 1984, Shells and Sea Life, v. 16, no. 11, p. 214, pl. 2, fig. 12.

*Description*: "Shell small, from 20 to 25 mm in length and possessing five to six low, slightly oblique and fluted varices. Varices a little wider and heavier structurally than in *M. cellulosus*. In general, the shell is heavier and a little more globose than the typical species [*F. cellulosa*]. All specimens so far examined have a somewhat shorter siphonal canal." (Clench and Pérez Farfante, 1945)

PLATE 23

Figures

	Page
1-4. <i>Favartia (Favartia) pacei</i> Petuch . . . . .	126
1. (X 3) USNM 859940 (holotype); height 16.2 mm, diameter 11.8 mm. Locality: Key Largo, Florida. Recent.	
2. (X 3) USNM 880028; height 16.0 mm, diameter 10.6 mm. Locality: Tea Table Key, Florida. Recent.	
3. (X 3) USNM 880029; height 12.3 mm, diameter 9.0 mm. Locality: Johns Pass, Florida. Recent.	
4. (X 3) USNM 880030; height 12.8 mm, diameter 9.2 mm. Locality: Stirup Key, Florida. Recent.	
5, 6. <i>Favartia (Favartia) barbarae</i> Vokes, n. sp . . . . .	134
5. (X 3) USNM 880031 (holotype); height 21.0 mm, diameter 11.9 mm. Locality: off Río Lagartos, Yucatan, Mexico. Recent.	
6. (X 3) USNM 880032 (paratype); height 19.8 mm, diameter 12.0 mm. Locality: same as holotype.	



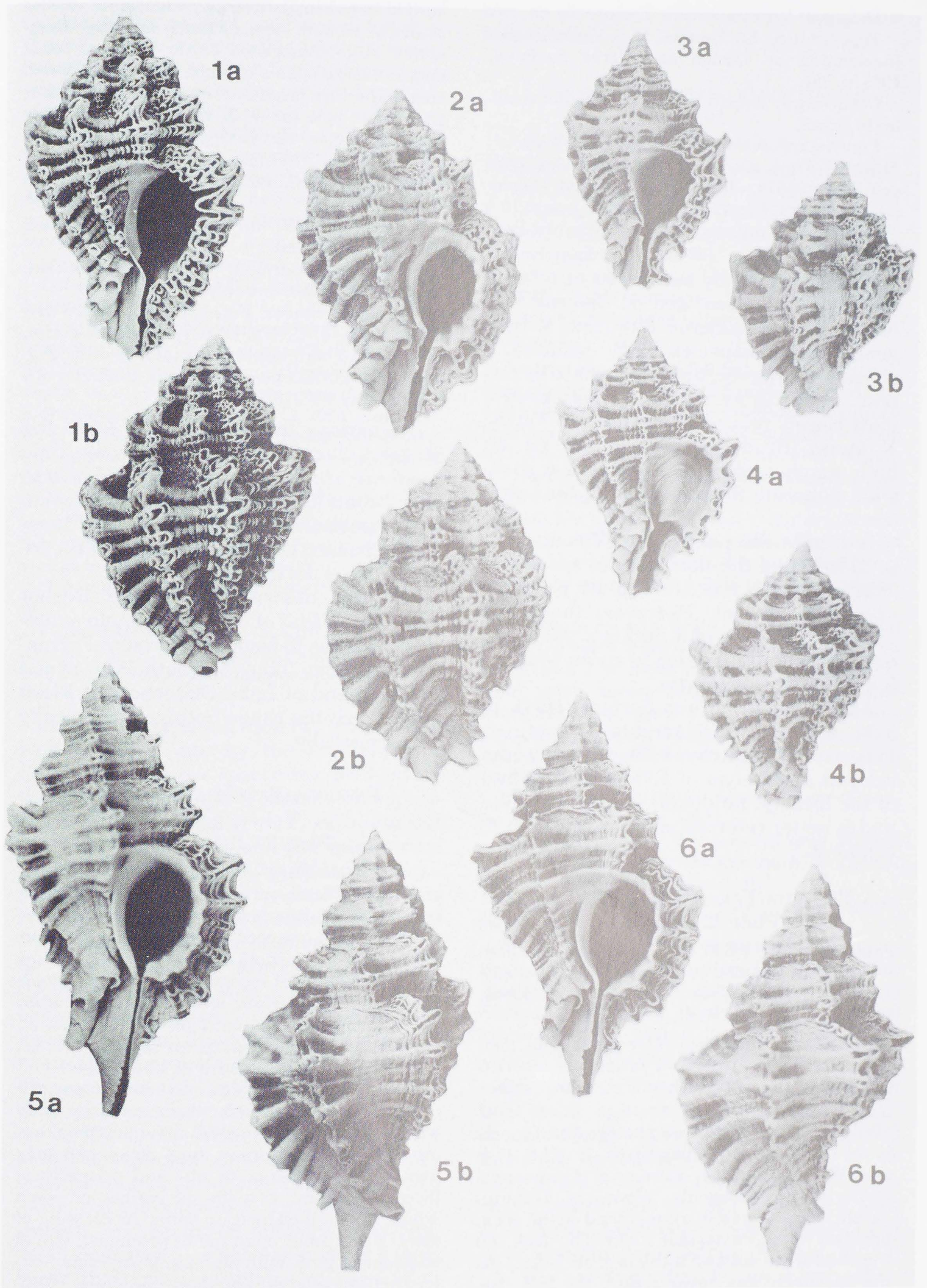


PLATE 23



*Holotype*: Not found.

*Type locality*: St. Thomas, U.S. Virgin Islands (designated by Clench and Pérez Farfante, 1945, p. 55).

*Occurrence*: Recent only, from Greater Antilles to Brazil.

*Figured specimens*: Fig. 1, Bullis Collection\*; height 27.8 mm, diameter 17.5 mm; locality, Oregon Station 5679, off Guajira Peninsula, Colombia, 44 meters. Fig. 2, USNM 880025; height 15.4 mm, diameter 10.9 mm; locality, off Guajira Peninsula, Colombia.

*Discussion*: Many authors have synonymized *F. cellulosa* and *F. nuceus* and others have considered *F. nuceus* to be a geographic subspecies of *F. cellulosa*. I consider, however, the two forms to be distinct. *Favartia nuceus* is a larger species, most closely related to the eastern Pacific *F. incisa* (Broderip, 1833) (pl. 22, fig. 3); both are characterized by a globular shell, with elaborate filigree covering the spiral cords.

In a previous publication (Vokes, 1984, p. 214) I cited the name of this species as "*nucea*", as did Fair (1976, p. 62; probably upon my advice). However, the name "*nuceus*" (Latin - of a nut) is a noun and does not change gender to agree with the feminine genus *Favartia*.

As Clench and Pérez Farfante (1945, p. 55) stated, the illustration of *Murex jamaicensis* Sowerby, 1879, generally considered a synonym of *F. nuceus* (because of the locality, no doubt) is more elongate and is better referred to synonymy with *F. cellulosa*.

FAVARTIA (FAVARTIA) LINDAE Petuch  
Plate 22, figures 4-6

*Favartia lindae* PETUCH, 1987, New Caribbean Moll. Faunas, p. 14, pl. 1, figs. 5, 6; PETUCH, 1988, Neogene Hist. Trop. Amer. Moll., p. 153, pl. 31, fig. 6 (holotype).

*Description*: "Shell small for genus, thin, delicate, elongated, fusiform; 5 varices per whorl; 6 major cords around body whorl, with 1 minor

cord in-between; cords frilly, fimbriated; varices coarsely ribbed, cancellated; siphonal canal with 2 large, fimbriated cords; siphonal cords end in 2 large spines on each varix on siphonal canal; aperture large in proportion to shell size; shell color pale tan with varices being darker tan-brown; spire elevated; protoconch and early whorls brown." (Petuch, 1987)

*Holotype*: USNM 859805; height 11.2 mm, diameter 6.0 mm.

*Type locality*: 50 km south of Apalachicola, Florida, 150 meters.

*Occurrence*: Bermont Formation, Florida; Recent, Gulf of Mexico only (?).

*Figured specimens*: Fig. 4, USNM 859805 (holotype). Fig. 5, USNM 880027; height 16.2 mm, diameter 9.0 mm; locality, Sanibel, Florida. Fig. 6, USNM 482061; height 8.5 mm, diameter 5.4 mm; locality TU 978.

*Discussion*: In the material from the Steger Collection given to me some time ago there are three specimens said only to have "come from Sanibel." As they seem to be specimens of this apparently deep-water species, it is unfortunate that the locality data is not more specific.

Although described from the Recent fauna of the Gulf of Mexico, a single example (pl. 22, fig. 6) from the Bermont Formation at locality TU 978, South Bay, at the southern end of Lake Okeechobee, Florida, extends the range both geographically and temporally.

FAVARTIA (FAVARTIA) BARBARAE  
Vokes, n. sp.  
Plate 23, figures 5, 6

*Description*: Shell with six teleoconch whorls; protoconch and earliest ornamentation unknown. Spiral ornamentation on second teleoconch whorl of one cord near anterior suture; on third teleoconch whorl a second cord added at shoulder, with faint secondary threads on shoulder ramp. Body whorl with five major cords; one additional major cord on siphonal canal. Several secondary threads on shoulder ramp, also between cord at base of body whorl and that on siphonal canal, and one between posterior two cords and anterior three cords on body whorl. With increasing shell size cords weakening in intervarical areas, best developed only immediately adjacent to ab- and adapertural faces of varices. Five to six varices on each whorl, not well-aligned up spire. At crossing of spiral cords, small open spines produced, that at shoulder largest. With increasing shell size, varices becoming larger and more elaborate; multiple shell layers on adapertural varical faces scalloped by spiral ornamentation. Shell surface be-

\*When this specimen was photographed it was in the collection of Harvey Bullis, Jr., U.S. Fish and Wildlife Service, Bureau of Commercial Fisheries, at Pascagoula, Mississippi. Unfortunately, it was stored in a metal shed on the dock, adjacent to the Pascagoula River. The dock and the shed were washed away in a hurricane. As the specimen was never sent to the U.S. National Museum by Bullis, it is presumed to have been "lost at sea."



tween varices shagreened by intersection of faint spiral threads and small growth lamellae. Suture slightly appressed. Aperture ovate; inner lip smooth, free-standing in anterior portion, appressed in posterior portion. Inner side of outer lip faintly lirated, margin of outer lip crenulated by siphonal cords. Siphonal canal long for the genus, narrow, recurved dorsally. Shell color white, with two brown bands at shoulder and base of body whorl, best seen immediately adjacent to varices. In well-preserved specimens a faint frosting of intritacalx. Operculum unguiculate, nucleus terminal.

*Holotype*: USNM 880031; height 21.0 mm, diameter 11.9 mm.

*Type locality*: 180 km east of Arrecife Alacran, or approximately 75 km due north of Río Lagartos, Yucatan, on coral and broken shell. No depth was recorded but according to a bathymetric chart (e.g., AAPG, 1984, Bathymetry of the Gulf of Mexico and the Caribbean Sea) the depth in this area is approximately 50 fathoms (= 91 meters).

*Etymology of name*: In honor of the late Barbara Steger (Mrs. Dan Steger), Tampa, Florida, who generously provided the type material, as well as much more over the years.

*Occurrence*: Known only from the type locality.

*Figured specimens*: Fig. 5, USNM 880031 (holotype). Fig. 6, USNM 880032 (paratype); height 19.8 mm, diameter 12.0 mm; locality same as holotype.

*Discussion*: Among material given to me several years ago by the late Barbara Steger, were three specimens dredged off the northern coast of Yucatan. The specimens have a similarity to *F. cellulosa* but are more attenuated and the intervarical space is smoother. The type locality is approximately 90 meters in depth, which is somewhat deeper than *F. cellulosa* lives.

The specimens were originally identified by Mrs. Steger as *Murexiella levicula* (Dall) and one can well understand why. Both species have about five almost winged varices; however, *M. levicula* is even smoother between the varices and does not have the "cellular" appearance of the spiral ornamentation typical of the genus *Favartia*. The varical extensions along the siphonal canal of *M. levicula* are ornamented by three small spines on each varix, but the canal of *F. barbarae* is almost smooth, and recurved dorsally, as is typical of *Favartia*. It is species such as *F. barbarae* that cause problems of separation between these two generic groups. Nevertheless, I believe the two are separa-

ble, as discussed above under the genus *Murexiella*.

(?)*FAVARTIA* (*FAVARTIA*) *VARIMUTABILIS*

Houart

Plate 24, figures 5, 6

*Favartia* (*Favartia*) *varimutabilis* HOUART, 1991, Nautilus, v. 105, no. 1, p. 32, text-figs. 12 (protoconch), 20, 21 (radula) 34, 35 (holotype), 36 (paratype) [as *Favartia* (*Caribiella*) *varimutabilis*, p. 28, 29].

*Favartia varimutabilis* Houart. KAICHER, 1991, Card Catalogue World-wide Shells, pack 59, Muricidae - Part VI, no. 6007 (holotype).

*Description*: "Shell 8.5-9 mm in length, stout, fusiform. Spire high, with 2.5 protoconch whorls and 5 weakly convex, teleoconch whorls. Suture impressed. Protoconch whorls rounded, ending with a deeply indented varix. Last whorl with 3-5 irregular, rounded, erratically placed, squamose varices. Penultimate whorl bearing 8 or 9 varices. No intervarical axial sculpture. Spiral sculpture of 7 cords, occasionally with 1 thread between each pair of cords, 2 or 3 adapical cords sometimes extending as small spinelets or varices.

"Aperture roundly-ovate, outer lip erect and smooth, weakly lirated within. Columellar lip rim erect, with 2 or more small and narrow folds. Anal notch broad, shallow. Siphonal canal short, narrowly open, weakly bent adaperturally, ornamented with 2 small open spines. Shell pale orange to pale brown, with darker spiral cords." (Houart, 1991)

*Holotype*: MORG 26458; height 9 mm, diameter 5 mm (*fide* Houart, 1991).

*Type locality*: R/V *Marion-Dufresne* Station DC 15, approximately 150 km south of Vitória, Espírito Santo, Brazil, 37 meters.

*Occurrence*: Recent only, southeastern Brazil.

*Figured specimen*: Fig. 5, MORG 26458 (holotype). Fig. 6, MNHN (paratype); height 9.0 mm, diameter 5.1 mm; locality R/V *Marion-Dufresne* Station DC 22, Vitória Bank, approximately 200 km southeast of Vitoria, Espírito Santo, Brazil (photographs courtesy of R. Houart).

*Discussion*: The generic placement of this small species is questionable. Although Houart placed it in the genus *Favartia*, he described it as having "2 or more small folds" on the columellar lip, a characteristic not usually associated with that genus. Further, he expressed doubt as to whether the holotype (his figs. 34, 35) and the paratype (fig. 36) are conspecific. The paratype seems to be a species of *Favartia* similar to *F. zalaya* Vokes, with a



small, almost entire aperture. But the holotype of *F. varimutabilis* has a more open aperture with fairly strong lirae on the inner side of the outer lip, in addition to the columellar plicae, and the overall appearance is not like any known species of *Favartia*. However, neither is it like any other genus. Therefore, for the present, I am assuming that the holotype is aberrant, and the *Favartia*-like paratype is the more characteristic example.

Houart compares his new species to *Favartia (Caribiella) alveata* (Kiener) [in fact, his illustrations of the protoconch (fig. 12) and the radula (figs. 20, 21) are given as *Favartia (Caribiella) varimutabilis*] but there is little resemblance between the two forms.

#### FAVARTIA (FAVARTIA) species

*Favartia (Favartia)* sp. HOUART, 1991, *Nautilus*, v. 105, no. 1, p. 32, text-figs. 13 (protoconch), 33 (shell).

*Occurrence*: Recent only, Espírito Santo, Brazil.

*Discussion*: This small species (height 8.2 mm, diameter 5.0 mm) was figured by Houart from material dredged off south-eastern Brazil (Vitória Bank, off Vitória, Espírito Santo, in 52 meters). As he noted,

the specimens available were insufficient to compare with any known species of *Favartia*.

#### Subgenus CARIBIELLA Perrilliat, 1972

*Caribiella* PERRILLIAT, 1972, *Paleontología Mexicana*, no. 32, p. 82.

Type species: *Murex intermedius* C.B. Adams, 1850 (= *Murex alveatus* Kiener, 1842), by original designation.

*Discussion*: This small subgroup of *Favartia* is marked by having a more elongate, dorso-ventrally flattened shell. It is represented by only a few species: the type species in the western Atlantic; *F. erosa* (Broderip, 1833) and *F. purdyae* Vokes and D'Attilio, 1980, in the eastern Pacific; and *F. ponderi* Myers and D'Attilio, 1989, in the western Pacific. The American species are probably all descendants of the Late Miocene *F. carmenae*, n. sp. The Indo-Pacific species, *F. ponderi*, is so similar to the Caribbean *F. alveata* as to appear to be almost the same (see Vokes, 1985, pl. 3, figs. 25, 26) and its origin is a mystery.

#### FAVARTIA (CARIBIELLA) CARMENAE

Vokes, n. sp.

Plate 24, figure 1

### PLATE 24

Figures	Page
1. <i>Favartia (Caribiella) carmenae</i> Vokes, n. sp. . . . .	136
(X 3) USNM 645986 (holotype); height 18.5 mm, diameter 9.5 mm. Locality: USGS 23737, Santa Rosa, Veracruz, Mexico. (?)Medias Aguas Formation.	
2. <i>Favartia (Caribiella) erosa</i> (Broderip) . . . . .	138
(X 3) USNM 880033; height 16.5 mm, diameter 8.3 mm. Locality: Isla Gobernador, Panama. Recent.	
3, 4. <i>Favartia (Caribiella) alveata</i> (Kiener) . . . . .	139
3. (X 3) MCZ 156123 (lectotype – <i>M. intermedius</i> Adams); height 20.0 mm, diameter 10.0 mm. Locality: Jamaica. Recent.	
4. (X 3) USNM 880034; height 18.9 mm, diameter 9.6 mm. Locality: Curaçao, Netherlands Antilles. Recent.	
5, 6. (?) <i>Favartia (Favartia) varimutabilis</i> Houart . . . . .	135
5. (X 6) MORG 26458 (holotype); height 9.0 mm, diameter 5.0 mm. Locality: R/V <i>Marion-Dufresne</i> Station DC 15, off Vitória, Espírito Santo, Brazil. Recent.	
6. (X 6) MNHN (paratype); height 9.0 mm, diameter 5.1 mm. Locality: R/V <i>Marion-Dufresne</i> Station DC 22, off Vitória, Espírito Santo, Brazil. Recent. (Photographs courtesy of R. Houart)	



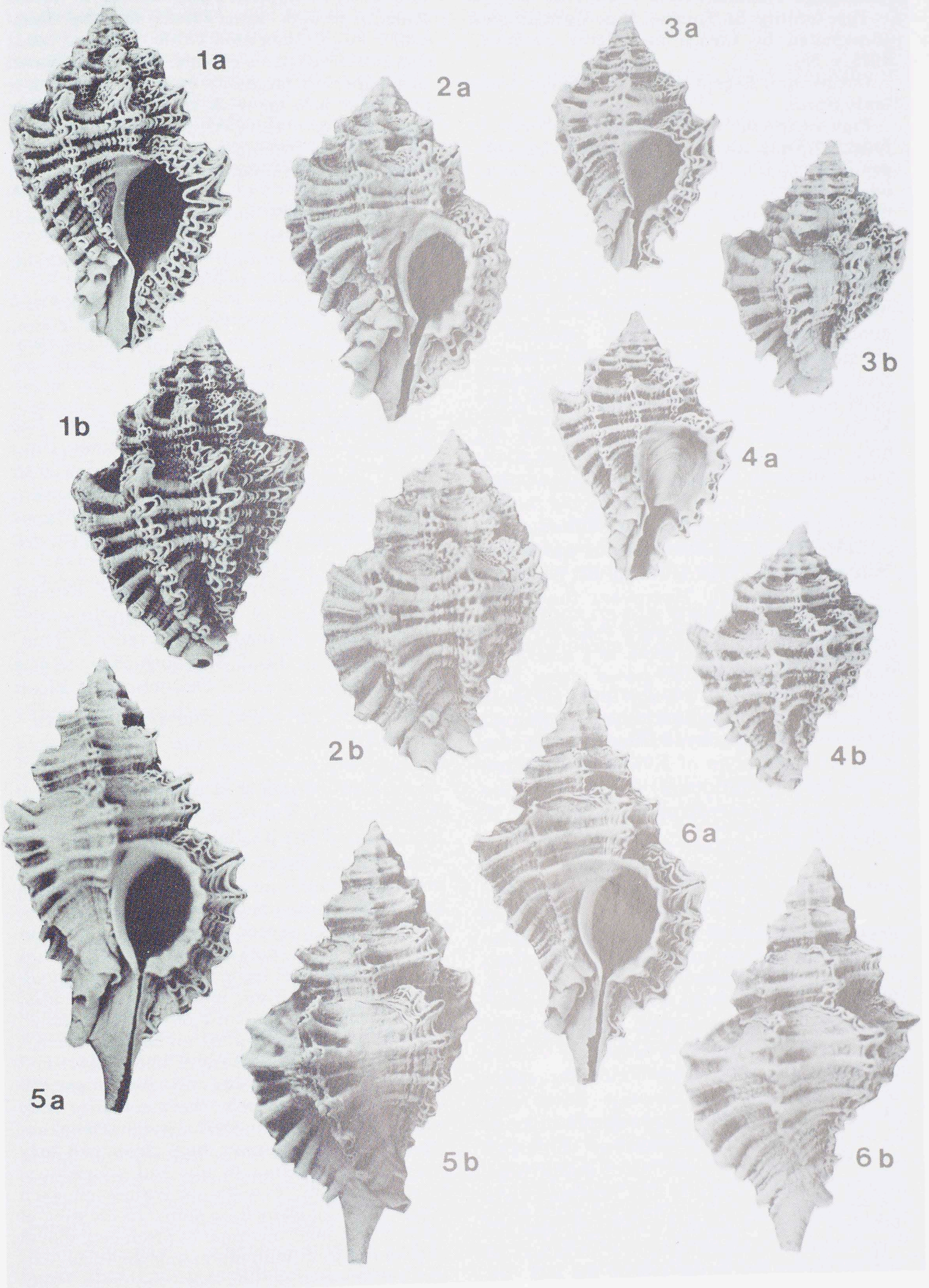


PLATE 23



*Aspella (Caribiella) intermedius* (C.B. Adams).  
PERRILLIAT, 1972, Paleontología Mexicana, no. 32, p. 83, pl. 39, figs. 14, 15; pl. 40, figs. 1, 2 (not of Adams).

*Description:* Holotype (and only specimen) with six teleoconch whorls, protoconch and earliest ornamentation not known. Spiral ornamentation on early spire whorls of three flattened cords, that in middle the strongest; by fourth teleoconch whorl a smaller secondary cord intercalated between median and anterior cords. Body whorl with five heavy, convex-sided cords, formed of a series of overlapping scales resulting from incremental growth and giving the edges of the cords a saw-tooth pattern. Between posterior two cords and anterior three cords, a smaller intercalary cord, ornamented like the others but not as wide. An additional two heavy cords on siphonal canal; between cord at base of body whorl and those on siphonal canal a deeply excavated space lacking spiral ornamentation but crossed by axial ridges. Axial ornamentation on spire of about seven flattened varices per whorl, arching posteriorly to connect with previous whorls. At about fifth teleoconch whorl two varices on opposite sides of the whorl becoming larger, causing a dorso-ventral flattening, similar to species of the genus *Aspella*. Apertural faces of the two enlarged varices elaborately filigreed by multiple layers of shell material scalloped by spiral cords; those former varices between the two enlarged ones decreasing in strength to little more than axial ridges. Shell surface between spiral cords shagreened with faint growth lamellae. Suture impressed, crossed by varices. Aperture ovate; inner lip smooth, anterior portion free-standing, posterior portion slightly appressed. Inner side of outer lip lirate within; margin crenulated by spiral cords. Siphonal canal short, broad, recurved distally; terminations of previous canals giving rise to a small fasciole.

*Holotype:* USNM 645986; height 18.5 mm, diameter 9.5 mm.

*Type locality:* USGS 23737, (?)Medias Aguas Formation; 3 km northeast of Santa Rosa [now Istal], formerly on the Veracruz to Santa Lucrétia [now Jesus Carranza] railroad [which now exists only as the highway right-of-way to Istal], Veracruz, Mexico.

*Etymology of name:* In honor of Maria del Carmen Perrilliat Montoya, Instituto de Geología, Universidad Nacional Autónoma de México, for her outstanding contributions to the paleontology of Mexico.

*Occurrence:* (?)Medias Aguas Formation, Veracruz, Mexico.

*Figured specimen:* USNM 645986 (holotype).

*Discussion:* At the U.S. National Museum there is an extensive collection made in 1920 by Bruce Wade at a locality described

as "the head of a small stream flowing into Arroyo Tomas Martinez, about 3 km to the northeast of Santa Rosa or about 28 km northwest of Santa Lucrecia [on the Ferrocarril de Veracruz al Pacifico, State of Veracruz]." In this collection, which has been monographed by Perrilliat (1972-1984) there is a single specimen of *Caribiella* assumed to be ancestral to both the western Atlantic and eastern Pacific Recent members of the subgenus.

We have tried to relocate this site for years, with no success, spending hours following trails over the hills in the general vicinity of "3 km northeast of Santa Rosa." I fear that in the years since 1920 the area has been so completely deforested and turned into cattle pasture that soil erosion has completely buried the former outcrop, which is certainly regrettable, for the Santa Rosa fauna is remarkable and unlike any other in the western Atlantic. It is similar to the famous Bowden, Jamaica, fauna in that it is a mixture of shallow and deep-water species, and almost certainly represents a gravity-flow of shallow-water material into deeper water.

At Santa Rosa itself (locality TU 1323) and nearby (TU 1324), Dr. W.H. Akers (personal communication, 1979) has dated the beds as Neogene Zone N. 17, or Late Miocene, and the name Medias Aguas Formation has been proposed for these beds by Akers (1980, p. 487). I assume that the Santa Rosa fauna is the same but there is nothing in the muricid species that confirms or denies this dating.

The new species was referred by Perrilliat (1972, p. 83) to the Recent *F. alveata* (under the name *Aspella intermedius*). But it differs from the living species in having a more pronounced bilateral flattening, mimicking the genus *Aspella* to which it is only distantly related. In general shape this Mexican species more closely resembles the Recent eastern Pacific *F. erosa* (Broderip, 1833) (pl. 24, fig. 2) but differs in not having the flattened spiral cords, as in both *F. erosa* and *F. purdyae*. A detailed comparison, with excellent drawings, of the spiral ornamentation on *F. alveata* and *F. erosa* has been given by D'Attilio (1988, p. 74), who described the spiral ornamentation seen in both *F. carmenae* and *F. alveata* as: "The scabrous segments of each cord are fluted, raised strongly in relief,



bowl-like with scalloped edges, each bowl-form segment narrower at its contact with the one below." Like the Atlantic *F. alveata*, the Mexican species is marked by having small spiral threads between the major spiral cords, a feature not seen in the Pacific species.

FAVARTIA (CARIBIELLA) ALVEATA  
(Kiener)

Plate 24, figures 3, 4

- Murex erosus* var. G.B. SOWERBY, II, 1841, *Conch. Illus.*, *Murex*, fig. 96.
- Murex alveatus* KIENER, 1842, *Coq. Viv.*, v. 7, *Murex*, p. 94, pl. 46, fig. 2; REEVE, 1845, *Conch. Icon.*, v. 3, *Murex*, pl. 32, figs. 157, 163; SOWERBY, 1879, *Thes. Conch.*, v. 4, *Murex*, pl. 23, fig. 232.
- Murex intermedius* C.B. ADAMS, 1850, *Cont. to Conch.*, v. 1, no. 4, p. 60 (*non M. intermedius* Brocchi, 1814).
- Ocenebra alveata* (Kiener). TROSCHER, 1869, *Das Gebiss der Schnecken*, v. 2, p. 119, pl. 11, fig. 10 (radula).
- Murex (Favartia) intermedius* Adams. DALL and SIMPSON, 1901, *U.S. Fish Comm.*, *Bull.*, v. 20, pt. 1, p. 408.
- Tritonalia intermedia* (Adams). M. SMITH, 1939, *Illus. Cat. Recent Species Rock Shells*, p. 16, pl. 12, fig. 12 (SMITH, 1953, *ibid.*); CLENCH and TURNER, 1950, *Occ. Papers Moll.*, Harvard Univ., v. 1, no. 15, p. 294, pl. 39, fig. 15 (lectotype).
- Ocenebra intermedia* (Adams). WARMKE and ABBOTT, 1961, *Caribbean Seashells*, p. 108, fig. 19i; HUMFREY, 1975, *Sea Shells of the West Indies*, p. 142, pl. 16, fig. 12.
- Aspella elegans* "Perrilliat Montoya." VOKES, 1971, *Bulls. Amer. Paleontology*, v. 61, no. 268, p. 44 (said to be "n.n. pro *intermedius* Adams" in Perrilliat, 1971 [1972], but not actually published by her).
- Caribiella intermedius* (C.B. Adams). VOKES, 1971, *Bulls. Amer. Paleontology*, v. 71, no. 268, p. 60.
- Favartia (Caribiella) alveata* (Kiener). ABBOTT, 1974, *Amer. Seashells* (ed. 2), p. 187, fig. 1955; VOKES and VOKES, 1983, *Meso-amer. Ecol. Inst.*, Mon. 1 (MARI Publ. 54), p. 24, pl. 12, fig. 12; VOKES, 1984, *Shells and Sea Life*, v. 16, no. 11, p. 214, pl. 2, fig. 14; VOKES, 1985, *Conch. Amer.*, *Bull.*, v. 13, no. 2, p. 33, pl. 3, fig. 25; D'ATTILIO, 1988, *Festivus*, v. 20, no. 8, p. 73, text-figs. 1, 2 (shell), 5, 6 (detail of sculpture).
- Caribiella alveata* (Kiener). KAICHER, 1974, *Card Catalogue World-wide Shells*, pack 6, *Muricidae - Part II*, no. 582.
- Favartia alveata* (Kiener). RIOS, 1975, *Brazilian Marine Moll. Icon.*, p. 86, pl. 25, fig. 354;

RADWIN and D'ATTILIO, 1976, *Murex Shells of the World*, p. 144, pl. 24, fig. 16, text-fig. 92 (detail of sculpture, mislabeled as *F. erosa*); FAIR, 1976, *The Murex Book*, p. 20, pl. 20, figs. 302, 302A; RIOS, 1985, *Seashells of Brazil*, p. 85, pl. 30, fig. 371; DE JONG and COOMANS, 1988, *Stud. Fauna Curaçao, Caribbean Islands*, v. 49, p. 73.

*Description*: "M. testa oblonga, costis varicibusque reticulata, alba, spira longissima; varicibus sex aut octo, regulariter ordinatis, seriatim alveatis; apertura parva, rotunda; labro dextro crasso, intus denticulato; canali brevissimo." (Kiener, 1842)

*Holotype*: Not found (not at Muséum National d'Histoire Naturelle, Virginie Heros, letter, 1993); height 22 mm (*fide* Kiener, 1842, p. 94).

*Type locality*: Jamaica (type locality of *Murex intermedius* Adams).

*Occurrence*: Recent only, from Bermuda to Bahia, Brazil, off the coast of Louisiana and Texas to Costa Rica and northern South America.

*Figured specimens*: Fig. 3, MCZ 156123 (lectotype - *M. intermedius* Adams); height 20.0 mm, diameter 10.0 mm; locality, Jamaica. Fig. 4, USNM 880034, height 18.9 mm, diameter 9.6 mm; locality, Curaçao, Netherlands Antilles.

*Discussion*: The original illustration of *Murex alveatus* is rather small, being presented at life-size, and there is no type locality, but the original description is good, and Kiener compares his species with other species of the genus *Favartia*. It is surprising that the similarity between the Kiener species and that of C.B. Adams was not recognized earlier.

While I was preparing the Catalogue of the genus *Murex* (Vokes, 1971a), Carmen Perrilliat, Instituto de Geología, UNAM, Mexico, was working on her monograph of the Santa Rosa fauna, discussed above. We had much correspondence regarding the identity of the small species named above as *F. carmenae*. I felt that it was a new species near *Murex intermedius* and "*Aspella*" *erosa* (as we thought of it in those days!) but that it should be reassigned subgenerically.

In February, 1970, she advised me that she had borrowed the type material of *Murex intermedius* from the Harvard Museum of Comparative Zoology and she was of the opinion that the Santa Rosa specimen and the Jamaican one were the same species, which she proposed to rename "*Aspella (Caribiella) elegans*, n.n., as *Murex intermedius* is preoccupied."



In February, 1971, her publication was still "in press" but she advised me that she had seen page proof and gave me the reference to "Paleontología Mexicana, Num. 32, 1971, p. 83, lam. 39, figs. 14, 15; lam. 40, figs. 1, 2." At this time I was holding up the page proof on my own Catalogue, so with the information she sent I went ahead and included the name *Aspella elegans* Perrilliat, 1971, *n.n. pro M. intermedius*, type of *Caribiella*.

My paper appeared in August, 1971, and it was not until 1972 that Perrilliat's work finally appeared. Imagine my surprise (and chagrin) to open it and discover that instead of *Aspella elegans*, she had reverted to *Murex intermedius* for the type of *Caribiella*, and the Santa Rosa species. Thus, we have a nomenclatorial tangle. The taxon *Aspella elegans* is valid as Perrilliat in Vokes, 1971, *n.n. pro Murex intermedius* Adams non Brocchi [ICZN Code Art. 13(a)iii] and becomes another subjective synonym of *Murex alveatus* Kiener. However, the generic taxon *Caribiella* is not valid "in Vokes" as there was no description [ICZN Art. 13(b)].\*

#### Subgenus PYGMAEPTERYYS Vokes, 1978

*Pygmaepterys* VOKES, 1978, Ann. Natal Mus., v. 23, no. 2, p. 398.

Type species: *Murex alfredensis* Bartsch, 1915, by original designation.

*Discussion:* This is another of the groups for which the western Atlantic species have been monographed (Vokes and D'Attilio, 1980). At that time, the generic placement of the subgenus was in question. Originally, *Pygmaepterys* was proposed as a subgenus of the muricine genus *Pterynotus* Swainson, 1833 (type species: *Murex pinnatus* Swainson, 1833). But, the radula of one of the Caribbean species assigned to *Pygmaepterys* is muricopsine. The question in 1980 was whether the Caribbean *P. germaniae* and the East African type species were, in fact, both referable to the same subgenus, or was this parallelism, so typical of the family Muricidae as a whole.

\*Thankfully, for we are thus spared the necessity of having to cite the subgenus as *Caribiella* Perrilliat in Vokes, type species: *Aspella elegans* Perrilliat in Vokes, *n.n. pro M. intermedius* Adams non Brocchi (= *Murex alveatus* Kiener)!

Regrettably, we still do not have the answer. No one has yet examined the animal of the type species. Other Indo-Pacific species, such as *F.(P.) yemenensis* (Houart and Wranik, 1989), have a muricopsine radula (Houart and Wranik, 1989, text-fig. 2), similar to that of the Eastern Pacific *F.(P.) poormani* Radwin and D'Attilio (1976, text-fig. 181). However, their radulae differ slightly from the western Atlantic *F.(P.) germaniae* (Vokes and D'Attilio, 1980, text-fig. 1) in having several secondary denticles toward the outer edges of the rachidian tooth (rather like the radula of some species of *Murexsul* and, especially, *Maxwellia* – see Radwin and D'Attilio, 1976, *Maxwellia gemma*, text-fig. 97).

Therefore, I am placing all of these species with similar morphology in the subgenus *Pygmaepterys*, with the understanding that in time, we may change this assignment. The general morphology of this group consists of relatively small shells (most 10 mm or less in height, although a few "giant" species measure up to 20 mm), with numerous (three to ten) winged varices on the body whorl, strong spiral sculpture, and a denticulate aperture. Denticles may or may not be present on the inner lip, but are always present on the inner side of the outer lip.

Once the subgenus was delineated, several previously described species were recognized as members of *Pygmaepterys*. In addition, several new species have been described since 1978, so that today at least 23 species, fossil and Recent, are considered members of this subgenus.

The subgenus is world-wide tropical in distribution, with 11 Recent species in the Indo-Pacific and seven living species in the western Atlantic. Two more are known from the Chipola Formation and one Recent form is known from the eastern Pacific. In Europe there is one fossil species in the Stampian (Oligocene) of France: "*Murex*" *subdecussatus* d'Orbigny, 1852 (*n.n. pro Murex decussatus* Grateloup, 1846, non Gmelin, 1791); and a second in the Miocene of Romania: "*Murex*" *giselae* Boettger, 1901. The latter was previously assigned to *Pazinotus* (Vokes, 1970, p. 6), but examination of the illustration of the type in Zilch (1934, pl. 15, fig. 79) and another specimen in the Mayer Eymar Col-



lection (now part of the Naturhistorisches Museum Basel collections) shows that the shell surface is ornamented by the characteristic *Pygmaepterys* growth lamellae and is unlike the smooth *Pazinotus*. There may be other fossil species that have not been recognized. Without a specimen in hand one would not suspect that "*Murex*" *subdecussatus* should be placed here, but examination of a specimen (see pl. 25, fig. 3) immediately demonstrates the similarity to the Chipola species *F.(P.) pratulum* (pl. 25, fig. 2).

FAVARTIA (PYGMAEPTERYS) DREZI  
(Vokes and D'Attilio)  
Plate 25, figure 1

?*Pygmaepterys drezi* VOKES and D'ATTILIO, 1980, Tulane Stud. Geol. Paleont., v. 16, no. 2, p. 48, pl. 1, fig. 5.

*Description*: "Shell large for the group; with five post-nuclear whorls; protoconch unknown. Spiral ornamentation consisting of two major cords on the first and succeeding post-nuclear whorls; with on the body whorl five strong cords and, in addition, one or more intercalary minor cords. On the short siphonal canal another two major cords and some minor cords. Axial ornamentation of narrow recurved varices, eight in number on each whorl before the adult body whorl; there every other varix tending to be obsolete - only six varices on the body whorl of the holotype with intervarical nodes replacing the "lost" varices. Apical edge of each varix flexed toward the aperture, reflecting the posterior expansion of the columellar lip. Spiral cords crossing the varices forming short spinelets, largest at the shoulder. Apertural faces of the varices covered by numerous minutely crenulate lamellae; in addition, intervarical areas crowded with crenulate axial growth lamellae. Aperture oval, inner side of outer lip with six denticles, corresponding to the areas between the spiral cords. Inner lip smooth, appressed, with a wide expansion at the posterior end and three small denticles at the anterior end. Siphonal canal short, broad, slightly recurved at the distal end; former terminations making a small fasciole." (Vokes and D'Attilio, 1980)

*Holotype*: USNM 294289; height 11.8 mm, diameter 7.0 mm.

*Type locality*: TU 546, Chipola Formation; Tenmile Creek, about 1 3/4 miles west of Chipola River (NE 1/4 Sec. 12, T1N, R10W), Calhoun County, Florida.

*Occurrence*: Chipola Formation, Florida.

*Figured specimen*: USNM 294289 (holotype). Additional locality: TU 830.

*Discussion*: The inflated whorl shape and denticulate inner lip indicates that this species probably is ancestral to the Late Miocene to Recent *F.(P.) germainae*. In the type lot there are three specimens, but no additional material has been discovered since 1980 and nothing can be added to the previous discussion.

FAVARTIA (PYGMAEPTERYS) PRATULUM  
(Vokes and D'Attilio)  
Plate 25, figure 2

*Pygmaepterys pratulum* VOKES and D'ATTILIO, 1980, Tulane Stud. Geol. Paleont., v. 16, no. 2, p. 49, pl. 1, figs. 6, 7; GIBSON SMITH and GIBSON SMITH, 1983, Veliger, v. 25, no. 3, p. 180.

*Description*: "Shell large for the group, with six post-nuclear whorls and a protoconch of two and one-half somewhat bulbous whorls. Spiral ornamentation beginning with first one, then two strong cords, and a faint third at the shoulder, increasing to seven on the body portion of the last whorl and several smaller cords on the siphonal canal. Axial ornamentation of nine lamellar varices on each whorl except the last where there are only six to eight, with no trace of 'remnant' varices in the form of intervarical nodes where the varices would have been. Varices composed of a series of laminae pressed together; both the ad- and abapertural faces markedly scabrous. Spiral cords crossing the varices as small channels of outfolded laminae, giving the illusion of spinelets, especially at the shoulder. Varices standing free along the siphonal canal as a laminated frill, in the manner of *Naquetia*; with numerous axial growth lamellae between the varices, elaborately crenulated by invisible spiral threads, giving the intervarical areas a cancellate appearance. Aperture elongate-oval; inner lip smooth, only slightly expanded and appressed at the posterior end; inner side of outer lip with seven denticles, those in the center tending to be paired. Siphonal canal medium in length, only indistinctly set off from body whorl. Distal end slightly recurved, with the tips of former canals forming a long curved fasciole." (Vokes and D'Attilio, 1980)

*Holotype*: USNM 294290; height 10.9 mm, diameter 5.5 mm.

*Type locality*: TU 546, Chipola Formation; Tenmile Creek, about 1 3/4 miles west of Chipola River (NE 1/4 Sec. 12, T1N, R10W), Calhoun County, Florida.

*Occurrence*: Chipola Formation, Florida.

*Figured specimen*: USNM 482062; height 12.3 mm, diameter 6.3 mm; locality TU 830. Additional localities: TU 554, 950, 951.



*Discussion:* Since the original description, only a single example of this species has been collected (by Gary W. Schmelz at locality TU 830). This specimen (pl. 25, fig. 2) is slightly larger than the holotype and clearly shows the decrease in the number of varices on the body whorl.

FAVARTIA (PYGMAEPTERYYS) GERMAINAE  
(Vokes and D'Attilio)  
Plate 25, figure 4

?*Pygmaepterys germainae* VOKES and D'ATTILIO, 1980, Tulane Stud. Geol. Paleont., v. 16, no. 2, p. 50, pl. 1, figs. 1-4, text-fig. 1 (radula); GIBSON SMITH and GIBSON SMITH, 1983, Veliger, v. 25, no. 3, p. 179.

*Pygmaepterys germainae* [sic] Vokes and D'Attilio. KAICHER, 1980, Card Catalogue World-wide Shells, pack 25, Muricidae - Part V, no. 2580 (holotype).

*Favartia (Pygmaepterys) germainae* (Vokes and D'Attilio). VOKES, 1984, Shells and Sea Life, v. 16, no. 11, p. 214.

*Favartia (?Pygmaepterys) germainae* (Vokes and D'Attilio). VOKES, 1989, Bulls. Amer. Paleontology, v. 97, no. 332, p. 72, pl. 8, fig. 6.

*Pygmaepterys germainae* Vokes and D'Attilio. HOUART, 1991, Nautilus, v. 105, no. 1, p. 32, text-fig. 37.

*Description:* "Shell small, with four post-nuclear whorls and a protoconch of approximately one and one-half bulbous whorls, the exact termination being difficult to ascertain among the

overlapping varices from the first post-nuclear whorl well onto the protoconch. Spiral ornamentation of two strong cords on the spire; five major spiral cords on body whorl; three somewhat weaker cords on the siphonal canal. Axial ornamentation of seven varices on each whorl except the last, where there is a tendency to drop one of the varices, leaving a small intervarical node in place of the varix. Intervarical areas covered with elaborate crenulated axial growth lamellae, between and crossing the spiral cords. Each varix forming as a flange, well behind the aperture, with the adapertural face also ornamented by growth lamellae, with small recurved spinelets where the spiral cords cross the varices, that at the shoulder being the longest; a strong adapertural flexure at the adapical end of each varix, reflecting the posterior expansion of the inner lip. Aperture oval, inner lip in adult specimens with about four denticles at the anterior end and another two at the expanded and appressed posterior end. Outer lip with six strong denticles, corresponding to the area between the spiral cords. Siphonal canal short, broad, recurved at the distal end, terminations of former canals forming a small fasciole. Shell color a light beige, aperture a rich mahogany. Operculum straw-colored, typically muricoid, with a terminal nucleus. Radula muricopsine." (Vokes and D'Attilio, 1980)

*Holotype:* USNM 783319; height 7.3 mm, diameter 4.0 mm.

*Type locality:* Off Punta Higüero (or Jigüero), northwestern Puerto Rico, 90 meters.

*Occurrence:* Cercado and Gurabo formations,

PLATE 25

Figures	Page
1. <i>Favartia (Pygmaepterys) drezi</i> (Vokes and D'Attilio) . . . . .	141
(X 4) USNM 294289 (holotype); height 11.8 mm, diameter 7.0 mm. Locality: TU 546, Tenmile Creek, Florida. Chipola Formation.	
2. <i>Favartia (Pygmaepterys) pratulum</i> (Vokes and D'Attilio) . . . . .	141
(X 4) USNM 482062; height 12.3 mm, diameter 6.3 mm. Locality: TU 830, Tenmile Creek, Florida. Chipola Formation.	
3. <i>Favartia (Pygmaepterys) subdecussata</i> (d'Orbigny) . . . . .	141
(X 4) NMB H 17472; height 11.5 mm, diameter 5.5 mm. Locality: Dax, France. Stampian.	
4. <i>Favartia (Pygmaepterys) germainae</i> (Vokes and D'Attilio) . . . . .	142
(X 6) USNM 783320 (paratype A); height 7.0 mm, diameter 4.0 mm. Locality: Colón, Panama. Recent.	
5. <i>Favartia (Pygmaepterys) richardbinghami</i> (Petuch) . . . . .	147
(X 4) USNM 859847 (holotype); height 16.1 mm, diameter 7.8 mm. Locality: off Palm Beach Island, Florida. Recent.	
6, 7. <i>Favartia (Pygmaepterys) oxossi</i> (Petuch) . . . . .	144
6. (X 6) USNM 780650 (holotype); height 9.0 mm, diameter 4.6 mm. Locality: Abrolhos Archipelago, Brazil. Recent.	
7. (X 5) USNM 880035; height 10.0 mm, diameter 5.8 mm. Locality: off Guarapari, Espírito Santo, Brazil. Recent.	



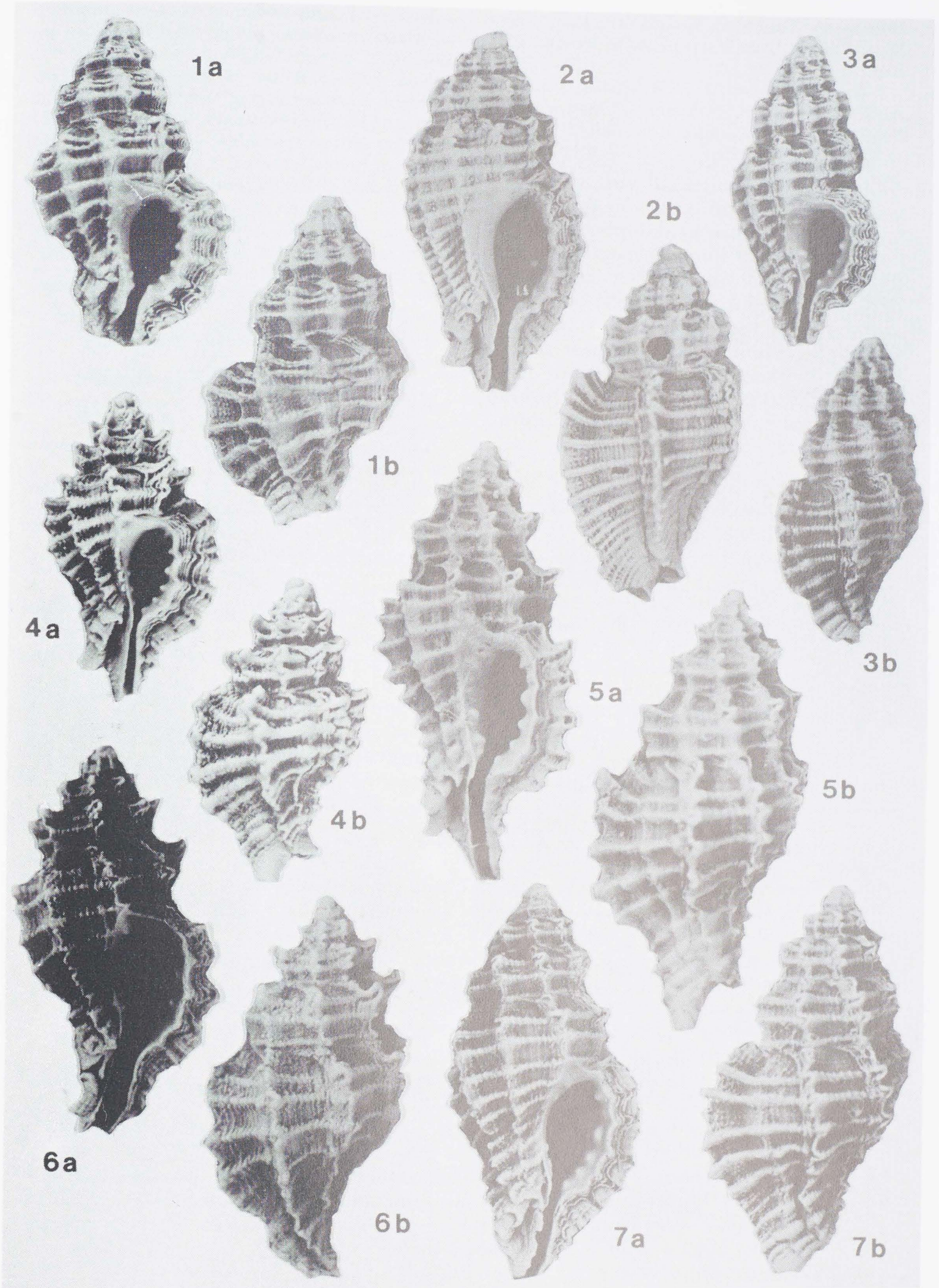


PLATE 25



Dominican Republic; Moín Formation, Costa Rica; Recent, from Puerto Rico to Panama and Espírito Santo, Brazil.

*Figured specimen:* USNM 783320 (paratype A); height 7.0 mm, diameter 4.0 mm; locality, Colón, Panama. Additional localities: TU 953, 1215, 1227A, 1230, 1250.

*Discussion:* This small species (maximum height 8 mm) occurs in the Recent fauna of the Caribbean at depths of 12 to 90 meters. We have some 25 specimens from the Cercado and Gurabo formations of the Dominican Republic. Its rarity in the reported Recent faunas probably is due to its small size. When described it was known from as far south as Panama, but since then Houart (1991, p. 32) has extended the range to the submarine banks off Espírito Santo, Brazil.

FAVARTIA (PYGMAEPTERYS) OXOSI (Petuch)  
Plate 25, figures 6, 7

*Muricopsis oxossi* PETUCH, 1979, Biol. Soc. Washington, Proc., v. 92, no. 3, p. 517, figs. 1-G, 1-H; VOKES, 1984, Shells and Sea Life, v. 16, no. 11, p. 214; RIOS, 1985, Seashells of Brazil, p. 84, pl. 30, fig. 370 (holotype); PETUCH, 1987, New Caribbean Moll. Faunas, p. 26, 140, pl. 15, figs. 15, 16 (holotype); PETUCH, 1988, Neogene Hist. Trop. Amer. Moll., p. 163, pl. 39, figs. 8, 9 (holotype).

*Description:* "Small, fusiform, spire high, acute; suture indistinct; sculpture consisting of 5

raised axial cords and numerous close-packed, overlapping scales, giving shell lamellose appearance; varices flattened, winglike, heavily scaled, with 5 flattened spines along edges; spine on shoulder largest, recurved posteriorly; spines on last varices fused into single large varical wing with serrate edge; 7 varies [sic] on last whorl of holotype; color creamy-yellow with 3 slightly darker bands, one at shoulder, one at mid-body, and one at base of siphonal canal; shell covered with irregular white intriticalx [sic]; siphonal canal long, fully 1/4 of shell length; aperture white; inner edge of outer lip with 5 low, rounded teeth; operculum unknown." (Petuch, 1979)

*Holotype:* USNM 780650; height 9.0 mm, diameter 4.6 mm.

*Type locality:* 2 km east of Santa Barbara Island, Abrolhos Archipelago, Bahia, Brazil, 25 meters.

*Occurrence:* Recent only, known only from Brazil.

*Figured specimens:* Fig. 6, USNM 780650 (holotype). Fig. 7, USNM 880035; height 10.0 mm, diameter 5.8 mm; locality, Rasa Island, off Guarapari, Espírito Santo, Brazil, 30 meters.

*Discussion:* The holotype of *Muricopsis oxossi* Petuch (1979, p. 517, figs. 1-G, 1-H) is immature and does not show the expanded terminal varix. As the subgenus *Pygmaepterys* had not been recognized in the western Atlantic at the time of the description, the similarities were overlooked. However, the surface of the holotype is covered with growth lamellae, as is typical of

PLATE 26

Figures	Page
1-3. <i>Favartia (Pygmaepterys) juanita</i> (Gibson Smith and Gibson Smith) . . . . .	146
1. (X 8) USNM 784694 (holotype); height 7.6 mm, diameter 3.7 mm. Locality: Borburata, Carabobo State, Venezuela. Recent. (Photographs courtesy of J. Gibson Smith)	
2. (X 8) USNM 880036; height 6.7 mm, diameter 3.5 mm. Locality: same as holotype.	
3. (X 6) Shasky Collection; height 9.2 mm, diameter 4.7 mm. Locality: Isla Margarita, Venezuela. Recent.	
4, 5. <i>Favartia (Pygmaepterys) alicae</i> (Petuch) . . . . .	147
4. (X 5) USNM 859846 (holotype); height 11.0 mm, diameter 5.7 mm. Locality: Bonaire, Netherlands Antilles. Recent.	
5. (X 6) Sunderland Collection; height 9.1 mm, diameter 4.9 mm. Locality: Bonaire, Netherlands Antilles. Recent.	
6. <i>Favartia (Pygmaepterys) lourdesae</i> (Gibson Smith and Gibson Smith) . . . . .	146
(X 8) USNM 784695 (holotype); height 6.0 mm, diameter 3.3 mm. Locality: Isla La Orchila, Venezuela. Recent. (Photographs courtesy of J. Gibson Smith)	
7. <i>Favartia (Pygmaepterys) rauli</i> (Espinosa) . . . . .	147
(X 6) USNM 880037 (paratype); height 7.5 mm, diameter 4.7 mm. Locality: Cienfuegos, Cuba. Recent.	



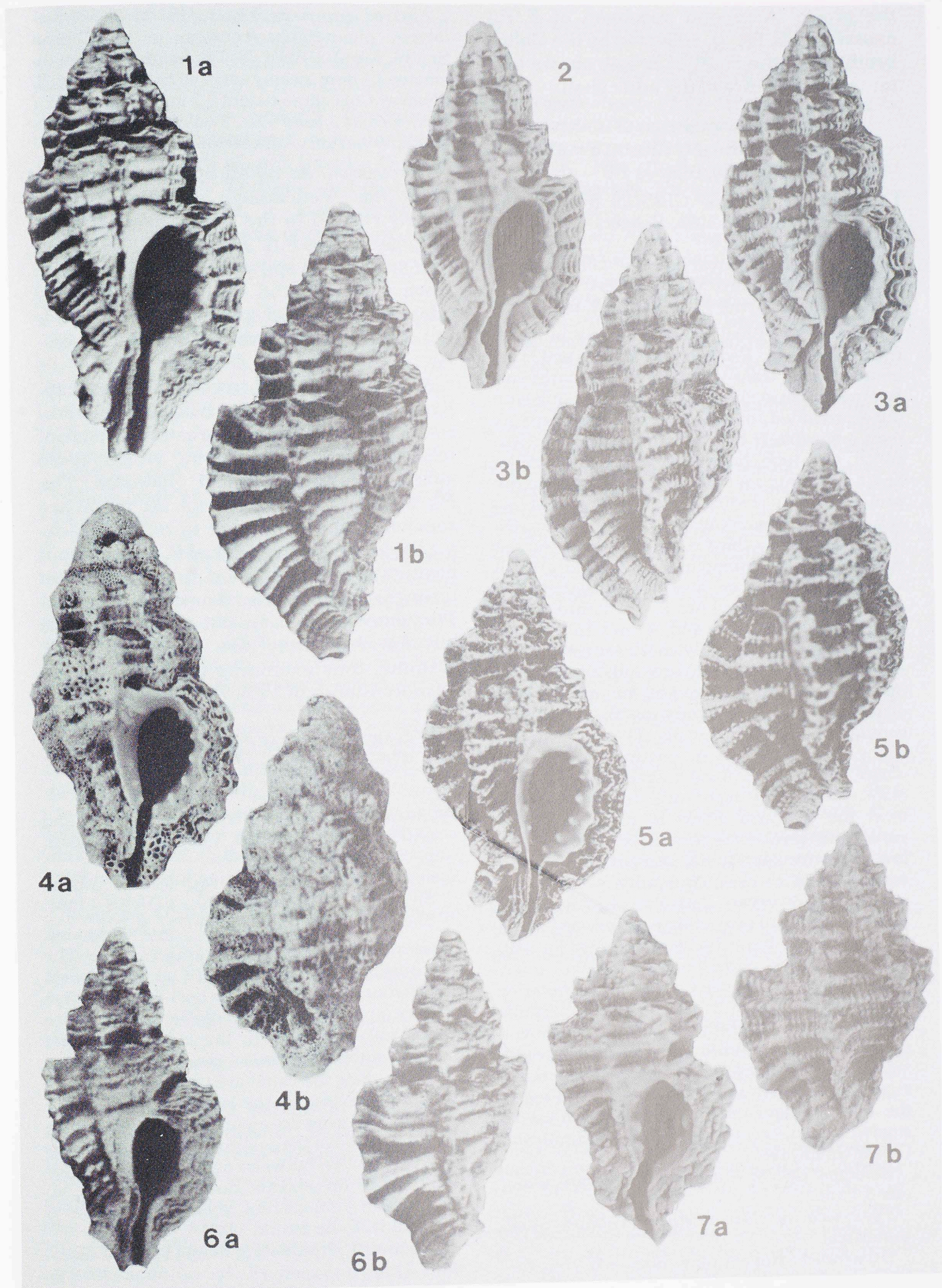


PLATE 26



the group. A second specimen of *F.(P.) oxossi* (pl. 25, fig. 7), collected by the Coltro brothers on the coast of Brazil, shows better the true nature of the adult shell.

FAVARTIA (PYGMAEPTERYS) JUANITAE  
(Gibson Smith and Gibson Smith)

Plate 26, figures 1-3

*Pygmaepterys juanitae* GIBSON SMITH and GIBSON SMITH, 1983, *Veliger*, v. 25, no. 3, p. 179, text-figs. 6, 7.

*Favartia (Pygmaepterys) juanitae* (Gibson Smith and Gibson Smith). VOKES, 1984, *Shells and Sea Life*, v. 16, no. 11, p. 214, pl. 2, fig. 16.

*Description*: "Shell small with five and three-quarter whorls. Protoconch of one and one-quarter white, translucent, bulbous whorls; surface microscopically granular; terminating with a low, rounded, opisthocyrt varix, followed almost immediately by the first varix of the teleoconch, with nine, hook-like varices in all on the first turn, adhering to and projecting above the protoconch, thus hiding it. First sculpture of two spiral cords crenulating the simple varices. On the second turn a third spiral cord appears, the varices become compounded by axial growth lamellae which cover, also, the areas between varices. A fourth cord lies in the suture with a wider interspace between it and the earlier cords. Below, on the bodywhorl, are three more spiral cords decreasing in strength down to the base of the whorl, followed by five minor cords on the canal. The terminations of the varices accentuate the anterior fasciole. The nine varices, aligned along the spire, continue to the last whorl where one is missing, usually the penultimate. The top of each varix runs forward to meet the previous whorl at the subsequent varix. The spiral cords terminate on each varix in a minuscule open spine, except for the uppermost cord at the shoulder where there is a strong spine curved abaperturally. Aperture oval, the outer lip projecting well forward of the terminal varix. Inner lip smooth, outer lip with seven denticles corresponding to the interspaces between the major spiral cords. Anterior canal almost as long as the aperture, partially closed and slightly recurved. Shell cream-coloured with a narrow brown band just below the suture and another just above at mid-whorl, occupying the wider spiral interspace; the top of the aperture and the middle of the outer lip stained brown, accordingly." (Gibson Smith and Gibson Smith, 1983)

*Holotype*: USNM 784694; height 7.6 mm, diameter 3.7 mm.

*Type locality*: Borburata, Carabobo State, Venezuela.

*Occurrence*: Recent only, northern Venezuela.

*Figured specimens*: Fig. 1, USNM 784694 (holotype; photographs courtesy of J. Gibson Smith). Fig. 2, USNM 880036; height 6.7 mm, diameter 3.5 mm; locality same as holotype. Fig. 3, Shaskey Collection; height 9.2 mm, diameter 4.7 mm; locality, Islas Los Frailes, off Isla Margarita, Venezuela, 7 meters on coral.

*Discussion*: As noted by the original authors this Venezuelan species is most closely related to the Late Early Miocene Chipola species *F.(P.) pratulum*. In the Recent species the spiral cords are somewhat more flattened and the varices lack the adapically directed spines at the shoulder but otherwise the forms are markedly similar.

Material collected by Donald Shaskey, Redlands, California, contains several specimens from the northeastern corner of Isla Margarita, Venezuela, which seem most nearly referable to *P. juanitae*. The Isla Margarita specimens (pl. 26, fig. 3) are somewhat more rounded in outline, lacking the angulate shoulder of *P. juanitae* but having the eight flattened spiral cords that distinguish this species from similar forms. They may prove to be yet another species but for now they are included in *P. juanitae*, thus extending the range to the offshore islands of Venezuela.

FAVARTIA (PYGMAEPTERYS) LOURDESÆ  
(Gibson Smith and Gibson Smith)

Plate 26, figure 6

*Pygmaepterys lourdesae* GIBSON SMITH and GIBSON SMITH, 1983, *Veliger*, v. 25, no. 3, p. 180, text-figs. 8, 9.

*Favartia (Pygmaepterys) lourdesae* (Gibson Smith and Gibson Smith). VOKES, 1984, *Shells and Sea Life*, v. 16, no. 11, p. 214.

*Description*: "Shell small, pure white. The protoconch and spiral sculpture as in *Pygmaepterys juanitae*. On the bodywhorl there are five primary spiral cords; the three of the spire whorls, followed below by the wider interspace, then by two more primary cords to the base of the shell; along the canal are two to five (usually four) minor cords. On the last whorl the varices reduce from nine to eight, sometimes seven. The outer edge of the scabrous varices is indented at the junction between outer lip and anterior canal. Inner lip smooth, denticles in outer lip rudimentary, numbering about five." (Gibson Smith and Gibson Smith, 1983)

*Holotype*: USNM 784695; height 6.0 mm, diameter 3.3 mm.

*Type locality*: Isla La Orchila, Venezuela.



*Occurrence:* Recent only, offshore islands along the north coast of Venezuela.

*Figured specimen:* USNM 784695 (holotype; photographs courtesy of J. Gibson Smith).

*Discussion:* This second Venezuelan species of *Pygmaeapterys* was described from the off-shore islands (Isla La Orchila, Islas Roques, Isla Tortuga) and is smaller than *F.(P.) juanita*. It does not have a close relationship to any of the known species of the subgenus.

FAVARTIA (PYGMAEPTERYS) RICHARDBINGHAMI  
(Petuch)

Plate 25, figure 5

*Muricopsis richardbinghami* PETUCH, 1987, New Caribbean Moll. Faunas, p. 26, pl. 5, figs. 12, 13.

*Pygmaeapterys richardbinghami* (Petuch). KAI-CHER, 1990, Card Catalogue World-wide Shells, pack 59, Muricidae - Part VI, no. 6098 (holotype).

*Description:* "Shell fusiform, elongated, with elevated spire; shell with 8 varices per whorl; body whorl ornamented with 5 large, evenly-spaced, raised cords; siphonal canal with 4 cords; spire whorls with 3 spiral cords; shoulder tabulate, sharp-angled; varices thin, winglike, with 5 large, bladelike serrations; serrations correspond to cords in intervarical regions; posteriormost serration largest, spinelike, pointed posteriorly; aperture small, oval; outer lip thickened, with 5 large denticles along inner edge; shell color tan, with 2 thin reddish-brown bands, 1 around subsutural region and 1 around break between body whorl and siphonal canal; spire whorls with reddish-brown subsutural band; interior of aperture pale tan." (Petuch, 1987)

*Holotype:* USNM 859847; height 16.1 mm, diameter 7.8 mm.

*Type locality:* Off Palm Beach Island, Palm Beach County, Florida, under coral rubble, 100 ft. [30 meters].

*Occurrence:* Recent only, known only from the type locality.

*Figured specimen:* USNM 859847 (holotype).

*Discussion:* Also named in the genus *Muricopsis* and compared by the author to *Muricopsis oxossi*, the fimbriate nature of the surface ornamentation indicates placement in *Pygmaeapterys* the best choice for this species, as it is for *F.(P.) oxossi*. Known only from the holotype, this is the largest species of *Pygmaeapterys* in the western Atlantic. Additional material may demonstrate synonymy with *F.(P.) oxossi*.

FAVARTIA (PYGMAEPTERYS) ALICEAE  
(Petuch)

Plate 26, figures 4, 5

*Muricopsis alicae* PETUCH, 1987, New Caribbean Moll. Faunas, p. 100, pl. 17, figs. 8, 9.

(?)*Pygmaeapterys alicae* [sic] (Petuch). KAI-CHER, 1991, Card Catalogue World-wide Shells, pack 59, Muricidae - Part VI, no. 6007 (holotype).

*Description:* "Shell small for genus, elongated, with high, elevated spire; 6 fimbriated varices per whorl; varices with 6 short, bladelike serrations; intervarical areas and backs of varices of body whorl with 6 large, raised, fimbriated spiral cords; inside of lip with 6 large denticles; shell color pure white." (Petuch, 1987)

*Holotype:* USNM 859846; height 11.0 mm, diameter 5.7 mm.

*Type locality:* Southern coast of Bonaire, Netherlands Antilles, in coral rubble, 2 meters.

*Occurrence:* Recent only, Netherlands Antilles.

*Figured specimens:* Fig. 4, USNM 859846 (holotype). Fig. 5, Sunderland Collection; height 9.1 mm, diameter 4.9 mm; locality, Bonaire, Netherlands Antilles, 2-3 meters.

*Discussion:* In his description Petuch does not mention two small denticles on the columellar lip of this species. Although four species of *Pygmaeapterys* occur in the southern Caribbean, *F.(P.) alicae* may be distinguished readily by the rounded nature of the shell outline and its slightly larger size. Unlike the other three, this species has a rounded outline with the maximum diameter at the mid-point of the body whorl, not at the shoulder, as in the others. The species it most nearly resembles is the Chipola Formation *F.(P.) drezi*, in which the whorls are more inflated, causing the suture to be more impressed.

FAVARTIA (PYGMAEPTERYS) RAULI  
(Espinosa)

Plate 26, figure 7

*Pygmaepteris* [sic] *rauli* ESPINOSA, 1990, Poeyana, no. 407, p. 1, text-fig. 1a, 1b (holotype), 1c (paratype), 1d (juvenile).

*Description:* "Concha subfusiforme ancha, de tamanõ pequeño. La protoconcha está formada por una vuelta algo grande y redondeada, de superficie aparentemente lisa; pero con puntos microscópicos, la cual pasa a la teleoconcha sin escultura de transición. La teleoconcha tiene unas cinco vueltas, con seis várices axiales por vuelta, estrechas y laminares en su parte anterior. La várice labral es la más desarrollada. En la



última vuelta la escultura espiral está formada por cuatro cordones primarios: los dos superiores más unidos entre sí; de tres a cuatro cordones basales menos marcados por debajo de los cordones primarios, siendo el anterior el más señalado. En las restantes vueltas de la teleoconcha hay tres cordones espirales primarios. Los cordones formen espinas tubulares sobre las várices, abiertas en su parte anterior. La superficie de la concha está cubierta por finas laminillas de crecimiento, casi microscópicas, con el borde libre ondulado. Estas laminillas están más señaladas entre los cordones espirales. La abertura es aporcelanada, oval y pequeña, con cinco denticulos en el interior del labio palatal; uno superior; otro medio, grande y ancho, posiblemente formado por la fusión de dos dientes; y tres inferiores. Callo labial de borde libre en su porción columelar, en la que hay tres pliegues denticuliformes, de los que el superior es el más señalado. Canal sifonal abierto, moderadamente extendido.

"El color de fondo es blanco amarillento. En la última vuelta hay una banda pardo rojiza sobre el tercer cordón (de la sutura a la base) espiral primario. Esta banda oscura señala la línea de unión de las restantes vueltas. En la base de la concha hay otra banda del mismo color, pero más pálido." (Espinosa, 1990)

*Holotype*: Colección Malacológica, Instituto de Ecología y Sistemática, Academia de Ciencias de Cuba, no. 70; height 7.2 mm, diameter 4.3 mm.

*Type locality*: Playa Rancho Luna, Cienfuegos, Cuba; sand bottom with coral reefs, between 8 and 20 meters.

*Occurrence*: Recent only, known only from type locality.

*Figured specimen*: USNM 880037 (paratype); height 7.5 mm, diameter 4.7 mm; locality same as holotype.

*Discussion*: This recently described species is known only from the type lot collected at Cienfuegos, Cuba. The author, Jose Espinosa, kindly provided me with a paratype specimen, here figured. As he notes, this species differs from *P. germainae*, the most closely related species, by the greater number of whorls and fewer axial varices. Moreover, *P. germainae* has six denticles on both the inner and outer lips.

## V. LOCALITY DATA

The following are Tulane University fossil locality numbers:

60. Jackson Bluff Fm., borrow pits at Jackson Bluff, Ochlockonee River (NW 1/4 Sec. 21, T1S, R4W), Leon Co., Florida.
68. Caloosahatchee Fm., North St. Petersburg, 70th Ave. at 9th St. N., Pinellas Co., Florida.
78. Gosport Sand, Claiborne Bluff, east bank of Alabama River, south of bridge of U.S. Highway 84, Monroe Co., Alabama.
79. Caloosahatchee Fm. and Bermont Fm. mixed, spoil banks north and south side of Caloosahatchee River, at Ortona Lock (Sec. 27, T42S, R30E), Glades Co., Florida.
87. "Bashi" Fm., "Bashi boulders," west side of Pickett Creek on Alabama Highway 10, east edge of Butler, Choctaw Co., Alabama.
200. Pinecrest Beds, borrow pits about 1 mile southwest of Acline (Sec. 29, T41S, R23E), Charlotte Co., Florida.
201. Bermont Fm., spoil banks at pit just south of Belle Glade (at Belle Glade Camp), Palm Beach Co., Florida.
202. Caloosahatchee Fm., south bank of Caloosahatchee River, about 2 miles west of LaBelle (SE 1/4 Sec. 12, T43S, R28E), Hendry Co., Florida.
203. Caloosahatchee Fm., north bank of Caloosahatchee River, about 2 miles east of Fort Denaud (SW 1/4 Sec. 11, T43S, R28E), Hendry Co., Florida.
226. Red Bluff Fm., west bank Chickasawhay River, approximately 1 mile southwest of Hiwannee (SW 1/4 Sec. 28, T10N, R7W), Wayne Co., Mississippi.
457. Chipola Fm., west bank of Chipola River, about 1/2 mile below Tenmile Creek (SW 1/4 Sec. 17, T1N, R9W), Calhoun Co., Florida. (Same as USGS 2213, 2564, and 3419, "one mile below Bailey's ferry.")
458. Chipola Fm., east bank of Chipola River, above Farley Creek (SW 1/4 Sec. 20, T1N, R9W), Calhoun Co., Florida.
459. Chipola Fm., east bank of Chipola River, steep bank about 1500 feet above the mouth of Taylor Lake Branch (NW 1/4 Sec. 29, T1N, R9W), Calhoun Co., Florida.
519. Caloosahatchee Fm., Harney Pond Canal spoil banks, at Florida Highway 78, northwest side of Lake Okeechobee (NW 1/4 Sec. 18, T40S, R33E), Glades Co., Florida.
520. Pinecrest Beds, spoil banks, canal 0.9 mile east of Brighton on Florida Highway 70 (Sec. 25, T37S, R32E), Highlands Co., Florida.
523. Pinecrest Beds, Harney Pond Canal spoil banks, 6 miles northwest of Florida Highway 78, Brighton Indian Reservation (NW 1/4 Sec. 22, T39S, R32E), Glades Co., Florida.
525. Pinecrest Beds, U.S. Highway 41, at "Forty mile Bend," Dade Co., Florida.
527. Caloosahatchee Fm., north shore Lake Okeechobee, Pumping Station no. 127 (NE 1/4 Sec. 35, T39S, R33E), Glades Co., Florida.
528. Pinecrest Beds, Florida Highway 78, 5 1/2 miles west of Indian Prairie Canal (NW 1/4 Sec. 9, T40S, R33E), Glades Co., Florida.



- 529A. Fort Thompson Fm., north bank of Caloosahatchee River, about 2 miles west of La Belle (SE 1/4 Sec. 12, T43S, R28E), Hendry Co., Florida.
- 529B. Caloosahatchee Fm., same as TU 529A, but stratigraphically lower.
536. Caloosahatchee Fm., south bank of Caloosahatchee River about 1 mile east of La Belle (Sec. 3 & 4, T43S, R29E), Hendry Co., Florida. (Designated as type locality of the Caloosahatchee Formation by Olsson *in* Olsson and Petit, 1964, p. 529.)
- 539A. Bermont Fm., Shell Creek (upper beds), about 8 miles east of Cleveland (Sec. 30, T40S, R25E), Charlotte Co., Florida. (Designated as type locality of the Bermont Formation by DuBar, 1974, p. 221.)
- 539B. Caloosahatchee Fm., Shell Creek (lower beds), about 8 miles east of Cleveland (Sec. 30, T40S, R52E), Charlotte Co., Florida.
541. Pinecrest Beds and Caloosahatchee Fm. mixed, Miami Canal spoil banks, 2 miles north of pumping station at Broward county line, Palm Beach Co., Florida.
546. Chipola Fm., Tenmile Creek, about 1 3/4 miles west of Chipola River (NE 1/4 Sec. 12, T1N, R10W), Calhoun Co., Florida (= USGS 2212, "one mile west of Bailey's Ferry").
547. Chipola Fm., west bank of Chipola River, about 2000 ft. above Fourmile Creek (SW 1/4 Sec. 29, T1N, R9W), Calhoun Co., Florida.
548. Chipola Fm., west bank of Chipola River, at bend about 1800 feet south of mouth of Farley Creek (NW 1/4 Sec. 29, T1N, R9W), Calhoun Co., Florida.
554. Chipola Fm., east bank of Chipola River at power line crossing (SW 1/4 Sec. 17, T1N, R9W), Calhoun Co., Florida.
555. Chipola Fm., east bank of Chipola River, about 1000 ft. above Fourmile Creek (SW 1/4 Sec. 29, T1N, R9W), Calhoun Co., Florida.
558. Waccamaw Fm., borrow pits at north end of Crescent Beach Airport, Crescent Beach, Horry Co., South Carolina.
579. Caloosahatchee Fm., Miami Canal spoil banks, 4 miles north of pumping station at Broward county line, Palm Beach Co., Florida.
580. Bermont Fm., North New River Canal spoil banks, 1 mile south of South Bay, Palm Beach Co., Florida.
583. Caloosahatchee Fm., Miami Canal spoil banks, 7 miles north of pumping station at Broward county line, Palm Beach Co., Florida.
638. Agueguexquite Fm., roadcut, pipeline cut, and quarry on Mexico Highway 180, 14 miles east of junction with side road into Coatzacoalcos, Veracruz, Mexico.
642. Red Bluff Fm., Chickasawhay River at Hiwannee (NE 1/4 Sec. 28, T10N, R7W), Wayne Co., Mississippi.
725. Bermont Fm., North New River Canal spoil banks, 3 miles south of South Bay, at Okeelanta, Palm Beach Co., Florida.
726. Caloosahatchee Fm., Hendry County rock pit, 1/2 mile north of Florida Highway 80, three miles west of La Belle (SE 1/4 Sec. 14, T43S, R28E), Hendry Co., Florida.
727. Bermont Fm., borrow pits 2.2 miles east of U.S. Highway 27, 15 miles south of South Bay, Palm Beach Co., Florida.
728. Pinecrest Beds, spoil banks on west side of Kissimmee Canal and east side of Kissimmee River, just across from U.S. Corps of Engineers Structure 65-D (Sec. 33, T36S, R33E), Okeechobee Co., Florida.
729. Pinecrest Beds, spoil banks on west side of Kissimmee Canal and east side of Kissimmee River, approximately 1/2 mile south of U.S. Corps of Engineers Structure 65-D (S 1/2 Sec. 33, T36S, R33E), Okeechobee Co., Florida.
730. Pinecrest Beds, embankment of Seaboard Airline Railroad, just west of Kissimmee River, (NW 1/4 Sec. 20, T36S, R33E), Highlands Co., Florida.
736. Pinecrest Beds and Caloosahatchee Fm. mixed, spoil banks on south side of Florida Highway 70 and east side of Kissimmee River, Okeechobee Co., Florida.
745. Caloosahatchee Fm., Miami Canal spoil banks, 10.8 miles north of pumping station at Broward county line, Palm Beach Co., Florida.
751. Bermont Fm., North New River Canal spoil banks, 1 1/2 miles south of South Bay, Palm Beach Co., Florida.
753. Pinecrest Beds, spoil banks on south side of Canal 41-C, 5.8 miles east of Brighton (SE 1/4 Sec. 35, T37S, R33E), Highlands Co., Florida.
755. Caloosahatchee Fm., Miami Canal spoil banks, 17.4 miles north of pumping station at Broward county line, Palm Beach Co., Florida.
756. Pinecrest Beds, Port Charlotte Development, spoil banks west side of Elkcan Waterway, 2.3 miles southeast of Port Charlotte Railroad Station (formerly Murdock) and 1.7 miles east of U.S. Highway 41 (Sec. 10, T40S, R22E), Charlotte Co., Florida.
759. Bermont Fm., spoil banks north side of Caloosahatchee River, 2 miles west of Ortona Lock (NE 1/4 Sec. 29, T42S, R30E), Glades Co., Florida.
767. Caloosahatchee Fm. and Bermont Fm. mixed, spoil banks north side of Caloosahatchee River, 5 miles west of Ortona Lock (NW 1/4 Sec. 36, T42S, R29E), Glades Co., Florida.
768. Caloosahatchee Fm. and Bermont Fm. mixed, spoil banks north side of Caloosahatchee River, 5 1/2 miles west of Ortona Lock (NW 1/4 Sec. 35, T42S, R29E), Glades



- Co., Florida.
769. Pinecrest Beds, spoil banks east side of Kissimmee River, 1 1/2 to 2 miles south of U.S. Corps of Engineers Structure 65-D (NE 1/4 Sec. 35, T36S, R33E), Okeechobee Co., Florida.
770. Pinecrest Beds and Caloosahatchee Fm. mixed, spoil banks west side of Kissimmee River, 1 1/2 to 3 1/2 miles north of Florida Highway 70 (Secs. 10, 14, 15, and 28, T37S, R33E), Highlands Co., Florida.
791. Bermont Fm., spoil banks, Florida Cross State Barge Canal, 1 1/2 miles west of U.S. Highway 19 at Inglis, Citrus Co., Florida.
796. Pinecrest Beds, material exposed during construction of "Alligator Alley," 12.8 miles east of Florida Highway 29 (T49S, R32E), Collier Co., Florida.
797. Pinecrest Beds, material exposed during construction of "Alligator Alley", 13.3 miles east of Florida Highway 29 (T49S, R32E), Collier Co., Florida.
803. Bermont Fm., spoil banks south side of Caloosahatchee River, 2 miles west of Ortona Lock (NE 1/4 Sec. 29, T42S, R 30E), Glades Co., Florida.
816. Caloosahatchee Fm. and Bermont Fm. mixed, borrow pits, Cecil M. Webb Wildlife Management Area, 1.8 miles east of U.S. Highway 41 and 7.2 miles north of the Lee county line, Charlotte Co., Florida.
818. Chipola Fm., Farley Creek, 0.1 mile west of bridge of Florida Highway 275 (SW 1/4 Sec. 21, T1N, R9W), Calhoun Co., Florida.
819. Chipola Fm., Farley Creek, 0.2 mile west of bridge of Florida Highway 275 (SW 1/4 Sec. 21, T1N, R9W), Calhoun Co., Florida).
820. Chipola Fm., Farley Creek, at bridge of Florida Highway 275 (SW 1/4 Sec. 21, T1N, R9W), Calhoun Co., Florida.
821. Chipola Fm., Farley Creek, 0.1 mile east of bridge of Florida Highway 275 (SW 1/4 Sec. 21, T1N, R9W), Calhoun Co., Florida.
822. Chipola Fm., Farley Creek, 1/4 mile east of bridge on Florida Highway 275 (SW 1/4 Sec. 21, T1N, R9W), Calhoun Co., Florida.
823. Chipola Fm., Farley Creek, about 2000 feet east of bridge of Florida Highway 275 (SE 1/4 Sec. 21, T1N, R9W), Calhoun Co., Florida.
824. Chipola Fm., Farley Creek, about 1/2 mile east of bridge of Florida Highway 275 (SE 1/4 Sec. 21, T1N, R9W), Calhoun Co., Florida.
825. Chipola Fm., Farley Creek at abandoned mill about 1/4 mile west of bridge of Florida Highway 275 (SW 1/4 Sec. 21, T1N, R9W), Calhoun Co., Florida.
826. Chipola Fm., Farley Creek, about 0.1 mile west of abandoned mill, which is 1/4 mile west of bridge of Florida Highway 275 (on section line between Sec. 20 & 21, T1N, R9W), Calhoun Co., Florida.
827. Chipola Fm., Farley Creek, about 1/2 mile west of bridge of Florida Highway 275 (SE 1/4 Sec. 20, T1N, R9W), Calhoun Co., Florida.
830. Chipola Fm., Tenmile Creek, at power line crossing about 1 mile west of Chipola River (SE 1/4 Sec. 12, T1N, R10W), Calhoun Co., Florida.
870. Waccamaw Fm., pits on east side of North Carolina Highway 130, 2.8 miles north of Old Dock School, Old Dock, Columbus Co., North Carolina.
933. Pinecrest Beds, material exposed during construction of "Alligator Alley," 21.5 miles east of Florida Highway 29, Collier Co., Florida.
939. Caloosahatchee Fm. and Bermont Fm. mixed, south side of Caloosahatchee River, 5.2 miles west of Ortona Lock (NW 1/4 Sec 36, T42S, R29E), Glades Co., Florida.
950. Chipola Fm., Chipola River, west bank about 2000 feet above Farley Creek (SW 1/4 Sec. 20, T1N, R9W), Calhoun Co., Florida.
951. Chipola Fm., Tenmile Creek, about 1 1/4 miles west of Chipola River (SE 1/4 Sec. 12, T1N, R10W), Calhoun Co., Florida.
953. Moín Fm., type locality, Moín Hill, railroad cut and adjacent ditches on road to Sandoval 4.5 km west of Puerto Limón, Costa Rica.
954. Moín Fm., hill cut immediately behind Standard Fruit Co., box factory, just west of cemetery at Pueblo Nuevo, about 2 km west of Puerto Limón, Costa Rica.
974. Caloosahatchee Fm. and Bermont Fm. mixed, northside Caloosahatchee River, 2 1/2 to 3 1/2 miles west of center of former Lake Hicpochee (now drained) (unmapped area, T42S, R32E), Glades Co., Florida.
975. Caloosahatchee Fm., spoil banks north side Caloosahatchee River, 0 to 1/2 mile west of center of former Lake Hicpochee (now drained) (unmapped area, T42S, R32E), Glades Co., Florida.
977. Unnamed post-Pleistocene formation, mud-lump no. 90, mouth of South Pass, Mississippi River delta, Plaquemines Parish, Louisiana.
978. Bermont Fm., spoil banks at pit on south side of waterworks, about 1 1/2 miles north-east of South Bay, Palm Beach Co., Florida.
982. Pinecrest Beds, Port Charlotte Development, spoil banks on northwest side of Florida Highway 771, on canal 3 1/2 miles southwest of junction with U.S. Highway 41 (Sec. 15, T40S, R21E), Cahrlotte Co., Florida.
987. Bermont Fm., spoil banks south side West Plam Beach Canal, at Loxahatchee, on U.S. Highway 98, Palm Beach Co., Florida.
988. Bermont Fm., spoil banks, West Palm Beach Canal at Twenty Mile Bend Recreation area, about 1 mile east of junction of U.S. Highways 98 and 441, Palm Beach Co., Florida.



991. Caloosahatchee Fm., Cochran rock pit, 2 1/2 miles west of La Belle, on north side of Florida Highway 80, Hendry Co., Florida.
998. Chipola Fm., Tenmile Creek, about 1 1/4 miles west of Chipola River (SE 1/4 Sec. 12, T1N, R10W), Calhoun Co., Florida.
999. Chipola Fm., Farley Creek, about 300 yards downstream from bridge of Florida Highway 275 (SW 1/4 Sec. 21, T1N, R9W), Calhoun Co., Florida.
1000. Pinecrest Beds, APAC pits at east end of 17th street (T36S, R19E), about 8 miles east of U.S. Highway 301 at Sarasota [now northwest corner of Fruitville Road exit I-75], Sarasota Co., Florida.
1023. Caloosahatchee Fm. and Bermont Fm. mixed, pits on U.S. Highway 441, at intersection of Florida Highway 717, about 1 mile east of Pahokee, Palm Beach Co., Florida.
1044. Pinecrest Beds, spoil banks, west side of L-28 Interceptor Canal, 3 1/2 miles north of junction with Hendry County Highway 833, north side of Big Cypress Indian Reservation (T47S, R33E), Hendry Co., Florida.
1046. Agueguexquite Fm., roadcuts on both sides of Mexico Highway 180, 7.5 miles (12 km) east of junction with side road into Coatzacoalcos, Veracruz, Mexico. (This locality is that described in Perrilliat Montoya, 1960, p. 5).
1048. Chipola Fm., Farley Creek, about 0.8 mile east of bridge of Florida Highway 275 (NE 1/4 Sec. 21, T1N, R9W), Calhoun Co., Florida.
1049. Farley Creek, about 1.0 mile east of bridge on Florida Highway 275 (NE 1/4 Sec 21, T1N, R9W), Calhoun Co., Florida.
1174. Caloosahatchee Fm., spoil banks along canals north of Florida Highway 858, 1.3 miles east of junction with Florida Highway 846 (SE 1/4 Sec. 13, T48S, R27E), east of Naples and south of Immokalee, Collier Co., Florida.
1175. Pinecrest Beds and Caloosahatchee Fm. mixed, spoil banks along canals south of Florida Highway 858, 2.0 miles east of junction with Florida Highway 846 (SE 1/4 Sec. 24, T48S, R27E), east of Naples and south of Immokalee, Collier Co., Florida.
1177. Pinecrest Beds and Caloosahatchee Fm. mixed, Mule Pen Quarry, north side of Florida Highway 846, 9.1 miles east of U.S. 41 at Naples Park (SE 1/4 Sec. 24, T48S, R26E), Collier Co., Florida.
1196. Chipola Fm., Farley Creek, about 0.8 mile east of bridge on Florida Highway 275 (NE 1/4 Sec. 21, T1N, R9W), Calhoun Co., Florida.
1210. Gurabo Fm., Río Gurabo, east bank, first bluff downstream from ford on Los Quemados-Sabaneta road, Dominican Republic.
1211. Gurabo Fm., Río Gurabo, west bank, second bluff below the ford on Los Quemados-Sabaneta road, Dominican Republic.
1215. Gurabo Fm., Río Gurabo, bluffs on both sides, from the ford on Los Quemados-Sabaneta road, upstream to approximately 1 km above the ford, Dominican Republic.
1219. Gurabo Fm., Río Amina, bluffs on east side of river immediately upstream from ford that is 2 km west of Potrero and about 3 km downstream from "La Represa," Dominican Republic.
1227. Gurabo Fm., Arroyo Zalaya, which crosses road to Jánico from Santiago de los Caballeros, 11 km south of bridge over Río Yaque del Norte at Santiago, Dominican Republic.
- 1227A. Gurabo Fm., Arroyo Zalaya, turbidity flow lens (ca. 30" long, 6" thick) about two feet above base of outcrop, at point approximately 75 feet downstream from highway bridge, Dominican Republic.
1230. Cercado Fm., Río Cana, east bank, just above the bridge at Caimito on Los Quemados-Sabaneta road, Dominican Republic.
1239. Moín Fm., hill cut above Standard Fruit Co., box factory at Pueblo Nuevo (same as TU 954 but stratigraphically about 50 ft. higher - above coral horizon), Puerto Limón, Costa Rica.
1240. Moín Fm., Barrio Los Corales, top of hill at end of road that passes Standard Fruit Co., box factory (see TU 954), 1.8 km north of main highway at Pueblo Nuevo, which is 2 km west of Puerto Limón, Costa Rica.
1249. Unnamed formation, roadcut 8.6 km west of the plaza at San Cristobal, on road to Bani, Dominican Republic (= loc. H-20001, Bermudez, 1949).
1250. Gurabo Fm., Río Verde, south bank, just above the ford at the crossing of a side road that connects Duarte Highway and La Vega-Moca Highway, about 10 km north of La Vega, Dominican Republic.
1269. Cantaure Fm., series of arroyos about 500 meters south of "Casa Cantaure". [which is literally one house and which is about 400 meters south of older, now abandoned, house that was the "Casa Cantaure" of Jung, 1965, and others], 14 km (by road) west of Pueblo Nuevo, Paraguana Peninsula, Venezuela.
1277. Gurabo Fm., Río Gurabo, both sides, upstream from the horsetrail to 0.5 km above the trail, or approximately 2 km (airline) to 2.5 km above the bridge on Los Quemados-Sabaneta road, Dominican Republic.
1288. Red Bluff Fm., type locality, east bank Chickasawhay River, about 1 1/2 miles south of Shubuta (NE 1/4 Sec. 16, T10N R7W),



- Wayne Co., Mississippi.
1292. Gurabo Fm., Río Mao, west bank, bluffs about 1.5 to 2 km upstream from Mao Adentro, or about 9 km (by road) south of Mao, Dominican Republic.
1296. Gurabo Fm., Río Gurabo, both sides, from about 0.5 km above the horsetrail to approximately 1 km above the trail, or about 2.5 to 3 km (airline) above the ford on Los Quemados-Sabaneta road, Dominican Republic.
1307. Moín Fm., hill top approximately halfway between Puerto Limón and Barrio Los Corales and about 0.5 km north of highway at Pueblo Nuevo, Costa Rica.
1323. (?) Medias Aguas Fm., Istal (formerly Santa Rosa), town on side road that was old railroad right-of-way, 6 miles west of Mexico Highway 185, at a point 10 miles north of side road to Jesus Carranza, Veracruz, Mexico.
1324. (?) Medias Aguas Fm., road to Istal (formerly Santa Road), road is old railroad right-of-way, 3 miles west of Mexico Highway 185, at a point 10 miles north of side road to Jesus Carranza, Veracruz, Mexico.
1358. Cercado Fm., Río Gurabo, west side at and downstream from mouth of Arroyo La Cabra, approximately 6 km (airline) above the ford on Los Quemados-Sabaneta road, Dominican Republic.
1364. Baitoa Fm., Boca de los Ríos, below the waterfall in Arroyo Hondo, which enters Río Yaque del Norte from the east, just below the confluence with Río Bao, downstream from Baitoa, Dominican Republic.
1412. Gurabo Fm., Río Guanajuma, which is a tributary of Río Amina from the west, bluff on south side, just upstream from trail at Higuerito Penuelas, which goes to the river approximately 2.5 km upstream from the confluence with Río Amina; or about 1 km above the ford on the road to Potrero, Dominican Republic.
1422. Cercado Fm., Arroyo Bellaco (or Beyaco on topographic maps), which is a tributary of Río Cana from the east, coral reef that is exposed for approximately 1 km below the ford at Las Caobas Adentro, 1 km southwest of Las Caobas, Dominican Republic.
1453. Gurabo Fm., Arroyo Zalaya, from above the waterfall (which is approximately 1 km above the bridge on road from Jánico to Santiago de los Caballeros, 11 km south of bridge over Río Yaque del Norte at Santiago) to the headwaters, Dominican Republic.
- 1453A. Gurabo Fm., Arroyo Zalaya, shallow-water gravity flows into the deep-water beds, one just above waterfall, and another about 0.5 km upstream from waterfall, Dominican Republic.
1489. Moín Fm., Barrio Los Corales no. 3, about 0.4 km north of TU 1240, Puerto Limón, Costa Rica.
1490. Moín Fm., Barrio Los Corales no. 3, about 0.4 km east of TU 1240, Puerto Limón, Costa Rica.
1491. Pinecrest Beds, North Ft. Myers, pits open during construction of Cape Coral, northwest of intersection of U.S. Highway 41 and Florida Highway 78, Lee Co., Florida.
1493. Pinecrest Beds, Arvida Pit, on Bird Road (= W. 40th St.), approximately 5 miles west of Florida Turnpike, on west side of Coral Gables, Dade Co., Florida.
1512. Caloosahatchee Fm. and Bermont Fm. mixed, DeSoto Shell Company, pits 2 miles east of Florida Highway 31, about 12 miles south of Arcadia (T39S, R25E), DeSoto Co., Florida.
1524. Pinecrest Beds, Quality Aggregate Pit, off Richardson Road, north side of Fruitville Road and east of highway I-75, east of Sarasota, Sarasota Co., Florida.
1536. Pinecrest Beds, Caloosahatchee Fm. and Bermont Fm. mixed, Star Ranch, Bergeron Rock Co. pit, 11.4 miles south of South Bay, and 0.8 mile west of U.S. Highway 27, Palm Beach Co., Florida.

The following are Tulane University Recent locality numbers:

- R-42. Anna Maria Key, off Sarasota, Florida; dredged in approximately 46 meters by James Moore, Bradenton, Florida.
- R-99 *Anton Bruun* Curise 10, dredged in 31 meters, off northeastern Yucatan Peninsula (21° 41' N, 86° 34' W), Mexico.
- R-109. Bahia de las Minas, Isla Payardi, Prov. of Colon, Panama (7000 YBP).
- R-188. Venado Island, just east of Canal Zone-Panama boundary line, Canal Zone (Pacific side).
- R-318. Buck Island, beach at south point of island, off northeast end of St. Croix, U.S. Virgin Islands.
- R-326. Beach at Caribe Playa Hotel, about 12 miles east of Guayama, Puerto Rico.
- R-360. Beach at Nagua, northeastern Dominican Republic.
- R-366. Punta Cahuita, 42 km southeast of Puerto Limon, Costa Rica.
- R-389. Monte Cristi, beach at foot of mountain, at north side of town, Dominican Republic.
- R-423. Playa Las Salinas, at Pta. Caballera, mouth of Bahia de las Calderas, west of Bani, Dominican Republic.

The following are Naturhistorisches Museum, Basel Switzerland, fossil locality numbers:

16842. Cercado Fm., Río Cana, approximately 2.5 km below the bridge at Caimito, Los



- Quemados-Sabaneta road, Dominican Republic.
16943. Baitoa Fm., Río Yaque del Norte, just downstream from Boca de los Rios, Dominican Republic.
17515. Cantaure Fm., Casa Cantaure, Paraguaná Peninsula, Edo. de Falcón, Venezuela [= locality TU 1269].
17516. Cantaure Fm., Casa Cantaure, Paraguaná Peninsula, Edo. de Falcón, Venezuela [= locality TU 1269].
17530. Mataruca Member, Caujarao Fm., Cementerio de Carrizal, Edo. de Falcón, Venezuela.
17531. Punta Gavilán Fm., type locality, Punta Gavilán, Edo. de Falcón, Venezuela.

## VI. LITERATURE CITED

- ABBOTT, R.T., 1954, New Gulf of Mexico gastropods (*Terebra* and *Ocenebra*): *Nautilus*, v. 68, no. 2, p. 37-44, pl. 2.
- ABBOTT, R.T., 1958, The marine mollusks of Grand Cayman Island, British West Indies: *Acad. Nat. Sci. Phila.*, Mon. 11, 138 p., 5 pls., 7 text-figs., 11 maps.
- ABBOTT, R.T., 1974, *American Seashells*. Second Edition. Van Nostrand Reinhold Co., New York, 663 p., 24 color plates, 6405 text-figs.
- AKERS, W.H., 1980, Ancient environments and geological ages in Mexico: *Proc. International Sym. on Marine Biogeography and Evolution in the Southern Hemisphere* (Auckland, 17-20 July, 1987), p. 491-499, 1 text-fig.
- BOZZETTI, L., 1991, Two new Muricidae from Somalia: *La Conchiglia*, Ann, 22, no. 260, p. 43-45, 5 figs.
- BROWN, R.W., 1954, *Composition of scientific words*. Publ. by the author, Washington, D.C., 882 p.
- CERNOHORSKY, W.O., 1978, The taxonomy of some Indo-Pacific Mollusca, pt. 6: *Auckland Inst. Mus.*, Rec., v. 15, p. 67-86, 40 figs.
- CLENCH, W. J., and ISABEL PÉREZ FARFANTE, 1945, The genus *Murex* in the western Atlantic: *Johnsonia*, v. 1, no. 17, 58 p., 29 pls.
- CROSSE, J.C.H., 1869, Diagnoses molluscorum novorum: *Jour. de Conchyl.*, v. 17, p. 408-410; 1871, *ibid.*, v. 19, p. 59-71, pls. 1-4.
- COSSMANN, A.E.M., 1903, *Essais de paléoconchologie comparée*, v. 5. Paris, 215 p., 9 pls.
- COSSMANN, A.E.M., and A. PEYROT, 1923, *Conchologie néogénique de l'Aquitaine*: *Soc. Linn. Bordeaux, Actes*, v. 75, p. 69-144, pls. 12-18.
- DALL, W.H., 1889, Reports on the dredging, under the supervision of Alexander Agassiz, in the Gulf of Mexico (1877-78) and in the Caribbean Sea (1879-80), by the U.S. Coast Survey Steamer "Blake," Lieut.-Commander C.D. Sigsbee, U.S.N., and Commander J.R. Bartlett, U.S.N., commanding. XXIX. Report on the Mollusca; Part II. Gastropoda and Scaphapoda: *Harvard Mus. Comp. Zool.*, Bull., v. 18, p. 1-492, pls. 10-40.
- DALL, W.H., 1890, Contributions to the Tertiary fauna of Florida . . . : *Wagner Free Inst. Sci.*, Trans., v. 3, pt. 1, 200 p., 12 pls.
- DALL, W.H., 1915, A monograph of the molluscan fauna of the *Orthaulax pugnax* zone of the Oligocene of Tampa, Florida: *U.S. Natl. Mus.*, Bull, 90, 173 p., 26 pls.
- DALL, W.H., and C.T. SIMPSON, 1901, The Mollusca of Porto Rico: *U.S. Fish Comm.*, Bull., v. 20, pt. 1, p. 351-524, pls. 53-58.
- DANCE, S.P., 1966, *Shell collecting*. London, 344 p., 35 pls.
- D'ATTILIO, ANTHONY, 1988, Comparison of two *Favartia* (*Caribiella*) species, one from the western Atlantic and one from the eastern Pacific: *Festivus*, v. 20, no. 8, p. 73-76, 8 figs.
- D'ATTILIO, ANTHONY, and B.W. MYERS, 1986, Notes on generic characters: *Festivus*, v. 18, no. 10, p. 136-143, 16 figs.
- D'ATTILIO, ANTHONY, and B.W. MYERS, 1987, Emended description and designation of lectotypes for *Favartia* (*Murexiella*) *humilis* (Broderip, 1833) and *F. (M.) norrisii* (Reeve, 1845) and discussion of *F. (M.) laurae* (E.H. Vokes, 1970); Muricidae: *Festivus*, v. 19, no. 1, p. 2-8, 12 figs.
- DUBAR, J.R., 1974, Summary of the Neogene stratigraphy of southern Florida in Post-Miocene stratigraphy, central and southern Atlantic Coastal Plain, R.J. OAKS, JR., and J.R. DUBAR, editors, *Utah State University Press*, p. 206-231, figs. 1-5, tables 1-7.
- FAIR, R.H., 1976, *The Murex book*, an illustrated catalogue of Recent Muricidae (Muricinae, Muricopsinae, Ocenebrinae). Privately printed, Honolulu, Hawaii, 138 p., 23 pls., 67 text-figs.
- GARDNER, JULIA, 1948, Mollusca from the Miocene and lower Pliocene of Virginia and North Carolina: *U.S. Geol. Surv.*, Prof. Paper 199 (in 2 parts), 310 p., 38 pls.
- GIBSON-SMITH, J., 1976, A new taxon in the genus *Charonia* (Mollusca: Gastropoda) from the Pliocene of Venezuela, and its implications: *Asoc. Ven. Geol. Min. Pet.*, Bol., v. 19, no. 1, p. 1-15, pl. 1.
- GIBSON-SMITH, J., and W. GIBSON-SMITH, 1979, The genus *Arcinella* (Mollusca: Bivalvia) in Venezuela and some associated faunas: *GEOS*, no. 24, p. 11-32, pls. 1-3, 2 text-figs.
- GIVENS, C.R., and M.P. KENNEDY, 1976, Middle Eocene mollusks from northern San Diego County, California: *Jour. Paleontology*, v. 50, p. 954-975, pls. 1-4, 2 text-figs., 2 tables.



- HEILPRIN, ANGELO, 1886-1887, Explorations on the west coast of Florida. . . : Wagner Free Inst. Sci., Trans., v. 1, 134 p., 19 pls. [p. 1-64b + plates, 1887; p. 65-127, 1886. See Petit and Wilson, 1986, Tulane Stud. Geol. Paleont., v. 19, p. 95-96.]
- HÖRNES, MORIZ, 1856, Die Fossilen Mollusken des Tertiär-Beckens von Wien. v. 1, Univalves: K.-K. Geol. Reichsanst., Abh., v. 3, p. 1-736, pls. 1-52, 1 map.
- HOUART, ROLAND, 1980, Description et illustration d'un deuxième exemplaire de *Murexiella (Subpterynotus) exquisitus* (G.B. Sowerby III, 1904) (Gastropoda: Muricidae: Muricopsinae): Soc. Belge Malac., Informations, Ser. 8, no. 4, p. 79-83, pl. 1A.
- HOUART, ROLAND, 1990, On the rediscovery of *Muricopsis (Risomurex) schrammi* (Crosse, 1863): Amer. Conchologist, v. 18, no. 1, p. 8, 5 figs.
- HOUART, ROLAND, 1991, The southeastern Brazilian Muricidae collected by *RV Marion-Dufresne* in 1987, with the description of three new species: Nautilus, v. 105, no. 1, p. 26-37, 46 figs.
- HOUART, ROLAND, and W. WRANIK, 1989, Description of two new species of the genus *Pygmaeptyrys* Vokes and report of *Typhis (Talityphis) bengalensis* (Radwin and D'Attilio, 1976) (Gastropoda: Muricidae) from the Gulf of Aden: Apex, v. 4, no. 4, p. 85-90, 9 figs.
- HUMFREY, MICHAEL, 1975, Sea shells of the West Indies. Taplinger Publ. Co., New York, 351 p., 32 pls., 20 text-figs.
- de JONG, K.M., and H.E. COOMANS, 1988, Marine gastropods from Curaçao, Aruba, and Bonaire: Stud. Fauna Curaçao and Carib. Islands, v. 69, no. 214 (Natuur. Stud. Suriname en Nederlandse Antillen, no. 121), 261 p., 47 pls., maps.
- JUNG, PETER, 1965, Miocene Mollusca from the Paraguana Peninsula, Venezuela: Bulls. Amer. Paleontology, v. 49, no. 223, p. 385-652, pls. 50-79, 2 text-figs., 2 tables.
- JUNG, PETER, 1969, Miocene and Pliocene mollusks from Trinidad: Bulls. Amer. Paleontology, v. 55, no. 247, p. 289-657, pls. 13-60, 4 text-figs.
- KEMPERMAN, T.C.M., and H.E. COOMANS, 1984, Studies on West Indian Marine Molluscs, 1. *Risomurex mosquitensis*, a new Caribbean species, with remarks on the status of the genus *Risomurex* (Gastropoda: Muricidae): Bull. Zool. Mus. Univ. Amsterdam, v. 10, no. 1, p. 1-7, 12 figs.
- KIENER, L.C., 1842-1843, Spécies général et iconographie des coquilles vivantes. . . Famille des canalifères, troisième partie, Genre Rocher. Paris, 130 p., 47 pls. [plates issued in 1842; text issued in 1843].
- LAMARCK, J.B.M. de, 1816, Tableau Encyclopédique et Méthodique, pt. 23, pls. 391-488; Liste des objets, 5 p.
- MACNEIL, F.A., and D.T. DOCKERY III, 1984, Lower Oligocene Gastropoda, Scaphopoda, and Cephalopoda of the Vicksburg Group in Mississippi: Mississippi Bur. Geol., Bull. 124, 415 p., 72 pls., 16 text-figs.
- MANSFIELD, W.C., 1931, Some Tertiary mollusks from southern Florida: U.S. Natl. Mus., Proc., v. 79, art. 21, p. 1-12, pls. 1-4.
- MANSFIELD, W.C., 1937, Mollusks of the Tampa and Suwannee Limestones of Florida: Florida Dept. Conservation, Geol. Bull. 15, 334 p., pls. A-D, 1-21, 2 text-figs., 2 tables.
- MANFIELD, W.C., 1939, Notes on the Upper Tertiary and Pleistocene Mollusks of peninsular Florida: Florida Dept. Conservation, Geol. Bull. 18, p. 1-75, pls. 1-4, 2 text-figs. 5 tables.
- MAURY, C.J., 1917, Santo Domingo type sections and fossils, Pt. 1, Mollusca: Bulls. Amer. Paleontology, v. 5, no. 29, p. 165-415, pls. 27-65, map; Pt. 2, Stratigraphy: *Ibid.*, v. 5, no. 30, p. 416-460, pls. 66-68, correlation chart.
- MEEDER, J.F., 1990, Biostratigraphy, paleoecology, sedimentology and depositional model of the Tamiami Formation (Pliocene) of south Florida with a discussion of corals and coral reefs, in W.D. ALLMON and T.M. SCOTT, eds., Plio-Pleistocene Stratigraphy and Paleontology of south Florida: Southeastern Geol. Soc. Annual Fieldtrip Guidebook, 53 unnumbered p., 17 figs., 11 tables.
- MORGAN, J.P., J.M. COLEMAN, and S.M. GAGLIANO, 1963, Mudlumps at the mouth of South Pass, Mississippi River. . . : Louisiana State University Studies, Coastal Studies no. 10, 190 p.
- OLSSON, A.A. and T.L. MCGINTY, 1958, Recent marine mollusks from the Caribbean coast of Panama with the description of some new genera and species: Bulls. Amer. Paleontology, v. 39, no. 177, p. 1-58, pls. 1-5.
- OLSSON, A.A., and R.E. PETIT, 1964, Some Neogene Mollusca from Florida and the Carolinas: Bulls. Amer. Paleontology, v. 47, no. 217, p. 509-574, pls. 77-83.
- PERRILLIAT, MONTOYA, M.C., 1960, Moluscos del Mioceno de la Cuenca Salina del Istmo de Tehuantepec, México: Paleontología Mexicana, no. 8, 38 p., 4 pls., 2 text-figs., 1 table.
- PERRILLIAT [MONTOYA], M.C., 1972, Monografía de los moluscos del Mioceno Medio de Santa Rosa, Veracruz, México; Parte I (Gasterópodos: Fissurellidae a Olividae): Paleontología Mexicana, no. 32, 119 p., 51 pls., 1 table, 1 map.



- PERRILLIAT, M.C., 1973, Monografía de los moluscos del Mioceno Medio de Santa Rosa, Veracruz, México. Parte II (Gasterópodos: Mitridae a Terebridae): Paleontología Mexicana, no. 35, 97 p., 30 pls., 1 table.
- PERRILLIAT, M.C., 1974a, Monografía de los moluscos del Mioceno Medio de Santa Rosa, Veracruz, México. Parte III (Gasterópodos: Pyramidellidae a Siphonariidae): Paleontología Mexicana, no. 37, p. 1-46, pls. 1-8, 1 table.
- PERRILLIAT, M.C., 1974b, Monografía de los moluscos de Mioceno Medio de Santa Rosa, Veracruz, México. Parte IV (Esfacópodos: Dentaliidae, Siphonodentaliidae): Paleontología Mexicana, no. 37, p. 51-64, pls. 9-14, 1 table.
- PERRILLIAT, M.C., 1976, Monografía de los moluscos del Mioceno Medio de Santa Rosa, Veracruz, México. Parte V (Pelecípodos: Nucleidae a Limidae): Paleontología Mexicana, no. 42, 104 p., 24 pls., 1 table.
- PERRILLIAT, M.C., 1977, Monografía de los moluscos del Mioceno Medio de Santa Rosa, Veracruz, México. Parte VI (Pelecípodos: Lucinidae a Solecurtidae): Paleontología Mexicana, no. 43, 60 p., 30 pls., 1 table.
- PERRILLIAT, M.C., 1984, Monografía de los moluscos del Mioceno Medio de Santa Rosa, Veracruz, México. Parte VII (Pelecípodos: Dreissenidae a Verticordiidae): Paleontología Mexicana, no. 48, 88 p., 25 pls., 1 table.
- PETIT, R.E., and DRUID WILSON, 1986, Publication dates of Heilprin's *Explorations on the West Coast of Florida*: Tulane Stud. Geol. Paleont., v. 19, no. 2, p. 95-96.
- PETUCH, E.J., 1979, New gastropods from the Abrolhos Archipelago and reef complex, Brazil: Biol. Soc. Washington, Proc., v. 92, p. 510-526, 4 figs.
- PETUCH, E.J., 1986, The Pliocene reefs of Miami: their geomorphological significance in the evolution of the Atlantic Coastal Ridge, southeastern Florida, U. S. A.: Jour. Coastal Research, v. 2, no. 4, p. 391-408, pls. 1-4, 5 text-figs.
- PETUCH, E.J., 1987, New Caribbean molluscan faunas. Coastal Educ. Resh. Found. (CERF), Charlottesville, Virginia, 154 + 4 p., 29 pls., 1 text-fig.
- PETUCH, E.J., 1988, Neogene History of tropical American mollusks. Coastal Educ. Resh. Found. (CERF), Charlottesville, Virginia, 217 p., 39 pls., 23 (+ 7 unnumbered) text-figs.
- PETUCH, E.J., 1992, New mollusks from Los Roques Archipelago, Venezuela, an isolated Caribbean atoll: La Conchiglia, Ann. 23, no. 262, p. 5-11, 11 figs., 1 map.
- PETUCH, E.J., 1993, Molluscan discoveries from the tropical western Atlantic region: La Conchiglia, Ann. 25, no. 266, p. 51-56, 11 figs.
- PONDER, W.F., 1972, Notes on some Australian genera and species of the family Muricidae (Neogastropoda): Malac. Soc. Australia, Jour., v. 2, no. 3, p. 215-248, pls. 20-23, 4 text-figs.
- PORTER, H.J., and D.A. WOLFE, 1971, Mollusca from the North Carolina commercial fishing grounds for the Calico Scallop, *Argopecten gibbus* (Linne): Jour. de Conchyl., v. 109, p. 91-108.
- RADWIN, G.E., and ANTHONY D'ATTILIO, 1971, Muricacean supraspecific taxonomy based on the shell and the radula: Echo, no. 4, p. 55-67, 23 figs.
- RADWIN, G.E., and ANTHONY D'ATTILIO, 1976, Murex shells of the world; an illustrated guide to the Muricidae. Stanford University Press, Stanford, California, 284 p., 32 colored pls., 192 text-figs.
- RADWIN, G.E., and ANTHONY D'ATTILIO, 1978, Comments on subfamilial relationships in two amphi-American muricid genera - *Acanthotrophon* and *Attiliosa*: Tulane Stud. Geol. Paleont., v. 14, no. 3, p. 131-134, 7 figs.
- REEVE, L.A., 1846, Conchologia Iconica; or illustrations of the shells of molluscous animals, v. 3, *Ricinula*, pls. 1-6.
- RIOS, E.C., 1970, Coastal Brazilian Seashells. Museu Oceanográfico, Rio Grande, RGS, Brazil, 255 p., 60 pls., 4 maps.
- RIOS, E.C., 1975, Brazilian marine mollusks iconography. Museu Oceanográfico, Rio Grande, RGS, Brazil, 331 p., 91 pls.
- RIOS, E.C., 1985, Seashells of Brazil. Museu Oceanográfico, Rio Grande, RGS, Brazil, 329 p., 102 pls.
- ROBINSON, D.G., 1991, The systematics and paleoecology of the Prosobranch Gastropods of the Pleistocene Moín Formation of Costa Rica. Unpublished dissertation, Tulane University, 748 p., 28 pls., 5 text-figs.
- SCHUCHERT, CHARLES (Assist. by DALL *et al.*), 1905, Catalogue of the type specimens of fossil invertebrates in the Department of Geology, U.S. Natl. Museum: U.S. Natl. Mus., Bull. 53, pt. 1, 704 p.
- SMITH, MAXWELL, 1938, Further notes upon Tertiary and Recent mollusks from Florida, with descriptions of new species: Nautilus, v. 51, p. 88-89, pl. 6.
- SMITH, MAXWELL, 1939, An illustrated catalog of the Recent species of the Rock Shells: Muricidae Thaisidae and Coralliophilidae. Tropical Laboratory, Windermere, Florida, p. i-ix, 1-83, 21 pls., text-figs. a-z2.
- SMITH, MAXWELL, 1940, New Recent and fossil mollusks from Florida: Nautilus, v. 54, no. 2, p. 44-46, pl. 2.



- SMITH, MAXWELL, 1953, An illustrated catalog of the Recent species of the Rock Shells: Muricidae Thaisidae and Coralliophilidae. Tropical Laboratory, Windermere, Florida. p. i-ix, 1-84, 23 pls., text-figs. a-z2. [A revised edition of the 1939 book of the same name.]
- SMYTHE, K.R., and P.G. OLIVER, 1986, A new species of *Muricopsis* from Oman (Prosobranchia: Muricacea): Jour. of Conch., v. 32, p. 181-183, pls. 18, 19.
- SOWERBY, G.B., JR., 1879, Thesaurus Conchyliorum, v. 4, *Murex*, p. 1-55., 24 pls.
- SUNDERLAND, KEVAN, 1987, *Muricopsis sunderlandi* Petuch, 1987: Amer. Conchologist, v. 15, no 4, p. 3, illus.
- SUNDERLAND, KEVAN, and LINDA SUNDERLAND, 1993, Caribbean muricids: Amer. Conchologist, v. 21, no. 4, p. 14, 15, illus.
- SUGARMAN, P.J., K.G. MILLER, J.P. OWENS, AND M.D. FEIGENSON, 1993, Strontium-isotope and sequence stratigraphy of the Miocene Kirkwood Formation, southern New Jersey: Geol. Soc. Amer., Bull., v. 105, p. 423-436, 9 figs., 1 table.
- TRYON, G.W., JR., 1880, Manual of Conchology, v. 2, Muricinae, Purpurinae. Philadelphia, 298 p., 70 pls.
- VAUGHAN, T.W., *et al.*, 1921, Geological reconnaissance of the Dominican Republic: Geol. Surv. Dominican Rep., Mem. 1, 268 p., 23 pls. (incl. maps).
- VOKES, E.H., 1963, Notes on Cenozoic Muricidae from the western Atlantic region, with descriptions of new taxa: Tulane Stud. Geol., v. 1, no. 4, p. 151-163, pls. 1, 2.
- VOKES, E.H., 1964, Supraspecific groups in the subfamilies Muricinae and Tritonaliinae (Gastropoda: Muricidae): Malacologia, v. 2, no. 1, p. 1-41, pls. 1-3.
- VOKES, E.H., 1967, Cenozoic Muricinae of the western Atlantic region. Unpublished dissertation, Tulane University, 490 p., 26 pls., 2 tables.
- VOKES, E.H., 1968, Cenozoic Muricidae of the western Atlantic region. Part IV – *Hexaplex* and *Murexiella*: Tulane Stud. Geol., v. 6, no. 3, p. 85-126, pls. 1-8, 1 text-fig.
- VOKES, E.H., 1970, Cenozoic Muricidae of the western Atlantic region. Part V – *Pterynotus* and *Poirieria*: Tulane Stud. Geol. Paleont., v. 8, no. 1, p. 1-50, pls. 1-7, 1 text-fig.
- VOKES, E.H., 1971a, Catalogue of the genus *Murex* Linné (Mollusca: Gastropoda); Muricinae, Ocenebrinae: Bulls. Amer. Paleontology, v. 61, no. 268, p. 1-141.
- VOKES, E.H., 1971b, The geologic history of the Muricinae and the Ocenebrinae: Echo, no. 4, p. 37-54, 6 figs.
- VOKES, E.H., 1976, Cenozoic Muricidae of the western Atlantic region. Part VII – *Calotrophon* and *Attiliosa*: Tulane Stud. Geol. Paleont., v. 12, no. 3, p. 101-132, pls. 1-8, 2 text-figs.
- VOKES, E.H., 1980, Review of the muricid genus *Acanthotrophon* (Mollusca: Gastropoda): Veliger, v. 23, no. 1, p. 10-14, figs. 1-18.
- VOKES, E.H., 1984, Comparison of the Muricidae of the eastern Pacific and western Atlantic, with cognate species: Shells and Sea Life, v. 16, no. 11, p. 210-215, 2 pls., 10 color figs.
- VOKES, E.H., 1985, Those amazing Mactan muricids (and some of their friends): Conch. Amer. Bull., v. 13, no. 2, p. 29-34, 39 figs.
- VOKES, E.H., 1988, Muricidae (Mollusca: Gastropoda) of the Esmeraldas beds, northwestern Ecuador: Tulane Stud. Geol. Paleont., v. 21, no. 1, p. 1-50, pls. 1-6, 15 text-figs., 1 table.
- VOKES, E.H., 1989, Neogene Paleontology in the northern Dominican Republic. 8. The Family Muricidae (Mollusca: Gastropoda): Bulls. Amer. Paleontology, v. 97, no. 332, p. 5-94, pls. 1-12, 21 text-figs. 3 tables.
- VOKES, E.H., 1992, Cenozoic Muricidae of the western Atlantic region. Part IX – *Pterynotus*, *Poirieria*, *Aspella*, *Dermomurex*, *Calotrophon*, *Acantholabia*, and *Attiliosa*; additions and corrections: Tulane Stud. Geol. Paleont., v. 25, nos. 1-3, p. 1-108, pls. 1-20, 10 text-figs., 2 tables.
- VOKES, E.H., and ANTHONY D'ATTILIO, 1980, *Pygmaeptyrys*, a newly described taxon of Muricidae (Mollusca: Gastropoda), with the description of three new species from the Cenozoic of the western Atlantic: Tulane Stud. Geol. Paleont., v. 16, no. 2, p. 45-54, pls. 1, 2; 1 text-fig.
- VOKES, E.H., and ROLAND HOUART, 1986, An evaluation of the taxa *Muricopsis* and *Risomurex* (Gastropoda: Muricidae), with one new species of *Risomurex*: Tulane Stud. Geol. Paleont., v. 19, no. 2, p. 63-88, pls. 1-4.
- VOKES, E.H., and ROLAND HOUART, 1989, Comment on the proposed designation of *Risomurex mosquitensis* Kemperman & Coomans, 1984 as the type species of *Risomurex* Olsson & McGinty, 1958 (Mollusca, Gastropoda): Bull. Zool. Nomen., v. 46, no. 3, p. 187.
- WARD, L.W., and B.W. BLACKWELDER, 1987, Late Pliocene and Early Pleistocene Mollusca from the James City and Chowan River formations at the Lee Creek mine: Smithsonian Cont. Paleobiology, no. 61, p. 113-283, pls. 1-47, 14 text-figs., 2 tables.



- WEISBORD, N.E., 1957, Notes on the geology of the Cabo Blanco area, Venezuela: *Bulls. Amer. Paleontology*, v. 38, no. 165, p. 1-25, 1 map.
- WEISBORD, N.E., 1962, Late Cenozoic gastropods from northern Venezuela: *Bulls. Amer. Paleontology*, v. 42, no. 193, p. 1-672, pls. 1-48.
- WOODRING, W.P., 1970, Geology and Paleontology of Canal Zone and adjoining parts of Panama. Description of Tertiary mollusks (Gastropods: Eulimidae, Marginellidae to Helminthoglyptidae): U.S. Geol. Surv., Prof. Paper 306-D, p. 199-452, pls. 48-66.
- WORK, R.C., 1969, Systematics, ecology, and distribution of the mollusks of Los Roques, Venezuela: *Bull. Mar. Sci.*, v. 19, no. 3, p. 614-711, 5 figs.
- ZILCH, ADOLF, 1934, Zur Fauna des Mittel-Miocens von Kostez (Banat). Typus-Bestimmung und Tafeln zu O. BOETTGER'S Bearbeitung: *Senckenbergiana*, v. 16, p. 193-302, pls. 1-22.

## POSTSCRIPT

The gender of the word "*Haustellum*" was not a problem so long as the taxon was treated as a subgenus of the masculine genus *Murex*. But with elevation to full generic rank the question arose and it was concluded (Vokes, 1993, p. 12\*) that *Haustellum* is a neuter noun. Thus, several species names in the western Atlantic fauna should be modified to agree. These are: *adelosum*, *blakeanum*, *messorium*, *polyneumaticum*, and *rubidum*. The name *chrysostoma* is a noun and all other valid names are either patronymics or geographic terms, which do not change.

\*VOKES, E.H., 1993, Taxonomic note on the genus *Haustellum* (Gastropoda: Muricidae): *Amer. Conchologist*, v. 21, no. 4, p. 12.

## VII. APPENDIX I: ALPHABETICAL LIST OF SPECIES INCLUDED IN THIS PART

The following list includes all species treated systematically and is a complete list of names for all western Atlantic species, fossil and Recent, valid or invalid, referred to the subfamily Muricopsinae.

The original genus in which the species was named is given in brackets following the name. Those species names in ALL CAPS are new taxa described herein. The generic assignment that follows the name of the author is that one to which the species is referred in this paper. Those names without a generic assignment are considered synonyms of the species cited.

- aliceae* [*Muricopsis*] Petuch, 1987. FAVARTIA (PYGMAEPTERYS)
- alta* [*Ocenebra*] Dall, 1890. = *cellulosa*
- alveatus* [*Murex*] Kiener, 1842. FAVARTIA (CARIBIELLA)
- AMPHILOGOS [*Murexsul*] Vokes. MUREXSUL
- ascensus* [*Calotrophon*] Vokes, 1976. ACANTHOTROPHON
- aspinosus* [*Murex*] Meyer, 1886. MURICOPSIS (RISOMUREX)
- BARBARAE [*Favartia*] Vokes. FAVARTIA s.s.
- burnsi* [*Murex*] Whitfield, 1894. = *faceta*
- calhounensis* [*Murexiella*] Vokes, 1968. HOMALOCANTHA
- caribbaea* [*Tritonalia*] Bartsch and Rehder, 1939. MURICOPSIS (RISOMUREX)
- CARMENAE [*Favartia*] Vokes. FAVARTIA (CARIBIELLA)
- cellulosa* [*Murex*] Conrad, 1846. FAVARTIA s.s.
- COMPTULUS [*Murexsul*] Vokes. MUREXSUL
- conradi* [*Murex*] d'Orbigny, 1850. = *mantelli*
- crassicosta* [*Jania*] Benoist, 1873. MURICOPSIS (RISOMUREX)
- crispangula* [*Murex*] Heilprin, 1886. HOMALOCANTHA
- deformis* [*Ricinula*] Reeve, 1846. MURICOPSIS (RISOMUREX)
- drezi* [*Pygmaepterys*] Vokes and D'Attilio, 1980. FAVARTIA (PYGMAEPTERYS)
- duffy* [*Muricopsis*] Petuch, 1992. = *huberti*
- edwardpauli* [*Murexiella*] Petuch, 1990. MUREXIELLA s.s.
- elegans* [*Aspella*] "Perrillat Montoya" in Vokes, 1971. = *alveata*
- emipowlusi* [*Ocenebra*] Abbott, 1954. MUREXSUL
- facetus* [*Murex*] Vokes, 1963. MUREXIELLA s.s.
- fasciatus* [*Murexiella*] "Vokes" Sunderland and Sunderland, 1992. = *hilli*
- galbensis* [*Risomurex*] Jung, 1969. MURICOPSIS (RISOMUREX)
- germainae* [*Pygmaepterys*] Vokes and D'Attilio, 1980. FAVARTIA (PYGMAEPTERYS)
- gilbertharrisii* [*Drupa*] Weisbord, 1962. MURICOPSIS (RISOMUREX)
- glyptus* [*Murex*] M. Smith, 1938. MUREXIELLA s.s.



- graceae* [Tritonalia] McGinty, 1940. MUREXIELLA s.s.
- harasewychi* [Murexsul] Petuch, 1987. MUREXSUL
- hexagonus* [Murex] Lamarck, 1816. = *oxytata*
- hidalgoi* [Murex] Crosse, 1869. MUREXIELLA s.s.
- hilli* [Murexiella] Petuch, 1987. MUREXIELLA s.s.
- huberti* [Muricopsis] Radwin and D'Attilio, 1976. MURICOPSIS s.s.
- iemanja* [Murexiella] Petuch, 1979. = *glypta*
- intermedius* [Murex] C.B. Adams, 1850. = *alveata*
- jamaicensis* [Murex] Sowerby, 1879. = *cellulosa*
- JOSEI [Muricopsis] Vokes. MURICOPSIS s.s.
- juanitae* [Pygmaepterys] Gibson Smith and Gibson Smith, 1983. FAVARTIA (PYGMAEPTERYS)
- kalafuti* [Murexiella] Petuch, 1987. MUREXIELLA s.s.
- larvaecosta* [Murex] Heilprin, 1886. = *crispangula*
- leonardhilli* [Murexiella] Petuch, 1987. = *macgintyi*
- levicula* [Ocinebra] Dall, 1889. MUREXIELLA s.s.
- lindae* [Favartia] Petuch, 1987. FAVARTIA s.s.
- lourdesae* [Pygmaepterys] Gibson Smith and Gibson Smith, 1983. FAVARTIA (PYGMAEPTERYS)
- lyonsi* [Muricopsis] Petuch, 1986. = *oxytata*
- macgintyi* [Murex] M. Smith, 1938. MUREXIELLA s.s.
- mantelli* [Murex] Conrad, 1834. MUREXIELLA s.s.
- MARCUSI [Muricopsis] Vokes. MURICOPSIS s.s.
- micromeris* [Murex] Dall, 1890. FAVARTIA s.s.
- mimicus* [Murexsul] Vokes, 1989. MUREXSUL
- minirosea* [Ocinebra] Abbott, 1954. FAVARTIA s.s.
- mosquitensis* [Risomurex] Kemperman and Coomans, 1984. = *deformis*
- muricoides* [Fusus] C.B. Adams, 1845. = *caribbaea*
- NANISSIMUS [Murexsul] Vokes. ?MUREXSUL
- necocheanum* [Sistrum, as *nicocheanum*] Pilsbry, 1900. MURICOPSIS (?RISOMUREX)
- nuceus* [Murex] Mörch, 1850. FAVARTIA s.s.
- oxossi* [Muricopsis] Petuch, 1979. FAVARTIA (PYGMAEPTERYS)
- oxytata* [Murex] M. Smith, 1938. MURICOPSIS s.s.
- pacei* [Favartia] Petuch, 1988. FAVARTIA s.s.
- PARVULA [Murexiella] Vokes. MUREXIELLA s.s.
- petiti* [Murexiella] Vokes, 1968. MUREXIELLA s.s.
- PETUCHI [Murexiella] Vokes. MUREXIELLA s.s.
- PEREXIGUA [Muricopsis] Vokes. MURICOPSIS s.s.
- praepauxillus* [Murex] Maury, 1917. MURICOPSIS s.s.
- pratulum* [Pygmaepterys] Vokes and D'Attilio, 1980. FAVARTIA (PYGMAEPTERYS)
- puntagordanum* [Murex] Weisbord, 1962. MUREXIELLA s.s.
- quisqueyensis* [Muricopsis] Vokes, 1989. MURICOPSIS s.s.
- rauli* [Pygmaepterys] [sic] Espinosa, 1990. FAVARTIA (PYGMAEPTERYS)
- richardbinghami* [Muricopsis] Petuch, 1987. FAVARTIA (PYGMAEPTERYS)
- rosea* [Ricinula] Reeve, 1846. MURICOPSIS (RISOMUREX)
- rubidum* [Sistrum] Dall, 1889. = *deformis*
- scabrosa* [Tritonalia] Dall, 1915. MURICOPSIS s.s.
- schrammi* [Engina] Crosse, 1863. MURICOPSIS (RISOMUREX)
- shilohensis* [Murex] Heilprin, 1888. MUREXIELLA s.s.
- SHIRLEYAE [Muricopsis] Vokes. MURICOPSIS s.s.
- STEPHENSÆ [Murexiella] Vokes. MUREXIELLA s.s.
- striata* [Muricidea] Gabb, 1873. ACANTHOTROPHON
- striatoides* [Acanthotrophon] Vokes, 1980. ACANTHOTROPHON
- sunderlandi* [Muricopsis] Petuch, 1987. MURICOPSIS s.s.
- taylorae* [Murexiella] Petuch, 1987. MUREXIELLA s.s.
- textilis* [Murex] Gabb, 1873. MUREXIELLA (SUBPTERYNOTUS)
- thalmanni* [Hexaplex] Vokes, 1968. MUREXSUL
- varimutabilis* [Favartia] Houart, 1991. ?FAVARTIA s.s.
- vaughani* [Murexiella] MacNeil in MacNeil and Dockery, 1984. MUREXIELLA s.s.
- veracruzana* [Murexiella] Vokes, 1968. MUREXIELLA s.s.
- warreni* [Muricopsis] Petuch, 1993. MURICOPSIS s.s.
- withrowi* [Muricopsis] Vokes and Houart, 1986. MURICOPSIS (RISOMUREX)
- zalaya* [Favartia] Vokes, 1989. FAVARTIA s.s.
- zylmanae* [Muricopsis] Petuch, 1993. MURICOPSIS s.s.



VIII. APPENDIX I: STRATIGRAPHICAL LIST OF SPECIES  
INCLUDED IN THIS PART

The following list is arranged in approximately ascending stratigraphical order, with all of the species recognized as occurring in each formation.

EARLY EOCENE

Bashi Marl Member, Hatchitigbee Formation, Alabama

*Murexsul* species

MIDDLE EOCENE

Gosport Sand, Alabama

*Murexiella* (*Murexiella*) *mantelli*

EARLY AND MIDDLE OLIGOCENE

Red Bluff Formation, Mississippi

*Muricopsis* (*Risomurex*) *aspinosa*

*Murexiella* (*Murexiella*) *vaughani*

LATE OLIGOCENE/EARLY MIOCENE

Tampa Limestone, Florida

*Muricopsis* (*Muricopsis*) *scabrosa*

*Homalocantha* *crispangula*

EARLY MIOCENE

Kirkwood Formation, New Jersey

*Murexiella* (*Murexiella*) *shilohensis*

*Murexiella* (*Murexiella*) *faceta*

Chipola Formation, Florida

*Muricopsis* (*Muricopsis*) *shirleyae*

*Muricopsis* (*Muricopsis*) species

*Muricopsis* (*Risomurex*) *crassicosta*

*Murexsul* *nanissimus*

*Murexiella* (*Murexiella*) *parvula*

*Murexiella* (*Subpterynotus*) *textilis*

*Homalocantha* *calhounensis*

*Favartia* (*Pygmaepterys*) *drezi*

*Favartia* (*Pygmaepterys*) *pratulum*

Baitoa Formation, Dominican Republic

*Muricopsis* (*Muricopsis*) species

*Murexiella* (*Subpterynotus*) *textilis*

Cantaure Formation, Venezuela

*Muricopsis* (*Risomurex*) *crassicosta*

*Murexiella* (*Subpterynotus*) *textilis*

MIDDLE MIOCENE

Unnamed formation, Dominican Republic

*Homalocantha* species

Calvert Formation, Maryland

*Murexiella* (*Murexiella*) *shilohensis*

LATE MIOCENE

(?)Medias Aguas Formation, Mexico

*Murexiella* (*Murexiella*) species

*Favartia* (*Caribiella*) *carmenae*

Boleo Formation, Baja California (Pacific coast)

*Murexiella* (*Subpterynotus*) *textilis*

Cercado Formation, Dominican Republic

*Muricopsis* (*Muricopsis*) *praepauxilla*

*Murexiella* (*Murexiella*) *macgintyi*

*Favartia* (*Favartia*) species

*Favartia* (*Pygmaepterys*) *germainae*

Caujaro Formation, Venezuela

*Murexiella* (*Subpterynotus*) *textilis*

PLIOCENE

Gurabo Formation, Dominican Republic

*Muricopsis* (*Muricopsis*) *praepauxilla*

*Muricopsis* (*Muricopsis*) *quisqueyensis*

*Murexsul* *mimicus*

*Acanthotrophon* *striatus*

*Murexiella* (*Murexiella*) *hidalgoi*

*Murexiella* (*Murexiella*) *macgintyi*

*Favartia* (*Favartia*) species

*Favartia* (*Favartia*) *zalaya*

*Favartia* (*Pygmaepterys*) *germainae*

Esmeraldas Beds, Ecuador (Pacific coast)

*Muricopsis* (*Muricopsis*) *oxytata*

Morne l'Enfer Formation, Trinidad

*Muricopsis* (*Risomurex*) *galbensis*

Gatun Formation, Panama

*Murexiella* (*Subpterynotus*) *textilis*

Agueguexquite Formation, Mexico

*Muricopsis* (*Muricopsis*) sp. cf. *quiqueyensis*

*Murexsul* *thalmanni*

*Acanthotrophon* *striatoides*

*Murexiella* (*Murexiella*) *faceta*

*Murexiella* (*Murexiella*) *veracruzana*

*Murexiella* (*Murexiella*) *edwardpauli*

Punta Gavilán Formation, Venezuela

*Murexiella* (*Murexiella*) *macgintyi*

Pinecrest Beds [= Fruitville Formation], Florida

*Muricopsis* (*Muricopsis*) *oxytata*

*Acanthotrophon* *striatoides*

*Murexiella* (*Murexiella*) *shilohensis*

*Murexiella* (*Murexiella*) *faceta*

*Murexiella* (*Murexiella*) *hidalgoi*

*Murexiella* (*Murexiella*) *petuchi*

(?)*Murexiella* (*Murexiella*) *levicula*

*Murexiella* (*Subpterynotus*) *textilis*

*Favartia* (*Favartia*) *cellulosa*

Jackson Bluff Formation, Florida

*Murexiella* (*Murexiella*) *shilohensis*

*Murexiella* (*Murexiella*) *faceta*

*Murexiella* (*Subpterynotus*) *textilis*

Tamiami Formation, Florida

*Muricopsis* (*Muricopsis*) *oxytata*

*Acanthotrophon* *striatoides*

(?)*Murexiella* (*Murexiella*) *stephensae*

*Murexiella* (*Subpterynotus*) *textilis*

*Favartia* (*Favartia*) *cellulosa*



Duplin Formation, North Carolina  
*Murexiella (Murexiella) faceta*  
*Favartia (Favartia) cellulosa*

#### PLIO-PLEISTOCENE

Caloosahatchee Formation, Florida  
*Muricopsis (Muricopsis) oxytata*  
*Acanthotrophon striatoides*  
*Murexiella (Murexiella) shilohensis*  
*Murexiella (Murexiella) macgintyi*  
*Murexiella (Murexiella) glypta*  
 (?)*Murexiella (Murexiella) edwardpauli*  
*Murexiella (Subpterynotus) textilis*  
*Favartia (Favartia) micromeris*  
*Favartia (Favartia) cellulosa*

Tubará Group, Colombia  
*Muricopsis (Muricopsis) oxytata*

Mare Formation, Venezuela  
*Muricopsis (Risomurex) gilbertharrisi*  
*Murexiella (Murexiella) puntagordanum*

#### PLEISTOCENE

Waccamaw Formation, South Carolina  
*Murexsul comptulus*  
*Murexiella (Murexiella) shilohensis*  
*Murexiella (Murexiella) macgintyi*  
*Murexiella (Murexiella) glypta*  
*Murexiella (Murexiella) petiti*  
*Favartia (Favartia) cellulosa*

James City Formation, North Carolina  
 (?)*Murexiella (Murexiella) macgintyi*

Bermont Formation, Florida  
*Muricopsis (Muricopsis) oxytata*  
*Acanthotrophon striatoides*  
 (?)*Murexiella (Murexiella) macgintyi*  
*Murexiella (Murexiella) glypta*  
*Murexiella (Murexiella) graceae*  
*Favartia (Favartia) cellulosa*

*Favartia (Favartia) pacei*  
*Favartia (Favartia) lindae*

Moín Formation, Costa Rica

*Muricopsis (Muricopsis) sp. cf. quiqueyensis*  
*Muricopsis (Muricopsis) oxytata*  
*Muricopsis (Risomurex) deformis*  
*Murexsul harasewychi*  
*Murexsul amphilogos*  
*Acanthotrophon striatoides*  
*Acanthotrophon ascensus*  
*Murexiella (Murexiella) hidalgoi*  
*Murexiella (Murexiella) glypta*  
*Murexiella (Murexiella) edwardpauli*  
*Favartia (Pygmaepterys) germainae*

#### HOLOCENE

Unnamed formation, Louisiana  
*Murexsul emipowlusi*  
*Murexiella (Murexiella) levicula*  
*Favartia (Favartia) cellulosa*

#### RECENT

*Muricopsis (Muricopsis) oxytata, huberti, warreni, sunderlandi, zylmanae, perexigua, josei, marcusii*  
*Muricopsis (Risomurex) gilbertharrisi, deformis, schrammi, rosea, caribbaea, withrowi, necocheana*  
*Murexsul harasewychi, emipowlusi, species Acanthotrophon striatoides, sp. cf. ascensus*  
*Murexiella (Murexiella) hidalgoi, macgintyi, levicula, glypta, edwardpauli, puntagordanum, hilli, taylorae, kalafuti*  
*Favartia (Favartia) cellulosa, pacei, minirosea, nuceus, lindae, barbarae, (?)varimutabilis, species*  
*Favartia (Caribiella) alveata*  
*Favartia (Pygmaepterys) germainae, oxossi, juanita, lourdesae, richardbinghami, alicae, rauli*