THE FAMILY TORNIDAE (Gastropoda, Rissooidea) in the Caribbean and neighboring areas

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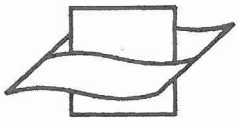

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INDEX OF SPECIES:

Iberus 29 (2) 2011

FAMILY TORNIDAE

The family Tornidae (Gastropoda, Rissooidea) in the Caribbean and neighboring areas

La familia Tornidae (Gastropoda, Rissooidea) en el Caribe y áreas vecinas

Federico RUBIO*, Raúl FERNÁNDEZ-GARCÉS** and Emilio ROLÁN***

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RESUMEN

Se estudian las especies del Caribe, incluidas en la familia Tornidae y que comprenden los géneros *Circulus, Teinostoma, Tornus, Anticlimax, Aorotrema, Cyclostremiscus, Cochliolepis, Episcynia, Parviturboides, Pleuromalaxis, Solariorbis, Vitrinella* y *Vitrinorbis*, sobre la base de unos 2700 ejemplares y conchas examinados. Los taxones estudiados de Tornidae son 101 en total, siendo 4 del género *Circulus*, 27 de *Teinostoma*, 2 de *Tornus*, 8 de *Anticlimax*, 2 de *Aorotrema*, 14 de *Cyclostremiscus*, 9 de *Cochliolepis*, 1 de *Episcynia*, 1 de *Parviturboides*, 1 de *Pleuromalaxis*, 16 de *Solariorbis*, 15 de *Vitrinella* y 1 de *Vitrinorbis*. De estas especies 23 son nuevas para la ciencia y se describen aquí: 8 en *Teinostoma*, 1 en *Anticlimax*, 3 en *Cyclostremiscus*, 3 en *Cochliolepis*, 4 en *Solariorbis* y 4 en *Vitrinella*. Se discuten las asignaciones a estos géneros y sus relaciones. Además, se aportan datos sobre 40 especies más, relacionadas en algún momento con la familia en estudio. Un nuevo nombre se propone para *"Cyclostrema" thomasi* Pilsbry, 1945, previamente ocupado.

Teinostoma nessaeum y *Teinostoma obtectum* son tratados como especies válidas, no sinónimos de *Teinostoma biscaynense; Cyclostremiscus trilix* no es sinónimo de *Cyclostremiscus pentagonus; Cyclostrema thomasi* no es sinónimo de *Vitrinella filifera*. Por el contrario, *Teinostoma clavium* es aquí considerada como sinónimo de *Teinostoma semistriatum*.

Se designan lectotipos para *Teinostoma reclusum, Teinostoma solidum, Parviturboides interruptus, Solariorbis petitii, Episcynia inornata* y *Cochliolepis parasitica*.

Se designan neotipos para *Teinostoma megastoma, Teinostoma semistriatum* y *Circulus* orbignyi.

Algunos tipos de las colecciones Dall y KJ Bush, todos en USNM, se fotografiaron por primera vez por SEM.

Del examen de los tipos de DALL (1927), llegamos a la conclusión de que un número de especies descritas en el mismo no son tornidos y sí skeneidos incluidos en los géneros *Cirsonella, Micro* y *Xyloskenea*.

ABSTRACT

The Caribbean species included within the family Tornidae in the genera *Circulus, Teinostoma, Tornus, Anticlimax, Aorotrema, Cyclostremiscus, Cochliolepis, Episcynia, Parvitur-*

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boides, Pleuromalaxis, Solariorbis, Vitrinella and *Vitrinorbis* are studied, based on about 2700 specimens and shells examined. There are a total of 101 species, including 4 in the genus *Circulus*, 27 in *Teinostoma*, 2 in *Tornus*, 8 in *Anticlimax*, 2 in *Aorotrema*, 14 in *Cyclostremiscus*, 9 in *Cochliolepis*, 1 in *Episcynia*, 1 in *Parviturboides*, 1 in *Pleuromalaxis*, 16 in *Solariorbis*, 15 in *Vitrinella*, and 1 in *Vitrinorbis*. Of all these species 23 are new and are described here: 8 in *Teinostoma*, 1 in *Anticlimax*, 3 in *Cyclostremiscus*, 3 in *Cochliolepis*, 4 in *Solariorbis*, and 4 in *Vitrinella*. The assignation of these species to these genera and their relationships are discussed. Furthermore, some information is given on 40 species more which have been related at times to the family studied. A new name is proposed for "*Cyclostrema*" *thomasi* Pilsbry, 1945, which is preoccupied.

Teinostoma nessaeum and *Teinostoma obtectum* are treated as valid species, not synonyms of *Teinostoma biscaynense*; *Cyclostremiscus trilix* is not a synonym of *Cyclostremiscus pentagonus*; *Cyclostrema thomasi* is not a synonym of *Vitrinella filifera*. Conversely, *Teinostoma clavium* is herein considered a synonym of *Teinostoma semistriatum*.

Lectotypes are here designated for *Teinostoma reclusum, Teinostoma solidum, Parviturboides interruptus, Solariorbis petitii, Episcynia inornata* and *Cochliolepis parasitica*.

Neotypes are designated for *Teinostoma megastoma, Teinostoma semistriatum,* and *Circulus* orbignyi.

Some types from the Dall and K.J. Bush collections, all in USNM, are photographed for the first time using SEM.

From the examination of Dall's (1927) types, we concluded that a number of species described therein are not tornids but skeneids included in the genera *Cirsonella, Micro* and *Xyloskenea*.

INTRODUCTION

The "vitrinellids" (Vitrinellidae Bush, 1897), here considered synonymous with Tornidae Sacco, 1896, are prosobranch molluscs generally living in shallow waters of tropical seas. In the Atlantic only *Tornus subcarinatus* (Montagu, 1803) and *Circulus striatus* (Philippi, 1836) live in the marine waters of Western Europe but there are many species known from the shores of West Africa (ADAM & KNUDSEN, 1969; ROLÁN & RUBIO, 2002; OLIVER & ROLÁN, 2011). There is no known case of anfiatlantism in species of the Tornidae family.

STIMPSON (1858) described the first vitrinellid for the malacological fauna of the SE United States: *Cochliolepis parasitica*, which was found alive under the scales of the giant scaly worm *Polydontes lupina*. GABB (1873, 1881) described several fossil species from the Miocene of Santo Domingo and the Pliocene of Costa Rica. Subsequently some of these species have been found living. *Circulus liratus* (A.E. Verrill, 1882) was described from north of Cape Hatteras, North Carolina

MOORE (1964) stated that no vitrinellids have been found south of Trinidad. Yet RIOS (1975, 1994) and DÍAZ MERLANO & PUYANA HEGEDUS (1994) mention several species from Brazil and Colombia respectively.

The supposed "vitrinellid" recorded alive in deeper water off the Azores by CLARKE (1962): *Teinostoma azorica* Dautzenberg & Fischer, 1896, was recently shown to be a turbinid. Its radula is rhipidoglossan, and its general characters are coincident with those of the Skeneinae species of the genera *Skenea* and *Dikoleps* (RUBIO & ROLÁN, 2009). Other vitrinellids collected in deep water such as *Circulus dalli* Bush (618 m), found very close to the north coast of Little Bahama Bank, have been considered to be transported downslope by the currents. *Teinostoma solidum* (Dall, 1889) was found below the continental shelf. MOORE (1964) mentions seeing specimens with animal and operculum in natural position, but in his opinion they could not be vitrinellids.

Most of the records of living vitrinellids are between one and several metres deep. Among the living species collected by PILSBRY & MCGINTY (1945a and 1946b) are: *Vitrinella helicoidea* C.B. Adams, *Teinostoma lerema* Pilsbry & McGinty, *Teinostoma parvicallum* Pilsbry & McGinty, *Teinostoma carinicallus* Pilsbry & McGinty and *Pleuromalaxis balesi* Pilsbry & McGinty. Other species collected alive: *Cyclostremiscus pentagonus* (Gabb) in sand-muddy bottom in Mississippi Sound; *Cyclostremiscus suppressus* (Dall) on *Thalassia* off Matheson Hammock, Biscayne Bay, less than 1 meter; *Solariorbis mooreana* (Vanatta), *Solariobis infracarinata* (Gabb), *Cyclostremiscus cubanus* (Pilsbry & Aguayo) and *Cyclostremiscus pentagonus* (Gabb) in sandy bottom and/or muddy-sandy bottom. *Circulus striatus* (Philippi), type species of the genus, lives on sandy bottoms off the Atlantic coasts of southern France and the Iberian Peninsula. The vitrinellids supposedly feed on detritus and diatoms.

We have scanty information on the soft parts of most of the species of the family Tornidae Sacco, 1896; it is a heterogeneous assortment of species fundamentally grouped together on the basis of some similarity of the shells. The ignorance of the soft anatomy and the radula of most of the species described up to now makes a correct generic and subgeneric placement difficult. The only anatomical studies published on these groups correspond to the type species of the genera *Circulus* Jeffreys, 1865 [*C. striatus* (Philippi, 1836) in FRETTER (1956)], *Cochliolepis* Stimpson, 1858 [*C. parasitica* Stimpson, in MOORE, 1972], *Tornus* Turton & Kingston, 1830 [*T. subcarinatus* (Montagu, 1803), in GRAHAM, 1982]. Also *Cyclostremiscus beaui* (P. Fischer, 1857) and *Circulus texanus* (Moore, 1965) in BIELER & MIKKELSEN (1988). We consider this an insufficient basis for understanding the family.

After a detailed anatomical examination of living samples of *Cochliolepis parasitica*, type species of the genus, MOORE (1972) placed *Cochliolepis* in Vitrinellidae, due their anatomical similarity. He went on to remark that, in spite of the fact that some of the species are more conchologically similar to those of *Tornus*, the relationship of *Cochliolepis* with *Tornus* and Tornidae is not close.

PONDER (1988) in his study on the phylogeny of Truncatelloidea (now known as Rissooidea), incorporated the available studies (FRETTER, 1956; MOORE, 1972; GRAHAM, 1982) into his own, apparently not published, and inferred that there was a complex of tornids-vitrinellids-adeorbids (= circulids), as a single family, which equates to Tornidae, but warned that two or more families could be separated from this group. This author affirmed that the Tornidae (included with vitrinellids for this analysis) have some characters in common, but in their overall anatomy approach the hydrobiids-truncatellids and more closely the Iravadiidae and Elachisinidae.

BIELER & MIKKELSEN (1988) studied several populations of two western Atlantic vitrinellids: *Cyclostremiscus beauii* (P. Fischer, 1897) and *Circulus texanus* (Moore, 1965) giving enough anatomical and radular data for generic differentiation.

PONDER (1994) described the external and internal morphology of three vitrinelliform species from Hong Kong. Two of these, *Sigaretornus plana* and *Circulus mortoni*, are placed in the Vitrinellidae, the other, a new genus and species, *Lantauia taylori*, is included in the Iravadiidae. The variation in organ systems in vitrinelliform species and the generic relationships are discussed, using the most comprehensive anatomical studies then available, provided by BIELER & MIKKELSEN (1988). They confirm that the anatomy of *Sigaretornus plana* and that of *Circulus mortoni* are very similar to that of *Cyclostremiscus beauii*, described in detail by BIELER & MIKKELSEN (1988). This shows the necessity of establishing a profile with the most important characters in vitrinellids and clarifying the relation between the type species of *Vitrinella*

and *Tornus*, as both are the type genera of the families Vitrinellidae and Tornidae, due to the controversy on the relationships of both families.

Authors such as GRAHAM (1982) have suggested that few differences were found between both families and so, they could be grouped together, while other authors, like MOORE (1965) and BIELER & MIKKELSEN (1988) have suggested that both could be kept separate.

RUBIO & ROLÁN (1998) reported on the radulae of *Pachystremiscus ornatus* (Olsson & McGinty, 1958) and *P. pulchellus* (Olsson & McGinty, 1958) and placed both species in the genus *Lodderena* (Archaeogastropoda, Skeneidae), considering *Pachystremiscus* a synonym of *Lodderena*.

The species of tornids and vitrinellids are very similar in soft anatomy and radula as shown in ROLÁN & RUBIO (2002) in their report on the Tornidae of the east Atlantic.

BOUCHET & ROCROI (2005) summarized the state-of-the-art for taxonomy of the Gastropoda, casting new light on the historical evolution of the phylum Mollusca. Malacologists currently consider this classification a "hybrid" of the pre-existing traditional taxonomy based on morphological characters and the more recent far-reaching revisions, based on the molecular characteristics of DNA and RNA. Also there are opinions about the classification of families into subfamilies which are often not well resolved, and should be regarded as the best possible hypotheses. In our opinion, the new classification of gastropods drastically changes existing systematics and is an important step forward the gastropod nomenclature. In this work, the family Tornidae Sacco, 1896 is divided into four subfamilies: Torninae Sacco, 1896; Circulinae Fretter & Graham, 1962; Teinostomatinae Cossmann, 1917; and Vitrinellinae Bush, 1897. The subfamily Torninae includes the genera previously placed in *Tornus*; Circulinae only includes the genus *Circulus*; the subfamily Teinostomatinae only has the genus *Teinostoma* and Vitrinellinae groups together the other genera included in the old family Vitrinellidae Bush, 1897, herein considered a subfamily. This new classification will be employed in the present work.

As most of the species included in the group under consideration here have a typical shell form (orbicular to lenticular), we must point out that some species with similar shells actually belong to other families: for example, the genus *Cyclostrema* Marryat, 1818 is in Liotiidae Gray, 1850; the genera *Ganesa* Jeffreys, 1883, *Lydiphnis* Melvill, 1906, *Dillwynella* Dall, 1889, *Molleriopsis* Bush, 1897 and *Leptogyra* Bush, 1897 are in Turbinidae Rafinesque 1815, subfamily Skeneinae Clark, 1851; the genus *Choristella* Bush, 1897 is in Lepetellidae Dall, 1881 and the genus *Cyclostremella* Bush, 1897 is in Pyramidelloidea, Odostomiidae Pelseneer, 1928. Some of these generic names have erroneously been employed for species included in the group studied here.

MATERIALS AND METHODS

Most of the material studied in the present work was acquired from sediments obtained by diving or from dredgings and later separated with a binocular lens under magnification. Consequently most of the material is composed of empty shells in shell grit; occasionally a shell with soft parts could be obtained. An important part of the material studied is from Cuba, to which area we initially planned to limit our work; this material was mainly obtained from the collections of the second author in Cienfuegos Bay and later deposited mostly at the MHNS. For this reason, at the beginning of this study we only examined Cuban shells. Subsequently we included new material obtained by the third author on several trips to Yucatan (Mexico), Guatemala, Nicaragua, and south and west Cuba. Finally, we added other materials collected by Colin Redfern in the Bahamas, by Jacques Pelorce in

several islands of the Caribbean, by some collectors from Itaparica, Brazil, and an important quantity from the collection of Harry G. Lee, which considerably amplified the study geographically and in terms of biodiversity. Some shells were lent by Marlo Krisberg, and we studied types and other material in other private collections and several Museums.

Abbreviations:

AMNH American Museum of Natural History, New York
ANSP Academy of Natural Sciences of Philadelphia
FLMNH Florida Museum Natural History, Gainesville
IES Instituto de Ecología y Sistemática, Havana
MCZ Museum of Comparative Zoology, Philadelphia
MHNS Museo de Historia Natural "Luis Iglesias", University of Santiago de Compostela (coll E. Rolán)
MNCN Museo Nacional de Ciencias Naturales, Madrid
MNHN Muséum National d'Histoire Naturelle, Paris
MPH Museo Poey, Havana
NHMUK National History Museum United Kingdom, London
PRI Paleontological Research Institution, New York
RNHL Rijksmuseum van Natuurlijke Historie, Leiden
USNM National Museum of Natural History, Washington
YPM Peabody Museum of Natural History, Yale University, New Haven, Connecticut
CCR collection of Colin Redfern, Boca Raton
CEG collection of E.F. Garcia, Louisiana
CFG collection of R. Fernández-Garcés, Cienfuegos
CFR collection of F. Rubio, Valencia
CHL collection of Harry G. Lee, Florida
CJP collection of J. Pelorce, Le Grau de Roi
CMK collection of M. Krisberg, Florida
sp specimen with soft parts
s empty shell
j juvenile
f fragment

SYSTEMATIC PART

Superfamily RISSOOIDEA Gray, 1847
Family TORNIDAE Sacco, 1896
Subfamily CIRCULINAE Fretter & Graham, 1962
Genus *Circulus* Jeffreys, 1865

Lydiphnis Dall, 1927, pp. 123

Circulus Jeffreys, 1865: 315. *British Conchology. Vol. VIII.* Marine shells comprising the remaining Conchifera, the Solenoconchia and Gasteropoda as far as *Littorina*. J. Van Voorst. Plenum Press, New York and London, 393(+1) pp., 8 pls + frontispiece.

Type species (by monotypy): *Trochus duminyi* Requien, 1848 (= *Valvata striata* Philippi, 1836).

Diagnosis: "*Shell relatively strong, depressed; base smooth, rounded, umbilicus opened and deep spiral sculpture present on the dorsum and on the periphery*".

Remarks: *Circulus* has been habitually treated as a section or subgenus of a better known genus. FISCHER (1887) places it as a subgenus of *Gibbula* Risso and BUSH (1897) as a section of *Vitrinella*. DALL (1927) reassigned to *Lydiphnis* Melville, 1906 some of the species placed in *Circulus* by Bush, but without giving an explanation.

THIELE (1929: 63) considered *Circulus* as a genus within *Cyclostrematidae* and mentions some details in the text about the radula.

FRETTER (1956) researched the anatomy of *Circulus striatus* (Philippi),

type species of *Circulus*, and found several discrepancies in Thiele in reference to this genus. The radula is taenioglossate, not rhipidoglossate, and the animal is similar in appearance to that of the Rissoidae. The animal has a pair of pallial tentacles on the right margin of the mantle, and epipodial tentacles are wanting. The sexes are separate, and the male has a penis.

KEEN (1960) places the genus in Cyclostrematidae, Order Archaeogastropoda. But the detailed anatomical work of FRETTER (1956) has shown that the animal belongs in Mesogastropoda close to the family Rissoidae.

Species have been placed in the genus *Circulus* in the Caribbean, West Africa and Australia. *Circulus striatus* (Philippi) has been found on the southeast coast of Europe and in the Mediterranean. *Circulus liratus* (A.E. Verrill, 1882) was found from the east coast of Florida up to New England in the United States and *Circulus semisculptus* (Olsson & McGinty, 1958) from both coasts of Florida and Panama. Several species have been described from the latter region, but apparently they must be reassigned to other genera.

The shells are very similar in their general aspect to those of *Solariorbis*, but they lack the strong rib close to the umbilicus.

According to MOORE (1964) *Adeorbis orbignyi* P. Fischer, 1857, described from Cuba, may be included in this genus, but the type in the Laboratoire de Malacologie of MNHN is lost and so he considered the taxon a *nomen dubium*.

BIELER & MIKKELSEN (1988) give a complete account of the anatomy and reproductive biology of two species grouping them in Vitrinellidae: *Cyclostremiscus beaui* (P. Fischer, 1857) and *Circulus texanus* (Moore, 1965), from populations of both species found in Florida, in burrows in fine sand of the stomatopod crustacean *Lysiosquilla scabricauda* (Lamarck, 1818). The great size of *Cyclostremiscus beaui* (6-8 mm maximum diameter) simplified the detailed study of its anatomy and morphology and at the same time allowed the authors to confirm FRETTER'S (1956) hypothesis that some characters found in *Circulus striatus*, are in proportion to its overall size.

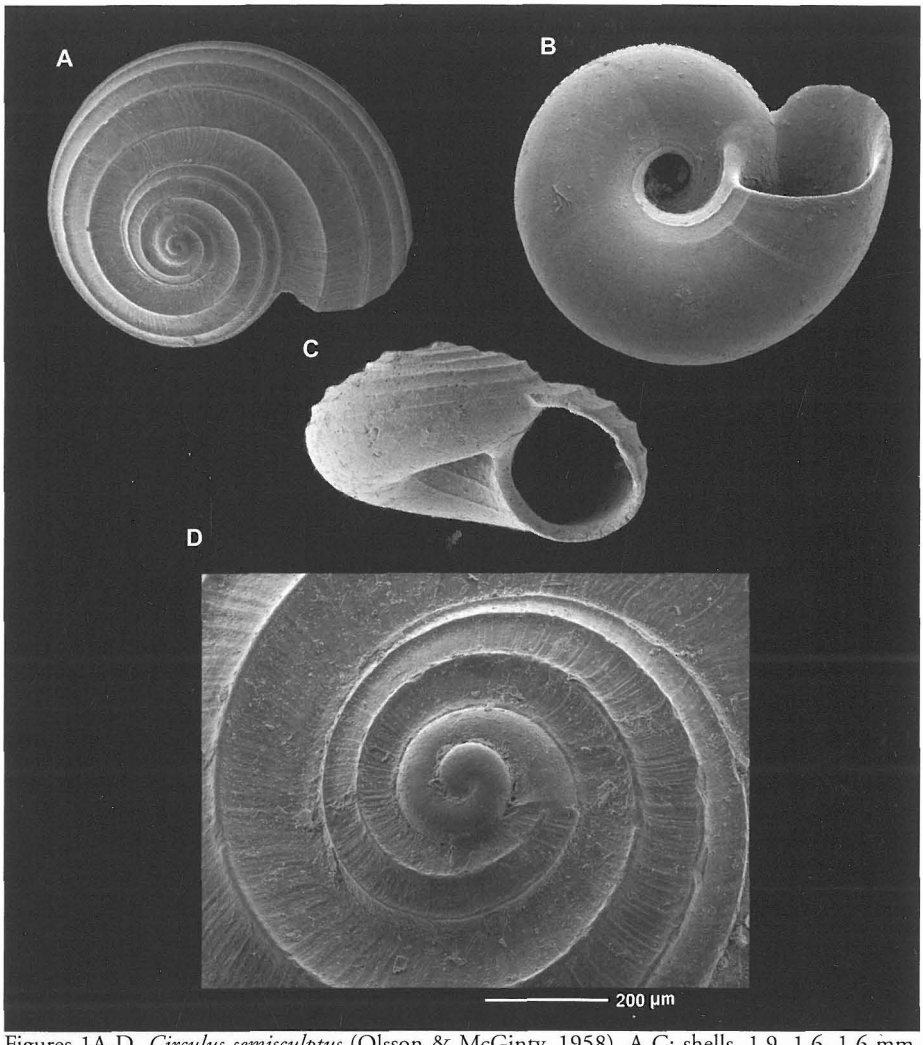
PONDER (1994: 258) says: "species of *Circulus* can be defined as vitrinellids having a spirally ridged shell with a simple non varicose aperture, a simple penis and a posteriorly notched foot lacking a metapodial tentacle. This latter character is absent in *Vitrinella texana* Moore, a species included in *Circulus* by BIELER & MIKKELSEN (1988)".

There are seven recent species of *Circulus* described from the east coast of USA and the Caribbean: *Circulus liratus* (A.E. Verrill, 1882), *Circulus texanus* (Moore, 1965), *Circulus semisculptus* (Olsson & McGinty, 1958), *Circulus orbignyi* (P. Fischer, 1957), *Circulus hendersoni* (Dall, 1927), *Circulus margaritiformis* (Dall, 1927) and *Circulus translucens* (Dall, 1927). In the present work all these taxa have been studied and figured. A neotype is designated for *C. orbignyi*, a taxon considered by some authors as a *nomen dubium*, the type material having been lost. DALL (1927) described *C. hendersoni*, *C. margaritiformis* and *C. translucens*, in the genus *Lydiphnis*, all of them from deep water dredgings in Georgia and Fernandina. These taxa will be discussed in the section following the main revision inasmuch as we have determined that they are not tornids but species in Skeneinae as will be demonstrated below.

Circulus semisculptus (Olsson & McGinty, 1958) (Figures 1A-D)

Vitrinella semisculpta Olsson & McGinty, 1958. *Bulletins of American Paleontology*, 39: 30-31, pl. 3, figs. 2-2b. [Type locality: Bocas Island, Panama].

Type material: Holotype represented in MOORE (1964: 220, fig. 7). Deposited in the ANSP (211888). Not examined.



Figures 1A-D. *Circulus semisculptus* (Olsson & McGinty, 1958). A-C: shells, 1.9, 1.6, 1.6 mm, Rancho Luna Beach, Cuba; D: protoconch.
Figuras 1A-D. Circulus semisculptus *(Olsson & McGinty, 1958). A-C: conchas 1,9 1,6, 1,6 mm, Playa Rancho Luna, Cuba; D: protoconcha.*

Other material examined: Cuba: 2 s, Rancho Luna Beach, Cienfuegos, 10-20 m (MHNS); 3 s, Rancho Luna Beach, 20-54 m (MHNS). Antigua and Barbuda: Antigua: 1 s, north St. John, 5-6 m (CJP). Martinique: 1 s, Pointe Borgnesse, 12 m, on sand-muddy on the base of the reef (CJP). Florida, USA: 1 s, SE Raccoon Key, Monroe Co., 0.5 m subtidal with *Halimeda* sps (CHL). Bahamas: 1 s, Olympus Reef, Grand Bahama Island, 36 m coralline algae bottom (CHL).

Description: Shell (Figs. 1A-C) rather strong, whorls rounded with spiral sculpture on the dorsum and base smooth. Protoconch (Fig. 1D) relatively large, about 310 µm maximum diameter, with 1 ½ spiral whorls where two stages of development are easily observable. Its surface is apparently smooth although some rough parts are present in the terminal

portion. A strong varix marks the separation from the teleoconch. Last whorl with 5 spiral cords distributed on the dorsal half of the whorl between the suture and the periphery. A fine axial striation covers the interspaces between the spiral cords. Base rounded, totally smooth except growth lines slightly oblique, peristome not continuous.

Habitat: MOORE (1964: 73) suggests that the species seems to prefer shallow water, and all the shells in the type series were in beach sediments. However, several others came from between 10 and 54 m deep.

Distribution: It has been recorded from Colón island and Bocas island, Panama (OLSSON & MCGINTY, 1958); from South Florida and Panama (MOORE, 1964); from South of Florida and Central America (HOUBRICK, 1968); from Portete, Costa Rica (HOUBRICK, 1968; ROBINSON & MONTOYA, 1987); from south Florida and the western Caribbean (ABBOTT, 1974); from Aruba (DE JONG & COOMANS, 1988); from Colombia (DÍAZ MERLANO & PUYANA HEGEDUS, 1994); from Abaco, Bahamas (REDFERN, 2001). In the present work Cuba, Antigua and Martinique are added.

Remarks: Our material matches the figure in MOORE (1964: 220, fig. 7) and the shell photographed by REDFERN (2001, fig. 184) from Abaco, Bahamas.

Circulus orbignyi (P. Fischer, 1857) (Figures 2A-D)

Adeorbis orbignyi Fischer, P. 1857. *Journal de Conchyliologie*, 6: 173. [Type locality: Cuba].
Circulus sp.: In REDFERN, 2001: 43, pl. 21, figs. 185.

Type material: The holotype is lost. Neotype (Fig. 2A), here designated, in MNHN (24227).
Other material examined: Cuba: 1 s, Jibacoa, 3-6 m (MHNS); 1 s, Baracoa, on beach (MHNS); 5 s, Cienfuegos Bay, 20 m (MHNS); 1 s, Cienfuegos Bay, 30 m (MHNS); 1 s, Rancho Luna Beach, 12 m (MHNS); 23 s, Rancho Luna Beach, 10-20 m (MHNS); 11 s, Rancho Luna Beach, 45 m (MHNS); 1 s, Punta Tamarindo, 15 m (MHNS). Grenadines: 1 s, Mayreau, 8 m, coralline sand with coral, gorgonies and sponges (CJP). Trinidad and Tobago: Tobago, 1 s, Horse Shoe reef, Tobago Cays, 15 m, in sediments (CJP). Nicaragua: 1 s, Cayo Witties, 15 m (MHNS). Panama: 1 s, Portobello, drift (CHL). Florida, USA: 1 s, Hallandale Beach, Broward Co., Florida, drift (CHL). Bahamas: 1 s, Grand Bahama Island, 0.5 m on sand (CHL).
Type locality: Cuba; the neotype is from Rancho Luna Beach, Cienfuegos, Cuba.

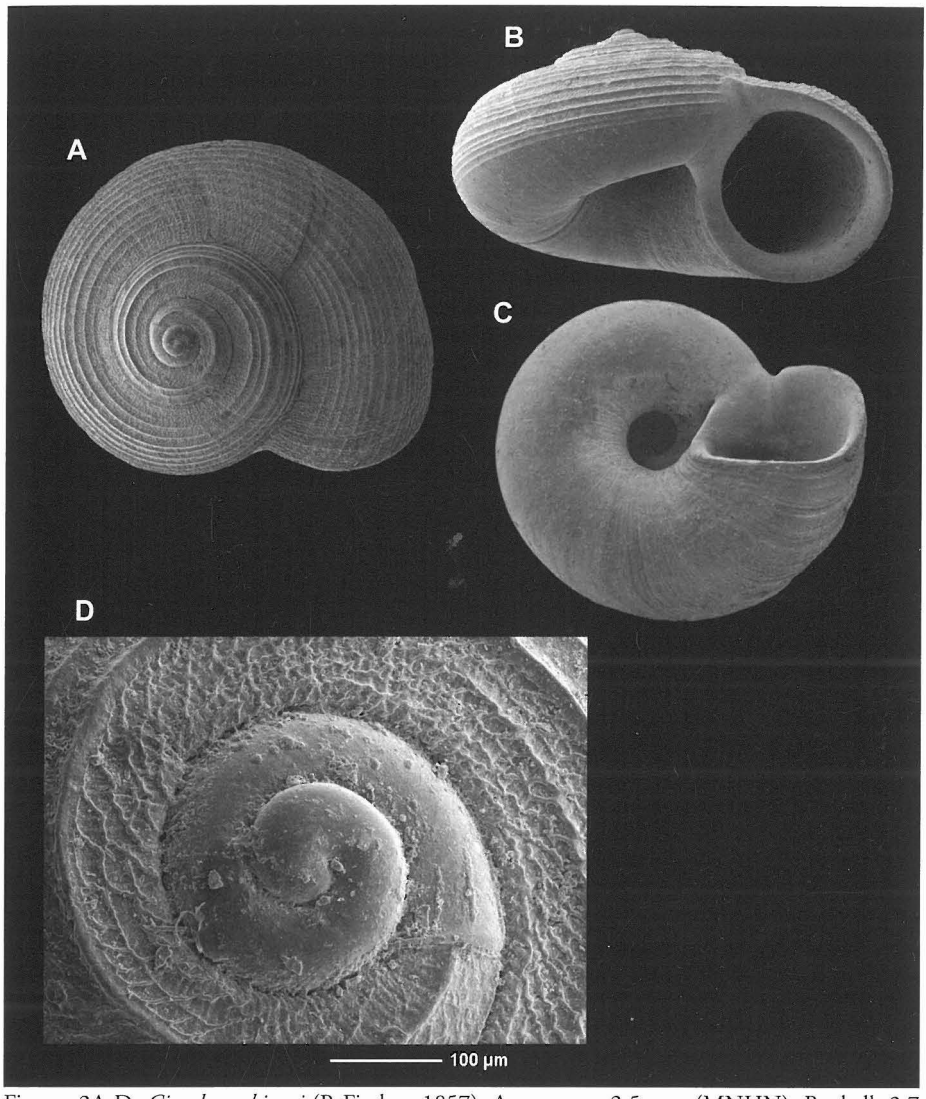
Description: Shell (Figs. 2A-C) strong, depressed, spire slightly elevated, composed of 4 ¼ whorls with spiral sculpture on its dorsal half and fine growth striae on the base. Umbilicus wide and deep. Protoconch (Fig. 2D) of almost 1 ¾ whorls, and about 302 μm in diameter, with two stages of development well separated; initially smooth, continuing with a slightly rough surface and 2-3 threads on its terminal portion. A strong varix marks the beginning of the teleoconch, which is composed of 2 ½ rounded whorls, smooth on the base except for growth lines, and 14 to 18 spiral cords on the dorsal middle on the last whorl. Spaces between cords covered by fine irregular reticulation. Aperture rounded, a little oblique. Columella slightly reflected. Under high magnification, faint spiral cordlets can be seen inside the umbilicus.

Dimensions: The neotype is 2.5 mm in diameter and 1.7 mm in height.

Animal and radula unknown.

Habitat: In Cuba it seems to be a widely distributed species, most shells were found between 10 and 20 m deep.

Distribution: The species is known from Cuba, Bahamas, the Grenadines and Tobago. It is mentioned from São Sebastião, São Paulo, Brazil (RIOS, 2008). It has been recorded from Abaco, Bahamas (REDFERN, 2001) as *Circulus sp*.



Figures 2A-D. *Circulus orbignyi* (P. Fischer, 1857). A: neotype, 2.5 mm (MNHN); B: shell, 2.7 mm, shell, Rancho Luna Beach, Cuba (CFG); C: 2.4 mm, Cayo Witties, Nicaragua (MHNS); D: protoconch.

Figuras 2A-D. Circulus orbignyi *(P. Fischer, 1857). A: neotipo, 2,5 mm (MNHN); B: concha, 2,7 mm, concha, Playa Rancho Luna, Cuba (CFG); C: 2,4 mm, Cayo Witties, Nicaragua (MHNS); D: protoconcha.*

Discussion: FISCHER (1857) in the original description of *Adeorbis orbignyi* said: "It is distinguished from congeneric species by the regularity of the ornamentation constituted by a dozen of transversal ribs placed at equal distance". MOORE (1964: 70-71) treated it as a *nomen dubium* only because the type was not found. This taxon cannot be considered as *nomen nudum* with a good description like the one available. The type, supposedly in the MNHN, is considered lost (Virginie

Héros pers. comm.). In our opinion there is no doubt that the description of this species corresponds to the shells we have from Cuba (type locality), where it is relatively common. For this reason and also because the taxon has been accepted by other taxonomists (e.g., www.malacolog.org) we have designated a neotype in order to maintain nomenclatural stability.

This species can be distinguished from *C. semisculptus* by the great number of spiral cords and the dense microsculpture between them.

Circulus liratus (A.E. Verrill, 1882) (Figures 3A-E)

Cyclostremiscus pentagonus auct. non Gabb, 1873.

Omalaxis lirata A.E. Verrill, 1882. *Transactions of the Connecticut Academy of Arts and Sciences* 5: 529. In BUSH, 1893, pl. 1, fig. 11-12]. [Type locality: USFC sta. 770, off Newport, Rhode Island, 16 m].

Type material: Holotype in USNM (406741). Not examined.

Other material examined: Florida, USA: 1 s, Atlantic Beach, Duval Co. (CHL); 4 s, 30 m, 35 mi E St. Augustine, St. Johns Co. (CHL); 2 s, 53 m, 75 mi E St. Augustine, St. Johns Co. (CHL); 4 s, 16th Ave. S, Jacksonville Beach, Duval Co. (CHL).

Description: After MOORE (1964: 74): "*Shell depressed, rather thick, whorls rounded, inner half of base smooth. Spiral sculpture of about eight to ten spiral ridges separated by grooves only slightly wider. Umbilicus wide and deep*". Protoconch projecting with nearly 2 ¾ smooth whorls, about 530 μm in maximum diameter. Teleoconch with only 1 ½ whorls, ornamented with 10 spiral cords distributed between the dorsum and the outer base. The interspaces are wider, without axial sculpture except fine growth lines. Base flat, without sculpture. Umbilicus wide, the previous whorls being visible in its interior, and delimited by a strong cord and 2-3 more on its inner wall.

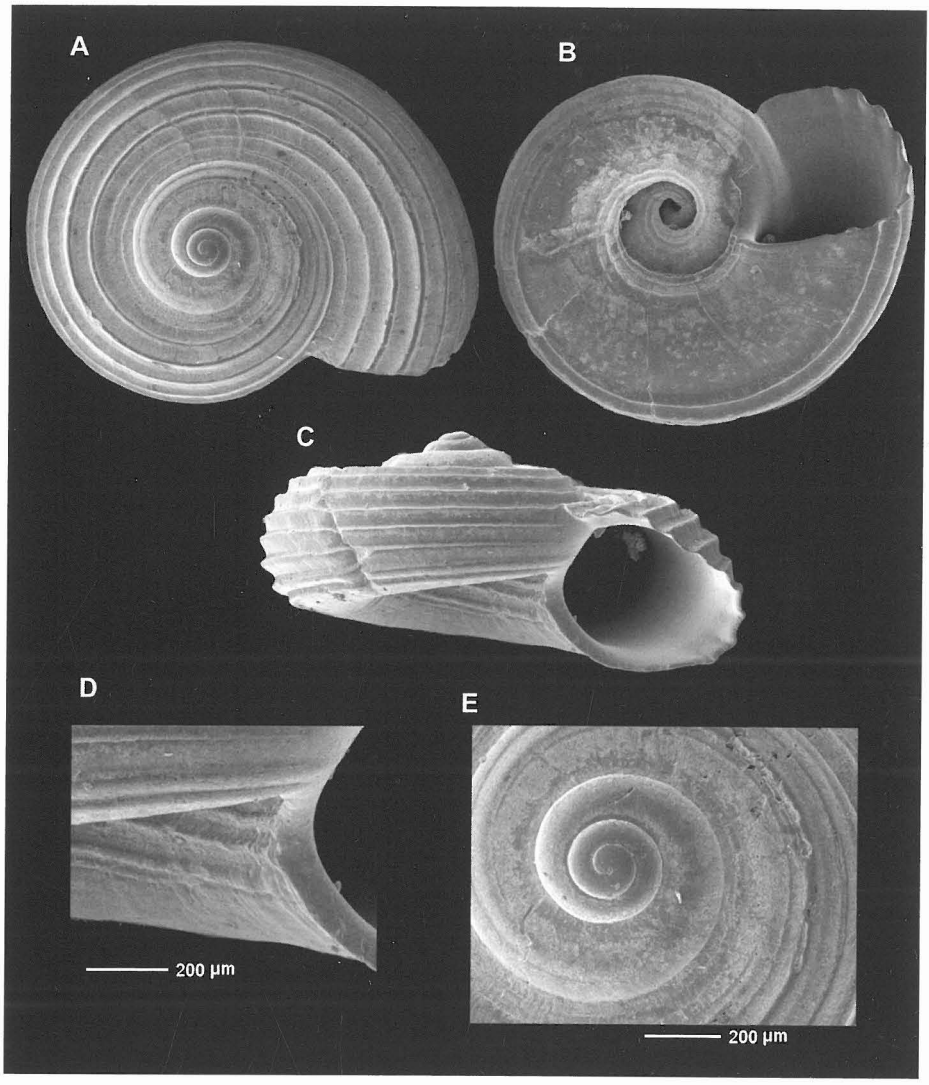
Holotype measures 2.1 mm. The figured shells are 2.3-2.7 mm in diameter and about 1.01 mm in height.

Habitat: This species seems to be found living in depths of a few meters (MOORE, 1964). The bathimetry reported in the literature is between 7 and 165 m.

Distribution: East coast of Florida to Rhode Island. Recorded from Newport, Rhode Island (VERRILL, 1882); from off Cape Hatteras, North Carolina (BUSH, 1897); from Rockaway, New York and off Lantana, Florida (MOORE, 1964); from St. Lucie Co., Florida (LYONS, 1989), from Atlantic Beach, Jacksonville Beach, Batten Island and St. Augustine, Florida (LEE, 2009).

Remarks: *C. liratus* is the only species of *Circulus* from the West Indies similar in morphological characters to *Circulus striatus* (Philippi, 1836) type species of the genus. *C. liratus* has been placed in the genera *Lydiphnis* and *Skenea*. *Circulus liratus* differs from *C. semisculptus* by its projecting protoconch while *C. semisculptus* is almost planispiral.

Solariorbis mooreana (Vanatta, 1904) is similar but it has a narrow umbilicus and lacks the thickening of the umbilical wall, which is typical of the *Solariorbis*; also this latter species lacks ornamentation in the interspaces between cords, and these cords do not extend to the base.



Figures 3A-E. *Circulus liratus* (A.E. Verrill, 1882). A-C: shells, 2.18, 2.14, 2.33 mm, Jacksonville Beach, Florida (CHL); D: detail of the umbilicus; E: protoconch.
Figuras 3A-E. Circulus liratus *(A.E. Verrill, 1882). A-C: conchas, 2,18, 2,14, 2,33 mm, Jacksonville Beach, Florida (CHL); D: detalle del ombligo; E: protoconcha.*

Circulus texanus (Moore, 1965) (Figures 4A-F)

Vitrinella texana Moore, 1965. *The Nautilus*, 78: 76-77, pl. 7 figs. 4-6. [Type locality: Mustang Island, near Port Aransas, Texas].
Vitridomus texanus (Moore, 1965), auct.

Type material: Holotype from Mustang Island, near Port Aransas, Texas, diameter, 1.72 mm, height, 0.78 mm. Deposited in the Division of Mollusks, USNM (636311). Not examined.

Other material examined: Brazil: 1 s, Itaparica (MHNS). Florida, USA: 1 s, Delray Beach, Palm Beach Co. (CHL); 1 s, Longboat Key, Sarasota Co. (CHL).

Description: Original description (MOORE, 1965): *"The shell is depressed, and has a flattened apex. The umbilicus is narrow but deep, and is almost flat sided. Sides of the shell curve out and down gently so that the periphery forms an angle with the base of the shell. The aperture is oblique.*

"The protoconch consists of 1 ¾ glassy whorls. The teleoconch consists of about 1 ¼ whorls, and is sculptured on the upper side with fine spiral grooves and on the lower side with numerous short radiating riblets. These riblets are crossed by a few weak spiral grooves, and there are several stronger spiral grooves in the umbilicus. The ventral side is flattened, and, in the holotype, bears about 36 radiating riblets. The riblets become indistinct on the last half of the whorl, and become difficult to count".

"The aperture is oblique, and is broadly ovate. The peristome is deeply notched at the upper inner angle. The parietal wall is rather thick, and is extended a little forward of the aperture. The umbilicus is narrow and almost flat sided, but there is no angle with the base of the shell. The shell itself is quite thin and fragile, and only the holotype and one immature paratype are unbroken. One paratype is actually only half of the body whorl of a broken shell".

After BIELER & MIKKELSEN (1988): *"Shell small (1.7-1.8 mm in diameter, 0.55-0.65 mm in height). With about 1 ½ teleoconch whorls; almost planispiral, sculptured dorsally and ventrally with about 18 fine spiral ribs; transparent when alive, opaque after death. Ribs slightly stronger, more widely spaced just below suture on dorsum and at periphery, where about 3 ribs form rounded keel below lateral midline. Suture impressed. Ventral surface below keel less convex. Often with 30-40 widely-spaced, low axial ribs which are primarily evident from inside of body whorl. Umbilicus wide. Outer lip very slightly reflected; some specimens with one former varix. Aperture at oblique angle to dorsoventral axis. Sutural sinus shallow. Periostracum thin, transparent, with spiral grooves more numerous than on shell surface. Protoconch smooth, 0.5 mm diameter, about 2 whorls. No sculptural demarcation separating protoconch I and protoconch II.*

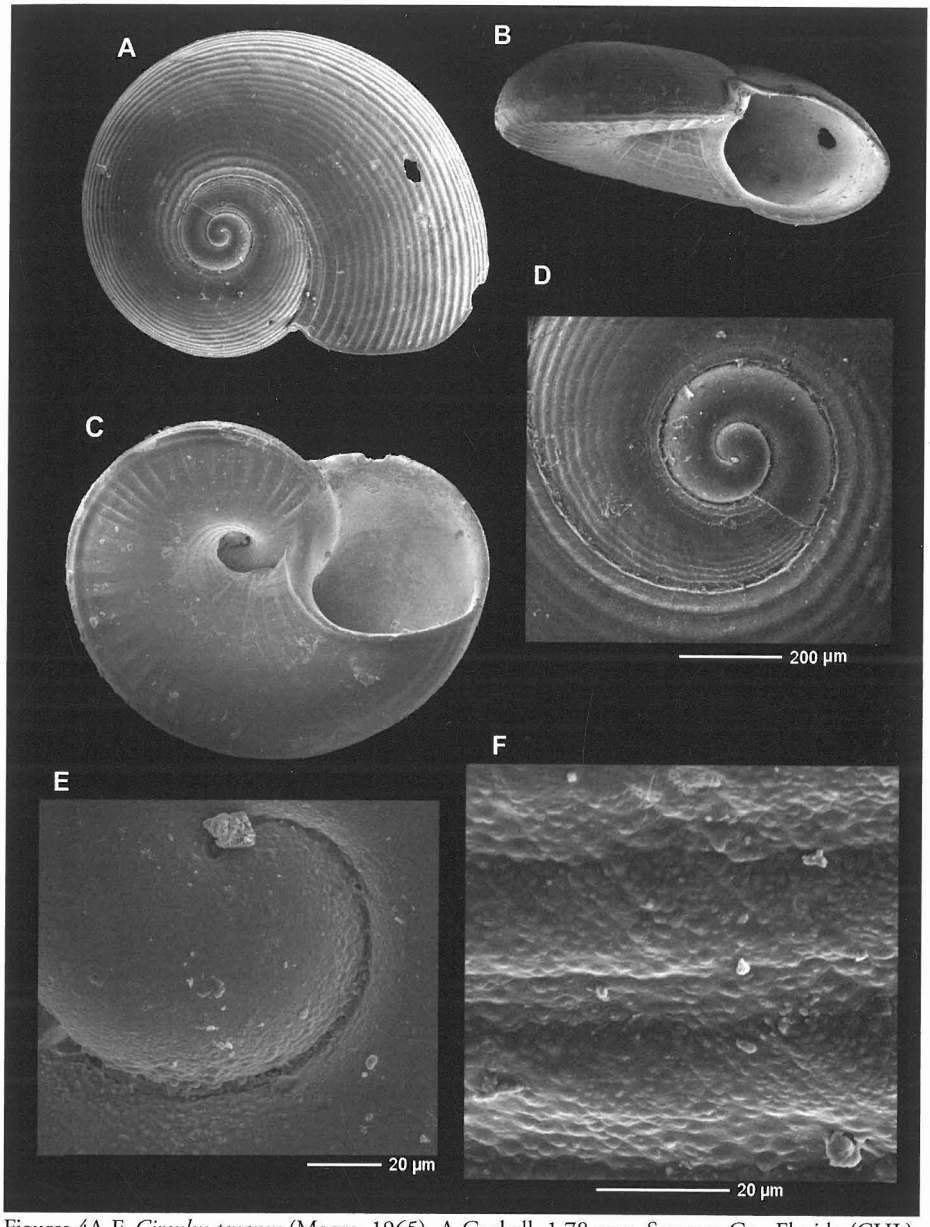
Maximum reported size: 2.1 mm".

We can add to this description the following: The protoconch (Figs. 4D-E) is about 340 μm in diameter, and it has a little more than 1 ½ whorls. Apparently it is smooth, but its nuclear portion is covered by very small tubercles of various sizes. This kind of microsculpture is also present on the dorsum of the teleoconch (Fig. 4F).

Habitat: Living specimens were taken from stomatopod burrows in shallow-water sand flats in the Indian River lagoon, St. Lucia County, eastern Florida (BIELER & MIKKELSEN, 1988). It prefers a rather narrow range of temperature and salinity, and is probably most abundant in shallow coastal waters. Its bathymetric range is between 0 and 44 m in depth, and it was found alive between 0 and 0.5 m.

Distribution: USA: Florida: East Florida; Texas. Reported from Port Aransas, Texas (MOORE, 1964); from Texas (ODÉ, 1987b); from the northwestern Gulf of Mexico (BIELER & MIKKELSEN, 1988).

Remarks: This species was described in the genus *Vitrinella* (MOORE, 1965). BIELER & MIKKELSEN



Figures 4A-F. *Circulus texanus* (Moore, 1965). A-C: shell, 1.78 mm, Sarasota Co., Florida (CHL); D: protoconch; E: detail of the protoconch; F: detail of the microsculpture of the teleoconch.
Figuras 4A-F. Circulus texanus *(Moore, 1965). A-C: concha, 1,78 mm, Sarasota Co., Florida (CHL); D: protoconcha; E: detalle de la protoconcha; F: detalle de la microescultura de la concha.*

(1988) placed it in the genus *Circulus* sensu lato because it agrees in shell shape and sculpture with the type species, *Circulus striatus* from the eastern Atlantic. It differs from all other western Atlantic Circulinae principally in having radiating riblets on the ventral side.

Subfamily TEINOSTOMATINAE Cossmann, 1917

Genus *Teinostoma* H. & A. Adams, 1853

Teinostoma H. & A. Adams, 1853. *Genera of Recent Mollusca* 1: 122.
Type species: *Teinostoma politum* H. & A. Adams, 1853 (by monotypy). *Proc. Zool. Soc. Lond.* pl. 10, figs. 1-3.

Diagnosis: Shell minute, depresed-turbiniform, thin, glassy, smooth, umbilicate. Protoconch of about 1.3 convex whorls. Teleoconch whorls convex, base and umbilical rim angulate. Multispiral operculum. Rádula: Central tooth cutting area broadly "V" shaped, serrated, 2 basal denticles, ventral process "U" shaped. Lateral tooth cutting area at inner third, broadly angulated and serrated. Inner marginal cutting area very broad, comb-like. Outer marginal cutting area short.

MOORE (1964) defines the species as: *"Shell small to minutecompact, depressed, low spired, few flattened whorls which are rounded or carinate; smooth or sculptured by fine striations, suture not impressed, umbilicus covered partly or entirely by a heavy callus pad which is extended over the parietal wall, columella concave, thick. Animal very similar to* Vitrinella *but with a longer foot".*

Remarks: According to PILSBRY (1953) the species included in the genus *Teinostoma* are known from the Upper Cretaceous to Recent, being very common in many Tertiary deposits. The genus *Teinostoma* has been subdividided by some authors into several subgenera (*Annulicallus, Pseudorotella, Idioraphe*); unfortunatly, the types of the type species of two of these subgenera are lost or in such poor condition that identification is uncertain. As the objective of this work is not supraspecific classification, we will group all the studied species in the genus *Teinostoma*.

Identification key

In order to make schematic the separation of the species in this group with so many species we present the following identification key for the genus pointing out the most important characters for each species:

1 - Shell with protoconch visible 2
- Shell with protoconch fully or partially covered by a thin coat 3

2 - Shell with rounded micropits spirally aligned 4
- Shell with spiral incised lines 5
- Shell completely smooth 6

3 - Shell with spiral cords 7
- Shell completely smooth 8

4 - Shell globose and fragile . . . . . *T. ciskae*
- Shell globose with low spire . . . . . *T. baldingeri*
- Shell with strong peripheral keel . . . . . *T. goniogyrus*
- Shell angular at the periphery . . . . . *T. lenticulare*
- Shell subangular . . . . . *T. reclusum*

5 - Shell obtusely subangular . . . . . *T. incertum*
- Shell with spiral irregular microcordlets fused between them in the first whorl . . . . . *T. anastomosis*
- Shell with spire slightly elevated and striated callus . . . . . *T. panamense*

6 - umbilicus completely covered by callus 9
- umbilicus partly covered by callus 10

7 - Shell totally covered by spiral cords . . . . . *T. semistriatum*
- Shell dorsally covered by fine spiral cordlets . . . . . *T. nesaeum*
- Shell with dorsum and umbilicus surrounded by a strong spiral carina *T. carinicallus*
- Shell with dorsum and umbilicus surrounded by a strong spiral carina and weak spiral striae . . . . . *T. lituspalmarum*

8 - Shell strongly depressed, transversely dilated . . . . . *T. obtectum*
- Shell with expanded aperture . . . . . *T. expansum*
- Shell minute, flattened above and below . . . . . *T. minusculum*
- Shell more elongated by extension (outwards from the outer lip . . . . . *T. lerema*
- Shell transversely ovate . . . . . *T. megastoma*
- Shell with periphery very rounded and strong umbilical callus . . *T. umbilicatum*

9 - broadly ovate aperture, rather strongly oblique . . . . . *T. biscaynense*
- protoconch placed below the next whorl, rounded aperture, peristome almost continuous . . . . . *T. cienfuegoensis*
- peristome externally reflected toward back . . . . . *T. helicinum*
- Shell pyriform, umbilical callus very large . . . . . *T. megacallum*
- a fine groove separates the umbilical callus from the columella . . . *T. parvicallum*

10 - a triangular callus at end of the columella . . . . . *T. solidum*
- no groove of separation between columella and callus . . . . . *T. cocolitoris*
- spire moderately elevated, callus with half moon shape . . . . . *T. lunense*
- a groove separating the umbilical callus from the columella . . . . . *T. altum*

Teinostoma ciskae Faber, 1995 (Figures 5A-C)

Teinostoma millepunctata Nowell-Usticke, 1969 non *T. millepunctatum* Pilsbry & Olsson, 1945. *A Supplementary Listing of New Shells, to be Added to the Check List of the Marine Shells of St. Croix*: 10, pl. 2, fig, 307.

Teinostoma millepunctata Nowell-Usticke, 1971. *A Supplementary Listing of New Shells, to be Added to the Check List of the Marine Shells of St. Croix, revised edition*: 6. [Type locality: Antigua, Secret Harbor, 40 ft].

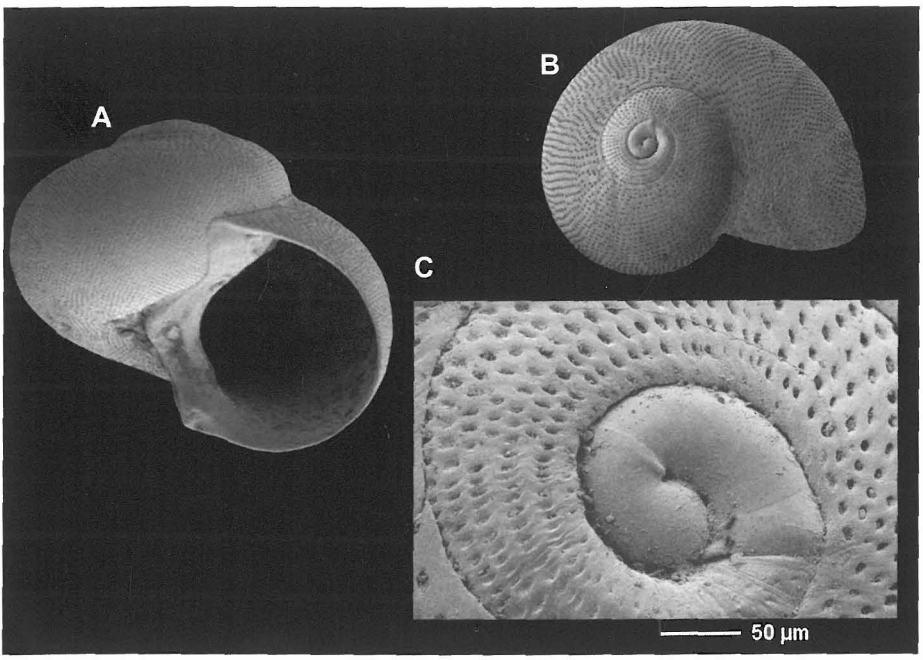
Teinostoma ciskae Faber, 1995. *De Kreukel*, 31: 62 [replacement name for *T. millepunctata* Nowell-Usticke, 1969].

Type material: Represented in NOWELL-USTICKE (1969, pl. 2, fig. 307). The lectotype of *T. millepunctata* was deposited in AMNH (n° 195413) (BOYKO & CORDEIRO, 2001). Not examined.

Other material examined: Cuba: 5 s, Bahía de Cienfuegos, 20-30 m (MHNS); 20 s, Rancho Luna Beach, 20-54 m (MHNS). Trinidad and Tobago: Tobago, 1 c, Horseshoe reef, 15 m, from shell grit (CJP). Virgin Islands: 1 s, Peter Island, 18 m, shell grit (CHL). Bahamas: 1 s, Olympus Reef, NNW West End, Grand Bahama Island, 36 m, from coralline algal fragments (CHL). Florida, USA: 2 s, APAC Pit, Sarasota Co. Plio-Pleistocene (CHL).

Description: Shell (Figs. 5A-B) globose, fragile, whitish and with its surface totally covered by punctiform incisions aligned spirally.

Protoconch (Fig. 5C) of about one whorl, with a finely granular surface at its beginning and smooth in the subsequent part, about 166 μm in diameter, and with two strong varices separating the two stages. Teleoconch of about 2 ¼ globose whorls, totally covered by the microsculpture mentioned above (Fig. 5C). Aperture rounded, external lip fine, inner lip and columella thickened.



Figures 5A-C. *Teinostoma ciskae* Faber, 1995. A-B: shells, 1.8, 1.2 mm, Rancho Luna Beach, Cienfuegos, Cuba; C: protoconch.
Figuras 5A-C. Teinostoma ciskae *Faber, 1995. A-B: conchas, 1,8, 1,2 mm, Playa Rancho Luna, Cienfuegos, Cuba; C: protoconcha.*

Umbilicus totally closed by an extension from the columella.

Dimensions: Holotype 1.59 mm in diameter. We have shells with about 2.5 mm in maximum dimension. Maximum reported size: 2.6 mm

Habitat: The species is distributed in the deep infralittoral, found between 15 and 54 m deep, on coralline bottoms.

Distribution: Known from Antigua, its type locality (NOWELL-USTICKE, 1969 and 1971; FABER, 1995); from Aruba (DE JONG & COOMANS, 1988); from Abaco, Bahamas (REDFERN, 2001) and from Virgin Islands, Bahamas, Tobago, and Cienfuegos, Cuba, in the present work.

Remarks: NOWELL-USTICKE (1969) described *Teinostoma millepunctata*. This name was preoccupied by *T. millepunctatum* Pilsbry & Olsson, 1945, from Ecuador, for this reason FABER (1995) proposed the replacement name *Teinostoma ciskae*, for Nowell-Usticke's species. *T. ciskae* may be distinguished from the other known species of *Teinostoma* by the more globose and fragile shell, by its peculiar protoconch, and mainly by its typical microsculpture of punctiform incisions. No similar species exists in the Caribbean region.

Teinostoma goniogyrus Pilsbry & McGinty, 1945 (Figures 6A-G)

Teinostoma goniogyrus Pilsbry & McGinty, 1945a. *The Nautilus*, 59: 3, pl. 1, figs. 8. [Type locality: Off Destin, west Florida].
Rotella carinata H. C. Lea, 1846. *Trans. Amer. Philos. Soc.*, 9: 263, pl. 36, fig. 78. (non d'Orbigny, 1842) [Type locality: Petersburg, Virginia, Neogene fossil].

Type material: Represented in PILSBRY & MCGINTY (1945a). Not examined.
Other material examined: Cuba: 1 s, Guajimico, 15 m (MHNS); 1 s, Cienfuegos Bay, stn. 12a, 22°07'N – 80°26'W, 4 m (MHNS); 12 s, Cienfuegos Bay, 10 m (CFG); 5 s, Rancho Luna Beach, 10-54 m (CFG). Florida, USA: 1 s, 65 mi. E St. Augustine, St. Johns Co., Fl., 53 m, dredged (CHL); 3 s, 32 mi. E St. Augustine, St. Johns Co., Fl., 30 m, dredged (CHL); 1 s, 23 mi. ENE Mayport, Duval Co., Fl., 26 m. (CHL); 1 s, Caloosahatchee Formation, La Belle, Hendry Co., Plio-Pleistocene (CHL).

Description: Shell (Figs. 6A-D) subconical, depressed, solid, whitish, and with a strong keel at the periphery. Protoconch (Figs. 6E-G) of about 2 whorls and about 360 μm in diameter, with a smooth surface at its beginning and fine lateral granulation and 5-6 spiral lines of small perforations on the subsequent part, varix scarcelly marked. Teleoconch of about 1 ¼ whorl, rapidly expanding, dorsally convex and ventrally concave in the umbilical area; surface totally covered by very fine clearly separated perforations, spirally aligned (Figs. 6G-H) and with a prominent cord-like keel at the periphery. A fine callus completely covers the umbilicus; a fine groove runs between the columella and the callus. Aperture ovoid, a little depressed, with the upper part of the external lip sharp and advanced.

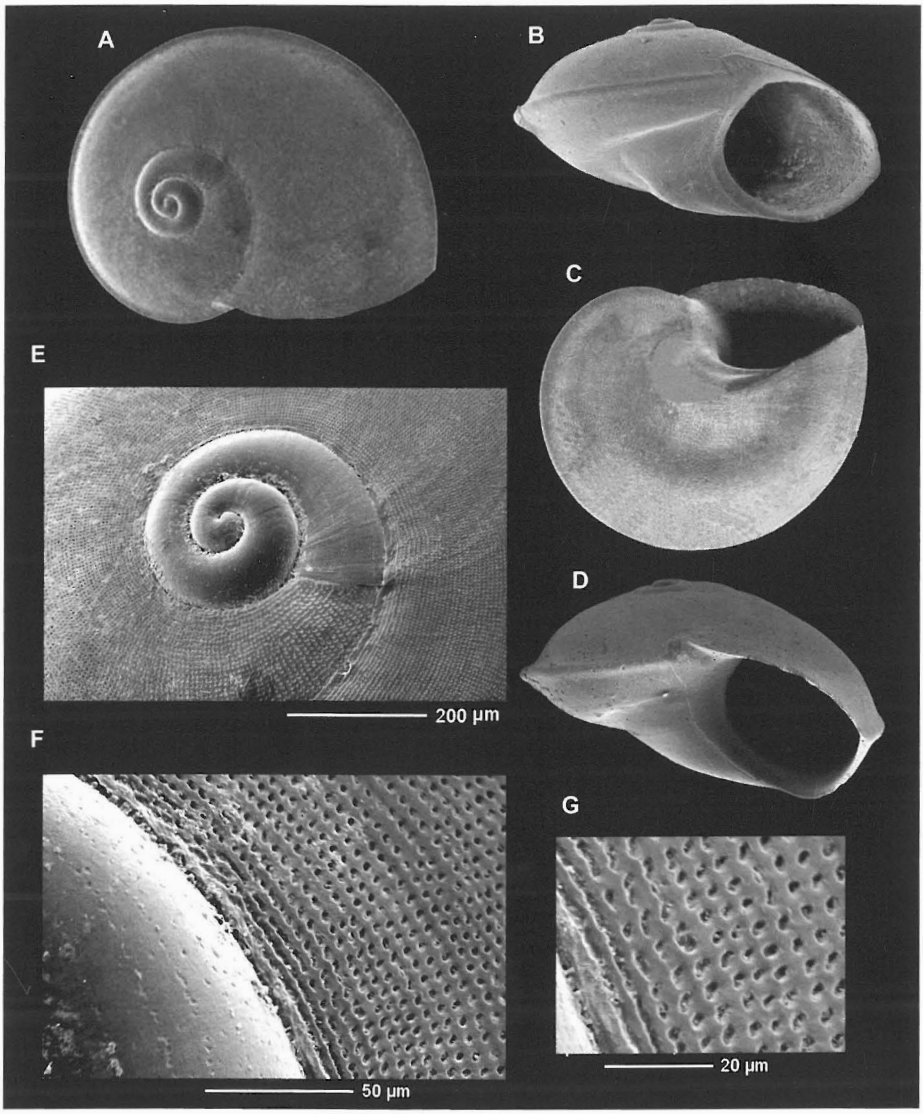
Dimensions: Holotype measures 1.95 mm in diameter. We have shells about 1.3 mm in maximum diameter.

Habitat: Marl Bottom, in 18-20 fms (32-56 m) (Pilsbry & McGinty, 1945a). It has been found alive between 42 and 59 m, but shells have been found in sediments collected between 10 and 100 m.

Distribution: It has been recorded from off Destin, west Florida (PILSBRY & MCGINTY, 1945a); from Bocas island, Panama (OLSSON & MCGINTY, 1958); from off northwest Florida, southern Haiti and Panama (MOORE, 1964); from northwest Gulf of Mexico (ODÉ, 1987); from Florida to Caribbean Panama (LYONS, 1989; LEE, 2009); from Colombia (DÍAZ MERLANO & PUYANA HEGEDUS, 1994); also from Cuba.

Remarks: PILSBRY & MCGINTY (1945a) mention that *Teinostoma goniogyrus* resembles *Rotella carinata* (d'Orbigny) from St. Thomas in shape, but instead of the small umbilical callus of that species, has a remarkable, extremely thick callus, exceeding that of any other *Teinostoma* except *T. pilsbryi*. Under high power some faint traces of close spiral striation can be seen in a few places on the unique type. MOORE (1964) commented that this species is also similar to *T. incertum* in the spiral punctiform lines and in the shape of the umbilical callus. *T. incertum* is more depressed and has a strong peripheral keel. The stratigraphic distribution of this species is from the Upper Miocene to Recent. There is a considerable variation of size between the fossil shells from the Miocene and Plio-Pleistocene and the recent ones.

PILSBRY & MCGINTY (1945a) described *T. goniogyrus* on the basis of a single shell, citing the wider umbilical callus as the specific difference from *R. carinata*. PILSBRY (1953) figured fossil shells of *T. goniogyrus* from Smithfield, Virginia and St. Petersburg, Plio-Pleistocene of southern Florida and kept the size of the umbilical callus as the only difference between species. We have examined shells from Florida and Cuba and found very little difference between them. We have also examined shells from the Pliocene, Caloosahatchee Formation, from La Belle, Florida, and we have not observed important differences in the size of the umbilical callus. K.J. BUSH (1897) identified two specimens from station 2278, off Cape Hatteras, in 16 fathoms (29 m), as the *R. carinata* of d'Orbigny.



Figures 6A-G. *Teinostoma goniogyrus* Pilsbry & McGinty, 1945. A-D: shells, 1.5, 1.5, 1.4, 1.5 mm, Cienfuegos Bay, Cuba; E: protoconch; F-G: microsculpture.
Figuras 6A-G. Teinostoma goniogyrus *Pilsbry & McGinty, 1945. A-D: conchas, 1,5, 1,5, 1,4, 1,5 mm, Bahía de Cienfuegos, Cuba; E: protoconcha; F-G: microescultura.*

In our opinion, *R. carinata* and *T. goniogyrus* may be the same species, and the different size of the umbilical callus is not enough for a specific separation. The problem is that the shells identified by K.J. Bush as *R. carinata* in USNM were not found. So, lacking comparative material, we keep both species-level taxa waiting until more material from the type locality is obtained in the future in order to decide if there is any specific difference.

Teinostoma lenticulare (H.C. Lea, 1846) (Figures 7A-K)

Rotella lenticularis H.C. Lea, 1846. *Trans. Amer. Philos. Soc.*, 9: 264, pl. 36, fig. 79. [Type locality: Petersburg, Virginia, Neogene fossil].

Type material: Type material in ANSP. Not examined.
Other material examined: Cuba: 12 s, Cienfuegos Bay, 22°07'N 80°27'W, 9 m (MHNS); 5 s, Cienfuegos Bay, sta. 12a, 22°07'N 80°26'W, 4 m; 19 s, Cienfuegos Bay, 10 m (MHNS); 1 s, Cienfuegos Bay, 20-30 m (MHNS); 15 c, Cienfuegos Bay, 10 m; 6 c, Cienfuegos Bay, 12 m (MHNS).

Description: This is the short original description: *"Shell lenticular, depressed, thin, smooth, polished, spire very short, sub-ovate; obtuse; sutures small, linear; whorls four, convex; last whorl angulate; base smooth; callus small; mouth sub-rotund; columella broad, curved"*. At same time H.C. Lea comments: *"The angle of the last whorl is very variable. It sometimes amounts almost to a carina. The mouth is nearly round. The callus is slightly depressed below the surrounding surface. This shell is, in part, allied to both the preceding species* [Rotella carinata], *but differs in the number of whorls, shape of the columella and spire, and the angle on the last whorl. They also differ much in thickness"*.

The shell (Figs. 7A-H) has the shape of a small trochoid, relatively solid, with a shagreen appearance due to minute punctae. Protoconch (Figs. 7I-J) of about 1 ¾ whorls and with about 310 μm in diameter, ornamented with very small and dispersed tubercles and 4-5 very fine spiral threads. Teleoconch of about 1 ½ whorls, rapidly expanding; the whorls are totally covered by very small punctiform pits, clearly separated from each other, spirally aligned and very dense. The middle of the last whorl is angular, and this angle is almost at the periphery, fading progressively and almost disappearing near the aperture. In adult specimens, from the last ½ whorl a thickening of the inner lip is present extending and projecting over the umbilicus nearly totally covering it and forming the characteristic callus of this species (Figs. 7 E-F). This callus can be observed in several degrees of development (Fig. 7K). The different forms of umbilical occlusion are related to the age and development of the individual.

Dimensions: Holotype 1.6 mm in diameter by 0.95 mm in height. Our largest shells measure 1.3 mm in diameter and 0.80 mm in height.

Habitat: The shells studied were collected in sediments between 4 and 30 m in depth, on a coralline sand bottom.

Distribution: Only known as recent species from Cienfuegos, Cuba.

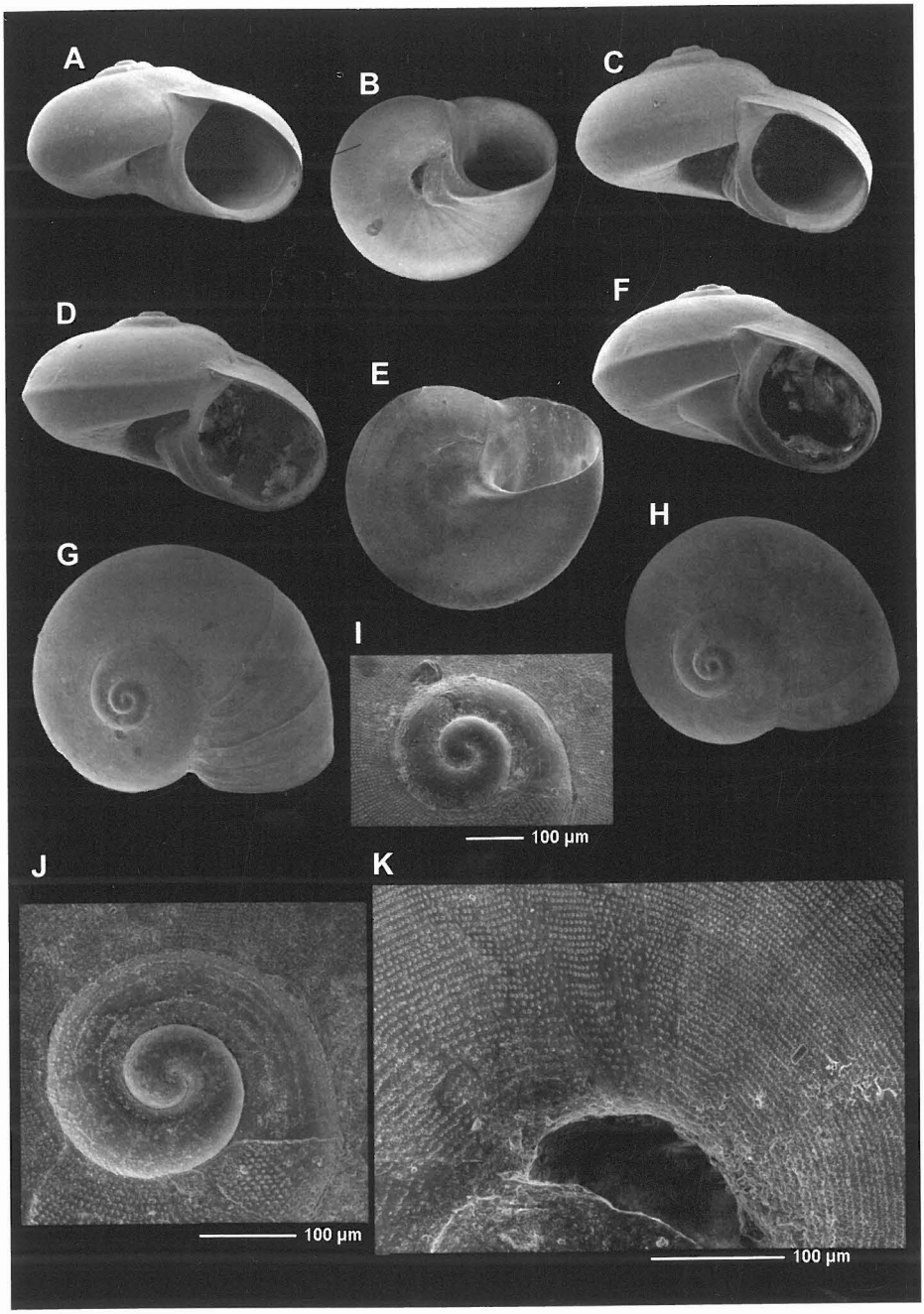
Remarks: *T. lenticulare* is a fossil species described from the Miocene of Smithfield, Virginia, Yorktown Formation.

PILSBRY (1953: pl. 50, figs. 3-3d), figured shells of *T. lenticulare* with sizes between 1.65 mm and 1.80 mm, and compared them to the type of Lea, with the intention of making a comparison with shells of *T. goniogyrus*. He did not mention any similarity to *T. incertum*, commenting that it is less depressed than *T. goniogyrus*, which in the first half of the last whorl is clearly angled, rather than keeled, and the angulation becomes obscure near the labrum. The columella is not clearly marked towards the external part from the umbilical callus.

MOORE (1964) also did not mention *T. lenticulare*. Further, he made no reference to *T. lenticulare* in his discussion of *T. incertum* only making a comparison to *T. parvicallum*.

In this species as well as others the callus form is very variable, and this is due to different developmental stages of the shell.

Teinostoma lenticulare as well as *T. goniogyrus, T. reclususm, T. ciskae* and *T. baldingeri* spec. nov. (see below), have a microsculpture formed by very small punctiform pits, clearly separated from each other, and spirally aligned. In contrast *T. incertum*, has punctiform pits at the beginning of the teleoconch, but they immediatly become incised spiral lines or sulci.



Figures 7A-K. *Teinostoma lenticulare* (H.C. Lea, 1846). A-H: shells in several positions, 1.1-1.3 mm, all from Cienfuegos Bay. I: protoconch; J: detail of the protoconch; K: detail of the umbilicus and microsculpture.

Figuras 7A-K. Teinostoma lenticulare *(H.C. Lea, 1846). A-H: conchas en diferentes posiciones, 1,1-1,3 mm, todas de la Bahía de Cienfuegos. I: protoconcha; J: detalle de la protoconcha; K: detalle del ombligo y microescultura.*

Teinostoma reclusum (Dall, 1889) (Figures 8A-G, 9A-F)

Ethalia reclusa Dall, 1889. *Bull. Mus. Comp. Zoology*, 18: 361, pl. 28, figs. 7. [Type locality: Yucatan Strait, 640 fms (1157 m); North Carolina, 12-63 fms (22-113 m)].

Type material: Syntype in MCZ (007552), from off Yucatan Strait, in 640 fms (1157 m) (Figs. 8A-G). This shell is here designated as the lectotype.
Other material examined: Florida, USA: 11 s, 32 mi. E St. Augustine, St. Johns Co., dredged 30 m (CHL); 1 s, 65 mi. E St. Augustine, St. Johns Co., dredged 53 m (CHL); 4 s, 29 mi. E Mayport, Duval Co., 23 m (CHL).

Description: This is the original description in DALL (1889a): "*Shell small, when fresh, vitreous transparent white, of three visible whorls, the last much the largest, smooth and polished above, or with only faint incremental lines below; periphery rounded, spire and base moderately rounded; margin of last whorl appressed at the suture so that the thin edge runs up over the preceding whorl and the real suture is almost invisible in fresh specimens; the outline of the preceding whorl being visible through the shell, the appearance of a suture is presented much nearer the periphery than the suture really is. Aperture nearly circular, oblique; the columella thick, appressed; umbilical callus sparse, not polished, in adolescent specimens not quite complete*".

We add: The shell (Figs. 8A-D, 9A-C) has 3 ¾ whorls, 2 corresponding to the protoconch and 1 ¾ to the teleoconch. The protoconch (Fig. 8F, 9D) is relatively large, about 260 μm in diameter, apparently smooth and two phases can be observed separated by a varix. The teleoconch is totally covered by rounded micropits clearly separated from each other, spirally aligned (Fig. 8G, 9E-F). The periphery of the last whorl is slightly angled near the base. Aperture quadrangular and peristome thick. Parietal callus wide. Columella and external lip wide and reflected outward. Base slightly convex, with a wide callus covering all the umbilicus.

Dimensions: The figured lectotype measures 1.7 mm in maximum diameter and 0.9 mm in height (ratio H/D= 0.52).

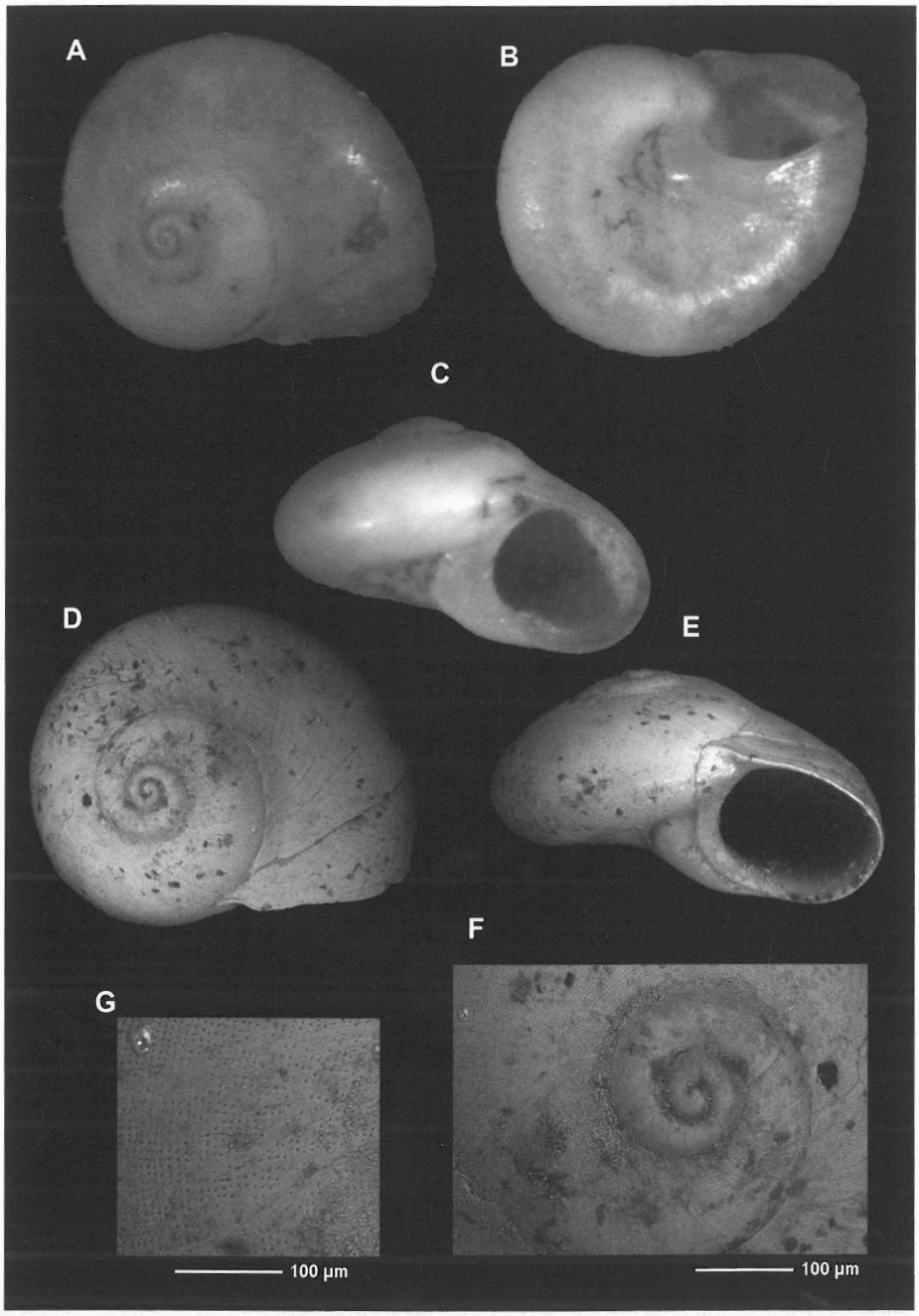
Habitat: This species is considered as being from deep water, having been described from shells collected in the Yucatan Strait in 1152 m depth (640 fathoms). In North Carolina (DALL, 1889) it was collected between 12 and 63 fms (22-113 m), on sandy and gravelly bottom in the warmer area. ODÉ (1987) recorded it at 22 m from North Carolina. LEE (2009) recorded it at 65 miles east of St. Augustine, St. Johns Co., Florida, dredged at 53 m.

Distribution: USA: North Carolina (JOHNSON, 1934; ODÉ, 1987a); Florida (LEE, 2009); Gulf of Mexico, 640 fms 1057 m; Yucatan Strait, Gulf of Mexico, 640 fms (1057 m) (DALL, 1889a).

Remarks: DALL (1889) reported the following: "This species is nearest to *Ethalia diaphana* d'Orbigny, so far as the base is concerned, but resembles *E. anomala* d'Orbigny in its upper surface, and was inadvertently referred to that species in my Preliminary Report (Bull., IX, p. 52). It has, however, a more elevated shell and a proportionately larger last whorl, while *E. anomala* has no basal callus over the umbilicus".

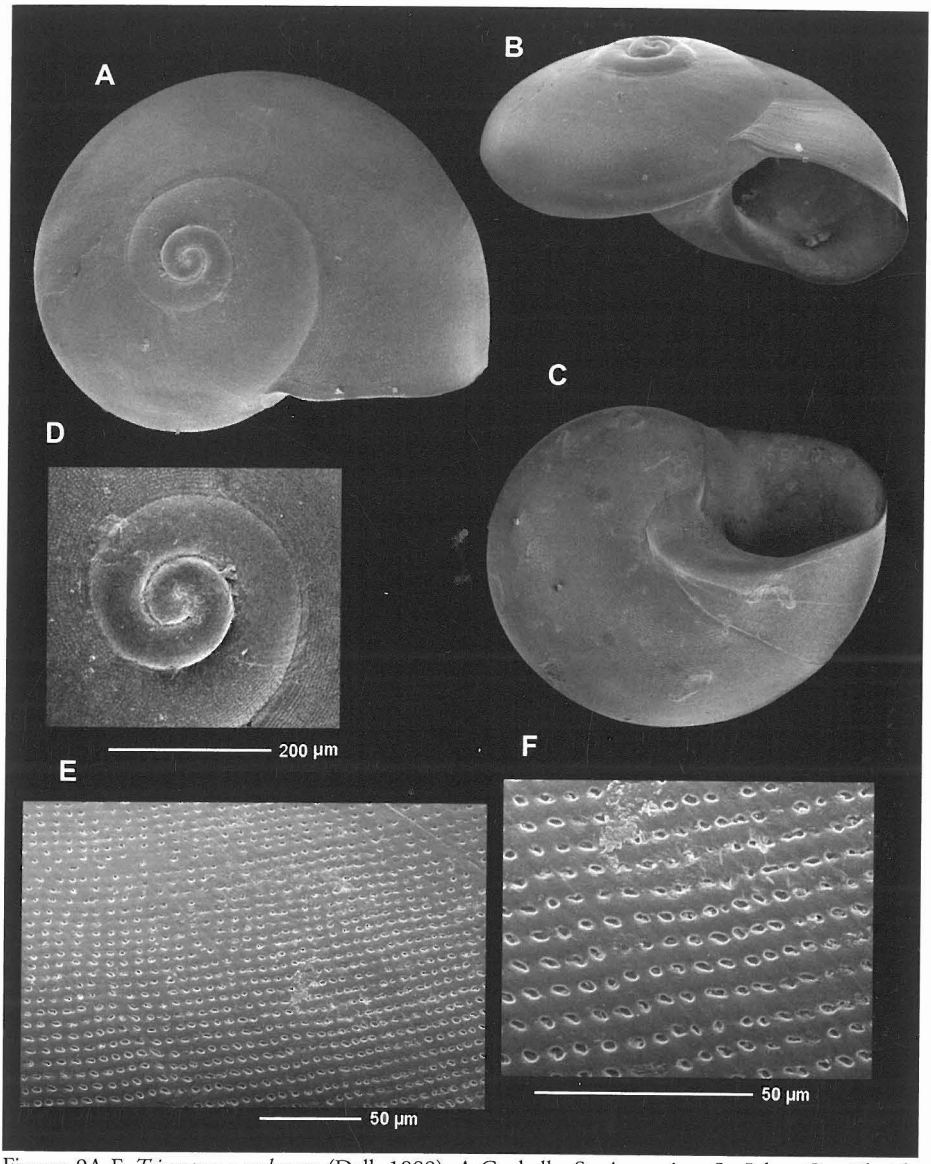
The figure in PILSBRY (1953, pl. 56, fig. 5) of the holotype of *T. subconicum* (H.C. Lea) is very similar to that of the holotype of *Ethalia reclusa* Dall, differing in the size of the callus, which does not totally cover the umbilicus and also because it lacks any microsculpture on the shell.

One of the distinguishing characters of *T. reclusum* are the micropits aligned spirally, which completely cover the shell. This character was not mentioned by DALL (1889) in the original description but was mentioned by LEE (2009, fig. 328) despite the companion shell figure appearing a little different from the lectotype.



Figures 8A-G. *Teinostoma reclusum* (Dall, 1889), lectotype from Yucatan Strait, 1.7 x 0.9 mm (MCZ 007552). A-C: optical photographs; D-E: SEM micrographs; F: protoconch; G: detail of the microsculpture.

Figuras 8A-G. Teinostoma reclusum *(Dall, 1889), lectotipo del Estrecho de Yucatán, 1,7 x 0,9 mm (MCZ 007552). A-C: fotografías ópticas; D-E: microfotografías MEB; F: protoconcha; G: detalle de la microescultura.*



Figures 9A-F. *Teinostoma reclusum* (Dall, 1889). A-C: shells, St. Augustine, St. Johns Co., Florida (CHL); D: protoconch; E-F: microsculpture.
Figuras 9A-F. Teinostoma reclusum *(Dall, 1889). A-C: conchas, St. Augustine, St. Johns Co., Florida (CHL); D: protoconcha; E-F: microescultura.*

T. reclusum could be grouped with *T. ciskae-T. goniogyrus-T. lenticulare*, all of which have their surface covered by pits.

T. ciskae is more globose and has fewer, larger micropits.

From *T. goniogyrus* and *T. lenticulare* it differs in having a smooth protoconch, the lack of spiral lines of micropits and the peripheral keel.

LEE (2009: 69; no. 328) figured this species (SEM).

Teinostoma baldingeri spec. nov. (Figures 10A-I)

Type material: Holotype (Figs. 10A-G) in MCZ (243769).
Type locality: At 3-4 miles S of Fort de France, St. Louis, Martinique, in 25-29 m.
Etymology: The specific name honors Adam J. Baldinger, Molluscs Collections Manager at the MCZ for his help in this paper.

Description: Shell (Figs. 10A-C) of very small size, whitish in color, almost transparent, shining, with a low spire, rounded periphery and globose appearance. The minute protoconch (Fig. 10I) has about 1 whorl, is apparently smooth, and measures 180 μm in diameter. The teleoconch has about 2 whorls, the suture is distinct, the periphery rounded, and is totally covered by micropits spirally aligned. The last whorl covers approximately 2/3 of the penultimate. Aperture oblique, subcircular; columella arched. Umbilical area concave, umbilicus completely covered by a thick callus that extends from the columella and which is characteristic of the species.

Dimensions: Holotype is 1.0 mm in maximum diameter.

Habitat: Dredged in 25-29 m.

Distribution: Only known from St. Louis, Martinique, the type locality.

Remarks: Despite its small size, we believe that the shell studied corresponds to an adult, if we consider the formation of the outer lip and columella, as well as the development of the umbilical callus.

Teinostoma baldingeri spec. nov. could be confused with other species of the genus *Teinostoma* such as *T. ciskae*, *T. goniogyrus*, *T. lenticulare* , *T. anastomosis* and *T. reclusum*, which have the same ornamentation, formed by micropits spirally aligned.

T. ciskae is more globose and its micropits are larger.

T. goniogyrus has a peripheral keel.

T. lenticulare has a peripheral keel and a protoconch with sculpture.

T. reclusum, is more depressed (ratio H/D= 0.52), has a different umbilical callus, and the spiral microsculpture is formed by aligned micropits.

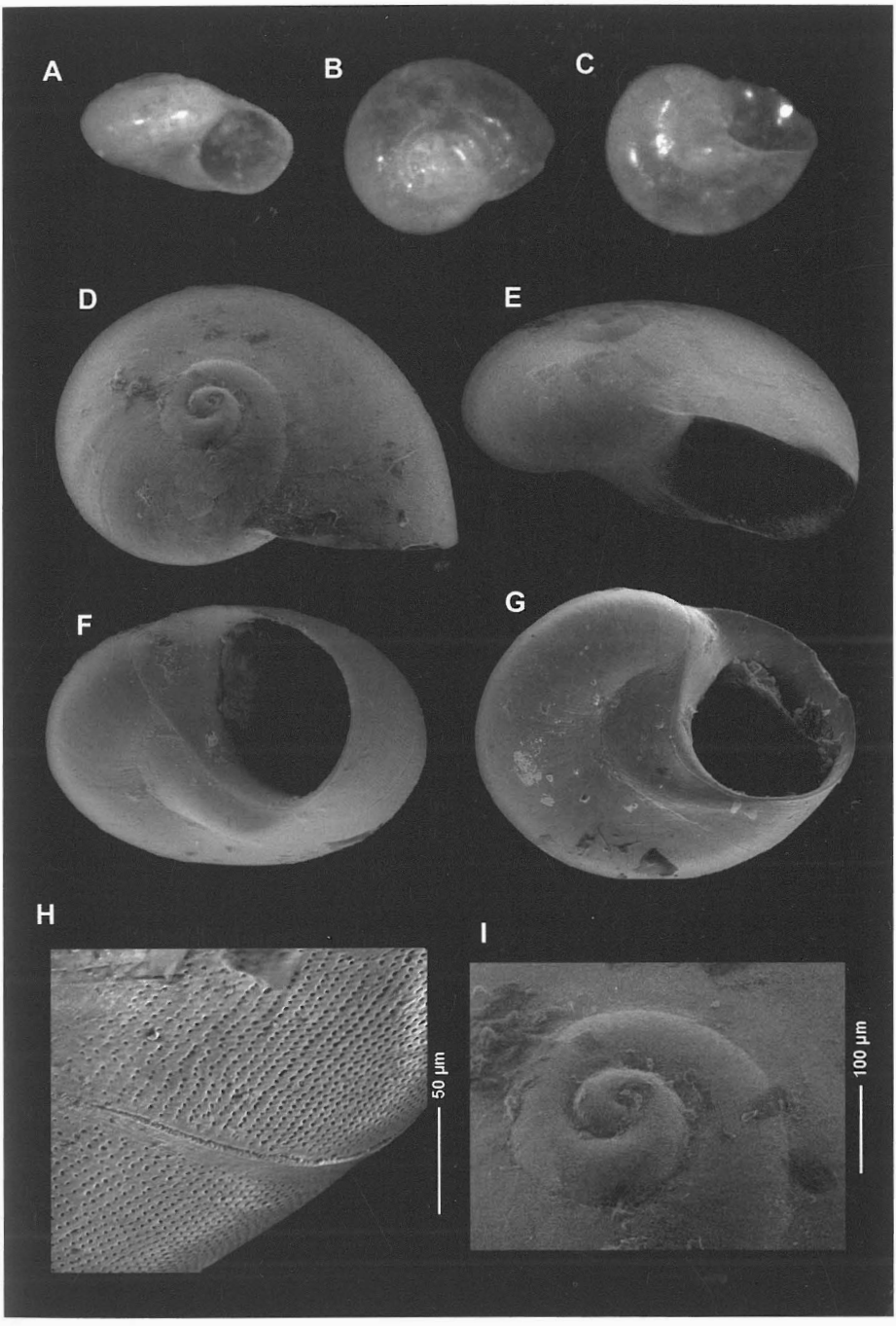
T. anastomosis spec. nov. (see below) has its first whorl totally covered by spiral irregular interdigitating microcordlets.

Teinostoma incertum Pilsbry & McGinty, 1945 (Figures 11A-E)

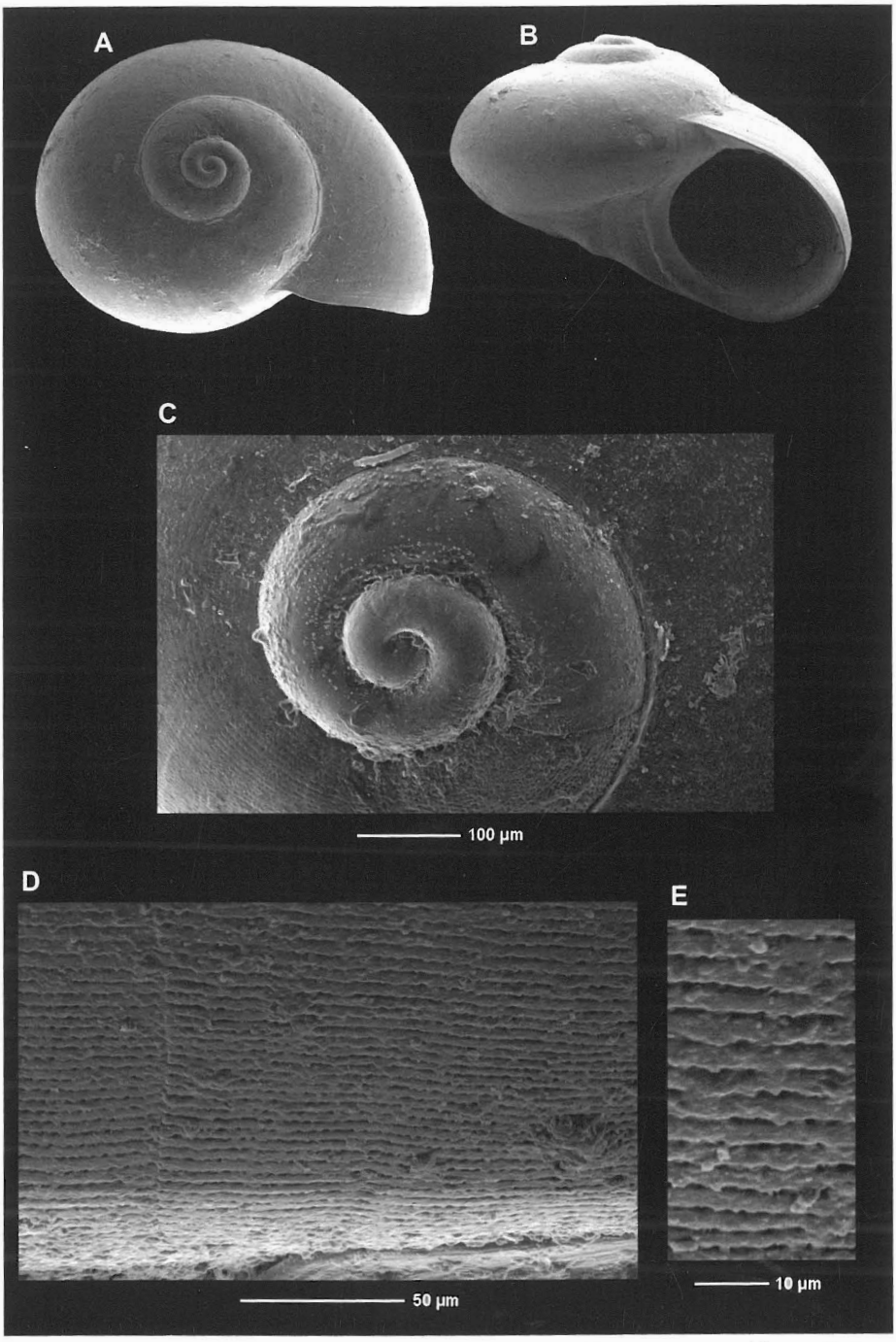
Teinostoma (Idioraphe) incertum Pilsbry & McGinty, 1945a. *The Nautilus*, 59: 7, pl. 1, fig. 7. [Type locality: Off Destin, northwest Florida].

Type material: Holotype of *T. incertum* in ANSP (181118). Not examined.
Other material examined: Florida, USA: 2 s, 1 m, Shoals reef, Shoals, Key West, Monroe Co. (CHL); 1 sp and 7 s, 32 mi E. St. Augustine, St. Johns Co., 30 m. dredged (CHL); 3 s, 23 mi ENE Mayport, Duval Co., 28 m (CHL); 2 s, 29 mi. ESE Mayport, Duval Co., 29 m, sand shell bottom (CHL).

Description: This is the original description: "*The shell is depressed but with a low-conic spire with distinct suture, a bluntly subangular periphery, microscopic spiral striation and very little umbilical callus. Whorls 3, convex, with impressed linear suture, the periphery of last whorl very obtusely subangular. The base is moderately convex, concave around the center. The oblique, circular aperture is somewhat angular above. Peristome blunt but rather thin outwardly; the columella very thick, passing into a moderate parietal callus. Behind the columellar thickening an umbilical callus closes the umbilicus, its edge ill-defined except towards the front of the shell, where it terminates in a rather deep*



Figures 10A-I. *Teinostoma baldingeri* spec. nov. A-C: holotype, 1 mm, optical photographs (MCZ 243769); D-G: holotype, SEM micrographs; H: microsculpture; I: protoconch.
Figuras 10A-I. Teinostoma baldingeri *spec. nov. A-C: holotipo, 1 mm, fotografías ópticas (MCZ 243769); D-G: holotipo, microfotografías MEB; H: microescultura; I: protoconcha.*



Figures 11A-E. *Teinostoma incertum* Pilsbry & McGinty, 1945. A-B: shell, 1.44 mm, Pelican Shoals, Florida (CHL); C: protoconch; D-E: microscupture.
Figuras 11A-E. Teinostoma incertum *Pilsbry & McGinty, 1945. A-B: concha, 1,44 mm, Pelican Shoals, Florida (CHL); C: protoconcha; D-E: microescultura.*

crease. Diameter 1.6 mm, height 0.95 mm".

There is a better and more complete description for *T. incertum* in MOORE (1964: 88-89).

The shell (Figs. 11A-B) is small, trochoid, relatively solid, with a shagreen appearance due to minute punctae. Protoconch (Fig. 11C) of about 2 whorls and about 380 μm in diameter, ornamented with randomly distributed tubercles and a line of tubercles close to the suture, the varix at the transition to the teleoconch is not thickened. Teleoconch of about 1 ½ whorls, increasing rapidly; whorls totally covered by pits in spiral lines connected by shallow grooves which transform them into incised lines. Periphery subangular, not angulated or keeled. Umbilicus totaly covered by numerous layers of callus originating behind the columella.

Dimensions: Holotype 1.6 mm in diameter by 0.95 mm in height. Our largest shells measure 1.44 mm in diameter.

Habitat: Marl bottom, in 32-36 m (PILSBRY & MCGINTY, 1945a).

Depth: 11 to 55 m. The shells studied were collected in sediments obtained at 1 m near the base of the reef. MOORE (1964) considered it as "a shallow shelf species along the Florida coasts".

Distribution: Known from the USA: East Florida, West Florida, Texas (PILSBRY & MCGINTY, 1945a; MOORE, 1964; LYONS, 1989; LEE, 2009); Florida and the east of Brazil (RIOS, 1994).

Remarks: PILSBRY & MCGINTY (1945a) mention, based on the incomplete callus and the final suture, that the name *"incertum"* does not refer to the validity of the species but to its systematic placement. They also comment that the minute spiral striation is too small to be shown in the figure of the holotype, suggesting that it is not present in beached shells.

It is curious to see that PILSBRY (1953, in OLSSON *ET AL.*, 1953) figured shells of *T. lenticulare* in comparison with *T. goniogyrus* but did not mention the existence of *T. incertum*, a species described by himself (PILSBRY & MCGINTY, 1945a: 7) which has a significant similarity in shell shape. MOORE (1964) also did not mention *T. lenticulare*. Further, he considers *T. incertum* close to *T. parvicallum*, from which it is differentiated by the spiral sculpture and the deeper suture. The umbilical callus, which is projected onto the lower part of the peristome, can also help in the identification.

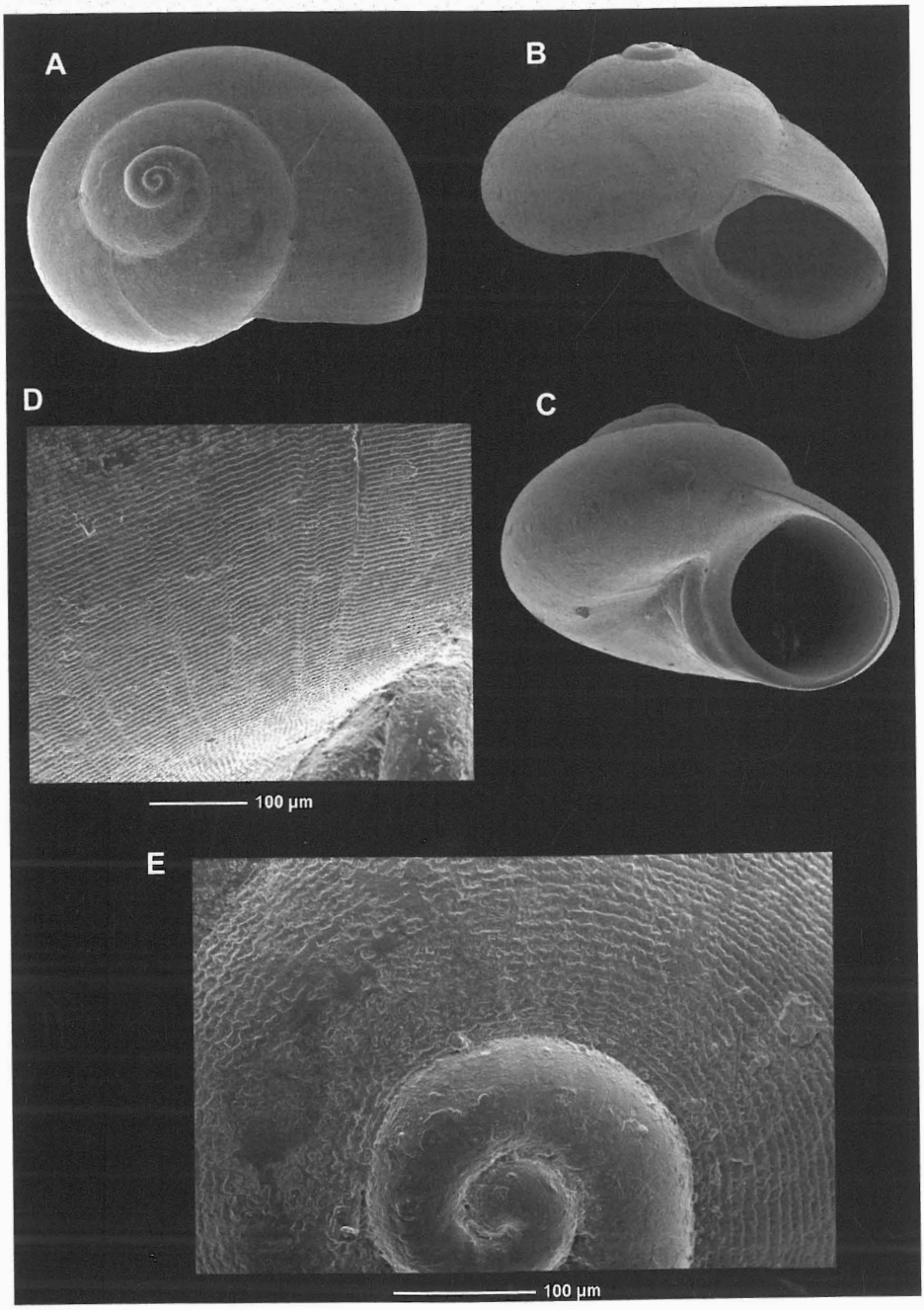
We think that the characteristic callus of *T. incertum* is simply due to the consideration of less than fully-developed specimens.

T. incertum is a species characterized by the microsculpture of the teleoconch, beginning with connected, vs. isolated, pits which promptly transform themselves into spiral lines completely covering the shell. *T. ciskae, T. goniogyrus, T. lenticulare, T. reclususm,* and *T. baldingeri* are different because the microculpture is formed by discrete punctiform pits spirally aligned but distinctly isolated from their neighbors.

LEE (2009: 68; no. 324) provided a SEM of a specimen missing some of its outer lip.

Teinostoma anastomosis spec. nov. Rubio, Rolán & Lee (Figures 12A-E)

Type material: Holotype (Figs. 12A-C) deposited in FLMNH (448607).
Type locality: Channel east of Seahorse Key, Cedar Keys, Levy Co., Florida, dredged 4.5-7 m.
Etymology: The specific name is in reference to the interdigitating sculpture on the early postnuclear whorls.



Figures 12A-E. *Teinostoma anastomosis* spec. nov. Rubio, Rolán & Lee. A-C. holotype, 1.79 mm, Channel east of Seahorse Island, Cedar Keys, Levy Co., Florida (FLMNH); D: microsculpture; E: microsculpture and protoconch.

Figures 12A-E. Teinostoma anastomosis *spec. nov. Rubio, Rolán & Lee. A-C. holotipo, 1,79 mm, Canal este de Seahorse Island, Cedar Keys, Levy Co., Florida (FLMNH); D: microescultura; E: microescultura y protoconcha.*

Description: Shell (Figs. 12A-C) solid, with trochoid aspect, a little wider than high (H/D= 0.75), and spire formed by 4 whorls. Protoconch (Fig. 12E) apparently smooth, measuring about 370 μm in diameter, with 1 ¾ whorls and with two stages, each delimited by a thick varix. The teleoconch has 2 ¼ whorls, the suture is distinct, the periphery rounded and totally covered by spiral irregular microcordlets (Figs. 12D-E) tend to fuse on the first whorl, producing micropits in their interspaces. Aperture rounded, slightly prosocline; columella thickened behind, without any canal, and with a callus which extends parallel to and behind it, partially closing the umbilicus.

Dimensions: Holotype is 1.79 mm in maximum diameter and 1.34 mm in height (ratio H/D= 0.75).

Habitat: Dredged between 4.5 to 7 m.

Distribution: Only known from the type locality.

Remarks: *Teinostoma anastomosis* spec. nov. may be distinguished from *T. ciskae, T. goniogyrus, T. lenticulare, T. baldingeri* and *T. reclusum*, because all these have a microsculpture formed by rounded micropits spirally aligned.

T. incertum and *T. panamense* have the same ornamentation formed by incised spiral lines, but *T. incertum* has a subangular periphery, and *T. panamense* is ornamented by widely-spaced punctiform incisions and has a striated umbilical callus.

Teinostoma panamense spec. nov. Rubio, Rolán & Lee (Figures 13A-D)

Type material: Holotype (Figs. 13A-B) deposited in FLMNH (448606).
Type locality: Portobello, Panama.
Etymology: The specific name alludes to the country where the species was collected.

Description: Shell (Figs. 13A-B) solid, with trochoid aspect and spire slightly elevated; formed by 4 whorls. Protoconch (Fig. 13C) a little uncleaned in the sutural area, without tubercles or spiral sculpture, measuring about 350 μm in diameter, with 2 whorls, delimited by a weak varix. The teleoconch has 2 whorls, is covered entirely by micropits aligned spirally, which initially are rounded and are closer, becoming somewhat more punctiform incisions (Fig. 13D). Suture covered by a thin horny layer uncemented. Periphery rounded, not keeled, angular, or subangular. Aperture rounded, slightly prosocline. Columella not thickened, separated from the callus by a shallow groove at its outer edge. Base slightly concave. A thick striated callus completely occludes the umbilicus.

Dimensions: Holotype is 1.40 mm in maximum diameter.

Habitat: Unknown. Material studied from drift sample.

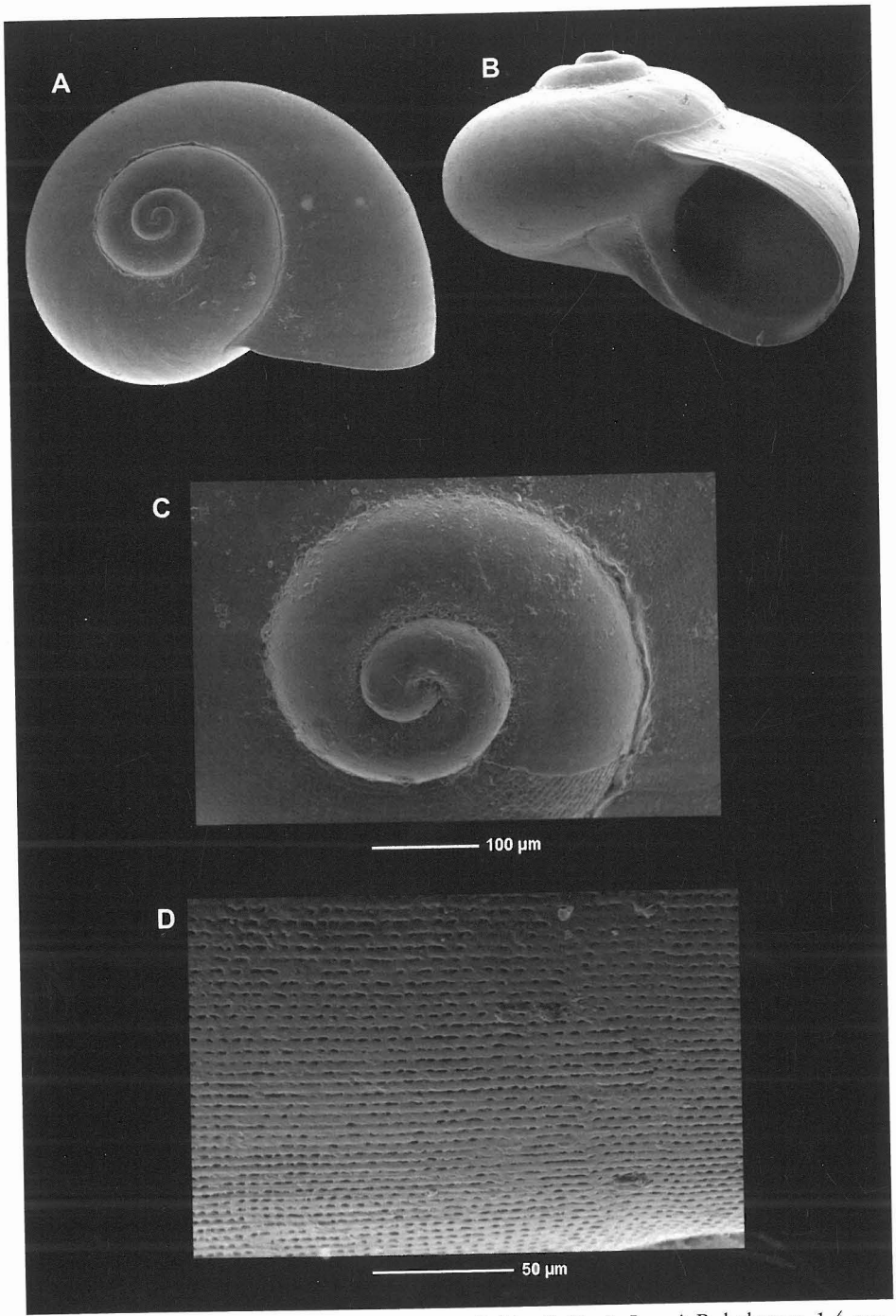
Distribution: Only known from the type locality.

Remarks: *Teinostoma panamense* spec. nov. can be distinguished from *T. ciskae, T. goniogyrus, T. lenticulare, T. baldingeri* and *T. reclusum* because all of these have a microscupture formed by rounded micropits spirally aligned.

T. incertum and *T. anastomosis* have the same ornamentation formed by incised spiral lines. But *T. incertum* has a subangular periphery and *T. anastomosis* is ornamented by spiral irregular microcordlets which are fused occasionally between them on the first whorl, presenting micropits in their interspaces.

Teinostoma biscaynense Pilsbry & McGinty, 1945 (Fig. 14A-D)

Teinostoma (Idioraphe) biscaynense Pilsbry & McGinty, 1945a. *The Nautilus*, 60: 5, pl. 1, fig. 4. [Type locality: Biscayne Bay at Coconut Grove, Florida].



Figures 13A-D. *Teinostoma panamense* spec. nov. Rubio, Rolán & Lee. A-B: holotype, 1.4 mm, Portobello, Panama (FLMNH); C: protoconch; D: microsculpture.
Figuras 13A-D. Teinostoma panamense *spec. nov. Rubio, Rolán & Lee. A-B: holotipo, 1,4 mm, Portobello, Panamá (FLMNH); C: protoconcha; D: microescultura.*

Type material: Holotype in ANSP (181104). Not examined.
Other material examined: Florida, USA: 1 s, 50-60 mi. E Ponte Vedra, St. Johns Co., 45 m (CHL); 1 s, Pelican Shoals, Key West, Monroe Co., 1 m, edge of reef (CHL); 1 s, 32 mi. E St. Augustine, St. Johns Co., 30 m (CHL); 1 f, Anclote Key, Pasco Co., sand bar (CHL). ABC: 3 s, off Palm Beach, Aruba, 5 m (CHL). Cayman Islands: 1 s, 100 m off Seven Mile Beach, 30 m, base of coral, Grand Cayman (CHL). Virgin Islands: 2 s, Dead Man Reef, 18 m (CHL). Panama: 1 s, Colín Is., Bocas Islands (CEG). Bahamas: 3 s, South Riding Rocks, Cay Sal Bank, 28 m, base of live coral reef (CHL). Cuba: 7 s, Guajimico (MHNS).

Description: Original description in PILSBRY & MCGINTY (1945a): *"The strongly depressed shell is glossy and smooth except for fine weak growth-lines; about equally convex above and below, with rounded periphery and small umbilical callus. There are about 3 ½ whorls, the first projecting, the next rather narrow and flat, the last whorl increasing very rapidly. The suture is distinct, visibly impressed, not obscured by overlaid callus. The broadly ovate aperture is rather strongly oblique, angular above. The upper margin is thin, arching rather strongly forward. The columella is rather thick, rounded, reflected in a broad callus covering the umbilicus and passing into a rather thin parietal callus, which is thickened in the posterior angle of the aperture. Diameter 1.8 mm, height 0.9 mm"*.

In our material it is possible to see that the largest shell has most of the columellar callus while there is a fine coating covering the suture.

Habitat: It lives in shell sand in Biscayne Bay at Coconut Grove and near Baker's Haulover, also on rocky sand bars (PILSBRY & MCGINTY, 1945a). It is a common inshore and shallow coastal water species in the southeastern United States (MOORE, 1964).

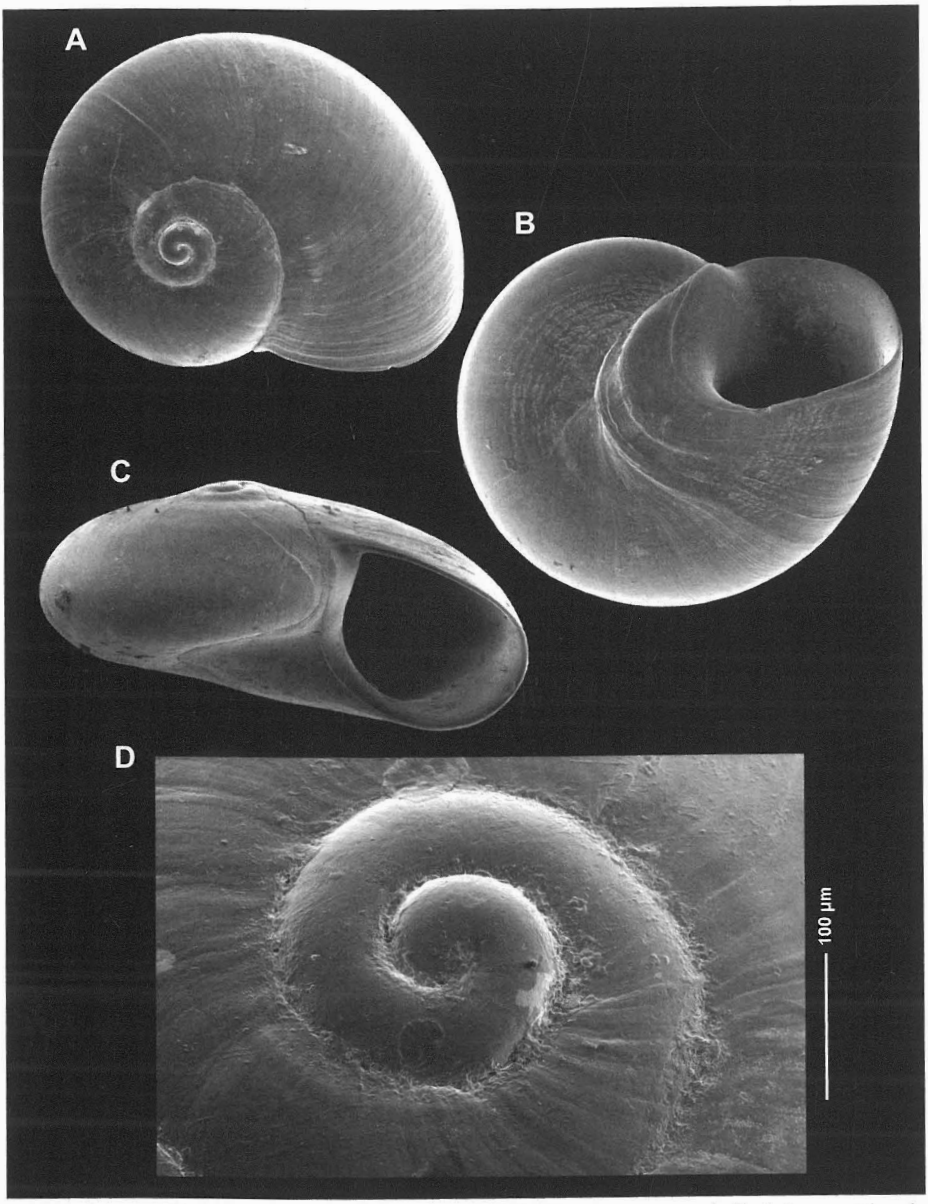
Distribution: *Teinostoma (Idioraphe) biscaynense* has been recorded from Biscayne Bay at Coconut Grove, Florida (PILSBRY & MCGINTY, 1945a); from East Florida, West Florida and Texas (MOORE, 1964); from Florida Peninsula (COOLEY, 1978); from Florida to Texas (EMERSON & JACOBSON, 1976; LYONS, 1989; LEE, 2009); from Mexico: Tabasco (GARCÍA-CUBAS & REGUERO, 1990) and Veracruz (REGUERO *ET AL.*, 1991); from Abaco, Bahamas (REDFERN, 2001). Now recorded from Panama and Cuba.

Remarks: In the original description, PILSBRY & MCGINTY (1945a) make reference to its similarity to *T. reclusum* in size and in the small columellar callus, being different because the spire of the latter species is more elevated, and the upper margin of the lip is also different.

MOORE (1964: 95) remarked that he had examined the types of *T. biscaynense*, *T. nesaeum* and *T. obtectum*, deposited in the ANSP, commenting that the type of de *T. biscaynensis* is a juvenile beached shell which had lost a great part of the dorsal callus; that of *T. obtectum* is also a beached shell but in better condition; finally, that of *T. nesaeum* is a specimen collected alive with soft parts remaining in the shell. After the comparison of the three types with hundreds of shells from Biscayne Bay, he commented that no differences between them were found except those related to variation in size. As for the spiral cordlets on the dorsum present in the shells of *T. nesaeum*, he did not consider them an important taxonomic character, making reference to them as "extremely evanescent". Thus, he concluded that *T. biscaynense*, *T. obtectum* and *T. nesaeum* were the same species giving *T. biscaynense*, the first species published in the same work, priority.

We do not agree with this conclusion, and, as we will show in the description and figures, each one has constant taxonomic characters sufficient to consider them as valid species just as they were described by PILSBRY & MCGINTY (1945a). The shells photographed agree perfectly with the material described and figured by PILSBRY & MCGINTY (1945a: fig. 4).

MOORE (1964) also stated that *T. biscaynense* is different from the other



Figures 14A-D. *Teinostoma biscaynense* Pilsbry & McGinty, 1945. A: shell, 1.3 mm, Florida (CHL); B-C: shells, 1.2, 1.36 mm, Guajimico, Cuba (MHNS); D: protoconch, from Cuba.
Figuras 14A-D. Teinostoma biscaynense *Pilsbry & McGinty, 1945. A: concha, 1,3 mm, Florida (CHL); B-C: conchas, 1,2, 1,36 mm, Guajimico, Cuba (MHNS); D: protoconcha, de Cuba.*

species of the genus *Teinostoma* from shallow water in the West Indies because it has the spire totally covered by a fine callous coat. Also, this character made it similar to *T. cryptospira* (= *T. umbilicatum*), a species from deep water off Cape Hatteras, North Carolina.

We do not agree with this because PILSBRY & MCGINTY (1945a) stated in their original description: *"The suture is distinct, visibly impressed, not obscured by overlaid callus"*. In relation with the protoconch: *"There are about 3 ½ whorls, the first projecting, the next ..."* Based on this passage, the spire of *T. biscaynense* cannot be totally covered by a callous coating, as is emphasized by MOORE (1964: 96, 98). This discrepancy may reflect an error in the identification of the examined types.

T. biscaynense differs from a group of species formed by *T. umbilicatum* (=*T. cryptospira*), *T. nesaeum*, *T. obtectum*, *T. lerema* and *T. clavium*, because in these a fine callous coat covers the spire, partially or totally, the protoconch being hidden in some of them.

Teinostoma obtectum Pilsbry & McGinty, 1945 (Figures 15A-B)

Teinostoma (Idioraphe) obtectum Pilsbry & McGinty, 1945a. *The Nautilus*, 59: 6, pl. 1, fig. 6. [Type locality: "Treasure Island", the first islet south of Singer Bridge, northern end of Lake Worth, Palm Beach, Florida].

Type material: Holotype in ANSP (181121). Not examined.
Material examined: Florida, USA: 1 s, 29 mi. ESE Mayport, Duval Co., Fl., 23 m(CHL); 1 s, just S jetty, Anastasia Island, St. Augustine Beach, St. Johns Co. (CHL); 1 s, beach, Indian Pass, Port St. Joe, Gulf Co. (CHL).

Description: This is the original description of PILSBRY & MCGINTY (1945a): *"The moderately solid smooth shell is strongly depressed, transversely dilated, the spire covered with a translucent glaze through which the suture shows. About three rather rapidly increasing but regularly spiral whorls are visible through the subtransparent callous coat over the spire, which superficially shows no trace of the suture. The periphery is rounded, the base not very convex. Aperture is rounded, but angularly produced and slightly channelled above and with a flattened parietal outline. Outer margin of peristome thin, the concave columella rather thick, passing into the rather large and slightly convex umbilical callus. Parietal callus is rather thick. Diameter 2.2 and 1.65 mm, height 0.95 mm"*.

Maximum reported size: 2.2 mm

Habitat: Shell sand bottom (PILSBRY & MCGINTY, 1945a). Bathymetric range 0 to 500 m.

Distribution: USA: Florida: East Florida (PILSBRY & MCGINTY, 1945a; MOORE, 1964: 4; LEE, 2009: 68); Mexico: Campeche State, Yucatan State, Quintana Roo (VOKES & VOKES, 1984); Venezuela: unlocalized (PRINCZ, 1982a); Puerto Rico (WARMKE & ABBOTT, 1961).

Remarks: After the description of the species PILSBRY & MCGINTY (1945a) mention: *"The elliptical outline, the strong depression, and the callus smoothly covering the spire, distinguish this species, which is known by a single shell. A small nick in the outer lip was restored in the figure"*.

MOORE (1964: 97) stated: *"The types of* Teinostoma biscaynensis, T. nasaeum *and* T. obtectum *have been examined by the writer. That of* T. biscaynensis *is a worn dead shell which has lost most of the dorsal shelly callus. The type of* T. obtectum *is also a dead shell, but is in much better condition. It is near the maximum size of the species. The type of* T. nasaeum *was taken alive, and the soft parts still remain in the shell. The writer has compared all three types with each other and with several hundred specimens from Biscayne Bay, and can find no differences other than those resulting from wear and tear or variation in size. As* T. biscaynensis *is the first species listed in PILSBRY & MCGINTY (1945a), it is given page precedence, and the other two species are placed in synonomy"*.

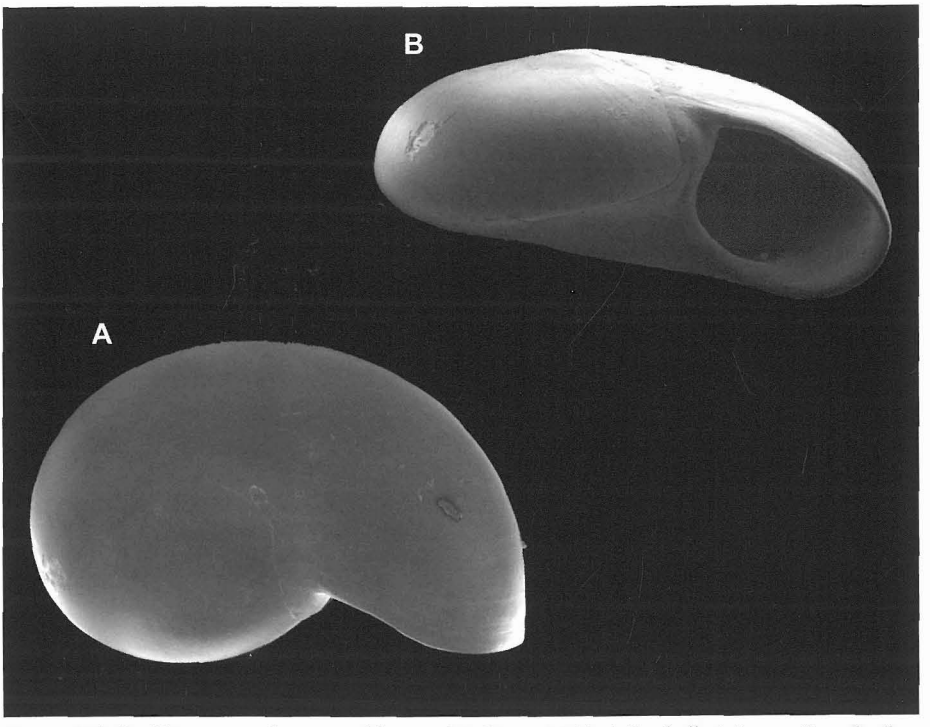


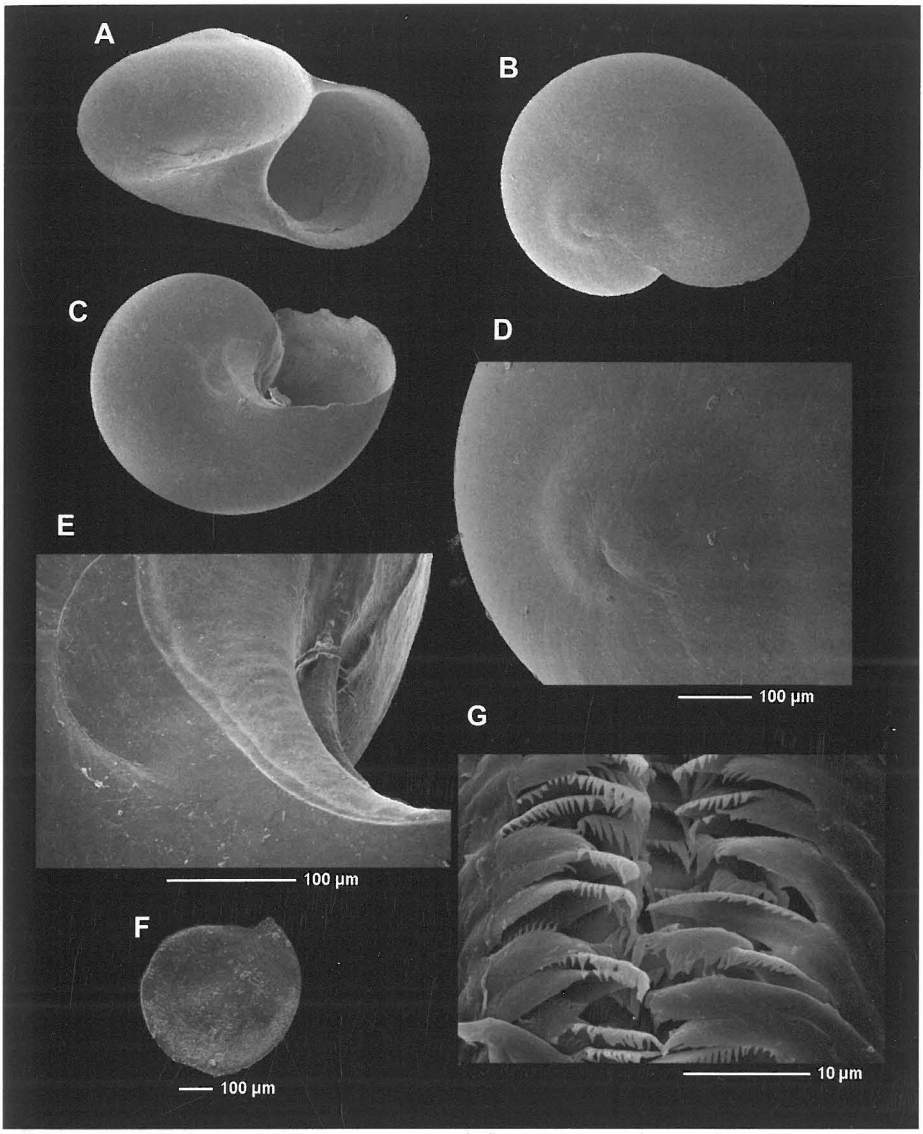
Figure 15A-B. *Teinostoma obtectum* Pilsbry & McGinty, 1945. A-B: shell, 1.9 mm, Port St. Joe, Gulf Co, Florida (CHL).
Figura 15A-B. Teinostoma obtectum *Pilsbry & McGinty, 1945. A-B: concha, 1,9 mm, Port St. Joe, Gulf Co, Florida (CHL).*

We can not agree with this opinion, because the descriptions and the figures of the original papers given by PILSBRY & MCGINTY (1945a) of these three species synonymized by MOORE (1964) have been enough to identify the material studied in them. Our only explanation is that there was mixing of the type material deposited in the museum. The shells photographed agree perfectly with the material described and figured by PILSBRY & MCGINTY (1945a: fig. 6).

There is a real confusion between *T. biscaynense* and *T. obtectum* because the latter species was described from a single shell and also because neither was figured with its original description. They were then placed in synonymy by MOORE (1964), whose judgement was accepted. *T. obtectum* differs from *T. biscaynense* in having the spire totally covered by a fine callous coating and also in the shape of the umbilical callus.

Teinostoma expansum spec. nov. (Figures 16A-G)

Type material: Holotype (Fig. 16A) deposited in MNCN (15.05/55063). Paratypes in USNM (1155031, 1 s, Fig. 16B) and MNHN (24402, 1 s, Fig. 16C).
Other material examined: Cuba: 2 sp and 4 s, Cienfuegos Bay, 22°07'N 80°27'W, 9 m (MHNS).
Type locality: Cienfuegos Bay, Cuba.
Etymology: The specific name refers to the expansion of the aperture.



Figures 16A-G. *Teinostoma expansum* spec. nov. A: holotype, 1.1 mm (MNCN). B-C: paratypes, 1.2, 1.3 mm, Cienfuegos, Cuba; D: protoconch; E: detail of the umbilical callus; F: operculum; G: radula. *Figuras 16A-G.* Teinostoma expansum *spec. nov. A: holotipo, 1,1 mm (MNCN). B-C: paratipos, 1,2, 1,3 mm, Cienfuegos, Cuba; D: protoconcha; E: detalle del callo umbilical; F: opérculo; G: rádula.*

Description: Shell (Figs. 16A-C) depressed, the spire totally covered by a fine callous surface which even hides the protoconch (Fig. 16D). By transillumination 3 ½ spiral whorls can be seen, the last one rapidly expanding and smooth except for fine growth lines. Aperture ovoid, oblique and wide; external lip sharp, projected outward. Columella (Fig. 16E) wide, rounded, reflected in a large callus which cover the umbilicus.

Dimensions: The largest shells studied were 1.3 mm in diameter.

Operculum (Fig. 16F) multispiral with a central nucleus.

Radula (Fig. 16G) taenioglossate, with formula 2+1+R+1+2. Central tooth wide basally, the ventral margin without denticles. Cutting area formed by a main large and sharp cusp and 4 denticles of lesser size on each side. Lateral teeth similar to the central one, the bases are quadrangular and also without denticles; border area with a central cusp and 5 smaller denticles at each side, more elongated wich central tooth. Marginal teeth wide and elongate; the inner with 28-30 slight denticles on the cutting edge is hook shaped; the outer marginal teeth are inclined outward in their upper third and have 14-18 denticles on the upper end of their internal margins.

Habitat: Our material was collected in about 9 m depth.

Distribution: Only known from Cienfuegos Bay, its type locality.

Remarks: *Teinostoma expansum* is close in shell characters to *T. biscaynense*, *T. obtectum* and *T. lerema*, all them characterized by having the spire covered totally or partially by a fine callous coat.

Teinostoma biscayense lacks this fine coat and the spire is free, thus allowing the protoconch to be photographed easily.

Teinostoma obtectum has a much more depressed shell, and the aperture is more deflected and oblique.

Teinostoma lerema has the aperture slightly oblique, grooved in the upper internal angle.

Teinostoma nesaeum Pilsbry & McGinty, 1945 (Figures 17A-F)

Teinostoma (Idioraphe) nesaeum Pilsbry & McGinty, 1945a. *The Nautilus*, 60: 5-6, pl. 1, fig. 2. [Type locality: Missouri Key, Florida].

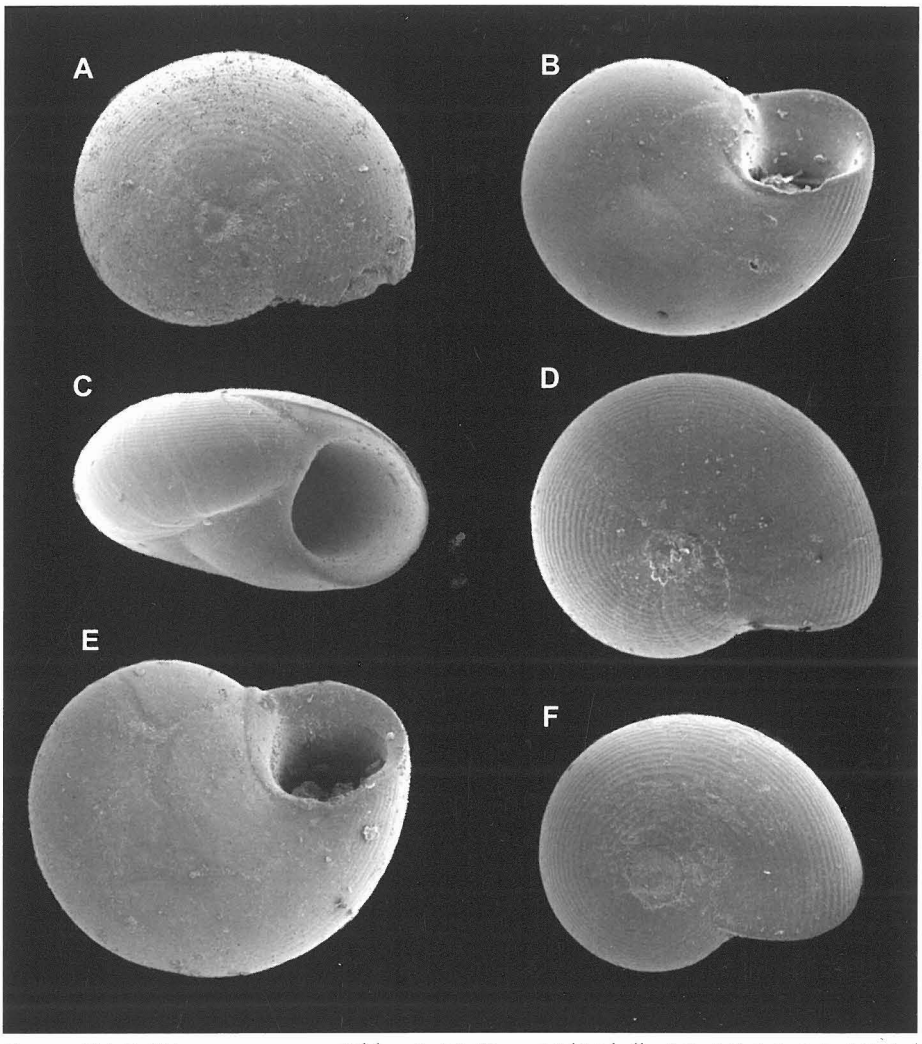
Type material: Holotype in ANSP (181117). Not examined.
Material examined: Cuba: 14 s, Guajimico, 15 m (MHNS); 1 s, Bahía de Cienfuegos, 20-30 m (MHNS); 15 s, Rancho Luna Beach, 30 m (MHNS).

Description: The original description in PILSBRY & MCGINTY (1945a: 5-6) is as follows: *"The shell is rather strongly depressed, about equally convex above and below, with rounded periphery; glossy, with some spiral striae on the upper surface, none on the lower. There are apparently about 2 ½ whorls, but the sutures are obliterated by a coat of translucent callus which covers the spire, with a shallow impression over the apex. The upper surface shows shallow spiral striae which weaken towards the periphery and disappear on the base. The aperture is oblique, rounded, but acute at the upper angle, which however is filled, making the cavity round. Outer lip blunt. Columella thickened, passing into the rather thick parietal callus. Umbilical callus thick, slightly convex, a trifle rugose"*. The shells are represented in Figs. 17A-F)

Dimensions: Holotype 1.45 mm on maximum dimensions (diameter). The largest shell in our material is 1.4 mm.

Habitat: Living under stones and in rocky sandbars (PILSBRY & MCGINTY, 1945a: 6). Mangrove swamps, sandy and rocky areas (VOKES & VOKES, 1984). Shallow, soft bottoms (DÍAZ MERLANO & PUYANA HEGEDUS, 1994).

Distribution: The species has been collected from Missouri Key, Florida and Biscayne Bay near Baker's Haulover, Miami (PILSBRY & MCGINTY, 1945a:6). From Colón and Bocas island, Panama (OLSSON & MCGINTY, 1958). From South and North Carolina to the Caribbean Sea (HOUBRICK, 1968). From Campeche to Carmen and Zacatal cities, from Ninum Point to Campeche, from El Cuyo to Ninum Point, from Point Yalcupul to Cerritos island and from isla Mujeres to Isla Holbox, Mexico (VOKES & VOKES, 1984). From Curaçao, Aruba and Bonaire (DE JONG



Figures 17A-F. *Teinostoma nesaeum* Pilsbry & McGinty, 1945, shells, 1.2, 1.2, 1.2, 1.1, 1.0, 1.4 mm, Rancho Luna Beach, Cuba (MHNS).
Figuras 17A-F. Teinostoma nesaeum *Pilsbry & McGinty, 1945, conchas, 1,2, 1,2, 1,2, 1,1, 1,0, 1,4 mm, Playa Rancho Luna, Cuba (MHNS).*

& COOMANS, 1988). From North Carolina to Panama and Colombia (DÍAZ MERLANO & PUYANA HEGEDUS, 1994). Also found in Cuba: Cienfuegos.

Remarks: MOORE (1964: 95-99) placed the taxa *T. nesaeum* and *T. obtectum* in synonymy with *T. biscaynense* (see above). We consider *T. nesaeum* a valid species, easily differentiable from its congeners by the following characters: dorsal ornamentation of fine spiral cordlets; base smooth; umbilical callus strong; suture covered by a translucent callus coat. These characters were also considered by PILSBRY & MCGINTY (1945a) as important for species separation.

All the shells studied have the cordlets on the dorsum but not on the base. We have not found intergradations.

Teinostoma semistriatum (d'Orbigny, 1842) (Figures 18A-I, 19A-F)

Trochus (Rotella) semistriata d'Orbigny, 1842. *Mollusques. Histoire Physique, Politique et Naturelle de l'île de Cuba* 2: 61, pl. 18, figs. 20-22. [Type locality: Cuba]
Pseudorotella semistriata (d'Orbigny): In P. Fischer, 1957. *Journal de Conchyliology* 6: 52.
Teinostoma (Idioraphe) clavium Pilsbry & McGinty, 1945a. *The Nautilus*, 60: 4, pl. 1, fig. 1. [Type locality: Tavernier, Key Largo].

Type material: Two syntypes in NHMUK (in very bad condition). Neotype here designated of *Trochus (Rotella) semistriata* in MCZ (208142), from La Chorrera, Habana, Cuba. Type species of *Teinostoma (Idioraphe) clavium* in ANSP (181106). Not examined.
Other material examined: Guadeloupe: 1 s, coralline sandy and rocky bottom, 2 m (CJP). Cuba: 5 s, Matanzas, Varadero (N Cardenas) (MCZ 109344); 7 s, Archipielago de los Canarreos, 15 m (MHNS); 8 s, Cayo Diego Perez, 12 m (MHNS); 19 s, Jibacoa, 3-6 m (MHNS); 1 s, Cienfuegos Bay, 20-30 m (MHNS); 48 s, Rancho Luna Beach, 20 m (MHNS); 2 s, Comodoro, 0 m (MHNS); 4 s, playa Girón, 5 m (MHNS). Florida USA: 1 s, Peanut Island, Lake Worth, Palm Beach Co. (CHL); 3 s, Virginia Key, Dade Co. (CHL); Spoil bank, APAC Pit, Sarasota Plio-Pleistocene (CHL). Bahamas: 2 s, Matt Lowes Cay, Abaco, grit (CHL); 1 s, Paradise Island, New Providence, 2 m (CHL); 6 s, West End, Grand Bahama Island, grit (CHL). Puerto Rico: 1 s, San Juan, grit (CHL). St. Martin: 15 s, Leeward Island, grit (CHL). Virgin Islands: 1 s, Frederiksted, St. Croix, grit (CHL).

Description: This is the original description in D'ORBIGNY (1842): *"Shell orbicular, depressed, thin, transparent, white, above transversely (i.e. concentrically) striae, beneath polished; umbilical callus shining; spire very short, obtuse, whorls four, slightly convex; aperture oval. Diameter 1.5 mm; height 0.7 mm"*.

Shell (Figs. 18A-F, 19A-E) strong, solid, somewhat depressed, totally covered by spiral cords. Umbilical callus wide (Fig. 18C). Protoconch (Figs. 18G-H, 19F) with about 1 ½ whorls, smooth, about 180 μm, partially covered by the first whorl of the teleoconch so only the apex of the protoconch is visible. Teleoconch with about 2 ¼ whorls, covered with spiral cords lacking sculpture in their interspaces (Fig. 18I); periphery rounded. Umbilical callus strong and wide, completely covering the umbilicus. Aperture oblique, with a small groove on the upper internal angle which is somewhat extended giving the shell an elongate aspect.

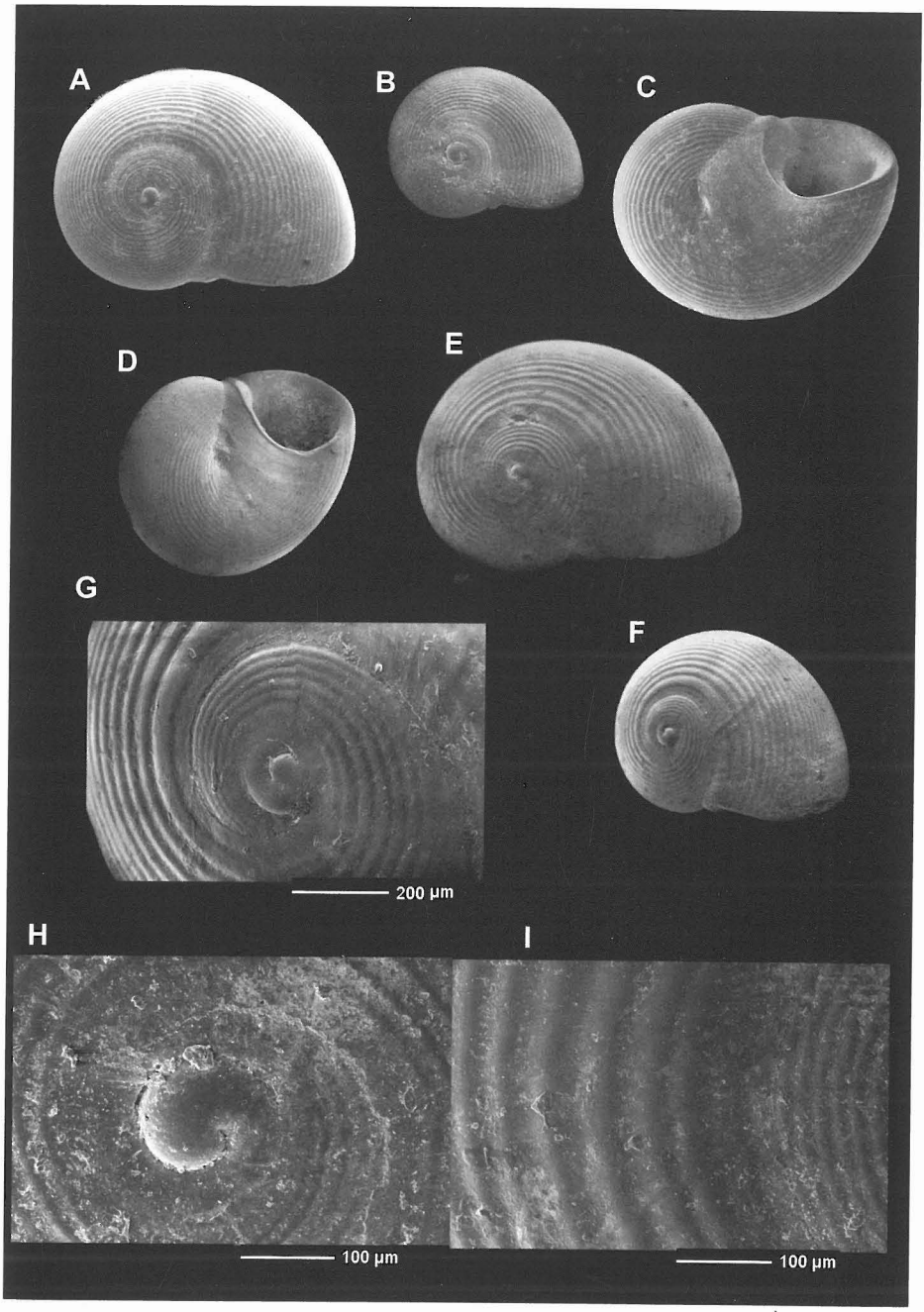
Dimensions: Holotype of *T. clavium* 2.3 mm in maximum diameter.

Habitat: This species lives in shallow water between 0 and 18 m depth. In Cuba it is relatively common, it was collected in sediments from between 5 and 30 m.

Distribution: Known from USA: Florida: East Florida, Florida Keys (JOHNSON, 1934; PILSBRY & MCGINTY, 1945a; MOORE, 1964; LEE, 2009); Mexico: Campeche State, Quintana Roo (ODÉ, 1987); Colombia, Venezuela: Sucre (DÍAZ MERLANO & PUYANA HEGEDUS, 1994; PRINCZ, 1986); Bahamas: New Providence (MOORE, 1964), Abaco (REDFERN, 2001); Puerto Rico (WARMKE & ABBOTT, 1961); Cuba (ORBIGNY, 1842; P. FISCHER, 1857; ESPINOSA *ET AL.*, 1985). Now recorded from Guadeloupe.

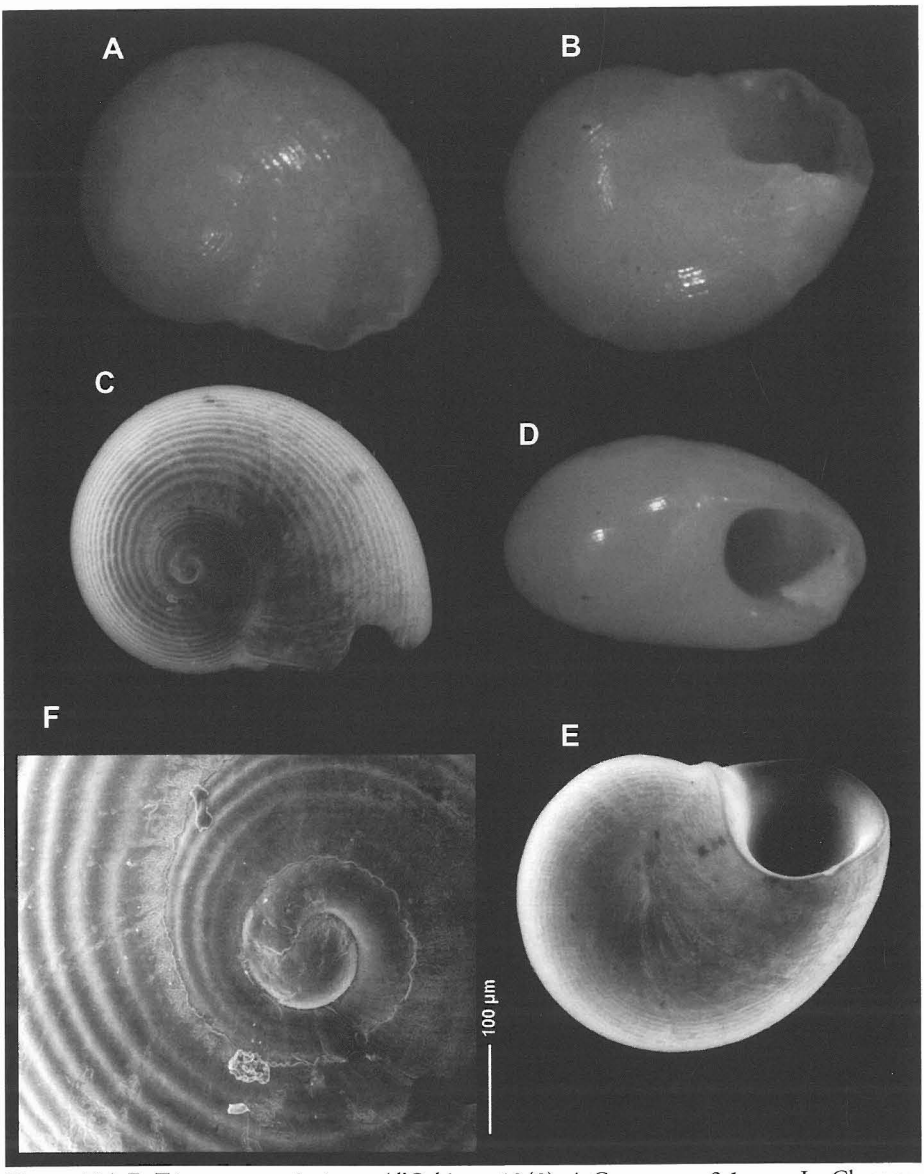
Remarks: *Nomen dubium* according to MOORE (1964: 81-82) who commented: *"The types of* Pseudorotella, T. semistriata *d'Orbigny, are in the British Museum (Natural History), but both types have deteriorated badly and the principle characters can not be made out. There has been a great deal of confusion with d'Orbigny's species for over a century, and, without an authentic specimen of* T. semistriata *to compare with other species, the true characters of the subgenus must remain in doubt. It is impossible to say which of d'Orbigny's (1842) species belong to the genus, and, since the types are no longer identifiable, they are here considered species indeterminate"*.

We have seen this type material in the NHMUK, and it is in very poor con-



Figures 18A-I. *Teinostoma semistriatum* (d'Orbigny, 1842). A-F: shells, 1.6, 0.9, 1.6, 1.1, 2.1, 1.1 mm, Cienfuegos, Cuba (MHNS); G: protoconch; H: detail of the protoconch; I: detail of microsculpture.

Figuras 18A-I. Teinostoma semistriatum *(d'Orbigny, 1842). A-F: conchas, 1,6, 0,9, 1,6, 1,1, 2,1, 1,1 mm, Cienfuegos, Cuba (MHNS); G: protoconcha; H: detalle de la protoconcha; I: detalle de la microescultura.*



Figures 19A-F. *Teinostoma semistriatum* (d'Orbigny, 1842). A-C: neotype, 2.1 mm, La Chorrera, La Habana (MCZ 208142); D-E: shells, 1.8, 2.2 mm, Matanzas, Cuba (MCZ); F: protoconch.
Figuras 19A-F. Teinostoma semistriatum *(d'Orbigny, 1842). A-C: neotipo, 2,1 mm, La Chorrera, La Habana (MCZ 208142); D-E: conchas, 1,8, 2,2 mm, Matanzas, Cuba (MCZ); F: protoconcha.*

dition, but in our opinion the taxon is not a *nomen dubium*.

In the type material of the Museum of Comparative Zoology (MCZ) there were two lots labeled: "*Pseudorotella semistriata* (Orb.), 5 specimens from Matanzas, Varadero, Cuba" deposited with nº 109344, which were sent by M. L. Jaume, a well-known Cuban malacologist, and another "*Teinostoma semistriata* d'Orb., 1 specimen from La Chorrera, Habana, Cuba," with nº 208142. We

studied them closely, and they conform to the description of *Trochus semistriata*. This species seems to be relatively common along the Cuban coast, having being found in the beached shell grit.

In SAGRA (1842: 177) Orbigny mentions in relation to *Rotella semistriata*: *"It lives in Cuba, together with the former (*R. diaphana*). It can be found in large numbers in the sands of Playa del Chivo y of La Chorrera; found also in St. Thomas"*.

For these reasons and in order to keep nomenclatural stability, we have designated as neotype the specimen from La Chorrera, Habana, deposited in MCZ with n° 208142 considering *T. clavium* Pilsbry & McGinty, 1945 a junior synonym.

In the original description d'Orbigny also mentions: *"beneath polished"*. This means the origin of the material employed for this description was beached and eroded; those shells have the base totally smooth and polished due to abrasion. However, as we can observe in fresh shells, the base is totally covered by spiral cordlets as is the dorsum.

Teinostoma semistriatum is a species easily distinguished from its congeners by its robustness and the size of the shell, the form of the umbilical callus, and the ornamentation of the teleoconch with spiral cords which completely cover the dorsum. The protoconch is partially concealed by the first whorl of the teleoconch. As in previous species, it can form a group with *T. umbilicatum*, *T. biscaynense*, *T. nessaeum* and *T. lerema*, because in all of them the last whorl is extended covering some or all of the previous whorls. MOORE (1964) mentions its similarity to *T. biscaynense* and *T. lerema*.

Teinostoma minusculum (Bush, 1897) (Figures 20A-D)

Pseudorotella minuscula Bush, 1897. *Transactions of the Connecticut Academy of Arts and Sciences* 10: 118-119, text-figs. 3a-c. [Type locality: USFC sta. 2283, off Cape Hatteras, North Carolina].

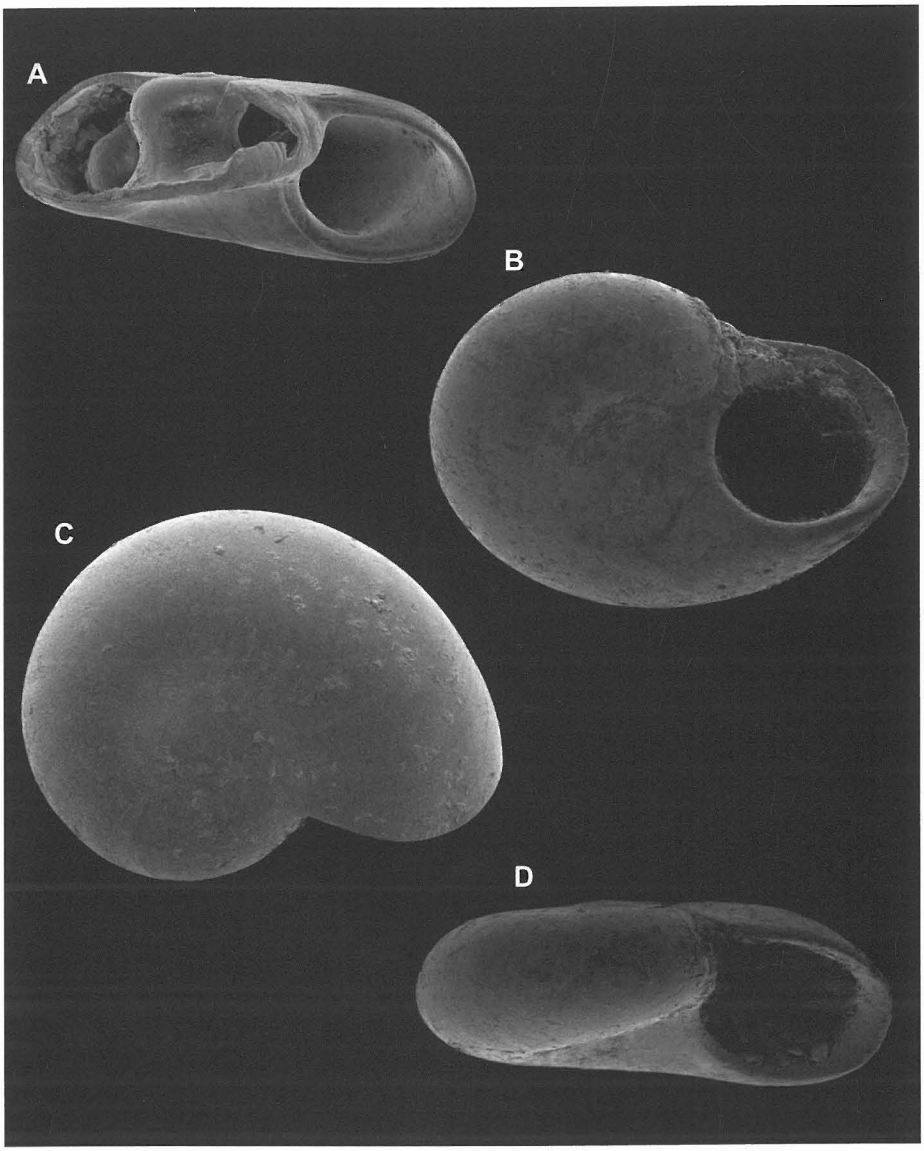
Type material: Holotype in USNM (41623) is a broken shell. Examined in micrograph (Fig. 20A).
Other material examined: USA: 1 s, off Dry Tortugas, Monroe Co., Florida, 20-50 fms (USNM); 1 s (more deteriorated), ENE Mayport, Duval Co., Florida, 26 m (CHL).

Description: Original description in BUSH (1897): *"Shell thick, solid, porcellanous, slightly tinted with yellow along the suture and on the base; flattened above and below, with the indented umbilical region covered with a thin lustrous glaze or layer of enamel. Surface smooth and very lustrous, marked only by irregular, microscopic, growth lines. Suture inconspicuous. Whorls about 2 ½, coiled in the same plane, lapping well on to each other, rapidly enlarging, with a very small nuclear whorl and large body-whorl. Aperture very oblique, somewhat ovate; peritreme not continuous, modified into a thin, inconspicuous glaze on the body-whorl, elsewhere with rounded edge, with a slight callous deposit beneath the suture where the outer-lip extends obliquely well forward from the body-whorl, with little, if any, curvature and forms a slight sutural notch. Greatest diameter, about 1.5 mm; height, about 0.5 mm"*. *T. minusculum* has the umbilical region entirely covered by a thin, very lustrous glaze or layer of enamel, not in any sense a thickened pad as in *Teinostoma umbilicatum*.

Habitat: Depth: 14 to 50 fms.

Distribution: USA: North Carolina (BUSH, 1897); Florida: East Florida (LEE, 2009)

Remarks: This species was described in the subgenus *Pseudorotella* P. Fischer, 1857. BUSH



Figures 20A-D. *Teinostoma minusculum* (Bush, 1897). A: holotype, 1.5 mm, (USNM, 41623); B-D: shell, 1.6 mm, Dry Tortugas, Monroe Co., Florida (CHL).
Figuras 20A-D. Teinostoma minusculum *(Bush, 1897). A: holotipo, 1,5 mm, (USNM, 41623); B-D: concha, 1,6 mm, Dry Tortugas, Monroe Co., Florida (CHL).*

(1897) says: *"This species approaches* Teinostoma cryptospira *(A.E. Verrill) Dall, but it is a much smaller shell, with the whorls quite differently coiled and with the umbilical callus represented by a thin glaze"*. Really, the only similarity with *Teinostoma cryptospira* is that both have the spire covered by a fine callous covering. LEE (2009: 68; no. 326) figured this species.

Teinostoma lerema Pilsbry & McGinty, 1945 (Figures 21A-H)

Teinostoma (Idioraphe) lerema Pilsbry & McGinty, 1945a. *The Nautilus*, 60: 6-7, pl. 2, figs. 1-1a. [Type locality: Missouri Key, Florida Keys].

Type material: Holotype in ANSP (181120). Not examined.
Other material examined: Cuba: 3 s, Cienfuegos Bay, 22°07'N, 80°27'W, 9 m (MHNS); 7 s, Cienfuegos Bay, 22°07'N80°26'W, 4 m (MHNS). Martinique: 1 s, Pointe Borgnesse, 12 m, sand-muddy bottom, close to the reef (CJP). St. Kitts & Nevis: 4 s, Monkey Shoals, Nevis Island, 18 m (CHL). Haiti: 1 s, Labaree, sand beach (CHL). Puerto Rico: 1 s, San Juan, grit (CHL). Panama: 3 s, Isla Careneros, 8-9 m (CHL); 1 s, 1 mi. Punta San Blas, San Blas Island, sand bar just inside reef (CHL).

Description: Shell (Figs. 21A-G) very small, solid, smooth and shiny. Protoconch (Fig. 21H) smooth, with about 2 whorls, and a diameter of about 200 μm, but usually partially covered by the first teleoconch whorl. The teleoconch has a little more than one whorl and is smooth except for fine growth lines. Suture covered by a fine callous coat. Umbilicus totally covered by a thin callus. Aperture oblique, rounded, without any sulcus on the upper internal angle; the outer lip is extended outward, giving the shell a more elongated aspect.

Dimensions: Holotype 1 mm in maximum diameter and 0.45 mm in height. The largest of our shells is 1.0 mm in diameter.

Animal figured by PILSBRY & MCGINTY (1945a, pl 2, fig. 1a).

Habitat: Living under rocks (PILSBRY & MCGINTY, 1945a). Collected alive under stones between 0.6 and 16 m in depth. The Cuban shells were found in sediments from between 4 and 9 meters. Records between 0 and 48 m.

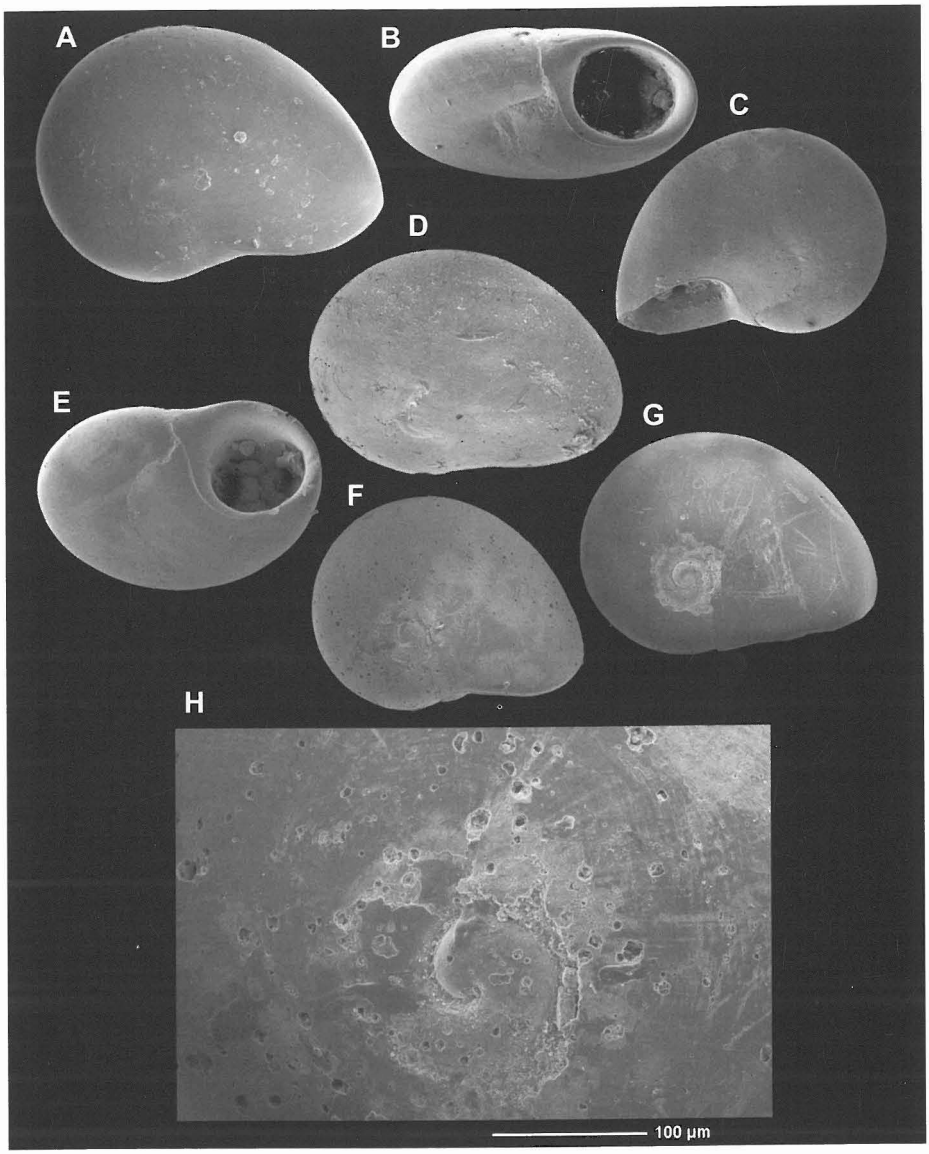
Distribution: Know from the USA: West Florida, Missouri Key (PILSBRY & MCGINTY, 1945a); Texas (ODÉ, 1987); Mexico: Tabasco, Veracruz, Campeche State (GARCÍA-CUBAS, 1971); Colombia (DÍAZ MERLANO & PUYANA HEGEDUS, 1994); Virgin Islands: St. John (MOORE, 1964), Curação (DE JONG & COOMANS, 1988); Cuba (SARASÚA, 1970; ESPINOSA *ET AL.*, 1985).

Remarks: It is the smallest *Teinostoma* described up to now. Its small size, the suture covered by a fine callous layer and the elongated form of the aperture differentiate it from congeneric species. *Teinostoma lerema* has a certain similarity to *T. biscaynense* in general form, but the latter has the spire totally covered by a fine callus.

Teinostoma umbilicatum (H.C. Lea, 1843) (Figures 22A-G)

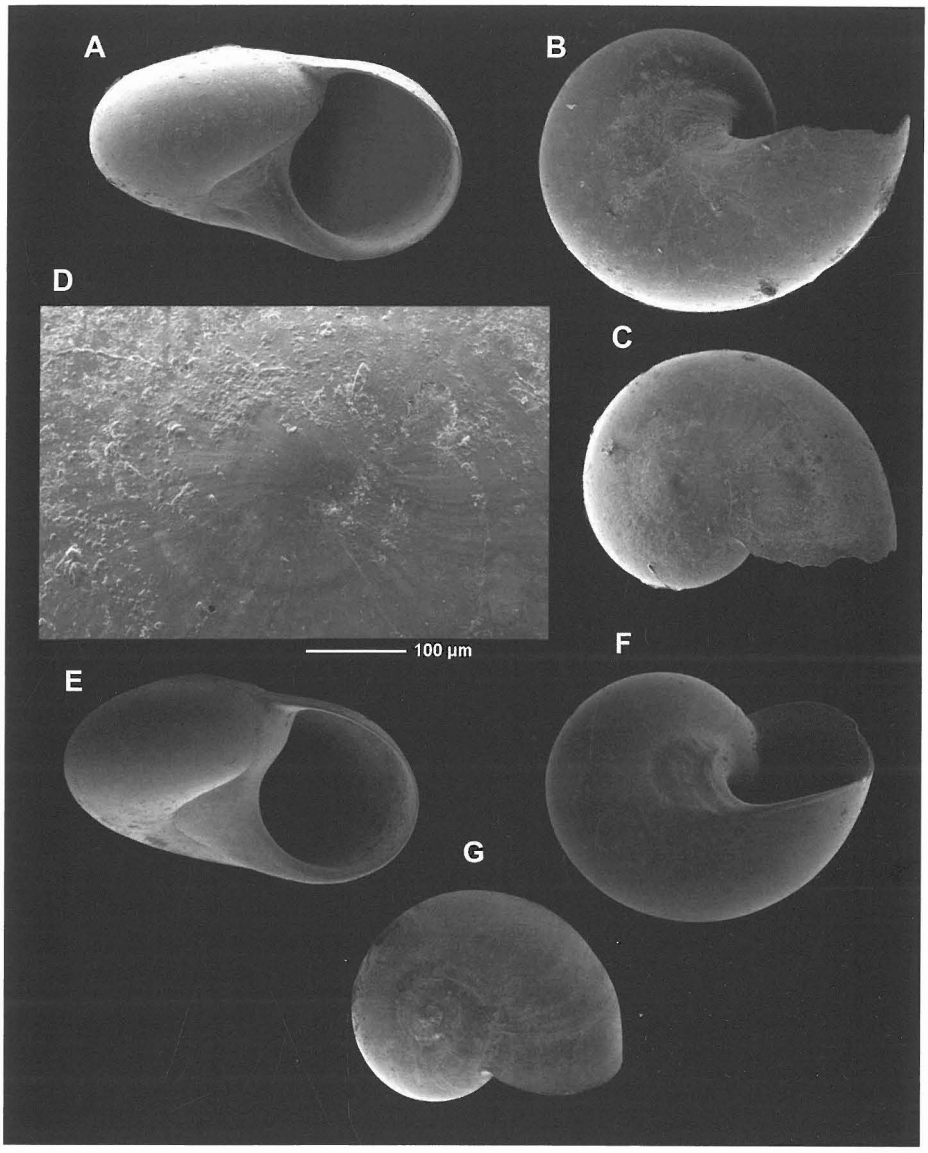
Rotella umbellicata H.C. Lea, 1843. *Proc. Amer. Philos. Soc.*, 3: 164. (Nude name).
Rotella umbilicata H.C. Lea, 1846. *Trans. Amer. Philos. Soc.* (new series) 9: 264, pl. 36, fig. 80. [Type locality: Miocene of Petesburg].
Rotella cryptospira A.E. Verrill, 1884. *Transactions of the Connecticut Academy of Arts and Sciences*, 6: 241-242 (not figured). [Type locality: USFC sta. 2109, off Cape Hatteras, North Carolina].

Type material: Lectotype of *Rotella cryptospira* USNM 35731; it was selected and figured by JOHNSON (1989). *MCZ Publications on Mollusks Occasional Papers on Mollusks*, 5(67): 32, pl. 10, fig. 8. Not examined.
Material examined: Cuba: 5 s, Rancho Luna Beach, 20-54 m (MHNS); 6 s, Cienfuegos Bay, 10 m (MHNS). Florida, USA: 1 s, 23 mi. ENE Mayport, Duval Co., 26 m (CHL); 1 s, Jacksonville Beach, Duval Co. grit (CHL); 2 s, Anclote Key, Pasco Co. sand bar (CHL); 7 s, channel E Seashore Key, Cedar Key, Levy Co. 4-6 m (CHL); 2 s, Louisiana: off western part, 22 m (CHL). Jamaica: 3 s, Priory, St. Ann's Parish, dredged shallow water (CHL). Trinidad and Tobago: Tobago: 7 s, Horse Shoe reef, 15 m, shell sand (CJP).



Figures 21A-H. *Teinostoma lerema* Pilsbry & McGinty, 1945; shells 1.0, 0.8, 0.7, 1.0, 0.8, 0.7, 0.9 mm, Rancho Luna Beach, Cienfuegos, Cuba (CFG).
Figuras 21A-H. Teinostoma lerema *Pilsbry & McGinty, 1945; conchas, 1,0, 0,8, 0,7, 1,0, 0,8, 0,7, 0,9 mm, Playa Rancho Luna, Cienfuegos, Cuba (CFG).*

Description: Shell (Figs. 22A-C, 22E-G) strongly depressed, smooth, rapidly expanding. A fine callous layer covers a great part of the previous whorl, keeping visible the protoconch and a small part of each whorl (Fig. 22D). Periphery very rounded. Aperture slightly oblique, rounded, grooved in the upper internal angle. Columella strong, reflected towards the external



Figures 22A-D. *Teinostoma umbilicatum* (H.C. Lea, 1843). A-C: shells, 1.9, 1.9, 1.6 mm respectively, Cienfuegos Bay, Cuba; D: protoconch; E-G: 1.8, 1.6, 1.3 mm, Tobago (CHL).
Figuras 22A-D. Teinostoma umbilicatum *(H.C. Lea, 1843). A-C: conchas, 1,9, 1,9, 1,6 mm respectivamente, Bahía de Cienfuegos, Cuba; D: protoconcha; E-G: 1,8, 1,6, 1,3 mm, Tobago (CHL).*

part forming a strong and characteristic callus which completely covers the umbilicus.

Dimensions: The lectotype is 2.5 mm in maximum diameter. The largest shell examined was 1.93 mm in diameter and 1.07 mm in height.

Habitat: A species of wide bathymetric distribution, recorded between 18 and 305 m depth. DALL (1892) collected

it alive off the coasts of North Carolina and Florida in 30 to 50 fathoms, U.S. Commission. Our material was collected on coralline sandy bottoms between 10 and 54 m.

Distribution: Recorded from the USA: New Jersey, Campeche, North Carolina and Florida (A.E. VERRILL, 1884; DALL, 1892; LEE, 2009); from Mexico: Campeche State (ODÉ, 1987a); Venezuela (PRINCZ, 1982) and Cuba (ESPINOSA *ET AL.*, 1985).

Remarks: VERRILL (1884) says: *"This species bears some resemblance to* Rotella anomala *D'Orbigny, but is peculiar in having the whorls of the spire concealed, or nearly so, by the last whorl"*. DALL (1892) mentions: *"This little shell resembles* T. umbilicatum *Lea in having the whorls nearly concealed by the thinned-out edge of the preceeding whorl, which is appressed nearly to the apex. The surface is smooth and polished. The fossils have been identified by comparison with a specimen named by the author, who has not yet figured his species"*. PILSBRY (1953: 416, in OLSSON *ET AL.*, 1953) placed *T. cryptospira* in the subgenus *Idioraphe* Pilsbry, 1922, saying: *"The suture is characterized because the last whorl envelopes all of those preceeding, or leaves only the apical whorl exposed. The suture is developed only as an arcuate or angular line radiating from summit to periphery"*. In this subgenus are included *T. umbilicatum*, *T. verrilli* O. Meyer, 1885 and *T. nanum* H.C. Lea, 1833. PILSBRY (1953) mentions that in many shells observed the callous coat in the sutural border of the last whorl almost reaches the apex or only the apex is free. The type of *T. umbilicatum* is broken, but the apical area is preserved in good condition. The *T. umbilicatum* group of teinostomes has continued to the present day in species only very slightly different from the ancestral form, the living representative being named *T. cryptospira*.

Teinostoma altum Pilsbry, 1953 (Figures 23A-D)

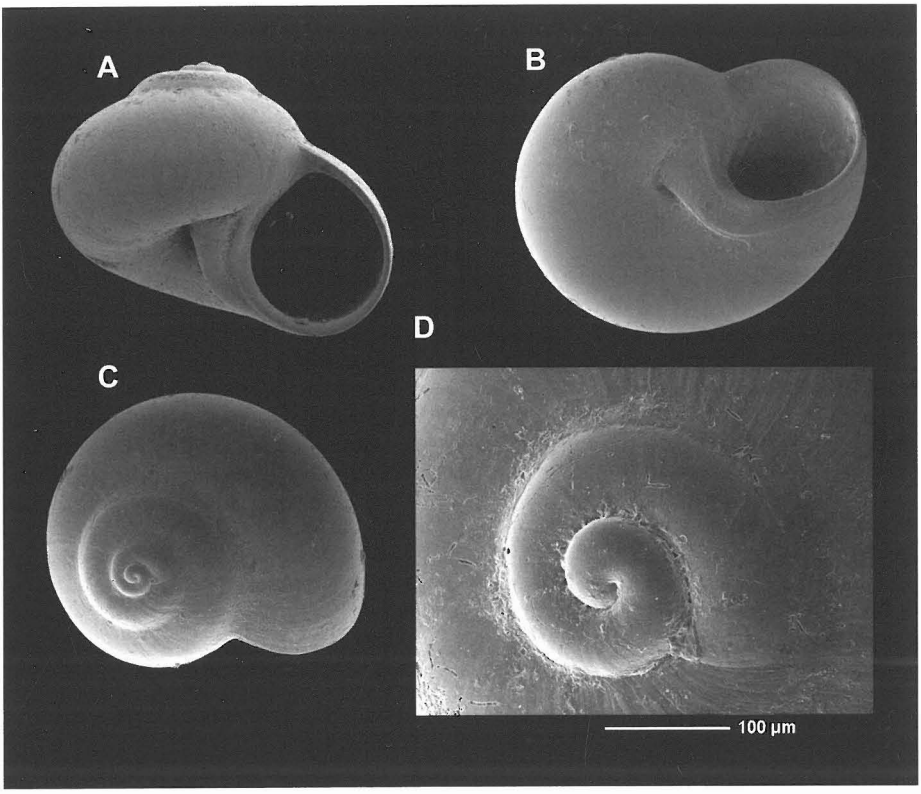
Teinostoma (Pseudorotella) altum Pilsbry, 1953 (in OLSSON *ET AL.*, 1953). *Acad. Nat. Sci. Philadelphia*, Monographs 8: 413, pl. 49, fig. 2-2f. [Type locality: Plio-Pleistocene of North St. Petersburg, Florida].

Type material: Holotype in ANSP (18398). Not examined.
Other material examined: Cuba: 2 s, Bahía de Cienfuegos, 20-30 m (MHNS).

Description: The original description in OLSSON *ET AL.* (1953) is as follows: *"The shell is solid, depressed globose with conic spire, smooth surface, very incomplete umbilical callus divided from the columella by a groove. It is often perforate, or the umbilicus may be closed. There are fully four moderately convex whorls united by a distinctly impressed suture. The last whorl is broadly rounded at periphery, the base strongly convex, excavated around the narrow umbilical crevice (which is often closed). The aperture is nearly circular, but angular above. Peristome is rather long and evenly concave, somewhat thickened, separated from the callus by a shallow groove at its outer edge. The umbilical callus is a rather small, convex, lunate lobe, which typically does not wholly close the umbilicus"*.

We show some images of shells (Figs. 23A-C) and protoconch (Fig. 23D). We must point out these distinguishing characters of the species: the elevated spire, the rounded periphery, the groove which separates the columella from the umbilical callus and that this callus does not always cover the umbilicus.

Dimensions: Holotype 2.2 mm in maximum diameter and 1.6 in height. Our largest shell is 1.50 mm in diameter



Figures 23A-D. *Teinostoma altum* Pilsbry, 1953. A-C: shells, 1.3, 1.4, 1.3 mm, Cienfuegos Bay, Cuba. D: protoconch.
Figuras 23A-D. Teinostoma altum *Pilsbry, 1953. A-C: conchas, 1,3, 1,4, 1,3 mm, Bahía de Cienfuegos, Cuba. D: protoconcha.*

and 1.15 mm in height (ratio H/D: 0.76).

Habitat: The only two shells found were from shell grit between 20 and 30 m in depth. Elsewhere in the literature it is reported from 0 to 139 m.

Distribution: Florida, USA: Fossil, from the Plio-Pleistocene of St. Petersburg (Pilsbry, 1953; Odé, 1987) Recent of: Cuba: Cienfuegos. USA: Georgia: 57 mi E Sapelo Is. 18-20 m (Lee, 2009). Florida: 28 mi E ESE Mayport, Duval Co. 22.5 m (LEE, 2009).

Remarks: Fossil species described from the Plio-Pleistocene of South Florida. The shells from Cuba seem to be recent.

Teinostoma altum is similar to *T. cocolitoris*, but the latter is larger, the spire lower, has fewer whorls and lacks the groove separating the columella and the umbilical callus.

From *T. parvicallum* it may be differentiated by the characters of the umbilical callus. Also it is a little similar to *T. reclusum* in its general form and in the groove in the umbilical callus, but the latter has a lower spire and a different peripheral profile.

Another close species is *Teinostoma subconicum* (H.C. Lea), described from the Miocene of Smithfield, Virginia from only one shell.

PILSBRY (1953; pl. 56, fig. 5), gives a drawing of this species showing the differences with *T. altum*: the shell is more depressed, the periphery of the last whorl more arched, and the umbilicus is totally closed.

In the web page www.jaxshell.org, as well as in "Marine Shells of Northeast Florida" and "Select Images of Western Atlantic Gastropods" there is a SEM micrograph of a specimen of *Teinostoma altum* called *Teinostoma sp. aff. altum*, dredged in 30 m, 32 mi E St. Augustine, Florida, which is identical to our material from Cuba and that figured by PILSBRY (1953). This figure also appears in (LEE, 2009: 67; species no. 320)

"Teinostoma" solidum (Dall, 1889) (Figures 24A-G)

Ethalia solida Dall, 1889. *Bull. Mus. Comp. Zoology*, 18: 362, pl. 28, figs. 3, 5. [Type locality: Station 19, Lat. 23°3'N, Lon. 83°10'W, off Bahia Honda, Cuba].

Type material: Syntype in MCZ (007553), from off Bahia Honda, Cuba. Range: 23.3°N-83.10°W, in 567 m. This shell is here designated the lectotype (Fig. 24).

Description: The original description in DALL (1889) is as follows: *"Shell small, solid, stout, ivory white, of three rounded whorls, the last much the largest. Sculpture of fine incremental lines, sometimes faintly wrinkled near the suture; upper surface rounded, subconic, the whorls not impressed at the suture, which is fairly distinct. Periphery rounded, base subconic, umbilicus reduced to a minute chink with a twisted callus above it; aperture circular, oblique, with a triangular callus at each end of the columella; the upper margin declining"*.

We add: The shell (Figs. 24A-E) is solid and compact, trochoid, spire formed by 3 ¼ rounded whorls separated by a distinct suture. The protoconch has scarcely one whorl (which is not certain due to the difficulty in discerning the separation from the teleoconch). It measures about 450 μm in diameter and the nucleus 160 μm. The protoconch is short, bulbous, and is covered by small, sharp, branching tubercles arranged in a spiral pattern. Teleoconch formed by 2 ½ whorls, totally smooth except for numerous growth lines. Umbilicus almost totally closed by a fine callous layer, which is the extension of the columella; within, it is possible to see two small folds which delimit several axial striae and spiral cordlets which cross and produce a reticular pattern. Aperture rounded, slightly angulate in its parietal part portion. Parietal callus, columella and internal lip strong and wide. There is no sulcus between the columella and the callus.

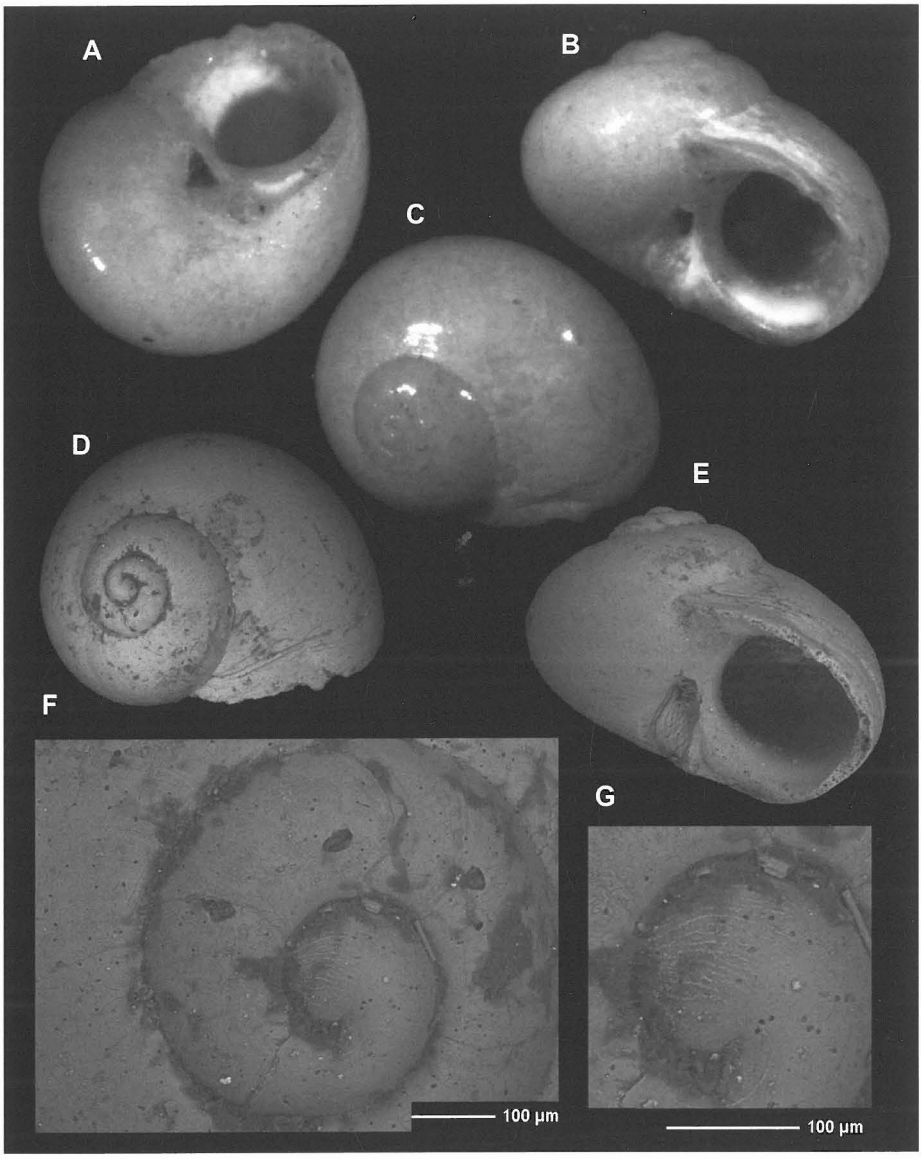
Dimensions: Lectotype 2.1 mm in maximum diameter and 1.6 mm in height.

Habitat: This is a fairly deep-water species that apparently lives only on the continental slope (MOORE, 1964). From 529-792 m.

Distribution: From Georgia to West Florida, off Fernandina (JOHNSON, 1934). Recorded in Bahia Honda, Cuba (DALL, 1889); Florida Keys (MOORE, 1964).

Remarks: Provisionally, we keep this species in the genus *"Teinostoma"* in quotes, uncertainty about its correct placement for the reasons cited above. The name *Teinostoma solidum* is preoccupied by a West African species of E.A. SMITH (1871: 737, pl. 75, fig. 25), which has all the typical characters of the genus. But the Caribbean species could be a Skeneid, in which case the name would be available because it was described in the genus *Ethalia*. At present, we prefer to keep it in this dubious status instead of creating a replacement name.

It is necessary to point out the great similarity of *"Teinostoma" solidum* to some species of the skeneid genera *Lisomphalia, Skenea* and *Trochaclis*. Some deep water species of the genus *Skenea* living along the coast of Iceland and Scandinavia are characterized by the trochoid aspect of the shell, the short and bulbous protoconch, usually sculp-



Figures 24A-G. "*Teinostoma" solidum* (Dall, 189), lectotype, 2.1 x 1.6 mm Bahía Honda, Cuba (MCZ 007553). A-C: optical photographs; D-E: SEM micrographs; F: protoconch; G: detail of the protoconch.

Figuras 24A-G. "Teinostoma" solidum *(Dall, 189), lectotipo, 2,1 x 1,6 mm Bahía Honda, Cuba (MCZ 007553). A-C: fotografías ópticas; D-E: microfotografías MEB; F: protoconcha; G: detalle de la protoconcha.*

tured, and having an umbilicus which, as in many species such as *Skenea trochoides* (Friele, 1876), is very narrow and deep and has riblets within. The species of the genus *Trochaclis* are characterized by a short and bulbous protoconch with fine spiral cordlets. WARÉN (1991: 179) reported that the genus

Trochaclis was originally classified in the Mesogastropoda and later transferred to the Vetigastropoda by HICKMAN & MCLEAN (1990) because of the morphology of the operculum, epipodium and ctenidium.

Due to these similarities we consider the placement of this species in Tornidae, subfamily Teinostomatinae as dubious, but we mantain this clasification until anatomical, opercular and radular morphology allow correct systematic placement. MOORE (1964) treated *T. solidum* and *T. floridensis* (Dall, 1889) in a similar fashion.

"Teinostoma" solidum is more solid and elevated than any other species described from this region (DALL, 1889). According to MOORE (1964: 100), the small, bulbous and ornamented protoconch, subglobose shape and narrow chink-like umbilicus and shelf within the aperture distinguish this species from other West Indian species.

Teinostoma lunense spec. nov. (Figures 25A-D)

Type material: Holotype (Figs. 25A-B) in MNCN (15.05/55066); a paratype in MHNS.
Type locality: Rancho Luna Beach, Cienfuegos, Cuba, 20 m.
Etymology: The specific name refers to the type locality.

Description: Shell (Figs. 25A-C) rounded, a little higher than wide, spire moderately elevated, with four whorls, solid, smooth and somewhat shiny. Protoconch (Fig. 25D) of about 1 ¼ smooth whorls. Teleoconch with surface smooth except for fine growth lines, periphery rounded. Suture faintly indicated, visible by transparency, covered by a fine callous layer. Aperture rounded, peristome almost continuous, internal upper angle grooved. Columella and inner lip rounded, reflected towards the umbilicus, forming a characteristic callus, wide and fine, with a half moon crescent shaped, which partially covers the umbilicus. There is no groove of separation between columella and callus.

Dimensions: Holotype is 1.3 mm in maximum diameter and 0.9 mm of in height.

Habitat: This species was collected in shell grit at 20 m depth.

Distribution: Only know from Cienfuegos, Cuba, the type locality.

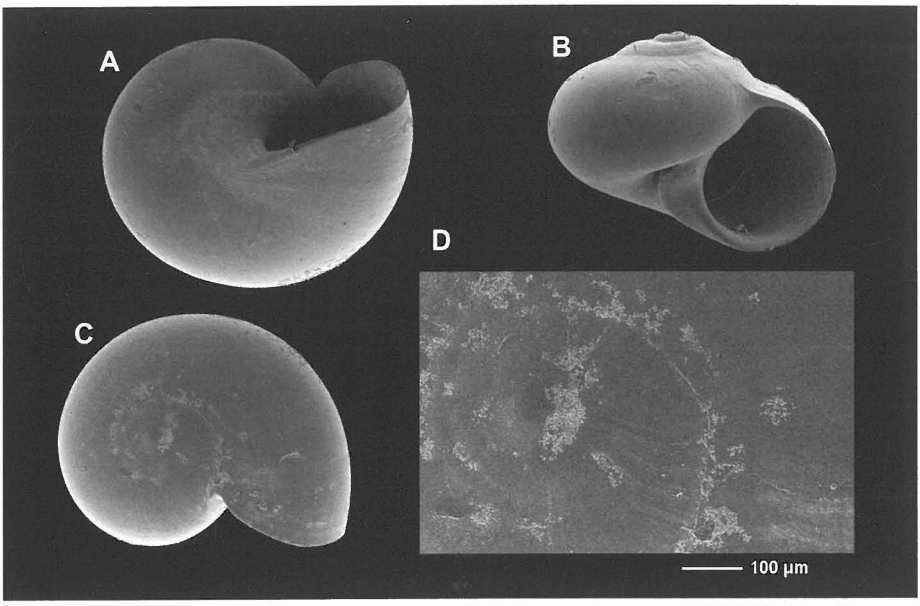
Remarks: The figure in PILSBRY (1953, pl. 56, fig. 5) of the holotype of *T. subconicum* (H.C. Lea) is very similar to this species differing in the size of the callus, which, like a crescent moon does not completely cover the umbilicus.

From *T. altum* it may be separated by the absence of the groove between the columella and the callus.

Teinostoma cocolitoris Pilsbry & McGinty, 1945 (Figures 26A-G)

Teinostoma (Ellipetylus) cocolitoris Pilsbry & McGinty, 1945a. *The Nautilus*, 59: 8-9, pl. 1, fig. 3. [Type locality: Off Lake Worth, Palm Beach County, Florida].

Type material: Holotype in ANSP (181122). Not examined.
Material examined: Cuba: 1 s, Canarreos Archipelago, 5 m; 1 s, Cayo Diego Perez, 5 m (MHNS); 13 s and 2 sp, Cienfuegos Bay, 20-30 m (MHNS); 3 s, Rancho Luna Beach, 10-20 m (MHNS); 16 s, Rancho Luna Beach, 10-30 m (MHNS); 10 s, Rancho Luna Beach, 45 m (MHNS); 16 s, Rancho Luna Beach, 20-54 m (MHNS); 3 c, Los Laberintos, Rancho Luna Beach, 35 m (MHNS); 19 s and 2 sp, Faro los Colorados, 56 m (MHNS); 2 s, Punta Tamarindo, 15 m (MHNS); 3 s, Havana, 30 m. USA: 31 s, off Louisiana, 56-65 m (CHL). Antigua and Barbuda: Antigua, 1 s, 67 m, SE Falmouth Harbour, dredged (CHL). Bahamas: 1 s, French Bay, San Salvador, 15 m, sand ledge (CHL); 4 s, Samphire Cay, NW Nassau, 15 m, base of reef (CHL). Jamaica: 3 s, Priory, St. Ann's, Parish, shallow water (CHL). ABC Islands: 1 s, off Klein Bonaire, Bonaire, 38 m, base of reef (CHL).



Figures 25A-D. *Teinostoma lunense* spec. nov. A-B: holotype, 1.3 mm, (MNCN); C: 1.5 mmm, paratype; both from Rancho Luna Beach, Cienfuegos, Cuba; D: protoconch.
Figuras 25A-D. Teinostoma lunense *spec. nov. A-B: holotipo, 1,3 mm, (MNCN); C: 1,5 mmm, paratipo; ambas de Playa Rancho Luna, Cienfuegos, Cuba; D: protoconcha.*

Description: Shell (Figs. 26A-F) with 3 ¾ rounded whorls, solid, smooth, rounded aperture, umbilicus partially occluded. Protoconch (Fig. 26G) of barely one whorl and about 230 µm in diameter, with a smooth surface and a strong varix at its end. Teleoconch of about 2 ¾ whorls. Dorsally convex with very numerous, curved, prosocline growth lines; ventrally, very slightly convex, with the same growth lines. Umbilicus narrow and deep, partially occluded by the callus that originates between the columella and the internal lip, callus small and semicircular. Aperture rounded, peristome continuous.

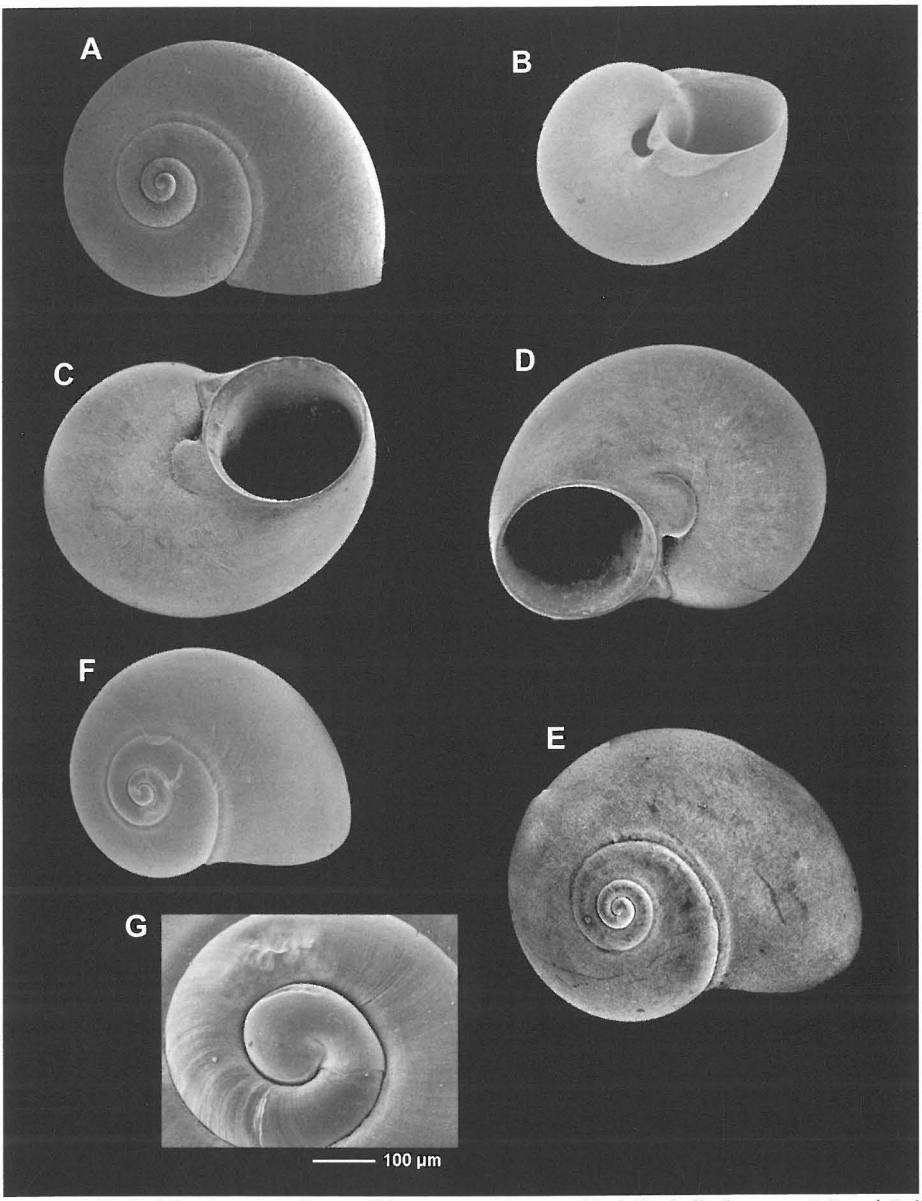
Dimensions: Holotype 3.0 mm in diameter and 2.0 mm in height. Our shells reach 2.85 mm in maximum diameter.

Operculum multispiral with a central nucleus.

Habitat: Species with wide bathymetric distribution, recorded between 18 and 122 m depth. In Cuba, it was found in sediments collected between 5 and 56 m; the living material examined was collected on coralline sandy bottom between 20 and 56 m. In Cuba, off Rancho Luna Beach and Yaguanabo, living specimens were collected at 30-36 m on *Halimeda* sp.

Distribution: Previously known from USA: North Carolina (PORTER, 1974), Florida (PILSBRY & MCGINTY, 1945a), Louisiana (ODÉ, 1987); Colombia (GARCIA, 2002); Brazil: Rio de Janeiro (RIOS, 1994); Abaco, Bahamian islands (REDFERN, 2001). Cuba: Cienfuegos Bay.

Remarks: This is a characteristic species, with its surface totally smooth, the aperture rounded, and the umbilicus partially closed by the callus; these characters differentiate it from other congeneric species. Its callus is similar to that of *T. incertum*, but the lack of ornamentation in the protoconch and teleoconch differentiate them.



Figures 26A-G. *Teinostoma cocolitoris* Pilsbry & McGinty, 1945. A-F: shells, between 2.0 and 2.6 mm, Cienfuegos Bay, Cuba; G: protoconch.
Figuras 26A-G. Teinostoma cocolitoris *Pilsbry & McGinty, 1945. A-F: conchas, entre 2,0 y 2,6 mm, Bahía de Cienfuegos, Cuba; G: protoconcha.*

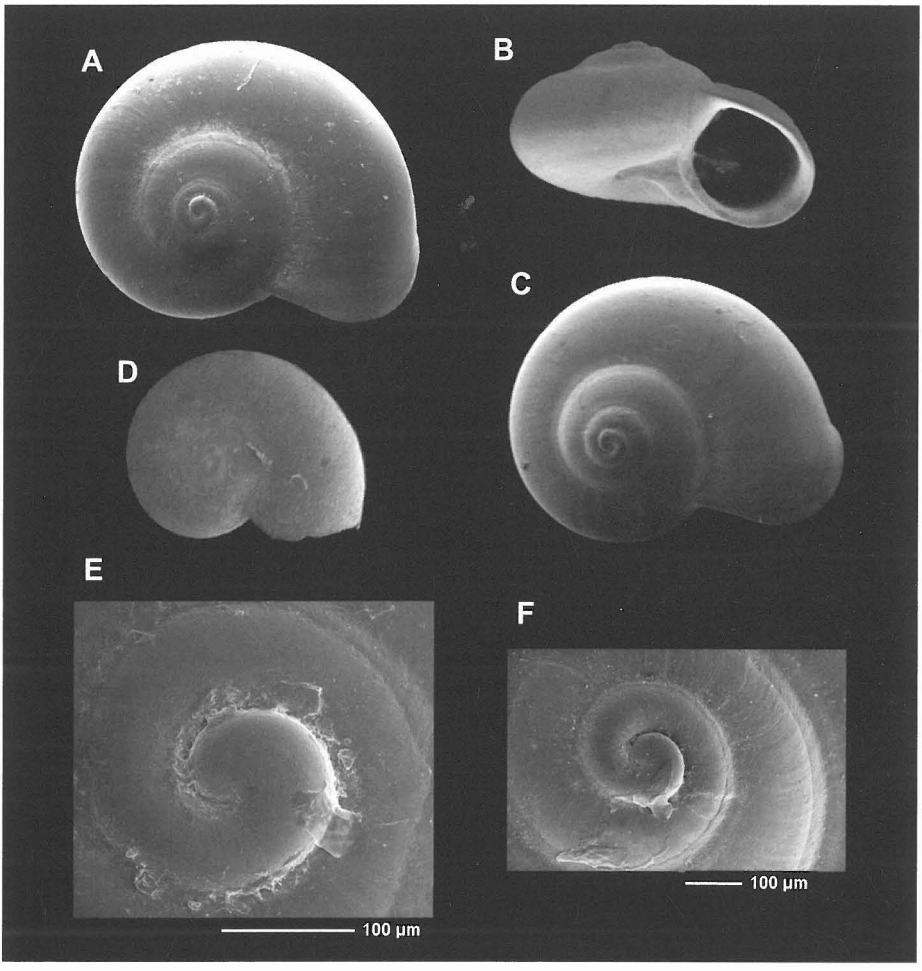
Teinostoma helicinum spec. nov. (Figures 27A-F)

Type material: Holotype (Fig. 27A) in MNCN (15.05/55064) and 2 paratypes (Fig. 27B y 27D) (15.05/55065), from type locality. Other paratypes: AMNH (1 s), FLMNH (448613, 1 s), MNHN (24403, 1 s), IES (2 s), MHNS (100540, 1 s), USNM (1155032, 1 s), CFR (3 s), GHL (1 s) and CFG (6 s).

Other material examined: Cuba: 3 s and 1 sp, Faro de los Colorados, 56 m (MHNS).
Type locality: Rancho Luna Beach, Cienfuegos, Cuba, 40-45 m.
Etymology: The specific name refers to the shape of the peristome, which resembles that of the land snail, subfamily Helicinae.

Description: Shell (Figs. 27A-D) strong, solid, somewhat depressed, with about 4 whorls, whitish, smooth and shiny. Protoconch (Figs. 27E-F) of about 1 ¼ smooth whorls and about 280 μm in diameter. It is separated from the teleoconch by a strong varix. Teleoconch of about 2 ½ whorls, totally smooth.

Convex dorsally with very numerous, curved, prosocline growth lines; ventrally, very slightly convex, also with the same growth lines. Periphery



Figures 27A-F. *Teinostoma helicinum* spec. nov.; A: holotype, 2.0 mm (MNCN); B: paratype, 1.8 mm, (MNCN); C: paratype, 1.9 mm (MNHN); D: paratype, 1.5 mm (MNCN), Rancho Luna Beach, Cienfuegos, Cuba; E-F: protoconch.
Figuras 27A-F. Teinostoma helicinum *spec. nov.; A: holotipo, 2,0 mm (MNCN); B: paratipo, 1,8 mm, (MNCN); C: paratipo, 1,9 mm (MNHN); D: paratipo, 1,5 mm (MNCN), Playa Rancho Luna, Cienfuegos, Cuba; E-F: protoconcha.*

rounded. A well formed suture can be seen by transillumination, being covered by a fine callous coat. Umbilicus entirely covered by a small callus formed by a thickening of the columella. Aperture nearly ovoid without any groove in the upper inner angle. Peristome sharp, externally reflected.

Dimensions: Holotype 2.0 mm in maximum diameter and 0.95 mm of in height.

Habitat: Collected on sandy bottoms between 20 and 56 m depth.

Distribution: Only known from Cienfuegos, Cuba.

Remarks: *Teinostoma helicinum* spec. nov. may be distinguished from its congeners by the fine and narrow callous layer which covers the suture, by the small umbilical callus, and particularly by the outwardly deflected peristome as seen in some species of terrestrial shells of the subfamily Helicinae.

It may be distinguished from *T. ciskae*, *T. goniogyrus* and *T. lenticulare* because these have the teleoconch surface totally covered by punctiform incisions; from *T. clavium* and T. *nesaeum* because these have the teleoconch covered totally or partially by spiral cords, and from *T. lerema*, *T. umbilicatum* and *T. biscaynense* because these have the protoconch totally covered by a fine callous layer. From *T. megacallus* it can be distinguished by its externally reflected peristome and the smaller umbilical callus, and from *T. megastoma* by the sunken protoconch of the latter.

Teinostoma megastoma (C.B. Adams, 1850) (Figures 28A-C)

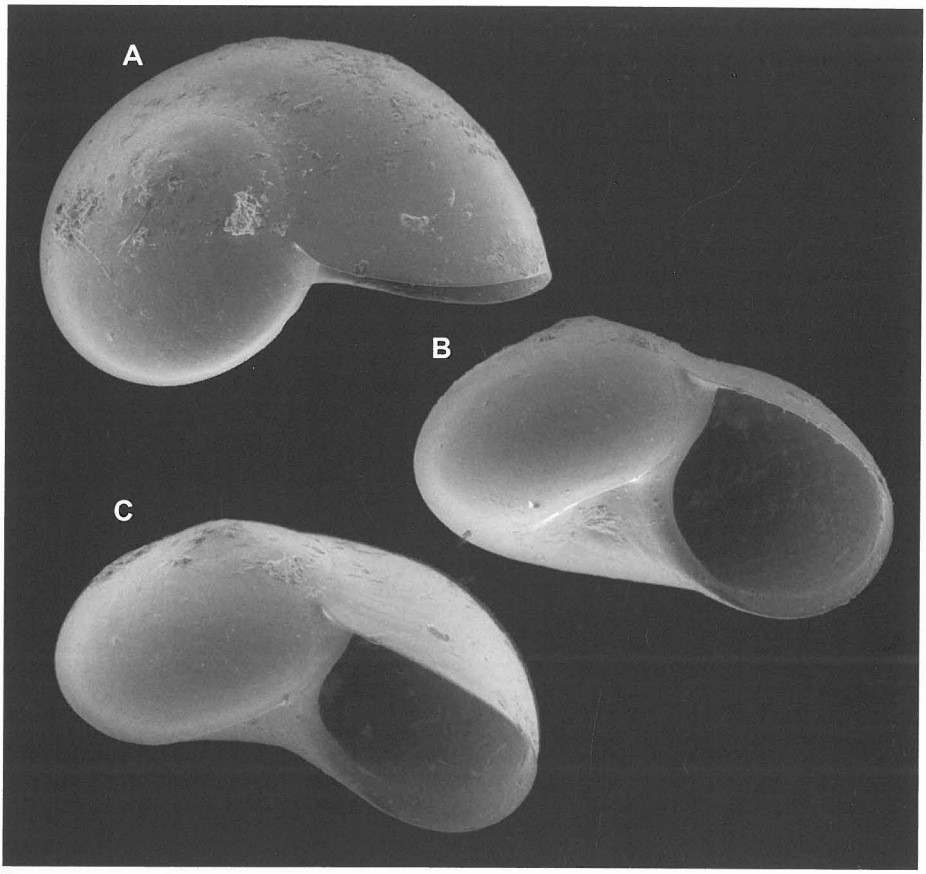
Vitrinella megastoma C.B. Adams, 1850. *Monog. Vitrin.*: 7. [Type locality: Port Royal, Jamaica].
Teinostoma biscaynense auct. non Pilsbry & McGinty, 1945a.

Type material: Lectotype (Figs. 28A-C) in MCZ (156269) after CLENCH & TURNER (1950: 306, plate 35, fig. 2). At present it is destroyed. There are 11 paralectotypes (labeled as paratypes), from Jamaica in MCZ (186187). A neotype is here designated from one of these shells (Figs. 28A-C) of this lot.
Material examined: Bahamas: 1 s, Olympus Reef, 12 mi. NNW West End, Grand Bahama, 36 m, coralline algae fragments (CHL). USA: Florida: 1 s, Spoil, Apac Pit, Sarasota Co., fossil (CHL); 1 s, 32 mi. E St. Augustine, St. Johns Co. 27 m ft (CHL). Louisiana: 1 s, 71-74 m (CHL).

Description: We repeat the original description in C.B. ADAMS (1850): *"Much depressed, transversely ovate: white, translucent: smooth and shining: apex very obtuse: spire convex, but little elevated: whorls a little more than three, moderately convex, with a distinct suture; last whorl very large, rapidly increasing in the last part, well rounded: aperture scarcely modified by the last whorl: umbilical region very widely and deeply indented. Mean divergence about 130°; length of spire 0.01 inch; total length .033 inch; greatest breadth 0.06 inch, least breadth 0.045 inch"*.

PILSBRY (1946) mentioned the original description and figured the species for the first time. He complemented the description: *"The shell is transparent, glassy, quite thin and globose for* Teinostoma, *with very large aperture, and very small, sloping umbilical callus, which is flat or slightly concave, the base rising around it. The wholly superficial suture is bordered by a false sutural line by transparence; sometimes this gives the illusion of a deeply impressed suture. Diameter: 2 mm, height 1.2 mm"*. And he follows: *"This was rather abundant. By the very small umbilical callus it agrees with* Pseudorotella, *as Miss Bush has noted on the label. The "paratype" figured is the largest in the lot. Adams's measurements were apparently from a smaller one. Except in size, the dozen specimens are all very much alike"*.

Shell (Figs. 28A-C) solid, smooth, whitish and shiny; spire of a little more than 3 rapidly-expanding whorls. Teleoconch with about 2 whorls, smooth except for fine growth lines. Periphery



Figures 28A-C. *Teinostoma megastoma* (C.B. Adams, 1850). A-C: neotype, 1.5 mm, Jamaica (MCZ 156269).
Figuras 28A-C. Teinostoma megastoma *(C.B. Adams, 1850). A-C: neotipo, 1,5 mm, Jamaica (MCZ 156269).*

rounded. Suture seen by transillumination to be covered by a fine coat of shell material which also covers the protoconch and the first teleoconch whorl. Each whorl covers much of the previous one. Callus completely covers the umbilicus. Aperture oval, not modified. Base concave, umbilicus totally covered by a fine callus.

Maximum reported size: 2.5 mm

Habitat: Species with wide bathymetric distribution, recorded between 0 and 123 m depth. Collected alive between 0 and 42 m. It lives in mangroves, sand, muddy, and rocky bottom. Shallow soft bottom (DÍAZ MERLANO & PUYANA HEGEDUS, 1994). In Cuba, most of the samples were collected between 4 and 10 m.

Distribution: Recorded from Port Royal, Jamaica (C.B. ADAMS, 1850; CLENCH & TURNER, 1950); from Colón and Bocas Island, Panama (OLSSON & MCGINTY, 1958); from St. Croix, Virgin Islands (NOWELL-USTICKE, 1959); from USA: Louisiana, Texas; Mexico: Campeche State, Yucatan State, Quintana Roo (MOORE, 1964; ODÉ, 1987); from NE Florida (LEE, 2009); from North Carolina and south of the Caribbean Sea, and Portete, Costa Rica (HOUBRICK, 1968); from Campeche to Ciudad del

Carmen and Zacatal, from Ninum Point to Campeche, from El Cuyo to Ninum Point, from Yalkupul Point to Cerritos Islands and from Isla Mujeres to Holbox Island, Mexico (VOKES & VOKES, 1984); from North Carolina to the western Caribbean (ABBOT, 1974); from Cuba (ESPINOSA *ET AL.*, 1985); from Portete and Moín, Costa Rica (ROBINSON & MONTOYA 1987); from Curaçao, Aruba and Bonaire (DE JONG & COOMANS, 1988); from North Carolina to Panama and Colombia (DÍAZ MERLANO & PUYANA HEGEDUS, 1994); from Brazil: Rio de Janeiro (RIOS, 1994). Martinique, in our material.

Remarks: The tube with the label of the lectotype in MCZ (156269) had only a few fragments; so, from the lot of the paralectotypes (MCZ 186187) we have selected one shell which is here designated the neotype.

PILSBRY (1946) accepted the descriptions and figured the species of *Vitrinella* described from Jamaica by C.B. Adams, but he placed this species in the genus *Teinostoma*, subgenus *Pseudorotella*, agreeing with the opinion of Katherine J. Bush noted in the label of lectotype, MCZ 156269. The globose aspect, the rounded aperture, the umbilical callus reduced to a fine slightly convex callous coat, and the protoconch placed below the following whorl separate it from its congeners. LEE (2009, fig. 325) figured a shell dredged at 27 m, 32 miles East of St. Augustine, Florida, but in our opinion this is not *T. megastoma* but a member of the Cornirostridae, genus *Tomura*. In the web page www.jaxshells.org, as well as in "Marine Shells of Northeast Florida" as in "Selected Images of Western Atlantic Gastropods" there is a SEM micrograph under the name of *Teinostoma megastoma* which, in our opinion, is *T. umbilicatum* (=*T. cryptospira*). The two species are similar because they have the spire partially covered by a fine callous coating. The differences between them are that in *T. umbilicatum* the callous cap completely covers the shell, including the protoconch; the spire is flat, the umbilical callus is stronger and the aperture is almost circular. In *T. megastoma* the spire is more elevated, the umbilical callus is finer, and the aperture ovoid.

Teinostoma cienfuegosense spec. nov. (Figures 29A-D)

Type material: Holotype (Fig. 29A) in MNCN (15.05/55061) and 2 paratypes (Figs. 29B-C) in MNCN (15.05/55062). Other paratypes: MHNS (100547, 10 s), AMNH (2 s), NHMUK (2 s), MNHN (24393, 2 s), (IES, 2 s), (CFR, 3 s) and (CFG, 6 s).

Other material examined: Cuba: 11 s, Cienfuegos Bay, 10 m (MHNS); 4 j, Cienfuegos Bay, 20-30 m (MHNS). Martinique: 1 c, Pointe Borgnesse, 12 m, sandy-muddy bottom, close the reef (CJP).

Type locality: Cienfuegos Bay, sta. 12a, 22°07'N 80°26'W, 4 m.

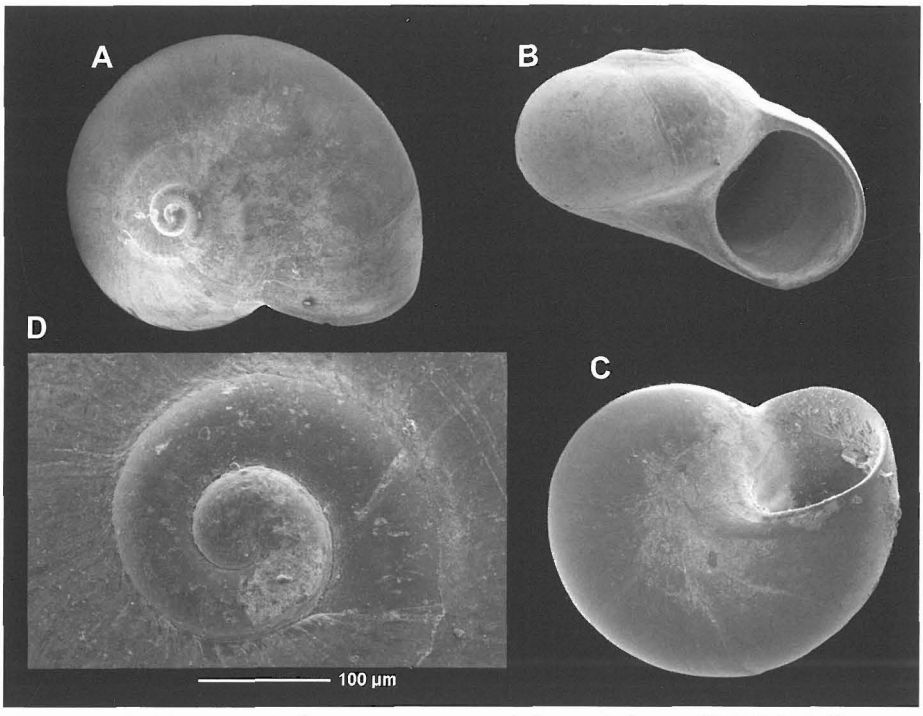
Etymology: The specific name refers to the type locality, an area extensively sampled by the second author.

Description: Shell (Figs. 29A-C) a little depressed, rounded, trochiform, solid, smooth, whitish and shiny; spire formed by 4 rapidly-increasing whorls. Protoconch (Fig. 29D) bulbous, of about 1 ¾ whorls, and of two clearly differentiated stages, the first one smooth and the second with small dispersed granules; it measures about 280 μm and it is placed below the next whorl. Teleoconch with about 2 ¼ whorls, totally smooth except for fine growth lines. Periphery rounded. Suture barely distinguishable, seen by transillumination to be covered by a fine coat of shell material. Each whorl covers much of the previous one. Callus covers the umbilicus completely.

Dimensions: Holotype is 1.43 mm of maximum diameter.

Maximum reported size: 2.5 mm

Habitat: In Cuba, most of the samples were collected between 4 and 10 m in coralline sand bottom.



Figures 29A-D. *Teinostoma cienfuegosense* spec. nov. A: holotype, 1.43 mm (MNCN); B-C: paratypes, 1.2, 1.3 mm, Cienfuegos Bay, Cuba (MNCN); D: protoconch.
Figuras 29A-D. Teinostoma cienfuegosense *spec. nov. A: holotipo, 1,43 mm (MNCN); B-C: paratipos, 1,2, 1,3 mm, Bahía de Cienfuegos, Cuba (MNCN); D: protoconcha.*

Distribution: Only known from Cienfuegos Bay, Cuba.

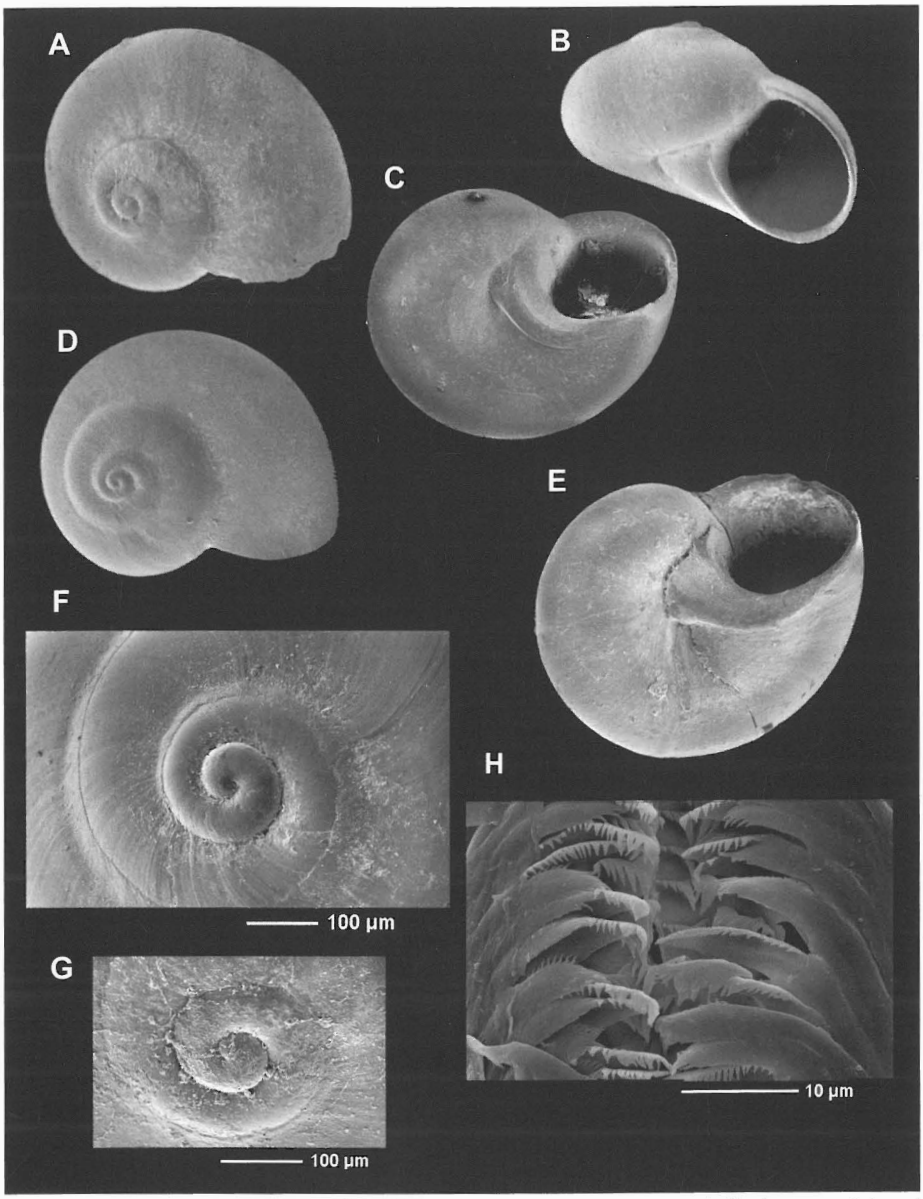
Remarks: Early in the course of this work this species was confused with *T. megastoma* on the basis of the figure of the holotype provided by PILSBRY (1946). *Teinostoma cienfuegosense* spec. nov. bears little similarity to *T. megastoma*, from which it can be distinguished by its uncalloused protoconch and the rounded, almost circular aperture.

The globose aspect, the rounded aperture, the umbilical callus reduced to a fine callous slightly convex coat, and the protoconch placed below the following whorl separate it from its congeners.

Teinostoma parvicallum Pilsbry & McGinty, 1945 (Figures 30A-H)

Teinostoma (Idioraphe) parvicallum Pilsbry & McGinty, 1945a. *The Nautilus*, 59: 4-5, pl. 2, fig. 2. [Type locality: Missouri Key, Florida].

Type material: Holotype in ANSP (181105). Not examined.
Material examined: Cuba: 34 s, Cienfuegos Bay, 22°07'N 80°27'W, 9 m (MHNS); 42 s, Cienfuegos Bay, 10 m (MHNS); 9 s, Rancho Luna Beach, 20 m (MHNS); 5 s, Rancho Luna Beach, 15-54 m (MHNS). Trinidad and Tobago: Tobago: 1 s, Horse Shoe Reef, 15 m, coralline sandy grit near the reef (CJP).



Figures 30A-H. *Teinostoma parvicallum* Pilsbry & McGinty, 1945. A-E; shells, between 1.0 and 1.5 mm, Cienfuegos Bay Cuba; F-G: protoconch; H: radula.
Figuras 30A-H. Teinostoma parvicallum *Pilsbry & McGinty, 1945. A-E; conchas, entre 1,0 y 1,5 mm, Bahía de Cienfuegos, Cuba; F-G: protoconcha; H: rádula.*

Description: In PILSBRY & MCGINTY (1945a: 4-5) and MOORE (1964: 85-87).

Shell (Figs. 30A-E) trochiform, with spire relatively high, umbilical callus medium in size, totally covering the umbilicus in adult individuals. Protoconch (Figs. 30F-G) of about 1 ¾ smooth whorls, and about 270 µm in diameter. Teleoconch of about 2 ¼ whorls, totally smooth except for small growth lines.

Periphery and base rounded. Between the columella and the umbilical callus there is a fine groove. Umbilicus generally closed totally by the callus, except in young individuals, in which a small fissure may persist. Aperture slightly oblique, with a sharp border on the external lip and a continuous peristome.

Dimensions: Holotype 2.0 mm in diameter by 1.5 mm in height. Our shells reach 1.5 mm in diameter and 1.09 mm in height, and being smaller keep the same ratio (D/H: 0.75).

Animal of holotype figured by PILSBRY & MCGINTY (1945a).

Radula (Fig. 30H) taenioglossate, with formula 2+1+R+1+2. Central tooth wide basally, the ventral margin well developed, without denticles. Cutting surface formed by a central large, sharp cusp and 5 denticles of medium size on each side. Lateral teeth similar to the central, their bases are quadrangular and also without denticles; free margin with a central cusp and 4-5 smaller denticles on each side, more elongated than central tooth. Marginal teeth long, narrow, and hook-shaped; the medial aspect with 24-26 weak denticles on the upper outer margin; the outer marginal teeth are inclined outwards in their distal third and possess 15-16 denticles on the upper end of their medial aspects.

Habitat: This species lives under stones between 10 and 50 m in depth. Some authors recorded it in deeper water (up to 90 m) based only on empty shells. Considered a continental species by MOORE (1964) it is widely distributed among the islands of the Caribbean.

Distribution: It has been recorded from the USA: Missouri Key, Florida (PILSBRY & MCGINTY, 1945a); from Puerto Rico (WARMKE & ABBOTT, 1961); from Florida Keys, Texas to Mexico (MOORE, 1964); from Texas (ANDREWS, 1977); from Cuba (ESPINOSA *ET AL.*, 1985); from Venezuela, Sucre and Isla Margarita (PRINCZ, 1986); from Florida to Texas (LYONS, 1989); from Colombia (DÍAZ MERLANO & PUYANA HEGEDUS, 1994); from Abaco, Bahamas (REDFERN, 2001). From Tobago, in the present work.

Remarks: *T. parvicallum* is very similar in general aspect with the shell of *T. incertum*, from which it can be distinguished by the obliteration of the umbilicus by callus even in juvenile shells and in lack of ornamentation on the teleoconch.

Teinostoma megacallum spec. nov. (Figures 31A-E)

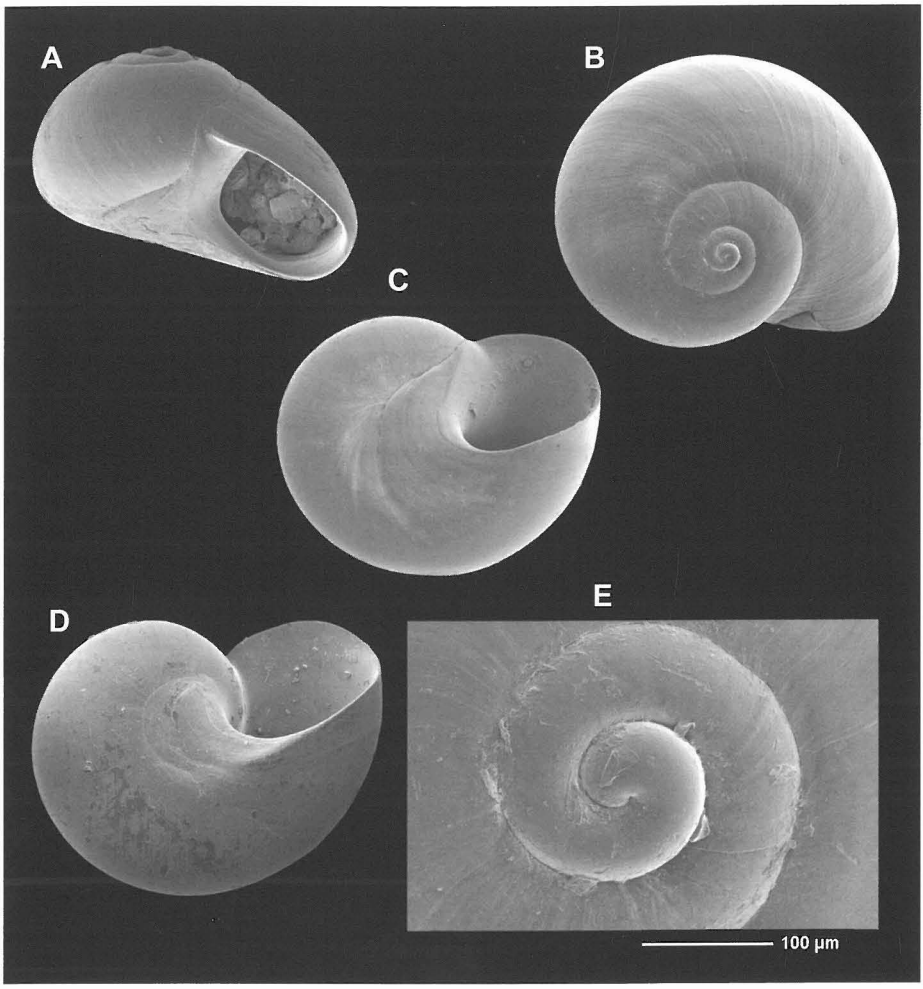
Type material: Holotype (Fig. 31A) in MNCN (15.05/55067), and 2 paratypes (Figs. 31B-C) in MNCN (15.05/55068), from type locality. Other paratypes from Cienfuegos Bay, sta. 12a, 22°07'N 80°26'W, 4 m: MHNS (100548, 1 s, Fig. 31D), MNHN (24394, 1 s), FLMNH (448614, 1 s), AMNH (1 s), CFG (2 s), CFR (2 s).

Other material examined: Cuba: 2 s, Cienfuegos Bay, sta. 12, 22°07'N 80°27'W, 9 m; 10 s, Cienfuegos Bay, sta. 12a, 22°07'N 80°26'W, 4 m; 1 s, Cienfuegos Bay, 20-30 m; 2 s, Rancho Luna Beach, 15-30 m.

Type locality: Cuba, Bahía de Sagua, northeast Cuba, 3-6 m.

Etymology: The specific name refers to the large callus, which characterizes the species.

Description: Shell (Figs. 31A-D) trochoid, pyriform, very solid, almost as wide as high, smooth, umbilical callus very large. Protoconch (Fig. 31E) of about 1 ½ smooth whorls, and about 230 μm in diameter. Teleoconch of about 2 whorls, no ornamentation, with visible suture and rapid expansion. Dorsally convex with very numerous, curved, prosocline growth lines; ventrally, very slightly convex, also with the same growth lines, which are more evident on the dorsum and periphery. Umbilicus totally hidden by a strong



Figures 31A-E. *Teinostoma megacallum* spec. nov. A: holotype, 1.65 mm, Sagua, Cuba (MNCN); B: paratype, 1.5 mm, Sagua, Cuba, (MNCN); C: paratype, 1.6 mm, Cienfuegos, Cuba (MNCN); D: paratype 1.8 mm (MHNS); E: protoconch.

Figuras 31A-E. Teinostoma megacallum *spec. nov. A: holotipo, 1,65 mm, Sagua, Cuba (MNCN); B: paratipo, 1,5 mm, Sagua, Cuba (MNCN); C: paratipo, 1,6 mm; Bahía de Cienfuegos, Cuba (MNCN); D: paratipo 1,8 mm (MHNS); E: protoconcha.*

callus formed by the thickening of the columella and the internal lip. Aperture nearly quadrangular with an expansion of the peripheral labrum, columella wide and almost straight, outer lip sharp, the upper part advanced.

Dimensions: Holotype 1.65 mm in maximum diameter and 1.12 mm of height.

Habitat: In Cuba this species has been collected in sandy grit between 3 and 30 m deep.

Distribution: Only know from Cienfuegos, Cuba.

Remarks: *Teinostoma megacallum* may be distinguished from its congeners by the robust shell and principally by the thick columella and the great size of the umbilical callus.

Teinostoma carinicallus (Pilsbry & McGinty, 1946) (Figures 32A-D)

Teinostoma lituspalmarum auct. non Pilsbry & McGinty, 1945.
Teinostoma (Annulicallus) carinicallus Pilsbry & McGinty, 1946a. *The Nautilus*, 60: 17-18, pl. 2, figs. 6-6b. [Type locality: Missouri Key, Florida].
Pseudorotella carinicallus Pilsbry & McGinty, 1946.
Pseudorotella carinicallum (sic).

Type material: Holotype in ANSP (181979). Not examined.
Other material examined: Florida, USA: 1 s east side, Peanut Island, under rocks (CMK); 1 s, Anclote Key, Pasco Co. (CHL); 1 s, Pelican Shoals, Key West, Monroe Co., 5-7 m, (CHL).

Description: The best description is in MOORE (1964: 101-102) *"Shell depressed, shoulder concave, bearing a low spiral rib at its outer edge; umbilicus surrounded by a strong spiral carina. Spire flattened, formed by four whorls, two in the protoconch and two in the teleoconch. Periphery rounded; umbilical area is bordered with a strong spiral carina. Aperture oblique, parietal callus rather thin. There is a small groove at the upper inner angle"*.

We add: A short channel is formed at the junction of the umbilical keel with the columella. The protoconch (Fig. 32D) is barely detectable due to a fine callous layer which covers the shell dorsally. In the studied material the dorsal cord is prominent and produces a distinct angulation on the shell.

Maximum reported size: 2.7 mm. Our shell (Figs. 32A-C) measures 2.15 mm in diameter and 1.25 mm in height.

Habitat: Depth between 0 to 46 m. The type specimen was taken alive in shallow water. However the species appears to be rare in shallow inshore waters (MOORE, 1964).

Distribution: USA: Florida: East Florida, West Florida, Florida Keys (PILSBRY & MCGINTY, 1946b); Texas (ODÉ, 1987b); Panama (OLSSON & MCGINTY, 1958).

Remarks: This species was collected from the Plio-Pleistocene of St. Petersburg. PILSBRY (1953) stated: *"among the Pliocene specimens there are many in which the spiral angle of the upper surface is wholly absent"*. Our shell presents the typical characters of the species.

T. carinicallus is very similar to *T. lituspalmarum* Pilsbry & McGinty. The main difference between the two species is that *T. carinicallus* is smooth and *T. lituspalmarum* has weak spiral striae.

Teinostoma lituspalmarum Pilsbry & McGinty, 1945

Teinostoma (Annulicallus) lituspalmarum Pilsbry & McGinty, 1945a. *The Nautilus* 59: 7-8, pl. 2, fig. 3. [Type locality: Off Palm Beach, Florida].

Type material: Holotype deposited in ANSP (181103). Not examined.

Description: See PILSBRY & MCGINTY (1945a).

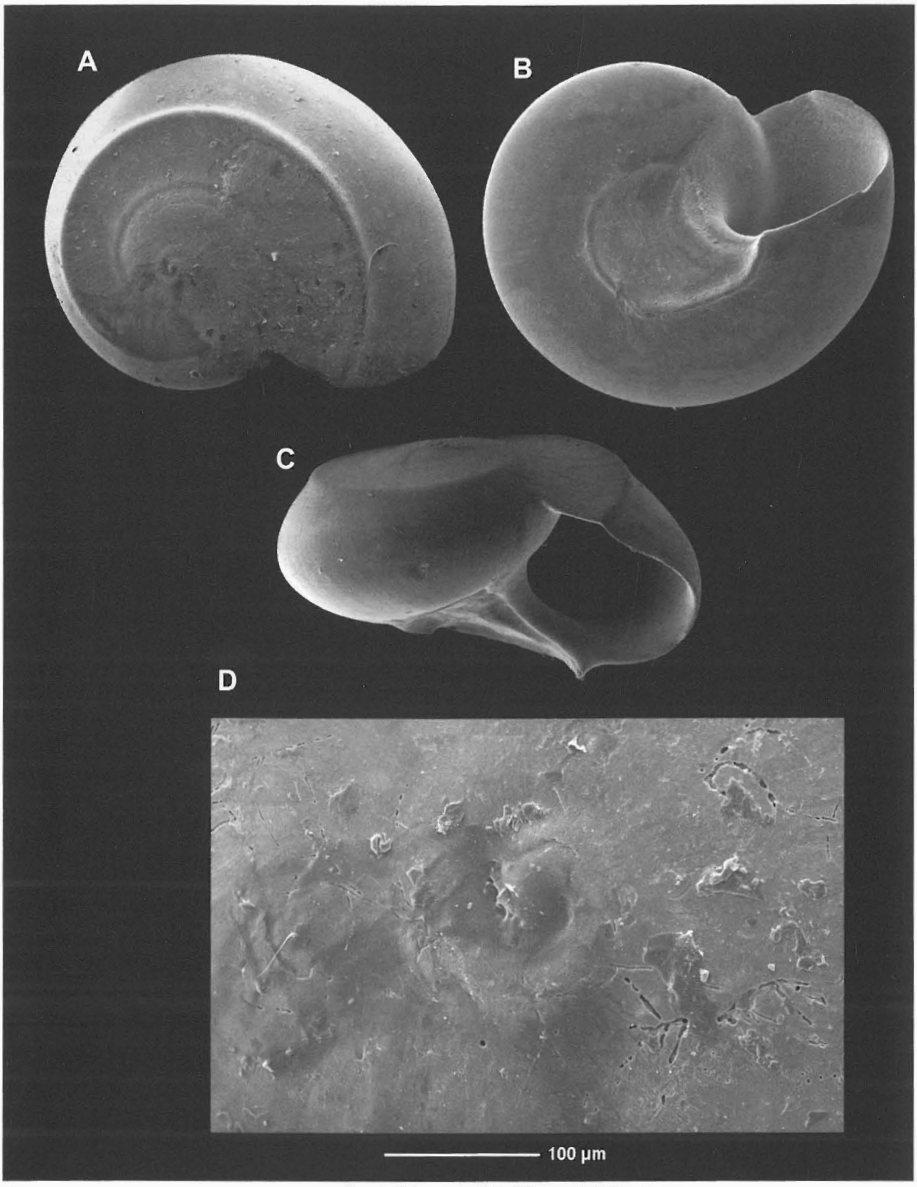
Maximum reported size: 1.7 mm.

Habitat: Rocky reef, in 90 m deep (50 fms).

Distribution: USA: Florida: East Florida (PILSBRY & MCGINTY, 1945a).

Remarks: See also *T. lituspalmarum* auct. = *T. carinicallus*.

Since its original description this species has not been recorded. MOORE (1964: 102-103) mentions: "Teinostoma carinicallus *is very similar to* T. lituspalmarum *Pilsbry and McGinty. The main difference*



Figures 32A-D. *Teinostoma carinicallus* Pilsbry & McGinty, 1946. A-C: shell, 2,15 mm, Peanut Island, Florida (CMK); D: protoconch.
Figuras 32A-D. Teinostoma carinicallus *Pilsbry & McGinty, 1946. A-C: concha, 2,15 mm, Isla Peanut, Florida (CMK); D: protoconcha.*

between the two species is that T. carinicallus *is smooth and* T. litus-palmarum *has weak spiral striae. More material may show that the two are merely forms of the same species, but it is best to keep them separate until the problem can be solved".*

Subfamily TORNINAE Sacco, 1896

Genus *Tornus* Turton & Kingston, 1830

Tornus Turton & Kingston, 1830. *Testacea Britanica*, pp. 438, pl. 7, fig. 9. [Type species: *Helix subcarinata* Montagu, 1803, by monotypy. Recent. Europe].

Adeorbis S. Wood, 1842. *Ann. Mag. Nat. History*, 9:530. [Type species: *Adeorbis subcarinatus* (Montagu, 1803)].

Diagnosis: Shell of small size (2-3 mm), solid, usually depressed, spire with 3-4 whorls. Protoconch smooth, between 1 and 2 whorls (most frequently 1 ¾), not elevated. Teleoconch with strong spiral cords crossed by strong axial ribs. External lip crenulated. Aperture subtrigonal. Operculum ovoid, paucispiral and chitinous.

Habitat: Acording to FRETTER & GRAHAM (1978) and GOFAS, PINTO AFONSO & BRANDAÕ (1985), the true *Tornus* live deeply buried in sand under stones, but they need clean sand through which the water circulates and allows good oxygenation. In The Straits of Gibraltar, Spain it lives with other species in areas with strong current and heavy waves partially buried in a sandy bottom among boulders and stones.

Remarks: Numerous species of *Tornus* have been described from European coasts as well as West Africa. ROLÁN & RUBIO (2002) revised the family Tornidae in the East Atlantic, studying 39 species of which 13 are in the genus *Tornus*. But on the other side of the Atlantic, no species had been described in the genus *Tornus* from either coast of the New World. However, two species previously placed in the genus *Cyclostremiscus* are, in our opinion, members of this genus. The morphology of their shells, very similar to some of the West African coast, is of interest.

Tornus caraboboensis (Weisbord, 1962) (Figures 33A-C)

Cyclostremiscus caraboboensis Weisbord, 1962. *Bulletins of American Paleontology*, 42(193): 140-141, pl. 13, figs. 7-9. [Type locality: La Salina, west of Puerto Cabello, state of Carabobo, Venezuela]. Fossil record.

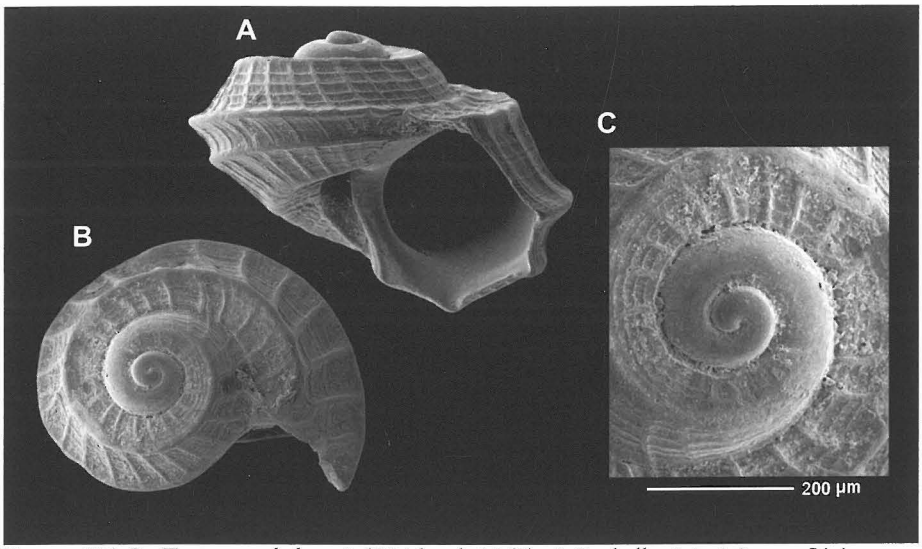
Type material: Type material deposited in PRI (26094). Not examined.
Other material examined: Guatemala: 2 s, Livingston, 2 m (MHNS).

Description: (See WEISBORD, 1962 and ALTENA, 1975). Shell (Figs. 33A-B) with a reticulated surface, produced by the spiral cords crossing the axial ribs. Protoconch (Fig. 33C) of about 1 ¾ smooth whorls, about 260 μm in diameter. Teleoconch sculpture formed by strong keel-like spiral cords placed one on the dorsum, two at the periphery, another one on the base, and finally the last one delimiting the umbilicus. Fine spiral threads are distributed between the keels. Spiral cords and threads are crossed by narrow strongly prosocline axial ribs. Aperture rounded, outer lip with five prominences caused by the ends of the spiral keels. Columella strong, slightly curved.

Dimensions: Holotype 2.3 mm in maximum diameter, but largest shells can reach 3.0 mm. Our material measures 1.23 mm in diameter and 0.82 mm in height.

Habitat: In shallow water. The samples studied were collected in muddy sand bottom at 2 m in depth.

Distribution: Species considered of continental distribution. Recorded from Venezuela (WEISBORD, 1962); Colombia (COSEL, 1986; DÍAZ



Figures 33A-B. *Tornus caraboboensis* (Weisbord, 1962). A-B: shells, 1.1, 1.0 mm, Livingston, Guatemala (MHNS); C: protoconch.
Figuras 33A-B. Tornus caraboboensis *(Weisbord, 1962). A-B: conchas, 1,1, 1,0 mm, Livingston, Guatemala (MHNS); C: protoconcha.*

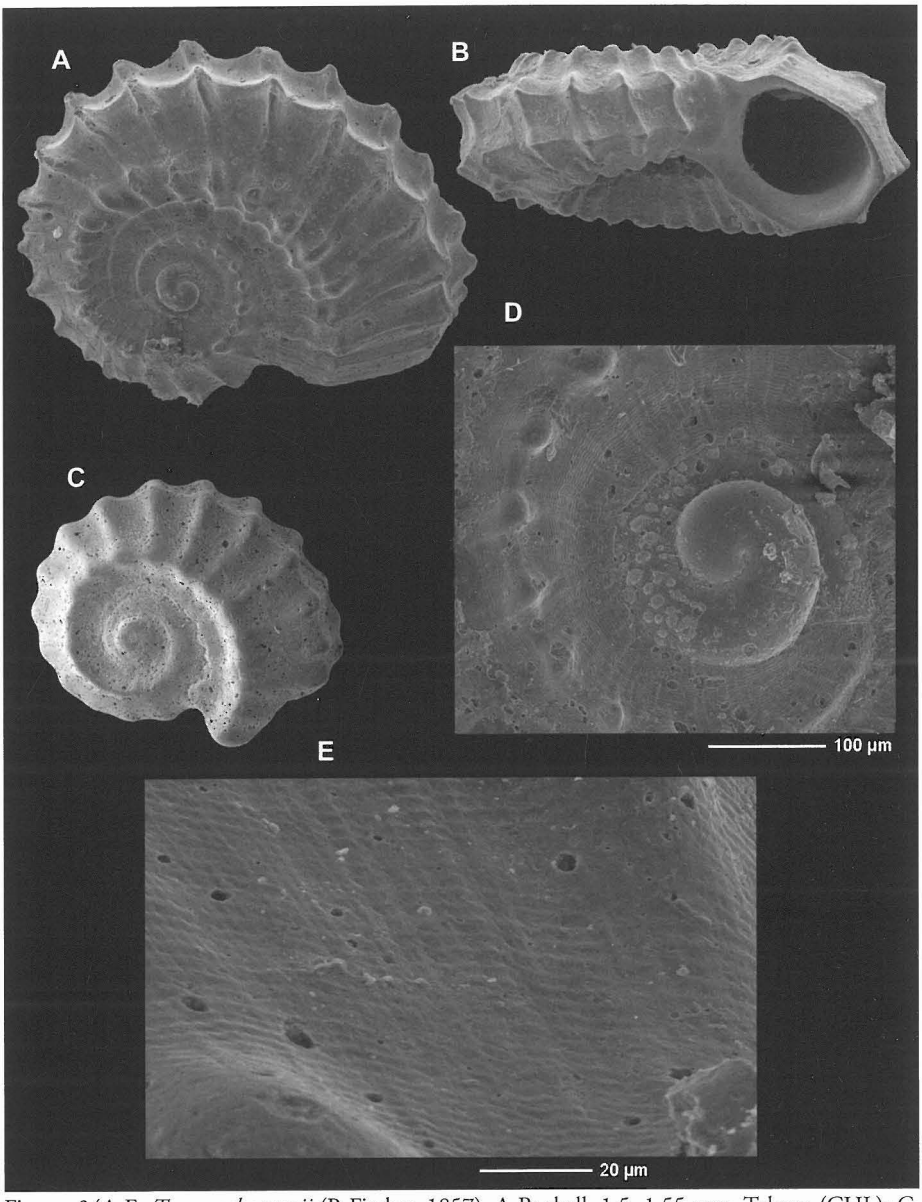
MERLANO & PUYANA HEGEDUS, 1994); Surinam (ALTENA, 1975); Curaçao: Schottegat and Spaanse Waters (DE JONG & COOMANS, 1988); Brazil: Espirito Santo (RIOS, 1994); Guatemala (the present work). The only insular record is that of DE JONG & COOMANS (1988) for Curaçao, very close to the continent, not entirely inconsistent with the "continental" distribution paradigm.

Remarks: This species was described as fossil in the Pliocene of Carabobo, Venezuela. The samples recorded from Surinam are also fossil but derived from the Holocene deposites. The material here studied is recent from Livingstone, Guatemala. By their development stage they seem to be juvenile shells. The morphology of the sculpture (strong cords and fine spiral cordlets crossing with axial ribs forming a characteristic reticule) recall some West African species of Tornidae, *T. subcarinatus* (Montagu, 1803); *T. africanus* Adam & Knudsen, 1969; *T. aemilii* Rolán & Rubio, 2002; *T. erici* Rolán & Rubio, 2002; and particularly *T. umbilicorda* Rolán & Rubio, 2002, a species with which it has considerable similarity. For this reason we have placed *Cyclostremiscus caraboboensis* in the genus *Tornus*.

Tornus schrammii (P. Fischer, 1857) (Figures 34A-E)

Cyclostrema schrammii P. Fischer, 1857. *Journal de Conchyliologie*, 6: 287-288, pl. 10, fig. 11 [Type locality: Guadeloupe].
Cyclostremiscus schrammii (P. Fischer, 1857)

Type material: Type material deposited in MNHN. Lost according to HOUBRICK (1967).
Other material examined: Guatemala: 1 s, Livingstone, 2 m (MHNS). Trinidad and Tobago: Tobago, 4 s, Buccoo (CHL).



Figures 34A-E. *Tornus schrammii* (P. Fischer, 1857). A-B: shell, 1.5, 1.55 mm, Tobago (CHL); C: shell, 1.15 mm, Livingstone, Guatemala (MHNS); D: protoconch, Tobago; E: microsculpture.
Figuras 34A-E. Tornus schrammii *(P. Fischer, 1857). A-B: concha, 1.5, 1,55 mm, Tobago (CHL); C: concha, 1,15 mm, Livingstone, Guatemala (MHNS); D: protoconcha, Tobago; E: microescultura.*

Description: Shell: see P. FISCHER (1857). Shell (Fig. 34A-C) very solid, depressed and whitish in color. Protoconch (Fig. 34D) with 1 ½ whorls, about 230 µm in diameter, with strong tubercles irregularly placed, which are smaller and more numerous near the varix which appears at the transition to the teleoconch. Teleoconch sculptured by 4 strong

nodular spiral cords (one on the dorsum, two on the periphery, and one more on the base. There are 20-22 strong axial ribs. At the crossing points there are nodules. Subsutural area ornamented by fine spiral striae. The nodules of the subsutural cord are more elevated than that of the upper peripheral cord. Aperture rounded, prosocline. Umbilicus wide and deep which allows the previous whorls to be seen.

Dimensions: The holotype is 2.0 mm in diameter. Largest shell, a paratype in MNHN, is 3.2 mm in diameter. Our shells did not exceed 1.55 mm.

Habitat: Recorded from the external reefs (VOKES & VOKES, 1984) and shallow water (ROBINSON, 1991).

Distribution: : It has been recorded from Guadeloupe (P. FISCHER, 1857); from Colón and Bocas Island, Panama (OLSSON & MCGINTY, 1958); from Costa Rica (HOUBRICK, 1967); from Guadeloupe and Central America (HOUBRICK, 1968); from Cancún to the Belize border, Arcas Keys, Alacran reef and Cayos del Norte and Lobos from the Banco Chinchorro, Mexico (VOKES & VOKES, 1984; ROBINSON, 1991); from the Caribbean Sea (ABBOTT, 1974); and from Colombia (DÍAZ MERLANO & PUYANA HEGEDUS, 1994).

Remarks: It is not a very common species, few shells are known even from the type locality. Since the description by P. FISCHER (1857), no new records had been published until HOUBRICK (1967), who figured one of seven shells found in Portete, Provincia Limón, Costa Rica. Houbrick considered this specimen of particular impostance since he reported that the holotype in the MNHN was lost.

Tornus schrammii is very similar in shell morphology to some species from the west coast of Africa such as *T. leloupi*, *T.* aff. *attenuatus*, *T. ryalli*, and *T. rachelae*. These all share a depressed shell sculptured with strong nodulous cords or tubular extensions.

Subfamily VITRINELLINAE Bush, 1897

Marine prosobranchs that have small or minute depressed shells, which are transparent while the animal is alive. The aperture is usually oblique, rounded, and without a terminal varix. There are usually one to three postlarval whorls which may be smooth or sculptured. The operculum is circular and multispiral, and the radula taenioglossate.

The animal has small black eyes, a pair of cephalic tentacles, and a pair of pallial tentacles. Both pairs are provided with mobile cilia for producing respiratory currents and are tipped with long stiff inmobile cilia. The male is equipped with a penis located behind the head and which extends back into the mantle cavity (MOORE, 1964).

In the Recent fauna, there are ten genera grouped within the subfamily Vitrinellinae: *Anticlimax* Pilsbry & McGinty, 1946; *Aorotrema* Schwengel & McGinty, 1942; *Cyclostremiscus* Pilsbry & Olsson, 1945; *Cochliolepis* Stimpson, 1858; *Episcynia* Mörch, 1875; *Parviturboides* Pilsbry & McGinty, 1950; *Pleuromalaxis* Pilsbry & McGinty, 1945; *Solariorbis* Conrad, 1865; *Vitrinella* C.B. Adams, 1850 and *Vitrinorbis* Pilsbry & Olsson, 1952, and all them are present in the geographic area studied. A new genus, *Neusas* Warén & Bouchet, 2001, has been placed provisionally in Vitrinellinae, although the authors considered it in an uncertain systematic position, probably not in the Tornidae

Genus *Anticlimax* Pilsbry & McGinty, 1946

Climacia Dall, 1903: 1633 (Preoccupied, M'Lachlan, 1869 (Neuroptera)).
Climacina Aguayo & Borro, 1946: 11. (Preoccupied by Gemellaro, 1878 (Mollusca)).
Anticlimax Pilsbry & McGinty, 1946. *The Nautilus*, 60: 12.
Type species: *Teinostoma (Climacia) calliglyptum* Dall, 1903 (by monotypy).

Remarks: PILSBRY & OLSSON (1950) revised the genus and gave the following description: *"The shell is wider than high, with a dome-shaped or low-conic spire of few (3 or 4) whorls, carinate periphery and more or less convex base. The protoconch is smooth, of scarcely more than one convex whorl to 1 ¼. Sculpture of close, usually punctate, spiral striation and radial wavelike ribs on the base, sometimes on the upper surface also. The aperture is oblique, quadrangular or triangular, with a thickened peristome, the outer lip is angular or often extended at the termination of the keel. Umbilicus bordered by a spirally emerging callous rib, terminating at the columella or in the genus* Subclimax *it fills the umbilicus"*.

PILSBRY & OLSSON (1950) divided *Anticlimax* into two subgenera:

Subgenus *Anticlimax s. str.*: characterized by having the umbilicus open, bordered by a spiral cord which terminates in the columella in a small triangular callus. Type species: *Anticlimax calliglypta* (Dall).

Subgenus *Subclimax*: characterized by having an umbilicus, totally or partially closed by a solid column which terminates in a callus fused to the columella. Type species: *A. hispanioliensis* Pilsbry & Olsson, 1950.

Nothing is known about the animal of *Anticlimax*. Its generic assignment has been based only on the distinguishing characters of the shell, as the form, the radial folds on the base, the angular form of the external lip, and the spiral grooves in zigzag, among others.

Most of the known species are fossil from the Miocene and Plio-Pleistocene. There are few recent species described, and they occur in North Carolina, Florida and Belize.

AGUAYO & BORRO (1946) described *Canimarina* and placed it provisionally as a subgenus of *Cyclostremiscus*, to accommodate the new species *Cyclostremiscus (Canimarina) crassilabris*.

This species, in their opinion, had characters which could ally it to the genera *Cyclostremiscus, Miralabrum, Teinostoma* and *Climacia*, but also it could be considered as a new genus due to its own different unique characters.

Almost at the same time, PILSBRY & MCGINTY (1946a) introduced the replacement name *Anticlimax*, for the monotypic genus containing *Teinostoma (Climacia) calliglyptum* Dall, 1903, since the genera *Climacia* Dall, 1903 and *Climacina* Aguayo & Borro, 1946, based on the same type species, were unavailable homonyms (see above).

FABER (2007) considers *Canimarina* a valid genus, comparing it only with *Cyclostremiscus*, and places it in Vitrinellidae solely on the basis of its lacking "a clear apertural varix". Also he considers *Solariorbis decipiens* Olsson & McGinty, 1958 a junior synonym of *Cyclostremiscus (Canimarina) crassilabris*. Since then databases treat *Canimarina* as a valid genus and place it in Vitrinellinae. In our opinion, *Canimarina* must be considered a synonym of *Anticlimax* for the following reasons:

-FABER (2007) considered it a valid genus without comparison to the genus *Anticlimax*.

-the description of the subgenus is not sufficiently detailed to allow distinction from other species placed in *Anticlimax*.

-*Cyclostremiscus (Canimarina) crassilabris* shares all the generic characters of *Anticlimax*.

-The stated date of publication for *Anticlimax* is July and that of *Canimarina* is August of the same year, giving the former priority.

Anticlimax crassilabris (Aguayo & Borro, 1946) (Figures 35A-G)

Cyclostremiscus (Canimarina) crassilabris Aguayo & Borro, 1946. *Revista de la Sociedad Malacológica "Carlos de la Torre,"* 4(2): 46-47, lám. 3, figs. 1-3. [Type locality: Barranco E. del rio Canímar. Formación "Yumurí," Upper Miocene. Matanzas, Cuba].

Solariorbis decipiens Olsson & McGinty, 1958. *Bulletins of American Paleontology*, 39: 28-29, pl. 3, figs. 5, 5a, 5b. [Type locality: Bocas Island, Panama].

Type material: Type of *Cyclostremiscus (Canimarina) crassilabris* deposited in Museo Poey, University of Havana. Type of *Solariorbis decipiens* in ANSP (211914). Not examined.

Other material examined: Cuba: 1 s, Carenas Key, Cienfuegos Bay, 3 m, under stones (MHNS); 1 s, in the channel to Cienfuegos Bay, 30 m (MHNS); 3 c, Rancho Luna Beach, 20 m (MHNS); 7 s Cienfuegos (MHNS). Martinique: 1 c, Pointe Borgnesse, 12 m, from coralline sandy grit near the reef (CJP).

Description: The description of the species in AGUAYO & BORRO (1946) is as follows: *"Concha diminuta, deprimida; espira cónica, algo elevada sobre el plano de la ultima vuelta. Provista de 2 ½ vueltas, la primera lisa, las siguientes esculpidas radial y espiralmente. Escultura axil o radial formada por costillitas salientes (unas 30 en la última vuelta) que desaparecen al 1/8 final de la última vuelta. Estas costilla persisten, aunque menos marcadas en el cuerpo de la última vuelta; pero desaparecen en la base al llegar a la quilla espiral inferior. Base lisa. Escultura espiral formada por dos quillas salientes que delimitan el contorno de la última vuelta, quedando articuladas por las costillas axiles. Además hay líneas finas espirales entre ambas quillas, y algunas evanescentes en la base. Cuerpo de la última vuelta de contorno cuadrangular visto de perfil. Ombligo estrecho, parcialmente cubierto por un callo. Al final de la última vuelta la quilla superior se proyecta tangencialmente hacia la abertura, formando un engrosamiento muy marcado en ángulo recto. Abertura subtriangular, engrosada por una callosidad formada por la citada prolongación de la quilla superior. Borde parietal de la abertura con un callo peculiar en su ángulo superior".*

The protoconch (Figs. 35F-G) is about 230 μm in diameter, and it is totally smooth. The teleoconch is totally covered by fine spiral cordlets. On the dorsum, strong radial ribs may be observed. They are slightly prosocline and, on the last 1/3 of the body whorl, become more fine and numerous and are crossed by the spiral cordlets to form a reticule. Basally the shell is very convex and expresses strong radial undulating ribs. The external lip is angled in the peripheral area and is projected forward forming a characteristic extension. Umbilicus small, partially occluded by the thickening and extension of the columella.

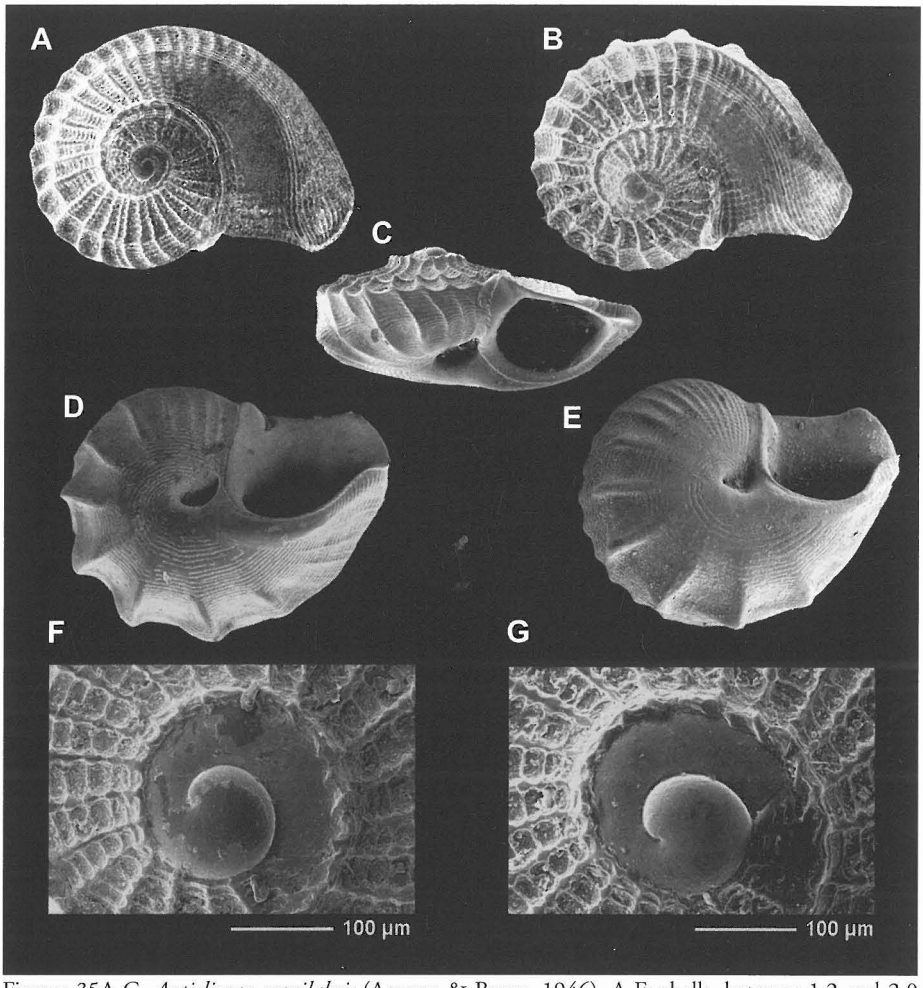
Dimensions: The holotype of *Cyclostremiscus (Canimarina) crassilabris* is 1.20 mm in maximum diameter and 0.78 mm in height. The holotype of *Solariorbis decipiens* measures 1.25 mm in maximum diameter and 0.50 mm in height.

Animal and radula unknown.

Distribution: Panama: Bocas Island (OLSSON & MCGINTY, 1958; FABER, 2007); and Portobello (FABER, 2007); Dominica (FABER, 2007); Cuba: Matanzas, fossil (AGUAYO & BORRO, 1946); Rancho Luna Beach, Cienfuegos Bay and Martinique, in the present work.

Habitat: In Cuba this is a uncommon species, having been found in sediments collected between 20 and 50 m in depth.

Remarks: *Anticlimax crassilabris* was described as fossil from the Upper Miocene, "Yumurí" Formation. AGUAYO & BORRO (1946) mention that the base is lacking sculpture. There are axial undulating folds, which do not appear in the original figuration. These axial folds on the base are observed in the individual examined from Cuba.



Figures 35A-G. *Anticlimax crassilabris* (Aguayo & Borro, 1946). A-E; shells, between 1.2 and 2.0 mm, Rancho Luna Beach, Cuba (MHNS); F-G: protoconch.
Figuras 35A-G. Anticlimax crassilabris *(Aguayo & Borro, 1946). A-E; conchas, entre 1,2 y 2,0 mm, Playa Rancho Luna, Cuba (MHNS); F-G: protoconcha.*

OLSSON & MCGINTY (1958) described *Solariorbis decipiens* on the basis of only one specimen. Which such limited material it has not been possible to know the morphological variability of the shell. Our shells conform to the description of *Solariorbis decipiens* as well as that of C. crassilabris and have a consistency in the distinguising characters. Principal among these features are the sculpture of the dorsum formed by axial ribs with spiral threads in the intervals and the strongly convex base with strong undulating radial folds. External lip angular and apparently not channeled by the keel. All specimens are characteristic of the genus *Anticlimax,* and for this reason we have placed the species in this genus and not in *Solariorbis*. At the same time the similarity of *Anticlimax crassilabris* to *Solariorbis decipiens* Olsson & McGinty impels us to consider the two synonymous.

Anticlimax glabra spec. nov. Rubio, Rolán & Pelorce (Figures 36A-D)

Type material: Holotype (Fig. 36A) and a paratype (Figs. 36B-C) in MNHN (24200).
Type locality: Grenadines, Martinique, Pointe Borgnese, 12 m.
Etymology: The specific name refers to the smooth surface of the shell in opposition to other congeneric species.

Description: Shell (Figs. 36A-C) very small, lenticular, spire consists of 3 rounds of rapid growth. Protoconch (Figs. 36D) slightly projecting, about 180 μm in diameter, and totally smooth. Teleoconch totally smooth except for the first quarter whorl in which there is ornamentation formed by spiral cords and axial ribs that intersect to form a characteristic reticulate sculpture. There is a thick subsutural cord that begins at the protoconch and ends in the parietal area of the aperture, forming a thick callus. Basally the shell is more convex than dorsally and withouth strong radial undulating ribs. Aperture oval and with a small groove at the upper inner angle; the external lip is angled at the periphery; columella straight, inner lip reflected toward the umbilicus. A thin horny layer covers the entire umbilical area.

Dimensions: The holotype measures 1.00 mm and the paratype 1.06 mm.

Animal and radula unknown

Distribution: Known only from the type locality.

Habitat: Collected in muddy sand at the base of the reef, at a depth of 12 m.

Remarks: *Anticlimax glabra* spec. nov. is very similar to *Anticlimax crassilabris* to the point that we thought that it represented eroded specimens of that species. But the characters are constant in both known specimens, and they are very characteristic of this new species. The protoconch shape, the angular, unchanneled external lip, the subsutural cord, and its similarity to *A. crassilabris* militated for its placement in *Anticlimax* although it also shares characteristics with *Teinostoma*.

Anticlimax glabra spec. nov. differs from *A. crassilabris* by its lack of dorsal and basal ornamentation, by its rounded periphery and by having its umbilicus completely covered by a thin horny layer.

Anticlimax decorata Rolán, Fernández-Garcés & Rubio, 1997 (Figures 37A-D)

Anticlimax decorata Rolán, Fernándes-Garcés & Rubio, 1997. *Iberus*, 15(1): 31-34. figs. 1-2 [Type locality: Rancho Luna Beach, Cienfuegos, Cuba].

Type material: Holotype in MNCN (15.05/27420) (Figs. 37A-B). Paratypes in the following collections: AMNH, NHMUK, CFG, IES, MHNS.
Other material examined: Cuba: 1 c, Rancho Luna Beach, 10-20 m.

Description: See ROLÁN, FERNANDEZ-GARCÉS & RUBIO (1997). Shell (Figs. 37A-B). Protoconch (Fig. 37D); microsculpture (Fig. 37C).

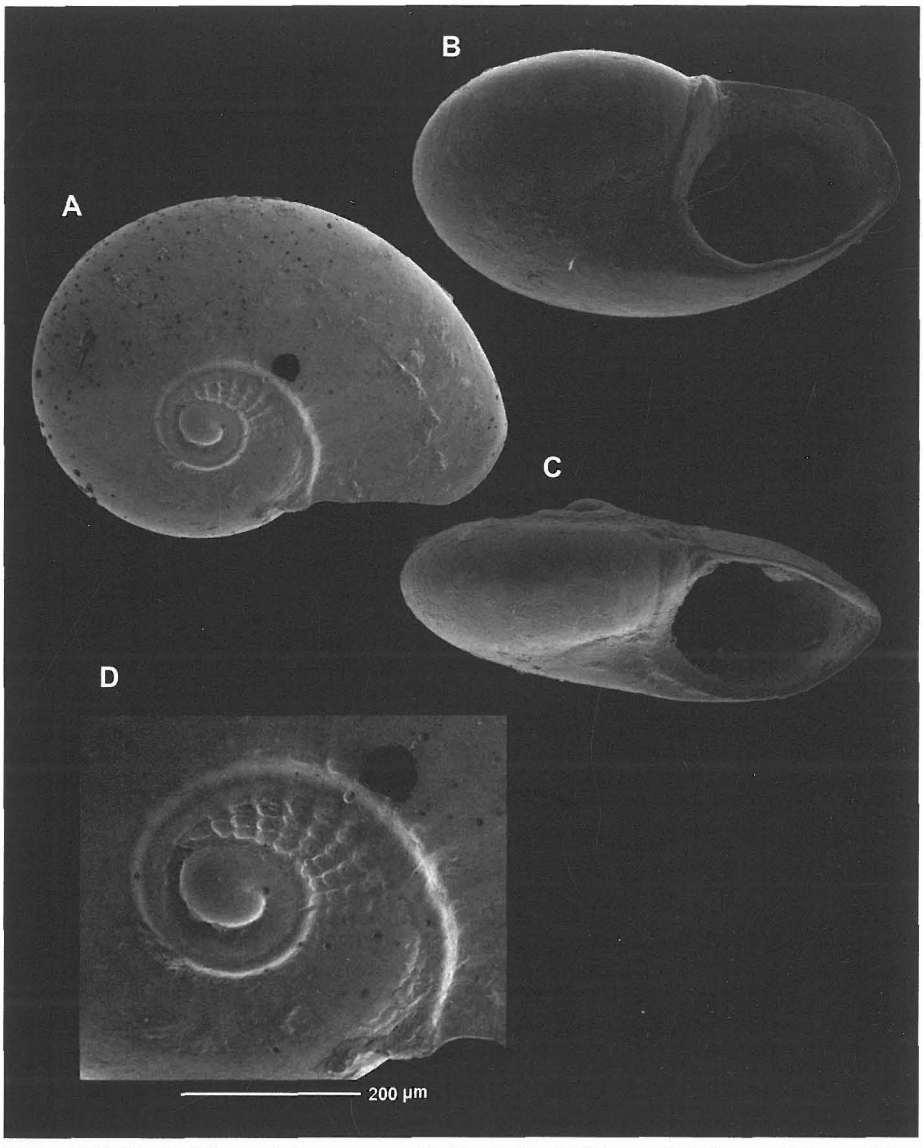
Dimensions: Holotype 1.4 mm in maximum diameter.

Animal and radula unknown.

Distribution: Only known from Cuba.

Habitat: Unknown.

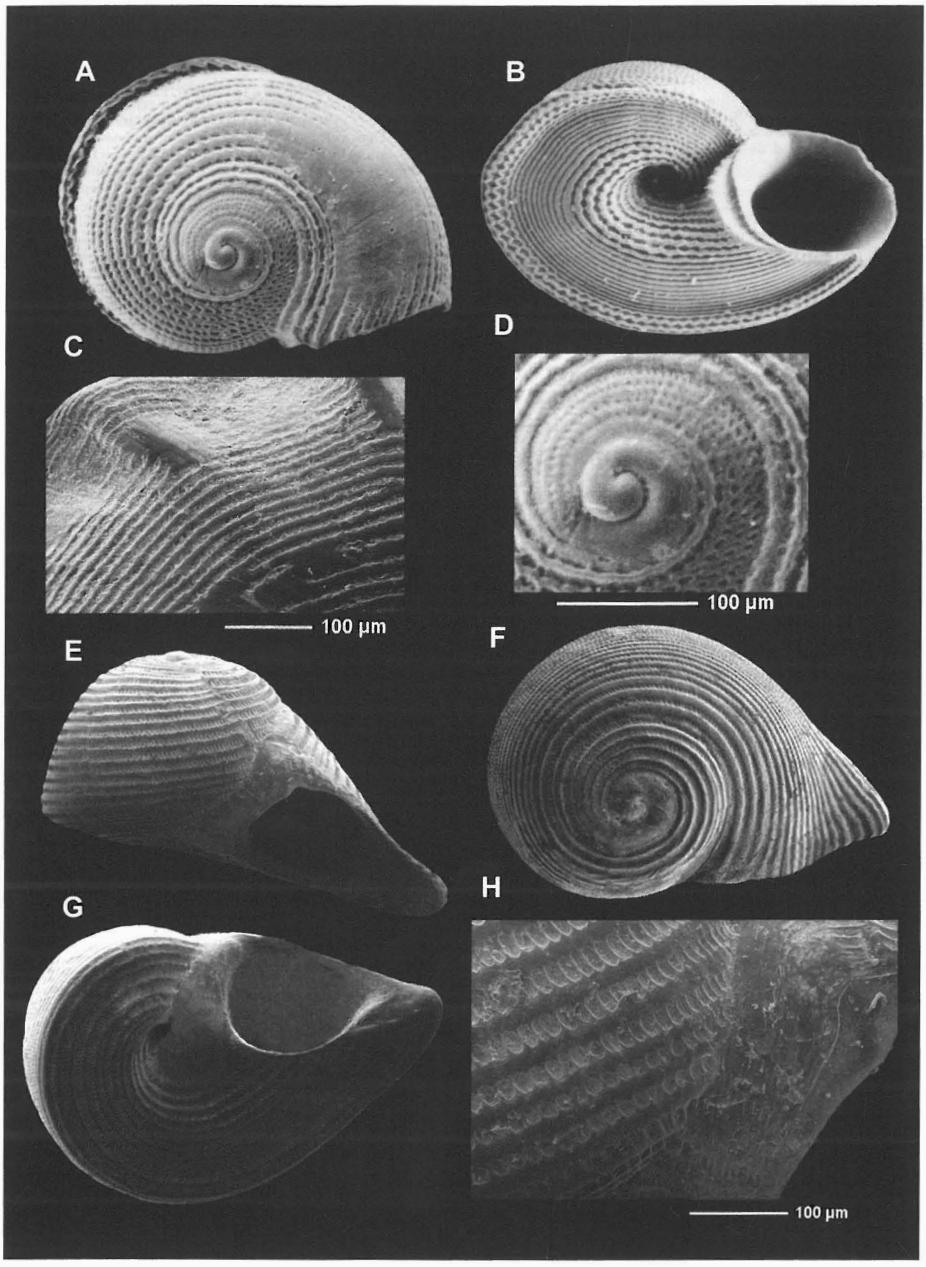
Remarks: The genus *Anticlimax*, as has been noted above, is divided in two subgenera: *Anticlimax* and *Subclimax*. PILSBRY & OLSSON (1950) mentioned that there is no species demonstrating intergradation between these subgenera. Nevertheless, *A. decorata* presents morpho-



Figures 36A-D. *Anticlimax glabra* spec. nov. Rubio, Rolán & Pelorce. A: holotype, 1.0 mm, Martinique (MNHN); B-C: paratype, 1.06 mm, Pointe Borgnese, Martinique (MNCN); D: protoconch.

Figuras 36A-D. Anticlimax glabra *spec. nov. Rubio, Rolán & Pelorce. A: holotipo, 1,0 mm, Martinique (MNHN); B-C: paratipo, 1,06 mm, Pointe Borgnese, Martinique (MNCN); D: protoconcha.*

logical characters which are intermediate. The open umbilicus and lack of columellar callus would place it in *Anticlimax s. st.*, but the absence of axial sculpture on the base and of any kind of prolongation of the labrum, suggest *Subclimax*. We prefer to employ only the full generic assignment in this report.



Figures 37A-D. *Anticlimax decorata* Rolán, Fernandez-Garcés & Rubio, 1997. A-B: holotype, 1.4 mm, Rancho Luna Beach, Cuba (MNCN); C: details of sculpture; D: protoconch.
Figures 37E-H. *Anticlimax proboscidea* (Aguayo, 1949). E-G: shells, 1.4, 1.4, 1.6 mm, Rancho Luna Beach, Cuba; H: detail of the microsculpture.
Figuras 37A-D. Anticlimax decorata *Rolán, Fernandez-Garcés & Rubio, 1997. A-B: holotipo, 1,4 mm, Playa Rancho Luna, Cuba (MNCN); C: detalle de la escultura; D: protoconcha.*
Figuras 37E-H. Anticlimax proboscidea *(Aguayo, 1949). E-G: conchas, 1,4, 1,4, 1,6 mm, Playa Rancho Luna, Cuba; H: detalle de la microescultura.*

Anticlimax proboscidea (Aguayo, 1949) (Figures 37E-H)

Teinostoma (Anticlimax?) proboscidea Aguayo, 1949. *Revista de la Sociedad Malacológica "Carlos de la Torre,"* 6: 93-94, pl. 4, fig. 5. [Type locality: Camarioca, Matanzas, Cuba].

Type material: Holotype in the Museo Poey (n° 12902), Havana, Cuba.
Other material examined: Antigua and Barbuda: Redonda island, 1 c, among rocks, 5-15 m. Cuba: 1 s, Rancho Luna Beach, 10-20 m; 1 s, Baracoa, 15 m; 2 s, Cienfuegos Bay, 15 m. ABC Islands: 1 s, 50 mi. off Palm Beach, Aruba, 5 m (CHL).

Description: This is the text in the original description (AGUAYO, 1949): *"Concha diminuta, sólida, blanca, en forma de domo, base casi plana, periferia obtusamente angular; ombligo marcado por una línea microscópica. Provista de 3 ½ vueltas de espira, de las cuales las nucleares (1 ½ vueltas) son lisas, y las restantes, con numerosas líneas espirales microscópicamente punticuladas (unas 15 en la última vuelta, desde la sutura hasta la periferia). Base con una escultura similar de 12 líneas espirales punticuladas. Región umbilical con un callo que no obtura por completo el umbilicus, dejando una pequeña cisura muy estrecha. Última vuelta prolongada tangencialmente de una manera semejante a la del género* Miralabrum *Pilsbry y Olsson, 1945. Abertura transversalmente ovoidal, pero casi subcircular, prolongada en un estrecho canal en el ángulo basal externo. Un grueso callo une a la abertura con la región parietal y columelar de la concha".*

The protoconch has a little more than one whorl, with a diameter of about 310 μm and under high magnification it can be seen that the surface is slightly roughened.

The teleoconch (Figs. 37E-G) is totally covered by evenly-spaced spiral cords, which present small ovoid small ovoid cells in their interspaces. Aperture triangular, the external lip is elongated basolaterally to produce an acute angulation at its lateral margin. Aside from this feature, the lip lacks an internal channel. Peristome thickened. The columellar callus is extended towards the base partially closing the umbilicus.

Dimensions: Holotype is 1.7 mm in maximum diameter. Our shells measure 1.55 mm in maximum diameter and 0.74 mm in height.

Animal and radula unknown.

Distribution: MOORE (1965) considered it endemic to Cuba. DE JONG & COOMAN (1988) recorded it in Bonaire and Aruba (5 sps). REDFERN (2001) mentions numerosous shells from Abaco, Bahamas, collected in sediment from 23 m in depth. One shell from Redonda (Antigua and Barbuda) confirms its presence for the Lesser Antilles.

Habitat: It is an uncommon species. We have it from sediments collected between 10 and 20 m in depth, but the holotype came from 40 m.

Remarks: AGUAYO (1949: 94) stated that the general aspect of *T. proboscidea* is similar to that of *Teinostoma pilsbryi* McGinty, 1945, from which it is distinguished by its small size, lack of the globose callus in the umbilicus, and the prolongation at the end of the last whorl. The domed shape and the aforementioned projection have similarity to some species of the genus *Anticlimax* Pilsbry & McGinty, 1946.

Teinostoma pilsbryi McGinty, 1945 is smaller and has a different umbilical callus.

Climacia tholus Pilsbry and McGinty, 1946 is smaller and has a different umbilical callus.

Anticlimax pilsbryi (McGinty, 1945) (Figures 38A-C)

Teinostoma pilsbryi McGinty in Pilsbry and McGinty, 1945. *The Nautilus*, 58: 142-143, pl. 1, fig. 5. [Type locality: One and one half miles off Cape Florida, 70 feet].

Climacia tholus Pilsbry & McGinty, 1946a. *The Nautilus*, 59: 79-80, pl. 1-1b, 2-2a. [Type locality: About four miles off Carysfort Light, Florida].

Type material: Holotype of *Teinostoma pilsbryi* in ANSP (181080). Holotype of *Climacia tholus* in ANSP (181290). Not examined.
Other material examined: Florida, USA: 1 s, Tarpon Springs, Hillsborough County, dredged in 12 m at SW of Anclote Key (CMK).

Description: The shell (Figs. 38A-B) has a dome shaped spire, peripheral keel at the base, a heavy callus which partly or completely fills the umbilicus, sculpture of many low close-set zigzag grooves, and low radiating waves on the base. Protoconch (Fig. 38C) of 1 ½ smooth whorls, size about 240 μm, without any varix at the transition to the teleoconch. Sculpture formed by fine spiral zigzag grooves. There are about 20 on the base and 22-23 on the dorsal aspect of the body whorl. A thick ridge borders the umbilicus, and a heavy callus fills it partly or completely. Aperture of triangular shape, a little oblique. Parietal callus well developed, columella very strong and extended towards the umbilicus. There is no sulcus at the convergence with the peripheral keel.

Holotype of *Teinostoma pilsbryi* 3.4 mm in diameter and 2.0 mm in height. The photographed shell measures 1.9 mm in diameter.

Habitat: This is a species of wide bathymetric distribution having been collected between 0 and 152 m in depth. MOORE (1986) considered it a continental species living in shallow water on mud bottom.

Distribution: USA: Florida: East Florida (MCGINTY, 1945; PILSBRY & MCGINTY, 1946a), Texas (ANDREWS, 1977); Mexico: Campeche State, Yucatan State, Quintana Roo (ODÉ, 1987b); Venezuela: unlocalized (PRINCZ, 1982). South Florida, Texas and Mexico (MOORE, 1964; EMERSON & JACOBSON, 1976).

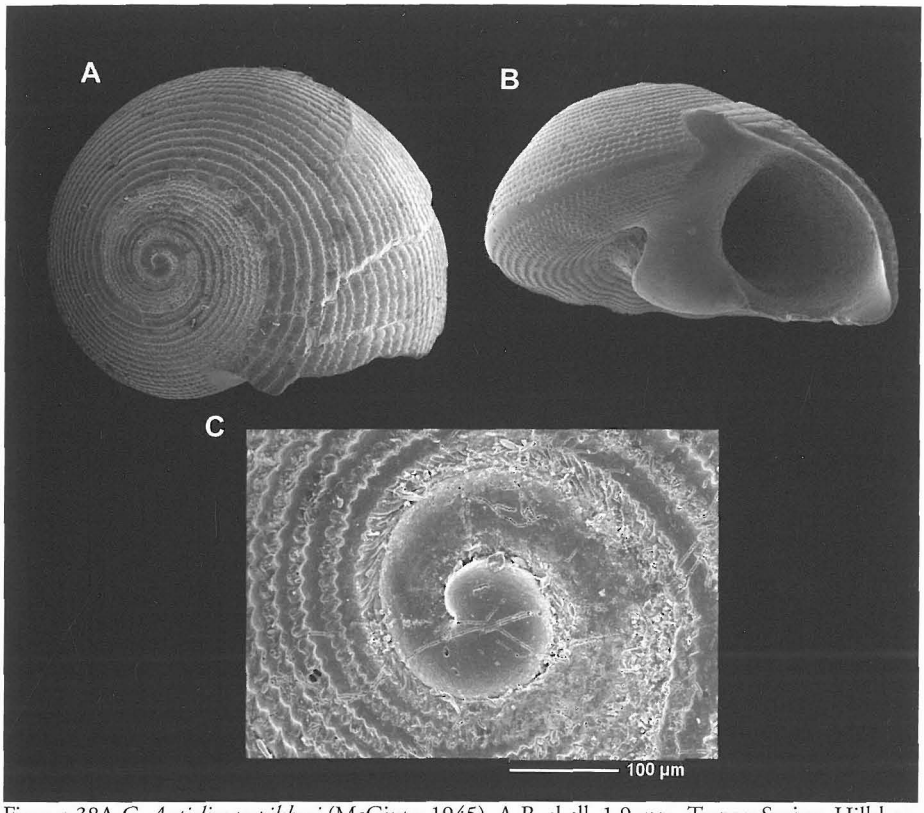
Remarks: MOORE (1964: 167) synonymyzed *Teinostoma pilsbryi* McGinty, 1945 and *Climacia tholus* Pilsbry & McGinty, 1946a, saying that the species has a considerable variation in size and extension of the umbilical callus and that these characters overlapped between the two taxa to the extent that one could not distinguish the two. We agree with this conclusion. The only difference between *A. pilsbry* and *A. tholus* is the size of the umbilical callus, which in *A. pilsbry* is large, reflected outward and occluding the umbilicus, which is narrow and deep. *A. pilsbryi* shows considerable variation in the size and extent of the umbilical callus. The lack of radial costulation on the base, observed in the holotype of *T. pilsbry*, was considered a consequence of the immaturity of the specimen. Moore placed both species in *Anticlimax*.

Anticlimax locklini Pilsbry & Olsson, 1950 (Figures 39A-D)

Anticlimax locklini Pilsbry & Olsson, 1950. *Bull. Amer. Paleont.*, 33: 114, nº 135, pl. 2, figs. 8, 8a, 9. [Plio-Pleistocene of Shell Creek, Florida].

Type material: Holotype in ANSP (nº 18393). Not examined.
Other material examined: Nicaragua: 1 s, Witties Reef, 20-30 m. (MHNS).

Description: This is the original description in PILSBRY & OLSSON (1950): *"The shell has a low-conic truncate upper surface, a carinate periphery and rather flatly convex base. The spire is small, occupying about one-third of the diameter of the shell. There are 3 ¼ whorls, the first 1 ¼ glossy, convex and projecting very slightly, the next whorl narrower, the penultimate whorl having several low radiating waves*



Figures 38A-C. *Anticlimax pilsbryi* (McGinty, 1945). A-B: shell, 1.9 mm, Tarpon Spring, Hillsborough Co., Florida (CMK); C: protoconch.
Figuras 38A-C. Anticlimax pilsbryi *(McGinty, 1945). A-B: concha, 1,9 mm, Tarpon Spring, Hillsborough Co., Florida (CMK); C: protoconcha.*

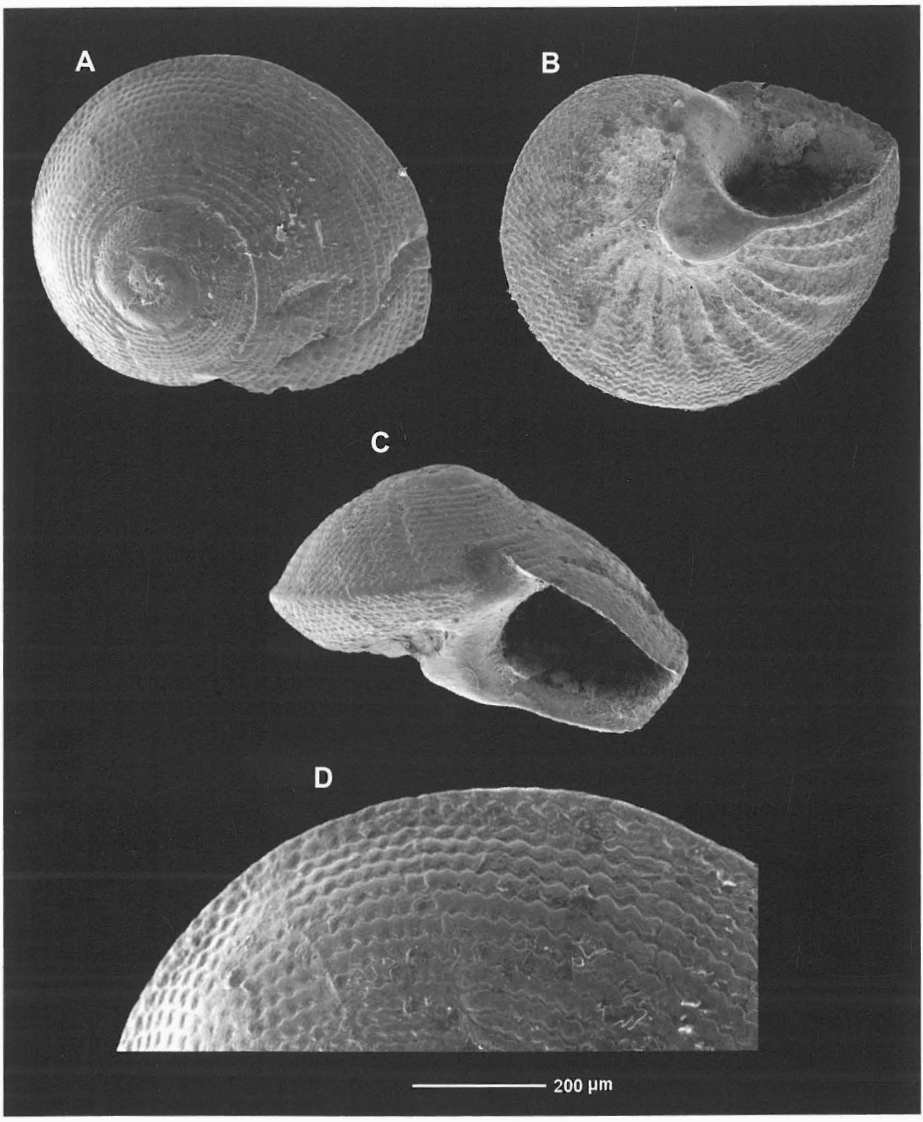
which do not extend upon the last part of the whorl. The last whorl has nearly straight lateral slopes, concave above the peripheral keel and closely marked with punctuate spiral striae. The base has about 12 somewhat protractively radiating wavelike ribs and weak, partly effaced striae. The aperture is triangular. The umbilicus is filled by a callus, forming a raised, convex pad in connection with the columellar callus, a small umbilical notch left next to the parietal callus".

Habitat: Our shell (Figs. 39A-C) was collected on a coralline bottom between 20 and 30 m in depth.

Distribution: Only know as a fossil species from Plio-Pleistocene of Shell Creek and St. Petersburg, Florida (PILSBRY & OLSSON, 1950); off Yucatan, Mexico (TREECE, 1980) and Witties Reef, Nicaragua.

Remarks: PILSBRY & OLSSON (1950) reported: *"This species differs from related Miocene forms by reduction of the radial waves of the upper surface to a few grouped near the middle of the penultimate whorl. The umbilical callus pad is quite unlike the complete one of* A. annae, *and* A. locklini *has a more pronounced peripheral keel than that species, the whorl being concave above it. As in other species, the number of radiating ribs varies individually".*

TREECE (1980) considered *A. locklini* a recent species recorded off Yucatan. Our shell confirms that *A. locklini* is a recent species.

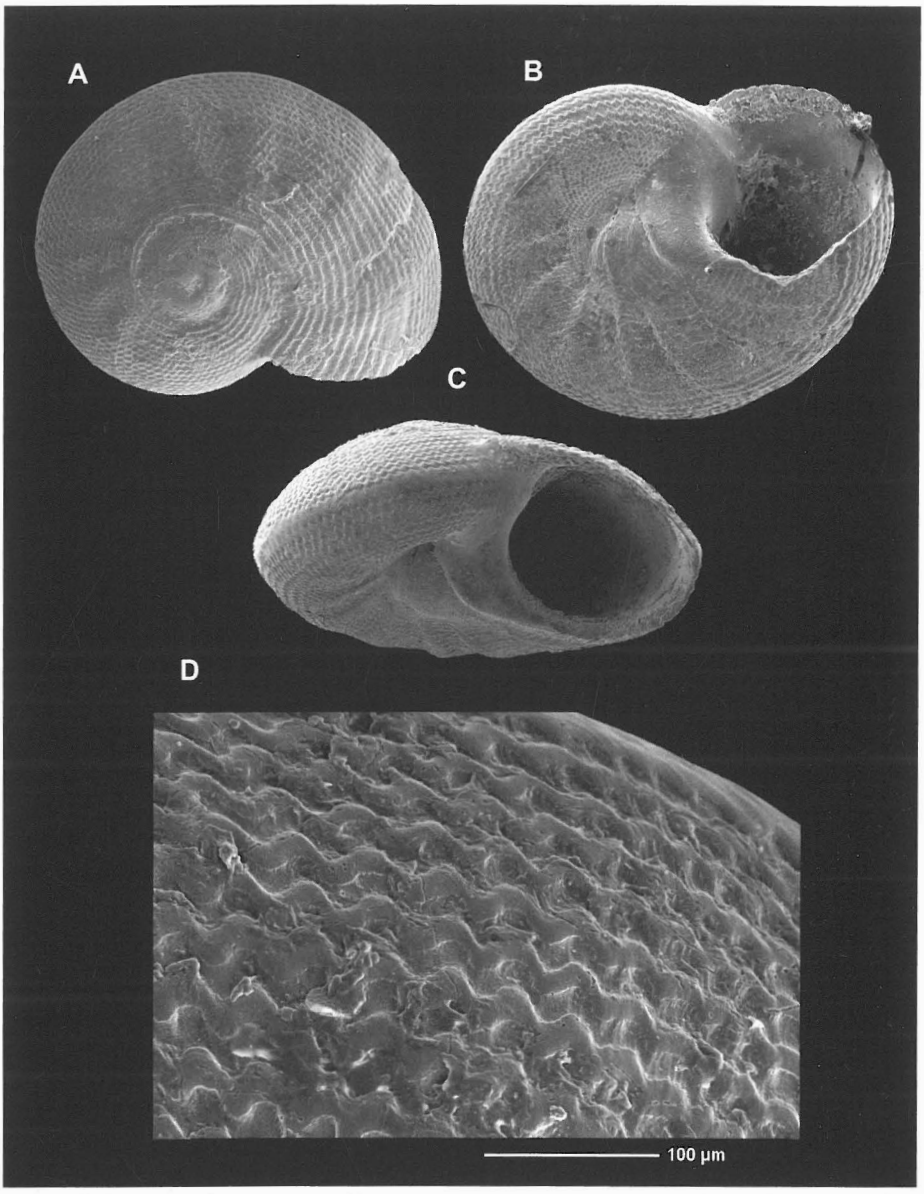


Figures 39A-D. *Anticlimax locklini* Pilsbry & Olsson, 1950. A-C: shell, 1.3 mm, Witties Reef, Nicaragua (MHNS); D: microsculpture.
Figuras 39A-D. Anticlimax locklini *Pilsbry & Olsson, 1950. A-C: concha, 1,3 mm, Witties Reef, Nicaragua (MHNS); D: microescultura.*

Anticlimax annae Pilsbry & Olsson, 1950 (Figures 40A-D)

Anticlimax annae Pilsbry & Olsson, 1950. *Bull. Amer. Paleont.*, 33: 113. nº 135: 11, pl. 3, figs. 12 a-b. [Type locality: Plio-Pleistocene of St. Petersburg, Florida –fossil species-].

Type material: Holotype and paratype in ANSP (nº 18397). Not examined.
Other material examined: Mexico: 1 s, Puerto Morelos, 24 m, Yucatan (MHNS).



Figures 40A-D. *Anticlimax annae* Pilsbry & Olsson, 1950. A-C: shell, 1.6 mm, Puerto Morelos, Yucatan (MHNS); D: microsculpture.
Figuras 40A-D. Anticlimax annae *Pilsbry & Olsson, 1950. A-C: concha, 1,6 mm, Puerto Morelos, Yucatán (MHNS); D: microescultura.*

Description: This is the original description (PILSBRY & OLSSON, 1950): *"The rather strong, solid shell is convex below, and in the form of a low truncate cone above the angular periphery. The spire is very narrow, level or slightly sunken. There are about three and one-third whorls the first 1 ¼ glossy, convex, the next narrow and depressed at first, but increasing rapidly near its end. The*

last whorl is very wide, sloping to the periphery. Sculpture of punctuate spiral grooves, about twenty on the upper surface, the base with similar but weaker grooves. Radiating sculpture of rather strong waves on the penult whorl and about half of the last whorl, the base having about 8 to 15 stronger radiating waves which fade out near the periphery. The aperture is subtriangular, a little effuse at the peripheral angle. The thick parietal callus extends well forward, and with the rather flattened, semicircular, columellar lobe, completely closes the umbilicus".

Holotype is 2.5 mm in diameter and 1.35 mm in height. Our shell (Figs. 40A-C) is 1.6 mm in diameter.

Habitat: Abundant in the Pliocene deposits of St. Petersburg. Our material was collected in sediments from coralline bottom.

Distribution: Only known as a fossil from St. Petersburg and Orlando, Florida. Our specimen is clearly of recent origin.

Remarks: PILSBRY & OLSSON (1950) stated: *"This species differs from* A. hispaniolensis *and* A. hispaniolensis cratera *by the very strong parietal callus and the more flattened callus pad which wholly closes the umbilicus. It is rather variable in size and especially in the development of radial waves on the upper surface. In most specimens examined, waves are present on the first half of the last whorl, but occasionally they do not extend beyond the penultimate whorl, the whole last whorl lacking of them".*

A. locklini is distinguished by the more pronounced peripheral keel and by a small thickened parietal callus and columella.

Anticlimax hispaniolensis cratera Pilsbry & Olsson, 1950 (Figures 41A-E)

Anticlimax hispaniolensis cratera Pilsbry & Olsson, 1950. *Bull. Amer. Paleont.*, 33: 116, nº 135, pl. 2, fig. 6, pl. 3, figs. 11-11b. [Miocene of Banana River, Costa Rica].

Type material: Holotype in ANSP (nº 18403). Not examined.
Other material examined: Nicaragua: 1 s, Witties, 20-30 m (MHNS).

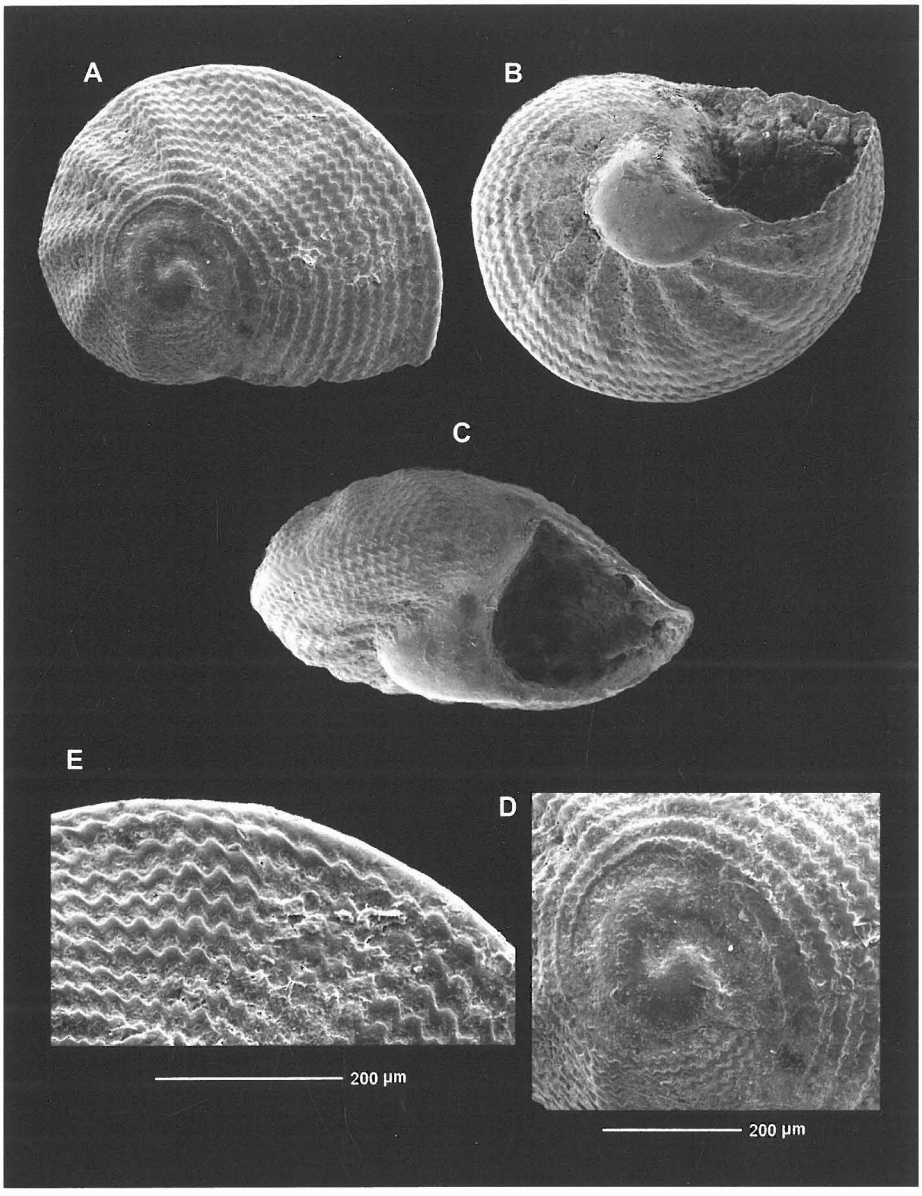
Description: This is the original description (PILSBRY & OLSSON, 1950): *"The shell is similar to* A. hispaniolensis *in form, but the spire is somewhat more sunken. There are 3 1/ 3 whorls, the first two planorboid, narrow. The last whorl rises in the narrowly rounded ridge, crater-like, around the spire, then slopes straightly to the blunty carinate periphery, below which it is rather weakly convex. Sculpture of strongly impressed punctuate (or minutely zigzag) spiral lines and radiating waves on the base. The aperture is triangular, the upper margin of the peristome nearly straight, extending above the peripheral keel. The umbilicus is filled by a callus which expands into a strongly convex semicircular pad, united with the columellar callus".*

Dimensiones: Our shell (Figs. 41A-C) has 1.0 mm in diameter.

Habitat: Our shell was collected in coralline bottom at a depth of 20-30 m.

Distribution: Only known as a fossil species from Miocene of Banana River, Costa Rica (PILSBRY & OLSSON, 1950) and Nicaragua.

Remarks: PILSBRY & OLSSON (1950) stated: *"The close relationship between* A. hispaniolensis cratera *and* A. hispaniolensis *has been noted under the latter species. Both are based upon specimens not fully mature. We believe that the posterior grooved commissure of the aperture, conspicuous in these specimens, would be nearly or wholly obliterated and the peris-*



Figures 41A-E. *Anticlimax hispaniolensis cratera* Pilsbry & Olsson, 1950. A-C: shell, 1.0 mm, Witties, Nicaragua (MHNS); D: protoconch; E: details of the microscupture.
Figuras 41A-E. Anticlimax hispaniolensis cratera *Pilsbry & Olsson, 1950. A-C: concha, 1,0 mm, Witties, Nicaragua (MHNS); D: protoconcha; E: detalle de la microescultura.*

tome thickened in the adult stage, as in A. annae".

This species has some similarity to *A. locklini*, from which it can be distinguished by the shape and larger extension of the columellar callus as well as the suppression of the radiating waves on the base.

Genus *Aorotrema* Schwengel & McGinty, 1942

Aorotrema Schwengel & McGinty, 1942. *The Nautilus*, 56: 17 (as a subgenus of *Cyclostrema*).
Type species: *Cyclostrema (Aorotrema) pontogenes* Schwengel & McGinty, 1942 (by original designation).

Diagnosis: *"Shell with a few whorls which are strongly angular above, at the periphery and around the broadly funnel shaped umbilicus; the aperture subtriangular, peristome only shortly in contact with preceding whorl or free".*

Remarks: Four species from the western Atlantic have been included in the genus *Aorotrema*: *A. cistronium* (Dall, 1889a), *A. pontogenes* Schwengel & McGinty, 1942; *A. erraticum* Pilsbry & McGinty, 1945 and *A. gardnerae* Pilsbry, 1953. The first three were considered as recent species while *A. gardnerae* was considered a fossil species from the Miocene. Of the recent species, *A. cistronium* and *A. pontogenes* have been considered valid species. MOORE (1964: 189), after the examination of the holotype of *A. erraticum*, decides that it is a juvenile of *Turbo castanea* Gmelin, as a result of the similarity of the details of the protoconch, shape, and teleoconch sculpture. Also, after the examination of a paratype of *A. pontogenes* he considered that it is a juvenile shell probably of an *Astraea*. With respect to *A. gardnerae*, the fossil species from the Miocene, he stated that by its shape it could be also a juvenile *Turbo*. Therefore the similarity between the species of *Aorotrema* with young *Turbo* or *Astraea* is evident, the latter differing by their possession of a calcareous operculum.

Aorotrema cistronium (Dall, 1889) (Figures 42A-G)

Cyclostrema cistronium Dall, 1889a. *Bulletin of the Museum of Comparative Zoology*, 18: 394, (DALL, 1889b, pl. 42, fig. 11) [Type locality: off the coast of North Carolina [USFC stas. 2595, 2598, 2608, 2610, 2612 (DALL, 1889b)]].

Type material: Type in ANSP (178697). Not examined.
Material examined: Florida, USA: 1 s, E Gulf Blvd, NE end Sand Key (CHL); 42 s, trawled 27 m, 20 mi E St. Augustine, (CHL); 71 s, dived, sponge grunge 36 m, 45 mi E Mayport, Duval Co. (CHL); 1 s, dredged 54 m, 20 mi SE Pensacola Co, (CHL); 4 s, *Ex* batfish trawled, 39-45 m, 60 mi E Ponte Vedra, St. Johns Co. (CHL); 1 s, dredged, 53 m, 65 mi E St. Augustine, St. Johns Co. (CHL). Fossil: 1 s, Pliocene of La Belle, FL (CHL).

Description: The original description by DALL (1889) is as follows:

"Shell small, white, with a polished nucleus, one and half rounded and as many more carinated whorls; spire depressed; radiating sculpture of fine close flexuous threads, which appear chiefly in the interspaces of the spirals, giving the surface a minutely punctate appearance; these extend over the whole surface except of the nuclear whorls; spiral sculpture of on the summit seven or eight, between the carinae six or eight, and on the base ten or fifteen extremely fine threads, even and uniform, with about equal interspaces, some a little granular from the radiating sculpture; beside these there are three very strong carinae; one forms the margin of the nearly flat spire, the second extends horizontally just below the periphery, the space between them deeply excavated; the third forms the edge of the funicular narrow deep umbilicus. The base is conical, excavated just within the peripheral carina;

it rises to the edge of the umbilicus, which is marked by a strong thread, and within is vertically striated. The last whorl descends from the general plane and finally becomes separated from the body whorl; the margin is simple, sharply angulated by the carinations, otherwise the aperture would be ovate, with the columellar side somewhat excavated".

Alt. 1.6; max. diam. 2.0 mm.

Maximum reported size: 2.5 mm.

Habitat: Off the coast of North Carolina, in 22-63 fms (40-130 m), on a sand and gravel bottom, in the warmer area (DALL, 1989a). From sponge-associated debris, in 39 m, East of Mayport, Florida (LEE, 2009).

Depth: 14 to 115 m (live 22 to 46 m).

Distribution: USA: North Carolina (DALL, 1989a), Texas (ODÉ, 1987b) and Florida (LEE, 2009). CAMPBELL (1993) recorded it as a fossil from the Pliocene of Yorktown and Chowan river formations in Virginia.

Remarks: The material examined agrees with that figured by PILSBRY (1953, pl. 54, figs. 5-5c) from St. Petersburg Plio-Pleistocene.

Some shells (Fig. 43E) have a separation of the aperture from the terminal body whorl.

Aorotrema pontogenes (Schwengel & McGinty, 1942)

Cyclostrema (Aorotrema) pontogenes Schwengel & McGinty, 1942. *The Nautilus*, 56: 17-18, pl. 3, fig. 3 [Type locality: South by West of Destin, Florida, 18 miles off shore].

Type material: A paratype in ANSP (178697). Not examined.

Description: This is the original description in SCHWENGEL & MCGINTY, (1942): *"The openly umbilicate, white shell is strongly bicarinate with flattened spire, of 3 whorls, the first two planorboid. The first 1 whorls are smooth, convex, the convexity increasing on the next whorl, and overhanging outwardly on the last whorl, forming a strong but blunt upper carina. There is a more extended and somewhat up-curved carina at the periphery, a deep concavity between the two carinae. Below the peripheral keel the surface slopes straight to the prominent ridge around the umbilicus.*

On the last whorls there is a secondary sculpture of fine low spiral threads, their intervals crossed by finer growth lines, giving a minutely punctate appearance in some places; these spirals not extending into the funnel-shaped umbilicus. Aperture with the columellar margin deeply concave in the middle. Outer lip inserted just below the keel of next-to-last whorl, gently sloping to the first carina, then concave to the stronger and more extended peripheral carina, below which it slants straight to the base".

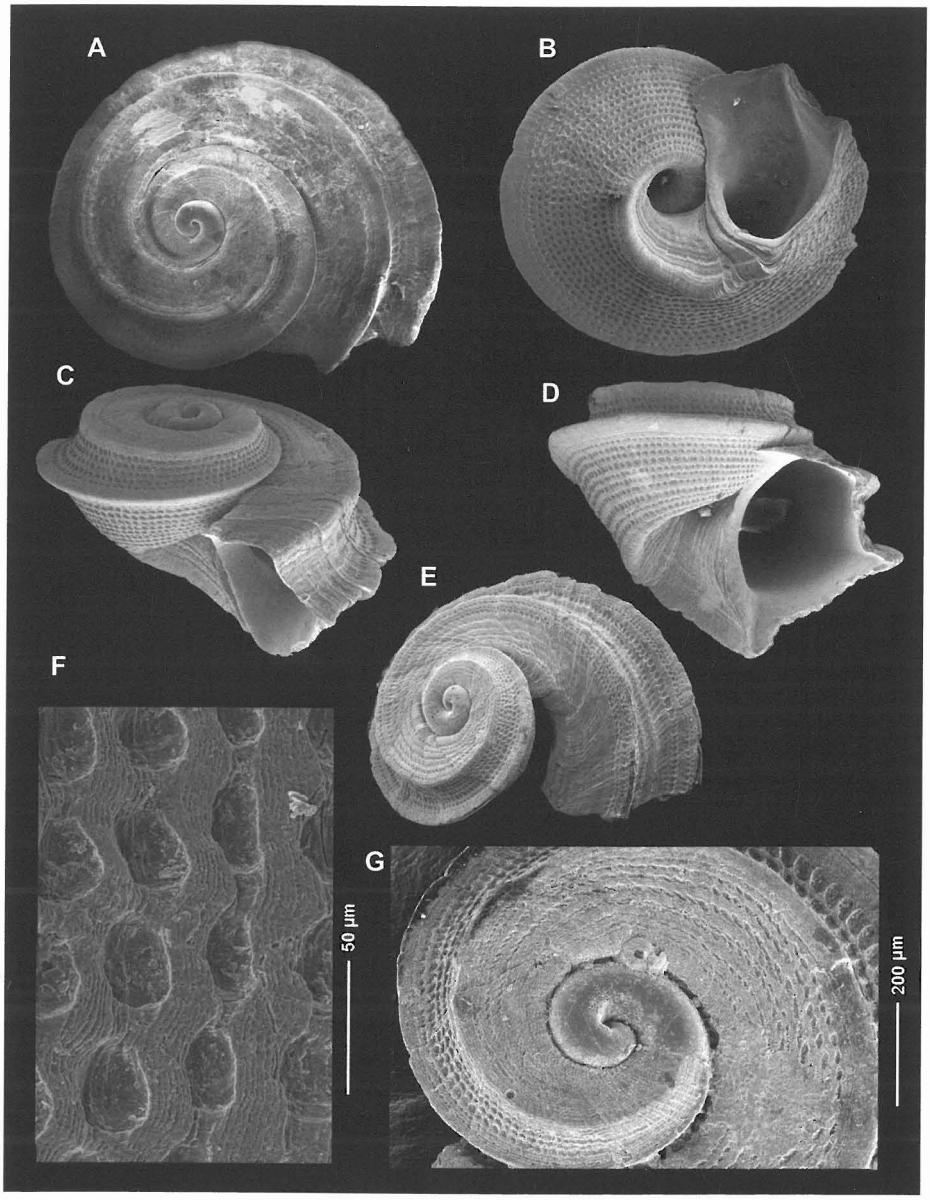
Height 1.3 mm, diameter 1.9 mm.

The umbilicate shell is strongly bicarinate. Protoconch of one whorl, smooth and glassy. Teleoconch consists of 1 ½ whorls; the spire is almost flat out to the shoulder. Carina strongly angular and outer slope is concave. Peripheral carina strong and flat on top. Ornamentation formed by fine punctate spirals, present over all the shell, even in the inner umbilicus. Aperture modified by the carina, columella large and concave. Umbilicus narrow and deep, well delimited by the umbilical carina.

Habitat: Dredged in 18 to 20 fathoms (32-36 m), off Destin, Northwest Florida. Collected on sandy marl bottom.

Distribution: USA: Florida: West Florida (SCHWENGEL & MCGINTY, 1942).

Remarks: SCHWENGEL & MCGINTY (1942) mention: *"This species is similar in size, sculpture and form to* C. cistronium *Dall, but the spire is flatter, second carina much more extended in a "pie-*



Figures 42A-G. *Aorotrema cistronium* (Dall, 1889). A-E: shells, 2.1, 1.86, 1.8, 1.8, 1.7 mm, Florida, (CHL); F: microsculpture; G: protoconch.
Figuras 42A-G. Aorotrema cistronium *(Dall, 1889). A-E: conchas, 2,1, 1,86, 1,8, 1,8, 1,7 mm, Florida, (CHL); F: microescultura; G: protoconcha.*

crust" manner, the last whorl not descending and the aperture more angled and not separated from the body whorl as in C. cistronium".

MOORE (1964) thought this might be juvenile *Astralium phoebium*.

We lack material on which to base an opinion.

Genus *Cyclostremiscus* Pilsbry & Olsson, 1945

Cyclostremiscus Pilsbry & Olsson, 1945: 266.
Type species: (by original designation) *Vitrinella panamensis* C.B. Adams, 1852. *Proc. Acad. Nat. Sci. Phila.*, 97: 266. Recent, Caribbean.

Diagnosis: The description of the genus (PILSBRY & OLSSON, 1945) is as follows: *"Shell small, solid, moderately strong, depressed or discoidal, much wider than high, umbilicate, of few whorls, from which the first 1 ½ to 2 form a smooth glassy protoconch. Last whorl typically with several spiral angles or carinae. Their intervals usually with lower axial riblets or striae. Aperture subcircular or modified by the angles of the shell, the peristome continuous, not thickened externally".*

Remarks: PILSBRY & OLSSON (1945) introduced *Cyclostremiscus* for a series of small or minute species, abundantly represented in the West American tropics. Some of them had been described in the genera *Vitrinella* and *Cyclostrema*. They designate *Vitrinella panamensis* C. B. Adams, 1852 as the type species of the genus; this species is characterized by *"the last whorl typically having several spiral angles or carinae, their intervals typically with lower axial riblets or striae".*

PILSBRY (1953) described the subgenus *Ponocyclus* with *Adeorbis beauii* as the type species, and distinguished it from *Cyclostremiscus* by its lack of axial sculpture.

MOORE (1964) divides *Cyclostremiscus* species into three small groups: *Cyclostremiscus beauii*, *C. dalli* and *C. pentagonus* are practically identical in their general appearance; all have 2 or 3 keels on the periphery and several grades of finer spiral sculpture. *C. suppressus* and *C. jeannae* resemble each other with their smaller umbilicus and three-keeled periphery. *C. cubanus* does not seem to have any relation to any of the previously mentioned species.

BIELER & MIKKELSEN (1988) after the study of the anatomy of *Circulus texanus* and *Cyclostremiscus beauii* making a comparison with *Circulus striatus*, conclude saying that the differences between both genera are mainly anatomical.

PONDER (1994) mentions that the assignation of *Cyclostremiscus beauii* to the genus *Cyclostremiscus* needs a revision.

The genus *Cyclostremiscus* Pilsbry & Olsson, 1945 is based on *Vitrinella panamensis* C.B. Adams, 1852. The type species is small, has strong axial sculpture (distinct axials lacking in *Cy. beauii*), a few strong spiral ribs which are rendered nodulose by the axials, and has an apertural varix. These shell characters are markedly discordant with those of *"Cy". beauii*. The genus *Ponocyclus* (Pilsbry, 1953) was erected for *Adeorbis beauii* and it can be used for this species.

If we accept this establishment, we could differentiate this group of species placing them outside *Cyclostremiscus* and including them in *Ponocyclus*, but this could only be tentative, because it is necessary to have an anatomical study of each species in order to decide their correct final position.

RUBIO & ROLÁN (1998) presented radular information on *Pachystremiscus ornatus* Olsson & McGinty, 1958 and *Pachystremiscus pulchellus* Olsson & McGinty, 1958 and placed both species in the genus *Lodderena* (Archaeogastropoda, Skeneidae), considering the genus *Pachystremiscus* as a synonym.

We have considered the comments of BIELER & MIKKELSEN (1988) and PONDER (1994) about the differences between *Circulus* and *Cyclostremiscus*, which are mainly anatomical. Also there is not a basic model of morphological characters which allows us to place the species in one or the other genus. So, it is very difficult to make a generic differentiation in the known species placed in group 1, which could be placed also in

Circulus. Only an anatomical study of each of them would allow us to know the correct genus. For all of these reasons, we prefer to keep these species in their present status, as considered by other authors.

The genus *Cyclostremiscus* is in our opinion one of the most conchologically heterogeneous of those within the subfamily Vitrinellinae. All the previously described recent taxa have been studied and figured in the present work, and two taxa new to science are also treated.

In an attempt to better differentiate *Cyclostremiscus* species we have distinguished two groups which clearly differ from the other congeners:

Group 1. *Cyclostremiscus beauii* – *C. multiliratus* - *C. dalli* – *C. pentagonus* – *C. trilix* – *C. hendersoni*.

Group 2. *C. bartschi* (only fossil) - *C. jeannae* - *C. suppresus* - *C. vanbruggeni* - *C.* sp.

The species not included in these groups have such distinctive morphological characters that their identification is relatively simple.

Group 1

These species are quite similar in general appearance; all have 2 or 3 peripheral keels and several degrees of smaller spiral sculpture.

Cyclostremiscus beauii (P. Fischer, 1857) (Figures 43A-E)

Cyclostrema angulatum auct. non A. Adams, 1850.

Adeorbis beauii P. Fischer, 1857. *Journal de Conchyliologie*, 6: 286, pl. 10, fig. 12. [Type locality: Guadeloupe].

Cyclostrema bicarinatum Guppy, 1866. *Quarterly Journal of the Geological Society of London*, 22(l): 281-295, pls. 16-18. [Type locality: "Miocene" (Lower Pliocene), Jamaica].

Skenea sulcata Simpson, 1887: 61 [*nomen nudum*, see MOORE, 1964: 131].

Adeorbis beauii bicarinatus (Guppy, 1866): Dall, 1903: 1595. [Type locality: Oligocene of Jamaica].

Circulus bicarinatus (Guppy, 1866): in WOODRING, 1828: 439, pl. 37, figs. 10-12.

Circulus stirophorus M. Smith, 1937. *The Nautilus*, 51: 67, pl. 6, figs. 2a, b [Type locality: Plio-Pleistocene, Florida].

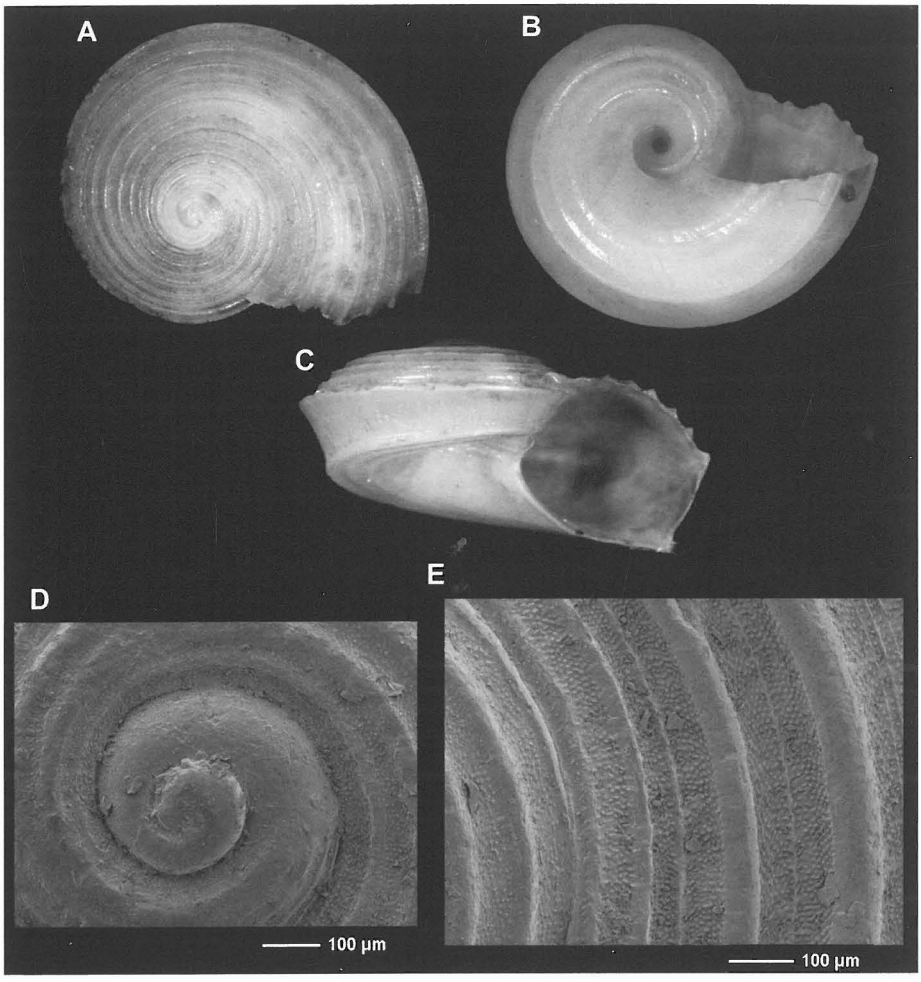
Type material: BIELER & MIKKELSEN (1988) designated the only specimen extant in the MNHN, corresponding to the lot deposited by Fischer, as lectotype.

Other material examined: Florida, USA: 2 s, 39-45 m, 50-60 mi., E Ponte Vedra, St. Johns Co., Fla. (CHL); 3 s, Delray Beach, Palm Beach Co. Fla (CHL); 2 s, 2 j, near Mantis Shrimp Holes, St. Lucia Inlet, Stuart Martin Co., Fla. (CHL); 1 s, 84 m, WNW Tortugas (CHL); 2 s, 54-60 m, Cedar Keys, Fla (CHL). Cuba: 3 s, Cienfuegos Bay, 10 m (MHNS). Colombia: 1 s, Cayos de San Andrés, in coral bottom 20-25 m (CHL).

Description: It is one of the better studied species of the Vitrinellinae, including morphology, radula, ecology, and anatomy, see BIELER & MIKKELSEN (1988).

Maximum reported size: 12.5 mm. The studied and photographed material (Figs. 43A-C) from Cuba measures 8.1 mm in maximum diameter and 3.0 mm in height. The shell from Colombia in the CHL is 10.1 mm.

Distribution: The species is known in the Western Atlantic, from North Carolina to Brazil. Recorded from Puerto Rico (WARMKE & ABBOTT, 1975). From Campeche to Ciudad del Carmen and Zacatal, from El Cuyo to Ninum Point, from Yalkupul Point to Cerritos Island and from Cancún to the Belize border, Mexico (VOKES & VOKES, 1983). From North Car-



Figures 43A-E. *Cyclostremiscus beauii* (P. Fischer, 1857). A-C: shell, 8.1 mm, Cienfuegos Bay, Cuba; D: protoconch; E: detail of the microsculpture.
Figuras 43A-E. Cyclostremiscus beauii *(P. Fischer, 1857). A-C: concha, 8.1 mm, Bahía de Cienfuegos, Cuba; D: protoconcha; E: detalle de la microescultura.*

olina to Florida; the Antilles; Ceará, Pernambuco and Alagoas, Brazil (RIOS, 1985). Guadaloupe; Jamaica; Florida; the Antilles; North Carolina; Dry Tortugas; Sint Maarten; Colombia; from North Carolina to Brazil (BIELER & MIKKELSEN, 1988). Aruba (DE JONG & COOMANS, 1988). From North Carolina to Brazil (ROBINSON, 1991). From North Carolina to the central coasts of Brazil (DÍAZ MERLANO & PUYANA HEGEDUS, 1994). Carolinas to West Indies (MORRIS, 1973). Laguna Indian River, Florida (MIKKELSEN *ET AL*, 1995). Cuba (ESPINOSA *ET AL.*, 1985).

Habitat: BIELER & MIKKELSEN (1988) reported this species inhabiting burrows of the stomatopod *Lysiosquilla scabricauda* (Mantis Shrimp), between 0.5

and 1 m in depth. Other authors mention its shells in the digestive tracts of the seastar *Astropecten articulatus* (Say, 1825), probably as prey, but parasitism is possible. Other recorded habitats are between 0 and 46 m in depth, sand, muddy, and rocky bottom (VOKES & VOKES, 1984); sand in shallow water (DÍAZ MERLANO & PUYANA HEGEDUS, 1994), but these are based on empty shells.

Discussion: *C. beauii* is the largest vitrinelid in the West Atlantic. It may be distinguished from other known species by its larger size, by its bicarinate periphery, and by the numerous and strong spiral cords which form its dorsal sculpture. Two recent species (*Cyclostremiscus major* Olsson & Smith, 1951 and *Cyclostrema gordana* Hertlein & Strong, 1951) from the Panamic region are very similar in size, sculpture and form. BIELER & MIKKELSEN (1988) consider *Cyclostrema bicarinata* Guppy and *Circulus stirophorus* Smith synonyms of *C. beauii*, indicating that the variation in the basal sculpture, probably due to ontogenetic change, was not enough reason for their differentiation.

Cyclostremiscus multiliratus spec. nov. Rubio, Rolán & Garcia (Figures 44A-F)

Type material: Holotype (Figs. 44A-C) in USNM (1155028) (ex CEG).
Type locality: SW Florida, 27°51.79'N – 84°59.82'W, dredged in 308-323 m.
Etymology: The name refers to the numerous cords on the dorsum.

Description: Shell (Figs. 44A-C) planispiral with spire slightly elevated, periphery bicarinate, and a wide umbilicus. Protoconch (Fig. 44F) slightly projected, with 1 ¼ whorls, and a maximum diameter of about 530 μm, apparently smooth with two stages dist inguis-hable: the first one, embryonic] with ¾ whorls; the second part is almost ½ whorls. Indistinct separation from the rest of the shell. Teleoconch with 2 ¼ whorls; sculpture formed by 2 keels which define the periphery of the shell, one placed on the middle part and the other in the basal area. First whorl with 10-12 spiral cordlets, with axial growth lines in the interspaces. The dorsum on the last whorl has 18-20 spiral cords, of which 6 are very closely-placed and near the suture and 3-4 near the peripheral keel; the interspaces between the cords are covered by microtubercles. Between the peripheral keels there are 10-12 fine spiral cordlets with regular interspaces. On the base there is a spiral cord limiting the umbilical infundibulum. Base and inside the umbilicus with numerous fine spiral cordlets. Aperture almost quadrangular, prosocline. Peristome modified by the peripheral keels; columellar area arched, parietal zone not thickened.

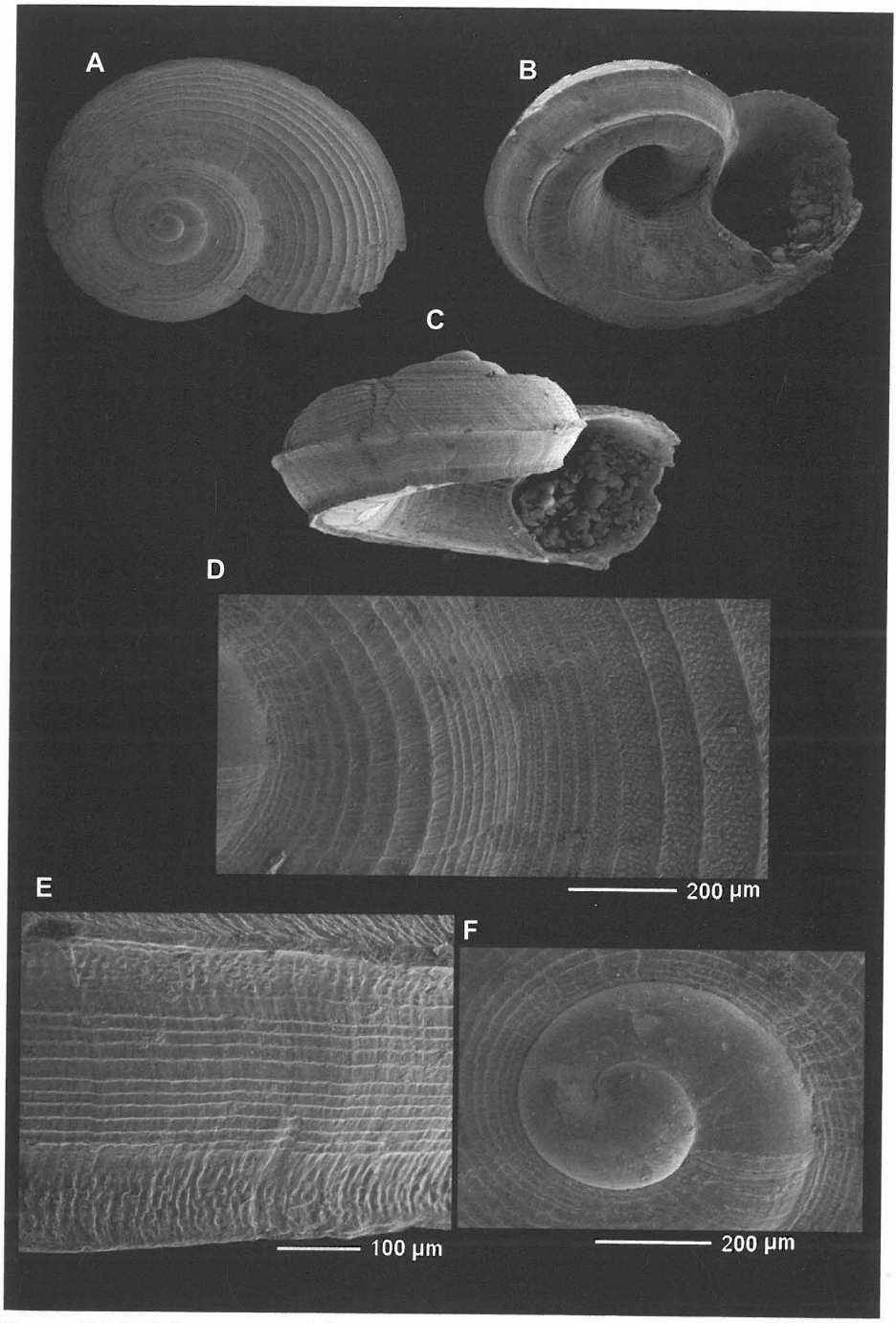
The holotype measures 3.18 mm in maximum diameter.

Distribution: Only known from SW Florida, its type locality.

Habitat: Deep water, dredged at 308-323 m deep.

Remarks: *C. multiliratus* spec. nov. is very similar in its general appearance to *C. beauii*, but the latter is larger, its protoconch has a smaller diameter, and the number of dorsal cords is smaller (5-7). Further, it lacks microtubercles between the dorsal cords and cordlets between the two peripheral keels.

Another similar species is *C. dalli*, but it lacks ornamentation between the cords, has fewer dorsal cords, which are stronger and more elevated, and lacks spiral cordlets between the peripheral keels. Both species have a wide bathymetric range.



Figures 44A-F. *Cyclostremiscus multiliratus* spec. nov. Rubio, Rolán & García. A-C: holotype, 3.18 mm (USNM); D: dorsal microsculpture; E: peripheral microsculpture; F: protoconch.
Figuras 44A-F. Cyclostremiscus multiliratus *spec. nov. Rubio, Rolán & García. A-C: holotipo, 3,18 mm (USNM); D: microescultura dorsal; E: microescultura periférica; F: protoconcha.*

Cyclostremiscus dalli (Bush, 1897) (Figure 45A-D)

Circulus dalli Bush, 1897. *Transactions of the Connecticut Academy of Arts and Sciences*, 10: 126, pl. 23, figs. 3-3a, 6. [Type locality: USFC sta. 2655, 27°22'N, 78°07'30"W].
Lydiphnis dalli (Bush, 1897).

Type material: Holotype in YPM (15802); paratype in USNM (44983). Not examined.
Other material examined: Florida, USA: 1 s, 36-90 m, off Dry Tortuga, Gulf of Mexico (CHL).

Description: The original description (BUSH, 1897) is as follows: *"This deep-water species is of more delicate texture and more transparent than the more northern shallow-water species of similar form. It is ornamented on the body-whorl with two rather inconspicuous carinae, one defining the base and the other on the periphery; above this the surface is cut by about seven delicate, unequal, microscopic shallow grooves or striae, the two uppermost being the most distinct; above these the surface is smooth and appears somewhat flattened; there are also a few less distinct striae below the periphery and in the umbilical region. Greatest width: 3.0 mm; height: 1.4 mm"*.

We add: This larger species (Figs. 45A-C) is characterized by having 2 strong keels, one basal and the other at the middle of the periphery. On the dorsum, between the peripheral keel and the suture, 4-6 strong spiral cords can be observed without any sculpture between the cords except for very fine growth lines. Near the base there are about 8 spiral cords, a little smaller that the dorsal ones and 3-4 more very fine threads inside the umbilicus. The protoconch (Fig. 45D) is wide, and has a little more than one whorl, about 540 μm in diameter, apparently smooth but perhaps with some small axial cordlets mainly at its terminus.

Maximum reported size: 4 mm. The shell figured here is 4,3 mm in diameter and 1.87 mm in height.

Habitat: Among Foraminifera, in 338 fms (608 m) (BUSH, 1897). Bathymetric range: 79 to 618 m.

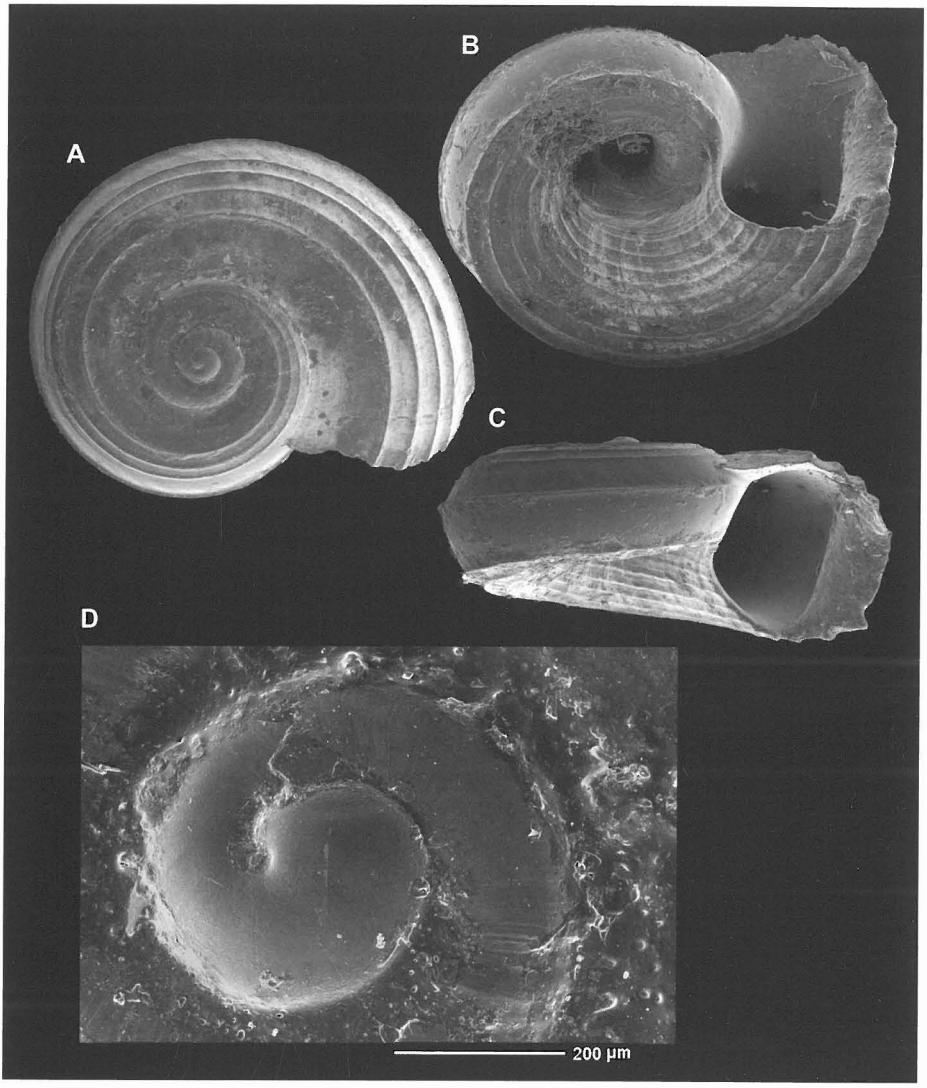
Distribution: USA: North Carolina, Florida: Florida Keys; Bahamas: Great Bahama Bank (BUSH, 1897 and MOORE, 1964).

Remarks: This larger species, with its inconspicuous sculpture, seems to be a connecting link between the distinctly grooved ones and the carinated ones, so we can make a series of gradation in sculpture from the smooth variety of *Cyclostremiscus supranitidus*, followed by *C. supranitidus* (typical), *C. trilix*, *C. dalli*, *C. smithi*, *C. striatus*, up to the strongly grooved *C. liratus* (Bush, 1897). The latter species may be distinguished from *C. pentagonus* and *C. trilix* by having two peripheral keels instead of three.

Cyclostremiscus pentagonus (Gabb, 1873) (Figures 46A-F)

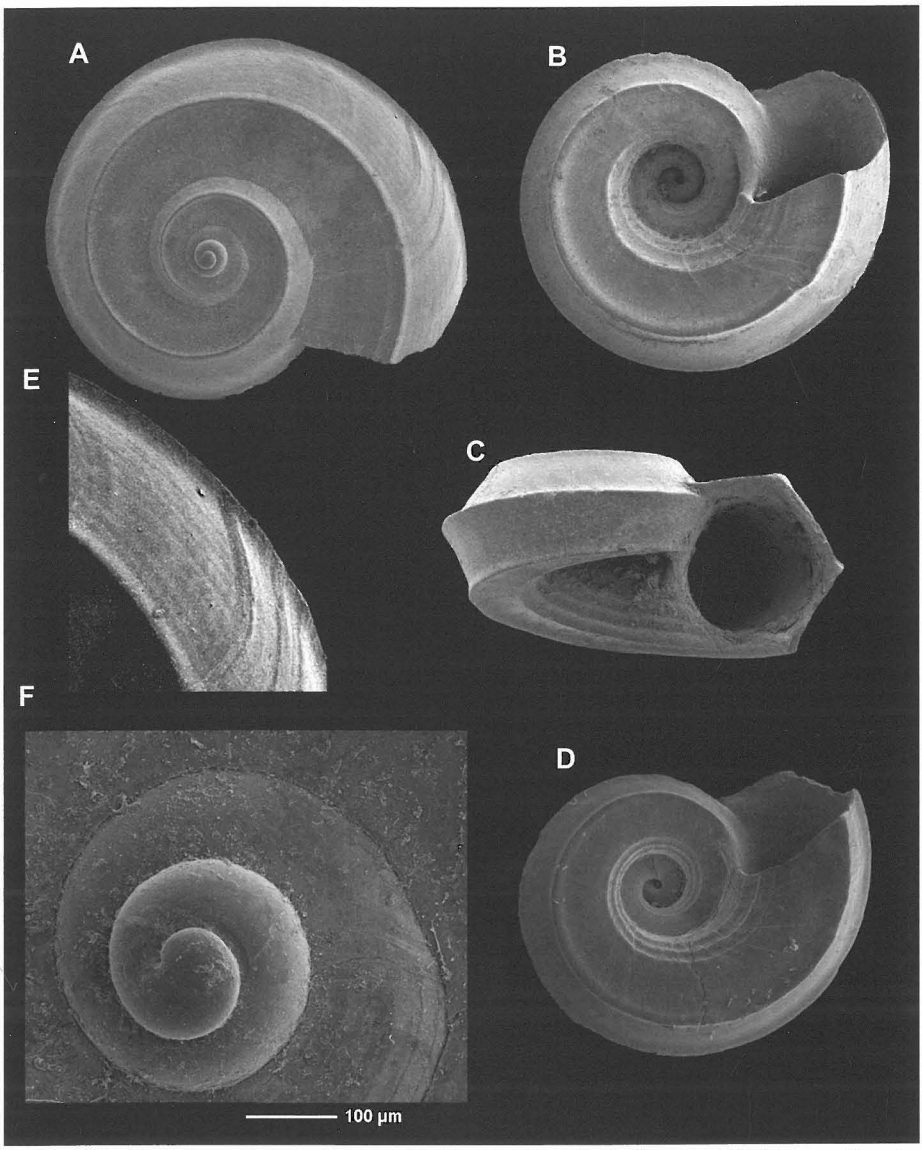
Adeorbis supranitidus auct. non Wood, 1842.
Cyclostrema pentagonum Gabb, 1873. *Amer. Philos. Soc. Trans. New series*, 15: 243. [Type locality: Miocene of the Dominican Republic].
Vitrinella pentagonus (Gabb, 1873): GABB, 1881: 368, pl. 47, fig. 68.
Cyclostremiscus pentagonus (Gabb, 1873): WOODRING (1928: 73).

Type material: Holotype in ANSP (2831) represented in MOORE (1964, fig. 23). Not examined.
Material examined: Cuba: 5 s, Rancho Luna Beach, 40 m (MHNS); 2 s, Cienfuegos Bay, 10 m (MHNS).



Figures 45A-D. *Cyclostremiscus dalli* (Bush, 1897). A-C: shell, 4.3 mm, off Dry Tortuga, Florida (CHL); D: protoconch.
Figuras 45A-D. Cyclostremiscus dalli *(Bush, 1897). A-C: concha, 4,3 mm, frente a Dry Tortuga, Florida (CHL); D: protoconcha.*

Description: Shell (Figs. 46A-C) rounded, depressed, whitish to yellowish brown in color, solid. Protoconch (Fig. 46D), erect projecting, with a little more than 2 whorls, smooth or slightly rough, and with a diameter of about 420 µm. Two well differentiated parts can be seen on it: the first one, embryonic, is shorter, with a little more that ½ whorl; the second is almost 1 ½ whorls. The separation from the rest of the shell is distinct. Teleoconch with 2 rapidly-increasing whorls; sculpture formed by 3 keels which define the periphery. There is a spiral cord which delimits



Figures 46A-F. *Cyclostremiscus pentagonus* (Gabb, 1873). A-C: shells, 2.9, 2.7, 2.3 mm, Rancho Luna Beach, Cienfuegos, Cuba (MHNS); D: shell, 2.1 mm, Brazil (CHL); E: microsculpture; F: protoconch.

Figuras 46A-F. Cyclostremiscus pentagonus *(Gabb, 1873). A-C: conchas, 2,9, 2,7, 2,3 mm, Playa Rancho Luna, Cienfuegos, Cuba (MHNS); D: concha, 2,1 mm, Brasil (CHL); E: microescultura; F: protoconcha.*

the umbilicus and fine spiral cords more evident in the spaces between the keels. Also there are fine sinuous axial growth lines. Umbilicus wide and deep exposing the previous whorls, even the protoconch; on its interior up to 5 spiral cords can be seen. Aperture hexagonal, more distinctly at the periphery because of the keels.

Dimensions: The holotype measures 3.5 mm. The studied shells were up to 2.96 mm in maximum diameter.

Habitat: The bathymetric range of this species is very wide, having been recorded between 0 and 538 m in depth for the three synonymized species; the records for living specimens are between 0 and 45 m: between 13 and 31 m (ABBOTT, 1974); in muddy sand in the surf zone (ANDREWS, 1977); in shallow water beetween 13 and 30 m in depth (DÍAZ MERLANO & PUYANA HEGEDUS, 1994).

Distribution: USA, Mexico, Costa Rica, Colombia; Venezuela, Puerto Rico and Cuba. Recorded from Cape Hatteras, North Carolina (BUSH, 1885). From Puerto Rico (WARMKE & ABBOTT, 1961). From North Carolina, northwestern Florida and Alabama, Texas and Campeche Bank, Miocene and Pliocene of Panama, Jamaica, Dominican Republic and Florida (MOORE, 1964). From North Carolina (PORTER, 1974). Off North Carolina to Florida, Texas and the West Indies (ABBOTT, 1974; EMERSON & JACOBSON, 1976). From the southeast of USA to the Antilles and Texas (ANDREWS, 1977). From Laguna de Termino, Campeche (GARCÍA-CUBAS, 1981). From Venezuela (PRINCZ, 1982). From Campeche to Ciudad del Carmen and Zacatal, and from Cancún to the Belize border, Mexico (VOKES & VOKES, 1984). From Puerto Rico (ORTIZ-CORPS, 1985). From Moín, Costa Rica (ROBINSON & MONTOYA, 1987). From North Carolina to Florida, Texas and the Caribbean Sea (LYONS, 1989). From off North Carolina to the Caribbean (ROBINSON, 1991). North Carolina Florida, West Indies, South Brazil (RIOS, 1994). From North Carolina to the South American coast (DÍAZ MERLANO & PUYANA HEGEDUS, 1994). From Cuba (ESPINOSA, FERNÁNDEZ-GARCÉS & ROLÁN, 1995). From Abaco, Bahamas Islands (REDFERN, 2001). From Cahuita to Gandoca, Costa Rica (ESPINOSA & ORTEA, 2001).

Remarks: Until its definitive placement in *Cyclostremiscus*, this species was placed in the genera *Adeorbis*, *Circulus*, *Lydiphnis*, *Skenea* and *Vitrinella*. The prominent protoconch and its tricarinate periphery in the recent samples, give the shells of this species a characteristic appearance and easily distinguish it from congeneric species. MOORE (1964) mentioned having seen living specimens of this species, and the animals showed the typical characters of the vitrinellids, with ciliated tentacles and without epipodia.

Cyclostremiscus trilix (Bush, 1885) (Figures 47A-D)

Skenea trilix Bush, 1885. *Expl. Albatross. Report U.S. Com. Fish and Fisheries for 1883*: 464. [Type locality: Off Cape Hatteras, North Carolina, 7-17 fathoms (13-31 m) [USFC sta. 2113 (JOHNSON, 1989)]].

Circulus trilix (Bush, 1885): BUSH, 1897: 127, pl. 22, figs. 6, 10, 12; pl. 41, fig. 7.

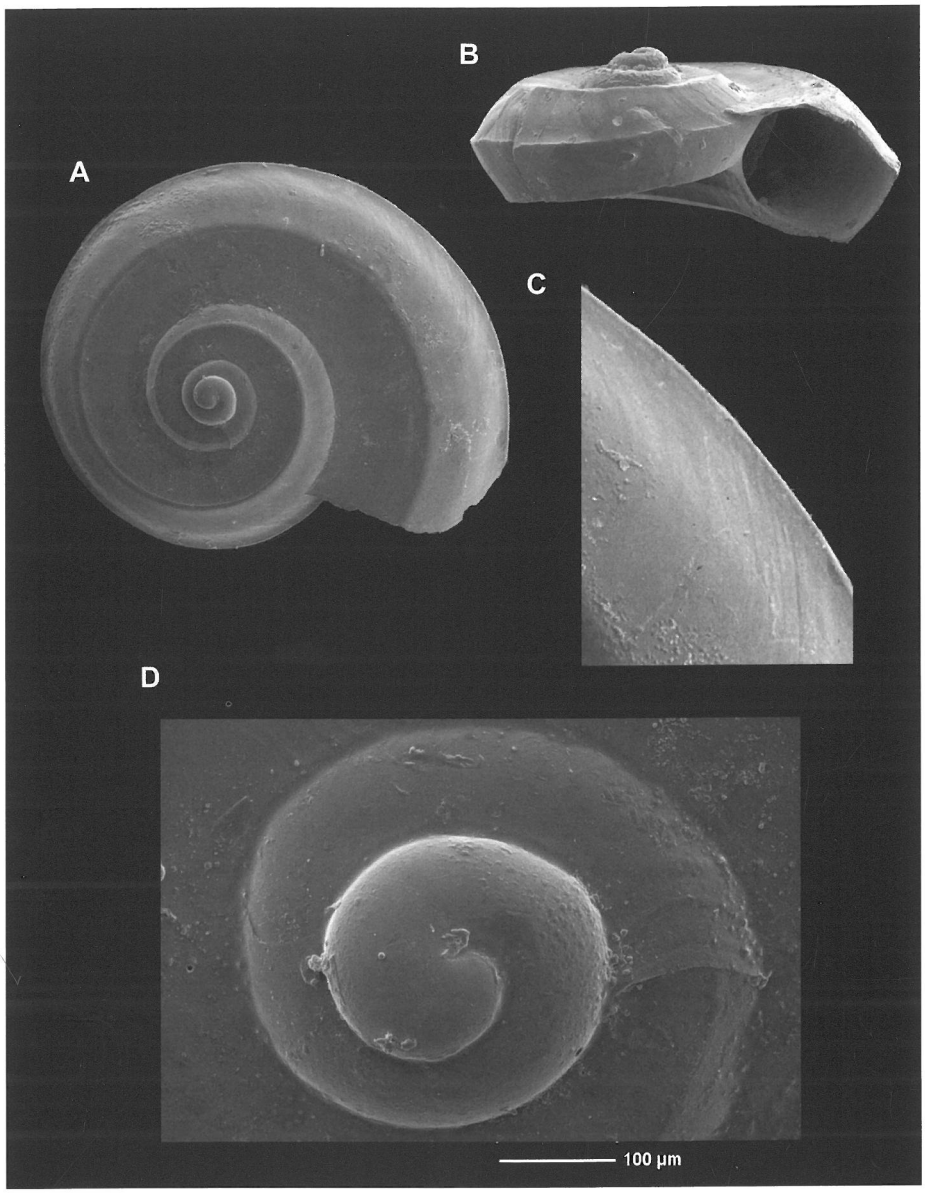
Cyclostremiscus trilix (Bush, 1885) *in* MOORE (1961: 18).

Type material: Holotype in USNM (35365). Not examined.

Material examined: Panama: 1 s, 600-700 m, off Atlantic coast (CHL).

Description: The original description in BUSH (1885: 584) is as follows: *"This species closely resembles* Adeorbis supranitida *Wood, in form and sculpture, but it has a thin, horny operculum and an animal like* Skenea". Depth range, 14 to 15 fathoms (25-27 m).

BIELER & MIKKELSEN (1988) mention: *"Based on the misconception that these species are archaeogastropods, BUSH (1897: 127, 142, pl. 22, figs. 47A-G) erroneously constructed a rhipidoglossate radula for* Circulus trilix *(Bush, 1885) [=* Cyclostremiscus pentagonus *(Gabb, 1837), fide MOORE,*



Figures 47A-D. *Cyclostremiscus trilix* (Bush, 1885). A-B: shells, 2.3, 1.7 mm, 600-700 m, off Atlantic coast, Panama (CHL); C: microsculpture; D: protoconch.
Figuras 47A-D. Cyclostremiscus trilix *(Bush, 1885). A-B: conchas, 2,3, 1,7 mm, 600-700 m, frente a la costa Atlántica, Panamá (CHL); C: microescultura; D: protoconcha.*

1964: 138]". Its radula is taenioglossate like any species of the Tornidae.

We add: Protoconch (Fig. 47D) projecting with almost 1 ¾ smooth whorls, about 440 µm in maximum diameter; under high magnification irregular microtubercles can be seen on its surface. A strong varix marks the transition to the teleoconch. On its first quarter whorl the teleoconch

exhibits a strong spiral cord which will later become a keel placed on the dorsal aspect of the periphery. There is no other dorsal spiral sculpture. On the ventral aspect, three spiral cords delimit the umbilicus. Aperture rounded; peristome continuous.

Maximum reported size: 3 mm

Habitat: The bathymetric range of this species is quite ample, having been collected between 2 and 538 m in depth. The species is relatively common in Cape Hatteras between 7 and 17 fms (19-31 m) of depth. The living material was collected between 26 and 27 m (BUSH, 1897).

Distribution: USA: Massachusetts, North Carolina (BUSH, 1885b; DALL, 1927), Florida: West Florida (MOORE, 1964); Texas (PARKER, 1959; MOORE, 1964); Puerto Rico (WARMKE & ABBOTT, 1961).

Remarks: *Cyclostremiscus trilix* was described initially in the genus *Skenea* and later transferred to the genus *Circulus*, *Lydipnis* and *Vitrinella*. WOODRING (1957) gives a lengthy discussion on *C. trilix* and *C. pentagonus*, concluding that the only difference was that *C. trilix* was larger. MOORE (1964) considers the two synonymous.

We believe that there are enough characters to distinguish these two taxa at the species level. The presence of microtubercles on the protoconch and the lack of spiral microsculpture between the perypheral keels allow us to differentiate *Cyclostremiscus trilix* from *Cyclostremiscus pentagonus*. The shell figured here is very similar to that described and figured by BUSH (1897).

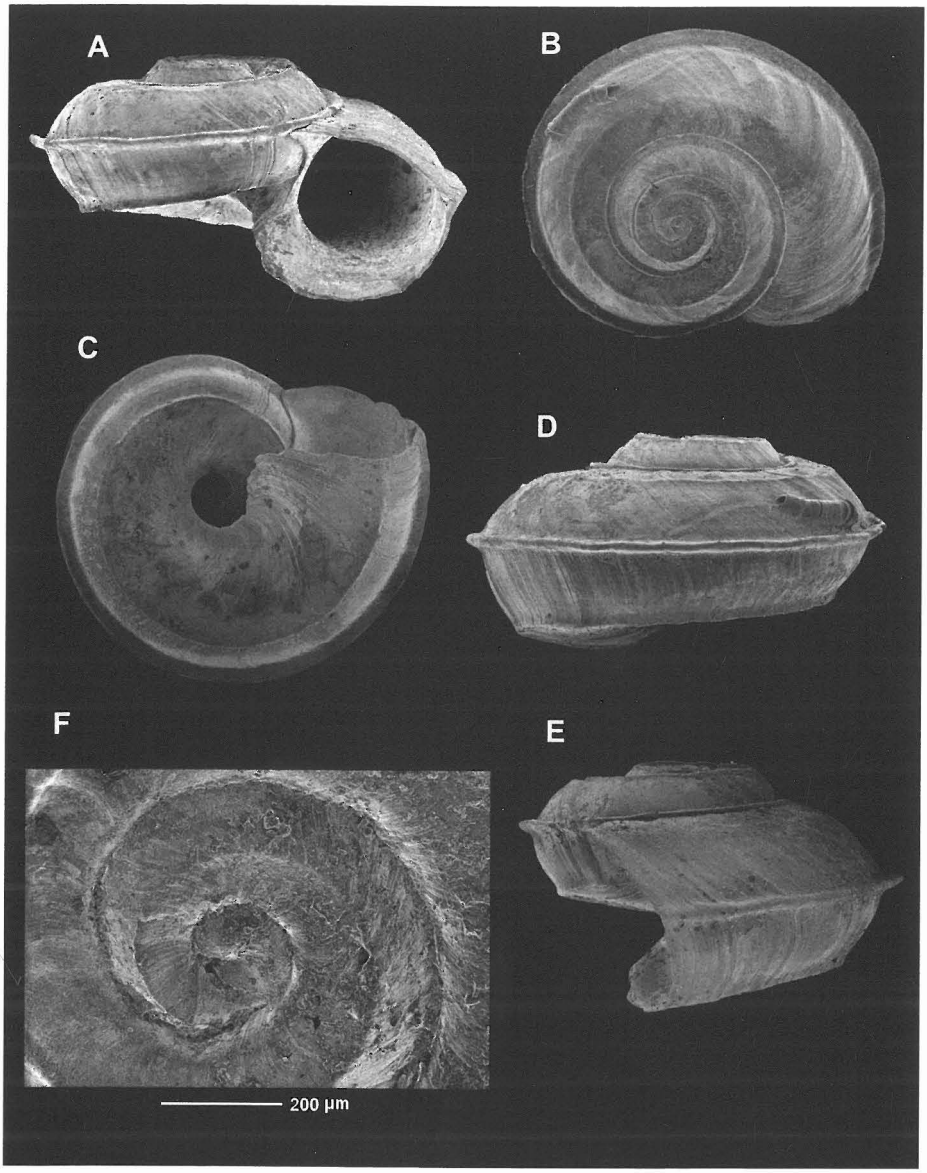
Cyclostremiscus hendersoni (Dall, 1927) (Figures 48A-F)

Lydiphnis hendersoni Dall, 1927. *Proceedings of the United States National Museum*, 70(2667): 124-125. [Type locality: Off Georgia].
Circulus hendersoni Dall.

Type material: Lectotype (Figures 48A-F) in USNM (108396). Examined by SEM.
Other material examined: None.

Description: This is the original description by DALL (1927): *"Shell small, white, depressed, glassy, with about three tricarinate whorls, the nucleus deeply sunken; axial sculpture of faint incremental lines, on the spire retractively oblique and on the base protractively arcuate; spiral sculpture of a prominent carina at the periphery, a less prominent one on the spire about one-third of the way from the suture to the periphery, and on the base another slightly nearer the umbilicus than to the periphery; these two secondary keels are variable, sometimes strong, sometimes almost obsolete, sometime partly one or the other on the same specimen; the edges of the carina are sometimes finely spirally striated, suggesting that they may when fresh and intact carry a series of epidermal fringes like* Episcynia*; the space within the basal carina is funicular, extending to a moderately narrow perforate umbilicus; the aperture would be rounded, but in those specimens in which the carinae are all developed the thin margin is modified and the aperture is angulated by them; in some specimens faint spiral striation is indicated on the surface between the carinae; the margin of the aperture in the adult is continuous over the body of the shell. Maximum diameter, 3.5 mm; minimum diameter, 2.9 mm; height, 1.3 mm".*

We add: The protoconch (Fig. 48F) is of small size, has a rough aspect and terminates with a thickened varix. Size about 170 μm in maximum diameter.



Figures 48A-F. *Cyclostremiscus hendersoni* (Dall, 1927). A-E: Lectotype in different positions, 3.5 mm (USNM, 108396); F: protoconch.
Figuras 48A-F. Cyclostremiscus hendersoni *(Dall, 1927). A-E: Lectotipo en distintas posiciones, 3,5 mm (USNM, 108396); F: protoconcha.*

The teleoconch has a very prominent peripheral keel placed in the middle of the shell; also two less prominent cords, one of them on the dorsum at the mid-point between the suture and the outer keel; and the other ventral, closer to the periphery. The dorsal cord slowly fades out disappearing near the middle of the body whorl. Under high magnification very fine spiral striae can be seen in the

spaces between the cords and the keel. Another character typical of this shell is that the last whorl envelops the previous one below the peripheral keel, which, being prominent, hides this suture. A thickening of the umbilical wall progressively covers the umbilicus, which is narrow and deep. Internal lip a little thickened and reflected outward, further impinging on the umbilicus.

Habitat: Dredged from 805 meters depth, in broken coral, on a coarse sand and broken shell bottom, where numerous samples were collected.

Distribution: Only known from the type locality.

Remarks: DALL (1927) mentions the following: *"The periostracum on* Episcynia *is extremely fugacious, and it is not prudent to assume that these and other small shells dredged and showing none are normally without one. A few have a persistent periostracum, and there is no good reason to suppose that others never posses one".*

The depressed spire, the tricarinate shell, with spiral striae between the keels, and the form of the umbilicus allow us to place this species in the genus *Cyclostremiscus*. Only the protoconch gives us some doubts, which can not be resolved due to the lack of live-collected material to permit study of the radula. *Cyclostremiscus pentagonus*, *C. trilix* and *C. dalli* are the species with greatest affinity, principally because of their shells bearing three spiral keels. The present species can be distinguished from them by the form of the inner lip and the ornamentation of the umbilicus.

Group 2

This group of species clearly shows the evolution from the fossil forms with elaborate ornamentation (*Cyclostremiscus bartschi*) towards the recent species with more subdued sculpture (*Cyclostremiscus* spec. nov.).

Cyclostremiscus bartschi (Mansfield, 1936) (Figures 49A-D)

Cyclostrema bartschi Mansfield, 1936. *Florida State Geol. Surv. Bull.* N° 3: 132, pl. 20, figs. 13-15. [Type locality: Upper Miocene of Harveys Creek, Leon Co., Florida] Fossil.

Material examined: Florida, USA: 1 s, Plio-Pleistocene Belle (CHL).

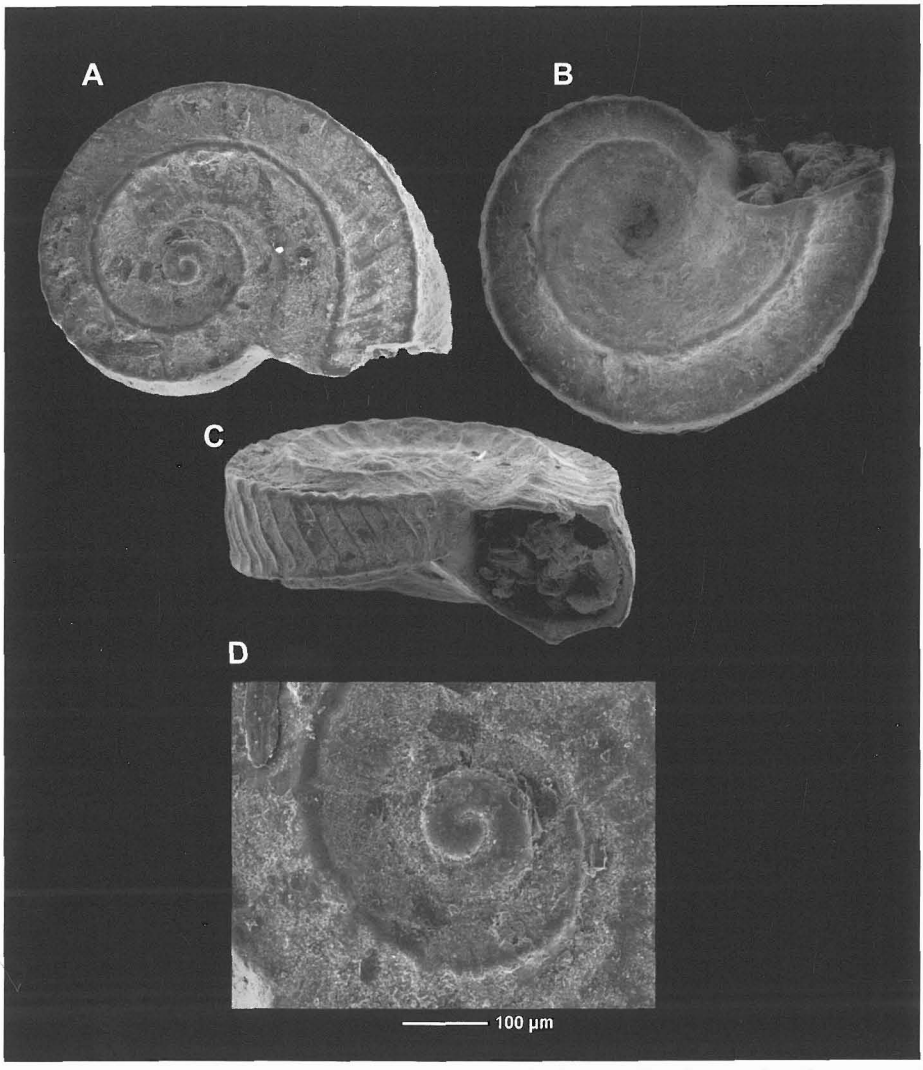
Description: In PILSBRY (1953): *"Shell is rather solid, discoidal, the upper surface flattened, with a spiral ridge midway on the last whorl, the vertical peripheral zone bounded by keels above and below; the base with a prominent keel bounding a broad, conic umbilicus. There are 3 ½ whorls, the first weakly convex; following half turn is narrower. After the second turn the whorls in apical view are somewhat concave and weakly folded radially on both sides of a median spiral ridge. The peripheral zone has oblique folds, and base is folded radially. Umbilicus is conic and has smooth, straight sides. The aperture is moderately oblique, more or less distinctly hexagonal, the peristome blunt, thickened at the basal angle and columellar slope, continued in a rather thick parietal callus, which is slightly advanced beyond the upper angle of the mouth".*

Height 0.9 mm, diameter 1.55 mm.

Habitat: Dredged from 28 and 30 fms (50-54 m), Sta. 2112 and 2110.

Distribution: TREECE (1980) mentions this species from the northeastern shelf and upper slope of Yucatan. RIOS (2009) also records it from Guatemala and East Brazil.

Remarks: This species was initially considered exclusively fossil following its original description. TREECE (1980)



Figures 49A-D. *Cyclostremiscus bartschi* (Mansfield, 1936). A-D: shell, 1.4 mm, Plio-Pleistocene of La Belle, Florida (CHL); D: protoconch.
Figuras 49A-D. Cyclostremiscus bartschi *(Mansfield, 1936). A-D: concha, 1,4 mm, Plio-Pleistoceno de La Belle, Florida (CHL); D: protoconcha.*

mentioned it as a recent species from Yucatan, Gulf of Mexico, but this record was considered dubious by Malacolog, version 4.1.1. <www.malacolog.org>. A Database of Western Atlantic Marine Mollusca. Rios (2008) recorded it again from Guatemala and East Brazil, and based on these records we have considered *Cyclostremiscus bartschi* as a recent species. Morphologically, the vertical periphery, limited by two keels, and the wide spiral cord placed on the dorsum and on the base of the shell are the main differential characters to distinguish it from closely related species. The nodules on the cords and keels are formed by the intersecting axial ribs.

Cyclostremiscus jeannae Pilsbry & McGinty, 1946 (Figures 50A-D)

Vitrinella panamensis auct. non C.B. Adams, 1852.
Cyclostremiscus jeannae Pilsbry & McGinty, 1946. *The Nautilus*, 59: 82, pl. 8, figs. 4-4a. [Type locality: Off Palm Beach, Florida].

Type material: Holotype in ANSP (181371). Figured by MOORE (1964, fig. 25). Not examined.
Material examined: Florida, USA: 1 s, 60 m, off Sombrero Light, Key Vaca, Monroe Co. (CHL); 1 s, dredged, 30 m, 32 mi E St. Augustine, Dt. Johns Co. (CHL); 1 s, 26 m, Tanzler's Waters, 23 mi ENE Mayport, Duval Co. (CHL); 1 s, 27.75 mi ESE Mayport, Duval Co. (CHL). St. Kitts & Nevis: 1 s, 18 m, base of the reef, Monkey Shoals (CHL). Guadeloupe: 1 s, Île d'Aves, Saint Martin Island, 8 m (CJP).

Description: Shell (Figs. 50A-B) depressed, spire flat, periphery flat, tricarinate, but central carina weak, umbilicus funnel shaped with strong delimiting carina. Protoconch (Fig. 50C) of about 1 ½ -2 whorls; smooth and glassy, about 250 μm in diameter. The end of the protoconch not clearly marked lacking a varix. Sculpture formed by a tricarinate periphery. There is a weak spiral rib on the middle of the dorsal side and a low cord at the suture. The base is smooth except for weak axial costulation. Umbilicus funnel shaped with flat walls, bordered by a strong descending carina. Aperture strongly modified by the carina and peripheral keels. The parietal callus is rather heavy and extends a little in front of the aperture.

Dimensions: The holotype size is 2.3 mm. The studied shells average 1.52 mm in maximum dimension (diameter).

Habitat: The bathymetric range of this species is ample, having been recorded between 0 and 128 m in depth; but the records for living material are between 42 and 91 m.

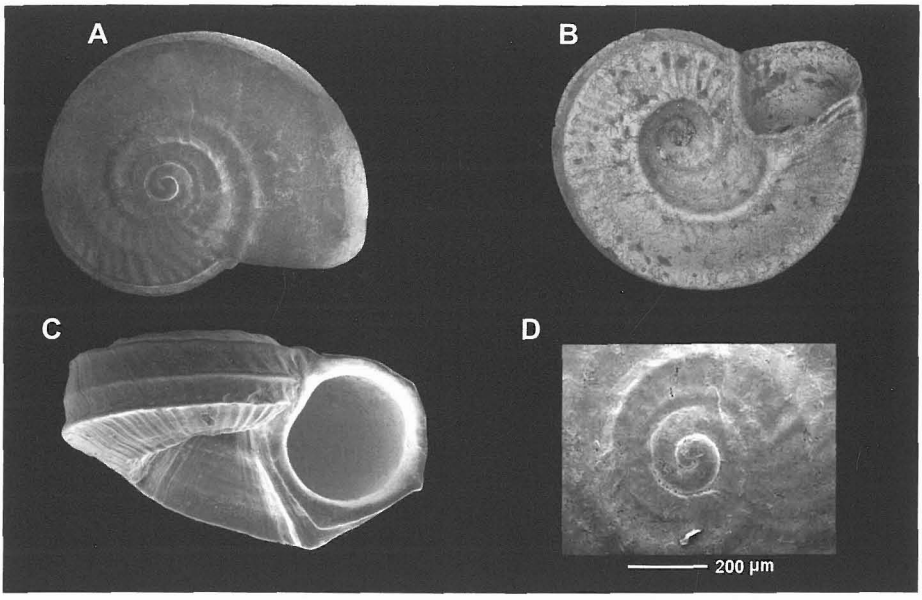
Distribution: It has been recorded from USA, off Palm Beach, Florida (PILSBRY & MCGINTY, 1946); Colón and Bocas Island, Panama (OLSSON & MCGINTY, 1958); Florida Peninsula, from Palm Beach to St. Petersburg (MOORE, 1964); North Carolina (PORTER, 1974); South half of Florida to Texas, Costa Rica and Panama (ABBOTT, 1974); Portete, Costa Rica (HOUBRICK, 1968; ROBINSON & MONTOYA, 1987); Louisiana and Texas (ODÉ, 1988); South Florida to Texas, Costa Rica and Caribbean Panama (LYONS, 1989); Mexico: Veracruz and Campeche State (REGUERO & GARCÍA-CUBAS, 1991); South Florida and from Texas to Panama and Colombia (DÍAZ MERLANO & PUYANA HEGEDUS, 1994); northeast Florida (LEE, 2009).

Remarks: The flat spire, the flattened periphery and the strong, descending umbilical carina are the important characters of the species. *C. jeannae* has a much larger umbilicus with a stronger bordering carina than *C. suppressus* (Dall, 1889). A similar species is *C. bartschi* (Mansfield, 1930), but it lacks the weak central keel on the periphery.

Cyclostremiscus suppressus (Dall, 1889) (Figures 51A-H)

Teinostoma (Ethalia) suppressa Dall, 1889a. *Bulletin of the Museum of Comparative Zoology* 18: 1-492, pls. 10-40. [Type locality: Goodland Point, West Florida].
Circulus suppressus (Dall, 1889).

Material examined: USA, Florida: 3 s, Anclote Key, Tarpon Springs (CHL); 1 sp, Sunset Park, Tarpon Springs, Pinellas Co. (CMK); 2 s, NE end Sand Key, Little Pass, Pinellas Co. (CHL); 1 s, Seaquarium Flats, Virginia Key, Dade Co. (CHL); 1 s, dredged 1.5-3 m, 5 mi SW Cedar Key, Levy Co. (CHL). Louisiana: 2 s, Last Island, Terra bone (CEG).



Figures 50A-D. *Cyclostremiscus jeannae* Pilsbry & McGinty, 1946. A-B; shells, 1.5 mm, San Martin Island (CJP); C: shell, 1.7 mm, Sombrero Light, Key Vaca, Florida (CHL); D: protoconch. *Figuras 50A-D.* Cyclostremiscus jeannae *Pilsbry & McGinty, 1946. A-B; conchas, 1,5 mm, San Martin Island (CJP); C: concha, 1.7 mm, Sombrero Light, Key Vaca, Florida (CHL); D: protoconcha.*

Description: Shell (Figs. 51A-D) depressed, spire flat, periphery strongly tricarinate, additional spiral carina close to suture, umbilicus minute, constricted, carinate. Protoconch (Fig. 51E) with 2 whorls, smooth and flat, and a diameter of about 390 µm. Teleoconch formed by about 2 whorls. Spiral sculpture consists of 3 narrow sharp keels on the periphery, the middle one a little more prominent than the others. Near the suture there is another less prominent keel. Base flattened, bordered by the lower peripheral carina on the outher edge, and by another carina around the umbilicus. Aperture oblique, parietal callus wide and with a sulcus on the upper inner angle. Umbilicus narrowed by the thickened inner wall.

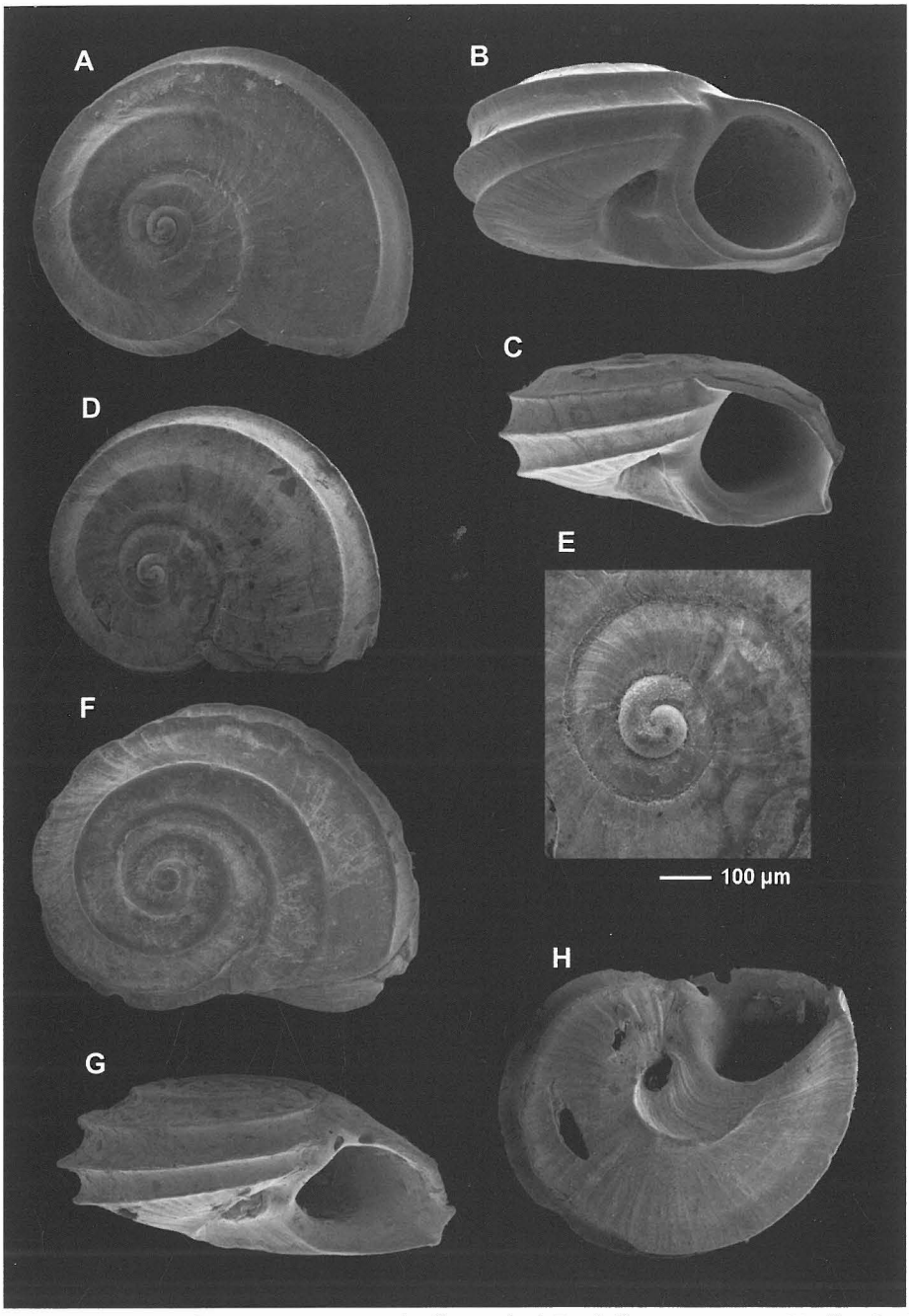
Dimensions: Maximum reported size: 2.4 mm. The figured specimens measure 1.5 and 1.8 mm in maximum diameter.

Habitat: Depth: 0 to 58 m (live 0.6 m). MOORE (1964) reported that this species lives in shallow water strictly and is restricted to continental shores.

Distribution: USA: North Carolina, Florida: East Florida, West Florida (DALL, 1889a; JOHNSON, 1934), Louisiana, Texas; Mexico: Campeche State, Yucatan State. Recorded from Goodland Point; Hemphill and Baker's Haulover, Biscayne Bay, Florida (PILSBRY & MCGINTY, 1946) and from the lower east coast and entire west coast of Florida and the coast of Texas (MOORE, 1964; EMERSON & JACOBSON (1976); from North Carolina (PORTER, 1974); from Louisiana and Texas (USA) and Campeche State and Yucatan State, Mexico (ODÉ, 1988).

Remarks: The flat spire, the three strong and sharp carinae, and the reduced umbilicus are the identifying characters of this species.

The shells from Last Island, Terrabone, Louisiana, are apparently more depressed, present two strong cords on the dorsum, one of them near the suture, and the umbilicus is a little



Figures 51A-H. *Cyclostremiscus suppressus* (Dall, 1889). A-D: shells, 1.5, 1.8 mm, Pinellas Co., Florida (CMK); E: protoconch. F-H: shells, 2.2, 2.1 mm, Last Island, Terrabone, Louisiana (CEG).

Figuras 51A-H. Cyclostremiscus suppressus *(Dall, 1889). A-D: conchas, 1,5, 1,8 mm, Pinellas Co., Florida (CMK); E: protoconcha. F-H: conchas, 2,2, 2,1 mm, Last Island, Terrabone, Louisiana (CEG).*

more closed than in shells from Florida. This could represent the morphological variability of the species.

The closest species is *Cyclostremiscus jeannae*, which is distinguished by the lack of pronounced peripheral keels and the presence of a wide umbilicus.

Cyclostremiscus colombianus Pilsbry & Olsson, 1845 is morphogically similar.

Cyclostremiscus vanbruggeni de Jong & Coomans, 1988 (Figures 52A-E)

Cyclostremiscus vanbruggeni de Jong & Coomans, 1988. *Studies on the Fauna of Curaçao and other Caribbean Islands*, 69: 32, pl. 2, fig. 136. [Type locality: Curaçao / Aruba].

Type material: Holotype in ZMA (3.87.063). Not examined.
Material examined: Brazil: 2 s, Praia da Itararé, São Vicente, São Paulo (CHL). Trinidad and Tobago: Tobago, 1 s, Scarborough (CHL).

Description: The original description is as follows: *"Shell wider than high. The sculpture consists of fine spiral striae and low radial ribs which on the upper side of the last whorl are weak or nearly absent. On the periphery at the beginning of the last whorl there are 3 smooth keels of which the middle one soon disappears and gradually also the upper one, so that near the aperture practically only the lower keel remains. On the upper side there is a ridge which gradually fades away. The very wide umbilicus is bordered by a ridge"*.

Maximum reported size: 1.6 mm

Habitat: Nothing is mentioned by DE JONG & COOMANS (1988) about the habitat of this species. The shell photographed was collected in sandy sediments.

Distribution: ABC Islands: Aruba, Curaçao (DE JONG & COOMANS, 1988).

Remarks: The closest species conchologically is *Cyclostremiscus jeannae*, from which it can be distinguished by the weaker dorsal ornamentation and the smaller umbilicus. *Cyclostremiscus suppressus* may be distinguished by its lack of axial sculpture except very fine growth lines.

Cyclostremiscus diminutus spec. nov. Rubio, Rolán & Pelorce (Figures 53A-G)

Type material: Holotype (Figs. 53A-D) in MNHN (24201) (*ex* CJP); one paratype from Pointe-á-Pitre, Guadeloupe (FLMNH, 448611). Other paratypes: USNM (1155030, 1 s, Fig. 53D), AMNH (1 s, Fig. 53E), from Bocas Island, Panama (*ex* CHL); CHL (1 s, Puerto Rico).
Type locality: Guadeloupe.

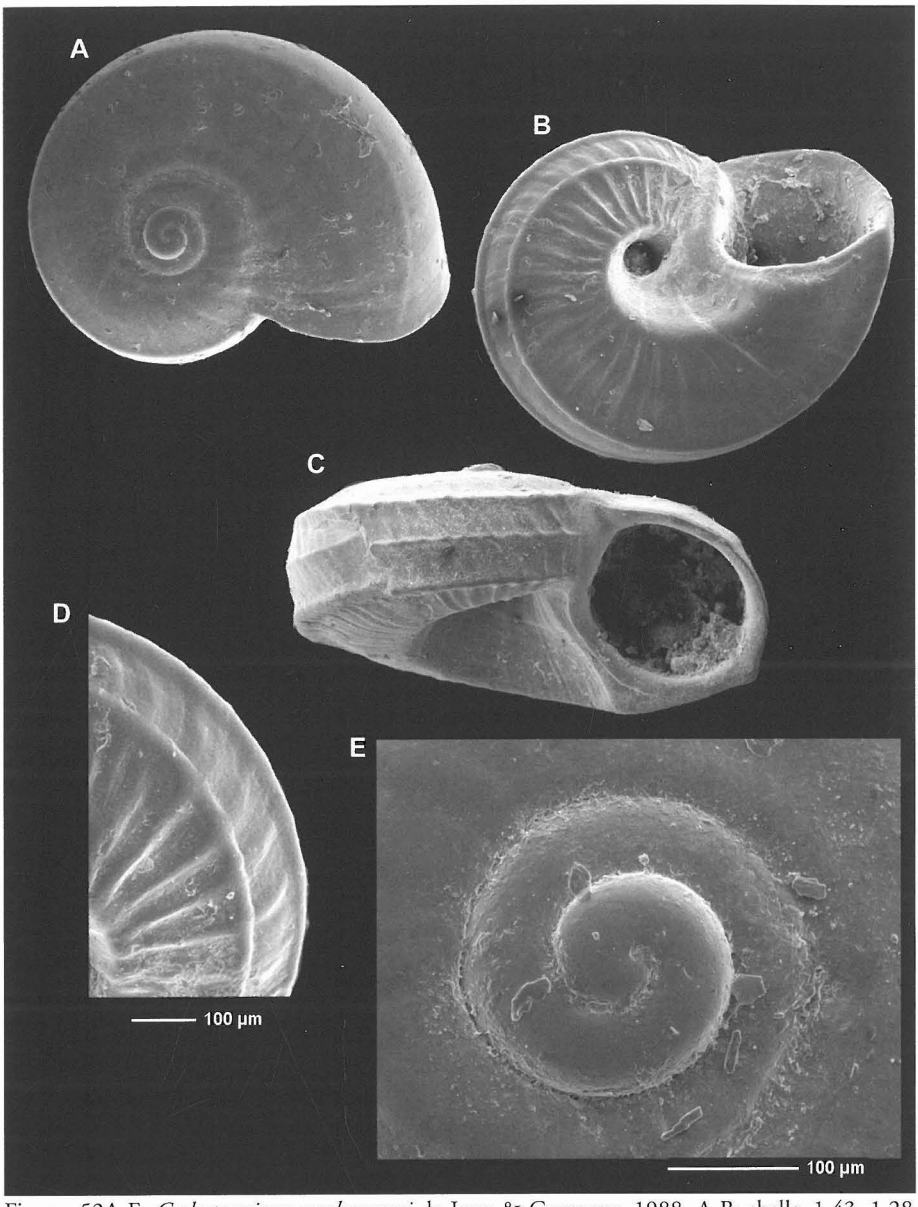
Description: Shell (Figs. 53A-C) solid, depressed, lenticular, with a short spire. Protoconch (Fig. 53D) smooth, bulbous, about 290 μm in diameter, with 1 ¼ whorls. Teleoconch with a little more than one whorl. Ornamentation produced by 5 spiral cords which are distributed regularly on the periphery and which are marked by axial growth striae, also evident near the umbilicus. At the beginning of the teleoconch a spiral cord may be seen on the dorsum but it promptly fades. Aperture rounded, columella and inner lip reflected outward. Umbilicus wide and deep, spiral cords absent from its border and inner aspect.

Holotype is 0.75 mm in maximum diameter and 0.32 mm in height.

Habitat: No information. All the material was collected in drift sediments.

Distribution: Only known from the type material: Guadeloupe, Puerto Rico and Panama.

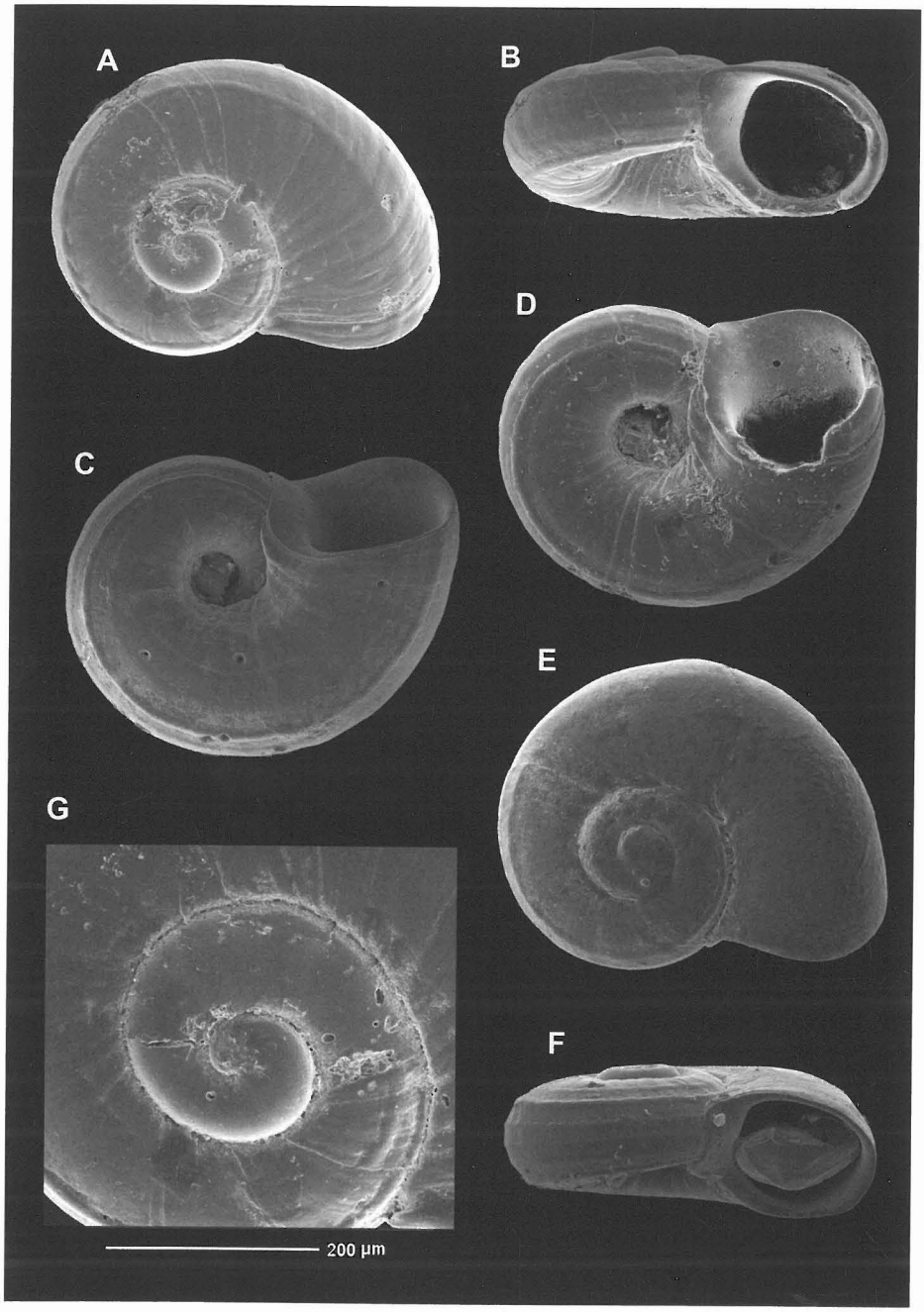
Remarks: *Cyclostremiscus* spec. nov. may be distingished from the other



Figures 52A-E. *Cyclostremiscus vanbruggeni* de Jong & Coomans, 1988. A-B: shells, 1.43, 1.28, Praia da Itararé, São Vicente, São Paulo (CHL); C: shell, 1.7 mm, Searborough, Tobago (CHL); D: detail of the sculpture; E: protoconch.

Figuras 52A-E. Cyclostremiscus vanbruggeni *de Jong & Coomans, 1988. A-B: conchas, 1,43, 1,28, Praia da Itararé, São Vicente, São Paulo (CHL); C: concha, 1,7 mm, Searborough, Tobago (CHL); D: detalle de la escultura; E: protoconcha.*

species of the complex *bartschi-jeannae-vanbruggeni-suppresus*, by the lack of any axial sculpture, having at the periphery 5 spiral cords not particularly prominent, delimiting a convex periphery.



Figures 53A-G. *Cyclostremiscus diminutus* spec. nov. Rubio, Rolán & Pelorce. A-C: holotype, 0.75 mm, Guadeloupe (MNHN); D-E: paratypes, 0.95, 0.87 mm, Bocas Island, Panama (USNM and AMNH, *ex* CHL)); F: paratype, 0,92 mm, Puerto Rico (CHL); G: protoconch.

Figuras 53A-G. Cyclostremiscus diminutus *spec. nov. Rubio, Rolán & Pelorce. A-C: holotipo, 0,75 mm, Guadeloupe (MNHN); D-E: paratipos, 0,95, 0,87 mm, Isla Bocas, Panamá (USNM and AMNH, ex CHL)); F: paratipo, 0,92 mm, Puerto Rico (CHL); G: protoconcha.*

Cyclostremiscus cubanus (Pilsbry & Aguayo, 1933) (Figures 54A-G)

Circulus cubanus Pilsbry & Aguayo, 1933. *The Nautilus*, 46: 120. pl. 6 figs. 6-6b. [Type locality: Varadero, Matanzas, Cuba].
Cyclostrema cubanus (Pilsbry & Aguayo, 1933).
Cyclostremiscus puntagordensis Weisbord, 1962: 141-142, pl. 13, figs. 10-12. [Type locality: Playa Grande Formation (Maiquetía member) at W-23, north flank of Punta Gorda anticline, Venezuela]. Fossil record.

Type material: Holotype in ANSP (160198). Represented in MOORE (1964: 230, fig. 26).
Other material examined: Belize: 2 s, 18 m, Deadman's Reef, Turneffe Island (CHL). Panama: 1 s, 1 mi N Punta San Blas, San Blas Islands (CHL). Honduras: 3 s, Calabash, Roatan Island (CHL). Puerto Rico: 2 s, Holiday Inn, San Juan (CHL). Cuba: 4 s, Varadero Beach, Matanzas (MCZ 109345, 179783); 1 s, Archipelago de los Canarreos, 5 m (CFR); 1 s, Cayo Avalos, 8 m (MHNS); 1 s, Cayo Diego Perez, beached (MHNS); 1 s, Faro Perez Diego, 10 m (MHNS); 2 s, Jibacoa, 3-6 m (MHNS); 5 s, Rancho Luna Beach, 10 m (MHNS); 15 s, Rancho Luna Beach, 20 m (MHNS); 4 s, Rancho Luna Beach, 45 m. Florida, USA: 1 s, 30 m, 32 mi E St. Augustine, St. Johns (CHL). Bahamas: 1 s, 15 m, French Bay, San Salvador (CHL); 4 s, 36 m, Mt Olympus Reef, 12 mi NNW Great Bahama Is (CHL); 4 s, 15 m, Samphire Cay, near Nassau (CHL); 21 s, 18 m, South Ridring Rocks, Cay Sal Bank (CHL); 1 s, 25 m, Marina Long Cay (CHL). Saint Kitts & Nevis: 6 s, 18 m, Monkey Shoals (CHL). Martinique: 1 s, coralline reefs of Point Borgnesse, 12 m, sand-muddy bottom (CJP). Trinidad and Tobago: Tobago, 16 s, Horse Shoe Reef, 15 m, shells grit bottom (CJP). Aruba: 1 s, 15 m, off Palm Beach (CHL). Bonaire: 1 s, 39 m, off Klein Bonaire (CHL). Virgin Islands: 5 s, 18 m, Deadman Chest (CHL); 5 s, Magens Bay, N coast of St. Thomas (CHL); 1 s, Virgin Gorda (CHL).

Description: Shell (Figs. 54A-C) depressed, whitish, robust, with spiral sculpture. Protoconch (Fig. 54D) of almost 1 ½ whorls, about 270 μm in diameter, and with two clearly differentiated stages; numerous strong irregular tubercles are seen on its surface. There is no varix evident at the transition between protoconch and teleoconch. The latter has about 1 ¼ rapidly-expanding whorls. Ornamentation formed by 6 strong spiral cords: 3 on the periphery, keel-like, having a slightly oblique profile; dorsally one spiral cord extends between the suture and the upper peripheral cord. On the base there are two spiral cords: one around the umbilicus and the other between this and the basal peripheral cord. On the spiral cords some thickening can be seen at the points where the axial growth striae cross. The entire surface of the shell is covered by a microsculpture (Figs. 54E-G) of fine spiral anastomosing threads. Aperture quadrangular, thickened; outer lip with very fine dentition on its inner margin. Columella and internal lip reflected towards the umbilicus. Parietal callus complete. Umbilicus wide and deep. Dimensions: The holotype is 1 mm in maximum diameter.

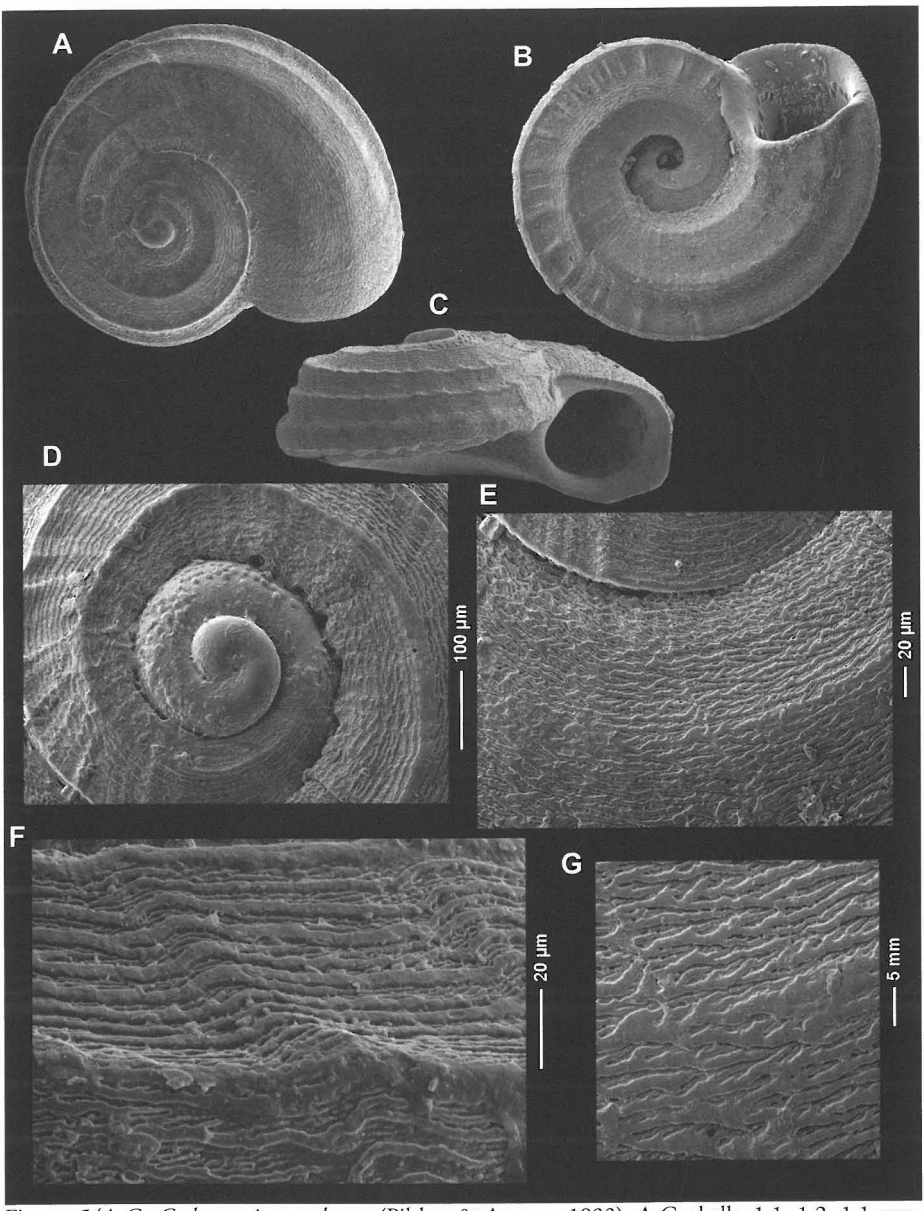
In our material there are some larger shells (1.20 mm in maximum diameter).

Animal and radula unknown.

Habitat: The bathymetric range of this species is large, having been recorded between 0 and 140 m in depth. There is no record of live-collected material, so its true habitat is unknown.

Distribution: This species has a wide Caribbean distribution. It has been recorded from Varadero, Cuba (PILSBRY & AGUAYO, 1933); from Florida, Cuba and the Virgin Islands (MOORE, 1964); from Florida, Garden Banks, Texas (ODÉ, 1988); from Florida, St. Augustine (LEE, 2009); from Abaco, Bahamas (REDFERN, 2001); and from Panama (OLSSON & MCGINTY, 1958). More localities are added in the present work.

Remarks: We have pointed out some shell features which were not mentioned in the original description or considered erroneous in the original or subsequent descriptions. With respect to the protoconch, PILSBRY & AGUAYO (1933) mentioned only that it is smooth and small; the dimensions of the holotype are erroneus because it was reported to be 1 mm in height and 0.45 mm in diameter. MOORE (1964) says that the protoconch has 2 ¼ whorls when really it has only 1 ½; he also comments that the



Figures 54A-G. *Cyclostremiscus cubanus* (Pilsbry & Aguayo, 1933). A-C: shells, 1.1, 1.2, 1.1 mm, Rancho Luna Beach, Cienfuegos, Cuba (MHNS); J-K: protoconch; E-G: details of the microsculpture.

Figuras 54A-G. Cyclostremiscus cubanus *(Pilsbry & Aguayo, 1933). A-C: conchas, 1,1, 1,2, 1,1 mm, Playa Rancho Luna, Cienfuegos, Cuba (MHNS); J-K: protoconcha; E-G: detalles de la microescultura.*

microsculpture covers all the shell, but it is absent from the umbilicus.

C. puntagordensis, a species placed in synonymy by MOORE (1964) was described as a fossil from the Plio-Pleistocene of Venezuela by WEISBORD (1962), but the only shell known, the hololotype, has slighty larger dimensions (1.4 mm).

Cyclostremiscus euglyptus Aguayo & Borro, 1946 (Figures 55A-D)

Cyclostremiscus euglyptus Aguayo & Borro, 1946. *Rev. Sdad. Malac. "Carlos de la Torre,"* 4(1): 9-10, figs. 4-6. [Type locality: Matanzas, Cuba].

Type material: Holotype represented in AGUAYO & BORRO (1946, figs. 4-6), in MPH (11877). Described as a fossil of the Upper Tertiary found in the formation "Yumurí," Upper Miocene of Cuba.
Other material examined: Cuba: 1 s, Cayo Avalos, 8 m (MHNS); 1 s, Cayo Perez Diego, 5 m (MHNS); 1 s, Jibacoa, 3-6 m (MHNS); 16 s, Cienfuegos Bay, 20-30 m (CFG); 2 s, Rancho Luna Beach, 12 m (CFG); 47 s, Rancho Luna Beach, 20 m (MHNS); 1 s, Rancho Luna Beach, 35 m (CFG); 14 s, Rancho Luna Beach, 45 m (CFG); 5 s, Faro los Colorados, 56 m (CFG); 2 s, Punta Tamarindo, 25 m (CFG).

Description: Shell (Figs. 55A-C). The original description of AGUAYO & BORRO (1946: 9-10) is as follows: *"Concha pequeña, discoidal, de espira muy poco elevada, ampliamente umbilicada. Con 1 ¼ vueltas embrionarias lisas y 2 ¼ postnucleares fuertemente esculpidas. Escultura espiral formada por dos quillas periféricas que limitan el contorno de la última vuelta y otra basal que bordea el ombligo. Finas líneas espirales se observan entre las expresadas quillas. Escultura axial formada por unas 40 costillas radiales en la última vuelta, que forman nódulos o incisiones al cruzar los cordones espirales. Periferia de la última vuelta con los lados casi paralelos y formando ángulos marcados con el eje de la concha. Ombligo amplio, dejando ver las vueltas nucleares. Pared del ombligo con escultura radial, pero sin líneas espirales. Abertura cuadrangular, con el lado columelar muy arqueado; el resto poligonal por la articulación de las quillas espirales".*

Protoconch (Fig. 55D) with a diameter of about 190 μm, smooth except at the earliest, embryonic, part where irregular short lines can be seen. The separation from the teleoconch is very evident.

Dimensions: the holotype is 1.05 mm in diameter and 0.56 mm in height. The single paratype, from the same lot, measured 1 mm in diameter and 0.60 mm in height. The dimensions of our material are similar to those of the holotype.

Habitat: This species is relatively common in Cuba. Its bathymetric distribution is between 5 and 60 m; most of the shells of our material were collected between 20 and 56 m.

Distribution: Only known from Cuba.

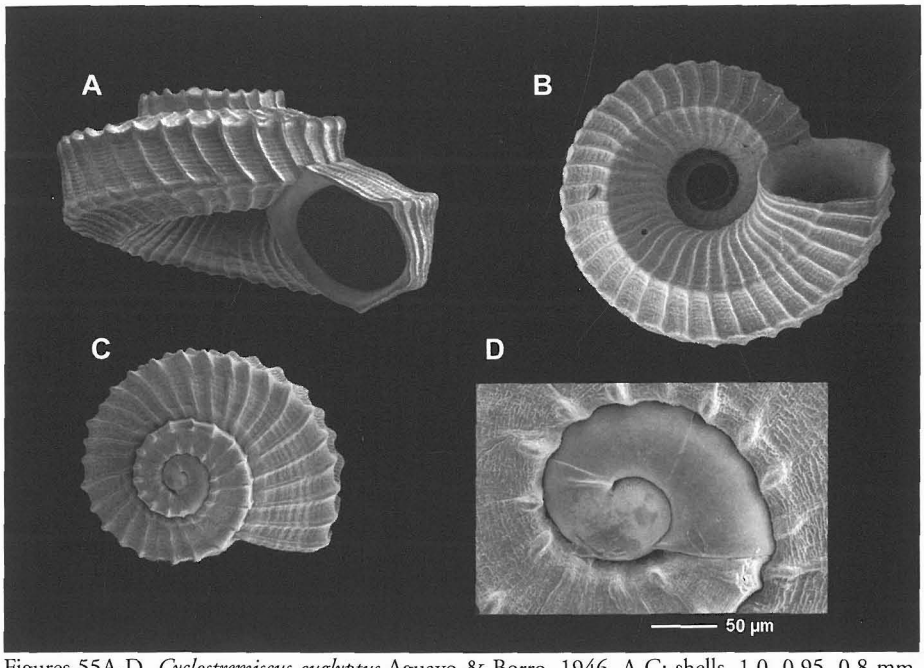
Remarks: There is no other species in the genus with this shell morphology, thus its identification is easy. Being a species probably "endemic" to the island of Cuba, it has been overlooked in published works and electronic databases.

Cyclostremiscus microstriatus spec. nov. Rubio, Rolán & Lee (Figures 56A-H)

Vitrinorbis sp. Lee, 2009: 69, nº 333.

Type material: Holotype (Fig. 56A) in MNCN (15.05/55055). Paratypes in the following collections: MNHN (24395, 1 s, Fig. 56B), MHNS (100549, 1 s, Fig. 56C) from the type locality (all *ex* CFG). Other paratypes: FLMNH (448609, 1 s, Fig. 48D, trawled 30 m, 35 mi E Mayport, Duval Co., Fla.; 3 s, trawled 30 m, 35 mi E St. Augustine, St. Johns Co., Fla. (Fig. 56E) (one in USNM 1155029, other in ANSP and a third in CHL).
Type locality: Rancho Luna Beach, Cienfuegos, Cuba.
Etymology: The specific name refers to the minute striation in the interspaces between cords.

Description: Shell (Figs. 56A-E) of very small size, planispiral, robust, whitish, solid, not shiny. Protoconch (Fig. 56F) with a fine granulation barely observable; 1 ¼ whorls and about 240 μm in diameter; there is no thick rib at



Figures 55A-D. *Cyclostremiscus euglyptus* Aguayo & Borro, 1946. A-C: shells, 1.0, 0.95, 0.8 mm, Cienfuegos, Cuba; D: protoconch.
Figures 55A-D. Cyclostremiscus euglyptus *Aguayo & Borro, 1946. A-C: conchas, 1,0, 0,95, 0,8 mm, Cienfuegos, Cuba; D: protoconcha.*

the junction with the teleoconch. Teleoconch with about 1 ¾ whorls. The entire shell is covered by wide spiral cords of almost equal size. The interspaces between cords are covered by fine axial incisions (Figs. 56G-H). On the last whorl there are between 20 and 23 cords; 7-8 on the dorsum, 8 on the periphery and 6-8 on the base. On the base, there is a space without cords from the middle of the last whorl to the umbilical border. Umbilicus smaller than those in congeneric species, the previous whorls can be seen on its interior. Aperture prosocline, rounded, thickened, its external margin forms a characteristic point in the area where the 7th-9th cords, the three most prominent ones, are placed. The columella as well as the internal lip and the upper part of the external lip are reflected outward. The first peripheral cord, as well as the dorsum and the last peripheral cord near the base are visible from above, the base being sligtly concave.

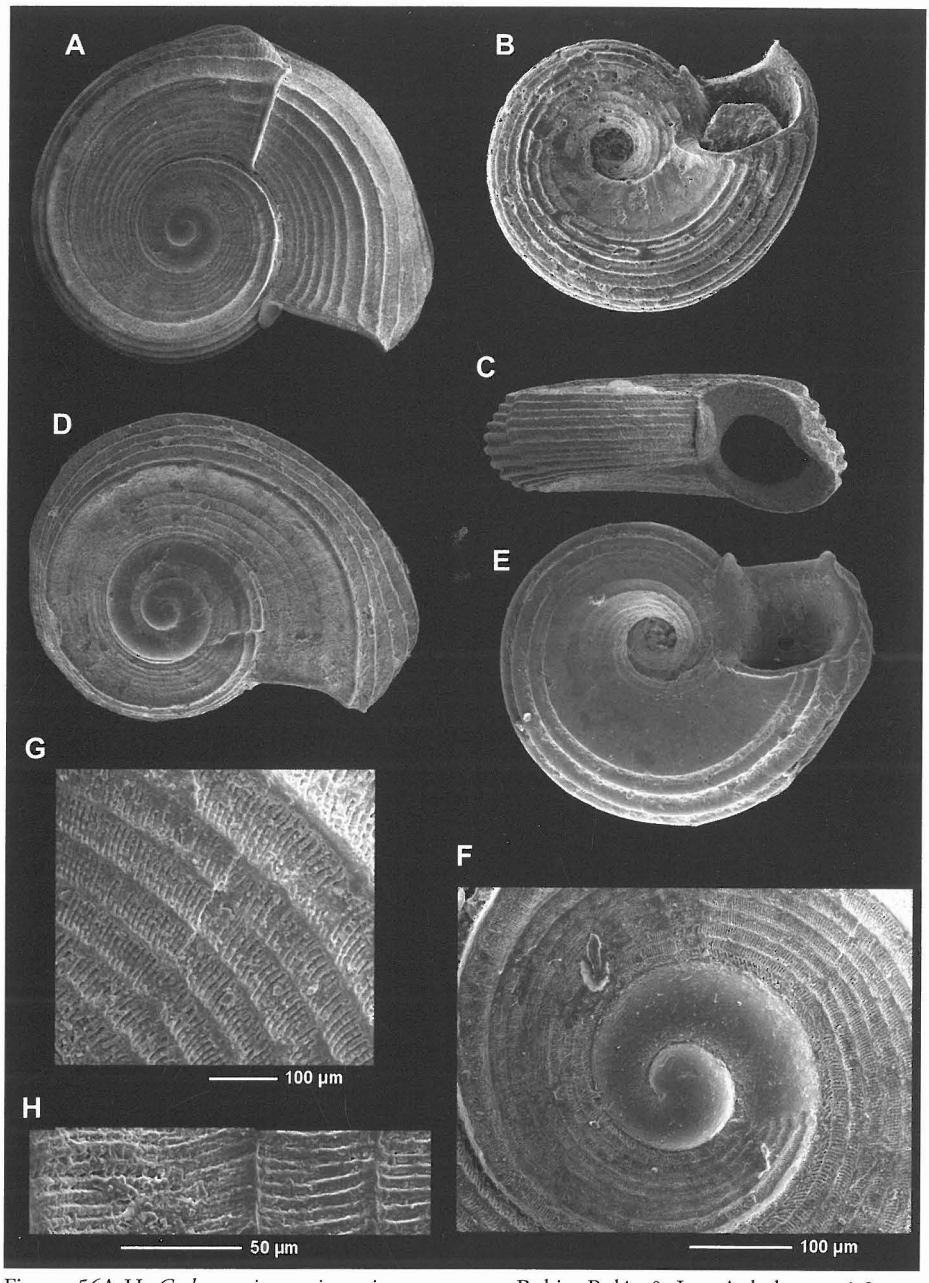
Dimensions: The holotype is 1.3 mm in maximum diameter and 0.40 mm in height.

Animal and radula unknown.

Distribution: Known only from Cienfuegos, Cuba and Florida, USA.

Discussion: Cyclostremiscus microstriatus spec. nov., is a very characteristic species; its form is almost planispiral, its ornamentation is formed by subequal spiral cords and very fine axial incisions in the interspaces, as well as the prolongation which forms the border of the external lip.

A similar species was recorded by LYONS (1989) as *Vitrinorbis* sp. It is much more flattened in profile and is markedly angulate at the level of the lowest peripheral keel. LEE (2009) suggested that *Circulus gunteri* (Mansfield, 1930), described from the Miocene of Florida, was ancestral to *Cyclostremis-*



Figures 56A-H. *Cyclostremiscus microstriatus* spec. nov. Rubio, Rolán & Lee. A: holotype, 1.3 mm (MNCN); B: paratype, 1.1 mm (MNHN); C: paratype, 1.0 mm (MHNS), Rancho Luna Beach, Cienfuegos, Cuba; D: paratype, 1.3, Duval Co., Florida (FLMNH); E: paratype, 1.2 mm, E St. Angustin, St. Johns Co., Florida (USNM); F: protoconch; G-H: microsculpture.

Figures 56A-H. Cyclostremiscus microstriatus *spec. nov. Rubio, Rolán & Lee. A: holotipo, 1,3 mm (MNCN); B: paratipo, 1,1 mm (MNHN); C: paratipo, 1,0 mm (MHNS), Playa Rancho Luna, Cienfuegos, Cuba; D: paratipo, 1,3, Duval Co., Florida (FLMNH); E: paratipo, 1,2 mm, E St. Angustin, St. Johns Co., Florida (USNM); F: protoconcha; G-H: microescultura.*

cus microstriatus spec. nov. (his *Vitrinorbis* species [no. 333]); the fossil, while having the same flat spire, differs in having the body whorl totally covered by cords and lacking the labral projection.

Circulus quadricristatus (Aguayo, 1949) is also similar to *C. microstriatus* spec. nov., but it only presents 4 wide cords on the periphery and lacks the labral projection.

LEE (2009) also suggested that the Panamic *Cyclostremiscus salvatierrensis* Hertz, Myers & Gemmill, 1992 was cognate with *C. microstriatus* spec. nov. (his *Vitrinorbis* species [no. 333]).

Genus *Cochliolepis* Stimpson, 1858

Cochliolepis Stimpson, 1858. *Proc. Boston Soc. Nat. Hist.*, VI: 308.
Type species: *Cochliolepis parasiticus* [sic] Stimpson, 1858, by monotypy. Recent, Caribbean.

Diagnosis: MOORE (1964: 168) *"Thin-shelled, strongly depressed and openly umbilicate. Apex flat or sunken, surface smooth except for growth lines or occasionally spiral striations. Aperture oblique, peristome very briefly in contact with preceding whorl. Adult whorls rapidly increase in size. Soft parts described as bright red, with two long pallial tentacles, and with a supplementary gill projecting from the right side of the aperture. Operculum thin and flexible".*

C. parasitica was collected alive below the "elytra" of the giant worm *Polidontes lupinus*. *C. parasitica* is a commensal and not a parasite. It apparently feeds on the fine particulate organic material drawn into the tube by the worm`s respiratory and feeding current. It possibly performs a cleaning function.

Remarks: MOORE (1964) commented on the distribution of the genus: *"the genus appears to be confined to the West Indian region.* C. parasitica *is found on the Carolina coast,* C. nautiliformis *and* C. striata *live on the Gulf of Mexico and* C. adamsii *is known from Guadeloupe".*

However, we have found a very different situation: First at all, we have tried to make the specific differentiation basing not only on the characters of the teleoconch but also the protoconch. Fortunately we were able to compare shells from very different Caribbean localities confirming the morphology of the protoconch of *Cochliolepis parasitica* shown for the first time *by* REDFERN (2001). The sculpture is very characteristic, and it allows the distinction from congeneric species even as juveniles.

As for *Cochliolepis nautiliformis* (Holmes, 1859), in spite of the opinion of some authors who consider it as a synonym of *C. parasitica*, we could not confirm this due to the difficulty of observing the protoconch of that species; thus we prefer to present it provisionally as a separate taxon.

Cochliolepis adamsii (P. Fischer, 1857) (Figures 57A-D)

Adeorbis adamsii P. Fischer, 1857. *Journal de Conchyliologie*, 6: 287, pl. 10, fig. 11. [Type locality: Guadeloupe].

Type material: In MNHN. Not examined.
Other material examined: Bahamas: 1 s, beach near Current Cut, Current Eleuthera (CHL); 1 s, 36 m, Olympus Reef, 12 mi NNW West End, Grand Bahama Island (CHL). Florida, USA: 1 s, 1 m, Peanut Island, Palm Beach Co. (CHL).

Description: This is the original description of P. FISCHER (1857: 287): *"Testa translucida, corneo-alba, nitida, complanata, suborbiculari, umbilicata; suprà minutissimé et concentricè striata; subtus laevicula; anfractibus 3 ½ rapidè accrescentes, ultimo compressiusculo, non carinato; aperture subovata, parum transversa; margine dextro tenui, fragil"*. This description must be suplemented with some information obtained from the materal presently studied:

Shell (Figs. 57A-D) depressed, fragile, of whitish-tan color, comprised of 3 ½ rapidly-expanding whorls. Protoconch (Fig. 57C) about 390 μm in diameter with a nucleus of about 160 μm. Following the nucleus a prominent spiral sculpture appears, being formed by four discrete cordlets which terminate at the beginning of the teleoconch. The teleoconch has a fine spiral striation which is crossed by numerous distinct growth lines, even into the widely-open umbilicus. Aperture suboval, with a fine and fragile border. No columellar or parietal callus.

Dimensions: Holotype 6.5 mm in maximum diameter and 2.0 mm in height.

Our shells are 7.1 and 6.2 mm in diameter.

Animal and radula unknown.

Habitat: This species, as well as its congeners, prefers shallow water in coastal bays. No bathymetric information was provided in the original description. Our shell came from a sandy and rocky bottom at 2 m deep.

Distribution: Recorded from USA: Florida: Florida Keys (MAURY, 1922; MOORE, 1964) and Guadeloupe (FISCHER, 1857).

Remarks: The species was previously included in the genus *Macromphalina*.

MOORE (1964) mentioned that during his stay in Paris in 1963, he examined the type of *Adeorbis adamsii* P. Fischer, 1857, concluding that "it is a *Cochliolepis* very similar to *C. striata* Dall, 1889, but more inflated".

The four species in the West Indian region may be separated into two groups: *C. parasitica* and *C. nautiliformis* are relatively small, smooth and shiny; *C. striata* and *C. adamsii* are relatively larger, spirally striated and have a light tan coloration. Contrary to the observations of MOORE (1964: 174), the base presents the same ornamentation as the rest of the shell.

Cochliolepis holmesii (Dall, 1889) (Figures 58A-F)

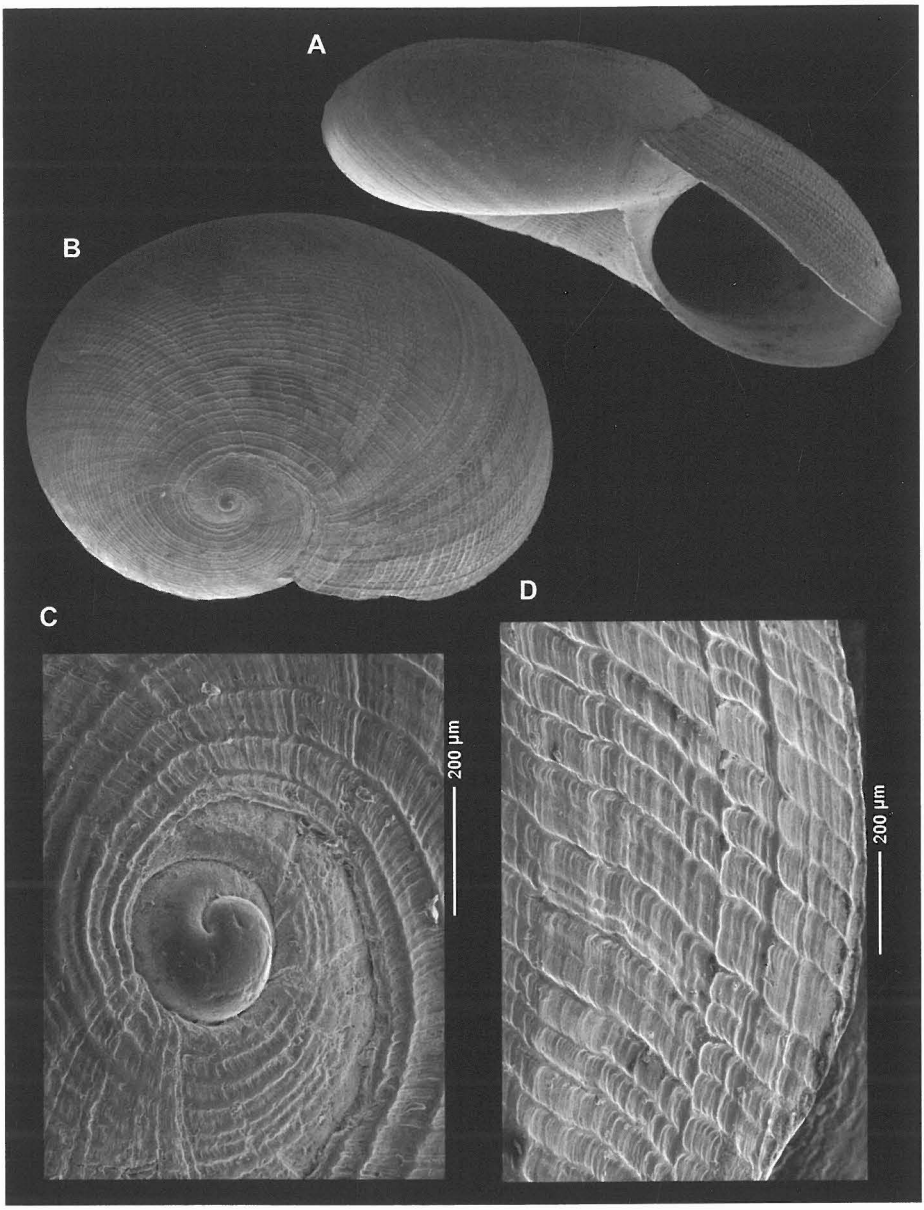
Cochliolepis parasiticus [sic] Holmes, 1859. *Post-Pleiocene Fossils of South Carolina:* 93-94, pl. 14, figs. 9, 9a, 9b. [Type locality: South Carolina, Post Pliocene] non *Cochliolepis parasiticus* [sic] Stimpson, 1858.

Vitrinella holmesii Dall, 1889a. *Bulletin of the Museum of Comparative Zoology* 18: 360, 392.

Type material: Deposited in MCZ. Not examined.

Material examined: Florida, USA: 5 s, APAC Pit, Sarasota, Plio-Pleistocene (CHL). Mexico: 2 s, Puerto Morelos, Yucatan, 10-16 m (MHNS).

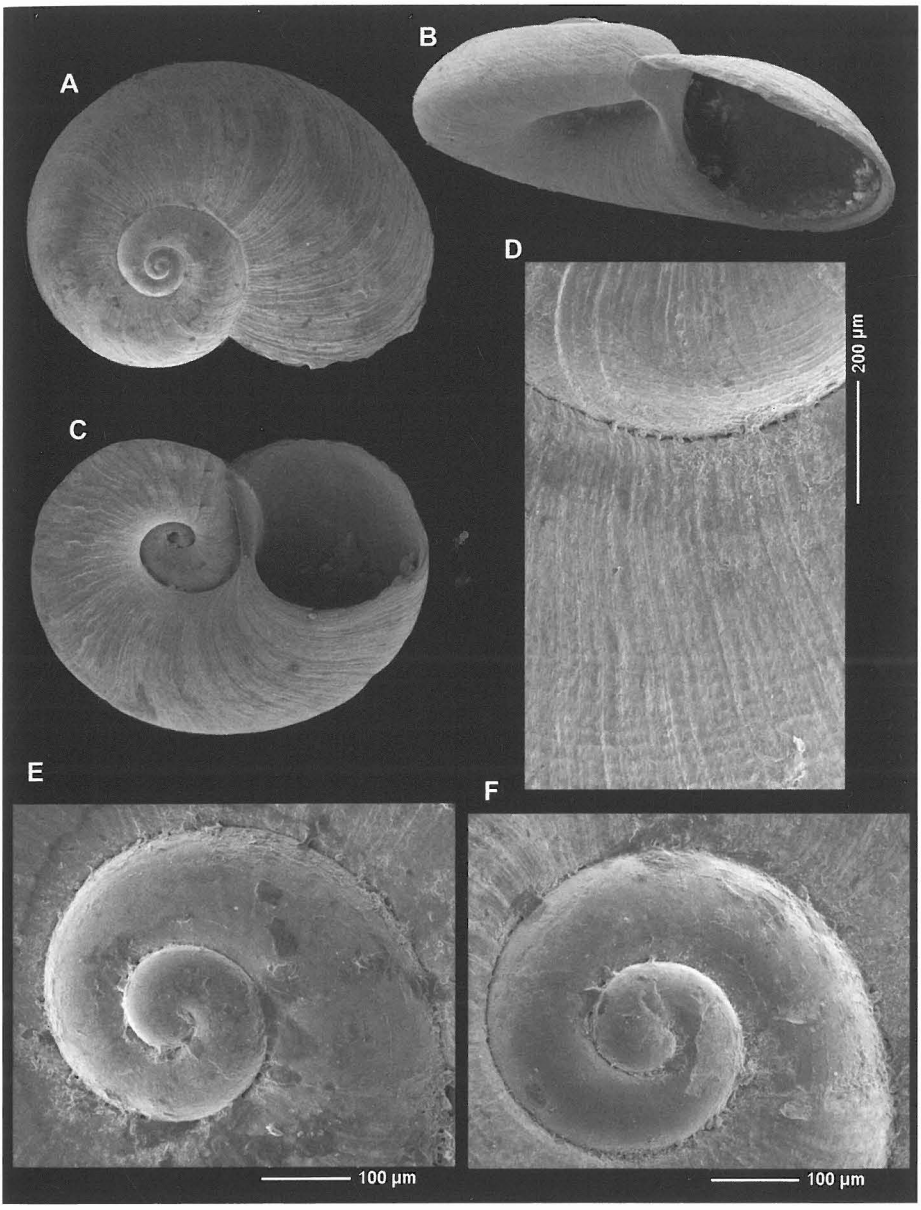
Description: From PILSBRY (1953: 433-434): *"The thin shell is biconvex; the periphery, below the middle of the whorl, is quite narrowly rounded, the whorl being more convex above than below it. The spire is nearly level but the apex is visible in a face view. The suture is deeply impressed, the whorls convex. The umbilicus is very broad and open, with a deep suture, the umbilical side of the whorls being strongly convex. The weak wrinkles of growth become stronger as they approach the lip, and are often rather fine and close on the base of the last third of the body-whorl. A microscopic, close, spiral striation covers the last whorl in good specimens, being weaker*



Figures 57A-D. *Cochliolepis adamsii* (P. Fischer, 1857). A-B; shells, 7.1, 6.2 mm, Bahamas (CHL); C: protoconch; D: microsculpture.
Figuras 57A-D. Cochliolepis adamsii *(P. Fischer, 1857). A-B; conchas, 7,1, 6,2 mm, Bahamas (CHL); C: protoconcha; D: microescultura.*

at the base. The aperture is oblique. Peristome is thin, the columellar margin concave below, then in a straight line to the insertion just below the periphery. It is thin throughout. The parietal callus is very short and thin".

We add: The shells (Figs. 58A-C) examined have the protoconch (Figs.



Figures 58A-F. *Cochliolepis holmesii* (Dall, 1889). A-C: shells, 3.66, 3.0, 2.96 mm, Plio-Pleistocene of Sarasota, Florida (CHL); D: microsculpture; E-F: protoconchs.
Figuras 58A-F. Cochliolepis holmesii *(Dall, 1889). A-C: conchas, 3,66, 3,0, 2,96 mm, Plio-Pleistoceno de Sarasota, Florida (CHL); D: microescultura; E-F: protoconchas.*

58E-F) bulbous, about 470 µm, 1 ¾ whorls, and with a very marked suture. Two stages may be easily distinguished: the embryonic shell is ¾ of whorl, measuring about 170 µm in diameter and is covered by a fine granulation, more evident in the areas close to the suture. The second stage has 5-6 fine spiral lines and minute growth marks.

The teleoconch is completely covered by growth marks and spiral striae; on the dorsum of the shell the collabral growth marks are more robust, especially at the later stages of growth, while on the base they are finer and denser on the last third of the whorl. Periphery subangular.

Maximum reported size: 2.4 mm

Habitat: Depth: 2 to 11 m.

Distribution: USA: Florida: East Florida (LYONS, 1989); Mexico: Cozumel (MOORE, 1973).

Remarks: The name *Vitrinella holmesii* was introduced by Dall because *Cochliolepis parasiticus* [sic] Stimpson was misidentified by HOLMES (1859: 93-94, pl. 14, figs. 9, 9a, 9b); it was, in fact, a new species.

The type of this species appears to be lost; it was described and figured by HOLMES (1859) but no topotypic specimens have been collected. Dall's notes (1892) mention a specimen in the USNM (114368), which he identified with the Post-Pliocene species of HOLMES (1859). DALL (1889a) used the spelling *'holmesi'* on p. 360 and *'holmesii'* on p. 392. DALL (1892), acting as First Reviser, employed the latter spelling, thus establishing the correct original spelling.

C. holmesii was described as a fossil of the Post-Pleiocene of South Carolina (HOLMES, 1859; DALL, 1889a); from the Miocene of Duplin County, North Carolina (DALL, 1892); from the St. Petersburg Pliocene, the Pliocene in the Waccamaw formation of North Carolina, and the Miocene of the Natural Well, Duplin Co., North Carolina (PILSBRY, 1953).

Cochliolepis nautiliformis (Holmes, 1859) (Figures 59A-C)

Adeorbis nautiliformis Holmes, 1859: 93, pl. 14, figs. 8-8b. [Type locality: Cainhoy, Wando River, South Carolina].

Type material: Unknown.

Other material examined: Florida, USA: 1 sp, Tarpon Springs, Pinellas Co., S end of the parking lot Howard Park, (CHL); 1 s, Gulfport, Pinellas Co. (CHL).

Remarks: In discussing figured specimens of *Cochliolepis nautiliformis* (Holmes) from the St. Petersburg Plio-Pleistocene, PILSBRY (1953) in OLSSON & HARBISON (1953) commented: *"DALL (1889: 360) stated that* A. nautiliformis *Holmes is identical with* C. parasitica *Stimpson, and this synonymy has been accepted by some later authors without verification. There are several specific differences, the most conspicuous being the much more extensive envelopment of the spire in* C. nautiliformis, *reducing the visible spiral, the summit being left as a slight depression. The apical whorl is wider and fully exposed in* C. parasitica".

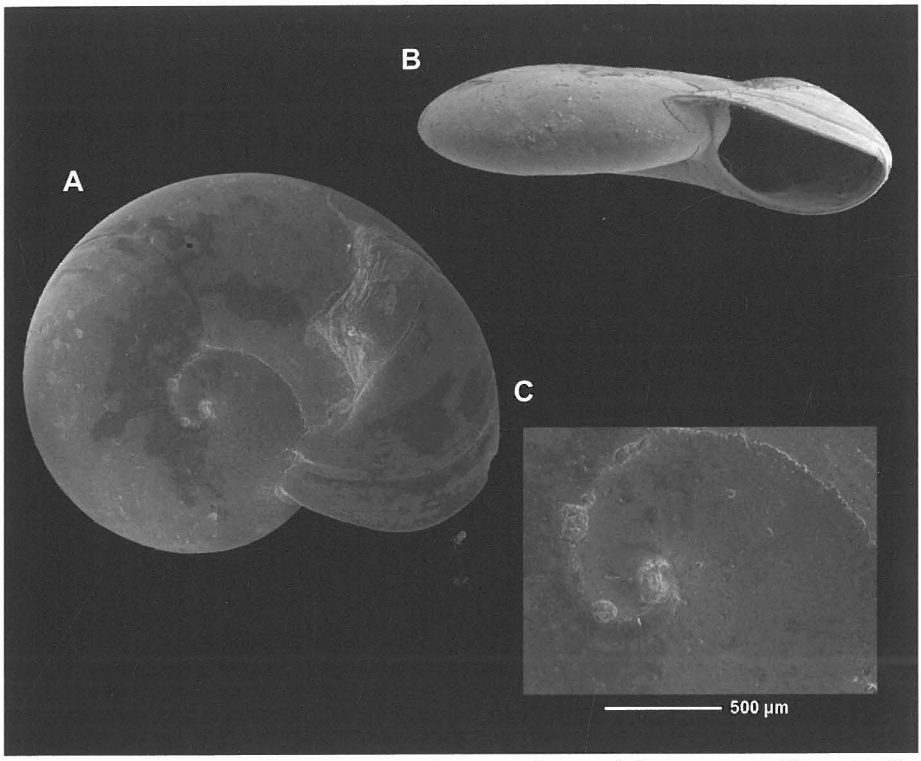
We have insufficient material to formulate an opinion about this taxon, therefore we present figures of what we perceive as this species. The problem can only be resolved with more material, including live-collected specimens.

Cochliolepis parasitica Stimpson, 1858 (Figures 60A-G, 61A-H, 62A-F)

Cochliolepis parasiticus [sic] Stimpson, 1858: 307-309, text-fig. [Type locality: Charleston Harbor, South Carolina].

Nemafera compressa Kurtz, 1960: 8. Not figured. [Type locality: Fort Johnson, South Carolina].

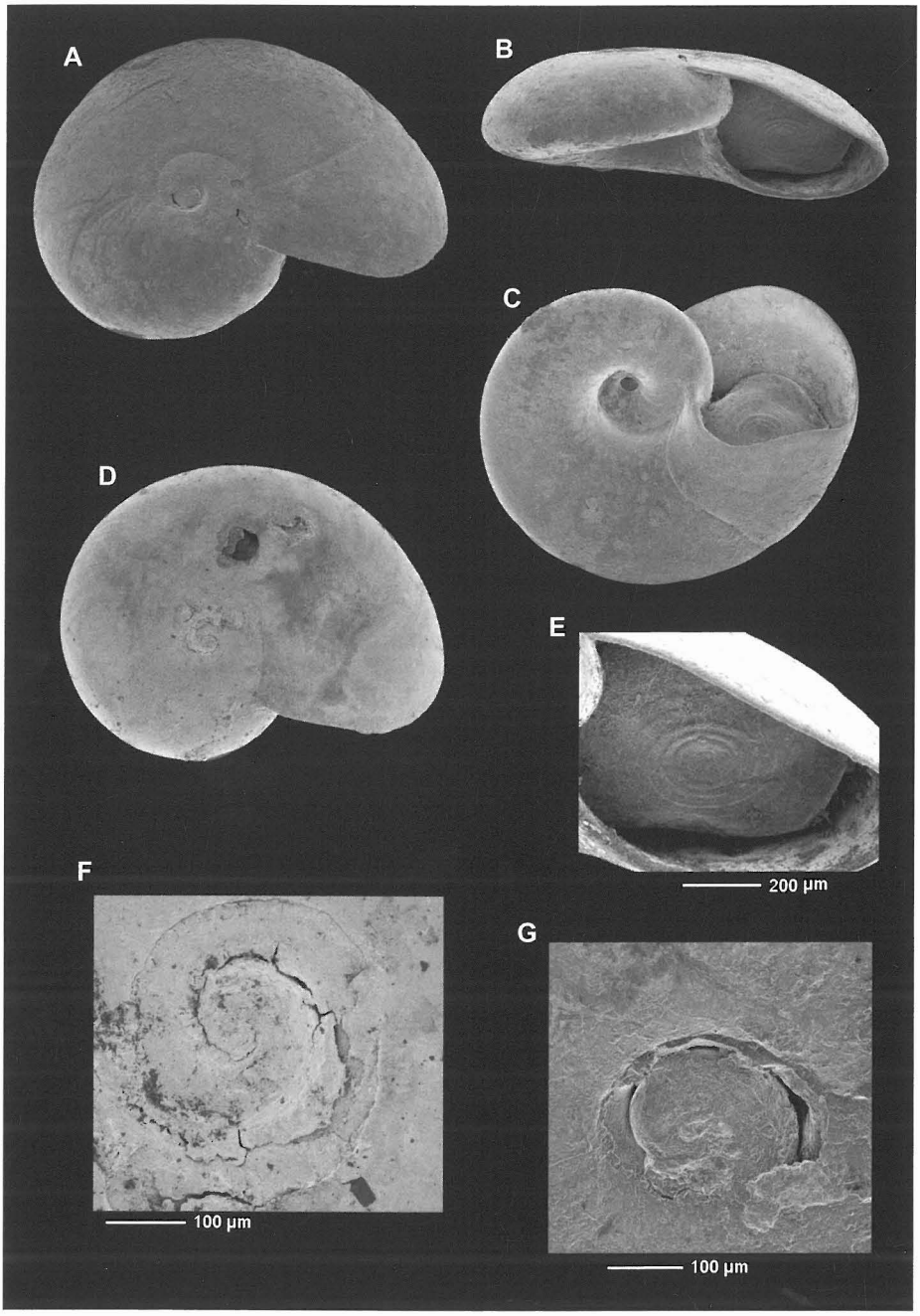
Type material: Two syntypes in USNM (95079) (corresponding to two specimens deposited with n° 87142, given by Stimpson to Isaac Lea). Examined in photographs (Figures 60A-G). The larger one is here designated the lectotype.



Figures 59A-C. *Cochliolepis nautiliformis* (Holmes, 1859). A-B: shell, 5.0 mm, Gulfport, Pinellas Co., Florida (CHL); C: protoconch.
Figuras 59A-C. Cochliolepis nautiliformis *(Holmes, 1859). A-B: concha, 5,0 mm, Gulfport, Pinellas Co., Florida (CHL); C: protoconcha.*

Other material examined: Bermuda: about 300 s, Gibbons Bay (CHL). Bahamas: 1 s, Channel, Chub Cay (CHL); 1 s, W end Grand Bahama (CHL); 3 s, beach, 300 m N Current Cut, Eleuthera (CHL); 2 s, 15 m, NW Nassau (CHL); 85 s and some j, from Abaco, 10-23 m (CCR). Florida, USA: 1 s, 36-90 m, off Dry Tortugas (CHL); 2 s, beach, 500 m W Flamingo Visitors Center, Monroe Co (CHL). Mexico: 3 s, Puerto Morelos, Yucatan, 8-18 m (MHNS). Guadeloupe: 1 s, north Olive Bay, 2 m, among rocks (CJP). Cuba: 5 s, Maria la Gorda, 20 m (MHNS); 3 s, Playa Girón, 2 m (MHNS); 4 s, Cayo Carenas, Cienfuegos Bay, 5 m. Turks & Caicos: 13 s, 18 m, French Cay (CHL). Puerto Rico: 1 s, beach, Holiday Inn, San Juan (CHL). St. Kitts and Nevis: 1 s, 14 m, The Garden, Nevis (CHL). Aruba: 1 s, 15 m, off Palm Beach (CHL). Grand Cayman Island: 1 s, beach grit, 100 m S. Rum Pt., Cayman Kai (CHL).

Description: Shell (Figs. 60A-D, 61A, 62A-C): See STIMPSON (1858). The best description is in MOORE (1972: 103): *"The smooth glassy shell is strongly depressed, flattened on top, and broadly umbilicate. The protoconch is slightly immersed in the teleoconch and consists of about 1 ¾ whorls. The teleoconch consists of slightly more than two whorls in a large specimen 4.02 mm in diameter. The first adult whorl has a thin callus of shell up to, or sometimes covering part of, the protoconch; the suture is carried out toward the periphery on the last half whorl. The suture thus follows a nearly crescent-shaped curve from the protoconch to the inner corner of the aperture. There is a thin*



Figures 60A-G. *Cochliolepis parasitica* Stimpson, 1858. A-B: lectotype, 3.4 mm (USNM 87142); C-D: shell of the same lot, 3.4 mm (USNM); E: detail of the operculum; F-G: protoconch of the both specimens. (SEMs by Yolanda Villacampa, USNM).

Figuras 60A-G. Cochliolepis parasitica *Stimpson, 1858. A-B: lectotipo, 3,4 mm (USNM 87142); C-D: concha del mismo lote, 3,4 mm (USNM); E: detalle del opérculo; F-G: protoconcha de ambos ejemplares. (fotografías al MEB de Yolanda Villacampa, USNM).*

callus on the parietal wall, and the columella is thickened where it joins the preceding whorl. The aperture is oblique, for the upper part the peristome is extended well beyond the remainder of the outer lip. The aperture is wider than high, with a ratio of about 4 to 3. The outer lip is thin, smooth, and with no thickening to indicate maturity. Most adult specimens have one or more strong growth lines, which give a nautiloid appearance to the shell. The umbilicus is widely open and penetrates to the protoconch. Height-to-breadth ratio for the teleoconch is about 1.0 to 3.5. A specimen 4.02 mm in diameter was 1.23 mm high. Maximun diameter is about 4.5 mm".

Curiously, until the work of REDFERN (2001) the protoconch of *Cochliolepis parasitica* had never been described, probably due to the destruction of the holotype and because putative type material now in USNM (labelled "syntype", possible paratypes), though juveniles, have the protoconch eroded or concealed in callus. In our opinion the description of the protoconch of *Cochliolepis parasitica* is very important, because it is necessary for the correct differentiation from otherwise quite similar species in the genus.

According REDFERN'S (2001) description: *"The protoconch of adult shells is usually abraded, showing only traces of the distinctive sculpture seen on a larval shell. The embryonic whorl is smooth and translucent, but the subsequent whorl is more opaque, with an irregular pattern of raised zigzag spiral threads. Each of these produces random off-shoots that project obliquely towards the adjacent thread, and this sculpture tends to become more regular towards the periphery".*

We were able to compare the protoconchs from the Bahamas with those from Bermuda and Turks & Caicos, and we conclude that, despite small differences among them, all fall within Redfern's description (Figures 60F-G, 61B-H, 62D-F).

Maximum reported size: 4.2 mm. Lectotype in USNM 3.4 mm. The other specimen in the lot is of a similar size.

Size of a specimen from Playa Giron, Cuba: shell 3.05 mm diameter; protoconch 570 μm in diameter.

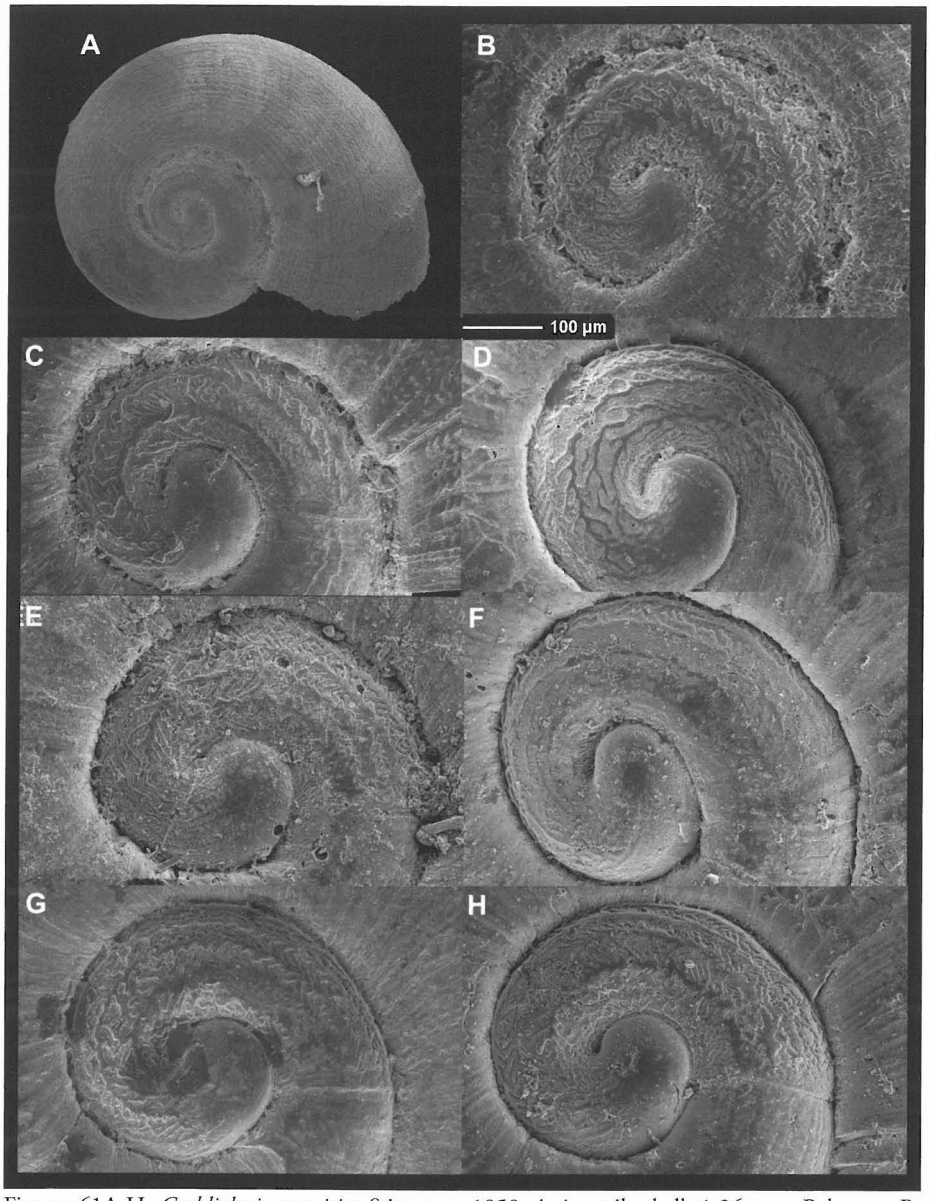
Size specimen from Puerto Morelos, Yucatan: shell 2.63 mm diameter; protoconch 463 μm in diameter.

The animal has a pair of cephalic tentacles, two more pallial tentacles, which project from the upper angle of the aperture, a medium-sized slipper-like foot, a multispiral operculum, a large and well developed ctenidium and an elongate, narrow and curved penis in the male (MOORE, 1972).

Habitat: Depth: 0 to 48 m (living at 0.3 to 0.6 m). MOORE (1972) concludes that *C. parasitica* is not a parasite of the annelid *Acoetes lupina* Stimpson, but a herbivore which lives as a dependent symbiont. Since the snails are often found on the worm itself, they possibly perform a cleaning function.

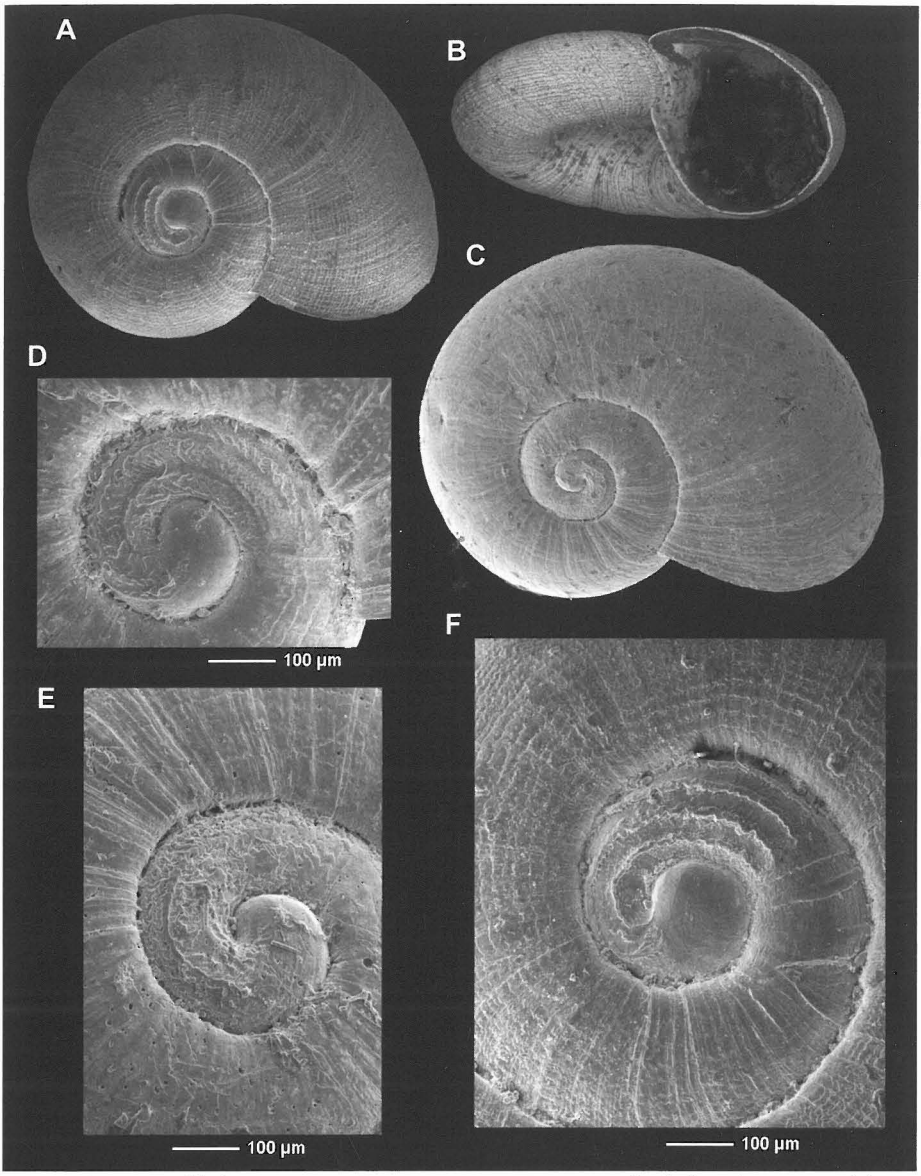
Distribution: *Cochliolepis parasitica* Stimpson was originally found in the harbor of Charleston, South Carolina, living under scales of the annelid *Acoetes lupina*. It was reported by HOLMES (1860) from the Post-Pliocene at Simmons Place, Wando River, South Carolina, but this was an erroneous identification; the species figured by him is not that of Stimpson, and it was renamed *Vitrinella holmesii* Dall.

Its actual known range is: USA: North Carolina, South Carolina, Florida: West Florida, Florida Keys, Texas; Mexico: Campeche State, Yucatan State, Quintana Roo; Colombia; Bermuda; Puerto Rico. Recorded from Charleston Harbor, South Carolina (STIMPSON, 1858); from (DALL, 1892); from Cainhoy, Wando River, South Carolina (HOLMES, 1859); from Fort Johson, South Carolina (KURTZ, 1860); from Beaufort, North Carolina (HARTMAN, 1945); from Grand Cayman (ABBOTT, 1958) but MOORE (1972) considers that Abbott's record corresponds to another different species); from the west coasts of Florida and Aransas Bay, Texas (MOORE, 1964); from Aransas Bay, Texas to Beaufort,



Figures 61A-H. *Cochliolepis parasitica* Stimpson, 1858. A: juvenile shell, 1.36 mm, Bahamas; B: protoconch, Bahamas; C-H: protoconchs, Bermuda (CHL).
Figuras 61A-H. Cochliolepis parasitica *Stimpson, 1858. A: concha juvenil, 1,36 mm, Bahamas; B: protoconcha, Bahamas; C-H: protoconchas, Bermuda (CHL).*

North Carolina (MOORE, 1972); from North Carolina (PORTER, 1974); from Campeche State, Yucatan State and Quintana Roo, Mexico (ODÉ, 1988); from Colombia (DÍAZ MERLANO & PUYANA HEGEDUS (1990); from Florida (LYONS, 1998); from Abaco, Bahamas (REDFERN, 2002) and from St. Augustine (LEE, 2009); from Cuba in the present work.



Figures 62A-F. *Cochliolepis parasitica* Stimpson, 1858. A-B: juvenile shell, 1.6 mm, Guadeloupe (CJP); C: shell, 2.1 mm, Maria la Gorda, Cuba; D-F: protoconchs; D: from Turks & Caicos; E: Maria la Gorda; F: from Guadeloupe.

Figuras 62A-F. Cochliolepis parasitica *Stimpson, 1858. A-B: concha juvenil, 1,6 mm, Guadeloupe (CJP); C: concha, 2,1 mm, Maria la Gorda, Cuba; D-F: protoconchas; D: de Turks & Caicos; E: Maria la Gorda; F: de Guadeloupe.*

C. parasitica has been recorded as fossil (as *Adeorbis nautiliformis*; a disputed synonym) from the post-Pliocene of South Carolina at the Wando River (HOLMES, 1860); from the Plio-Pleistocene of the Caloosahatchie beds, Florida (DALL, 1892) and from the Plio-Pleistocene of St. Petersburg, Florida (PILSBRY, 1953).

Remarks: The type specimen of *C. parasitica* was lost in the Chicago fire of 1871, but two specimens given by Stimpson to Isaac Lea are now in the National Museum, n° 95079. The larger one, diameter 3.4 mm, is designated the lectotype.

Cochliolepis striata Dall, 1889 (Figures 63A-E)

Cochliolepis parasitica auct. non Stimpson, 1858.
Cochliolepis striata Dall, 1889. *Bull. Mus. Comp. Zool. Harvard*, 18: 360. [Type locality: Egmont Key, Tampa Bay, Florida].

Type material: In USNM. Not examined.
Other material examined: Mexico: 1 s, Puerto Morelos, Yucatan, 6-18 m (MHNS). Florida, USA: 4 s, Sanibel, Lighthouse Beach (CHL); 1 s, dredged 4.5-7 m, Seahorse Key, Cedar Keys, (CHL); 1 s, APAC Pit, Sarasota Pit, Plio-Pleistocene (CHL).

Description: Protoconch (Fig. 63D-E) white in color, smooth, composed of 2 whorls (frequently not fully exposed, partially or totally covered by the subsequent whorls), and for this reason its diameter cannot be accurately measured. The shell (Figs. 63A-C) is light honey in color, shows a uniform sculpture on its entire surface, including the base and the inner umbilical area; this is formed by numerous spiral cordlets with axial microstriae in the interspaces. There are also sinous growth lines. The spiral cords with microstriae are predominant on the dorsum of the shell, while on the base and in the umbilicus the growth lines are predominant.

Dimensions: Holotype 6.5 mm in maximum diameter and 2.0 mm in height.

Our largest shells measure 7.8 mm in diameter.

Animal and radula are unknown.

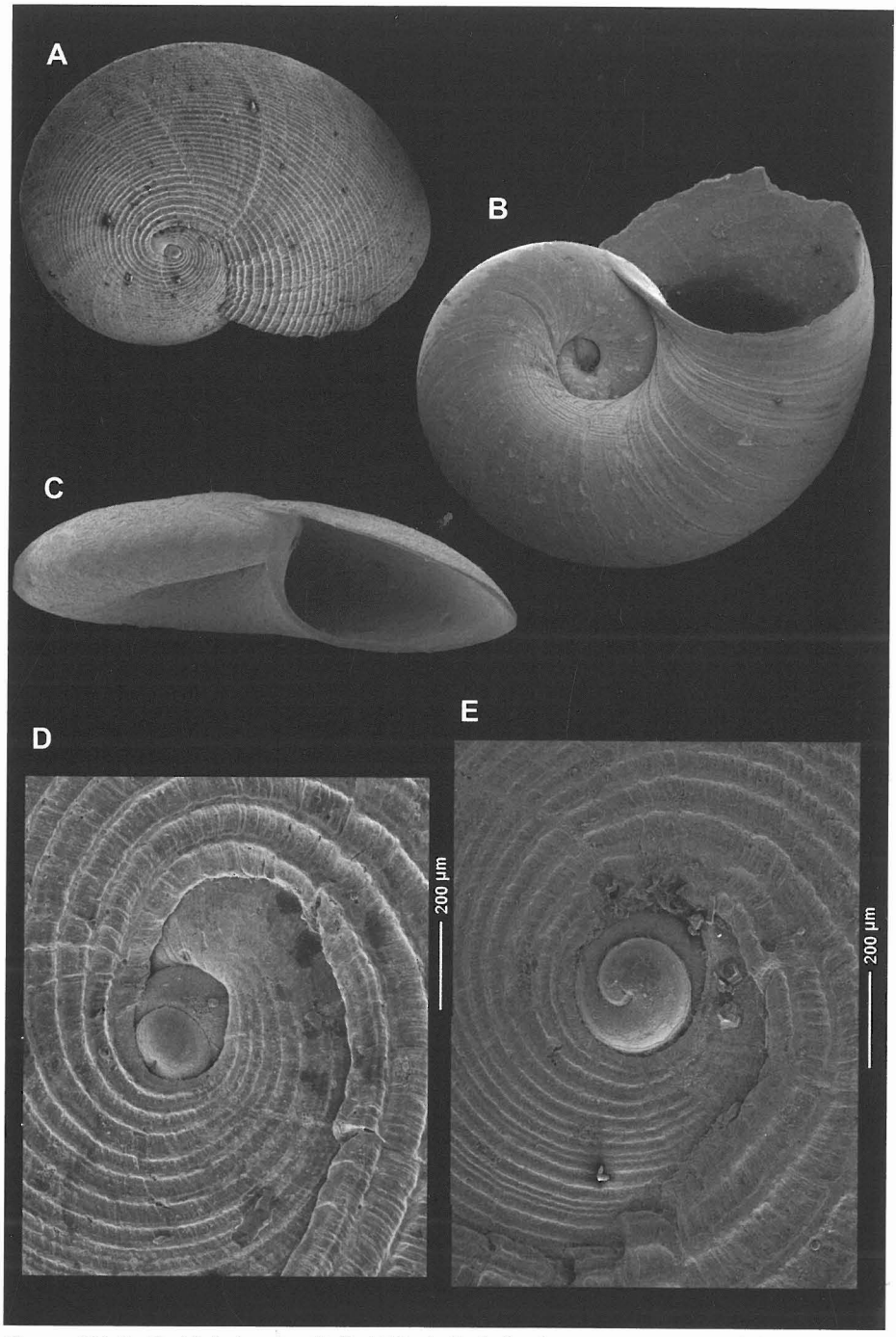
Distribution: This species has been recorded from Beaufort, North Carolina (JACOT, 1921); from Florida (JOHNSON, 1934); Virgin Islands (NOWELL-USTICKE, 1959); from North Carolina, Florida: East Florida, West Florida and Texas (MOORE, 1964, EMERSON & JACOBSON (1976); from southeastern Panama (RADWIN, 1969); from Texas (ANDREWS, 1977); from northwest Gulf of Mexico (ODÉ, 1969, 1988); from Abaco, Bahamas (REDFERN, 2001); also, in the present work, from Mexico: Yucatan and Cuba: Cienfuegos.

Habitat: MOORE (1964) indicated that the species seems to prefer coastal bays with shallow waters. It is distributed in the intertidal area between 0 and 27 m. Various authors who have found it reported a depth between 0 and 50 m, but these records were based only on empty shells. Nothing is known of the soft parts. MOORE (1964: 41) considers *C. striata* an endemic species from the Gulf of Mexico, with strictly limited distribution. Our record indicates that the distribution is wider than expected.

Remarks: The spiral cords and the axial microstriae in the interspaces distinguish this species from all congeners. Contrary to MOORE (1964: 174) the shell has the same sculpture on the base as on the rest of the shell.

Cochliolepis planispiralis spec. nov. (Figures 64A-E)

Type material: Holotype (Fig. 64A) in MNCN (15.05/55054); paratypes: MHNS (100550, 1 s, Fig. 64B), MNHN (24396, 1 s, Fig. 64C), IES (1 s), CFG (1 s), MCZ (1 s), USNM (1155034, 1 s), all from the type locality.
Type locality: 15-20 m, Puerto Morelos, Yucatan, Mexico.
Etymology: The specific name refers the planispiral development of the shell spire.



Figures 63A-E. *Cochliolepis striata* Dall, 1889. A-C: shells, 6.2, 7.8, 7.8 mm, Sanibel Light House Beach, Florida; D-E: protoconchs.
Figures 63A-E. *Cochliolepis striata* Dall, 1889. A-C: conchas, 6,2, 7,8, 7,8 mm, Sanibel Light House Beach, Florida; D-E: protoconchas.

Description: Shell (Figs. 64A-C) depressed, planispiral, the spire formed by about 2 ½ whorls. The protoconch (Fig. 64D-E) has one whorl or a little more, measuring about 480 μm in diameter. The embryonic whorl is smooth, but the subsequent whorl has an irregular pattern of raised zigzag spiral threads. Each of these produces random off-shoots that project obliquely towards the adjacent thread, and this sculpture tends to become more regular towards the periphery. Varix at the transition to the teleoconch not very thickened. Teleoconch with two whorls and rounded periphery. Ornamentation consists of fine spiral grooves, which are best seen in the first whorl of the spire and at the periphery, and marked growth lines, some of them very sharp, spread over the dorsum and base of the shell. The umbilicus is widely open, and on its apex the protoconch can be seen. Aperture ovoid, parietal area not callous, columella straight, reflected outward, with slight thickening of the umbilical wall; no progresive occlusion of the umbilicus is observed.

Dimensions: The holotype is 2.63 mm in maximum diameter; one paratype (MCZ) reachs 2.8 mm.

Habitat: The shells were collected in sandy bottom.

Distribution: Only known from the type locality.

Remarks: The dorsal and basal ornamentation are very constant. *Cochliolepis planispiralis* spec. nov. shows great similarities to *C. parasitica* in protoconch ornamentation and teleoconch spiral grooves, but it is different because the periphery is regularly rounded and not in a low position; also in the development of the spire, and shape of the periphery, dorsal border of the aperture and columella (see Fig. 64).

C. holmesii, *C. patricioi* and *C. differens* are different by the different sculpture of the protoconch.

C. striata and *C. adamsi* lack the spiral cordlets in the protoconch, having a stronger striation on the teleoconch.

Cochliolepis patricioi spec. nov. Rubio, Rolán & Lee (Figures 65A-G)

Type material: Holotype (1 s, Figs. 65A-B) in FLMNH (448608); paratypes: USNM (1155035, 1 s), ANSP (1 s), CHL (1 s) from St. Augustine, St. Johns (Figs. 65C-E) (all *ex* CHL).
Type locality: 60 m, off Sombrero Light, Key Vaca, Monroe Co. Florida, USA.
Etymology: The species is named for Patricio Calviño, good friend of the first author.

Description: Shell (Figs. 65A-E) depressed, almost planispiral, composed of 3 ½ whorls. The protoconch (Fig. 65F-G) has 1 whorl measuring about 340 μm in diameter, apparently smooth although very small granules can be seen all over, mainly on the areas close to the suture. Varix at the transition with the teleoconch not thickened. Teleoconch with two whorls; the first possessing 35-40 somewhat robust axial ribs. At the beginning of the second whorl the ribs begin to rapidly fade and soon change into simple, but marked, growth lines. This ornamentation, although most easily seen dorsally, can be observed on the periphery as well as on the base. Umbilicus wide and deep. Aperture ovoid, parietal area not callous, columella reflected outward, without thickening of the umbilical wall or progressive occlusion of the umbilicus.

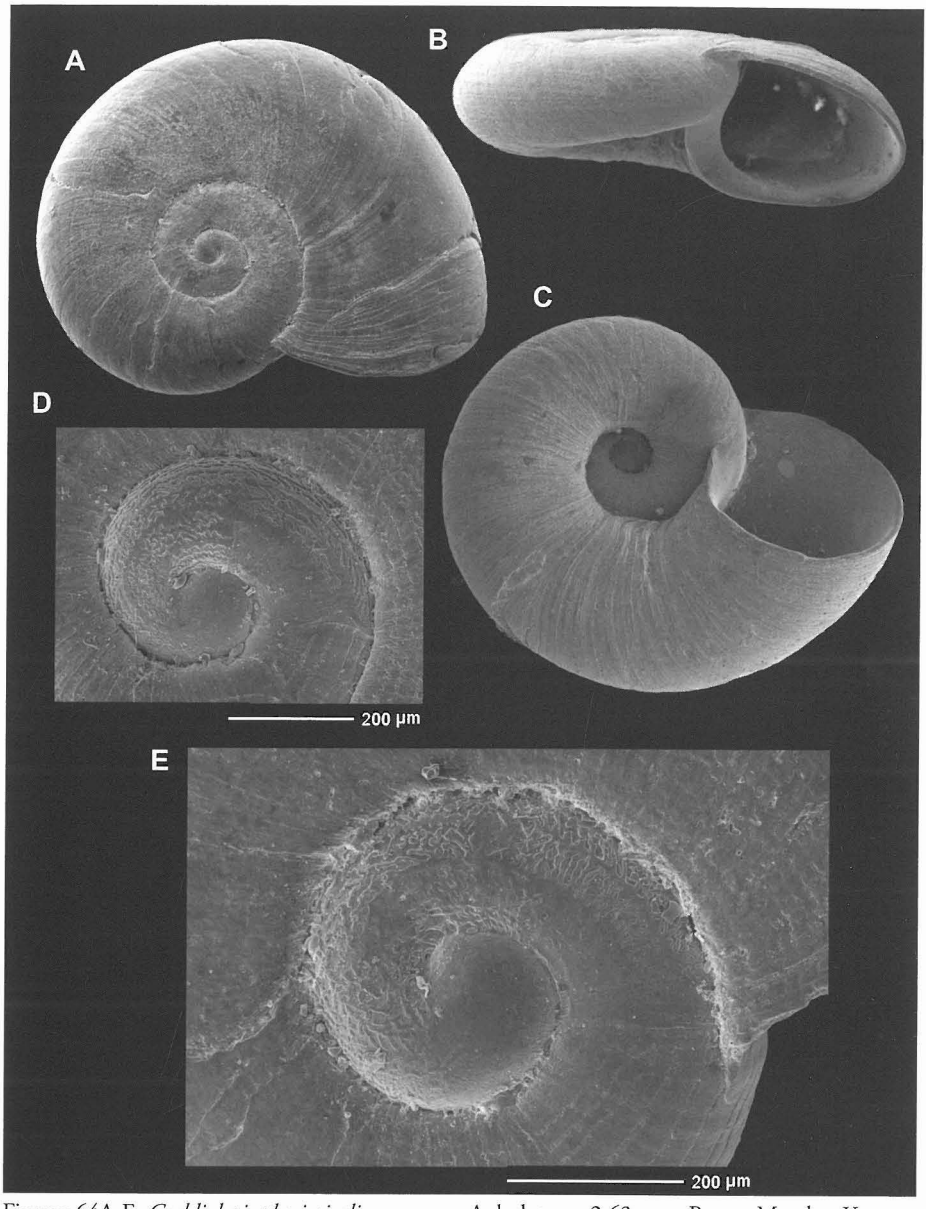
Dimensions: 2.0 mm in maximum diameter.

Habitat: Collected in sandy sediment at 60 m.

Distribution: Only known from the type locality and off St. Augustine, Florida.

Remarks: The dorsal ornamentation is very variable. Some shells lack the axial ribbing so evident on the first whorl of the teleoconch, showing only strong growth lines.

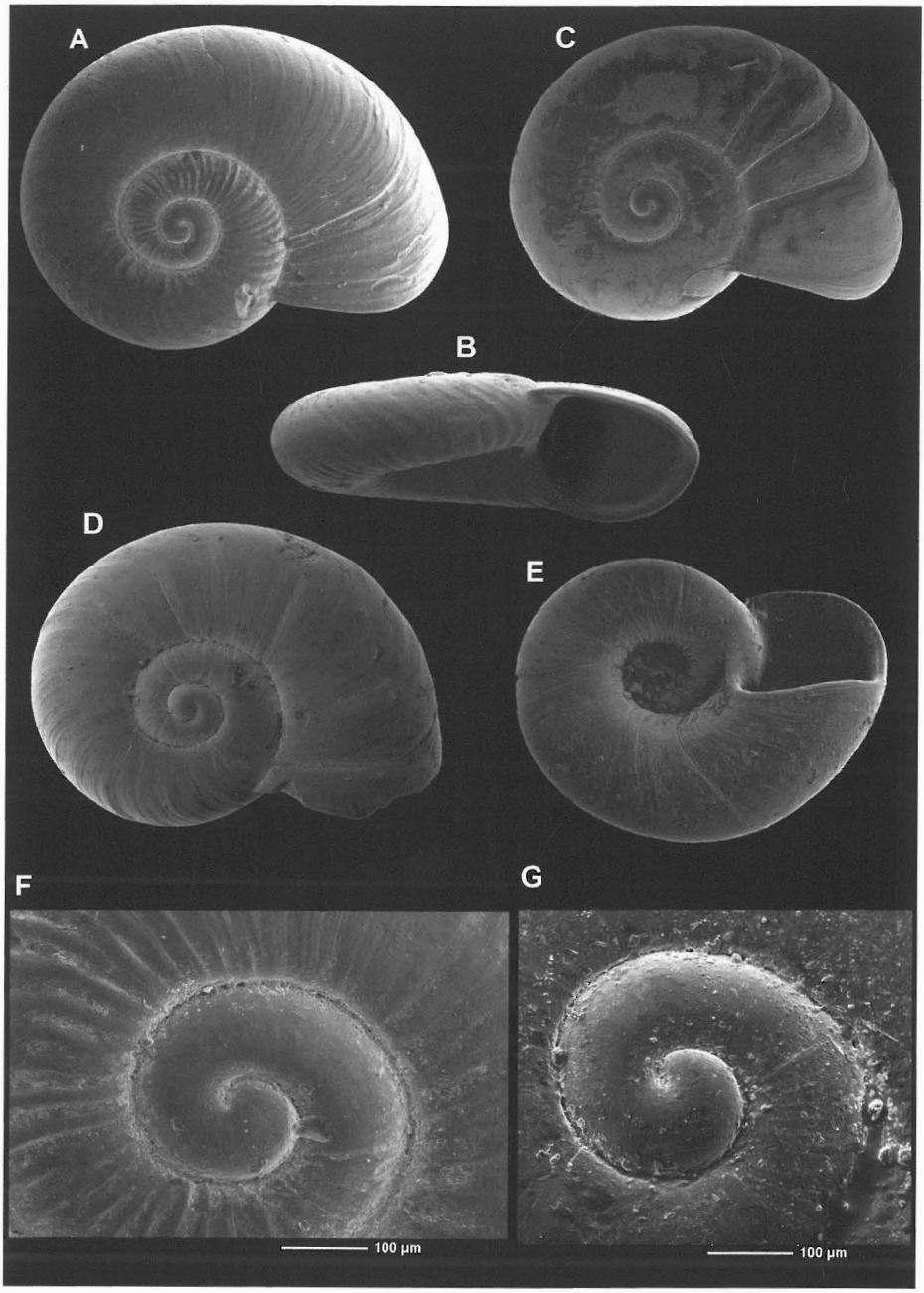
Cochliolepis patricioi spec. nov. can be distingished from:



Figures 64A-E. *Cochliolepis planispiralis* spec. nov. A: holotype, 2.63 mm, Puerto Morelos, Yucatan (MNCN); B-C: paratypes, 2.4 mm (MNHN), 2.2 mm (MHNS); D-E: protoconchs.
Figuras 64A-E. Cochliolepis planispiralis *spec. nov. A: holotipo, 2,63 mm, Puerto Morelos, Yucatan (MNCN); B-C: paratipos, 2,4 mm (MNHN), 2,2 mm (MHNS); D-E: protoconchas.*

C. parasitica, which has consistent sculpture in the protoconch and lacks ribs on the first whorl of the teleoconch.

C. holmesii, which also lacks this ribbing and has the periphery lower and subangulate, rather than rounded and at mid-whorl.



Figures 65A-G. *Cochliolepis patricioi* spec. nov. Rubio, Rolán & Lee. A-B: holotype, 2.0 mm, Monroe Co. Florida (FLMNH); C-E: paratypes: 1.8, 1.9, 1.7 mm, St. Augustine, Florida (USNM, ANSP and CHL, respectively); F-G: protoconchs: F: from the holotype; G: from the paratype of fig. C.

Figuras 65A-G. Cochliolepis patricioi *spec. nov. Rubio, Rolán & Lee. A-B: holotipo, 2,0 mm, Monroe Co. Florida (FLMNH); C-E: paratipos: 1,8, 1,9, 1,7 mm, St. Augustine, Florida (USNM, ANSP y CHL, respectivamente); F-G: protoconchas: F: del holotipo; G: del paratipo de la fig. C.*

C. striata and *C. adamsi*, which also lack the ribs on the teleoconch and have conspicuous spiral striation.

C. differens spec. nov., which lacks the axial ribs on the first whorl of the teleoconch, has a more inflexed columella, and has a smaller umbilicus.

Cochliolepis differens spec. nov. Rubio, Rolán & Lee (Figures 66A-D)

Type material: Holotype (Figs. 66A-D) in FLMNH (448615) *ex* CHL.
Type locality: APAC Pit, Sarasota, Florida, USA Plio-Pleistocene.
Etymology: The specific name refers to the shell characters, which differ rather strikingly from those of its congeners.

Description: Shell (Figs. 66A-C) depressed, fine, smooth, composed of 3 ¾ whorls. The protoconch (Fig. 66D) has 1 ½ bulbous whorls, about 430 μm in diameter, slightly raised above the other whorls. Two stages can be discerned: on the first the surface is covered by microgranules; the second exhibits fine growth striae. Teleoconch formed by 2 ¼ convex and rapidly-expanding whorls and is totally smooth except for fine growth lines. Suture wide and strongly marked on all the shell except on the last quarter of the body whorl. Periphery nearly symmetrically rounded. Aperture strongly prosocline, angled at the suture. Columella arched, a little reflected towards the umbilicus; external lip sharp, angled at the periphery and a little sinuous basally. Parietal callus barely appreciable. Umbilicus wide and deep, with a straight and striated wall.

Dimensions: Holotype is 4.3 mm in maximum diameter and 1.76 mm in height.

Habitat: Unknown.

Distribution: Only known from the type material.

Remarks: *Cochiolepis differens* can be distinguised from *C. parasitica*, because the latter has sculpture on the protoconch and its apex is flat.

C. holmesii has a different protoconch sculpture and a sculptured teleoconch.

Cochiolepis striata and *C. adamsi* have conspicuous spiral sculpture on the teleoconch.

C. patricioi has axial ribs on the first whorl of the teleoconch, possesses a less inflexed columella, and has a larger, more open umbilicus.

Cochliolepis sp. (Figures 67A-C)

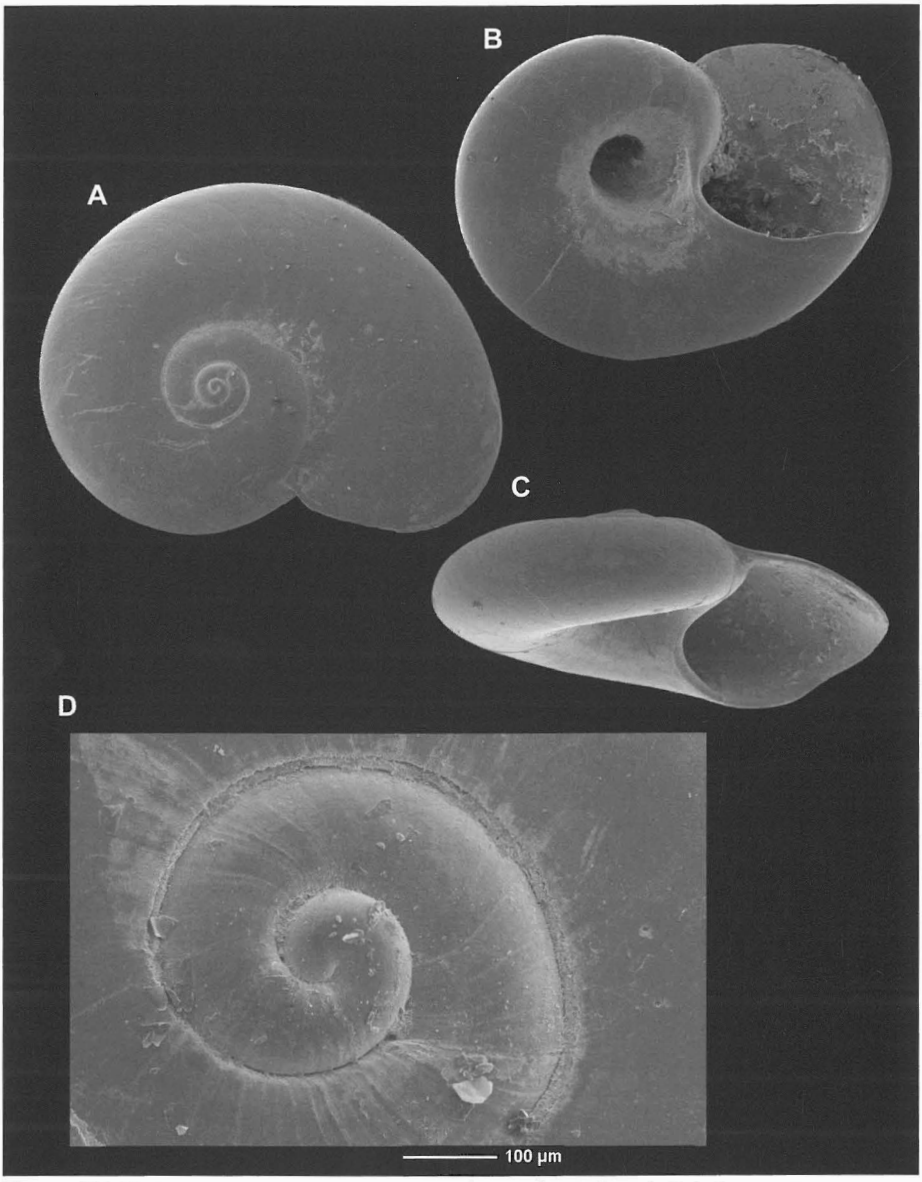
Material examined: Cuba: 2 s, Rancho Luna Beach, Cienfuegos, 20 m (MHNS).

Description: Protoconch (Fig. 67C) white in color, smooth, formed by 1 ¼ whorls of spire and about 360 μm of diameter; apparently it has two well-differentiated stages, the first is bulbous, projected from the rest of the shell and terminates in a varix; the second stage, of one whorl only has fine growth lines. A varix marks the beginning of the teleoconch and the onset of the spiral sculpture. The shell (Figs. 67A-B) is light honey in color, and shows a uniform sculpture on the entire surface, including the base and the inner umbilical area; this is formed by numerous spiral cordlets with axial microstriae in the spaces between cords. Sinuous growth lines are also present.

Dimensions: Our shells measure 2.9 and 3.0 mm in diameter and 1.63 mm in height.

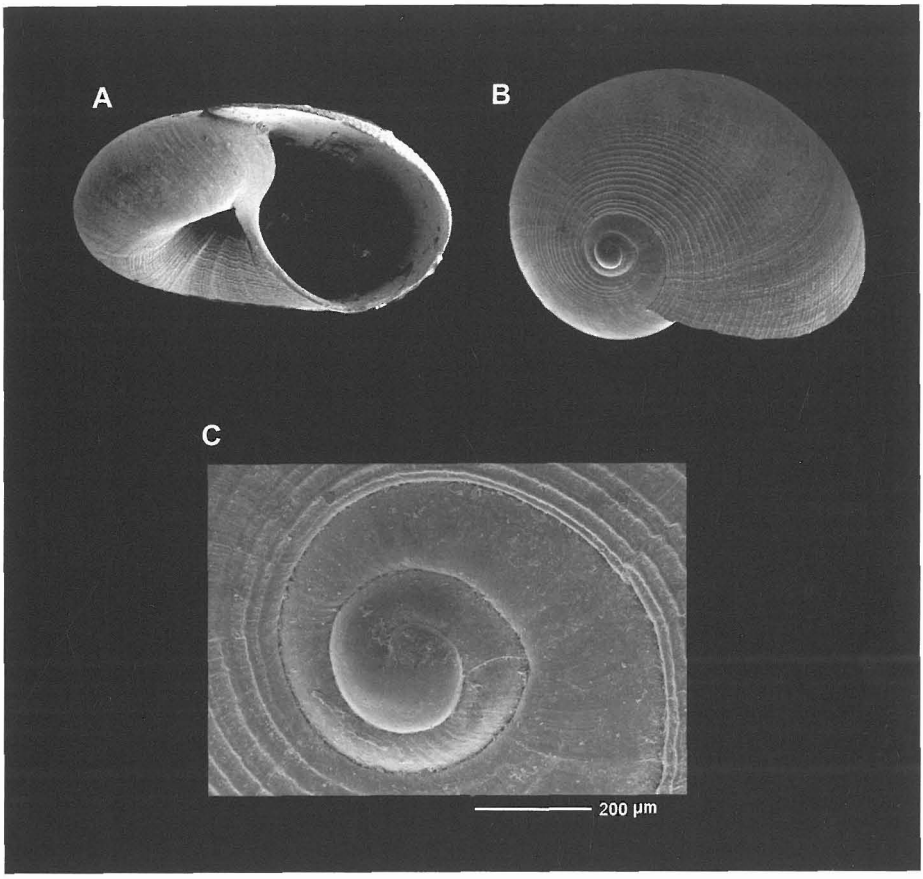
Animal and radula are unknown.

Remarks: *Cochliolepis sp.* is rather similar in its general appearance to *C. adamsii*, but the protoconch is pro-



Figures 66A-D. *Cochliolepis differens* spec. nov. Rubio, Rolán & Lee. A-C: holotype, 4.3 mm, Plio-Pleistocene of Sarasota, Florida (FLMNH); D: protoconch.
Figuras 66A-D. Cochliolepis differens *spec. nov. Rubio, Rolán & Lee. A-C: holotipo, 4,3 mm, Plio-Pleistoceno de Sarasota, Florida (FLMNH); D: protoconcha.*

jected upward, shows two different stages of development, and is not partially covered by the first whorl of the teleoconch. Since this is the main distinguishing character and we have such scanty material we defer naming this taxon until we have more material for study.



Figures 67A-C. *Cochliolepis* sp. A-B: shells, 2.9, 3.0 mm, Rancho Luna Beach, Cuba; C: protoconch.
Figuras 67A-C. Cochliolepis *sp. A-B: conchas, 2,9, 3,0 mm, Playa Rancho Luna, Cuba; C: protoconcha.*

Genus *Episcynia* Mörch, 1875

Episcynia Mörch, 1875 (described as subgenus of *Architectonica*). *Malak, Blätter*, 22: 155.
Type species: (by monotypy) *Solarium inornatum* d'Orbigny, 1842.

Diagnosis: Shell trochiform, whorls rather convex, and with a minutely serrate peripheral keel, base flattened, umbilicus narrow and deep, flat sided and strongly angled with the base of the shell. Periostracum thin, produced into spiral fringes of filaments above and below the periphery.

Remarks: MOORE (1964) placed *Episcynia multicarinata* in synonymy with *Episcynia inornata* comparing the types of Dall and d'Orbigny and reporting that there were no morphological differences between them. Species of *Episcynia* are known from the Miocene to Recent. Two valid species have been described from the West Atlantic: *Episcynia inornata* (a recent species) and *Episcynia naso* (a fossil species from the Miocene of the Dominican Republic).

Episcynia inornata (d'Orbigny, 1842) (Figures 68A-F, 69A-C)

Trochus (Solarium) inornatum d'Orbigny, 1842. *Moll. Hist. Phys. Pol. et Nat. L'île de Cuba*, 2: 67-68, pl. 19, figs. 25-27. [Type locality: Saint Thomas, Virgin Islands].

Vitrinella multicarinata Dall, 1889. *Bull. Mus. Comp. Zoology*, 18: 392-393. [Type locality: Off Cape Hatteras, North Carolina, 15 fms].

Type material: Lectotype (here designated) in NHMUK (Fig. 69C) and paralectotypes (Figs. 69A-B).

Other material examined: Florida, USA: 1 s, beach, 16 Ave. S, Jacksonville Beach, Duval Co. (CHL); 1 s, 39-45 m, 40-60 mi E Ponte Vedra, St Johns Co. (CHL); 1 s, 30 m, 20 mi E St. Augustine, St Johns Co. (CHL); 1 s, 53 m, 65 mi E St. Augustine, St Johns Co. (CHL); 1 s, 4.5-6 m, E Seahorse Key, Cedar Keys, Levy Co. (CHL). Cuba: 6 s, Cienfuegos Bay, 20 m (MHNS); 32 s, Rancho Luna Beach, 10-54 m (CFG). Martinique: 1 s, Fort de France, NW of Grande Seche, 18 m (MCZ 361885); 1 s, Fort de France, St. Louis, 3-4 miles S. of Fort, 14-16 fms (MCZ 243767). Surinam: 1 s, 70 miles NNE Paramaribo, 6°52'N, 54°46'W, 51 m (MCZ 274032). Brazil: 1 s, Praia Itararé, São Vicente, São Paulo (CHL); 1 s, Itaparica, 4-5 m (MHNS); 2 s, Salvador (MHNS).

Description: The most complete description is in Moore (1964: 105-109).

Shell (Figs. 68A-D) with 5 whorls. The protoconch (Figs. 68E-F) has barely one whorl with a slightly rough surface, about 190 μm in maximum diameter.

Dimensions: the figured shell is 3.3 mm in diameter and 1.73 mm in height.

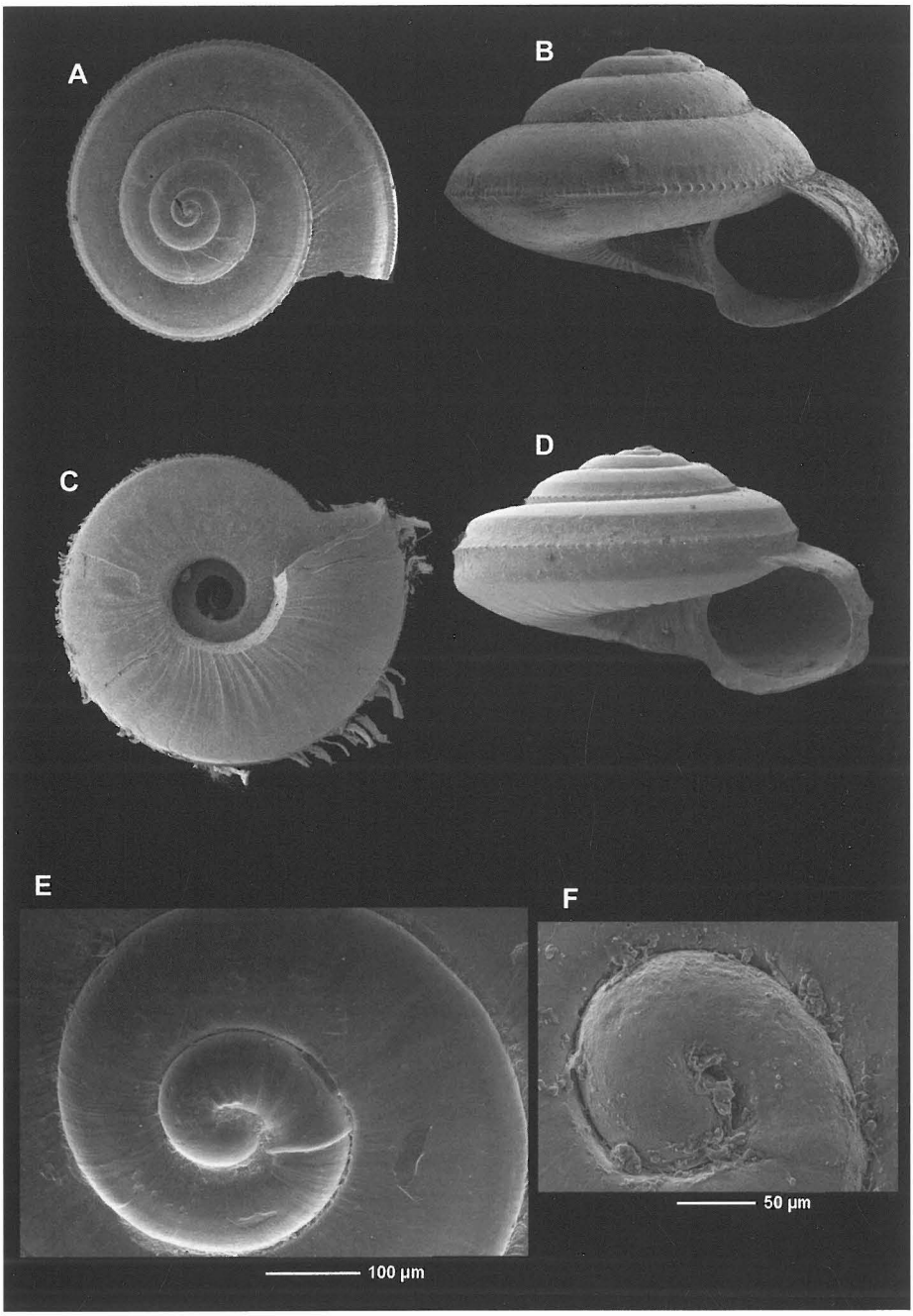
Animal and radula unknown.

Habitat: Species with a large bathymetric distribution, recorded between 15 and 110 m in depth. According to Moore (1964) the species has a wide range of distribution, but it is uncommon; it seems that the species prefers shallow water and the deepest record for living material is 15 fathoms, cited by Dall (1889a).

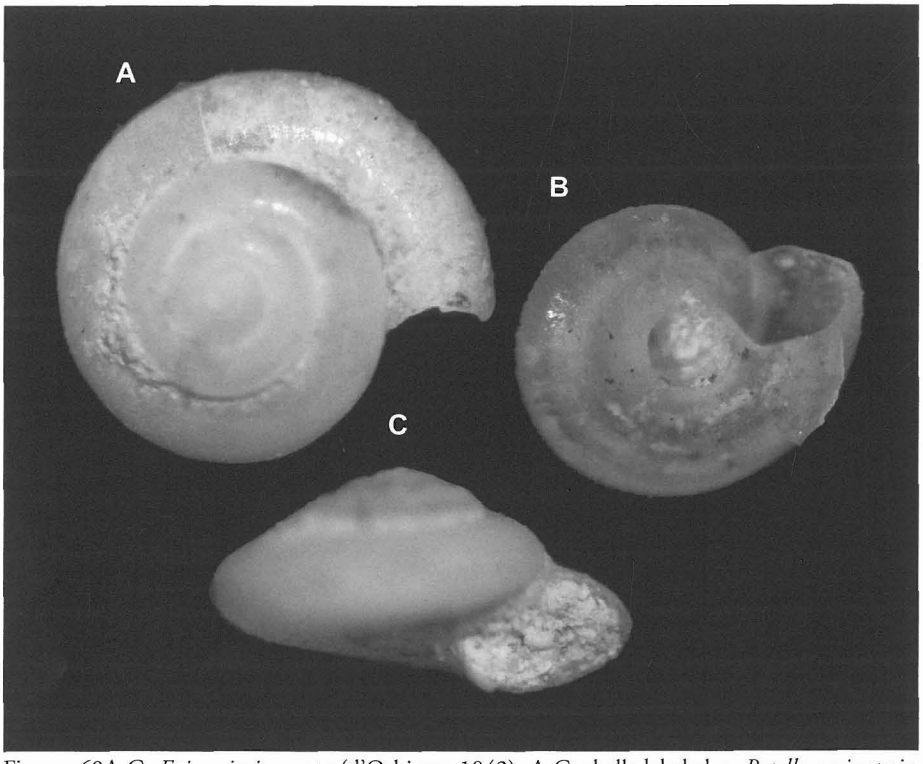
Distribution: It has been recorded from St. Thomas, Virgin Islands (d'Orbigny, 1842); from off Cape Hatteras, North Carolina (Dall, 1889); from Lake Worth, Palm Beach, Cape Florida, Miami and Destin, Florida (Pilsbry & McGinty, 1946); from Pernanbuco and Alagoas, Brazil (Lange de Morretes, 1949); from Bocas Island, Panama (Olsson & McGinty, 1958); from North Carolina, South Florida, west coast of Florida, Texas, Panama, Puerto Rico and the Virgin Islands (Moore, 1964); Puerto Rico (Warmke & Abbott, 1961); from northwestern Campeche Bank, Mexico (Rice & Kornicker, 1965); from North Carolina to Florida, Texas and the Greater Antilles (Abbott, 1974); from Texas shores (Andrews, 1977); from Venezuela (Princz, 1982); Cuba (Espinosa *et al.*, 1985); from Pernambuco, Brazil (Mello & Perrier, 1986); from northwest Gulf of Mexico (Odé, 1988); from Aruba island (de Jong & Coomans, 1988); from shallow waters off Hutchinson Island, Florida to Texas and the Caribbean Sea (Lyons, 1989); from northeast Florida (Lee, 2009).

Remarks: Over the years, this species has been included in the genera *Adeorbis*, *Architectónica*, *Torinia*, *Trochus* and *Vitrinella* before its definitive placement in *Episcynia*. The fine periostracum, the finely serrated peripheral keel and the straight-sided umbilicus are the main distinguishing characters of this species.

Dall (1889a) described *Vitrinella (Episcynia?) multicarinata* from Cape Hatteras, North Carolina, but he did not make a comparison of his species with that of d'Orbigny, and most malacologists assumed that the two were different. Moore (1964) considered them synonymous, indicating that he had the opportunity to review d'Orbigny's four syntypes in the British Museum. The types were in a vial labelled by d'Orbigny as *Rotella carinata*, but they fit the description of *Solarium inornatum*. The specimens were compared to the American specimens, and no distinguishing characters could be found. Of the four syntypes, the smallest one (Fig. 69C) is in good condition and is hereby designated the lectotype. So, *Episcynia multicarinata* may be considered simply as a form with extra angulations on the periphery of the whorls (Fig. 68D).



Figures 68A-F. *Episcynia inornata* (d'Orbigny, 1842). A-C: shells, 3.2, 2.7, 3.3 mm, Rancho Luna Beach, Cienfuegos, Cuba (MHNS); D: shell, form "multicarinata," 3.6 mm, Praia Itararé, São Vicente, São Paulo (CHL); E-F: protoconchs, from Cuba and Florida.
Figuras 68A-F. Episcynia inornata *(d'Orbigny, 1842). A-C: conchas, 3,2, 2,7, 3,3 mm, Playa Rancho Luna, Cienfuegos, Cuba (MHNS); D: concha, forma "multicarinata," 3,6 mm, Praia Itararé, São Vicente, São Paulo (CHL); E-F: protoconchas, de Cuba y Florida.*



Figures 69A-C. *Episcynia inornata* (d'Orbigny, 1842). A-C: shells labeled as *Rotella carinata* in NHMUK: A-B: paralectotypes; C: lectotype.
Figuras 69A-C. Episcynia inornata *(d'Orbigny, 1842). A-C: conchas etiquetadas como* Rotella carinata *en NHMUK: A-B: paralectotipos; C: lectotipo.*

Genus *Parviturboides* Pilsbry & McGinty, 1950

Parviturboides Pilsbry & McGinty, 1950. *The Nautilus*, 63(3): 86.
Type species: (by original designation) *Vitrinella interrupta* C.B. Adams, 1850 = *Cyclostrema sanibelense* Pilsbry, 1939. Caribe, Recent.

Diagnosis: In MOORE (1964: 155) *"The shell is small, trochiform, sculpture of spiral cords and axial threads, umbilicus narrow and bordered by a spiral cord. Aperture subcircular but angular above, columellar margin thickened. The animal has two ciliated tentacles, black eyes, two pallial tentacles, a pair of opercular lobes amd the posterior end of the foot may be bilobed. The penis is long, straight, and glandular. The operculum is thin, multispiral and circular".*

Remarks: The shell is very similar to some of the genus *Parviturbo* Pilsbry & McGinty, 1945, from which it can be distinguished by its protoconch, which is less than 2 whorls, and by the abrupt beginning of the sculpture on the teleoconch. PILSBRY (1950: 87), in describing the genus *Parviturboides*, stated that it should be compared with the genus *Pseudorbis* Monterosato, 1884 for the similarity in shell characters. MOORE (1964: 156) stated *"but this has not yet been done"*. This comparison is

no longer necessary because the genus *Pseudorbis* was placed in Skeneidae by RUBIO & RODRÍGUEZ BABÍO (1991), who noted that its radula is rhipidoglossate, and its anatomical characters are similar to those of the genera *Skenea* and *Dikoleps*.

Parviturboides interruptus (C.B. Adams, 1850) (Figures 70A-I, 71A-E)

Vitrinella interrupta C.B. ADAMS, 1850. *Monograph of Vitrinella, a new genus of new species of Turbinidae*: 6. [Type locality: Port Royal, Jamaica].
Cyclostrema zacalles Mazÿck, 1913: 18.
Cyclostrema sanibelense Pilsbry, 1939. *The Nautilus*, 53: 53, pl. 8, fig. 3. [Type locality: Sanibel Island, Florida].
Parviturbo zacalles (Mazÿck, 1913): In PILSBRY & MCGINTY, 1945b. *The Nautilus*, 59: 57, pl. 6, figs. 2, 2a, 5.
"Cyclostrema" interruptum sanibelensis Pilsbry & McGinty, 1945b. *The Nautilus*, 59: 58, pl. 6, fig. 9.
Cyclostrema interruptum C.B. Adams *in* Pilsbry, 1946. *Notulae Naturae*, 162: 5, pl. 1, fig. 4-5.

Type material: CLENCH & TURNER (1950: 294, plate 35) mention two specimens in the lot of C.B. Adams Collection (MCZ 156270), and they represent two different shells in their plate, but they caption the two figures "holotype" despite the fact that there are two different shells depicted. In the actual lot examined by us only one shell is present and we consider it the lectotype.
Other material examined: Cuba: 159 sp, Cañón de la Bahía de Cienfuegos, between 0-10 m (CFG); 14 sp, Rancho Luna Beach, 10-20 m (MHNS); 28 sp, Rancho Luna Beach, 45 m (MHNS). Guadeloupe: 2 s, north coast, 2 m, between rocks (CJP); 3 s, Point-a-Pitre, 5 m (CHL). Florida, USA: 2 s, 21 m, 14 mi ENE Mayport, Duval Co. (CHL); 2 s, 3-4 ft, Pelican Shoals, Key West, Monroe Co. (CHL); 5 sp, Sebastian Inlet, Brevard County, North Jetty, under bridge (CHL); 3 s, SE Clearwater Island bridge Little Pass, Pinellas Co. (CHL); 1 s, 10th Avenue, Atlantic Beach, Duval Co. (CHL); 1 f, 2-3 m, Seahorse Key, Cedar Keys, Levy Co. (CHL). Puerto Rico: 7 s, beach, Holiday Inn, San Juan, (CHL). Virgin Islands: 7 s, beach, Magens Bay, N coast St. Thomas (CHL). Nicaragua: 3 s, The Witties, 20 m (MHNS). Panama: 1 s, beach, Portobello (CHL); 5 s, Careneros Island 9°20.394'N, 32°13.932'W, 8-9 m (CHL); 1 s, 1 mi Punta San Blas, San Blas Island, intertidal (CHL); 1 j, 09°22.027'N, 82°14.336'W (CEG). Venezuela: 12 s, near Jose Griego, N Margarita Island (CHL). Haiti: 6 s, Labaree, sand beach (CHL). Brazil: 1 s, Praia de Itararé, São Vicente, São Paulo (CHL).

Description: The best conchological and anatomical description is in MOORE (1964: 156-161).

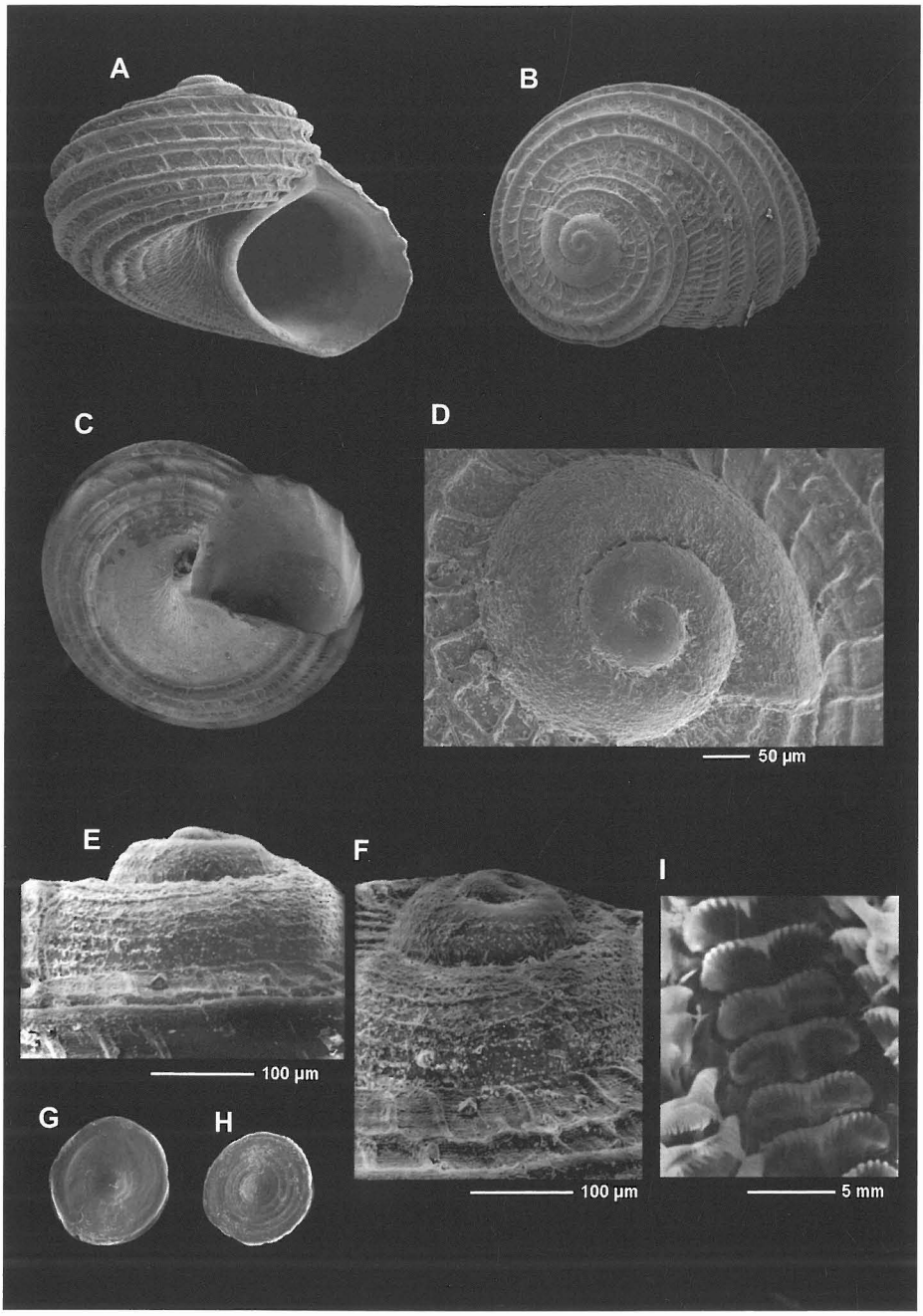
Shell (Figs. 70A-C, 71A-C) a little depressed, globose, trochiform, spiral sculpture formed by strong cords and fine axial striae; umbilicus very narrow. Protoconch (Figs. 70D-F) large, with a diameter of about 400 μm, its surface roughened by numerous tubercles and some spiral lines. Two different stages can be distinguished. Teleoconch with spiral strong cords and fine axial ribs in the interspaces; on the last whorl 8-9 spiral cords can be seen. Base rounded, aperture oblique, almost circular, but a little angled at the fusion point of the external lip with the columella.

Dimensions: Holotype 1.59 mm in diameter. Our largest shells measure about 2.5 mm in maximum dimension.

Operculum (Figs. 70G-H) chitinous, multispiral with a central nucleus.

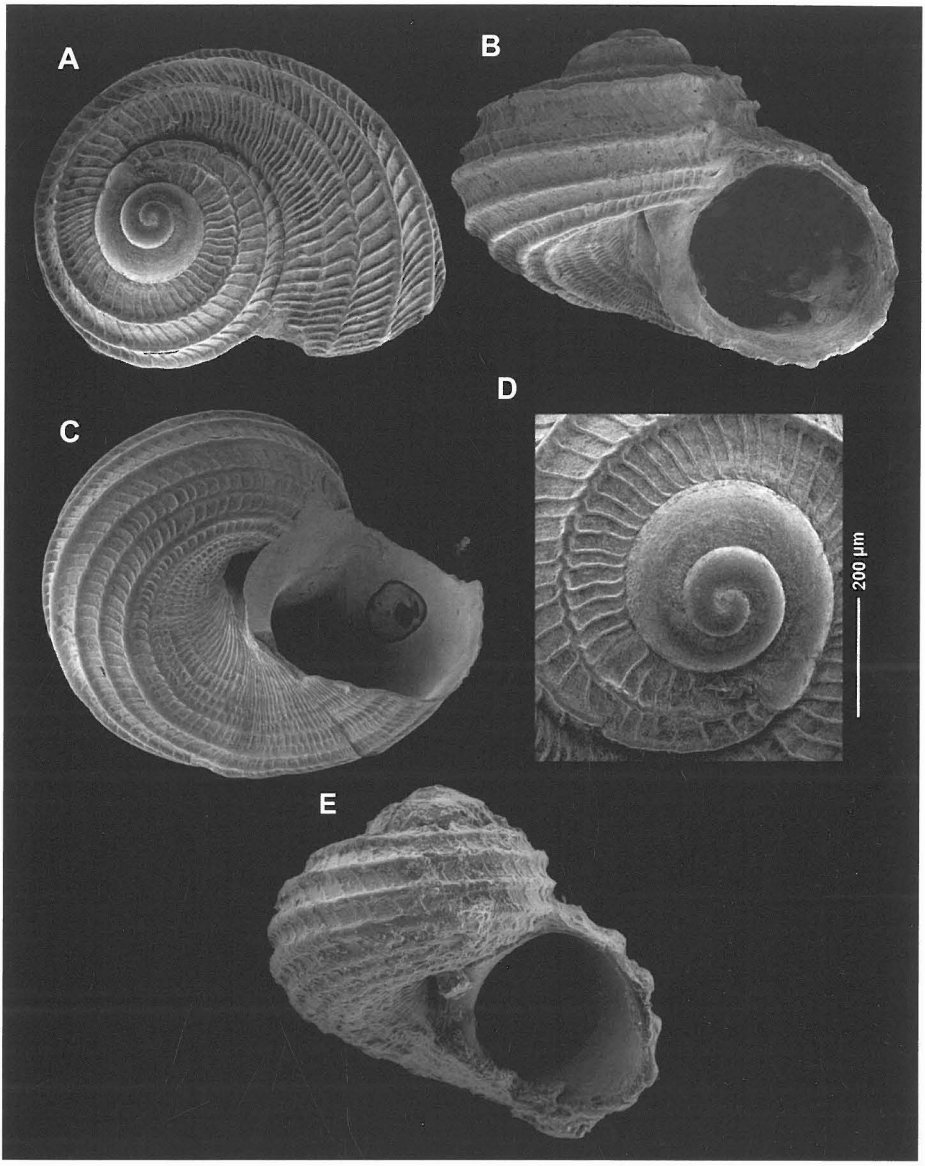
Radula (Fig. 70I) taenioglossate, the formula 2+1+R+1+2. Central tooth wide basally, with three denticles on the ventral margin. Cutting area formed by a large and sharp cusp and 6-7 small denticles of small size at each side. Lateral teeth similar to the central one, cutting area with a central cusp and 4-5 smaller denticles at each side. Marginal teeth elongated, with 22-25 denticles on the free margin.

Habitat: This species lives between 0 and 48 m deep; deeper records are based on empty shells. In Cienfuegos



Figures 70A-I. *Parviturboides interruptus* (C.B. Adams, 1850). A-C: shells, 1.4, 1.4, 1.3 mm, Rancho Luna Beach, Cienfuegos, Cuba (CFG); D-F: protoconchs; G-H: operculum, 0.65 and 0.5 mm, from shells of 1.5 and 1.4 mm; I: radula.

Figuras 70A-I. Parviturboides interruptus *(C.B. Adams, 1850). A-C: conchas, 1,4, 1,4, 1,3 mm, Playa Rancho Luna, Cienfuegos, Cuba (CFG); D-F: protoconchas; G-H: opérculos, 0,65 y 0,5 mm, procedentes de conchas de 1,5 y 1,4 mm; I: rádula.*



Figures 71A-E. *Parviturboides interruptus* (C.B. Adams, 1850). A-C: shells, 1.25, 1.1, 1.3 mm, The Witties, Nicaragua (MHNS); D: protoconch; E: shell, Guadeloupe (CJP).
Figuras 71A-E. Parviturboides interruptus *(C.B. Adams, 1850). A-C: conchas, 1,25, 1,1, 1,3 mm, The Witties, Nicaragua (MHNS); D: protoconcha; E: concha, Guadeloupe (CJP).*

Bay, Cuba it is relatively common between 0 and 10 m deep. It has been recorded on sponges from 7 to 90 m deep (ABBOTT, 1974). Under rocks and in crevices in shallow water (ANDREWS, 1977). On rocky coasts it has been found among sabellariid polychetes (WILEY *ET AL.* 1982). Also found on sandy and muddy bottoms (VOKES & VOKES, 1984). On reefs far from the coast this species

has been seen associated with colonies of *Oculina varicosa*, algae, sponges, octocorals and dead coral, between 6 and 80 m deep (REED & MIKKELSEN, 1987). Also on algae and sand bottom (MIKKELSEN *ET AL.* 1995). It has been collected directly on sponge and algae in 1-2 feet and from colonies of *Vermicularia knorri* taken at 30 m (LEE, 2009). In Cuba it has been collected in the bases of *Gorgonia flabellum* and *G. ventalina*.

Distribution: It is a common and widely distributed species in the West Indies. It has been recorded from Port Royal, Jamaica (C.B. ADAMS, 1850). From Sanibel Island, Florida (PILSBRY, 1939). From Colón and Bocas Island, Panama (OLSSON & MCGINTY, 1958). From South Carolina, Florida, Texas, Mexico, Panama, Jamaica, Haiti and Puerto Rico (MOORE, 1964; ANDREWS, 1977). From South Carolina to Gulf of Mexico and Caribbean Sea (HOUBRICK, 1968). From Portete, Costa Rica (HOUBRICK, 1968; ROBINSON & MONTOYA, 1987). From North Carolina (PORTER, 1974). From punta del Morro to Punta Delgada, Veracruz, Mexico (WILEY *ET AL.* 1982). From Campeche to Ciudad del Carmen and Zacatal; from El Cuyo to punta Ninum; from Punta Yalkupul to isla Cerritos; from Isla Mujeres to Isla Holbox; from Cancún to the Belize border (VOKES & VOKES, 1984). From North Carolina to Florida; Texas, the Antilles, Brazil, Uruguay (RIOS, 1985). From Cuba (ESPINOSA *ET AL.*, 1985). From Florida (REED & MIKKELSEN, 1987). Aruba; Puerto Rico (DE JONG & COOMANS, 1988). From Florida to Texas and north coast of South America, Colombia (DÍAZ MERLANO & PUYANA HEGEDUS, 1994). From Indian River Lagoon, Florida (MIKKELSEN *ET AL.* 1995); from Abaco, Bahamas (REDFERN, 2001). From Cahuita to Gandoca, Cuba (ESPINOSA & ORTEA, 2001). From St. Augustine Inlet, northeast Florida (LEE, 2009). Venezuela, Haití, Panama, Nicaragua, and Brazil from our material.

Remarks: *Parviturboides interruptus* is like no other vitrinellid from the West Atlantic. On the other hand, it can be confused with some species of the genus *Parviturbo* Pilsbry & McGinty, 1945, distinguished from them by its protoconch of no more than 2 whorls, its sculpture commencing abruptly at the end of the protoconch. Another genus with conchologically similar species, *Pseudorbis* Monterosato, 1884, has been placed in Skeneidae, based on the rhipidoglossate radula of *Pseudorbis granulum* (Brugnone, 1873), that has been recently observed (RUBIO & RODRÍGUEZ BABÍO, 1991).

Some populations (shown in Figures 71A-C) present more numerous riblets in the axial sculpture (about 45 on the first whorl versus 23) than the shells of other populations (Fig. 70A-E).

Genus *Pleuromalaxis* Pilsbry & McGinty, 1945

Pleuromalaxis Pislbry y McGinty, 1945a. *The Nautilus*, 59: 1-13.
Type species: (by monotypy) *Pseudomalaxis (Pleuromalaxis) balesi* Pilsbry & McGinty, 1945. Caribe, Recent.

Diagnosis: Shell strongly depressed, with two spiral keels on the periphery. Space between the keels concave, axial riblets present on both top and bottom of the whorl. Umbilicus wide, shallow to moderately deep.

Remarks: The taxon *Pleuromalaxis* was created as a section of *Pseudomalaxis*, as Pilsbry & McGinty believed that their species was congeneric with *Pseudomalaxis nobilis* A.E. Verrill. Later OLSSON & MCGINTY (1958) considered it a full genus and placed it in the Vitrinellidae, removing it from the Architectonicidae.

Pleuromalaxis balesi (Pilsbry & McGinty, 1945) (Figures 72A-D)

Pseudomalaxis (Pseudomalaxis) balesi Pilsbry & McGinty, 1945a. *The Nautilus*, 59: 10, pl. 2, fig. 8. [Type locality: Missouri Key, Florida Keys].

Type material: Holotype in ANSP (181124). Represented in MOORE (1964). Not examined.
Other material examined: Cuba: 2 s, Cayo Avalos, 8 m (MHNS); 1 s, Cayo Perez Diego, 5 m (MHNS); 1 s, Jibacoa, 3-6 m (MHNS); 1 s, Baracoa, 0 m (MHNS); 4 s, Guajimico, 0 m (MHNS); 3 s, Cienfuegos Bay, sta. 12, 22°07'N 80°27'W, 9 m (MHNS); 32 s, Cienfuegos Bay, 8 m (MHNS); 1 s, Cienfuegos Bay, 20-30 m (MHNS); 1 s, Rancho Luna Beach, 12 m (MHNS); 1 s, Rancho Luna Beach, 35 m (MHNS); 13 s, Rancho Luna Beach, 45 m (MHNS); 2 s, Los Laberintos, Rancho Luna Beach, 35 m (MHNS). Granadines: 1 s, Mayreau, 8 m, coralline sand with coral blocks, gorgonians and sponges (CJP). Trinidad and Tobago: Tobago, 1 s, Horse shoe reef, 15 m, sandy grit (CHL). Mexico: 1 s, Puerto Morelos, Yucatan, 6-18 m (MHNS).

Description: Shell (Figs. 72A-B) strongly depressed but not planispiral. Umbilicus wide. Protoconch (Fig. 72D) apparently smooth, measuring 260 μm, it has two distinct parts, and terminates in a varix. Teleoconch completely covered by fine spiral cordlets. Peripherally bicarinate and concave between the two keels. On the dorsum there are two series of axial ribs: the finer ones begin on the suture and fade towards the middle of the dorsum; the stronger ones run from the middle of the dorsum out to the upper peripheral keel, forming strong nodules at their terminations. The base is divided in two by a strong spiral cord. Aperture oblique, peristome not continuous, parietal callus strong. Umbilicus wide and shallow which exposes the protoconch within.

Dimensions: Holotype 1.59 mm in diameter. Our material is between 1 and 1.5 mm, but a 1.8 mm shell is mentioned in the literature.

Operculum (Fig. 72C) fine, multispiral and with a central nucleus.

Habitat: This species has a wide bathymetric range, being recorded between 0 and 100 m in depth. It has been collected alive under rocks in shallow water (MOORE, 1964). In Cuba it is a relatively frequent species but not common, only 1-2 specimens appear in each station studied. In Cuba it was collected between 0 and 40 m. Reported further down in other areas.

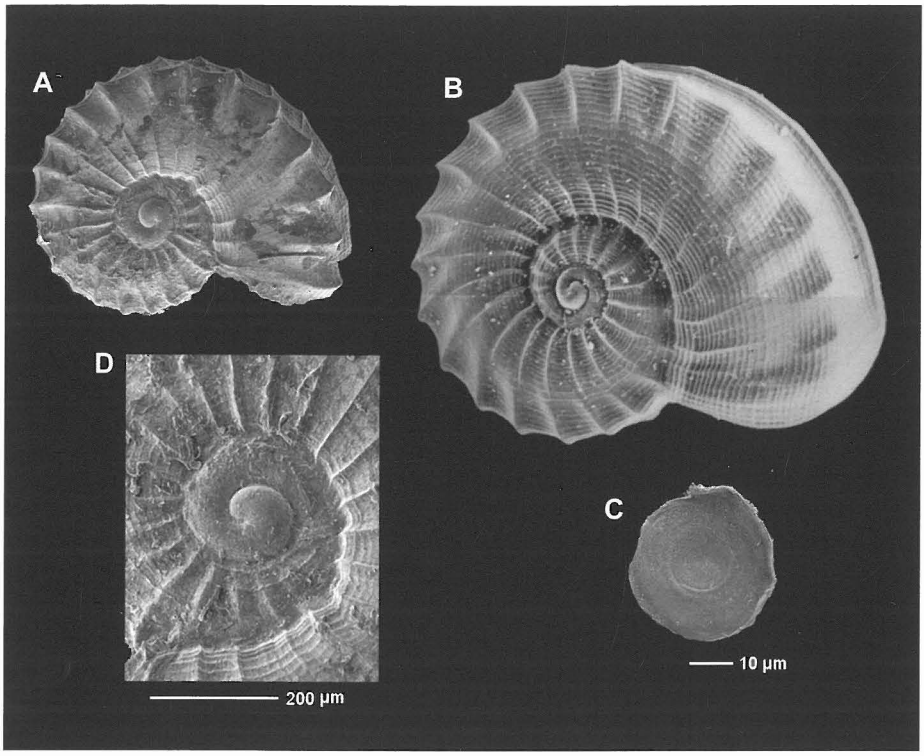
Distribution: It is recorded from the USA: Missouri Key, Florida Keys (PILSBRY & MCGINTY, 1945a); from Havana Province, Cuba (JAUME & BORRO, 1946); from Bocas Island, Panama (OLSSON & MCGINTY, 1958); from Grand Cayman Island (ABBOTT, 1958); from Puerto Rico (WARMKE & ABBOTT, 1961); from Florida, Texas and Panama (MOORE, 1964); from Southeast Florida, Texas and the Caribbean (ABBOTT, 1974); from Quintana Roo, Mexico (VOKES & VOKES, 1984). From Grenadines and Tobago in the present work.

Remarks: The only other species known in this genus, *Pleuromalaxis pauli* Olsson & McGinty, 1958,is smaller and has a more elevated spire.

Genus *Solariorbis* Conrad, 1865

Solariorbis Conrad, 1865. *Amer. Journ. Conch.* 1: 30.
Type species: (by monotypy) *Delpinula depressa* Lea. Eocene of Clairbonian, Alabama.

Diagnosis: After PILSBRY (1953): *"Shell 2 to 4 mm, white, strong, depressed, with 3 or 4 whorls, either rounded or angular, and usually with some spiral striation, the grooves typically punctate; apical whorls level and smooth. The umbilicus has a spiral ridge on a thickening of the wall,*



Figures 72A-C. *Pleuromalaxis balesi* (Pilsbry & McGinty, 1945). A-B: shells, 1.0, 1.5 mm, Rancho Luna Beach, Cienfuegos, Cuba; C: operculum; D : protoconch.
Figuras 72A-C. Pleuromalaxis balesi *(Pilsbry & McGinty, 1945). A-B: conchas, 1,0, 1,5 mm, Playa Rancho Luna, Cienfuegos, Cuba; C: opérculo; D : protoconcha.*

ending in a callus lobe or ledge at the columellar margin. Aperture rounded, with a small groove at the top. Outer lip rather thin and evenly curved".

Remarks: *Solariorbis* was described as a section or subgenus of *Teinostoma*. The peculiar thickening around the umbilicus is one of the more important characteristics of the genus. Another character common to many species is the reticular punctate sculpture due to the interaction of spiral grooves and axial ribs; this character was mentioned by DALL (1892) in reference to *T. depressum* as the type species of *Solariorbis*. The genus is distributed from the Eocene to the Recent with numerous fossil species described. MOORE (1964) considered the following species as Recent: *S. multistriata* (A.E. Verrill, 1884), *S. mooreana* (Vanatta, 1904), *S. blakei* (Rehder, 1944), *S. infracarinata* (Gabb, 1881), *Solariorbis schumoi* (Vanatta, 1913), *S. hondurasensis* (Vanatta, 1913), *S. terminalis* (Pilsbry & McGinty, 1946), *S. corylus* Olsson & McGinty, 1958, *S. decipiens* Olsson & McGinty, 1958, and *S. semipunctus* Moore, 1964. To these it is necessary to add *S. guianensis* Altena, 1966 and *S. antillensis* de Jong & Coomans, 1988, which were described subsequently; also included in the present account as recent are *S. funiculus* (Dall, 1892) and *S. contractus* (Vanatta, 1913). *Solariorbis decipiens* is transferred to the genus *Anticlimax* due to the conchological similarity with the species of this genus.

Some species previously placed in the genus *Solariorbis*, such as *S. con-*

tractus, *S. funiculus* and *S. opsitelotus* present a small triangular thickening at the junction of the columella and the umbilical margin, which does not impinge on the umbilicus; further more they lack the characteristic ornamentation of the genus *Solariorbis* (the reticular punctate sculpture due to the interaction of the spiral grooves and axial ribs). For these reasons and because their spiral cord ornamentation, umbilical margin and protoconch are more similar to *Vitrinella anneliesae*, we have determined that they are better placed in *Vitrinella*.

Solariorbis antillensis de Jong & Coomans, 1988 (Figures 73A-C)

Solariorbis antillensis de Jong & Coomans, 1988. *Studies of the Fauna of Curaçao and other Caribbean Islands*, 69: 33, pl. 13, fig. 143. [Type locality: Curaçao / Aruba]

Type material: Holotype in ZMA (3.87.064). Represented in DE JONG & COOMANS (1988). Not examined.

Other material examined: Cuba: 1 s, Rancho Luna Beach, 35 m (MHNS). Puerto Rico: 1 s, E Boca de Cangrejos (MCZ 361886). Bahamas: 1 s, South Riding Rocks, Cay Sal Bank, base of coral reef in fine sediment (CHL). Antiqua and Barbuda: 1 s, Île Sister, N St. Johns, 5-6 m (CJP). Guadeloupe: 2 s, 1 f, Port Louis, 0-2 m, brushing stones (CJP).

Description: The original description given by DE JONG & COOMANS (1988) is as follows: *"Shell disc-shaped, wider than high, 1 ½ nuclear and two postnuclear whorls. The whorls are rounded, without carinae and covered by spiral striae with punctuated grooves.* S. antillensis *differs from* S. guianensis *by a quite different protoconch, the under side being less flattened, the umbilicus less closed, the axial wrinkles less manifest, the spirals more prominent and their punctuation more clear"*. The ambiguity of the distinguishing characters has given us reason to amplify the description.

We add: Shell (Figs. 73A-B) planispiral, depressed, shell of 2 ¾ rapidly-expanding whorls. Protoconch (Fig. 73C) with 1 ¼ whorls, totally smooth, about 240 μm in maximum diameter. Teleoconch with 1 ½ whorls ornamented by regularly spaced axial ribs and spiral cords of equal size. This sculpture covers all the shell except a small area on the base close to the periphery. The intersection of ribs and cords forms a regular reticulation characteristic of the genus. Aperture rounded, base of the columella and internal lip thickened and reflected outward forming a typical callus. Umbilicus narrow and deep, nearly closed by the thickening of the columella until the last ¼ of the body whorl, which then deviates laterally.

Dimensions: Holotype 1.6 mm in diameter. The figured specimen measures 1.29 mm in maximum dimension.

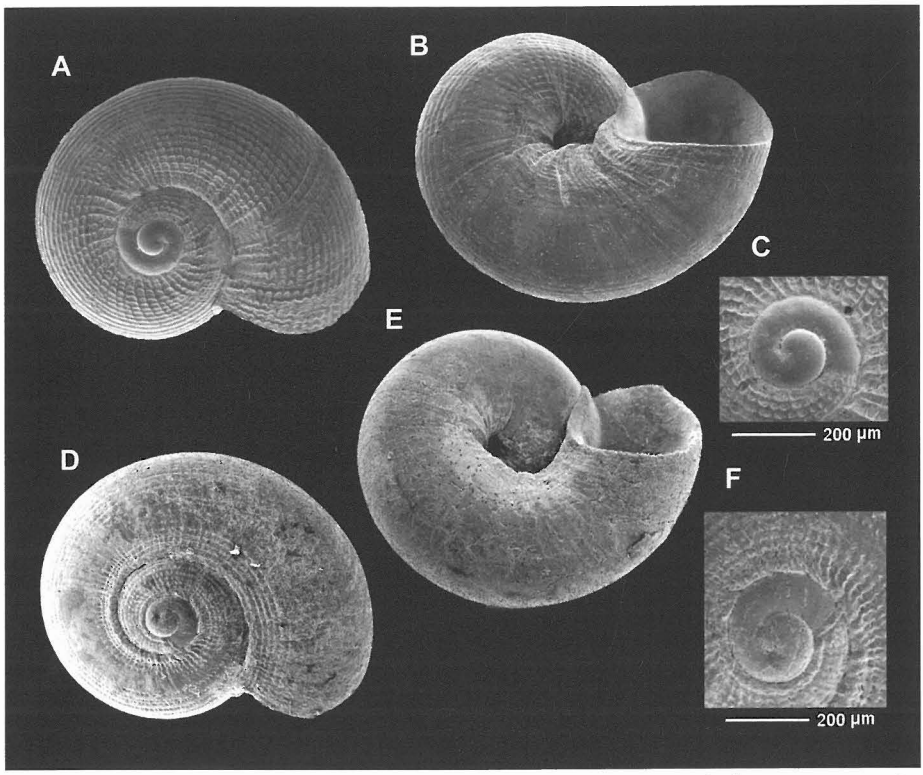
Habitat: Nothing is mentioned by DE JONG & COOMANS (1988) in the description work of the species. Our material comes from a coralline sandy bottom 35 m deep.

Distribution: Only know from Curaçao / Aruba, Puerto Rico, Bahamas, and Cuba.

Remarks: *S. antillensis* is very close to *S. guianensis*, with which it can be confused. It is best differentiated by the regularity of the ornamentation, which forms a characteristic reticulation not present in *S. guianensis*.

Solariorbis guianensis Altena, 1966 (Figures 73D-F)

Solariorbis guianensis Altena, 1966. *Zoologische Mededelingen*, 41: 238-239, figs. 4a-c. [Type locality: Cupido, Maratakka River, Surinam].



Figures 73A-C. *Solariorbis antillensis* de Jong & Coomans, 1988. A-B: shell, 1.3 mm, Rancho Luna Beach (MHNS); C: protoconch. Figures 73D-F. *Solariorbis guianensis* Altena, 1966. D-E: shell, 1.5 mm, Cienfuegos Bay (MHNS); F: protoconch.
Figuras 73A-C. Solariorbis antillensis *de Jong & Coomans, 1988. A-B: concha, 1,3 mm, Playa Rancho Luna (MHNS); C: protoconcha. Figuras 73D-F.* Solariorbis guianensis *Altena, 1966. D-E: concha, 1,5 mm, Bahía de Cienfuegos (MHNS); F: protoconcha.*

Type material: Represented in ALTENA (1966, 1975). Not examined.
Other material examined: Cuba: 2 s, Cienfuegos Bay, 20-30 m (MHNS).

Description: ALTENA (1966: 238, figs. 4a-c) figuring the holotype, presents a drawing without many details attempting to depict the essential aspects of ornamentation: spiral pitted lines and axial ribs. DE JONG & COOMANS (1988: 33) remarked: *"sculpture of the last whorl consisting of little pronounced and irregular fine radiating striae starting from the suture and the umbilicus, but not reaching the periphery and a few indistinct spirals, near the suture on the upper side and near the periphery on the under side;"* pointing out the distinguished characters of this species.

We add: Shell (Figs. 73D-E) lenticular, depressed, of 3 ½ rapidly increasing whorls. Protoconch (Fig. 73F) smooth, 1 ¼ whorl, measuring about 240 µm; a strong varix is present at the transition to the teleoconch, on the first whorl of which there is a pitted reticular sculpture formed by the crossing of spiral cords and axial ribs.

The principal distinguishing character is the ornamentation on the last

whorl, formed by fine and irregular radial ribs which begin at the suture and disappear before reaching the periphery, and spiral cordlets which are more evident near the suture and close to the umbilicus, keeping a central zone of the last whorl without sculpture. Base convex, without ornamentation, except for the growth lines. The umbilicus is narrow and deep, nearly obliterated by the thickened columella until the last ½ of the body whorl, where it abruptly deviates laterally. Aperture rounded, external lip fine, internal lip thickened and reflected towards umbilicus.

Dimensions: Holotype 0.90 mm in diameter. The figured shell measures 1.47 mm in maximum diameter.

Habitat: DE JONG & COOMANS (1988: 33) mention that a significant number of specimens was found near Cabrietenberg in Spaanse Water, always together with *Teinostoma lerema*. In the area studied by us it is quite scarce and only 2 specimens were found.

Distribution: Known from Colombia (DÍAZ MERLANO & PUYANA HEGEDUS, 1994), Aruba (DE JONG & COOMANS, 1988), and Cuba: Cienfuegos.

Remarks: Originally described as a fossil of the Holocene of Surinam. DÍAZ MERLANO & PUYANA HEGEDUS (1994) recorded it as live-collected in Colombia and DE JONG & COOMANS (1988) in Aruba. The shell presents the basic characters which distinguish this species from others included in the genus *Solariorbis*: the thickening of the umbilical wall and the finely pitted reticular sculpture.

Solariorbis blakei (Rehder, 1944) (Figures 74A-D)

Vitrinella blakei Rehder, 1944a. *The Nautilus*, 57: 97, pl. 9, figs. 1-2. [Type locality: Bed 1 (lowest bed) of the Talbot Formation, Wailes Bluff, near Cornfield Harbour, St. Mary's County, Virginia].

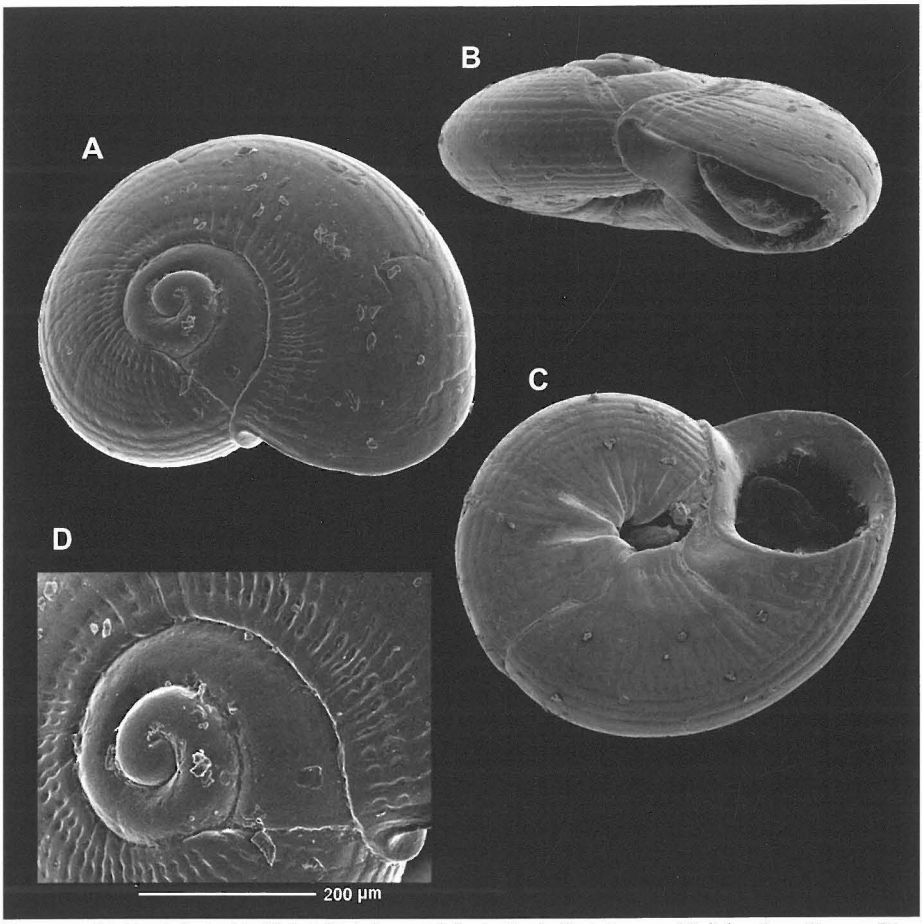
Type material: Holotype in USNM (537834). Not examined.
Material examined: Florida, USA: 4 s, E. St. Augustine, St. Johns Co., (CHL); 2 s, Cedar Key, Levy Co., 4.5-6 m shell/rubble bottom (CHL); 2 s, Stuart, Martin Co. (CHL); 2 s, Pinellas Co., (CHL); 1 s, SE Mayport (CHL). Puerto Rico: 2 s, beach at Holiday Inn, San Juan (CHL). Turks & Caicos: 1 s, Grand Turk (CHL).

Description: Shell (Figs. 74A-C) strongly depressed, small size, spire almost flat, very weakly sculptured, umbilicus nearly or entirely covered by the thickening of the umbilical wall. Protoconch (Fig. 74D) smooth with 2 whorls, size about 330 μm in diameter and projecting slightly apically. Teleoconch with 1 ¼ whorls, sculptured with faint spiral cords/grooves and short axial wrinkles that radiate out from the suture. On the last half whorl the cords are weakened and the axial ribs almost disappear, persisting only in the subsutural area. The base is broad, smooth, and evenly rounded. Aperture oblique with a heavy parietal callus. Columella thickened, reflected towards the umbilicus, forming a small callus. Umbilicus reduced to a very narrow fisure, limited, and partially occluded by the thickening of the umbilical margin although the columella deviates laterally in the last ¼ whorl. On the umbilical wall strong growth folds can be seen.

Dimensions: About 1.5 mm in maximum diameter.

Habitat: It lives in creeks and bays (ANDREWS, 1977). Bathymetric range: 0 to 26 m.

Distribution: This species was considered a continental species with an extensive distribution along the east coast of North America. It had never been reported from any of the West Indian islands (MOORE, 1964), but actually there are records from a few islands. USA: South Carolina, Florida:



Figures 74A-D. *Solariorbis blakei* (Rehder, 1944). A-C: shell, 0.8 mm, Holiday Inn, Puerto Rico (CHL); D: protoconch.
Figuras 74A-D. Solariorbis blakei *(Rehder, 1944). A-C: concha, 0,8 mm, Holiday Inn, Puerto Rico (CHL); D: protoconcha.*

East Florida, West Florida; Mississippi; Texas; Mexico: unlocalized; Costa Rica, Panama. Reported from Colón and Bocas Island, Panama (OLSSON & MCGINTY, 1958). From Florida, Mississippi, Texas, Oregon, and Campeche Bank, Mexico (MOORE, 1964). From South Carolina to the Gulf Mexico and the Caribbean Sea (HOUBRICK, 1968). From South Carolina to Texas and the Caribbean Sea (ABBOTT, 1974); from the states of the Gulf to Mexico (EMERSON & JACOBSON, 1976). East coast of the USA; Florida; states of the Gulf of Mexico; Mexico (ANDREWS, 1977). Portete, Costa Rica (HOUBRICK, 1968; ROBINSON & MONTOYA, 1987). From Martin, Palm Beach, Pinellas, and Levy Cos., Florida; Texas and Puerto Rico (ODÉ, 1988). From Lee Co. (GUNDERSEN, 1998). From SE Mayport and St. Augustine, Florida (LEE, 2009).

Remarks: Described as a Pleistocene fossil. *S. blakei* like *S. semipunctus* is smaller than other West Indian *Solariorbis*. *S. blakei* can be distinguished from *S. semipunctus* by the rounded and smoother dorsal surface.

Solariorbis elegans (Olsson & McGinty, 1958) (Figures 75A-G)

Vitrinella (Striovitrinella) elegans Olsson & McGinty, 1958. *Bulletins of American Paleontology* 39: 31, pl. 3, figs. 1-1d. [Type locality: Bocas Island, Panama].

Type material: Holotype in ANSP (211877). Not examined.
Material examined: Panama: 3 s, Bocas Island, drift (CHL); 2 s, Portobello, drift (CHL).

Description: Shell (Figs. 75A-E) white or glassy, depressed, about 3 ½ whorls. The protoconch (Figs. 75F-G) is projected over the teleoconch, has a little more than one whorl, smooth, and about 400 μm in maximum diameter. In some shells two strong varices can be seen, which mark the two stages of development. Teleoconch totally covered by spiral cords of similar size, which at the crossing points with the axial lines form small rectangles, more evident and rounded on the dorsum and on the base of the teleoconch, and a little more elongate on the periphery. There are more than 35 spiral cordlets on the last whorl. Aperture rounded, oblique, external lip fine, columella strong and reflected towards the umbilicus, forming a small callus. Umbilicus deep; the peristome sharp, a little thickened near the base. Inner wall of the umbilicus with growth folds.

The largest shell examined measures 2.0 mm in maximum diameter and 1.1 mm in height.

Habitat: Sand in shallow water (DÍAZ MERLANO & PUYANA HEGEDUS, 1994). Depth: 0 m (live 0 m).

Distribution: Costa Rica, Panama, Colombia, Venezuela: unlocalized.

Reported from Colón and Bocas Island, Panama (OLSSON & MCGINTY 1958). Central América (HOUBRICK, 1968). Western Caribbean (ABBOTT, 1974). Portete and Moin, Costa Rica (HOUBRICK, 1968; ROBINSON & MONTOYA 1987). From Venezuela (PRINCZ, 1982). From Costa Rica to Colombia (DÍAZ MERLANO & PUYANA HEGEDUS, 1994).

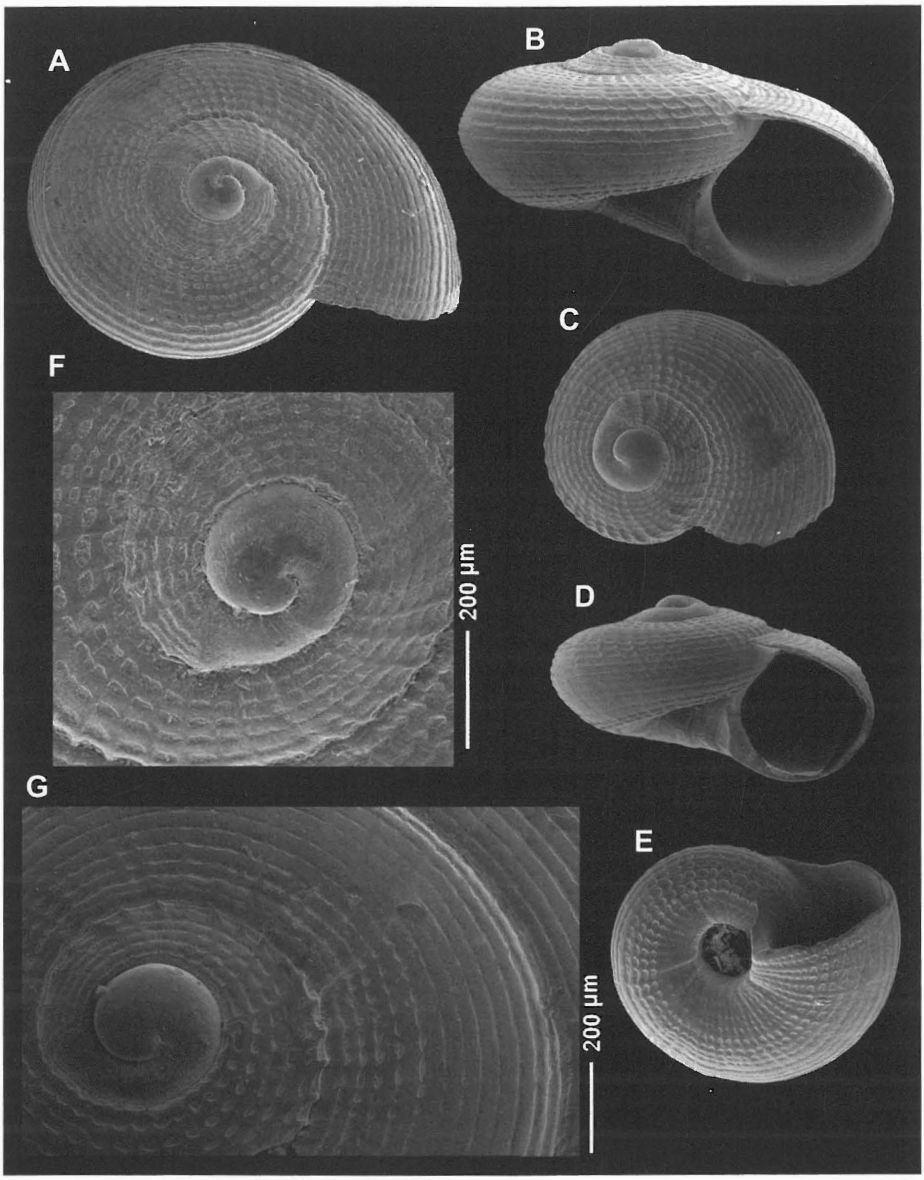
Remarks: Described in the subgenus *Striovitrinella* Olsson & McGinty, 1950; this is characterized by having the entire surface of the shell sculptured with fine, threadlike spirals, operculum circular, thin, chitinous, with numerous, slowly enlarging spiral whorls; radula taenioglossate. Based on the thickening of the umbilical wall due to the enlargement and reflecting towards the umbilicus of the columella, the columellar callus, and the pits formed by the crossing of spiral cords and growth folds, we have decided to place this species in *Solariorbis*.

Solariorbis elegans is very similar to *Solariorbis multistriatus*, from which it can be distinguished by the shape of the umbilical callus, being less globose, and because the protoconch is more erect.

Solariorbis infracarinatus (Gabb, 1881) (Figures 76A-H, 77A-C)

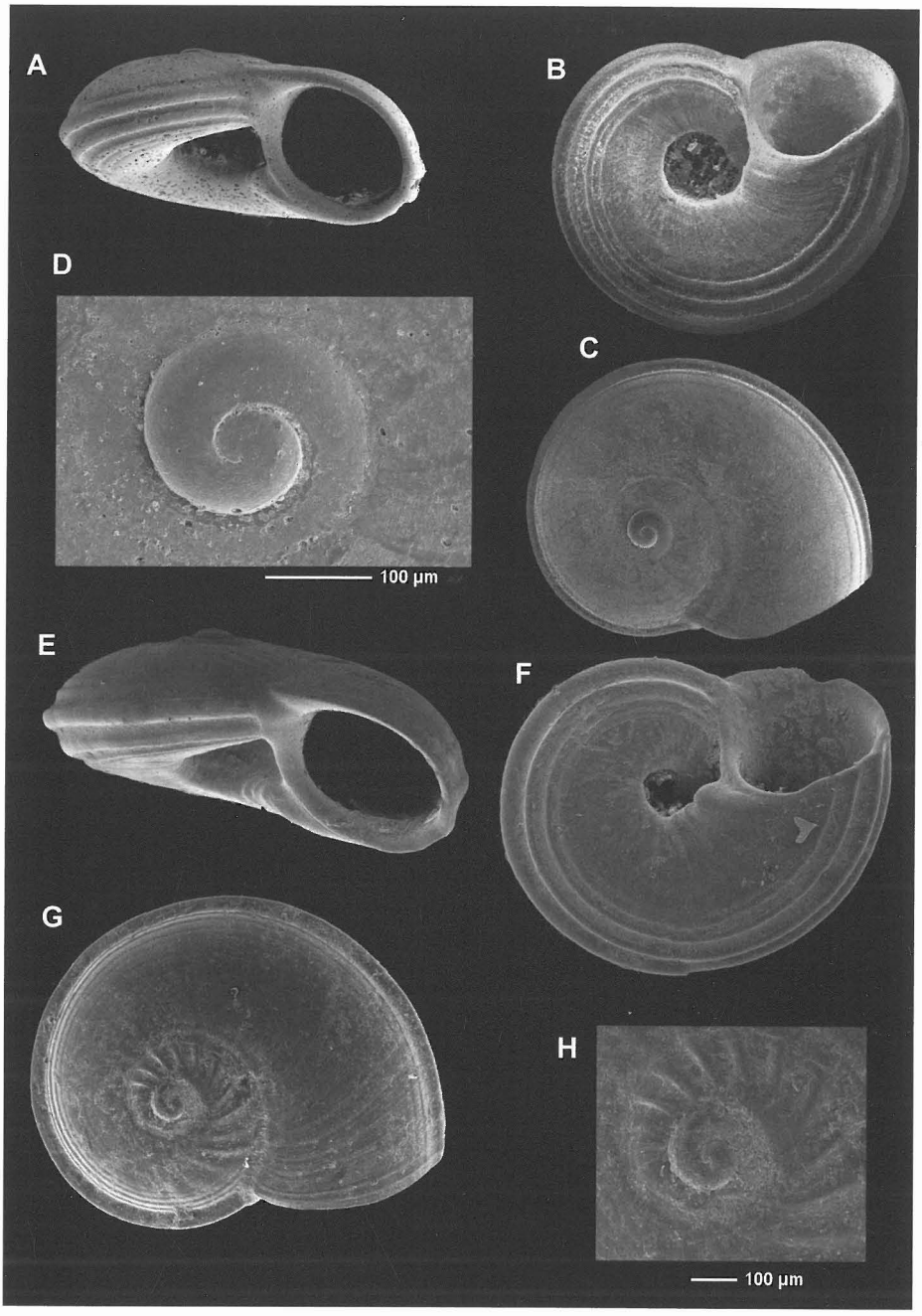
Adeorbis infracarinata Gabb, 1881. *Journ. Acad. Nat. Sci. Philadelphia*, 2 serie, 8: 365, pl. 46, fig. 62 [Type locality: Pliocene beds of Limon, Costa Rica].
Teinostoma bartschi Vanatta, 1913. *Proc. Acad. Nat. Sci. Phil.*, 65: 26-27, pl. 2, figs. 9-11. [Type locality: Porto Barrios and Livingston, Guatemala].
Solariorbis euzonus Pilsbry & McGinty, 1950. *The Nautilus*, 63: 85, pl. 5, figs. 7-7a. [Type locality: Sebastian, Indian River County, Florida].

Type material: Holotype of *Adeorbis infracarinata* in ANSP (3380) and figured by MOORE (1965). Holotype of *Teinostoma bartschi* in ANSP (76501) figured by VANATTA (1913). Not examined.



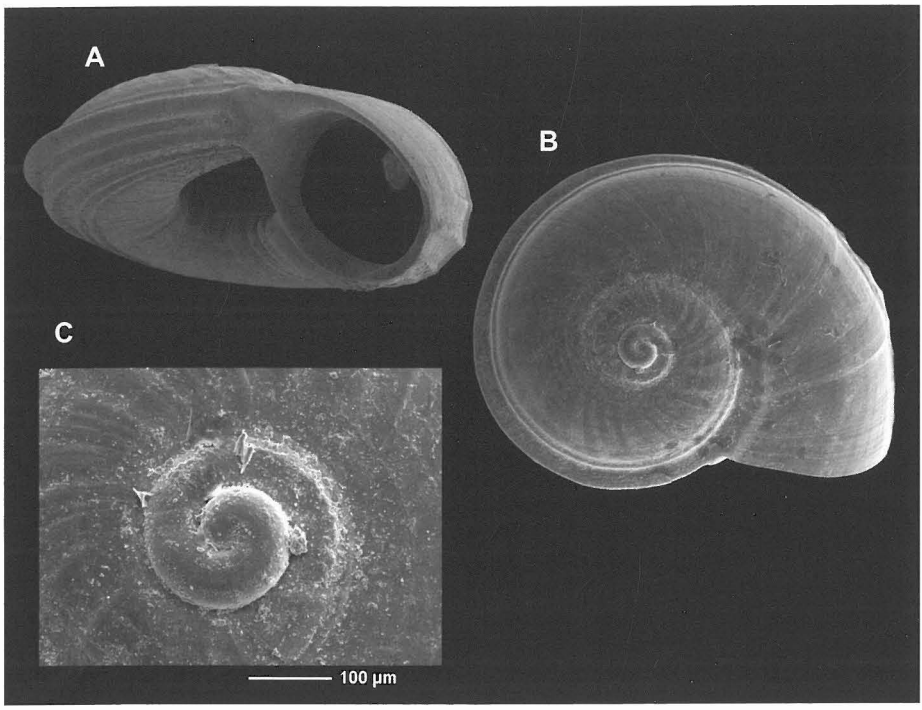
Figures 75A-G. *Solariorbis elegans* (Olsson & McGinty, 1958). A-B: shell, 2.0 mm, Portobello, Panama (CHL); C-E: shells, 1.5, 1.4, 1.5 mm, Bocas Island, Panama (CHL); F-G: protoconchs. *Figuras 75A-G.* Solariorbis elegans *(Olsson & McGinty, 1958). A-B: concha, 2,0 mm, Portobello, Panama (CHL); C-E: conchas, 1,5, 1,4, 1,5 mm, Isla Bocas, Panama (CHL); F-G: protoconchas.*

Other material examined: Guatemala: 2 s, Livingston, 3 m (MHNS). Brazil: 1 s, Itaparica (MHNS); 1 s, Praia de Itararé, São Vicente, São Paulo (CHL). Florida, USA: 7 s, Cedar Key (CHL); 1 s, Bahia Honda Key, Monroe Co. (CHL); 1 s, Marco Island, Collier Co. (CHL); 1 s, SE Mayport (CHL); 2 s, APAC Pit, Sarasota, Plio-Pleistocene (CHL).



Figures 76A-H. *Solariorbis infracarinatus* (Gabb, 1881). A-C: shell, 1.4 mm, Livingstone, Guatemala (MHNS); D: protoconch; E-H: form with axial ribs, 1.7, 1.8, 2.0 mm, Florida, USA (CHL); H: protoconch.

Figuras 76A-H. Solariorbis infracarinatus *(Gabb, 1881). A-C: concha, 1,4 mm, Livingstone, Guatemala (MHNS); D: protoconcha; E-H: forma con costillas axiales, 1,7, 1,8, 2,0 mm, Florida, USA (CHL); H: protoconcha.*



Figures 77A-C. *Solariorbis infracarinatus* (Gabb, 1881). A-B: shell, 1.7 mm, Itaparica, Brazil (MHNS); C: protoconch.
Figuras 77A-C. Solariorbis infracarinatus *(Gabb, 1881). A-B: concha, 1,7 mm, Itaparica, Brazil (MHNS); C: protoconcha.*

Description: Shell (Figs. 76A-C, 77A-B) depressed, rounded spire, carinate at the periphery, and narrowly umbilicate. Protoconch (Fig. 76D) of nearly 1 ½ whorls and about 340 µm in diameter. Teleoconch of about 2 whorls with a strong carina near the periphery. Between this and the umbilicus there are 3 spiral cords. On the dorsum, between the suture and the periphery there are numerous axial ribs. A strong cord borders the umbilicus internally, thickening slowly towards the aperture and forming a callous lobe on the columellar margin typical of the genus.

Habitat: Species common in shallow water in coastal bays. Amply distributed in continental waters. Not recorded in any island of the West Indies (MOORE, 1964).

Distribution: It has been recorded from Florida to Texas (USA), Campeche Bank (Mexico), Guatemala and Panama (MOORE, 1964). From the USA, North Carolina to Gulf of Mexico and Caribbean Sea (HOUBRICK, 1968). On both sides of Florida; from Texas to Campeche Bank; Central America (ANDREWS, 1977). From Campeche to Ciudad del Carmen and Zacatal, Mexico (VOKES & VOKES, 1984). From Florida (LYONS, 1989). South of Florida; Texas; Caribbean Sea (ROBINSON, 1991). Florida and Texas to Colombia (DÍAZ MERLANO & PUYANA HEGEDUS, 1994). Rio Grande do Norte, Brazil (RIOS, 1994). Our material is from Livingston, Guatemala. Also Florida Plio-Pleistocene: record from Chesapeake Bay, Virginia by WASS (1972: 125) needs confirmation.

Remarks: MOORE (1964) considered *Teinostoma bartschi* Vanatta, 1913 and *Solariorbis euzonus* Pilsbry & McGinty, 1950 synonyms

of *Solariorbis infracarinatus* not finding important differences. In spite of this, some databases treat *T. bartschi* as a valid species. The figured shell (Figs. 77A-C) was collected in Livingston, Guatemala, its type locality.

PILSBRY (1953) figured a shell of *Solariorbis euzonus* from the Plio-Pleistocene of St. Petersburg, in which he distinguished 2-3 fine but easily-seen spiral cordlets on the dorsum, above the keel, as well as fine axial ribs on the first whorl of the teleoconch, which fade on the last whorl. Both these features can be found in well-preserved specimens of *T. bartschi* and *S. infracarinata*.

VANATTA (1913) and PILSBRY & MCGINTY (1950), in describing *T. bartschi* and *S. euzonus* respectively, did not compare these species to *S. infracarinatus* described by GABB (1881). Based on the preceding analysis, and consistent with MOORE (1964), we consider *T. bartschi* and *S. euzonus* junior synonyms of *S. infracarinatus*.

In reference to *S. infracarinatus*, MOORE (1964) stated: *"No other* Solariobis *in the western Atlantic has the combination of low round spire, radial waves on the first whorl and spiral sculpture which is not visible from above"*. We agree with this diagnosis.

Solariorbis mooreanus (Vanatta, 1904) (Figures 78A-F)

Vitrinella mooreana Vanatta, 1904. *Proc. Acad. Nat. Sic. Philadelphia*, 55: 757, figs. 1-3. [Type locality: Gulf side of Crooked Island near Panama City, Florida].

Solariorbis bassilisus Pilsbry, 1953. *Monographs of Acad. Nat. Sci. Philadelphia*, 18: 420, pl. 56, figs. 4-4c. [Type locality: Pliocene of St. Petersburg, Florida].

Type material: Five syntypes of *Vitrinella mooreana* in ANSP (84611). Holotype of *Solariorbis bassilisus* deposited in ANSP (18408). Not examined.

Other material examined: Cuba: 3 s, Cienfuegos Bay, 20-30 m (MHNS). Florida, USA: 1 sp, St. Joe Bay, grass flats (CHL). Brazil: 1 s, Praia de Itararé, São Vicente, São Paulo (CHL); 1 s, off Santos, São Paulo State, trawled by nets at 100 m (CHL).

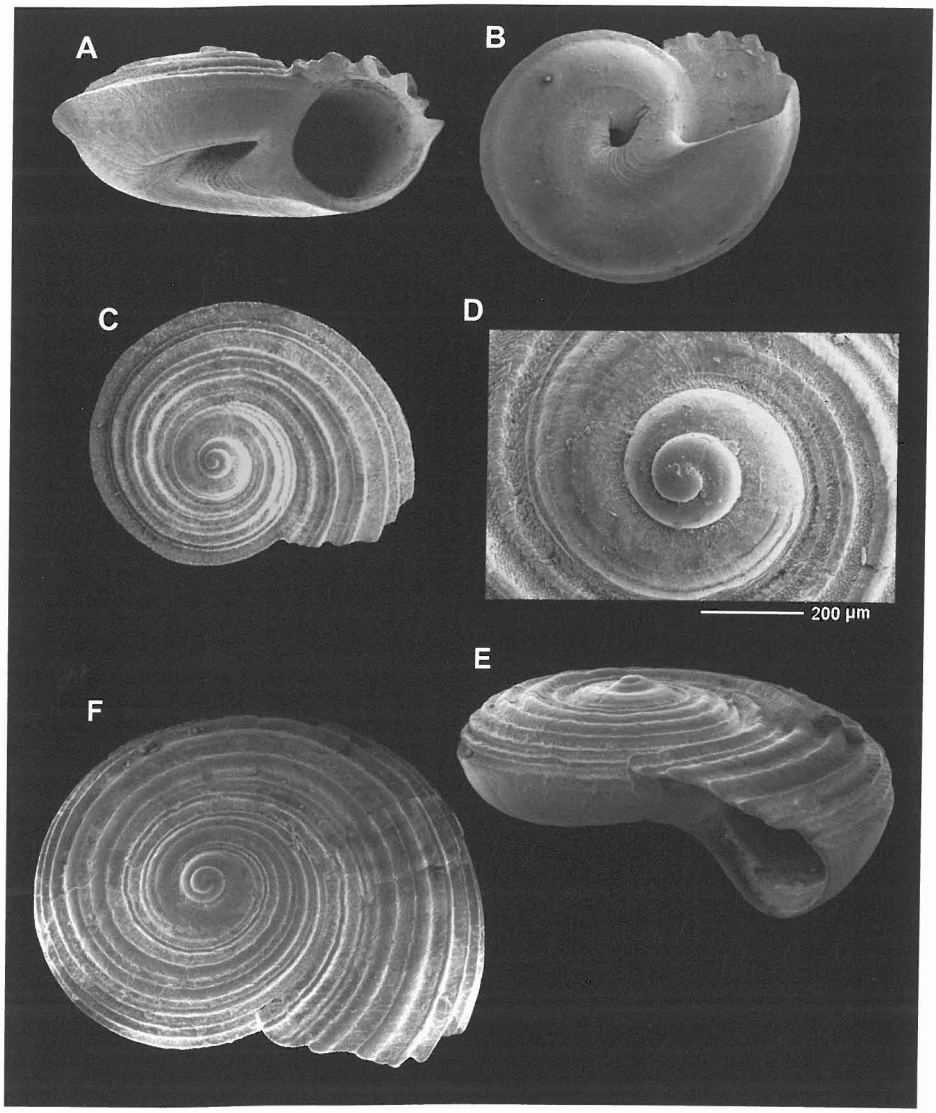
Description: Shell (Figs. 78A-C, 78E-F) depressed, with six spiral ridges on dorsal of the shell. The peripheral cord is very prominent, like a keel. Base smooth, umbilicus narrow and deep. The protoconch (Fig. 78D) is projected over the teleoconch, with 2 spiral whorls, smooth and with about 350 μm in maximum diameter. The teleoconch has two spiral whorls; the periphery is keeled by a peripheral cord, sharp and prominent, and strong cords on the dorsum. Ornamentation formed by punctiform sulcus, dorsally as well as ventrally. Base slightly concave. Aperture rounded, without canal on the upper internal angle. Columella thickened, with an expansion which from the internal lip is reflected outward forming a small triangular callus which closes the umbilicus gradually.

Dimensions: Holotype of *Vitrinella mooreana* is 1.08 mm in diameter and 1.2 mm of height. There are records up to 2.75 mm. Holotype of *Solariorbis basilissus* is 2.4 mm in diameter and 1.25 mm in height.

Animal and radula unknown.

Habitat: The species has been found in a shell grit bottom at 9 m. According to MOORE (1964) it occurs on sandy bottoms in turbid waters.

Distribution: Recorded from Gulf side of Crooked Island near Panama City, Florida (VANATTA, 1904); from Missisippi (ANDREWS, 1977); from East and West Florida (LYONS, 1998); from Texas (ODÉ, 1988a); from Florida, Texas, north-



Figures 78A-F. *Solariorbis mooreanus* (Vanatta, 1904). A-C: shell, 1.9 mm, Cienfuegos Bay (MHNS); D: protoconch; E-F: shell, 2.6 mm, Itararé, São Vicente, Brazil (CHL).
Figuras 78A-F. Solariorbis mooreanus *(Vanatta, 1904). A-C: concha, 1,9 mm, Bahía de Cienfuegos (MHNS); D: protoconcha; E-F: concha, 2,6 mm, Itararé, São Vicente, Brasil (CHL).*

east Brazil, and Abrolhos Islands (Rios, 1994). Also from Cienfuegos, Cuba.

Remarks: This species is also known as a fossil. *Solariorbis mooreanus* is different from the congeneric species by the spiral cords which cover the dorsum of the shell, the sharp and prominent peripheral cord which forms a keel around the shell, the spiral sulcus with punctiform incisions which cover the interspaces between the cords, and the triangular callus originating at the internal lip, which impinges on the umbilicus as it grows.

Solariorbis multistriatus (A.E. Verrill, 1884) (Figs. 79A-I)

Ethalia multistriata A.E. Verrill, 1884. *Trans. Connect. Acad. Arts and Sci*, 6: 242-243. [Type locality: *Albatross* sta. 2109, off Cape Hatteras, North Carolina].

Type material: Lectotype in USNM (35733). Not examined.
Other material examined: Cuba: 5 s, Cienfuegos Bay, 20 m (MHNS); 2 s, Rancho Luna Beach, 20 m (MHNS).

Description: Shell (Figs. 79A-E) strong, spire a little elevated, formed by 3 ½ whorls. Protoconch (Figs. 79G-I) relatively large, bulbous, measuring about 480 μm and with a little more than one whorl; two stages are distinguised, the first one with a rough surface and the second with an evident reticulation and between one and seven strong varices on its dorsal aspect. Teleoconch with 2 ½ whorls, totally covered by spiral cords of similar size, more than 50 on the body whorl. Between the cords there are spiral punctiform sulci (Fig. 79F) formed by the intersections with axial ribs. The pitting is more evident on the first whorl of the teleoconch, being barely detectable on the body whorl. Due to the thickening of the umbilical margin a characteristic triangular callus is formed and a gradual closing of the umbilicus is produced.

Dimensions: Lectotype 1.59 mm in diameter. The larger shell figured is 3.1 mm of maximum diameter.

Animal and radula are unknown.

Habitat: Species with a large bathymetric distribution, recorded between 5 and 312 m deep. Our shells were collected on coralline sandy bottom at 20 m. The type material was obtained at 142 fms (312 m).

Distribution: Recorded off Cape Hatteras (A.E. VERRILL, 1884); from Cuba: North Havana Province (AGUAYO & JAUME, 1936); North Carolina to West Indies (ABBOTT, 1974); from Bocas Island, Panama (OLSSON & MCGINTY, 1958); from the Yucatan Peninsula, Mexico (VOKES & VOKES, 1984); from the northeast Gulf of Mexico (PARKER & CURRAY, 1956); from Cape Lookout, North Carolina (MOORE, 1964); from Laguna de Termino, Campeche, Mexico (GARCÍA-CUBAS, 1982); from Puerto Rico and the Lesser Antilles (WARMKE & ABBOTT, 1961); from Guyana (PRINCZ, 1977); from Venezuela (PRINCZ, 1982). Also Cienfuegos, Cuba.

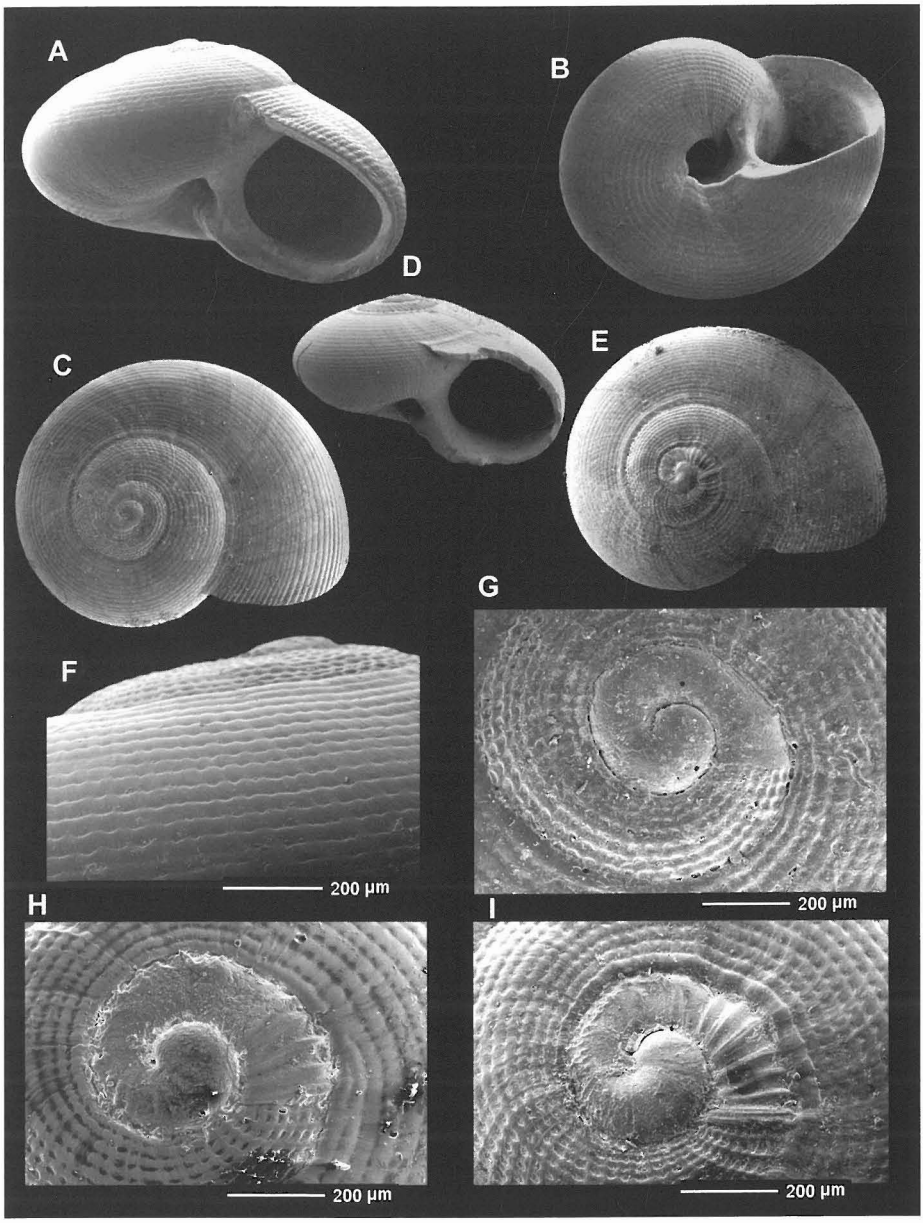
Remarks: *S. multistriatus* was described by A.E. VERRILL (1884) from a juvenile specimen, which had not yet developed all the adult conchological characters, and perhaps for this reason he placed the species in the genus *Ethalia*. BUSH (1897) placed the species in *Vitrinella* due to the apparent similarity of its shell to *V. helicoidea*, type species of that genus. MOORE (1964) moved it to *Solariorbis* after studying an adult specimen showing the thickening of the umbilical wall and pitted sulcus. He also mentioned that *S. multistriatus* is similar to *S. terminalis*, from which it can be differentiated by its smaller size, its higher spire and smaller umbilical callus.

In our opinion the number and regularity of the spiral cords and the triangular callus are the main distinguishing characters of this species.

Solariorbis truncatus (Gabb, 1881) (Figures 80A-C)

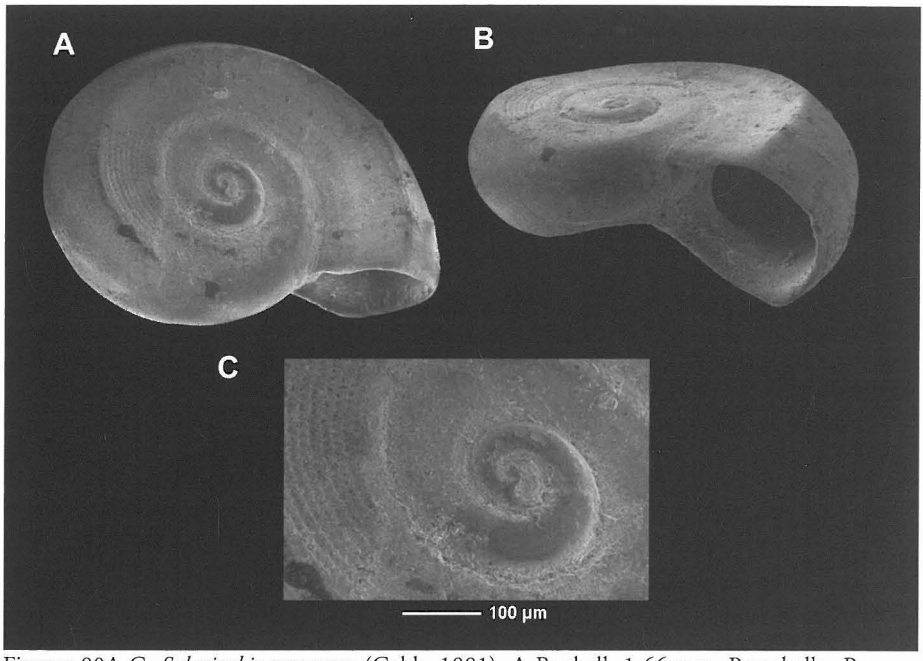
Vitrinella truncata Gabb, 1881. *Journ. Ac. Nat. Sci.*: 367, pl. 47, fig. 65. [Type locality: Limon, Costa Rica, Miocene].

Solariorbis corylus Olsson & McGinty, 1958. *Bulletins of American Paleontology, 39:* 28, pl. 3, figs. 4-4b. [Type locality: Bocas Island, Panama].



Figures 79A-I. *Solariorbis multistriatus* (A.E. Verrill, 1884). A-E: shells, 2.5, 2.6, 3.1, 2.56, 2.85 mm, Cienfuegos Bay; F: microsculpture; G-I: protoconchs.
Figuras 79A-I. Solariorbis multistriatus *(A.E. Verrill, 1884). A-E: conchas, 2,5, 2,6, 3,1, 2,56, 2,85 mm, Bahía de Cienfuegos; F: microescultura; G-I: protoconchas.*

Type material: *V. truncata*: Type in ANSP (3107). Holotype of *S. corylus* (ANSP 211909) and a paratype in ANSP (211910). Not examined.
Other material examined: 1 s, Portobello, Panama (CHL).



Figures 80A-C. *Solariorbis truncatus* (Gabb, 1881). A-B: shell, 1.66 mm, Portobello, Panama (CHL); C: protoconch.
Figuras 80A-C. Solariorbis truncatus *(Gabb, 1881). A-B: concha, 1,66 mm, Portobello, Panamá (CHL); C: protoconcha.*

Description: Shell (Figs. 80A-B) small, white or glassy, with a strongly flattened, depressed spire bounded by a ridged shoulder, the profile of the body whorl below the shoulder being wider and evenly convex. Protoconch (Fig. 80C) with 1 ½ whorls.

Maximum reported size: 2.4 mm

Habitat: Sandy bottom (DÍAZ MERLANO & PUYANA HEGEDUS, 1994).

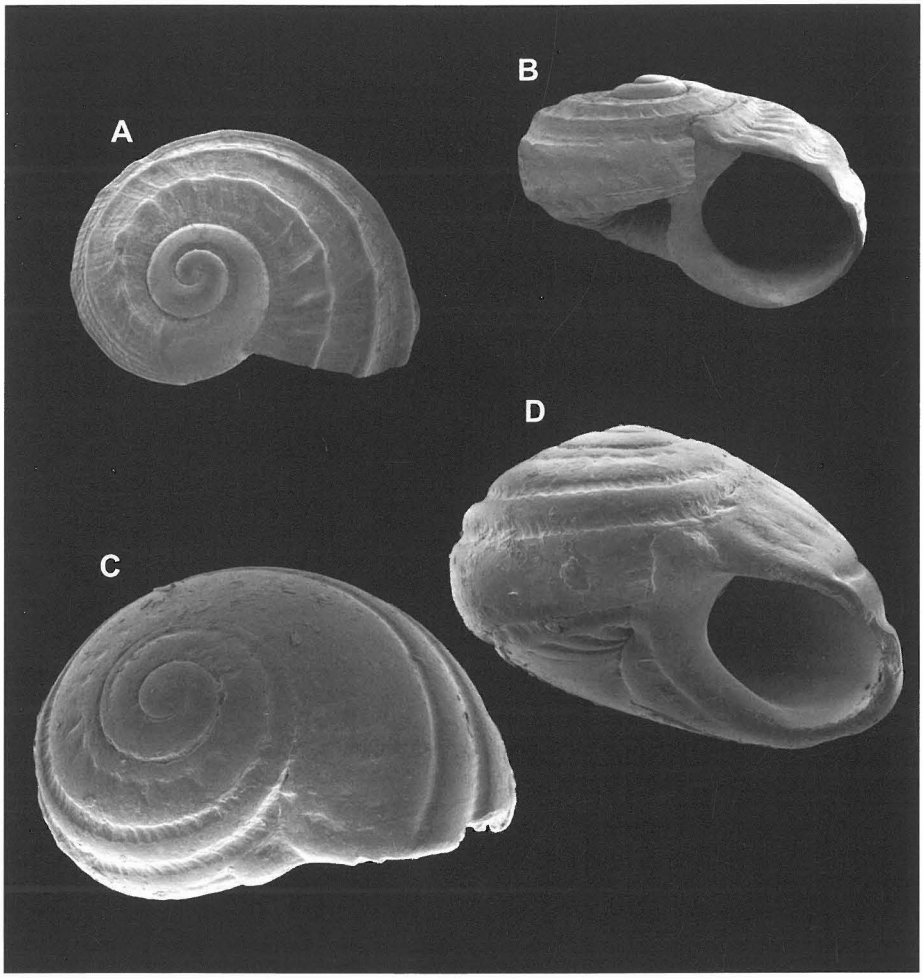
Distribution: Recorded from the Pleistocene, Moín, Costa Rica (ROBINSON & MONTOYA, 1987; ROBINSON, 1991). From Colón and Colón and Bocas Island, Panama (OLSSON & MCGINTY, 1958). From southeastern Panama (RADWIN, 1969). From Panama and Colombia (DÍAZ MERLANO & PUYANA HEGEDUS, 1994).

Remarks: OLSSON & MCGINTY (1958) stated: *"Similar to* S. contracta *(Vanatta) from Monkey River, Honduras but lacks the central or peripheral keel and has a higher shell".*

Solariorbis schumoi (Vanatta, 1913) (Figs. 81A-D)

Teinostoma schumoi Vanatta, 1913. *Proc. Acad. Nat. Sci. Philadelphia*, 65: 25-26, pl. 2, figs. 5, 10. [Type locality: Porto Barrios and Livingston, Guatemala].

Type material: Holotype in ANSP (73483) figured by VANATTA (1913). Not examined. Best representations in ALTENA (1966: 240-241, figs. 6a-e) and ALTENA (1975: figs. 11a-c).
Other material examined: Guatemala: 2 s, Livingston, 3-4 m (MHNS). Brazil: 1 s, Praia Itararé, São Vicente, São Paulo, drift (CHL).



Figures 81A-D. *Solariorbis schumoi* (Vanatta, 1913). A-B: shells, 0.8, 1.1 mm, Livingston, Guatemala (MHNS). C-D: shell, 1.8 mm, Praia Itararé, São Vicente, Brazil (CHL).
Figuras 81A-D. Solariorbis schumoi *(Vanatta, 1913). A-B: conchas, 0,8, 1,1 mm, Livingston, Guatemala (MHNS). C-D: concha, 1,8 mm, Praia Itararé, São Vicente, Brasil (CHL).*

Description: Shell (Figs. 81A-D) small, imperforate in adult individuals, white, very compact, suture marked, rounded periphery, with undulant profile due to the spiral cords; the penultimate whorl exhibits a spiral sulcus near the suture. Protoconch of nearly 1 ¾ whorls and about 340 μm in diameter. Teleoconch with 2 ½ whorls, with an ornamentation formed by strong spiral cords and fine spiral threads, strong axial ribs, and fine axial striae; the spaces between the cords are convex and are crossed by a fine axial striation. On the dorsum there is a strong nodulous cord produced by the intersection with axial ribs, the latter progressively more evident as the shell grows. There are 5-7 spiral cords on the periphery. Near the periphery of the base there are two spiral cords. Strong growth folds extend from the basal cords towards the inner part of the umbilicus. Aper-

ture suborbicular; external lip sharp, parietal area wide. Columella and inner lip are reflected outward, forming a wide callus which increases the umbilical wall and may close totally the umbilicus in adult shells. This character is fundamental in the placement of the related species, *T. hondurasensis*, in *Solariorbis*.

The holotype measures 2.23 mm in diameter and 1.51 mm in height. The largest shell figured measures 1.2 mm in diameter and 0.71 mm in height, and it is a non-adult individual.

Habitat: It lives in shallow water at about 2 meters depth.

Distribution: Known from Guatemala (VANATTA, 1913); Costa Rica, Panama and Colombia (COSEL, 1986); ABC Islands: Aruba (DE JONG & COOMANS, 1988); Brazil: Pernambuco, São Paulo (MELLO & PERRIER, 1986); Moin, Costa Rica (ROBINSON & MONTOYA, 1987); Surinam (ALTENA, 1966)

Remarks: This species was originally included in the genus *Teinostoma*. MOORE (1964) placed them in *Solariorbis* on the basis of the enlargement of the umbilical wall and the pitted spiral sulcus in the original figures of *T. schumoi* and *T. hondurasensis*. *T. schumoi* may be differentiated from *T. solidum* Smith by the sculpture on the dorsum; from *S. hondurasensis* Vanatta, 1913 it may be differentiated by having more spiral cords and being umbilicated as juvenile and imperforate, or nearly so, as an adult.

Solariorbis semipunctus Moore, 1965 (Figures 82A-D)

Solariorbis semipunctus Moore, 1965. *The Nautilus*, 78: 77-78, pl. 8, figs. 1-3. [Type locality: Northwest Campeche Bank, Mexico].

Type material: Holotype in USNM (636309) figured by MOORE (1965). Not examined. Best representation in FABER (2007).
Other material examined: Cuba: 3 s, Rancho Luna Beach, 20 m (MHNS); 2 s, Cienfuegos Bay, 20-30 m (MHNS).

Description: Shell (Figs. 82A-C) strongly depressed, 3 ¼ whorls, spiral sculpture punctiform with a rounded periphery and umbilicus sealed by callus. Protoconch (Fig. 82D) smooth with nearly 1 ½ whorls and about 200 μm in diameter. Teleoconch of about 1 ¾ whorls; fine spiral punctiform cordlets cover the whole surface. In the middle of the dorsum and after the first ½ whorl, the shell is keeled. The umbilicus of the adult shells is totally occluded by the columellar callus, which, in the form of a fine callous surface, also covers the cordlets close to the umbilicus. Base somewhat convex.

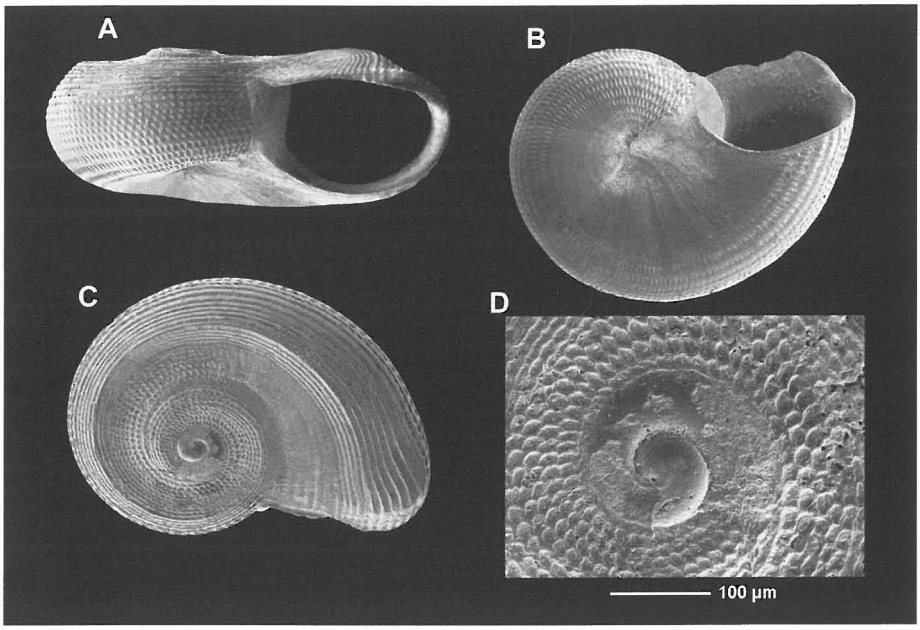
Dimensions: Holotype 0.93 mm in diameter and 0.4 mm of height. The material studied and figured is 1.4 and 1.6 mm in diameter and 0.6 mm in height.

Animal and radula unknown.

Habitat: The species lives on a muddy bottom at 18 m deep (MOORE, 1965). Our samples are from sediments collected on a coralline bottom between 25 and 50 m.

Distribution: Recorded from Yucatan State, Mexico and Haiti (MOORE, 1965); from Campeche Bank, Mexico (18 m) and Haiti (ABBOTT, 1974); from East and West Florida (LYONS, 1998); from Florida: Virginia Key and Schottegat, Curaçao (FABER, 2007) and from Cuba: Cienfuegos.

Remarks: *S. semipunctus* may be distinguished from its congeners by the strongly depressed spire, dorsal keel, and the umbilicus being totally occluded by the callus formed from the inner lip.



Figures 82A-D. *Solariorbis semipunctus* Moore, 1965. A-C: shells, 1.4, 1.6, 1.3 mm, Rancho Luna Beach (MHNS); D: protoconch.
Figuras 82A-D. Solariorbis semipunctus *Moore, 1965. A-C: conchas, 1,4, 1,6, 1,3 mm, Playa Rancho Luna (MHNS); D: protoconcha.*

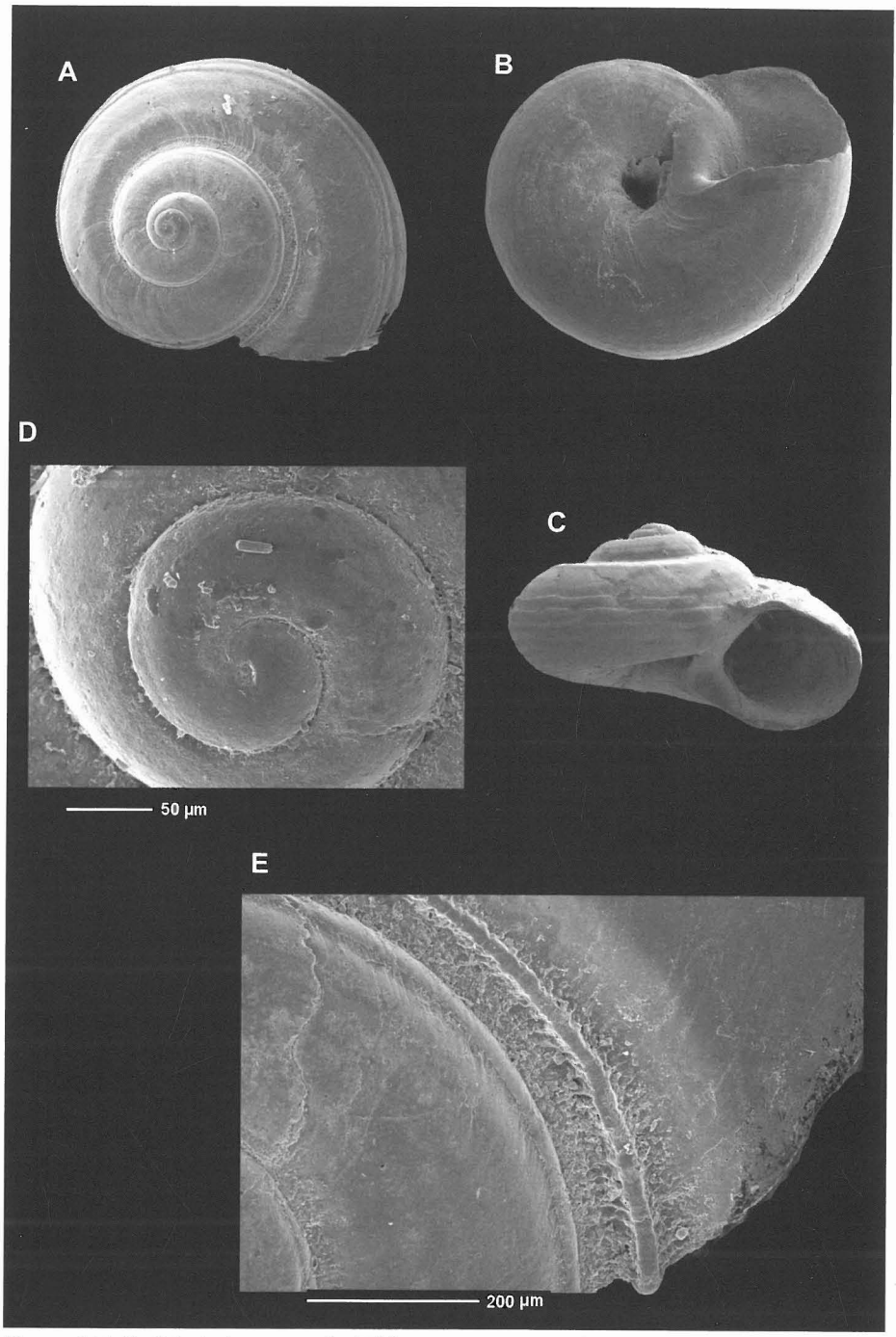
Solariorbis terminalis (Pilsbry & McGinty, 1946) (Figures 83A-E, 84A-F)

Vitrinella terminalis Pilsbry & McGinty, 1946. *The Nautilus*, 60: 17, pl. 2, fig. 5-5a. [Type locality: Destin, northwestern Florida].

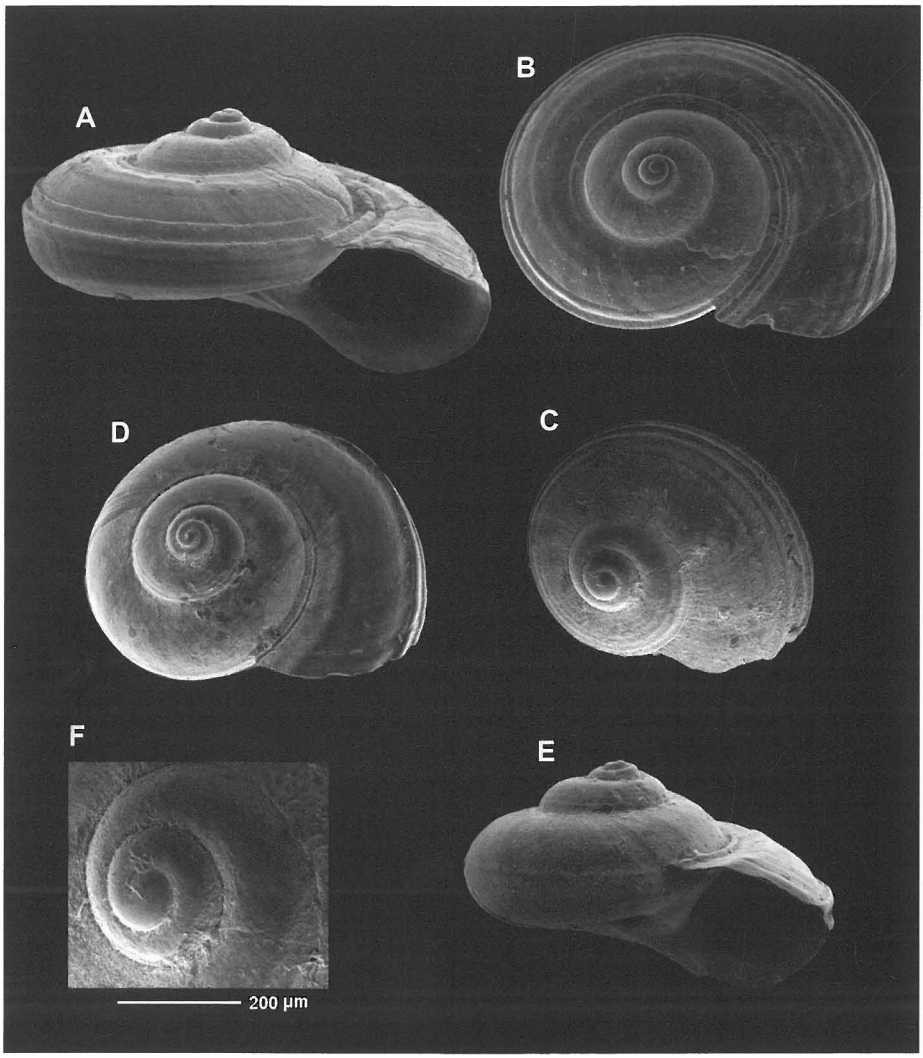
Type material: Type species in ANSP (181883). Not examined.
Material examined: Florida, USA: 1 s, Tarpon Springs, Pinellas Co., dredged S of Anclote Key, in 3.5-6 m (CMK); 2 s, 30°18.13'N 81°06.91'W, 24 m, off Mayport, Duval Co. (CHL); 1 s, off Fort Myers Beach, Lee Co., trawled 20 m (CHL); 2 s, 50-60 mi E Ponte Vedra, St. Johns Co., trawled at 39-45 m (CHL); 1 s, 10 mi SW Seahorse Key, Cedar Keys, Levy Co., trawled at 18 m (CHL); 1 s, St. Augustine, St. Johns Co., tailings scallop processing plant (CHL); 2 s, drift, Jacksonville Beach, Duval Co. (CHL).

Description: From the original description (Pilsbry & McGinty, 1946) we have copied some paragraphs which express important characters of the species: *"There are 4 ½ convex whorls joined by a rather strongly impressed suture. Last whorl is rounded at periphery and base. Sculpture of a few very weak but coarse spirals in the peripheral region. The columellar margin is extremely thick, reflected over part of the umbilicus".*

The low conic shell (Fig. 83A-C, 84A-C) is relatively thick and heavy, and has a very small constricted umbilicus. Protoconch of 2 smooth glassy whorls. Teleoconch has two whorls. The spire is elevated and allows all the whorls to be seen in apertural view. Suture impressed. The sculpture consists of several low spiral threads on the peripheral area. The base is broad and smooth except for spiral sculpture on the outer part. Aperture circular; columella thick and heavy (Moore, 1965: 117-118).



Figures 83A-E. *Solariorbis terminalis* (Pilsbry & McGinty, 1946). A-D: shell, 1.7 mm, Tarpon Spring, Pinellas Co. (CMK); D: protoconch eroded; E: detail of the spire.
Figuras 83A-E. Solariorbis terminalis (Pilsbry & McGinty, 1946). A-D: concha, 1,7 mm, Tarpon Spring, Pinellas Co. (CMK); D: protoconcha erosionada; E: detalle de la espira.



Figures 84A-F. *Solariorbis terminalis* (Pilsbry & McGinty, 1946). A: shell, 2.5 mm, off Fort Myers Beach, Lea Co. (CHL); B-C: shells, 2.3, 1.1 mm, off Mayport, Duval Co. Florida, 20 m (CHL); D-E: shells, 1.9, 1.8 mm, 50-60 mi E Ponte Vedra, St. Johns Co. (CHL); F: protoconch.
Figuras 84A-F. Solariorbis terminalis *(Pilsbry & McGinty, 1946). A: concha, 2,5 mm, frente a Fort Myers Beach, Lea Co. (CHL); B-C: conchas, 2,3, 1,1 mm, off Mayport, Duval Co. Florida, 20 m (CHL); D-E: conchas, 1,9, 1,8 mm, 50-60 millas al E de Ponte Vedra, St. Johns Co. (CHL); F: protocon-*

We add the following: The protoconch (Figs. 83D, 84F) has about 2 whorls, is smooth, and measures about 350 µm in diameter, lacking any thickening in the transition to the teleoconch. The teleoconch is dorsally smooth, having a marked suture developing into a sulcus which progressively enlarges until the middle part of the body whorl, thence forming a subsutural cord on the final quarter whorl. On the periphery of the last whorl 3-4 spiral cords can be seen. Columella wide, reflected towards the umbilicus, thickening the umbilical wall and subtotally closing the umbilicus. Internal lip reflected outward.

Within the umbilicus there are 2-3 fine spiral cordlets.

Dimensions: Maximum reported size: 2.4 mm

Habitat: This species lives on sandy bottom in depths between 18 and 35 m.

Distribution: USA: North Carolina (PORTER, 1974), West Florida (PILSBRY & MCGINTY, 1946b; MOORE, 1964); Panama (OLSSON & MCGINTY, 1958). MOORE (1964) considered the distribution of the species to be very limited, being restricted to northwestern Florida, but he did not consider the record of OLSSON & MCGINTY (1958) from Panama. ODÉ'S (1973b) record from the northwest Gulf of Mexico, must be confirmed, because he himself (ODÉ, 1988) did not again record this species.

Remarks: PILSBRY & MCGINTY (1946: 17) stated: *"The conic spire has more whorls and a deeper suture than in typical Vitrinellidae, and the columella is very heavily callused. The umbilicus is quite small up to the last half whorl of the umbilical suture, when it becomes rapidly much wider"*. In our opinion, the subsutural sulcus on the last whorl, the peripheral cords, and the lack of dorsal and basal ornamentation, with the exception of the thickened umbilical margin, are the distinguishing characters of the species.

Vitrinella diaphana (d'Orbigny, 1842) could be this species, but the type material is in such poor condition that this cannot be ascertained (see Fig. 108G). It should be considered, therefore, a nomen *dubium*.

Solariorbis ruris spec. nov. (Figures 85A-J)

Type material: Holotype (Fig. 85A) in MNCN (15.05/55058) and 1 paratype (Fig. 85B), from type locality, at -20 m (15.05/55059). Other paratypes: MHNS (100551, 1 s, Fig. 85C), at -20 m; MNHN (24397, 1 s, Figs. 85D-E), at -45 m.

Other material examined: Martinique: 1 s, (CJP) (Figs. 85F-G).

Type locality: Rancho Luna Beach, 20 m, Cienfuegos, Cuba.

Etymology: The specific name is derived from the Latin third declension noun *rus, ruris*, meaning "of the farm; rural" in reference to its surface, in some areas with parallel lines, as in the surface of a plowed field.

Description: Shell (Figs. 85E-G) of small size, depressed, solid, 4 whorls, with characteristic spiral threads and punctiform grooves. Protoconch (Figs. 85H) of about 2 whorls, measuring about 290 μm in diameter; its surface is covered by fine tubercles; a delicate varix is observed. Teleoconch of about 2 rapidly-increasing whorls; dorsally and ventrally convex; totally covered by spiral cordlets and punctiform incisions in the interspaces, forming the characteristic reticular punctiform sculpture. In the dorsal area of the last whorl, between the suture and the periphery, a central zone without spiral microsculpture can be observed; a similar area can be seen close to the umbilicus on the base of the last ½ whorl. Axial ornamentation consists of growth striae. Base slightly convex, umbilicus small, progresively occluded by the columellar callus. Aperture rounded, prosocline, external lip sharp, columellar margin and internal lip thickened, reflected towards the umbilicus forming a characteristic triangular callus.

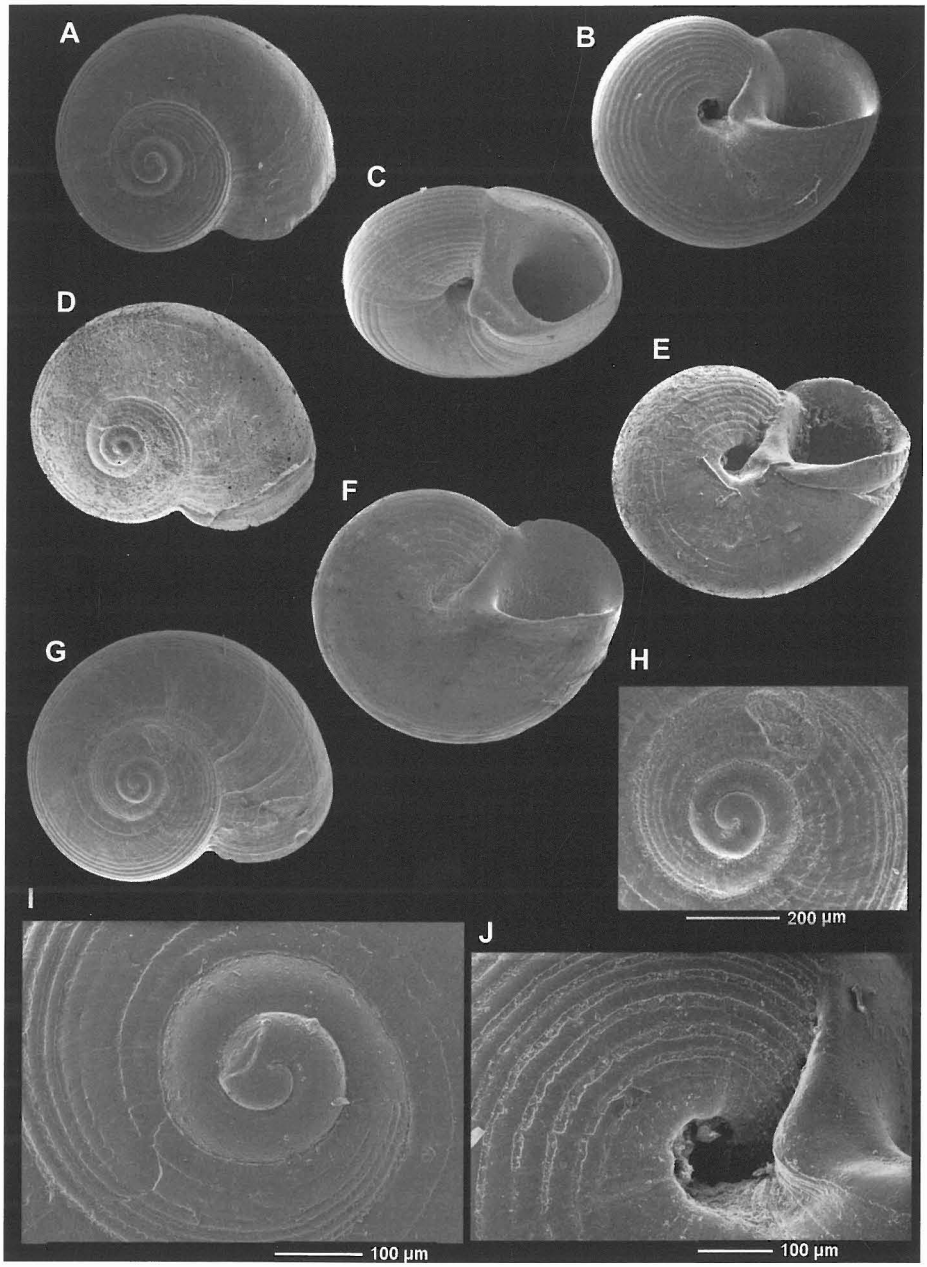
Dimensions: Holotype 1.50 mm in diameter and 0.57 mm in height.

Animal unknown.

Habitat: The species has been found on a coralline sandy bottom, sometimes with a little mud, at 45 m.

Distribution: Only known from Cuba and Martinique.

Remarks: *Solariorbis ruris* spec. nov. has a sculpture formed by spiral cordlets with punctiform incisions in the interspaces which covers all the shell except for a short band without



Figures 85A-J. *Solariorbis ruris* spec. nov. A: holotype, 1.3 mm, Rancho Luna Beach (MNCN); B: paratype, 1.4 mm (MNCN); C: paratype, 1.3 mm (MHNS); D-E: paratype, 1.3 mm (MNHN); F-G: shell, 1.5 mm, Martinique (CJP); H-I: protoconchs; H: from the shell of Fig. G; I: from the holotype Fig. A; J: detail of the base (paratype Fig. B).

Figuras 85A-J. Solariorbis ruris *spec. nov. A: holotipo, 1,3 mm, Playa Rancho Luna (MNCN); B: paratipo, 1,4 mm (MNCN); C: paratipo, 1,3 mm (MHNS); D-E: paratipo 1,3 mm, (MNHN); F-G: concha, 1,5 mm, Martinica (CJP); H-I: protoconchas; H: de la concha de la Fig. G; I: del holotipo Fig. A; J: detalle de la base (paratipo Fig. B).*

spiral microsculpture on the dorsum and base of the last whorl. It also possesses a triangular columellar callus.

Solariorbis terminalis is the only species with somewhat similar ornamentation, but the cords cover only the dorsum of the shell and are wider and less numerous.

From *Solariorbis lineopunctatus* (see below) it may be distinguished by the fewer, thicker and spiral cordlets.

From *Solariorbis* sp. (see below) it may be differentiated by its rounded convex periphery and the sulcus with punctiform incisions instead of quadrangular hollows.

Solariorbis lineopunctatus spec. nov. (Figures 86A-D)

Type material: Holotype (Figs. 86A-B) in MNCN (15.05/55056) and one paratype in MNCN (15.05/55057).
Type locality: Cienfuegos Bay, sta. 12, 22°07'N 80°27'W, 9 m, Cuba.
Etymology: The specific name refers to the punctiform sculpture aligned spirally which totally covers the shell.

Description: Shell (Figs. 86A-B) of very small size, not very depressed, apparently not very solid; spire formed by three rapidly-increasing whorls, sligtly angled at the periphery, not keeled. Protoconch (Figs. 86C) of about 2 whorls, measuring about 400 μm in diameter, being placed on a plane slightly above the subsequent whorls and with its surface covered by small tubercles and very fine spiral threads. [In some places these form a fine reticule. Teleoconch with a little more than 1 rapidly-increasing whorl; convex dorsally as well as on the base, periphery angled; surface totally covered by punctiform incisions spirally aligned except inside the umbilicus, where only numerous growth marks are appreciated. Aperture rounded, without a sulcus in the inner upper angle. Outer lip sharp. Columella and inner lip thickened and reflected outward. Umbilicus relatively wide and deep, without evident ornamentation except for the axial growth marks.

Dimensions: Holotype 1.05 mm in diameter, and 0.36 mm in height.

Animal unknown.

Habitat: The species was found in depths between 10 and 60 m, on coralline and slightly muddy bottoms.

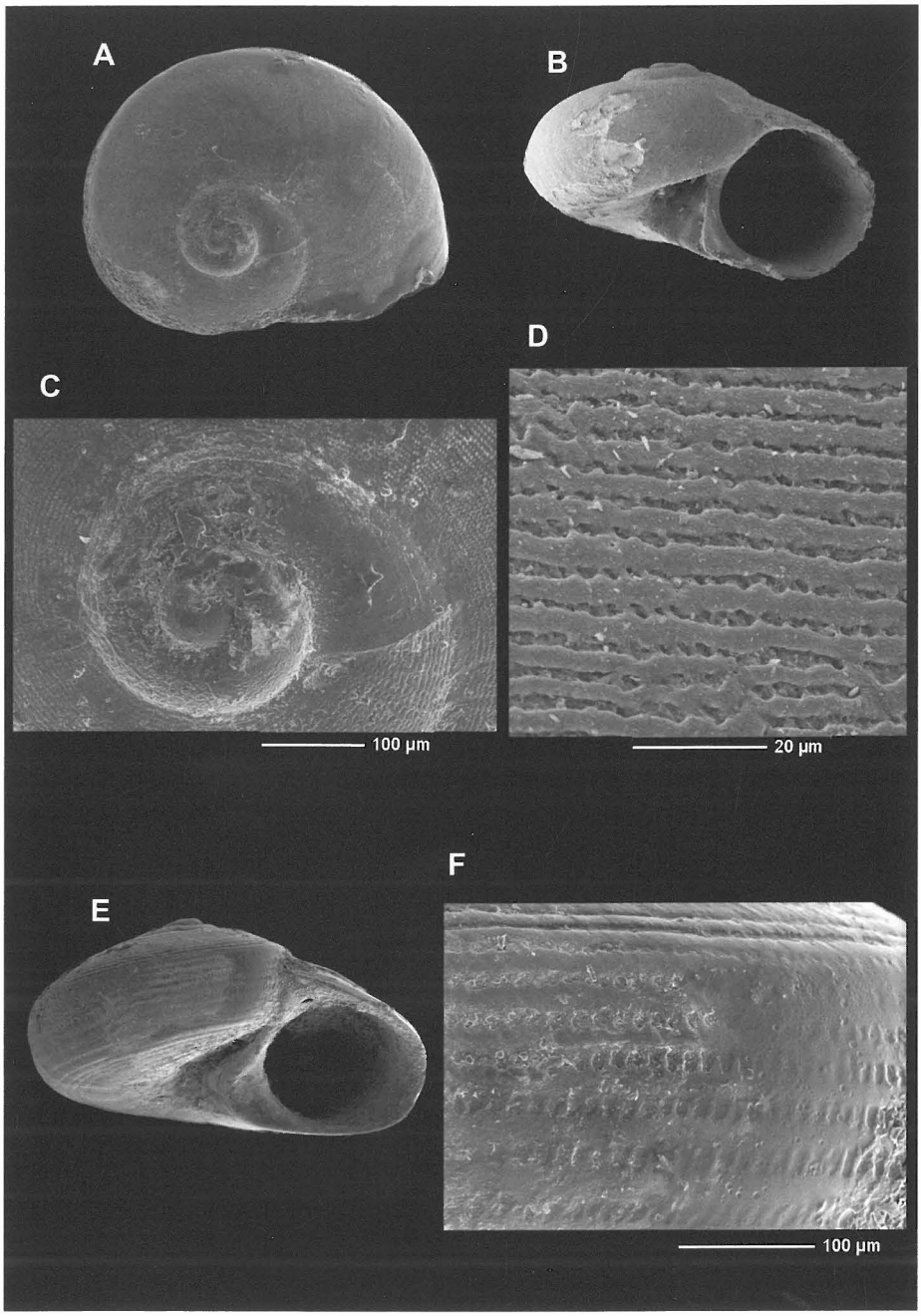
Distribution: Only know from Cuba.

Remarks: The shell of *Solariorbis lineopunctatus* spec. nov. is not very strong, with a fragile aspect, reddish color, and dull in luster. Its teleoconch, totally covered with spirally-aligned punctiform incisions makes it easily recognizable and distinguishes it from its congeners. Its ornamentation is rather similar to that present in some species of the genus *Teinostoma* (*T. goniogyrus, T. lenticulare*), but the wide umbilicus and the thickening of the umbilical border are distinctive.

Solariorbis sp. (Figures 86E-F)

Material studied: One shell (Figs. 86E) off Dominica, 200 m, in detritus obtained from inside submerged bottles (lost during the study).

Description: Shell (Fig. 86E) trochoid, solid, not very depressed, of dirty white color. Protoconch with about 2 spiral whorls on a little higher plane than the later whorls. Teleoconch formed by about 2 whorls totally



Figures 86A-D. *Solariorbis lineopunctatus* spec. nov. A-B: holotype, 1.05 mm, Cienfuegos Bay (MNCN); C: protoconch; D: microsculpture. Figures 86E-F. *Solariorbis* sp. E: shell, 1.47 mm, off Dominica; F: microsculpture.

Figuras 86A-D. Solariorbis lineopunctatus *spec. nov. A-B: holotipo, 1,05 mm, Bahía de Cienfuegos (MNCN); C: protoconcha; D: microescultura. Figuras 86E-F.* Solariorbis *sp. E: concha, 1,47 mm, frente a Dominica; F: microescultura.*

covered by spiral cords of equal size and axial sulci forming quadrangular spaces. Periphery only slighty convex, almost straight; a spiral cord in the dorsal extreme and another in the basal part form the limits and create slight angulations. Base slightly concave in its central part. Umbilicus small, almost occluded by a callus formed from a thickening of the columella. Aperture rounded, the superior angle with a sulcus; parietal area straight and thickened, external lip sharp. Columella widened and reflected towards the external part forming a characteristic callus.

Dimensions: The shell is 1.47 mm in diameter and 0.76 mm in height.

Animal unknown

Habitat: The only specimen known was collected in the shell grit found inside one of a few bottles found at 200 m.

Distribution: Only known from the island of Dominica.

Remarks: The present shell may be distinguished from its congeners by its sculpture of spiral cordlets and cuadrangular hollows covering the shell, by the wide callus formed by the thickening of the columella, and principally by the dorsal and basal cords which angulate the periphery, giving it an almost straight profile. *S. lineopunctatus* n. sp. has narrower, more numerous spiral cords and the sulcus has punctiform incisions. From *S. ruris* n. sp. it can be separated by the latter having the smooth zones on the body whorl and its smaller, triangular columellar.

Unfortunately this shell was lost during the study, and we decided not to name this species until new material can be collected.

Solariorbis punctostriatus spec. nov. Rubio, Rolán & Lee (Figures 87A-E)

Type material: Holotype (Figs. 87A-B) deposited in FLMNH (448610)(*ex* CHL). One paratype from the type locality (CHL). Another paratype in USNM (1155036, 1 s, *ex* CHL, from Courland Bay, Tobago).

Type locality: Isla Margarita, Venezuela.

Etymology: The specific name refers to its microsculpture formed by spiral striae with punctiform depressions.

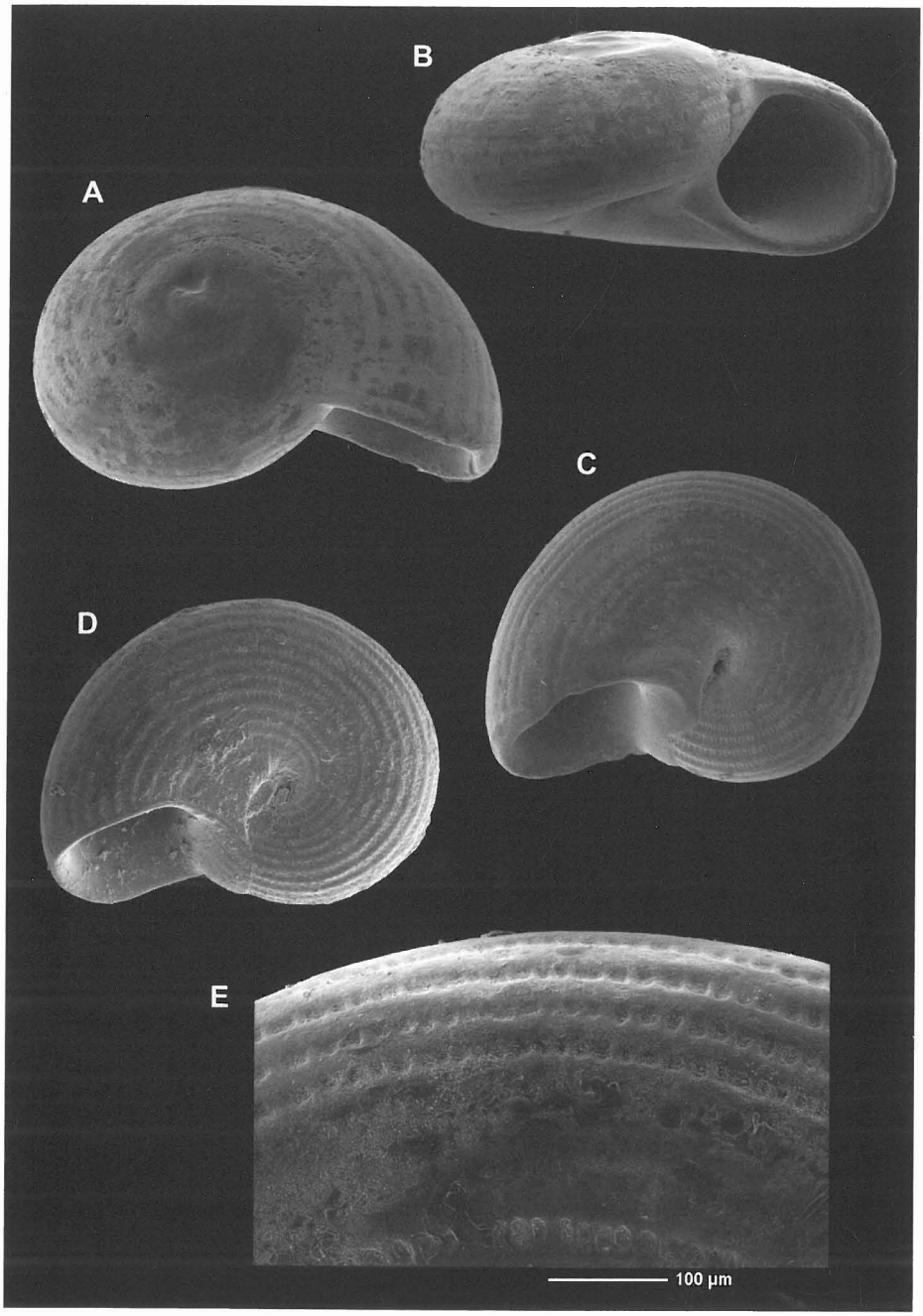
Description: Shell (Figs. 87A-D) solid, depressed, about equally convex above and below, with rounded periphery and spiral striae throughout. Protoconch of about 1 ½ whorls, not projecting upward. Teleoconch of about 2 whorls, totally covered by spiral cords, in interspaces of which axial striae can be seen, forming characteristic small hollows. Rounded periphery. Aperture rounded, slightly prosocline, external lip a little thickened, columella thickened and reflected outward forming a small callus. Umbilical area concave. Umbilicus almost closed by the thickening of the umbilical margin.

Dimensions: Holotype 1.39 mm in diameter and 0.63 mm height. One paratype with about 1.4 mm in maximum dimension.

Habitat: Unknown, the material was collected in sediments.

Distribution: Only known from Isla Margarita, Venezuela, its type locality, and Courland Bay, Tobago.

Remarks: *Solariorbis punctostriatus* spec. nov. has a shell very similar in general appearance to that of *V. cupidinensis*, from which it can be distinguished by having the umbilicus practically closed, almost reduced to a fissure, and by the columellar callus which thickens the umbilical wall and closes the umbilicus. Also it is similar to some *Teinostoma* species, from which it can be distinguished by the typical occlusion of the umbilicus by the thickening of the columella and by its typical *Solariorbis* sculpture.



Figures 87A-E. *Solariorbis punctostriatus* spec. nov. Rubio, Rolán & Lee. A-B: holotype, 1.4 mm, Isla Margarita, Venezuela (FLMNH); C: paratype, 1.4 mm, from type locality (CHL); D: paratype, 1.2 mm, Tobago (USNM); E: detail of the ornamentation.
Figuras 87A-E. Solariorbis punctostriatus *spec. nov. Rubio, Rolán & Lee. A-B: holotipo, 1,4 mm, Isla Margarita, Venezuela (FLMNH); C: paratipo, 1,4 mm, de la localidad tipo (CHL); D: paratipo, 1,2 mm, Tobago (USNM); E: detalle de la ornamentación.*

"Solariorbis" solidus spec. nov. (Figures 88A-F, 89A-F)

Type material: Holotype (Fig. 88A) in MNCN (15.05/55060). Paratypes: MNHN (24398, 1 s, Fig. 88B), NHMUK (1 s, Figs. 88E, 89A), MCZ (1 s, Figs. 89B-C), USNM (1155037, 1 s, Fig. 89F), all from type locality; AMNH (1 s, Fig. 88C) Cayo Diego Perez, Canarreos Archipelago, 20 m, Cuba; MHNS (100552, 1 s, Fig. 88D) Cienfuegos, 20-30 m.
Other material examined: Cuba: 3 s, Canarreos (MHNS). Florida, USA: 1 s, Little Madeira Bay. Everglades N.P. Florida, Monroe Co., low tide (CHL).
Type locality: Rancho Luna Beach, Cienfuegos, 20-45 m, Cuba.
Etymology: The specific name refers to the solidity of the shell, more observable in the contour of the aperture.

Description: Shell (Figs. 88A-E, 89A-F) trochoid, solid, yellowish white, polished and shiny. Protoconch (Fig. 88F) broad and flat, slightly projecting, with about 1 ¼ whorls, 410 μm in diameter, and without sculpture. Teleoconch of about 1 ¼ rapidly-increasing whorls; dorsally and ventrally convex. The shell is generally smooth and without sculpture except for weak axial growth lines, which in some specimens are much more rough and sharp, and faint spiral cords on the basal periphery. Aperture oval, outer lip thick, columellar margin thickened and reflected outward. Umbilicus wide and deep, inside there is a thick cord formed by a thickening of the columella, which surrounds and limits the umbilical infundibulum.

Dimensions: Holotype 1.3 mm in diameter, but there is a paratype 1.8 mm in diameter.

Animal unknown.

Habitat: This species has been collected between 5 and 45 m, on a coralline sand bottom.

Distribution: Only known from Cuba and Florida, USA.

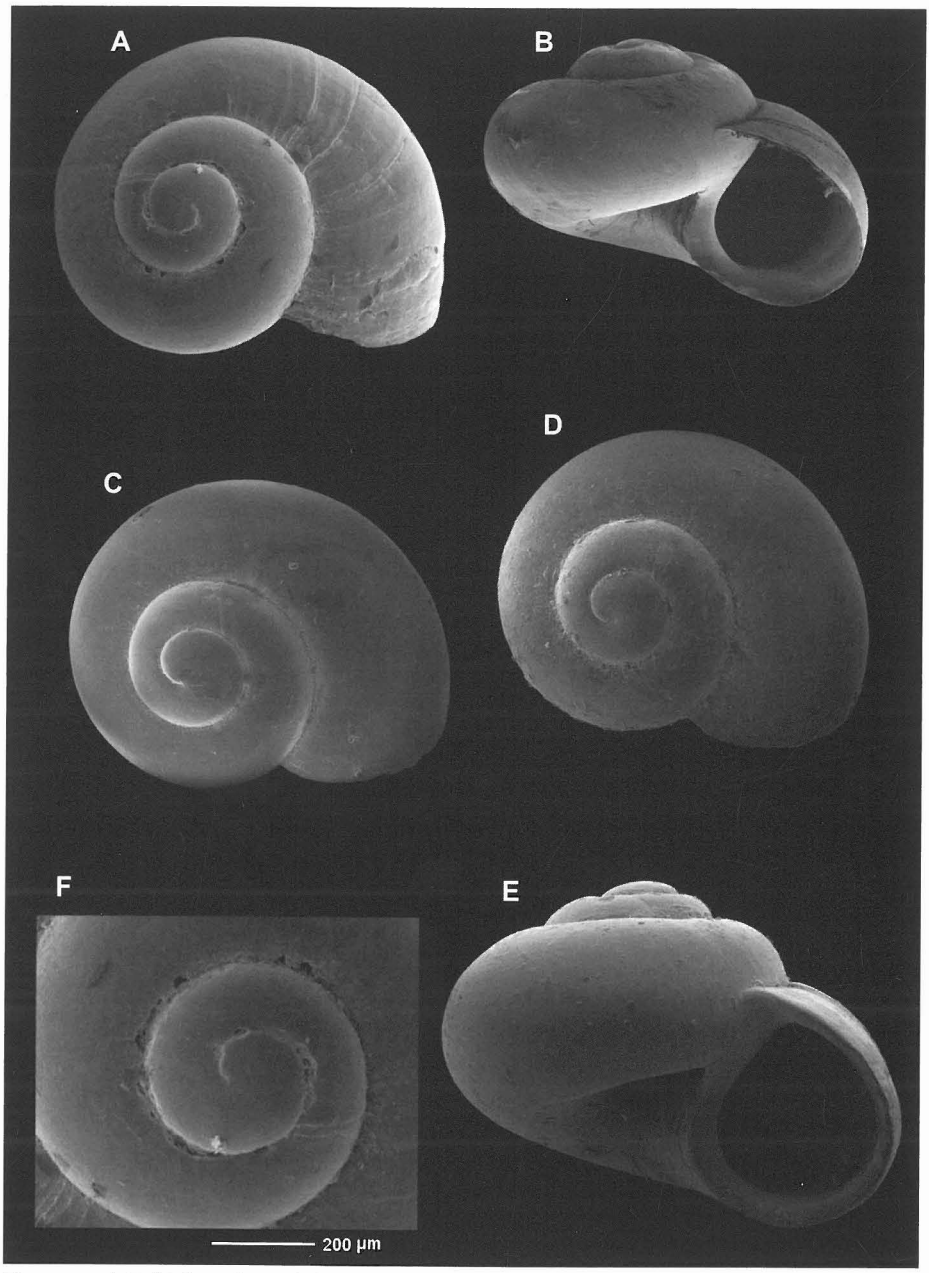
Remarks: We are not totally sure that this species is a tornid, not even having complete security about it being a marine species. Therefore its generic placement in *Solariorbis*, and even in Tornidae, is provisional. We made a comparison with a paratype of *Paludinella helicoides* "Gundlach" 1865 (MCZ), and our impresion is that the latter is not as solid. The dearth of conchological characters makes a proper comparison difficult. *Paludinella helicoides* is a species of fresh water hydrobiid considered endemic to Cuba, but due to its seldom being collected it has been recorded only a few times. Anyway, in our material there are other shells, collected in areas as distant as Cuba and Florida. We keep its provisional description while awaiting more material.

Although the overall appearance of the shell, wide umbilicus and aperture, predisposes us to place it in *Vitrinella*, the columellar thickening and the thickening of the umbilical wall are typical characters of the genus *Solariorbis*.

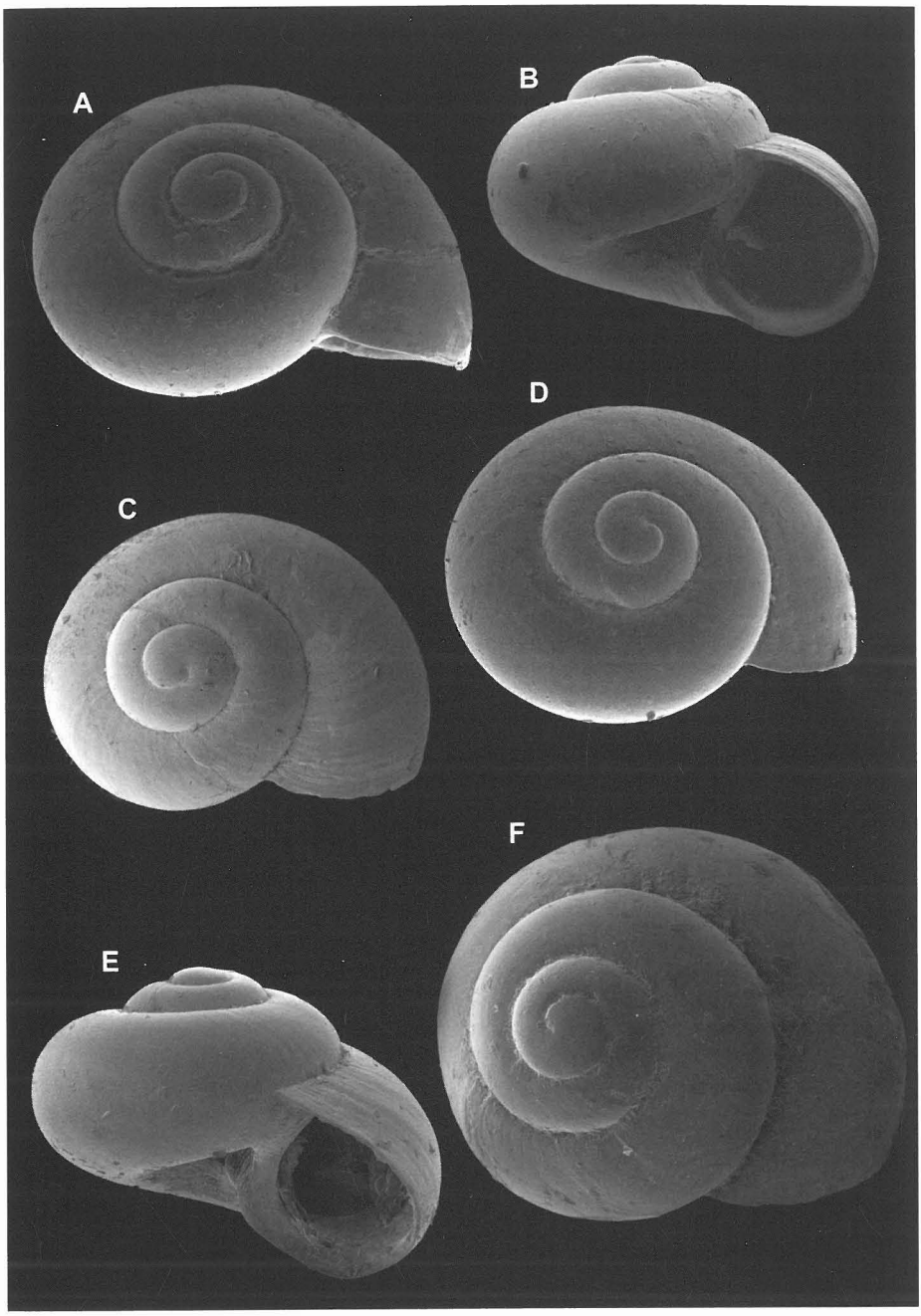
Solariorbis solidus spec. nov. differs from provisional congeneric species by a trochoid form, its wide umbilicus, the lack of ornamentation on the teleoconch, and its solidity in spite of its fragile appearance.

Genus *Vitrinella* C.B. Adams, 1850

Vitrinella C.B. Adams, 1850. *Monograph of Vitrinella, a new genus of species of Turbinidae*. 10 p. Amherst Massachusetts.
Type species: (by original designation) *Vitrinella helicoidea* C.B. Adams, 1850 (by subsequent designation: BUSH, 1897: 105. Caribbean, Recent.



Figures 88A-F. *"Solariorbis" solidus* spec. nov. A: holotype, 1.3 mm, Rancho Luna Beach, Cuba (MNCN); B: paratype, 1.08 mm, Rancho Luna Beach (MNHN); C: paratype, 1.14 mm, Canarreos, Cuba (AMNH); D: paratype, 1.08 mm, Cienfuegos Bay (MHNS); E: paratype, 1.6 mm, Rancho Luna Beach (NHMUK); F: protoconch of the holotype.
Figuras 88A-F. "Solariorbis" solidus *spec. nov. A: holotipo, 1,3 mm, Playa Rancho Luna, Cuba (MNCN); B: paratipo, 1,08 mm, Playa Rancho Luna (MNHN); C: paratipo, 1,14 mm, Canarreos, Cuba (AMNH); D: paratipo, 1,08 mm, Bahía de Cienfuegos (MHNS); E: paratipo, 1,6 mm, Playa Rancho Luna (NHMUK); F: protoconcha del holotipo.*



Figures 89A-F. *"Solariorbis" solidus* spec. nov. A: paratype, 1.6 mm, Rancho Luna Beach (NHMUK); B-C: paratype, 1.17 mm, Rancho Luna Beach (MCZ); D-E: shells, 1.2 mm, Cienfuegos Bay; F: paratype, 1.8 mm, Rancho Luna Beach (USNM).
Figuras 89A-F. "Solariorbis" solidus *spec. nov. A: paratipo, 1,6 mm, Playa Rancho Luna (NHMUK); B-C: paratipo, 1,17 mm, Playa Rancho Luna (MCZ); D-E: conchas, 1,2 mm, Bahía de Cienfuegos; F: paratipo, 1,8 mm, Playa Rancho Luna (USNM)..*

Diagnosis: Shell small, fine, smooth or weakly sculptured, low spire and open, deep umbilicus. Aperture rounded and only slightly modified by the previous whorl. Parietal callus usually thin. Animal provided with a pair of ciliated cephalic tentacles, a pair of epipodial tentacles, and a circular multispiral operculum. Radula taenioglossate.

Remarks: C.B. ADAMS (1850) instituted a new genus *Vitrinella* for five new species of micromolluscs found in beach sand from Jamaica. No type species was selected and none of the species was figured. BUSH (1897) designed *Vitrinella helicoidea* as the type species of the genus, describing this species again and figuring it for first time.

Vitrinella anneliesae de Jong & Coomans, 1988 (Figures 90A-I)

Vitrinella anneliesae de Jong & Coomans, 1988. *Marine gastropods from Curaçao, Aruba and Bonaire*: 31, pl. 2, fig. 131. [Type locality: Curaçao].

Type material: Holotype in ZMA (3.87.062). Represented in de JONG & COOMANS (1988). Not examined.

Other material examined: Cuba: 10 s, Canarreos Archipelago, 5 m (MHNS); 4 c, Cayo Avalos, 8 m (MHNS); 4 c, Cayo Diego Perez, 15 m (MHNS); 2 c, Faro Diego Perez, 10 m (MHNS); 3 s, Jibacoa, 3-6 m (MHNS); 3 c, Guajimico, 5 m (MHNS); 5 c, Cienfuegos Bay, 20-30 m (MHNS); 2 c, Cienfuegos Bay, 30 m (MHNS); 14 s, Rancho Luna Beach, 12 m (MHNS); 37 s, 10-30 m (MHNS); 2 s, Rancho Luna Beach, 35 m (MHNS); 20 s, Rancho Luna Beach, 45 m (MHNS); 106 s, Rancho Luna Beach, 5-54 m (MHNS); 7 s, Los Laberintos, Rancho Luna Beach, 35 m (MHNS); 21 c, Faro los Colorados, 56 m (MHNS); 11 s, Tamarindo Point, 56 m (MHNS). Martinique: 8 c, Pointe Borgnesse, 12 m, muddy sandy bottom near the reef (CJP). Grenadines: Mayreau, 1 c, west coast, 8 m, coralline sandy bottom with coral blocks, gorgonians, and sponges (CJP). Bahamas: 2 s, 6 m, off N Andros, dredgeg (CHL); 2 s, Riding Rocks, Cay Sal Bank, 18 m, base coral reef (CHL); 2 s, NW Nassau, 50 ft. Saint Vincent: 1 s (CHL). Honduras: 1 s, Roatan Island, 12 m, coralline sand. Puerto Rico: 1 s, NW Puerto Rico (CHL).

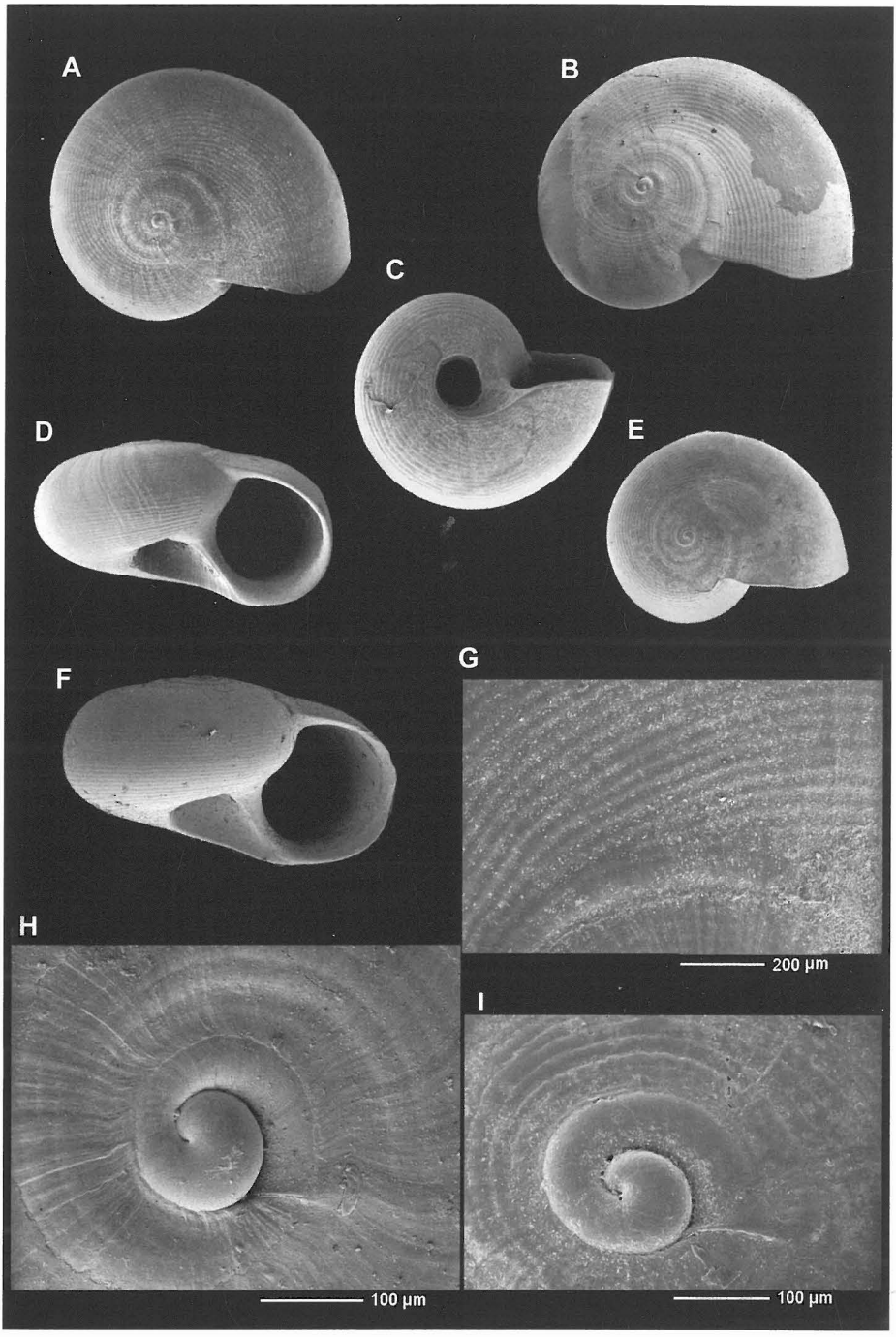
Description: The original description is as follow: "*Shell wider than high. Whorls without a keel. Except for the nucleus sculptured with fine spiral threads, which in larger specimens become hardly visible, or absent at the periphery of the last whorl. Umbilicus present*". This is a very short description for a correct specific determination.

Therefore we are providing a new description pointing out the most important distinguishing characters: Shell (Figs. 90A-F) subconical depressed, solid, whitish and without any keel, spire formed by 3 ½ convex whorls, each overlapping most of the previous whorl. Protoconch (Figs. 90H-I) about 300 μm in diameter and about 1 ¼ whorls, with a slightly rough surface and a strong varix which marks the beginning of the teleoconch. Teleoconch of a little more than 2 whorls, totally covered by fine spiral cordlets which reach from the suture to the umbilical border. On the dorsum of the body whorl, the cords diverge somewhat laterally to the growth axis so that new ones continue to appear at the suture. One prominent spiral cord limits and precipitously angulates the umbilical infundibulum, which is deep and not very wide. Aperture rounded; columella robust; inner lip thickened by the crossing of the umbilical cord but without any callus.

Dimensions: Holotype 1.59 mm in diameter. We have shells reaching about 2.5 mm in maximum dimension. Maximum reported size: 1.7 mm

Habitat: This is one of the most common species in Cuba. Usually it was collected between 10 and 56 m, but sometimes shells have been found in shallower water.

Distribution: ABC Islands: Curaçao (DE JONG & COOMANS, 1988); Mar-



Figures 90A-I. *Vitrinella anneliesae* de Jong & Coomans, 1988. A-F: shells, 2.7, 2.8, 2.1, 2.7, 2.2, 3.1 mm, Cienfuegos, Cuba (MHNS); G: microsculpture of the shell Fig. A; H-I: protoconchs. *Figuras 90A-I.* Vitrinella anneliesae *de Jong & Coomans, 1988. A-F: conchas, 2,7, 2,8, 2,1, 2,7, 2,2, 3,1 mm, Cienfuegos, Cuba (MHNS); G: microescultura de la concha de la Fig. A; H-I: protoconchas.*

tinique; Mayreau and Cuba: mainly collected in Cienfuegos Bay, but also in Canarreos and other areas.

Remarks: Since its original description this species has not been recorded from any Caribbean locality. It is a very characteristic species which has only a little similarity to *V. funiculus* and *V. contracta*. From *V. funiculus* it may be distinguished by the smaller umbilicus and by the smaller and more numerous spiral cordlets. From *V. contracta* it differs in the shape of its spiral cordlets and because they run parallel to, rather than obliquely from, the suture.

Vitrinella contracta (Vanatta, 1913) (Figures 91A-E)

Omalaxis funiculus contractus Vanatta, 1913. *Proc. Acad. Nat. Sci. Philadelphia*, 65: 25, pl. 2, figs. 4, 6. [Type locality: Monkey River, British Honduras].

Type material: Represented in VANATTA (1913) and deposited in ANSP (106.125). Not examined. **Other material examined**: Cuba: 14 s, Rancho Luna Beach, 45 m (MHNS). Trinidad and Tobago: Tobago, 2 c, Horse Shoe Reef, 15 m, shell grit (CJP). Bahamas: 5 s, Olympus Reef, NNW West End, Grand Bahama Island, 36 m, coralline algal fragments bottom (CHL); 4 s, French Bay, San Salvador, 18 m (CHL); 6 s, Grand Bahamas, 7.5 m (CHL). St. Kitts & Nevis: 4 s, Monkey Shoals, Nevis, 18 m (CHL). ABC Islands: 1 s, NW Klein Bonaire, Bonaire, 15 m (CHL). St. Vincent: 1 s (CHL). Belize: 4 s, Dead Mans Reef, Turneffe Is., 18 m, sand (CHL). Turks & Caicos: 3 s, French Bay, 18 m (CHL). Florida, USA: 3 s, APAC Pit, Sarasota, Plio-Pleistocene (CHL).

Description: Shell (Figs. 91A-C). Protoconch (Fig. 91D) of about 1 ¼ smooth whorls, about 200 μm in diameter, set in a lower plane than the teleoconch. Two different stages can be distiguished: the embryonic, with barely ½ whorl and the larval with ¾ whorl and partially covered by the first whorl of the teleoconch. The entire surface of the teleoconch is sculptured by spiral cords which are placed parallel to the suture (Fig. 91E); there is no punctiform sculpture; a more prominent spiral cord is placed in the middle of the periphery and gives a keeled profile to the shell. Base convex, umbilicus deep and narrow, delimited by a spiral cord and not closed by the columellar thickening. Aperture orbicular; columella and inner lip thickened and reflected outward.

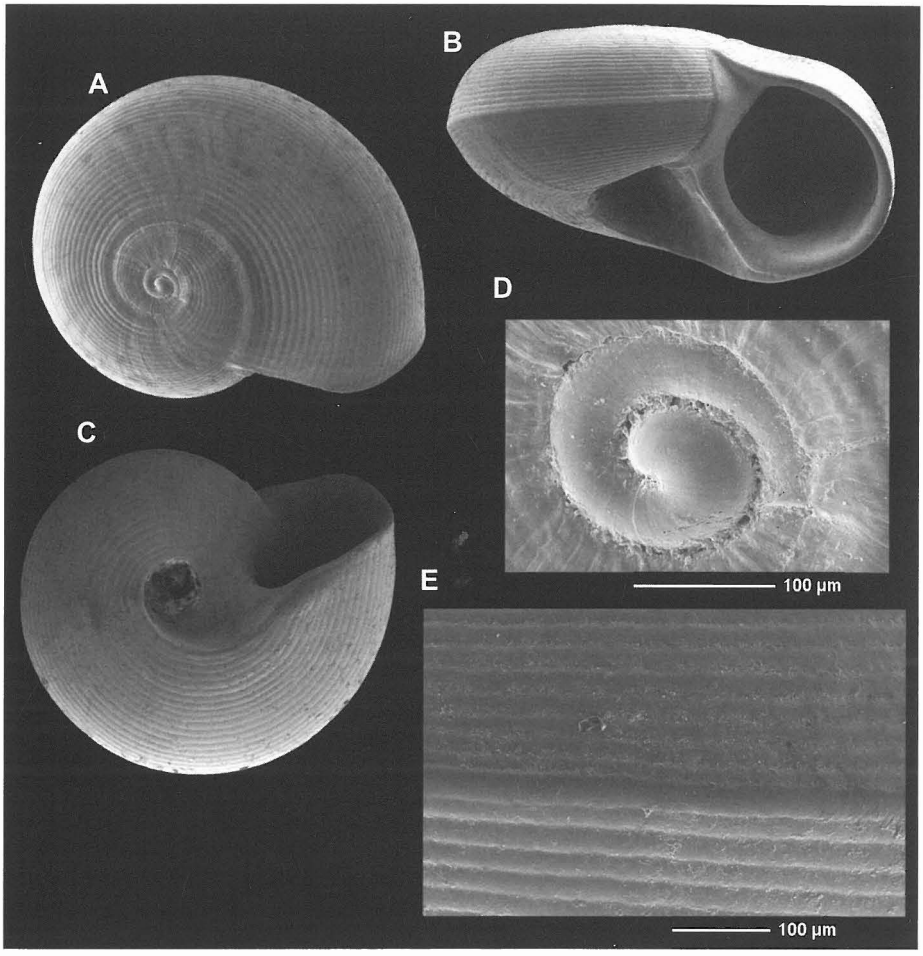
Dimensions: Holotype 1.85 mm in diameter. We have shells up to about 2.2 mm in maximum dimension.

Animal and radula unknown.

Habitat: Not described due to the fact that the holotype was found on an anchor. Our material was collected on coralline bottom between 25 and 50 m in depth.

Distribution: Known from Monkey River, British Honduras (VANATTA, 1913); Tobago; and Cienfuegos, Cuba.

Remarks: VANATTA (1913) described this taxon as a variety of *Omalaxis funiculus* Dall, from which it is distinguished by having a narrower umbilicus and because the spiral cords run parallel to the suture. *S. contracta* was placed in the genus *Solariorbis* due to the presence of a small triangular callus formed in the inner lip in the periumbilical region. We think that the existence of this small callus is insufficient indication to consider it a *Solariorbis*; instead, due to its similarity to several species of the genus *Vitrinella*, we consider its placement in this genus more accurate. *Vitrinella contracta*, as well *V. funiculus* and *V. anneliesae*, have a similar ornamentation, which is at the same time different from the other species included in this genus: smooth spiral cords, non-punctiform sulci, strong growth lines, and a strong periumbilical carina.



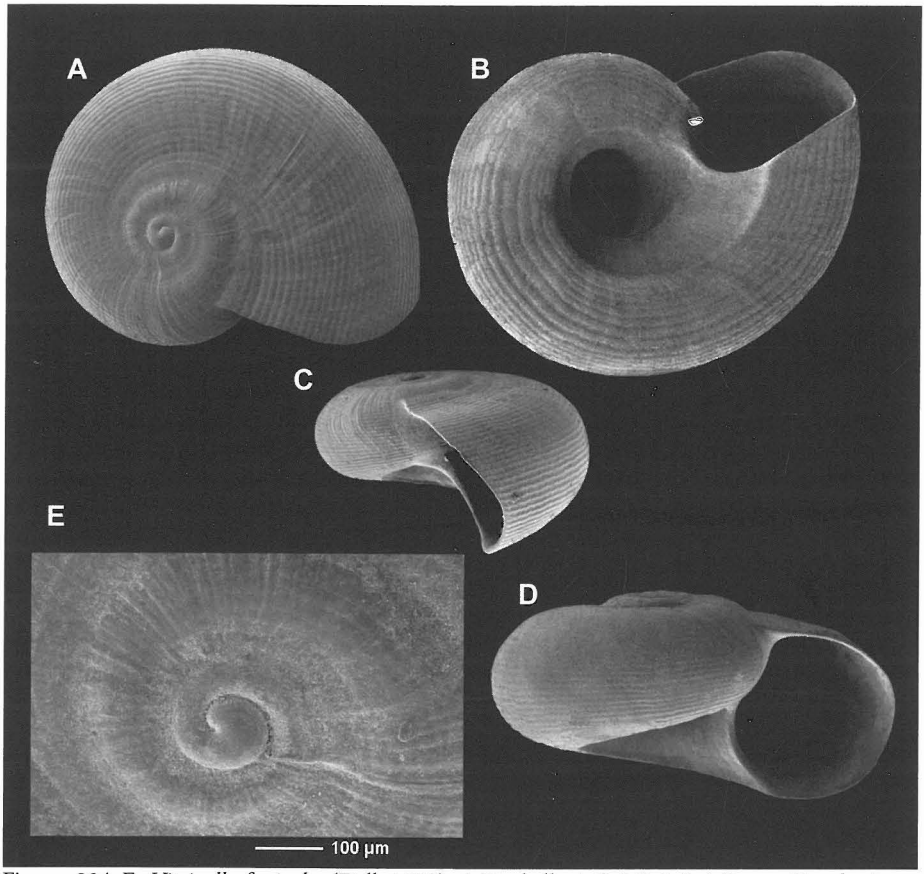
Figures 91A-E. *Vitrinella contracta* (Vanatta, 1913). A-C: shells, 2.0, 2.2, 2.0 mm, Rancho Luna Beach, Cuba. D: protoconch, from shell of Fig. A; E: sculpture.
Figuras 91A-E. Vitrinella contracta *(Vanatta, 1913). A-C: conchas, 2,0, 2,2, 2,0 mm, Playa Rancho Luna, Cuba. D: protoconcha, de la concha de la Fig. A; E: escultura.*

Vitrinella funiculus (Dall, 1892) (Figures 92A-E)

Teinostoma (Solariorbis) funiculus Dall, 1892. *Trans. Wagner Free Inst. Sci. Philadelphia*, 3: 417, pl. 23, fig. 15. [Type locality: Caloosahatchee River, Florida. Described as fossil of the Plio-Pleistocene].

Type material: Holotype in USNM (112652). Represented in DALL (1892). Not examined.
Other material examined: Cuba: 4 s, Rancho Luna Beach, 45 m.

Description: Shell (Figs. 92A-D). Protoconch (Fig. 92E) heterostrophic, of about 1 ¼ smooth whorls, about 230 µm in diameter, placed on a plane slightly below that of the teleoconch. Two distinct stages can be observed: the embryonic protoconch with barely ½ whorl and the larval one, which has ¾ of



Figures 92A-E. *Vitrinella funiculus* (Dall, 1892). A-D: shells, 1.6, 1.9, 1.5, 1.8 mm, Rancho Luna Beach (MHNS); E: protoconch.
Figuras 92A-E. Vitrinella funiculus *(Dall, 1892). A-D: conchas, 1,6, 1,9, 1,5, 1,8 mm, Playa Rancho Luna (MHNS); E: protoconcha.*

whorl and is partially covered by the first teleoconch whorl. In adult specimens there is no peripheral angulation. The teleoconch has its surface totally covered by spiral cordlets, which run obliquely from the suture and are a little wider on the base near the periumbilical cord. There is no punctiform ornamentation. Umbilicus very wide, infundibuliform, exposing the previous whorls. The umbilical wall, corresponding to the columellar margin, lacks spiral cords. No columellar callus.

Dimensions: Holotype 1.75 mm in diameter. We have shells of about 1.9 mm in maximum dimension.

Distribution: This species has been recorded live-collected in Colombia (DÍAZ MERLANO & PUYANA HEGEDUS, 1994). From Cuba, Cienfuegos in present work.

Remarks: DALL (1892) mentions that *V. funiculus* is very similar to the juveniles of *Teinostoma opsitelotus*, being distinguished from this species by the umbilical characters. *V. funiculus* is very similar to *V. anneliesae*, from which it can be distinguished by its fewer spiral cords and wider umbilicus which exposes the previous whorls. From *V. contracta* it may be differentiated by its spiral cordlets running obliquely, not parallel, to the suture and by the larger umbilicus.

Vitrinella opsitelotus (Dall, 1892) (Figures 93A-E)

Teinostoma opsitelotus Dall, 1892. *Trans. Wagner Free Inst. Sci.*, 3: 414, pl. 19, figs. 5, 5b. [Type locality: Plio-Pleistocene of the Caloosahatchee River and Shell Creek, Florida].
Solariorbis opsitelotus (Dall): In PILSBRY (1953). *Monogr. Acad. Nat. Sci. Philad.* 8: 419, pl. 53, figs. 4-4e.

Type material: Holotype in USNM (113104). Not examined. Specimens figured by PILSBRY (1953) deposited in ANSP (18411).
Other material examined: Florida, USA: 7 s, APAC Pit, Sarasota Plio-Pleistocene (CHL).

Description: Original description in DALL (1892: 414). Description expanded in PILSBRY (1953: 419).

Distribution: Fossil species recorded from the Pliocene of the Caloosahatchee River and Shell Creek, Florida (DALL, 1892); from St. Petersburg Pliocene and Alligator Creek at Acline, Florida (PILSBRY, 1953).

Remarks: DALL (1892) placed this species in the genus *Teinostoma* mentioning in his description that the umbilicus was "*completely filled by a flattish, somewhat irregular callus*," in shells which Dall believed to be adult of *T. opsitelotus*. PILSBRY (1953) placed it in *Solariorbis* mentioning: "*That [imperforate] form is not represented in the St. Petersburg series of over forty specimens. Many of them are about equal in size, and appear to be adult. This condition may perhaps permit the suggestion that Dall's form with the umbilicus filled by a callus is an abnormal or gerontic individual or possibly another species*".

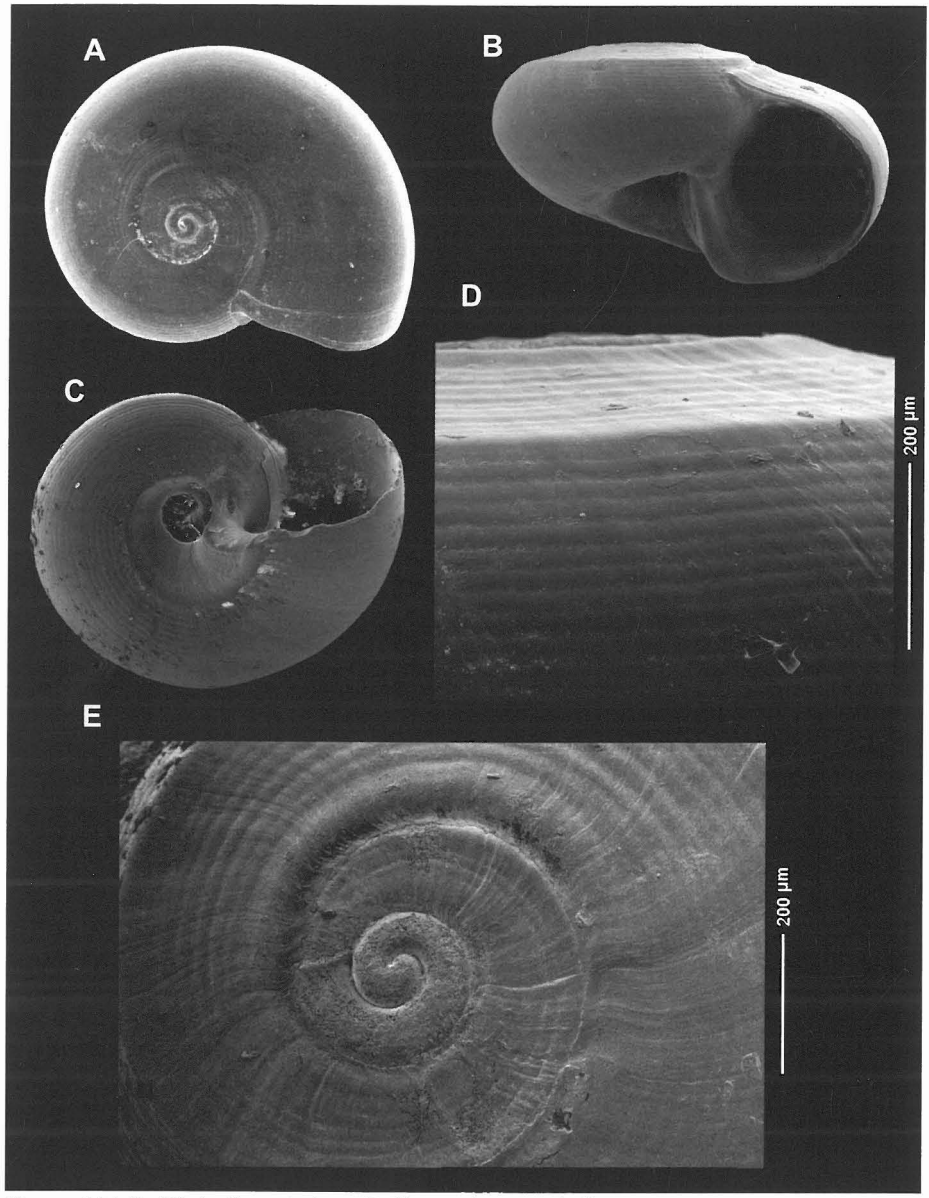
If the columellar thickening proves sufficient a a reason to keep it in the genus *Solariorbis*, the form and ornamentation of the protoconch, together with the sculpture of the teleoconch and the umbilicus (which in basal view, is not closed by the thickening of the umbilical wall) seem to place this species close to the *Vitrinella anneliesae*, *V. contracta* and *V. funiculus* group. So, in our opinion it must be placed in the genus *Vitrinella*.

Vitrinella helicoidea C.B. Adams, 1850 (Figures 94A-G, 95A-D)

Vitrinella helicoidea C.B. Adams, 1850. *Monograph of Vitrinella, a New Genus of New Species of Turbinidae*: 9. [Type locality: Port Royal, Jamaica].
Vitrinella praecox Pilsbry & McGinty, 1946b. *The Nautilus*, 60: 14-15, pl. 2, figs. 1-1b. [Type locality: North end of Lake Worth].

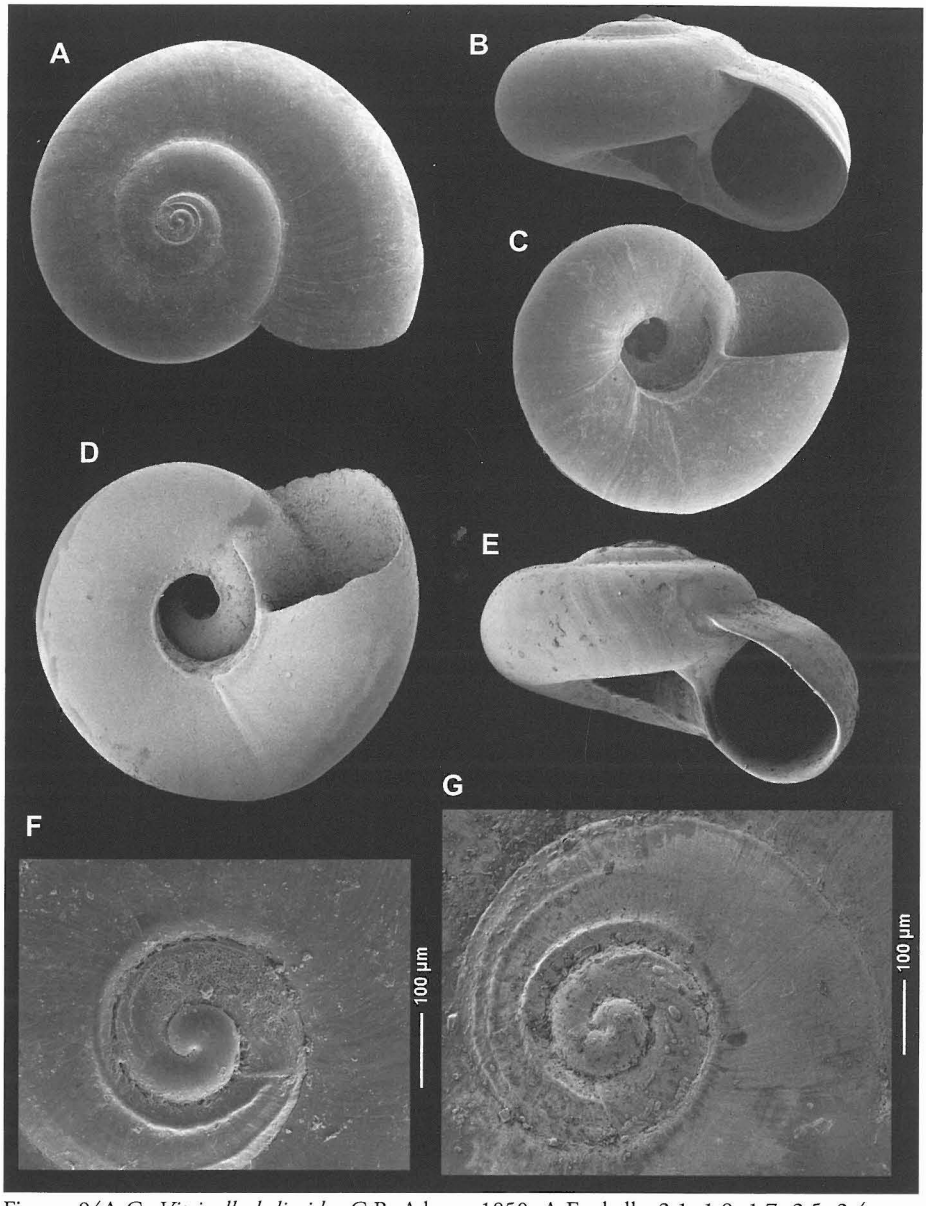
Type material: Lectotype in MCZ (156271), represented in CLENCH & TURNER, 1950: plate 35, fig. 1); 1 paralectotype (labeled as paratype), also from the type locality (MCZ 186188). *Vitrinella praecox* represented in PILSBRY & MCGINTY (1946b). Not examined.
Other material examined: Cuba: 5 s, Sancho Pardo Shoal, 15 m (MHNS); 5 s, Guajimico, 5 m (MHNS); 30 s, Cienfuegos Bay, 8 m (MHNS); 1 s, Cienfuegos Bay, sta. 12, 22°07'N 80°27'W, 9 m (MHNS); 4 s, Cienfuegos Bay, sta. 12a, 22°07'N 80°26'W, 4 m (MHNS); 3 s, Cienfuegos Bay, 20-30 m (MHNS); 18 s, Rancho Luna Beach, 20 m (MHNS); 1 j, Rancho Luna Beach, 10-20 m (MHNS); 4 s, Cienfuegos Bay, 8 m (MHNS); 4 s, Guajimico, figured (MHNS). Virgin Islands: 2 s, St. Thomas (MCZ 156276). Venezuela: 3 s, José Griego, north coast Isla Margarita, 0 m, drift (CHL). ABC Islands: 1 s, Newport Reef, Curaçao, 20 m (CHL). Antigua: 1 s, Falmouth Harbour, 1-2 m, sand grass, (CHL). Turks & Caicos: 1 s, The G Spot, French Cay, 18 m (CHL). Florida, USA: 1 s, off Boynton inlet, Palm Beach Co., 76-90 m (CHL).

Description: Shell (Figs. 94A-E) trochoid in shape, glossy, with a low profile, 4 ½ whorls; each whorl overlaps the periphery of the previous one. Protoconch (Figs. 94F-G) with a finely wrinkled surface at its beginning and spiral irregu-



Figures 93A-E. *Vitrinella opsitelotus* (Dall, 1892). A-C: shells, 2.1, 2.1, 2.2 mm, Sarasota Co. Florida (CHL); D: detail of the sculpture; E: protoconch.
Figuras 93A-E. Vitrinella opsitelotus *(Dall, 1892). A-C: conchas, 2,1, 2,1, 2,2 mm, Sarasota Co. Florida (CHL); D: detalle de la escultura; E: protoconcha.*

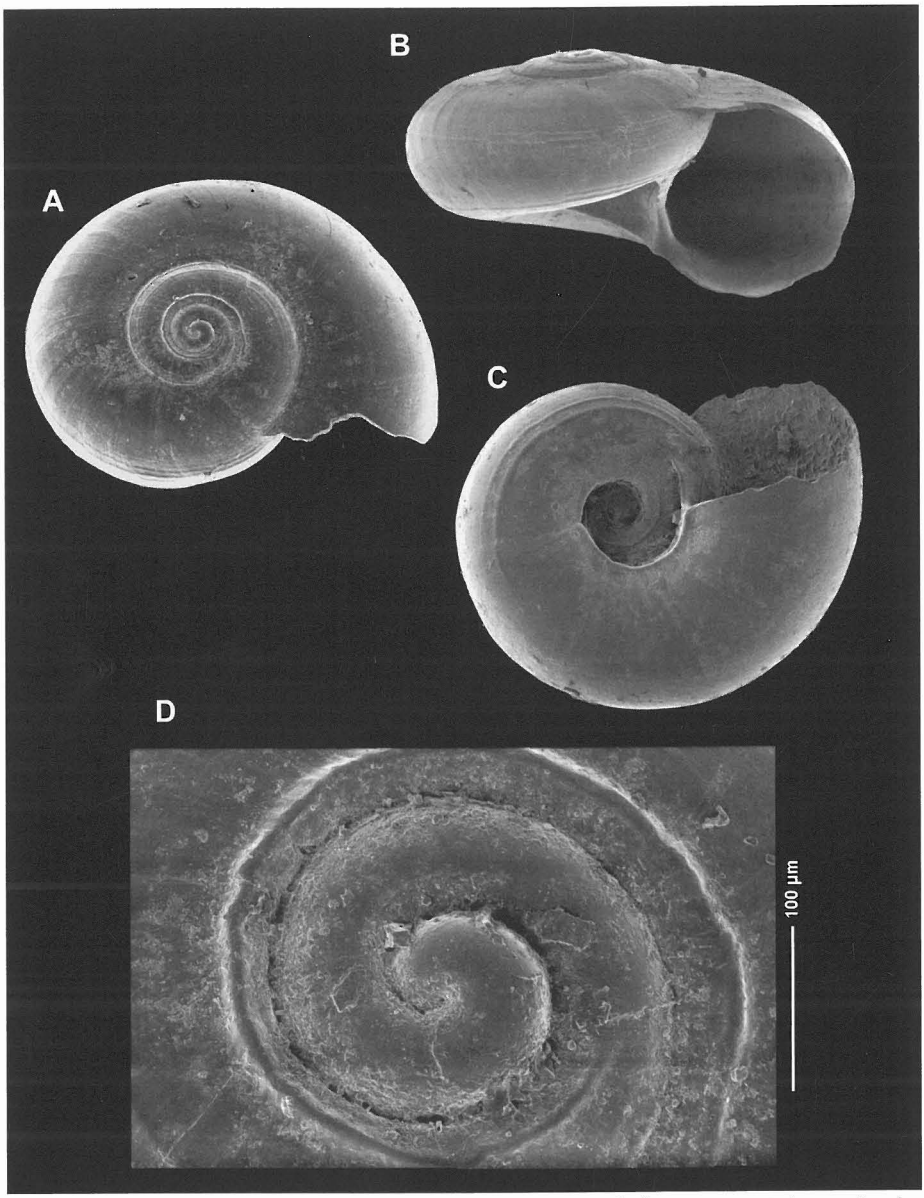
lar cordlets in the subsequent part; about 280 µm in diameter and a little more than 1 ½ whorls. Teleoconch formed by 2 ½ whorls. From the varix which marks the end of the protoconch there are two strong spiral cords which extend up to the end of the first whorl of the teleoconch where they fade out. The subsequent part of the



Figures 94A-G. *Vitrinella helicoidea* C.B. Adams, 1850. A-E: shells, 2.1, 1.9, 1.7, 2.5, 2.4 mm, Cienfuegos Bay, Cuba (MHNS); F-G: protoconchs.
Figuras 94A-G. Vitrinella helicoidea *C.B. Adams, 1850. A-E: conchas, 2,1, 1,9, 1,7, 2,5, 2,4 mm, Bahía de Cienfuegos, Cuba (MHNS); F-G: protoconchas.*

shells is nearly smooth, with only very fine growth lines. A spiral cord angulates the border of the umbilical infundibulum. Umbilicus deep with smooth walls.

Dimensions: Lectotype 2.7 mm in diameter and 1.6 mm in height. The largest shell in our material measures 2.95 mm in diameter and 1.7 mm in height.



Figures 95A-D. *Vitrinella helicoidea* C.B. Adams, 1850. A-C: shells, 1.8, 1.7, 1.4 mm, Sandro Pardo Shoal, Cuba (MHNS); D: protoconch.
Figuras 95A-D. Vitrinella helicoidea *C.B. Adams, 1850. A-C: conchas, 1,8, 1,7, 1,4 mm, Bajo de Sandro Pardo, Cuba (MHNS); D: protoconcha.*

Habitat: This species was found between 0 and 42 m in depth. It has been found under rocks close to shore (ANDREWS, 1977). Under rocks in shallow waters (DÍAZ MERLANO & PUYANA HEGEDUS, 1994). Our material was collected on a coralline bottom between 5 and 20 m.

Distribution: Recorded from Port Royal, Jamaica (ADAMS, 1850); from the north inlet of Lake Worth, Palm Beach Co., Florida (PILSBRY & MCGINTY, 1946); from Colón and Bocas Island, Panama (OLSSON & MCGINTY, 1958); Bermuda, off Cape Hatteras (JOHNSON, 1934), North Carolina, South Florida, Texas, Jamaica, Haiti, Puerto Rico and Panama (MOORE, 1964); Virgin Islands (NOWELL-USTICKE, 1959); SE United States; the Antilles; E coast of Central America (HOUBRICK, 1968). Puerto Rico (WARMKE & ABBOTT, 1975). Bermuda; from southeast USA to the Antilles; Texas; Quintana Roo; Costa Rica; Panama (ANDREWS, 1977). From Campeche to Ciudad del Carmen and Zacatal, Mexico (VOKES & VOKES, 1984). Curaçao (DE JONG & COOMANS, 1988). Bermuda; from North Carolina to Florida and the Caribbean Sea (ROBINSON, 1991). From Bermuda and North Carolina to the Dutch Antilles and Colombia (DÍAZ MERLANO & PUYANA HEGEDUS, 1994). Abaco, Bahamas (REDFERN, 2001). Our material extends the range to Cuba, the ABC Islands, Turks & Caicos, and Venezuela.

Remarks: MOORE (1964: 58) considers *V. praecox* a synonym of *V. helicoidea* applying the observation that it was described by PILSBRY & MCGINTY (1946) on the basis of juvenile specimens which show the spiral cords. We have found shells (Figs. 94C-E) with the teleoconch whorls more depressed, dorsally and ventrally, and which exhibit three spiral cords instead of two on the first ½ whorl of the teleoconch. The rest of the sculptural characters and dimensions of the shell and protoconch are similar (3 x 1.8 mm; proto 270 μm). Lacking radular and anatomical information on these slightly different shells, we provisionally consider them only morphological variations of a single species.

Vitrinella floridana Pilsbry & McGinty, 1946 (Figures 96A-D)

Vitrinella floridana Pilsbry y McGinty, 1946. *The Nautilus*, 60: 16-17, pl. 2, figs. 4-4a. [Type locality: Northern Biscayne Bay near Baker's Haulover, Miami].

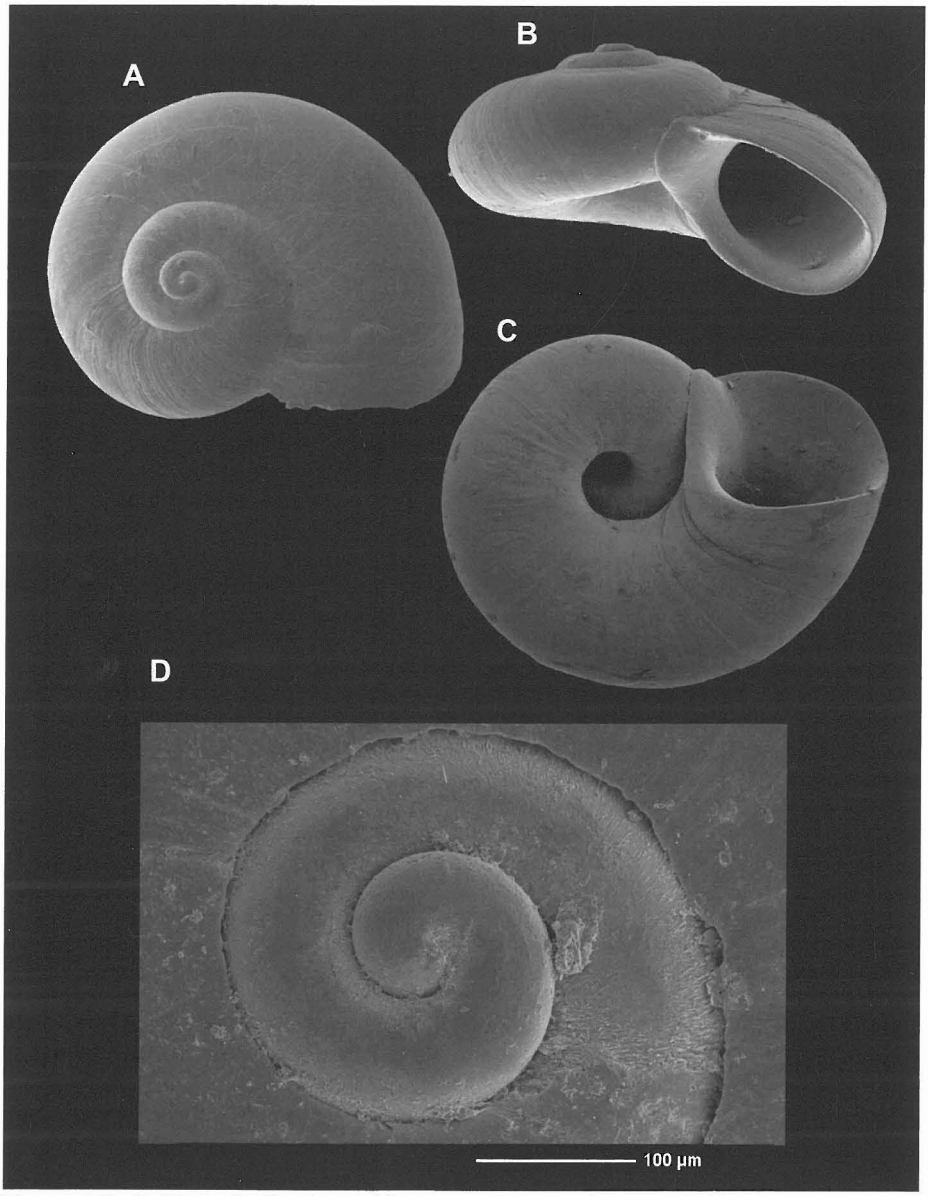
Type material: Holotype figured by MOORE (1964, Fig. 4) deposited in ANSP (181880). Not examined.
Other material examined: Florida, USA: 32 s, Hypoluxo Island, Lantana, Palm Beach Co., drift (CHL); 1 s, N Peanut Island, Lake Worth, Palm Beach Co., dredged at 2-4.5 m (CHL).

Description: This is the original description in PILSBRY & MCGINTY (1946): *"The minute shell is depressed, whitish, smooth, openly umbilicate, the umbilicus contained 3.25 times in the diameter. There are barely 3 ½ convex whorls, the last whorl somewhat flattened below the periphery, rounded at periphery, base, and umbilical border, the umbilicus rather broadly open, perspective, the whorls visible within it convex. The aperture is rather strongly oblique, rounded angular above (or in a basal view it appears bluntly triangular). Peristome thin, the upper margin only moderately arched forward. The columellar margin is thickened and runs forward above. Parietal callus rather thick and short. Diameter 1.95 mm, height 0.95 mm; umbilicus 0.6 mm wide".*

We can add: Shell (Figs. 96A-C). Protoconch (Fig. 96D) of about 1 ¾ whorls and about 330 μm in maximum diameter, with a slightly rough surface, more evident on the subsutural area, which gives it a frosted appearance. Teleoconch of about 2 whorls, smooth except for clear growth lines also visible within the umbilicus. Umbilicus wide and deep with rounded walls, lacking a periumbilical cord. Aperture ovoid strongly prosocline.

Dimensions: We have shells with about 1.30 mm in maximum dimension and 0.75 mm in height.

Habitat: This species has a mainly continental distribution, living between 0 and 46 m in depth. MOORE (1964) mentions that it is very common in some localities, having examined a lot of



Figures 96A-C: *Vitrinella floridana* Pilsbry & McGinty, 1946. A-C: shells, 1.3, 1.3, 1.4 mm, Hypoluxo Island, Lantana, Palm Beach Co., Florida (CHL); D: protoconch.
Figuras 96A-C: Vitrinella floridana *Pilsbry & McGinty, 1946. A-C: conchas, 1,3, 1,3, 1,4 mm, Hypoluxo Island, Lantana, Palm Beach Co., Florida (CHL); D: protoconcha.*

924 specimens from Mud Island, Aransas Bay, Texas.

Distribution: The species is known from the USA: Recorded from Northern Biscayne Bay near Baker's Haulover, Miami; Indian River south of Sebastian, Indian River Co.; North Inlet of Lake Worth, Palm Beach; and Barnes Sound,

Key Largo, Florida (PILSBRY & MCGINTY, 1946); East and West Florida, Texas (LYONS, 1971; ANDREWS, 1977); Texas (ODÉ, 1987). Mexico: Quintana Roo (VOKES & VOKES, 1984); Tamaulipas, Tabasco, Veracruz, Campeche Bank, Quintana Roo (GARCÍA-CUBAS, 1970, 1990). Colombia (DÍAZ MERLANO & PUYANA HEGEDUS, 1994). Cuba: Cienfuegos Bay.

Remarks: The small size, rather large umbilicus without a bordering cord, and the feeble convexity of the upper margin of peristome in apical or basal view are its more conspicuous features (PILSBRY & MCGINTY, 1946). *Vitrinella floridana* has a shell very similar in general appearance to that of *Vitrinella helicoidea* from which it can be distinguished by the ornamentation of the protoconch, by the lack of spiral cords on the first ½ whorl of the teleoconch and the lack of a bordering umbilical cord. From *Vitrinella canaliculata* it can be differentiated by the absence of the sutural canal and the ornamentation of the protoconch.

Vitrinella canaliculata spec. nov. (Figures 97A-C)

Type material: Holotype (Fig. 97A) in MNCN (15.05/55070). Paratypes: MHNS (100553, 1 s); MNHN (24399, 1 s); CFG (1 s).
Type locality: Rancho Luna Beach, Cienfuegos, Cuba.
Etymology: The specific name refers to the sutural canal which is visible along the full extent of the teleoconch.

Description: Shell (Figs. 97A-B) depressed, without sculpture and with a broad umbilicus. Protoconch (Fig. 97C) of about one whorl, with a slightly rough surface, and about 320 μm in maximum diameter; immediately after the protoconch there commences a wide suture which forms a small groove. Teleoconch of about 2 whorls, smooth except for fine growth and the sutural canal, which is visible all the way to the aperture. Umbilicus wide and deep with rounded walls, without a periumbilical cord.

Dimensions: Holotype 1.8 mm in diameter.

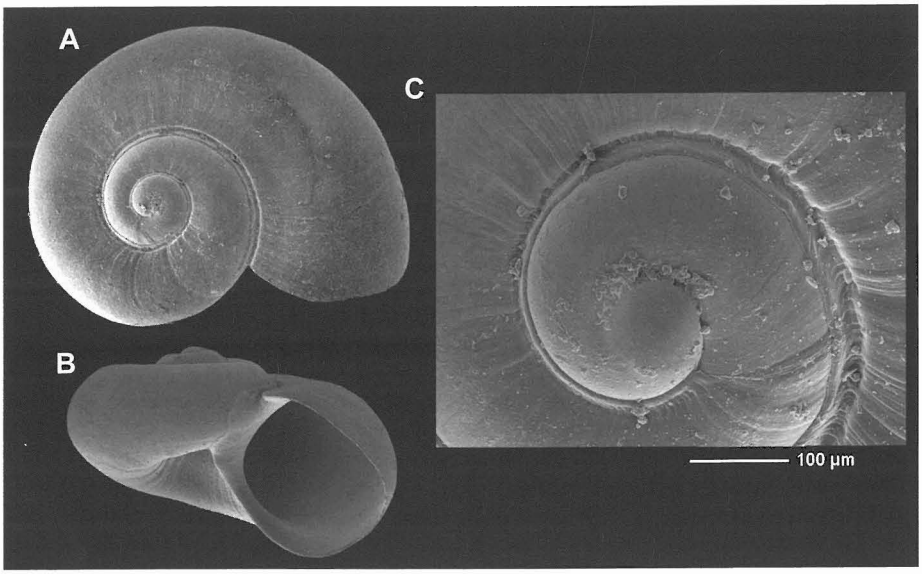
Habitat: The studied material came from coralline sand bottoms 20 m in depth.

Distribution: Only known from Rancho Luna Beach, Cienfuegos, Cuba, its type locality.

Remarks: *V. canaliculata* spec. nov. has a shell very similar in general appearance to that of *V. helicoidea* and *V. floridana*, from which it can be distinguished by the ornamentation of the protoconch, the lack of spiral cords on the first ½ whorl of the teleoconch, having a sutural canal and the lack of periumbilical cord.

Vitrinella aristata spec. nov. (Figures 98A-I)

Type material: Holotype (Fig. 98A) in MNCN (15.05/55069). Paratypes: ANSP (1 s); AMNH (4 s); FLMNH (448612, 1 s); MCZ (1 s); MHNS (100554, 24 s); MNHN (24400, 1 s); NHMUK (1 s); USNM (1155033, 1 s); IES (1 s); CFG (10 s), CHL (3 s) and CFR (10 s).
Other material examined: Cuba: 3 s, Cienfuegos Bay, 20-30 m (MHNS); 2 s, Rancho Luna Beach, 12 m (MHNS); 1 sp, 14 s, Rancho Luna Beach, 10-20 m (MHNS); 2 s, Rancho Luna Beach, 35 m (MHNS); 8 s, Rancho Luna Beach, 40 m (MHNS); 27 c, Rancho Luna Beach, 45 m (MHNS); 4 c, Los Laberintos, Rancho Luna Beach, 35 m (MHNS); 1 sp, 17 s Faro de los Colorados, 56 m (MHNS); 1 s, Punta de Tamarindo.
Type locality: Rancho Luna Beach, Cienfuegos, Cuba.



Figures 97A-C. *Vitrinella canaliculata* spec. nov. A-B: holotype, 1.8 mm (MNCN); B: paratype, 1.3 mm, Rancho Luna Beach (MHNS); C: protoconch.
Figuras 97A-C. Vitrinella canaliculata *spec. nov. A-B: holotipo, 1,8 mm (MNCN); B: paratipo, 1,3 mm, Playa Rancho Luna (MHNS); C: protoconcha.*

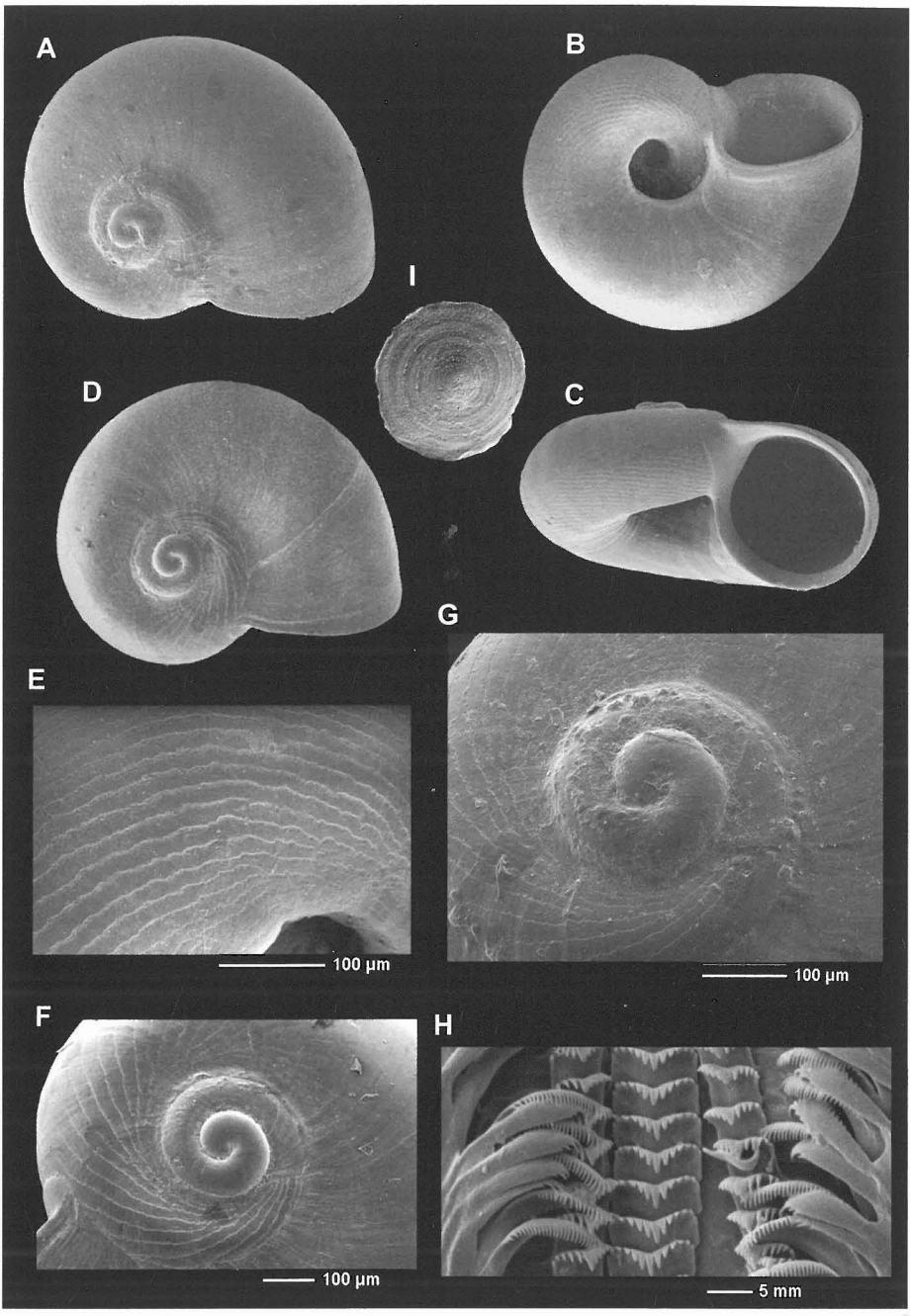
Etymology: The specific name refers to the unique pattern of dorsal opisthocline and ventral prosocline grooves, which meet at an acute angle at the mid-periphery creating a pattern reminscent of an ear, or husk, of grain, in Latin "arista".

Description: Shell (Figs. 98A-D) depressed, solid, brown, polished, and with characteristic oblique grooves. Protoconch (Figs. 98F-G) heterostrophic, about 1 ¾ whorls, and about 280 µm in diameter, placed on a plane slightly above that of the other whorls, with a smooth surface at its beginning followed by a segment with coarse prosocline growth lines terminating with a faint axial varix. Teleoconch of about 1 ¼ rapidly-increasing whorls; dorsally and ventrally convex; from the suture and from the umbilical border, oblique sulci (opisthocline and prosocline respectively) converge at the middle of the periphery. These sulci are less evident on the last ½ whorl. Aperture rounded, oblique, columellar margin not thickened, outer and inner lips sharp. Umbilicus wide and deep, exposing the previous whorls, without ornamentation except for the growth lines and several faint spiral cords.

Dimensions: Holotype 1.23 mm in diameter and 0.57 mm in height.

Operculum corneous and multispiral with a central nucleus.

Radula (Fig. 98H) taenioglossate, with formula 2+1+R+1+2. Central tooth wide basally, the ventral margin well developed, without denticles. Cutting area formed by a large and sharp cusp and 5 denticles of medium size at each side. Lateral teeth similar to the central one, but the base is narrower; free margin with a central cusp and 4-5 smaller denticles at each side. Marginal teeth narrow and elongate; the inner with 24-26 fine denticles on the upper outer margin; the outer marginal teeth are strongly inclined outward in their upper third and



Figures 98A-I. *Vitrinella aristata* spec. nov. A-B: holotype, 1.23 mm, Rancho Luna Beach, Cuba (MNCN); C-D: paratypes, 1.0, 0.9 mm, Rancho Luna Beach (MHNS); E: microsculpture; F-G: protoconch; H: radula: I: operculum, 0.5 mm in diameter.
Figuras 98A-I. Vitrinella aristata *spec. nov. A-B: holotipo, 1,23 mm, Playa Rancho Luna, Cuba (MNCN); C-D: paratipos, 1,0, 0,9 mm, Playa Rancho Luna (MHNS); E: microescultura; F-G: protoconcha; H: rádula: I: opérculo, 0.5 mm de diámetro.*

possess 16-18 denticles on the upper end of their inner margin.

Animal unknown. Operculum (Fig. 98I) rounded and multispiral.

Habitat: This species has been collected between 10 and 60 m, on a coralline, slightly muddy bottom.

Distribution: Only known from Cuba.

Remarks: *Vitrinella aristata* spec. nov. has a glistening shell with a very attractive and characteristic sculpture which makes it unmistakable. *V. anneliesae* is the only species with a similar ornamentation, with slightly oblique cords emerging from the suture. The radula is similar to that of other tornid species.

Vitrinella pseudoaristata spec. nov. (Figs. 99A-E)

Type material: Holotype (Fig. 99A) in MNCN (15.05/55071). Paratypes: MNHN (24401, 1 s, Fig. 99B) and IES (1 s, Fig. 99C), both from type locality.
Type locality: Rancho Luna Beach, Cienfuegos, Cuba.
Etymology: The specific name refers to the similarity with the species *Vitrinella aristata*.

Description: Shell (Figs. 99A-C) depressed, solid, polished, and with characteristic oblique grooves. Protoconch (Fig. 99D) heterostrophic, 1 ½ whorls, about 290 μm in diameter, and slightly projected. Teleoconch of about 2 rapidly-increasing whorls; dorsally and ventrally convex; completely smooth except for 5-6 somewhat oblique incised lines seen on the dorsum of the first teleoconch whorl; these fade on the periphery, which is rounded. A thick cordon marks the boundary of the umbilicus, which is not occluded by a callus. Aperture rounded, robust; thick and somewhat reflected columella, but without callus formation. Umbilicus not too wide or deep, flanked by the spiral cord. Aperture rounded, oblique, columellar margin not thickened, outer and inner lips sharp.

Dimensions: Holotype 1.26 mm in diameter, similar to the paratypes.

Animal and radula unknown.

Habitat: This species has been collected between 15 and 35 m in coralline sand.

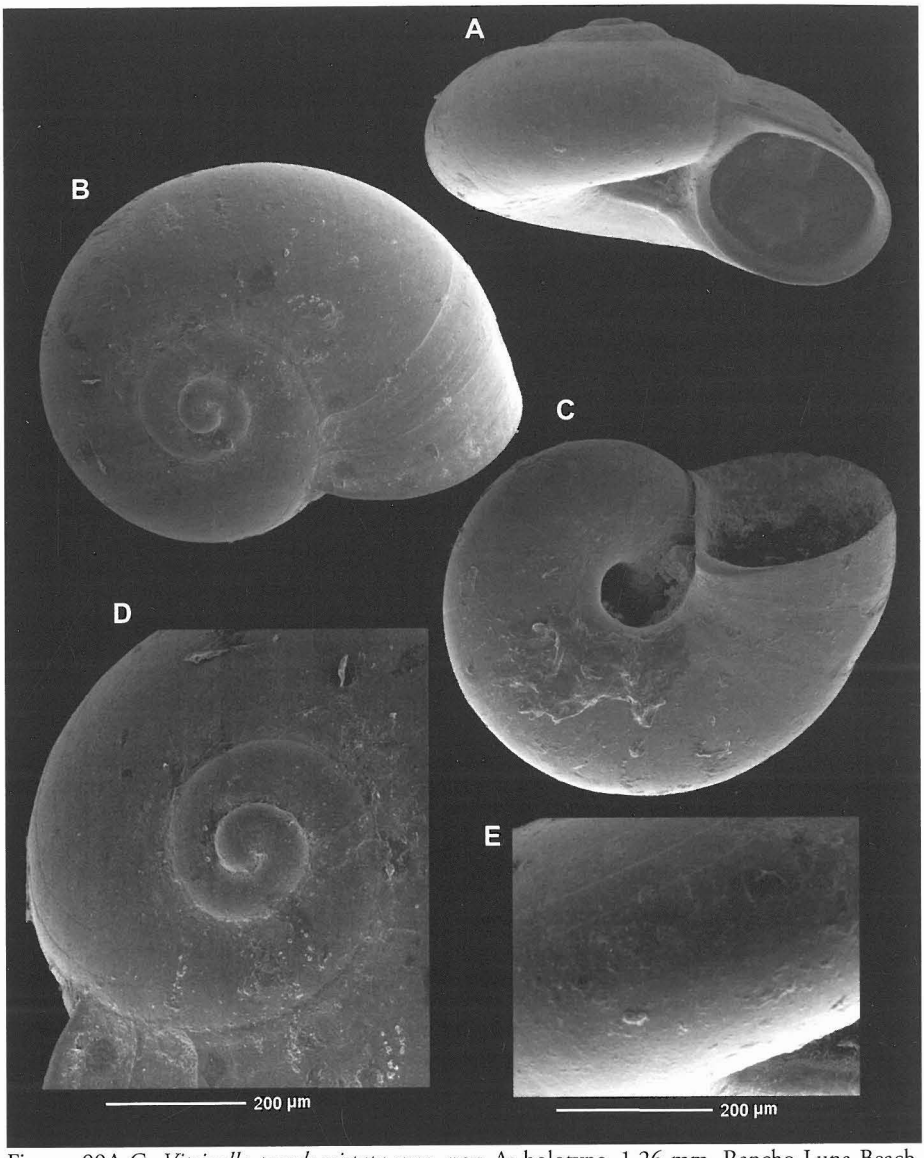
Distribution: Only known from Cuba.

Remarks: *Vitrinella pseudoaristata* spec. nov. has a glistening shell with a very attractive and characteristic sculpture which makes it unmistakable. *V. anneliesae* and *V. aristata* are the only species with a similar ornamentation, possessing slightly oblique cords near the suture. *V. pseudoaristata* spec. nov. differs from *V. aristata* spec. nov. by having fewer oblique lines and having them limited to the dorsum of the first teleoconch whorl; furthermore it has a spiral cord that delimits the umbilicus.

Vitrinella pelorcei spec. nov. (Figures 100A-C)

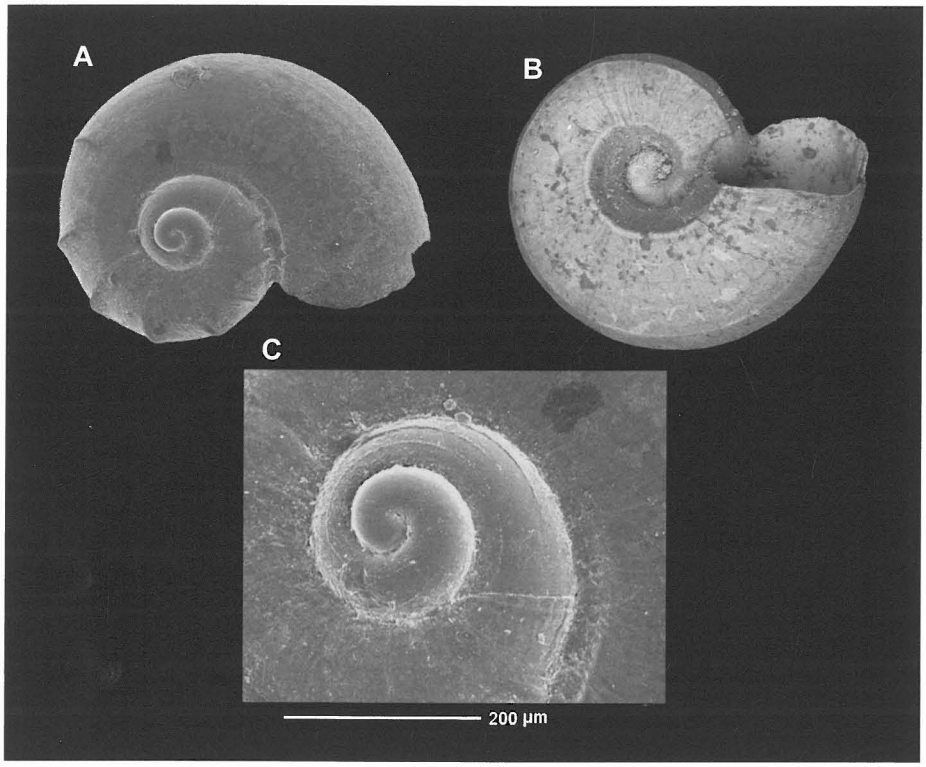
Type material: Holotype (Figs. 100A-B) in MNHN (24202).
Type locality: Reef Bay Bronage, Antigua.
Etymology: After Jacques Pelorce, the French malacologist who collected the holotype.

Description: Shell (Figs. 100A-B) of small size, depressed, appearing fragile, with a sutural groove and characteristic large axials ribs. Protoconch (Fig. 100C) of about 1 ¾ whorls, placed on a higher plane than the teleoconch, with a smooth surface at its beginning and 3-4 fine spiral cordlets of microtubercles in the subsequent part, about 290 μm in diameter. Teleoconch with almost 1 ¼ rapidly-increasing whorls; dorsally and ventrally convex. Ornamentation formed by axial growth lines and strong axial



Figures 99A-G. *Vitrinella pseudoaristata* spec. nov. A: holotype, 1.26 mm, Rancho Luna Beach, Cuba (MNCN); B: paratype, 1.2 mm, Rancho Luna Beach (MNHN); C: paratype, 1.2 mm, Rancho Luna Beach (IES); D: protoconch; E: microsculpture.
Figuras 99A-G. Vitrinella pseudoaristata *spec. nov. A: holotipo, 1,26 mm, Playa Rancho Luna, Cuba (MNCN); B: paratipo, 1,2 mm, Playa Rancho Luna (MNHN); C: paratipo, 1,2 mm, Playa Rancho Luna (IES); D: protoconcha; E: microescultura.*

ribs, nine on first teleoconch whorl; the last ¼ whorl loses its axial sculpture leaving only very faint spiral cordlets. The suture is very evident in the protoconch, and it becomes a wide groove along the teleoconch. Aperture rounded, oblique, columellar margin not thickened, outer and inner lips



Figures 100A-C. *Vitrinella pelorcei* spec. nov. A-B: holotype, 1.02 mm, Reef Bay Bronage, Antigua (MNHN); C: protoconch.
Figuras 100A-C. Vitrinella pelorcei *spec. nov. A-B: holotipo, 1,02 mm, Reef Bay Bronage, Antigua (MNHN); C: protoconcha.*

sharp. Umbilicus wide and deep exposing the previous whorls. No sculpture except for axial growth lines.

Dimensions: Holotype 1.02 mm in maximum diameter.

Animal and radula unknown.

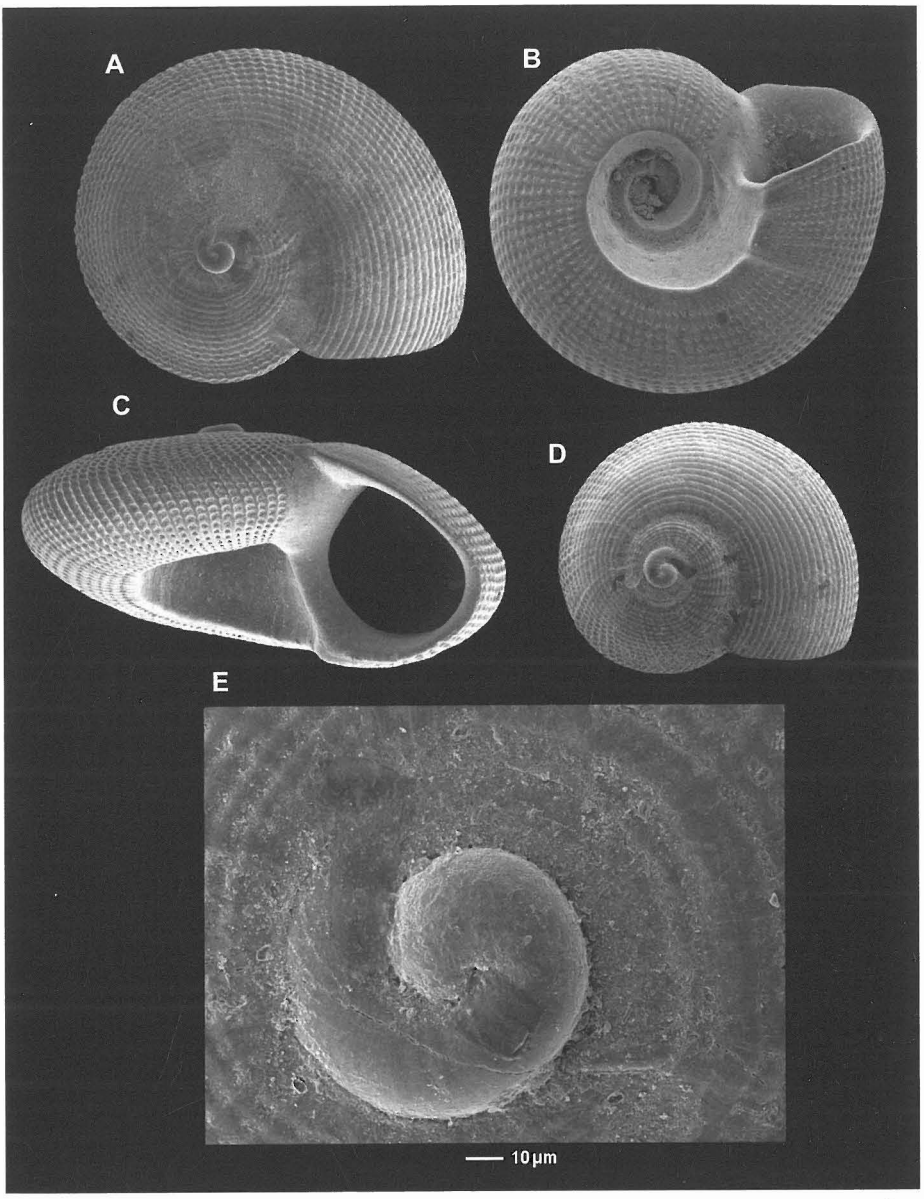
Habitat: The only shell known was collected on a coralline bottom at 1 m.

Distribution: Only known from Antigua, the type locality.

Remarks: *Vitrinella pelorcei* spec. nov. has a characteristic ornamentation formed by strong and widely-spaced axial ribs and an evident suture in the protoconch which in the teleoconch evolves into a sutural sulcus continuing to the aperture. These characters make this species unmistakable. *Vitrinella floridana* is the only species with a similar sutural sulcus, but it is narrower and deeper; Furthermore the latter has no other sculpture, axial or spiral.

Vitrinella aguayoi (Corgan, 1968) (Figures 101A-E)

Vitrinella tenuisculpta Aguayo & Borro, 1946b. *Rev. Sociedad. Malac. "Carlos de la Torre,"* 4(2): 43-44, pl. 3, figs. 4-6. [Type locality: Matanzas, Cuba], preoccupied by *Vitrinella tenuisculpta* Carpenter, 1865.
Solariorbis aguayoi Corgan, 1968.



Figures 101A-H. *Vitrinella aguayoi* Corgan, 1968. A-D: shells, 1.45, 1.4, 1.4, 1.2 mm, Cienfuegos, Cuba (MHNS); E: protoconch.
Figuras 101A-H. Vitrinella aguayoi *Corgan, 1968. A-D: conchas, 1,45, 1,4, 1,4, 1,2 mm, Cienfuegos, Cuba (MHNS); E: protoconcha.*

Type material: Holotype represented in AGUAYO & BORRO (1946, figs. 4-6). Deposited in Museo Poey, Havana, Cuba (12005). Described as fossil of the Upper Tertiary found in the formation "Yumurí," Upper Miocene of Cuba. Not examined.

Other material examined: Cuba: 6 s, Rancho Luna Beach, 12 m (MHNS); 51 s, Rancho Luna Beach, 10-20 m (MHNS); 1 s, Rancho Luna Beach, 35 m (MHNS); 1 sp, 5 s Faro de los Colorados, 56 m (MHNS).

Description: The original description (AGUAYO & BORRO, 1946b) is as follows: "*Concha diminuta, deprimida, plano convexa por encima, ampliamente umbilicada por debajo. Provista de 3 vueltas redondeadas, la ultima ligeramente aquillada. Las primeras 1 ½ (nucleares), lisas, las restantes de escultura reticulada. Escultura espiral formada por numerosas líneas salientes (unas 15 en la última vuelta); escultura axial formada por líneas mas elevadas que las espirales, formando con estas cuadrículas que comunican a la concha un aspecto granuloso. Periferia subangulosa. Ombligo amplio, formando con la base de la concha un ángulo muy marcado que lo bordea por completo. Abertura semilunar, con el borde unido por un leve callo parietal*".

Shell (Figs. 101A-C) subconical, depressed, solid, whitish and formed by 3 ¾ rapidly-increasing whorls. Protoconch (Fig. 101H) of about 1 ¾ whorls, about 290 μm in diameter, has a rough surface at its beginning and fine oblique threads in the subsequent part, slightly overlapped by the subsequent whorl. Teleoconch of about 2 ¼ whorls, sculpture of 38-39 spiral cordlets, 24 on the dorsum and 14-15 ventrally, spiral cordlets crossed by 75-80 fine axial ribs, forming small quadrangular hollows. Dorsally convex with a subangulated periphery. Ventrally slightly concave with one prominent spiral cord which limits a wide infundibulum of the deep umbilicus with smooth walls. Aperture oval almost circular, columella and inner lip very thick and reflected outward and the upper part of the external lip sharp and advanced. There is no columellar thickening or encroachment on the umbilicus. At junction of the columella and umbilical cord the aperture is slightly angulated.

Dimensions: Holotype 1.19 mm in diameter and 0.5 mm in height. We have shells reaching 1.45 mm in maximum dimension

Habitat: The type is a fossil specimen collected in the Upper Miocene of Cuba, from the "Yumuri" Formation. Our recent material was collected between 10 and 56 m.

Distribution: Cuba: Cienfuegos. Since its description this species has not been recorded from any other Caribbean locality. Thus it could be endemic to Cuba.

Remarks: *Solariorbis aguayoi* was proposed by CORGAN (1968) as a replacement name for *Vitrinella tenuisculpta* Aguayo & Borro, 1946, which is preoccupied by *V. tenuisculpta* Carpenter, 1865. The renamed species, known only from the Miocene of Cuba, was placed in the vitrinellid genus *Solariorbis* Conrad, 1865 by Corgan on the basis of reticulate microsculpture.

AGUAYO & Borro (1946b) mentioned that *V. tenuisculpta (=V. aguayoi)* is more similar to *Vitrinella multistriata* (A.E. Verrill), and it can be distinguished by being smaller, having weaker sculpture, the axial lines being proportionately more prominent than the spiral ones, the umbilicus wider, and the periphery angled angulate.

Vitrinella aguayoi and *V. calliglypta* are very similar, and they were considered as morphotypes of the one species in the past. They live in the same type of marine bottom, and maintain their distinguishing characters without intergradation. The protoconchs are identical in size and ornamentation and, as with other species included in the genus *Vitrinella* (*V. annelisae, V. contracta, V. funiculus*), the protoconch is slightly overlapped by the first whorl of the teleoconch.

Vitrinella aguayoi may be distinguished from *V. calliglypta* by its angled periphery and by the greater number of spiral cordlets and axial ribs.

Vitrinella calliglypta Aguayo, 1949 (Figures 102A-E)

Vitrinella (Delphinoidea) calliglypta Aguayo, 1949. *Rev. Sdad. Malac. "Carlos de la Torre,"* 6: 94, pl. 4, fig. 4, 6. [Type locality: Gibara, Eastern, Cuba].

Type material: Holotype deposited in the Museo Poey, Havana, Cuba (12901). Collected by P.J. Bermudez and C.G. Aguayo. Not examined.
Other material examined: Cuba: 2 s, Cienfuegos Bay, 20-30 m (MHNS); 1 s, Cienfuegos Bay, 30 m (MHNS); 48 s, Rancho Luna Beach, 10-20 m (MHNS); 3 s, Rancho Luna Beach, 40 m (MHNS); 8 s, Rancho Luna Beach, 45 m (MHNS); 3 s, Los Laberintos, Rancho Luna Beach, 35 m (MHNS); 3 s, Faro los Colorados, 56 m (MHNS).

Description: The original description (AGUAYO, 1949) is as follows: *"Concha diminuta, deprimida, planorboide, blanca, lustrosa, translúcida, ampliamente umbilicada. Espira deprimida, sutura profunda pero estrecha. Provista de 3 ½ vueltas, de las cuales 1 ½ son lisas, y las restantes con una escultura entrecruzada, formada por numerosas costillitas planas axiales, algo más estrechas que sus intervalos y muchas costillas espirales (unas 15 en la última vuelta) más bajas que las axiales, cuyo entrecruzamiento le da un aspecto de numerosas depresiones cuadrangulares. Periferia redondeada. Base aplanada, con un ámplio ombligo de un 40% del diámetro de la concha. Abertura subcircular, peristoma cortante".*

Shell (Figs. 102A-D) subconical depressed, solid, whitish, and comprised of 3 ¾ rapidly-increasing whorls. Protoconch (Fig. 102E) projecting slightly upward, about 1 ½ whorls and about 290 μm in diameter. It has a rough surface at its beginning and fine oblique threads in the subsequent part, slightly overlapped by the subsequent whorl. Teleoconch of about 2 whorls, with sculpture formed by 32-34 spiral cordlets: 20 on the dorsum and 12-14 ventrally, each crossed by 55-60 fine axial ribs, forming small quadrangular hollows. Dorsally slightly convex with a biangulated periphery. Ventrally the shell is slightly concave with one spiral cord which limits a wide infundibulum of the deep umbilicus. Aperture oval, almost circular, columella and inner lip very thick and reflected outward, and the upper part of the external lip sharp and advanced. At the junction between columella and the periumbilical cord, the aperture is slightly angulated.

Dimensions: Holotype 1.0 mm in diameter and 0.6 mm of height. We have shells reaching about 1.23 mm in maximum dimension.

Habitat: The type was dredged off Gibara, East of Cuba, at 30 fathoms in depth. Our material was collected between 10 and 56 m.

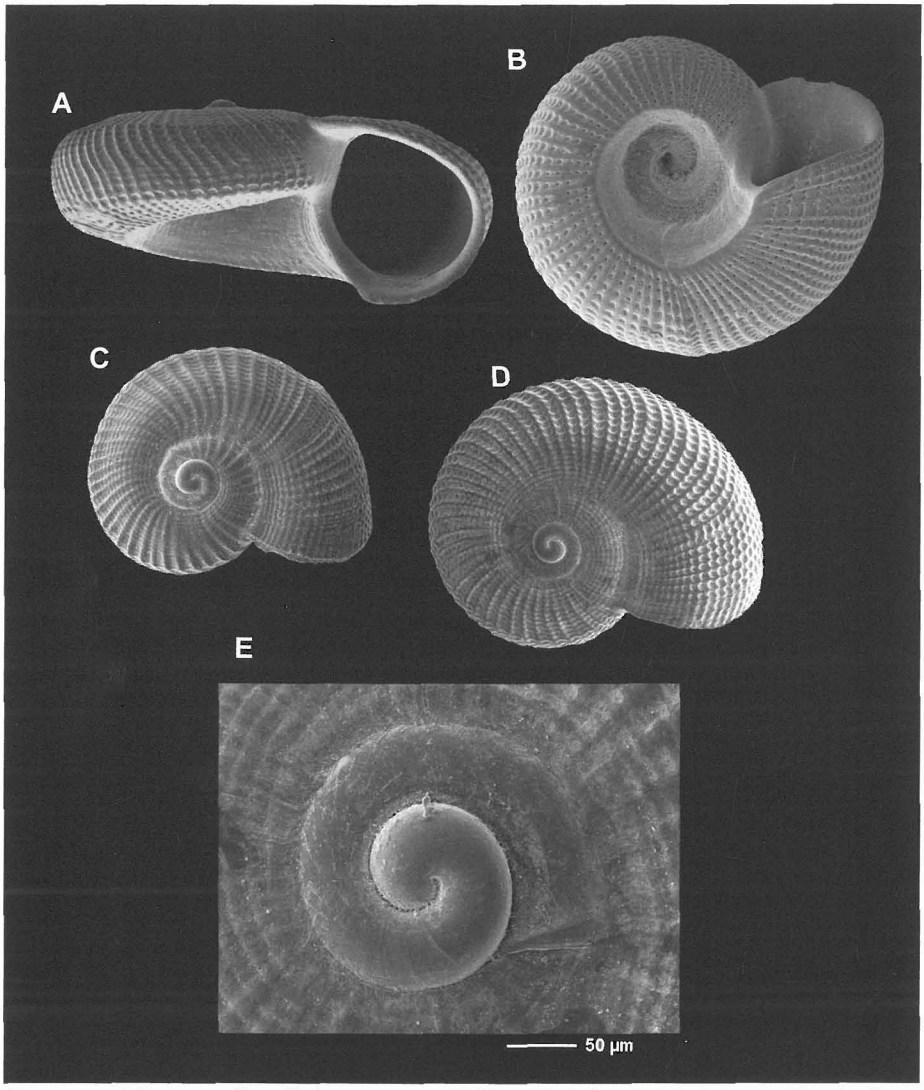
Distribution: Cuba: Holguin, Gibara, Cienfuegos. Since its description this species has not been recorded from any other Caribbean locality, so it could be endemic to Cuba.

Remarks: AGUAYO (1949) mentioned that *V. calliglypta* shows a little similarity to *V. tenuisculpta* Aguayo & Borro, and it can be distinguished by the biangulate periphery and the fewer axial ribs and spiral cords. *V. multistriata* Bush is smaller and has stronger sculpture.

Vitrinella cupidinensis Altena, 1966 (Figures 103A-F)

Vitrinella (Striovitrinella) cupidinensis Altena, 1966. *Zoologische Mededelingen*, 41: 235-236, figs. 2a-d. [Type locality: Cupido, river Maratakka, Surinam].

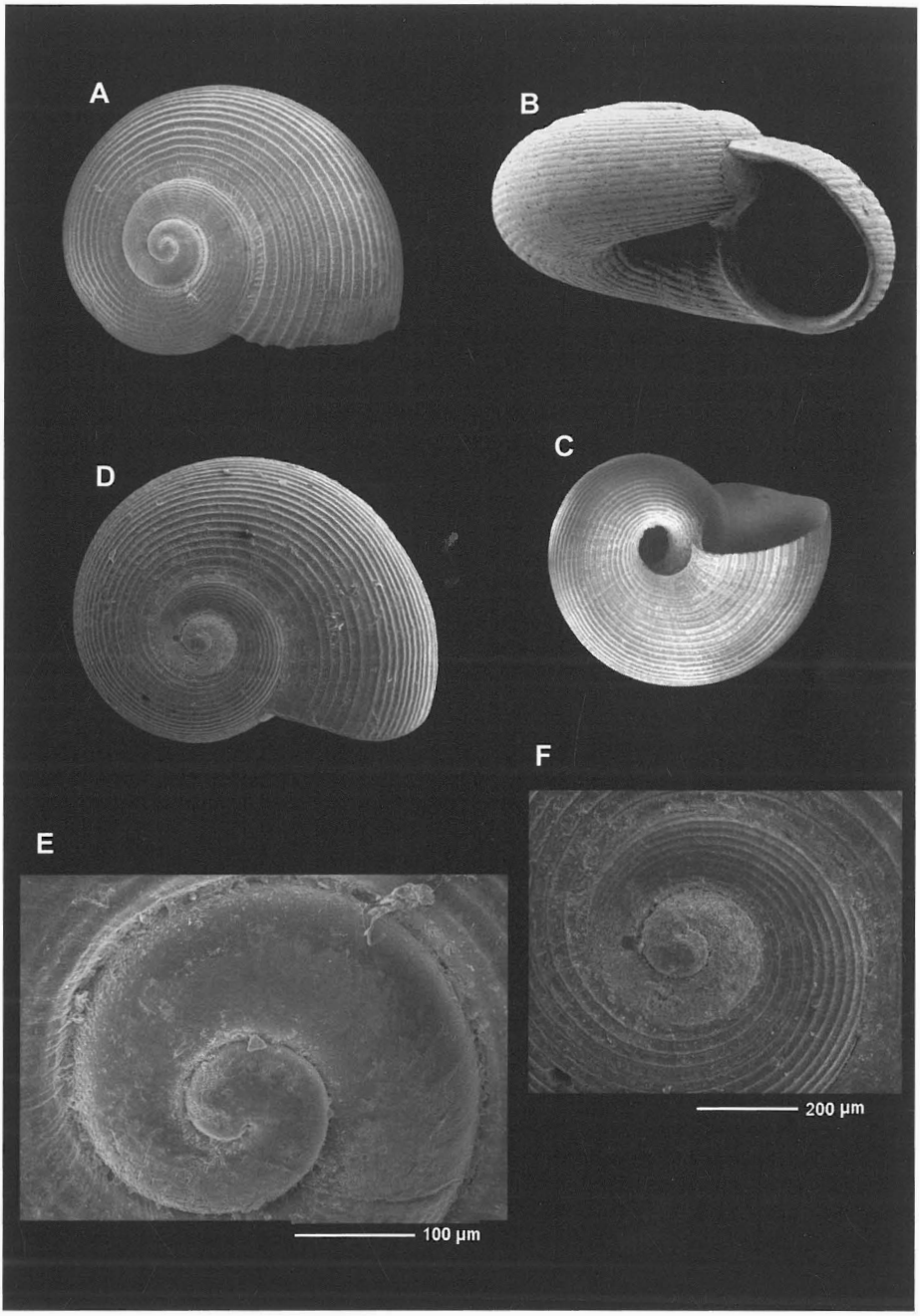
Type material: Represented in ALTENA (1966b, 1975). Not examined.



Figures 102A-E. *Vitrinella calliglypta* Aguayo, 1949. A-D: 1.4, 1.3, 1.1, 1.2 mm, Rancho Luna Beach, Cuba (MHNS); E: protoconch.
Figuras 102A-E. Vitrinella calliglypta *Aguayo, 1949. A-D: 1,4, 1,3, 1,1, 1,2 mm, Playa Rancho Luna, Cuba (MHNS); E: protoconcha.*

Other material examined: Guatemala: 2 s, Livingston, 3 m (MHNS). Trinidad and Tobago: Tobago, 1 s, Courland Bay, drift (CHL); 1 s, Scarborough (CHL). Venezuela: 1 f, Juan Griego, Isla Margarita (CHL); 2 s, Isla Margarita (CHL).

Description: Shell (Figs. 103A-C) lenticular, depressed, whitish, with 3 ¼ spiral whorls. Protoconch (Fig. 103D) 1 ½ whorls, diameter of about 350 µm; the first ½ whorl is smooth, and the next whorl has small granules on the peripheral area. Two varices mark the end of each stage. Teleoconch of about 1 ¾



Figures 103A-F. *Vitrinella cupidinensis* Altena, 1966. A-C: shells, 1.7, 1.7, 1.35 mm, Livingston, Guatemala (MHNS); D: shell, 1.7 mm, Tobago (CHL); E: protoconch, Guatemala; F: Protoconch, Tobago.

Figuras 103A-F. Vitrinella cupidinensis *Altena, 1966. A-C: conchas, 1,7, 1,7, 1,35 mm, Livingston, Guatemala (MHNS); D: concha, 1,7 mm, Tobago (CHL); E: protoconcha, Guatemala; F: protoconcha, Tobago.*

whorls, its surface totally covered by spiral cords of similar size and very fine axial striae which cross the sulci forming a characteristic sculpture.

Dimensions: Holotype 1.8 mm in diameter and 0.9 mm in height. We have shells reaching 1.7 mm in maximum diameter and 1.06 mm in height.

Habitat: We found no mention of the habitat of this species in the literature. Our material was collected in muddy bottom with turbid waters at 3 m.

Distribution: Colombia (DÍAZ & PUYANA, 1994). Brazil: Recife (Altena, 1966), Pernambuco (RIOS, 1994) and Livingston, Guatemala.

Remarks: *Vitrinella cupidinensis* was described from fossil shells in the Holocene of Surinam. The distinguishing characteristic of this species is the teleoconch sculpture of fine spiral cords crossed by very fine axial striae. ALTENA (1966) indicated that this species is very similar to *Vitrinella (Striovitrinella) elegans* Olsson & McGinty, 1958, but the latter is slightly larger and, at the same number of whorls, the spiral sculpture is smaller and the radial more prominent.

Vitrinella filifera Pilsbry & McGinty, 1946 (Figures 104A-D)

Vitrinella filifera Pilsbry & McGinty, 1946. *The Nautilus*, 60: 15, pl. 2, figs. 2-2b. [Type locality: Biscayne Bay at Baker's Haulover, Miami, Florida].

Type material: Holotype in ANSP (nº 181879) not figured by MOORE (1964). Not examined.
Material examined: Virgin Islands: 1 s, Magens Bay, N St. Thomas, (CHL).

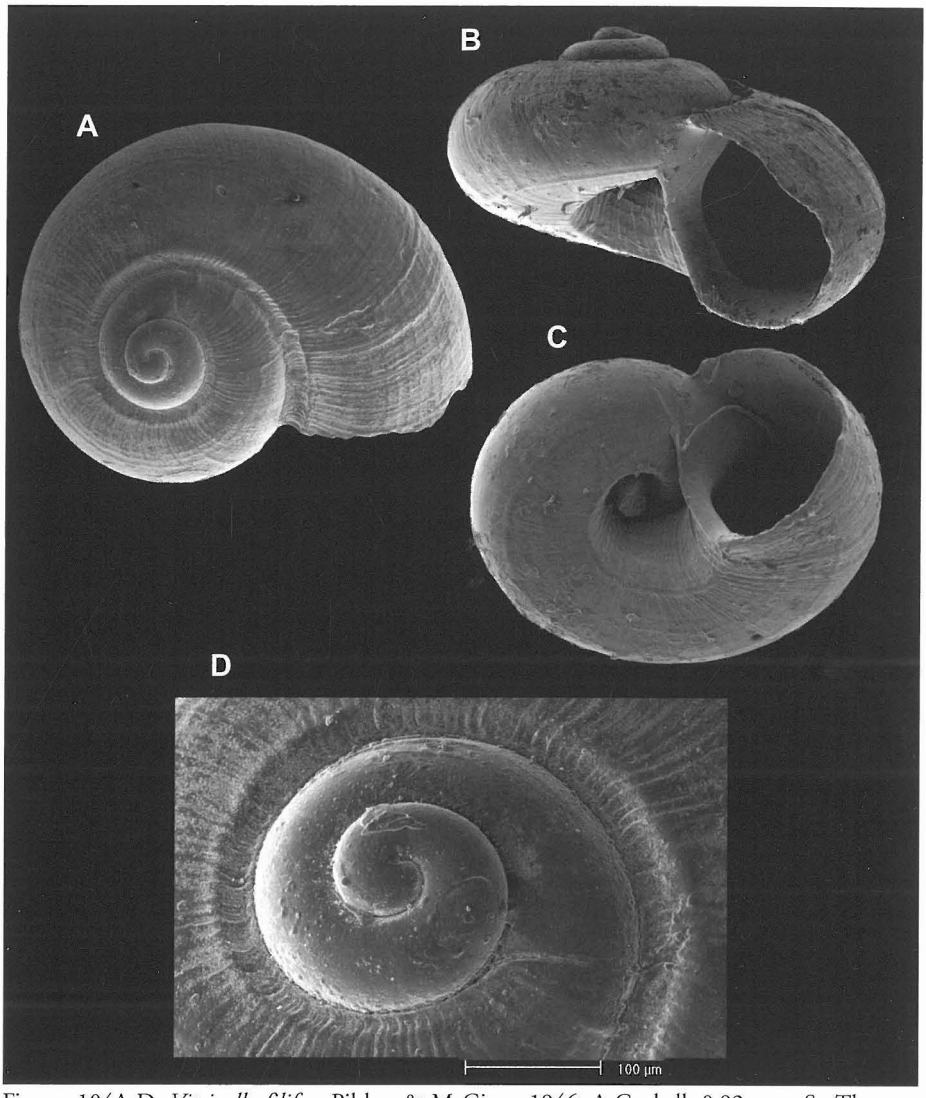
Description: This is the original description in PILSBRY & MCGINTY (1946): *"The shell is depressed, umbilicate, the width of umbilicus contained a little more than 4 times in the diameter; thin, white (dead), smooth. The upper surface is convex with slightly prominent apex, the whorls convex, the last whorl having a cord a short distance below the suture and parallel to it, becoming weaker near the aperture; the periphery is broadly rounded; base convex, a little impressed along the cord around the umbilicus; which in its last turn enlarges to about double its former width and is bounded by a cord which becomes weaker near the aperture. The aperture is rounded, somewhat oblique, the peristome thin, upper margin is strongly arched forward, retracted to the upper insertion, the basal margin straightened or a little curved forward in a basal view, and there is a slight angle at the termination of the umbilical cord. The columella is slanting, near straight, rather thick. Parietal callus thin. Diameter 1.25 mm; height 0.7 mm; 3 ¼ whorls"*.

We add the following: The protoconch (Fig. 104D) projects slightly, has 1 ¾ spiral whorls, is bulbous, measures about 280 μm in diameter, and is sculptured with microtubercles of varying size distributed irregularly, the larger ones near the subsutural area. On the last segment there are some spiral threads near the suture. The teleoconch has 1 ¼ whorls completely covered by dense, fine axial ribs, which cross the spiral cordlets, more evident on the periphery. The axial sculpture is predominant on the dorsum.

On the base two more prominent spiral cords can be observed; one of them borders the periphery, and the other delimits the umbilical zone. The umbilicus is wide, with convex walls on which axial and spiral cordlets can be seen. Aperture rounded, columella thickened and reflected outward.

Habitat: This species has not yet been found alive (PILSBRY & MCGINTY, 1946). MOORE (1964) did not comment on its ecology.

Distribution: The species is known from the USA: recorded from Biscayne Bay at Baker's Haulover, Miami, Florida (PILSBRY & MCGINTY, 1946b); from both sides of the Florida penin-



Figures 104A-D. *Vitrinella filifera* Pilsbry & McGinty, 1946. A-C: shell, 0.92 mm, St. Thomas, Virgin Islands (CHL); D: protoconch.
Figuras 104A-D. Vitrinella filifera *Pilsbry & McGinty, 1946. A-C: concha, 0,92 mm, St. Thomas, Virgin Islands (CHL); D: protoconcha.*

sula from Palm Beach to St. Petesburg (MOORE, 1964); from Florida to Texas and Colombia (ODÉ, 1987). Colombia, (DÍAZ MERLANO & PUYANA HEGEDUS, 1994). Brazil: Cabo Frio, Rio de Janeiro (RIOS, 1994).

Remarks: PILSBRY & MCGINTY (1946) described *Vitrinella filifera*, but in spite of some similarities with *V. thomasi* (Pilsbry, 1945), they didn't compare the two species. MOORE (1964) considered the two synonymous, indicating that *V. filifera* was described from a somewhat eroded adult shell which may have lost some sculptural characters Furthermore, he considered *Vit-*

rinella filifera as the valid nominal taxon since *"Cyclostrema" thomasi* was a secondary junior homonym of *Vitrinella thomasi* Bartsch, 1918 (see below). The strong thread which follows the suture and the strongly convex outline of the upper margin of the aperture, seen in apical or basal view, are distinctive features of this species, which has not yet been found alive (PILSBRY & MCGINTY, 1946). The projected protoconch, the fine and dense axial ribs, which cross the spiral cordlets, distinguish it from *V. solaris*.

Vitrinella solaris nom. nov. (Figures 105A-C)

"Cyclostrema" thomasi Pilsbry, 1945b. *The Nautilus*, 59: 60, pl. 6, figs. 7-7b. [Type locality: North Inlet of Lake Worth, Palm Beach, Florida].
[non *Vitrinella thomasi* Bartsch, 1918].

Type material: The holotype of *"Cyclostrema" thomasi* in ANSP (181309). The drawings in the original description are quite distinctive.
Other material examined: Cuba: 1 s, Cienfuegos Bay, 8 m (MHNS); 1 s, Cienfuegos Bay, 10-20 m (MHNS); 4 s, Cañon of Cienfuegos Bay, 8 m (MHNS); 1 s, Rancho Luna Beach, 10-20 m (MHNS); 2 s, Cayo Carenas, Cienfuegos Bay, 10 m (CFG).
Etymology: The specific name is based on the image of a child's drawings of the sun, rounded with radial lines.

Description: See PILSBRY (1945b).
The holotype is 1 mm.
Habitat: Species living in shallow waters. Bathymetric range: 1-20 m.
Distribution: USA: Florida (PILSBRY, 1945b); Texas (MOORE, 1964); ODÉ, 1987b). Cuba in our material.
Remarks: *Vitrinella solaris* nom. nov. and *Vitrinella filifera* are two very close species. For this reason, they were placed in synonymy by MOORE (1964). While it is true that the shells on which *V. filifera* was based were very eroded, and some characters were lost by abrasion, it is nonetheless a distinct species. The shells figured here show that there are two species involved, a little similar in profile but perfectly distinct in SEM microphotographs. *Vitrinella filifera* has narrow and curved axial ribs on the dorsum, and the protoconch has a spiral row of tubercles which are not seen in *V. solaris* nom. nov.

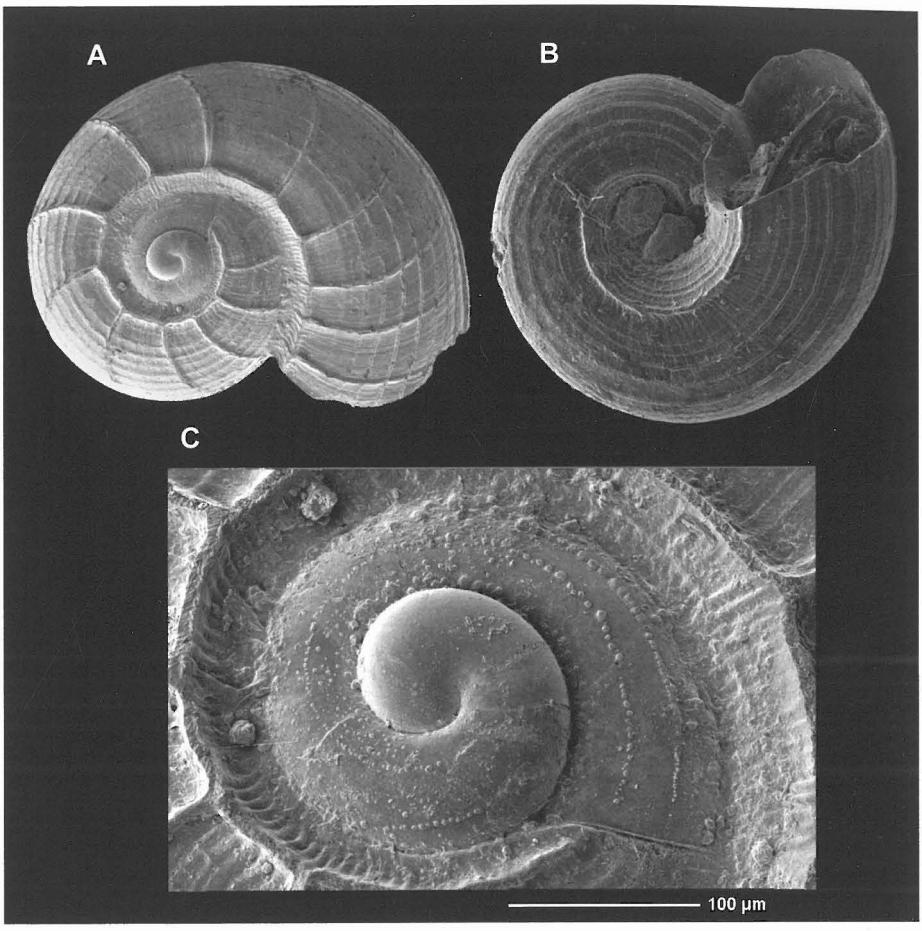
Genus *Vitrinorbis* Pilsbry & Olsson, 1952

Vitrinorbis callistus Pilsbry & Olsson, 1952. Type species by original designation.

Remarks: This genus was proposed for a group of minute, few-whorled discoidal species with a low, flat or concave spire, the base with a wide, open umbilicus and strongly carinated periphery. The surface is delicately sculptured with microscopic spiral threads which give it a soft, satiny luster. The two previously known species are from the eastern Pacific (Panamic Province), but the following one from the Caribbean appears to belong to this genus (PILSBRY & OLSSON, 1952).

Vitrinorbis elegans Olsson & McGinty, 1958 (Figures 106A-E)

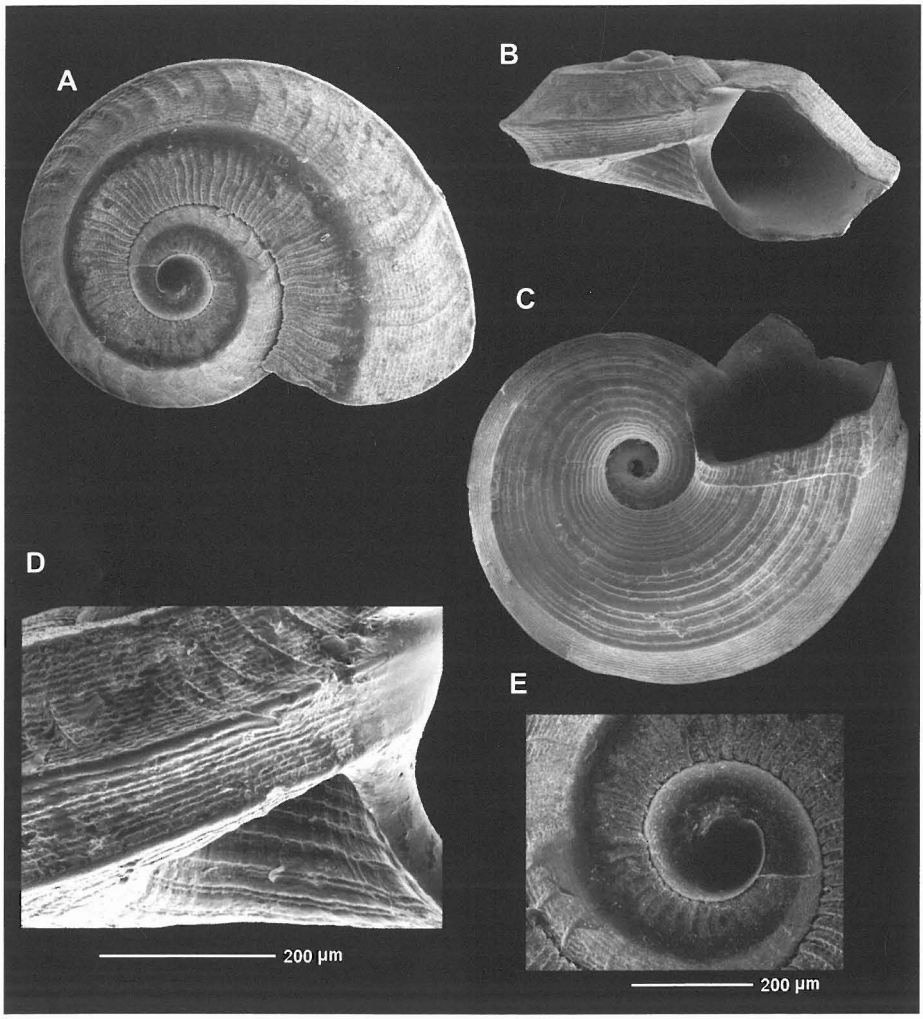
Vitrinorbis elegans Olsson & McGinty, 1958. *Bulletin of American Paleontology* 39: 31-32, pl. 4, figs. 3-3a. [Type locality: Bocas Island, Panama].



Figures 105A-C. *Vitrinella solaris* nom. nov. A-B: shells, 0.95, 0.95 mm, Cienfuegos Bay (MHNS). C: protoconch.
Figuras 105A-C. Vitrinella solaris *nom. nov. A-B: conchas, 0,95, 0,95 mm, Bahía de Cienfuegos (MHNS). C: protoconcha.*

Type material: Holotype (211881) and one paratype (211882) in ANSP. Not examined.
Other material examined: Panama: 2 s, Portobello (CHL); 3 s, Bocas Island, topotypes (CHL).

Description: The original description (OLSSON & MCGINTY, 1958) is rather complete: *"The shell is small (greater diameter, 1.4 to 1.7 mm.), thin, white or subtranslucent, depressed, with a large peripheral keel. The spire is slightly elevated, composed of 2 ½ to 3 whorls of which the nuclear portion of 1 ½ whorls is relatively large, smooth, helicoid in shape. The postnuclear whorls are a little convex or vaulted by a large, angular, submedial ridge; on the inner side of this ridge the surface is flattened to depressed, the outer side a little wider and slopes convexly towards the outer suture or towards the peripheral keel. The basal section of the shell is more depressed than the upper and likewise carries a submedial ridge or angle; within this ridge the surface has the shape of a vortex which dips into a deep umbilicus showing the inner volutions of*



Figures 106A-E. *Vitrinorbis elegans* Olsson & McGinty, 1958. A-C: shells, 1.6, 1.3, 1.6 mm, Bocas Island, Panama (CHL); D: detail of the sculpture; E: protoconch.
Figuras 106A-E. Vitrinorbis elegans *Olsson & McGinty, 1958. A-C: conchas, 1,6, 1,3, 1,6 mm, Isla Bocas, Panamá (CHL); D: detalle de la escultura; E: protoconcha.*

the spire whorls. Surface on both the dorsal and ventral sides has a delicate satiny texture produced by a sculpture of fine, microscopic spiral threads minutely cancellated by still finer lines of growth; in the sutural areas, the growth lines are heavier and may develop into axials nearly as large and strong as the spiral threads; aperture subovate, strongly oblique, attached weakly to the body whorl between the basal ridge and the peripheral keel; no parietal callus. Holotype greater diameter 1.4 mm".

Maximum reported size: 1.7 mm. Of the figured specimens, the larger is about 1.60 mm in diameter and the other about 1.27 mm in diameter and 0.59 in height.

Habitat: Nothing is known about the habitat of this species. The type material was obtained by sorting beach drift.

Depth: 0 m.

Distribution: Costa Rica (HOUBRICK, 1968); Panama (OLSSON & MCGINTY, 1958).

Remarks: This is the only species considered to be in the genus described in the Caribbean, the two previously known species are from the Panamic Province. This is a very characteristic species easily recognized by its delicate ornamentation and characteristic profile.

SPECIES NOT REPRESENTED IN OUR MATERIAL

Anticlimax schumoi (Vanatta, 1913)

Discopsis schumoi Vanatta, 1913. *Proc. of the Acad. of Nat. Sci. of Philadelphia*, 65: 24-25, pl. 2, figs. 2, 7. [Type locality: Monkey River, British Honduras].

Type material: In ANSP (76581).

Description: In VANATTA (1913).
Maximum reported size: 2.5 mm.
Distribution: British Honduras: Belize (VANATTA, 1913), Panama (RADWIN, 1969), Venezuela: unlocalized (PRINCZ, 1982).

Remarks: This species is not *Teinostoma schumoi* Vanatta, 1913.

Cochliolepis surinamensis Altena, 1966

Cochliolepis surinamensis Altena, 1966. *Zoologische Mededelingen*, 41: 236-237, figs. 3a-d. [Type locality: shell ridge at the "Kerkplein" (Church square) in Paramaribo, Surinam, at 1 m depth].

Type material: In RNHL.

Description: In ALTENA (1966).
Maximum reported size: 2.7 mm.
Distribution: Venezuela: unlocalized (PRINCZ, 1982).

Remarks: Described as Holocene fossil (ALTENA, 1966, 1975); recorded as living by PRINCZ (1982).

Discopsis omalos (de Folin, 1870)

Adeorbis omalos Folin, 1870. *Les Fonds de la Mer* 1: 190-191, pl. 23, figs. 6-7. [Type locality: Pointe-à-Pitre, Guadeloupe].
Discopsis omalus (sic): Error for *D. omalos* by JOHNSON (1934).

Description: In De FOLIN (1870).
Maximum reported size: 1.7 mm.
Distribution: Guadeloupe.

Remarks: PILSBRY & OLSSON (1945b) wrote that "D. omalos *has not been found, to our knowledge, since the original collection*". However the name *Discopsis omalos* has been used for Europe by NORDSIECK (1968), and West Africa, albeit with reservations, because the species was supposed to be Caribbean. The claim of PILSBRY & OLSSON (1945b) and the absence of specimens of this species in the material studied for this work, leads us to consider the possibility that the species is not really from the Caribbean and may have a limited distribution in the eastern Mediterranean and West Africa. De Folin was the captain of Bayonne harbour and received anchor mud from ships worldwide, which makes the possibility of mixing localities quite likely.

Pleuromalaxis pauli Olsson & McGinty, 1958

Pleuromalaxis pauli Olsson & McGinty, 1958. *Bulletins of American Paleontology*, 39: 30, pl. 3, figs. 3-3a. [Type locality: Bocas Island, Panama].

Type material: In ANSP (211902).

Description: In Olsson & McGinty (1958).

Maximum reported size: 1 mm.

Distribution: Panama; Trinidad & Tobago: Tobago (Olsson & McGinty, 1958).

Depth: 0 m.

Solariorbis hondurasensis (Vanatta, 1913)

Teinostoma hondurasensis Vanatta, 1913. *Proceedings of the Academy of Natural Sciences of Philadelphia*, 65: 26, pl. 2, figs. 8, 12. [Type locality: Belize and Monkey River, British Honduras].

Type material: In ANSP (76535).

Description: In Vanatta (1913).

Maximum reported size: 1.8 mm.

Distribution: British Honduras: Belize (Vanatta, 1913); Panama (Radwin, 1969).

Remarks: Moore (1964) placed this species in *Solariorbis*.

Solariorbis petitii (P. Fischer, 1857) (Figures 107A-B)

Skenea petitii P. Fischer, 1857c. *Journal de Conchyliologie*, 6: 288. [Type locality: Guadeloupe].

Type material: Syntypes in MNHN (23240), the better preserved one (Fig. 107) is hereby designated the lectotype.

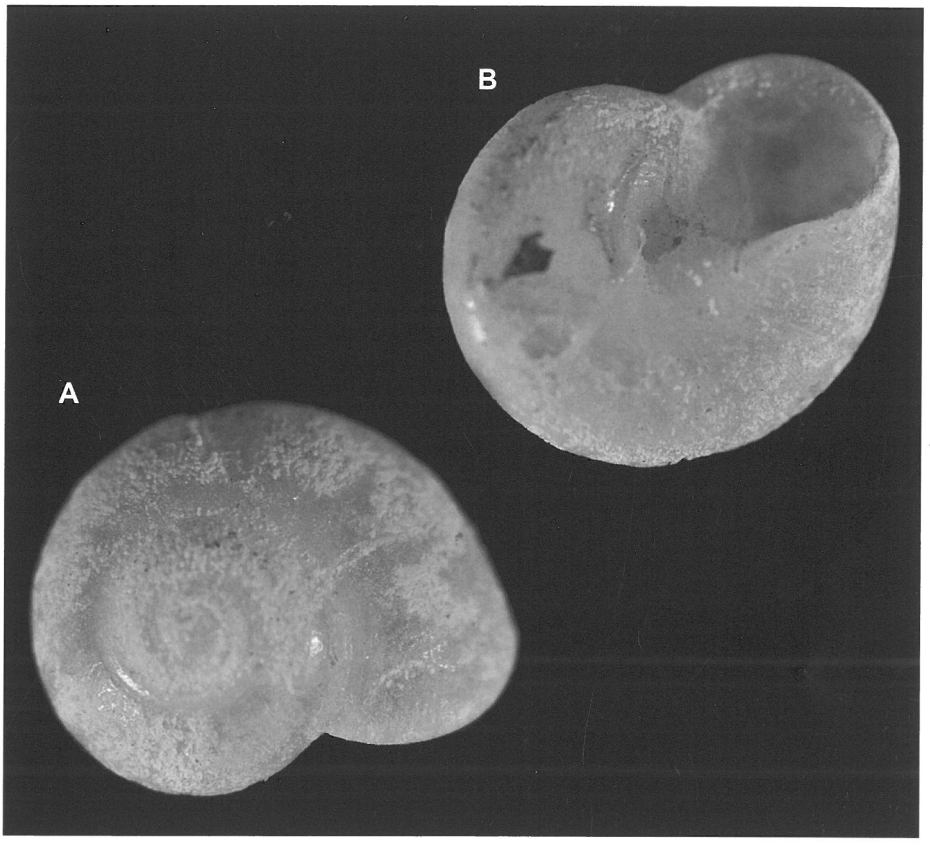
Description: In P. Fischer (1857).

Maximum reported size: 2.5 mm.

Distribution: Guadeloupe (P. Fischer, 1857).

Remarks: Moore (1964: 110-111): *"The type of this species could not be found in the Paul Fischer type collection in the Laboratoire de Malacologie in Paris. However, in the general collection of the Laboratoire there is a card bearing a glass tube containing four specimens. The card bears the following information:* "Adeorbis petitii *P. Fisch. (86)"*. In his discussion of his new species, Fischer states that soft parts and operculum resemble *Skenea planorbis*, while the shell has more the aspect of an *Adeorbis*. The shells fit the description of *Skenea petiti* with only one discrepancy, the diameter is 3 ½ mm instead of Fischer's figure of 2 ½ mm. Fischer apparently wrote *Adeorbis* on the card while working on the collection from the Antilles and did not bother to change it later. Thus the writer considers the four specimens to be the syntypes of Fischer's lost species. It has never been figured.

We have examined the photograph of one of the best preserved syntypes in MNHN and saw that the poor state of conservation precludes morphological comparison. Some small spiral cordlets on the external margin of the lip and the shape of the umbilicus suggest some similarity with *Solariorbis multistriatus*.



Figures 107A-B. *Solariorbis petitii* (P. Fischer, 1857). A-B: Lectotype (MNHN).
Figuras 107A-B. Solariorbis petitii *(P. Fischer, 1857). A-B: Lectotipo (MNHN).*

Teinostoma avunculus Pilsbry, 1953

Teinostoma (Pseudorotella) avunculus Pilsbry, 1953. *Monographs of the Academy of Natural Sciences of Philadelphia*, 18: 413-414, pl. 49, fig. 3-3d. [Type locality: Plio-Pleistocene of North St. Petersburg, Florida].

Type material: In ANSP (18917).

Description: In PILSBRY (1953).
Maximum reported size: 2.3 mm.
Distribution: USA: Florida, Texas (ODÉ, 1987b).
Depth: 11 to 18 m.
Remarks: Fossil species described by PILSBRY (1953); Recent species by ODÉ (1987b, 1988).

Teinostoma morlierei Jousseaume, 1872

Range: 14.5°N, 61°W.
Maximum reported size: 3.5 mm.
Distribution: Martinique.

Teinostoma parvum (Stimpson, 1851)

Rotella parva Stimpson, 1851 (dubious name).

Range: 34°N to 33.5°N; 79°W to 78°W.

Distribution: USA: North Carolina.

References: KURTZ (1860); PORTER (1974).

Vitrinella anomala (d'Orbigny, 1842) (Figures 108A-C)

Trochus (Rotella) anomala d'Orbigny, 1842. *Mollusques. Histoire Physique, Politique et Naturelle de l'île de Cuba* 2: 64, pl. 18, figs. 32-34. [Type locality: Saint-Thomas].

Type material: In NHMUK.

Description: D'ORBIGNY (1842) in Sagra: "*Concha orbicular, muy deprimida, translúcida, muy lisa, brillante, ligeramente aquillada en su contorno; ombligo abierto sin encostramiento calcareo, verificandose el engrosamiento calcareo por dentro del borde columelar. Espira casi horizontal, compuesta de cinco vueltas deprimidas. Boca oblonga, oval, el borde columelar muy grueso. Color blanco vítreo*".

Maximum reported size: 1.9 mm.

Distribution: Colombia (DÍAZ MERLANO & PUYANA HEGEDOS, 1994); Virgin Islands: St. Thomas (D'ORBIGNY, 1842).

Vitrinella carinata (d'Orbigny, 1842)

Trochus (Rotella) carinata d'Orbigny, 1842. *Mollusques. Histoire Physique, Politique et Naturelle de l'île de Cuba* 2: 62-63, pl. 18, figs. 26-28. [Type locality: Saint-Thomas].

Type material: The material in USNM was not found (Yolanda Villacampa, pers. comm.). The material in NHMUK apparently had the labels changed and was a different species.

Description: In D'ORBIGNY (1842).

Maximum Reported Size: 1.5 mm

Distribution: USA: North Carolina (PORTER, 1974); Virgin Islands: St. Thomas (D'ORBIGNY, 1842b). Depth: 29 m.

Remarks: *Nomen dubium* according to MOORE (1964).

Vitrinella hemphilli Vanatta, 1913

Vitrinella hemphilli Vanatta, 1913. *Proceedings of the Academy of Natural Sciences of Philadelphia* 65: 24, pl. 2, figs. 1, 3. [Type locality: Cedar Keys, Florida].

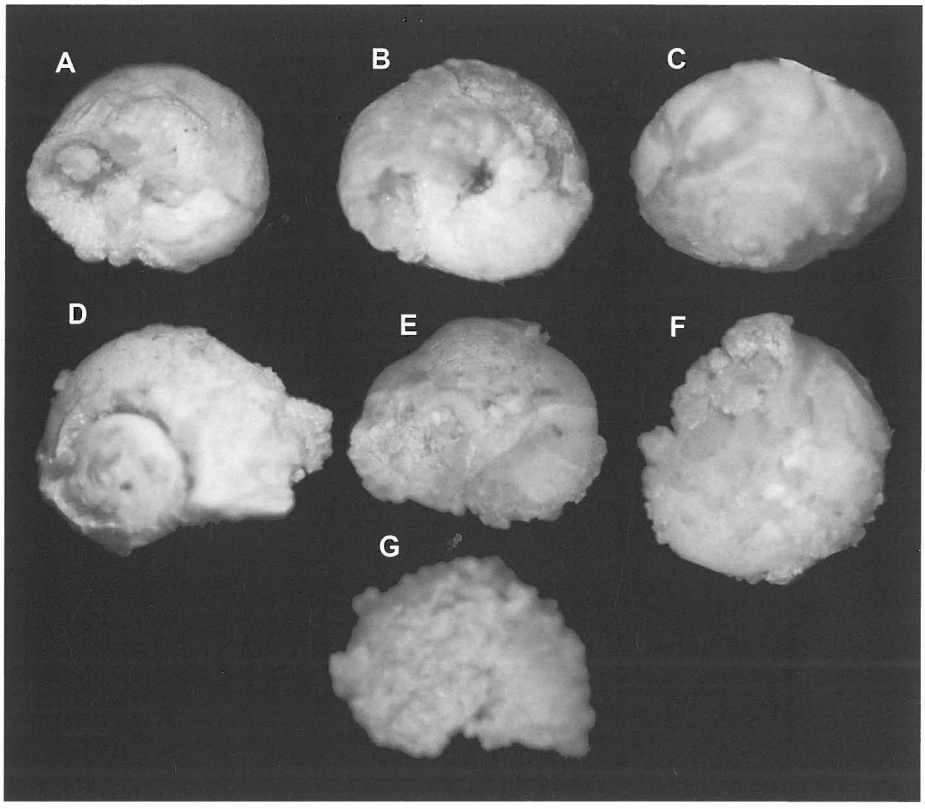
Type material: In ANSP (10236).

Description: In VANATTA (1913).

Maximum reported size: 2.5 mm.

Distribution: USA: Florida: West Florida (VANATTA, 1913); Texas (ODÉ, 1987c); Colombia (DÍAZ MERLANO & PUYANA HEGEDUS, 1994). Depth: 0.6 to 73 m (alive at 51 m).

Remarks: MOORE (1964): "V. hemphilli *has a dorsal spiral cord which disappears after one turn. In this, it is*



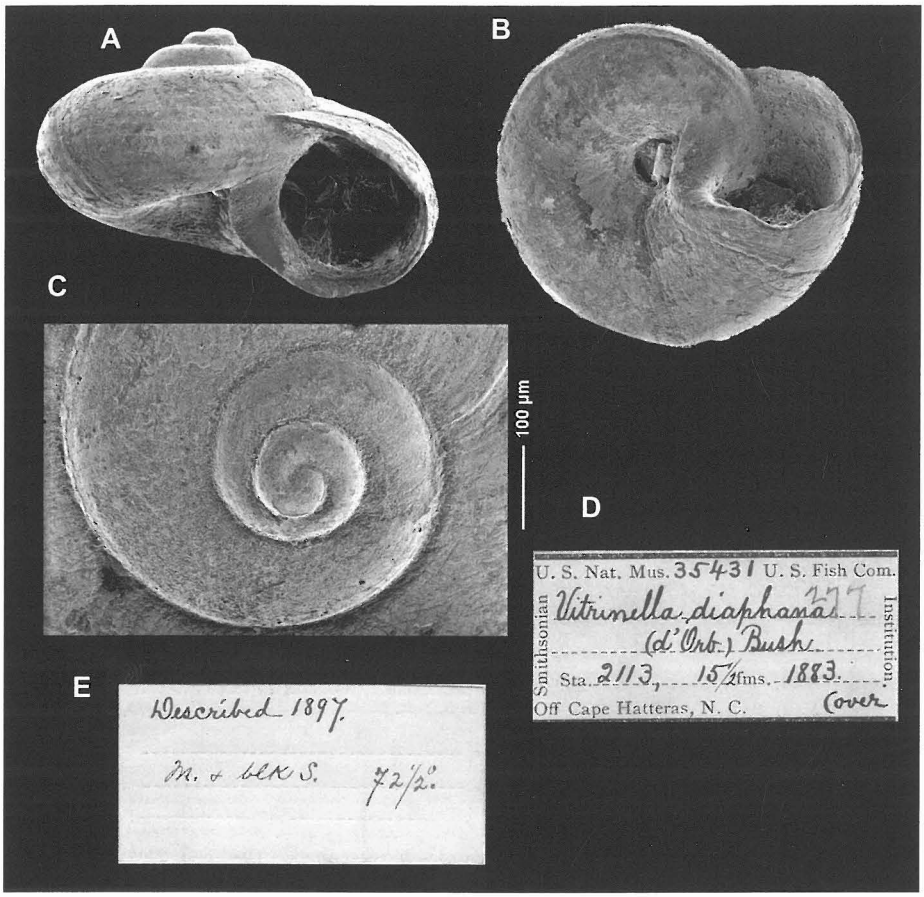
Figures 108A-G. Syntypes of *Rotella*. A-C: *Rotella anomala* (d'Orbigny, 1842), syntypes in NHMUK; D-F: *Rotella striata* (d'Orbigny, 1842), syntypes in NHMUK; G: *Rotella diaphana* (d'Orbigny, 1842), syntype in NHMUK.
Figuras 108A-G. Sintipos de Rotella. *A-C:* Rotella anomala *(d'Orbigny, 1842), sintipos en NHMUK; D-F:* Rotella striata *(d'Orbigny, 1842), sintipos en NHMUK; G:* Rotella diaphana *(d'Orbigny, 1842), sintipo en NHMUK.*

like V. helicoidea, *but the pointed spire and absence of a strong carina around the umbilicus separates it from that species".*

Vitrinella pusilla (L. Pfeiffer, 1840) (Figs. 108G, 109A-E)

Rotella pusilla Pfeiffer, 1840. *Archiv für Naturgeschichte*, 6(1): 255. Not figured [Type locality: Cuba (Nordküste, L. PFEIFFER 1839: 349; Matanzas Bay or Cardenas, based on localities cited by L. PFEIFFER, 1854].
Trochus (Rotella) diaphana d'Orbigny, 1842. *Mollusques. Histoire Physique, Politique et Naturelle de l'île de Cuba* 2: 62, pl. 18, figs. 23-25. [Type locality: Saint-Thomas].
Pseudorotella pusilla (L. Pfeiffer, 1840).

Type material: One syntype in NHMUK (Fig. 108G]. In USNM (35431) (secondary type collection: as *Rotella diaphana*).



Figures 109A-E. *Vitrinella diaphana* (d'Orbigny, 1842b). A-B: specimens identified by Bush, from off Cape Hatteras; 1.27 mm, USNM (35431); C: protoconch; D-E: labels.
Figuras 109A-E. Vitrinella diaphana *(d'Orbigny, 1842b). A-B: ejemplares identificados por Bush, procedentes de frente a Cape Hatteras; 1,27 mm, USNM (35431); C: protoconcha; D-E: etiquetas.*

Description: Original description of *Rotella pusilla* in PFEIFFER (1840): *"Testa discoidea nitide alba; anfract. 3; basi concaviuscula, medio callosa: apertura orbiculari. Diam. ¾, alt. 1/ 3 lin"*.

Original description of *Trochus (Rotella) diaphana* in D'ORBIGNY, 1842: *"Coquille orbiculaire, deprimee, diaphane, trés lisse, très polie, convexe du côte de la espire, legérement concave du côte de la bouche, la callosite étant peu etendue. Spire peu elevée, tres obtuse, composée de quatre tours convexes, á pourtour arrondie. Bouche ovale, oblique. Couleur: blanc transparent comme du verre.*

Maximum reported size: 1.5 mm.

Distribution: Cuba: North Havana Province (ARANGO, 1880); USA: North Carolina (BUSH, 1897); Panama: Bocas Island (OLSSON & MCGINTY, 1958).

Remarks: The types of *Rotella pusilla* Pfeiffer, 1840 are untraceable. L. PFEIFFER (1840) offered a short and ambiguous text and no figure. Consequently it may be confused with several taxa. The type material is from

Cuba, but we have not found any museum or shell collection with material labeled *R. pusilla*, which could serve as a reference. Therefore we consider *Rotella pusilla* L. Pfeiffer, 1840 as a *nomen dubium* until the type material is located. Under these conditions the synonymy established for *Vitrinella diaphana* can not be accepted.

The types of *Vitrinella diaphana* Orbigny, 1842 in NHMUK are in very poor condition (Fig. 108G). In the secondary type collection of the USNM (35431) are deposited 2 shells labeled by BUSH (1897) as *V. diaphana* (d'Orb.), from Cape Hatteras, North Carolina.

This taxon has been included in the following genera: *Parkeria, Adeorbis* and *Teinostoma*.

We have some doubts about the accuracy of the identification made by BUSH (1897) due to its great similarity to *Solariorbis terminalis*. The differences between them are quite minor: The shell labeled as *V. diaphana* lacks the subsutural sulcus, its periphery is more rounded, and some wide depressed spiral cords are visible on the whole surface of the shell. At present we shall keep the taxa separate until topotypes of *V. diaphana* become available. Such material should help in the correct assignament of both nominal taxa.

Vitrinella tryoni Bush, 1897

Vitrinella helicoidea auct. non C.B. Adams, 1850.

Vitrinella tryoni Bush, 1897. *Transactions of the Connecticut Academy of Arts and Sciences*, 10: 123, pl. 22, figs. 11-11a. [Type locality: USFC sta. 2278, off Cape Hatteras, North Carolina, 16 fms (29 m)].

Type material: Holotype in USNM (41561).

Description: BUSH (1897).

Maximum reported size: 2 mm.

Distribution: USA: North Carolina (BUSH, 1897); Cuba: North Havana Province, North Matanzas (AGUAYO & JAUME, 1936).

Depth: 29 m.

Remarks: The species was misidentified by TRYON (1888: 102, pl.34, figs. 40, 41) as *V. helicoidea* C.B. Adams. The type of this species (USNM 41561) is only a fragment and canot be identified at the species level (Yolanda Villacampa and Jerry Harasewych, pers. comm.).

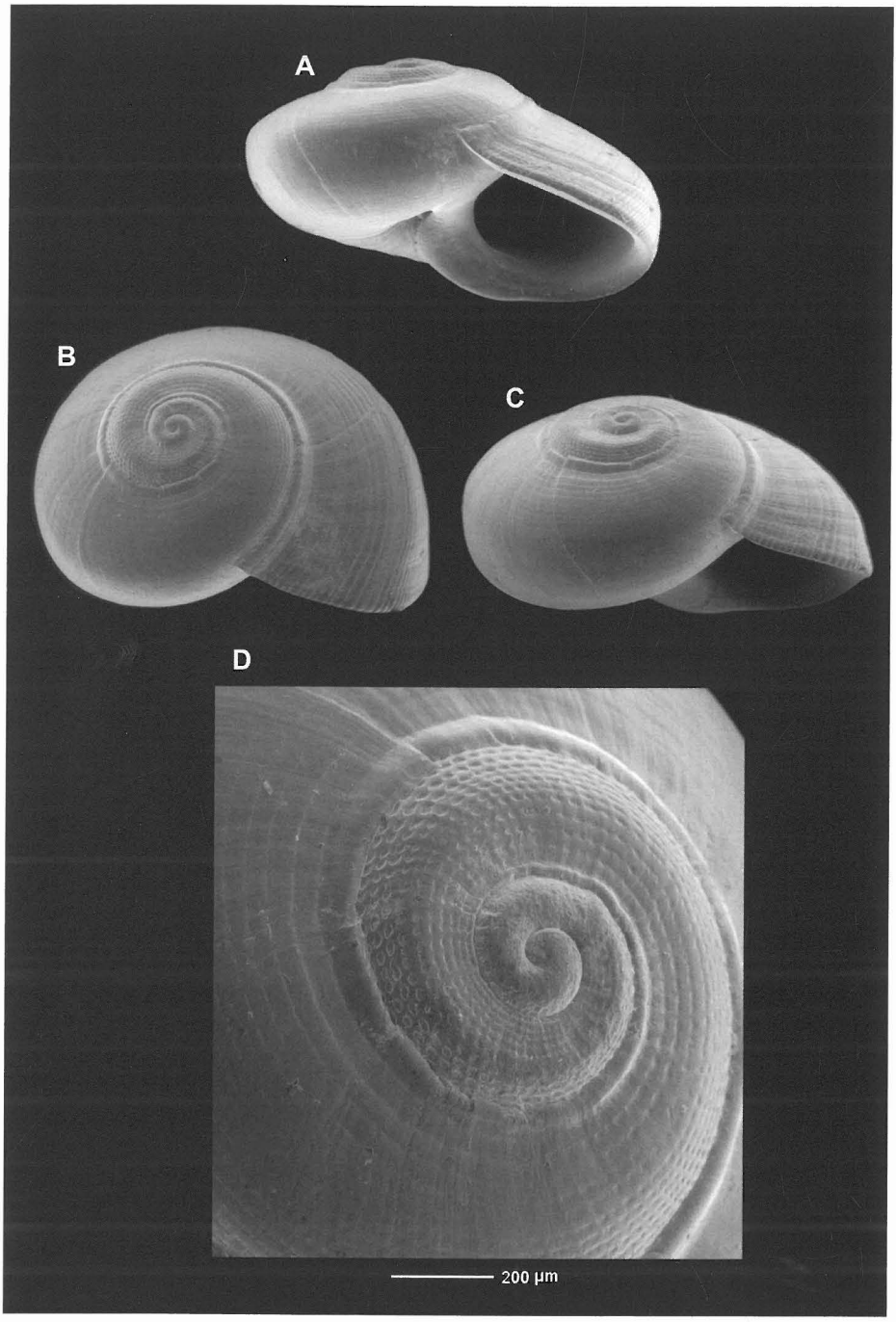
FOSSIL OR SUPPOSEDLY FOSSIL SPECIES, NOT RECENT

Many of the fossil species described in some papers (for example, PILSBRY, 1953) have been recorded in other works as also occurring in the recent. Other species, already known as fossil, are added in this paper to the recent fauna for the first time. Others yet, only known as fossil species, are not the main topic of this work. Of the last group, we can mention the following:

Anticlimax athleenae (Pilsbry & McGinty, 1946)

Climacia athleenae Pilsbry & McGinty, 1946. *The Nautilus*, 59: 78-79, pl. 8, figs. 3-3a. [Type locality: Boca Ciega Bay].

Type material: In ANSP (181291).



Figures 110A-F. *Cyclostremiscus fargoi* Pilsbry, 1953. A-C: shell, 1.6 mm, Pliocene of La Belle, Florida (CHL); D-F: shell, 1.4 mm, Pliocene of La Belle, Florida (CHL).
Figuras 110A-F. Cyclostremiscus fargoi *Pilsbry, 1953. A-C: concha, 1,6 mm, Plioceno de La Belle, Florida (CHL); D-F: concha, 1,4 mm, Plioceno de La Belle, Florida (CHL).*

Description: In PILSBRY & MCGINTY (1946).

Maximum reported size: 2.6 mm.

Distribution: USA: Florida: West Florida (Pilsbry & McGinty, 1946a); Colombia (DÍAZ MERLANO & PUYANA HEGEDUS, 1994).

Remarks: MOORE (1964) mentions: *"This species is known from a single specimen taken from fill dredged from Boca Ciega Bay. It is here considered to be a fossil of unknown age".*

Aorotrema gardnerae Pilsbry, 1953.

Aorotrema gardnerae Pilsbry, 1953. *Monographs of the Academy of Natural Sciences of Philadelphia*, 18: 424, pl. 39, fig. 13. [Type locality: Upper Miocene, Natural Well, Duplin Co., North Carolina].

Type material: In ANSP (19550).

Cyclostremiscus fargoi Pilsbry, 1953 (Figures 110A-F)

Cyclostremiscus fargoi Pilsbry, 1953. *Monographs of the Academy of Natural Sciences of Philadelphia*, 18: 424-425, pl. 56, figs. 1-1c. [Type locality: Plio-Pleistocene, St. Petersburg, Florida].

Type material: ANSP (18399).
Other material examined: USA: 2 s, Pliocene of La Belle, Florida (CHL).

Cyclostremiscus gunteri (Mansfield, 1930)

Circulus gunteri Mansfield, 1930. *Florida State Geol. Survey Bull.* 3: 132, pl. 20, figs. 16-18. [Type locality: Upper Miocene, Leon County, Florida].

Type material: In USNM (370493).

Cyclostremiscus olssoni Pilsbry, 1953.

Cyclostremiscus olssoni Pilsbry, 1953. *Monographs of the Academy of Natural Sciences of Philadelphia*, 18: 426, pls. 54, figs. 6-6c. [Type locality: Plio-Pleistocene, Shell Creek, Florida].

Type material: In ANSP (18453).

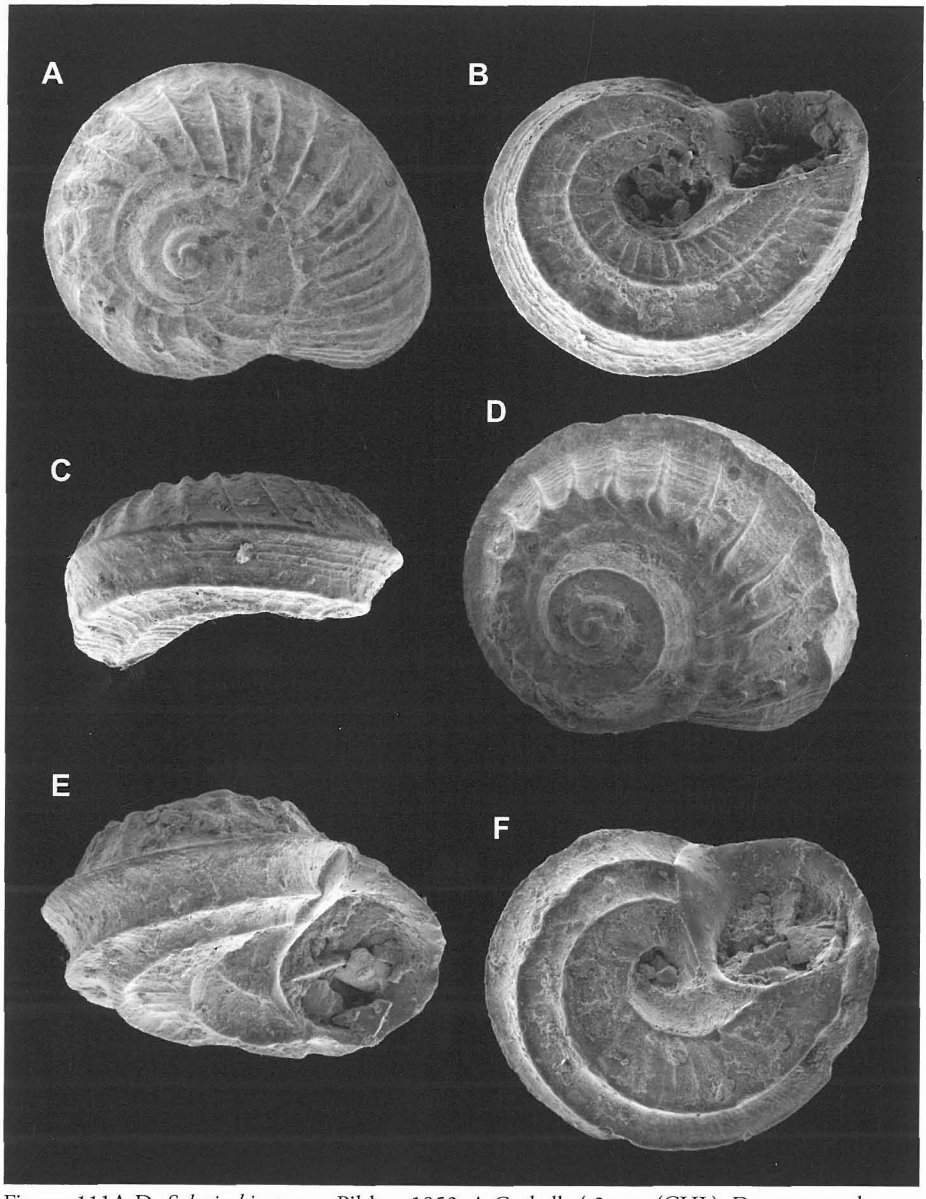
Parviturboides avitus Pilsbry, 1953.

Parviturboides avitus Pilsbry, 1953. *Monographs of the Academy of Natural Sciences of Philadelphia*, 18: 436, pl. 56, figs. 3-3a. [Type locality: Plio-Pleistocene, St. Petersburg, Florida].

Type material: In ANSP (18460).

Solariorbis eugenes Pilsbry, 1953 (Figures 111A-D)

Solariorbis eugenes Pilsbry, 1953. *Monographs of the Academy of Natural Sciences of Philadelphia*, 18: 418-419, pl. 54, figs. 1, 1a-b. [Type locality: Plio-Pleistocene, St. Petersburg, Florida].



Figures 111A-D. *Solariorbis eugenes* Pilsbry, 1953. A-C: shell, 4.3 mm (CHL); D: protoconch.
Figuras 111A-D. Solariorbis eugenes *Pilsbry, 1953. A-C: concha, 4,3 mm (CHL); D: protoconcha.*

Type material: In ANSP (18413).
Other material examined: USA, Florida: 1 s, fossil Pleistocene, ST. Petesburg (CHL).

Description: This is the original description in PILSBRY (1953): *"The shell is solid, somewhat lens-shaped, with low spire, rounded periphery and a rather narrow, deep umbilicus. There are 3 ½ whorls, the first 1 ½ relatively large, convex and smooth, the next whorl with about 8 or 9 narrow and*

shallow spiral grooves more or less distinctly interrupted by retractive radial striae crossing the grooves. On the last whorl this sculpture is nearly or wholly lost, leaving it almost smooth except for a distinct subsutural margin defined by a spiral groove. The aperture is oblique, subcircular but with a grooved upper angle. The peristome is rather thin. The columella is widened by a flat, triangular callus at the end of the rounded ridge which surrounds and contracts the umbilicus. The parietal callus is thin, its outer edge indistinct. Diameter 4.2 mm, height 2.5 mm".

Remarks: Plio-Pleistocene fossil species of St. Petersburg, Florida. We do not know any current reference for this species. PILSBRY (1953) commented: *"This appears to be a typical* Solariorbis, *having sculpture on the penult whorl like the type, becoming almost smooth at the last whorl"*. The shell figured does not appear to be a fossil shell.

Teinostoma caloosaense Dall, 1892

Teinostoma caloosaense Dall, 1892. *Trans. Wagner Free Inst. Sci.*, 3: 413, pl. 23, fig. 8. [Type locality: Plio-Pleistocene, Caloosahatchie River, Florida].

Type material: In USNM (113110).

Teinostoma tectispira Pilsbry, 1953

Teinostoma tectispira Pilsbry, 1953. *Monographs of the Academy of Natural Sciences of Philadelphia*, 18: 417, pl. 50, figs. 6-6c. [Type locality: Plio-Pleistocene, St. Petersburg, Florida].

Type material: In ANSP (18406).

SPECIES FROM NEIGHBOURING GEOGRAPHIC AREAS

Neusas marshalli (Sykes, 1925) (Figures 112A-C)

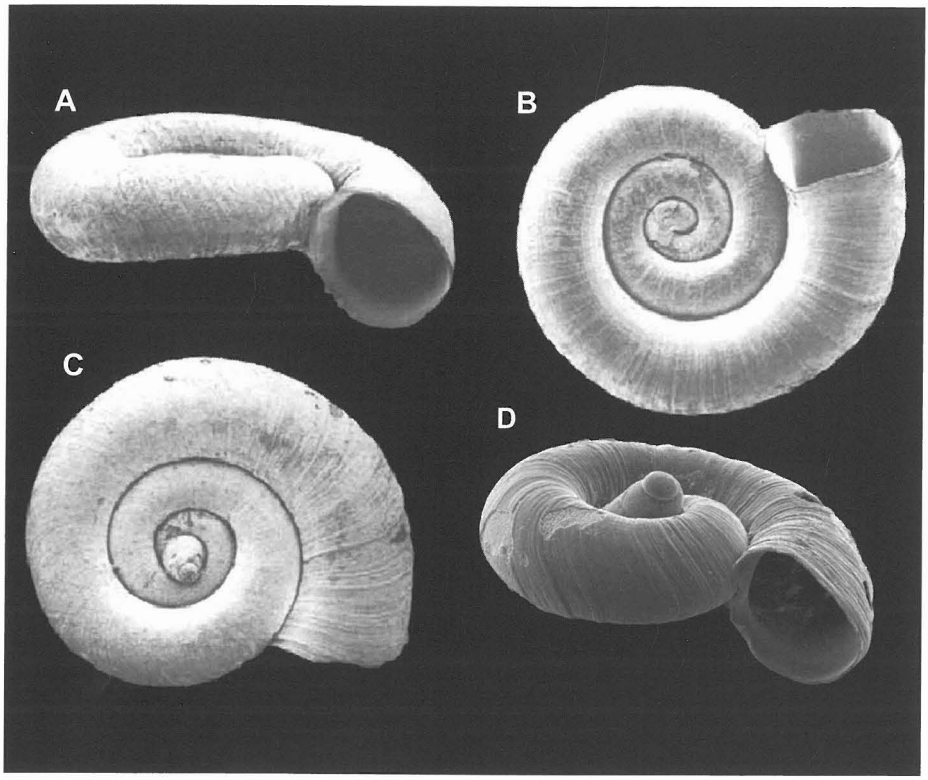
Homalogyra (?) marshalli Sykes, 1925: 193, pl. 9, fig. 9-9a [Type locality: off Portugal, 39°42'N, 09°43'W, 1092-1993 m, Porcupine Expedition sta. 17].

Description: SYKES (1925): *"Morphology: Shell planispiral, resembling a planorbid, with rounded and almost smooth whorls with a deep suture. Protoconch tall-spired and obliquely inserted, with slightly more than two whorls, smooth. Teleoconch with about three slightly irregularly coiled whorls. Operculum corneous, multispiral, round with central nucleus".*

Size: Shell diameter up to 2.06 mm.

Distribution: See WARÉN & BOUCHET (2001). Mid-Atlantic Ridge: Menez Gwen hydrothermal vent, Azores (37.84°N; 31.52°W to 9.72°W). Depth: 870 to 860 m (collected alive).

One shell (Fig. 112 D) of *Neusas* s.p (Absalão, pers. com.) showed the wide distribution of this genus in south Atlantic.



Figures 112A-D. *Neusas marshalli* (Sykes, 1925). A-C: shells, 2 mm, Menez Gwen hydrothermal vent, Azores, Atlantic Ocean (with authorization of A. Warén); D: *Neusas* sp., 1.1 mm, Campos Basin, Rio de Janeiro, Brazil (with authorization of R. Absalão).
Figuras 112A-D. Neusas marshalli *(Sykes, 1925). A-C: conchas, 2 mm, Menez Gwen hydrothermal vent, Azores, Atlantic Ocean (con la autorización de A. Warén); D:* Neusas *sp., 1.1 mm, Campos Basin, Rio de Janeiro, Brazil (con la autorización de R. Absalão).*

Ponderinella xacriaba Absalão, 2009 (Figures 113A-C)

Ponderinella xacriaba Absalão, 2009. *American Malacological Bulletin*, 27: 138, figs. 2E-H. [Type locality: BC Sul I, sta. 73, Campos Basin, Rio de Janeiro State, Brazil, 22°41'35"S, 40°00'45"W, 1950 m].

Description: Absalão (2009).
Maximum reported size: 1.23 mm.

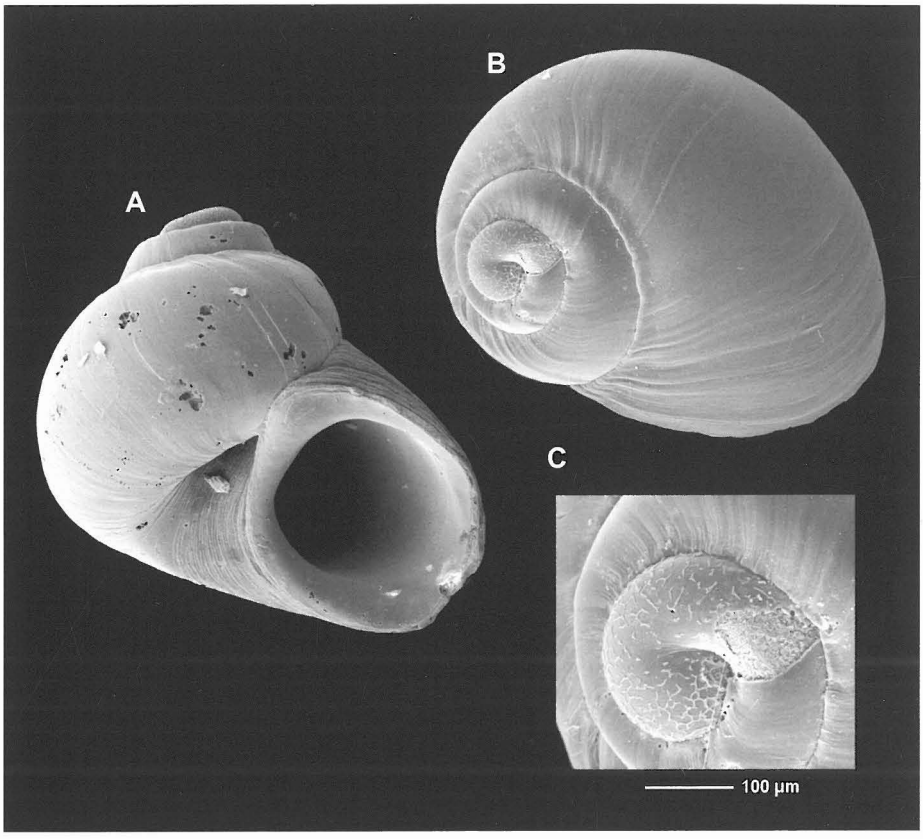
Distribution: Brazil: Rio de Janeiro.
Depth: 1030 to 1950 m.

Teinostoma abnorme E.A. Smith, 1890

Teinostoma ?abnorme E.A. Smith, 1890. *Proceedings of the Zoological Society of London*, 1890: 293, pl. 24, fig. 5. [Type locality: St. Helena].

Description: In Smith (1890).
Maximum reported size: 1 mm.

Distribution: Eastern Atlantic: St. Helena. Only known from its type locality.



Figures 113A-C. *Ponderinella xacriaba* Absalão, 2009. (Photographs authorized by R. Absalão)
Figuras 113A-C. Ponderinella xacriaba *Absalão, 2009. (Fotografías autorizadas por R. Absalão)*

SPECIES RECORDED ERRONEOUSLY FROM THE CARIBBEAN

Adeorbis elegans (A. Adams, 1850)

Cyclostrema elegans A. Adams, 1850. *Proceedings of the Zoological Society of London*, 18: 44. [Type locality: Sibonga, island of Cebu, Philippines, 10 fathoms (18 m)].

Remarks: It has been reported from St. Thomas but this is a species described from the Philippines and so its presence in the Caribbean is very improbable.

Vitrinella regularis (C.B. Adams, 1852)

Remarks: Holotype in MCZ (156374). With the shell is a label indicating "Jamaica". Probably it is an error, because it is a Pacific (Panamic) species.

SUPPLEMENT

DUBIOUS SPECIES, APPARENTLY NOT TORNIDAE

These taxa are not the subject of the present work. Nevertheless, some of them have been recorded dubiously or positively in Vitrinellidae. As we obtained photographs, we present some of them as information for the reader.

"Aorotrema" erraticum Pilsbry & McGinty, 1945 (Figure 114A)

Aorotrema erraticum Pilsbry & McGinty, 1945a. *The Nautilus*, 59: 1, pl. 11. [Type locality: 1.5 miles off Cape Florida, 12 fms (22 m)].

Material examined: 1 s, Cienfuegos, Cuba (MHNS).

Remarks: MOORE (1964: 189) said: *"the examination of the holotype of* A. erraticum *informs that it is a juvenile of* Turbo castaneus *Gmelin due to the coincidence of all the details, protoconch, shape and sculpture"*. We accept this opinion and represent a sample of this shell.

"Vitrinella tincta" C.B. Adams, 1850 (Figs. 114B-D)

Vitrinella tincta C.B. Adams, 1850. *Monograph of Vitrinella*: 8.

Type material: The lectotype in MCZ (156257) (figured in CLENCH & TURNER, 1950, plate 35 fig. 6) and 1 second specimen (also figured in CLENCH & TURNER, 1950, plate 35 fig. 3) labeled as paratype, in MCZ (186189).
Other material examined: Virgin Islands: 1 s, beach at Magens Bay, N coast of St. Thomas, Virgin Is. (CHL).

Remarks: This species is represented by some drawings of the types, and the description is commented on in CLENCH & TURNER (1950). The appearance is not that of a valid species but rather a juvenile *Tegula* as suggested by its colored spots aligned spirally.

"Vitrinella" carinifex Dall, 1927 (Figures 115A-D)

Vitrinella? Carinifex Dall, 1927. *Proceedings of the United States National Museum*, 70(2667): 126. [Type locality: Off Georgia].

Type material: Lectotype in USNM (108399) (Figs. 115A-D).

Description: In DALL (1927).

Distribution: Only known from the type material, from Georgia, USA. Range: 30.73°N; 79.43°W. Depth: 805 m.

Remarks: DALL (1927) comments: *"This is probably not a true* Vitrinella *and may be immature but certainly is not the young of any of the species enumerated in this discussion"*.

The lectotype of *Vitrinella carinifex* in USNM is not a *Vitrinella* or a tornid. In our opinion perhaps it is a young naticid (see the notch in the columella). Maximum reported size: 3.7 mm.

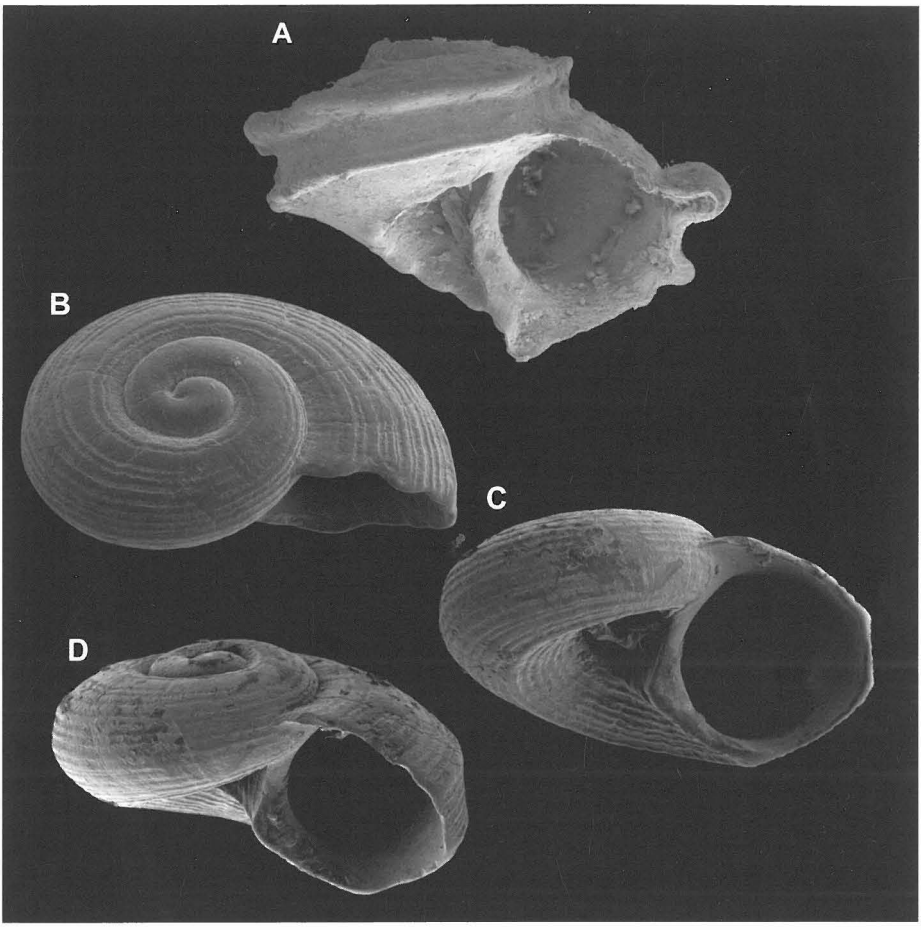


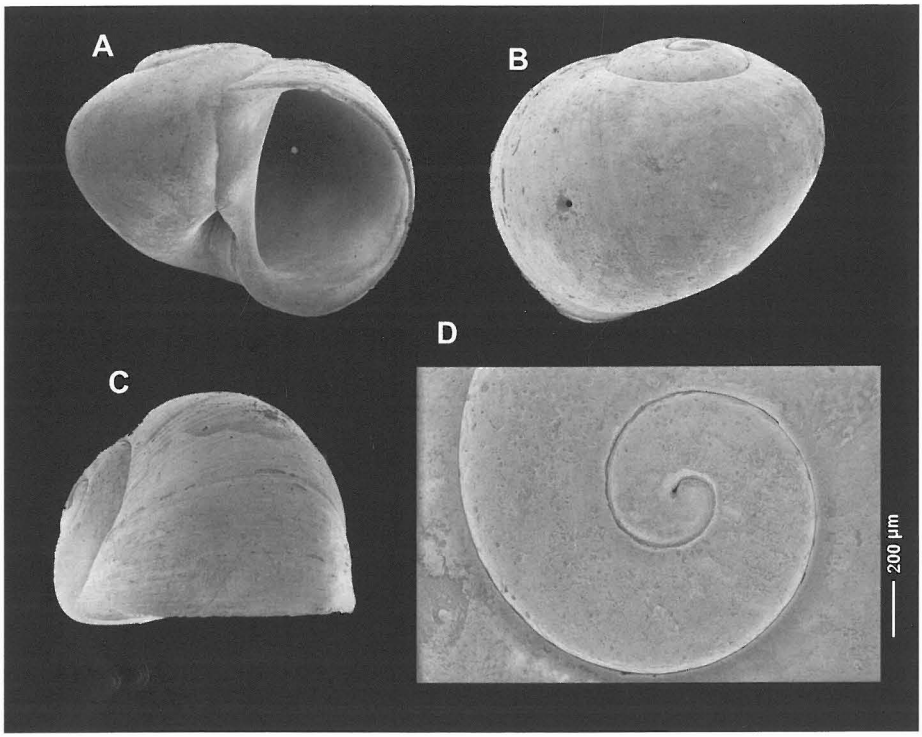
Figure 114A. *"Aorotrema" erraticum* Pilsbry & McGinty, 1945. A: shell, 5.1 mm, Cienfuegos, Cuba (MHNS). Figures 114B-D. *Vitrinella tincta* C.B. Adams, 1850. Lectotype (labeled as syntype) (MCZ 156257).
Figura 114A. "Aorotrema" erraticum *Pilsbry & McGinty, 1945. A: concha, 5,1 mm, Cienfuegos, Cuba (MHNS). Figuras 114B-D.* Vitrinella tincta *C.B. Adams, 1850. Lectotipo (etiquetado como sintipo) (MCZ 156257).*

Vitrinella cyclostomoides (L. Pfeiffer, 1840)

Helix (?) cyclostomoides Pfeiffer, 1840. *Archiv für Naturgeschichte* 6(1): 251, [Pfeiffer, 1850, pl. 85, figs. 24-26]. [Type locality: Cuba [Nordküste (L. PFEIFFER, 1839: 349); Matanzas (L. PFEIFFER, 1854c)].

Description: L. PFEIFFER (1840).
Maximum reported size: 3.2 mm.
Distribution: Cuba: North Matanzas: L. PFEIFFER (1840); L. PFEIFFER (1852). Depth: 0 m.

Remarks: This species has been treated as both terrestrial and marine. L. PFEIFFER (1840) named it a *Helix* but found his specimen(s) at the 'Seestrande'. He later expressed doubt



Figures 115A-D. "*Vitrinella" carinifex* Dall, 1927. A-C: lectotype, 3.5 mm in diameter (USNM 108399); D: protoconch. (SEM's by Yolanda Villacampa, USNM).
Figuras 115A-D. "Vitrinella" carinifex *Dall, 1927. A-C: lectotipo, 3,5 mm de diámetro (USNM 108399); D: protoconcha. (Fotografías al MEB de Yolanda Villacampa, USNM).*

that it was a landsnail (L. PFEIFFER, 1854: 179). ARANGO (1880) treated it as the valid name for *Adeorbis adamsii* and ESPINOSA *ET AL.* (1995) regarded it as a valid species of *Vitrinella*. TRYON (1887: 100), however, treated it as a *Microphysa* and RICHARDSON (1986) placed it in *Hojeda* (Sagdidae). It is not listed among the Cuban *Hojeda* by ESPINOSA & ORTEA (1999), and the only Cuban *Hojeda* with a range that includes Matanzas is *Hojeda boothiana* (L. Pfeiffer, 1839), a taxon that Pfeiffer clearly did not consider conspecific with his *Helix cyclostomoides*.

Vitrinella hyalina C.B. Adams, 1850

Vitrinella hyalina C.B. Adams, 1850e. *Monograph of Vitrinella, a New Genus of New Species of Turbinidae*: 5, Not figured. [Type locality: Port Royal, Jamaica].

Type material: Lost (CLENCH & TURNER, 1950).

Description: C.B. Adams (1850).
Maximum reported size: 1.7 mm.
Distribution: Jamaica: C.B. ADAMS (1850).

Remarks: Possibly this is a naticid (see MOORE, 1964: 51).

VITRINELLID SPECIES TRANSFERRED TO OTHER FAMILIES

Family TURBINIDAE Rafinesque, 1815

Some genera of this family are composed of small, lenticular or depressed shells with a low spire, and for these reasons they may be confused with Tornidae. Occasionally, some of them have been placed in this family so we make reference to them here.

Subfamily SKENEINAE Clark, 1851

Genus *Cirsonella* Angas, 1877

Cirsonella Angas, 1877: 38. Type species, by monotypy, *Cirsonella australis* Angas, 1877 (Fig. 11A), southern Australia.
Tharsis Jeffreys, 1883: 93 (not Giebel, 1847). Type species, by monotypy, *Oxistele romettensis* Granata, 1877, Mediterranean.
Tharsiella Bush, 1897: 113. Replacement name for *Tharsis* Jeffreys, 1883 not Giebel, 1847.
Porcupinia Cossmann, 1900: 43. Replacement name for *Tharsis* Jeffreys, 1883.
Porcupina Cossmann, 1925: 287. Misspelling.

Diagnosis: In WARÉN (1991: 159): *"Small skeneimorph gastropods with almost globular, smooth shell, almost round, prosocline aperture, with thickening at umbilicus. Protoconch finely and irregularly spirally striated. Operculum sturdy, yellowish with long growth zone. Radula with four to five undifferentiated lateral teeth and well developed basal plate on innermost marginal tooth. Propodial penis not present"*.

The operculum of *Cirsonella* differs from the typical species of *Skeneidae*, having its last 1/3 whorl slowly tapering, while in *Skeneidae*, it ends abruptly with an oblique edge covering about 1/20 of the whorl. Another differential characteristic is that species of *Cirsonella* retract the operculum only very slightly, or not at all, behind the peristome, contrary to most skeneids.

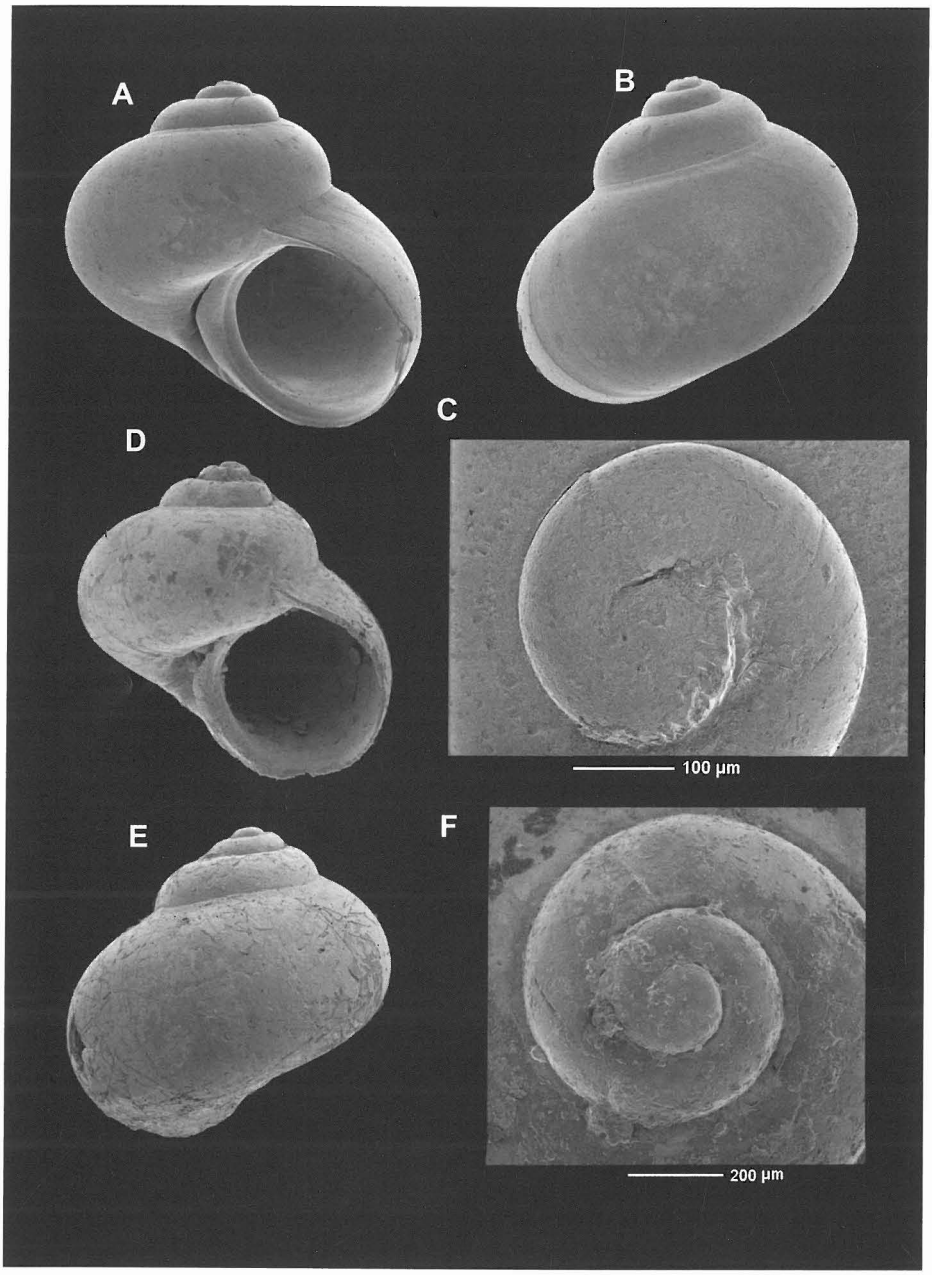
Cirsonella floridensis (Dall, 1927) (Figures 116A-C)

Pseudorotella floridensis Dall, 1927. *Proceedings of the United States National Museum* 70(2667): 126. [Type locality: *Albatross* sta. 2668, off Fernandina, Florida [actually off Georgia], 30°58'N, 79°38'W, 294 fathoms (529 m)].

Type material: Lectotype in USNM (108133). Examined by SEM microphotographs.

Original description: In DALL (1297): *"Shell small, porcelaneous white, smooth, polished, turbinate, with four well-rounded whorls; suture distinct, not deep; aperture nearly circular, the margin simple, continuous over the body with a marked deposit of enamel behind the body lip and over the umbilical region, completely closing the umbilicus and in the completely adult sometimes produced in subangulate form above and below. Height, 2 mm; maximum diameter, 3 mm"*.

We add the following: The protoconch measures 260 μm in maximum diameter, smooth and ¾ of a whorl. There is no sculpture. There are two fine spiral cordlets in the umbilicus and there is no umbilical cord bordering it. In the figured specimen the columellar callus reduces the umbilicus to a fine fissure, however, as is explained in DALL (1927), in other shells the callus totally covers the umbilicus. In the inner part of the aperture and along the columella and the inner lip there is a wide



Figures 116A-C. *Cirsonella floridensis* (Dall, 1927). A-B: lectotype, 2.2 mm in diameter (USNM, 108133); C: protoconch. (SEM's by Yolanda Villacampa, USNM). Figures 116D-F. *Cirsonella georgiana* (Dall, 1927); D-E: lectotype, 1.95 mm, (USNM, 329375); F: protoconch. (SEM's by Yolanda Villacampa, USNM).
Figuras 116A-C. Cirsonella floridensis *(Dall, 1927). A-B: lectotipo, 2.2 mm de diámetro (USNM, 108133); C: protoconcha. (Fotografías al MEB deYolanda Villacampa, USNM). Figuras 116D-F.* Cirsonella georgiana *(Dall, 1927); D-E: lectotipo, 1.95 mm, (USNM, 329375); F: protoconcha. (Fotografías al MEB de Yolanda Villacampa, USNM).*

fold which is like an "opercular stop", characteristic of the species of the genus *Cirsonella*.

The studied shell is 2.2 mm in diameter and 2.2 mm in height.

Habitat: Dredged from 678 meters depth, in gray sand and broken coral bottom. Abundant.

Distribution: From off Fernandina (actually off Georgia) (DALL, 1927); from North Carolina (PORTER, 1974); ODÉ (1987a).

Remarks: Actually this species has been placed in the genus *Teinostoma*. DALL (1927) mentions: "*This is much like* Pseudotorella solida, *but larger, more elevated, and with the umbilical pad heavier and more simple*". As in *Lydipnis margaritiformis*, the morphologic characters of the shell make one think it is a skeneid, most probably in the genus *Cirsonella* Angas, 1877. The shell studied is very similar to *Cirsonella extrema* Thiele, 1912 (USNM 613041), in WARÉN (1991: 212, fig. 11B), being distinguished from it by the lower number of spiral striae around the umbilicus. It is also similar to *Cirsonella romettensis* (Granata, 1877) even to the number of the spiral fillets around the umbilicus, but from that species it differs by its smooth vs spirally striated, protoconch. Based on all the above, we propose the new combination *Cirsonella floridensis* (Dall, 1927).

Cirsonella georgiana (Dall, 1927) (Figs. 116D-F)

Vitrinella georgiana Dall, 1927. *Proceedings of the United States National Museum* 70(2667): 109. [Type locality: Off Georgia].

Type material: Lectotype and six paralectotypes in USNM (329375). The lectotype examined by SEM microphotographs.

Original description: "*Shell minute, glassy white, low turbiniform, with about three and a half smooth, well-rounded whorls; nucleus minute, suture distinct, not deep; aperture subcircular, the peristome interrupted by the body whorl, not reflected, sharp; base roundly convex, with a minute perforate umbilicus, partly shadowed by the inner lip. Height 1.6; diameter, 2 mm*".

The lectotype is 1.95 mm in maximum diameter and 1.95 mm in height.

Habitat: Dredged from 805 meters depth, on a broken coral, coarse sand, and broken shell bottom.

Distribution: Only know from the USA: Georgia, the type locality.

Remarks: As in other described species, no spiral fine cordlets have been observed in the umbilicus; but there is a strong cord delimiting it. Due to the poor condition of the studied material, we can not determine if this is a previously known species. We believe that *Vitrinella georgiana*, the present species, as well as *Pseudorotella floridensis* and *Lydipnis margaritiformis*, all described by DALL (1927), are not tornids, but they may be placed in the subfamily *Skeneinae* Clark, 1851, genus *Cirsonella*. Thus the new combination should be *Cirsonella georgiana* (Dall, 1927).

Cirsonella margaritiformis (Dall, 1927) (Figures 117A-E)

Lydiphnis margaritiformis Dall, 1927. *Proceedings of the United States National Museum* 70(2667): 123-124. [Type locality: *Albatross* sta. 2668, off Fernandina, Florida [actually off Georgia], 30°58'N, 79°38'W, 294 fathoms (529 m)].
Circulus margaritiformis (Dall, 1927).

Type material: Lectotype (Figs. 117A-C) and a paralectotype in USNM (108146).

Description: This is the original description in DALL (1927: 123-124). *"Shell small, white, smooth, with nearly four whorls including a minute globular nucleus, having a general form much resembling* Margarites helicinus*; whorls moderately rounded, the last much the largest, suture distinct, not deep; surface smooth except for faint incremental lines, and on the base two strong widely spaced threads around the umbilical pit and a few faint spiral striae behind them; base rounded, umbilicus minutely perforate; aperture rounded with a small angulations above, the peristome continuous over the body, thin, and not reflected. Height, 3 mm; diameter, 4 mm".*

Habitat: Dredged from 678 meters on a gray sand and broken coral bottom.

Distribution: Only known from the type material.

Remarks: DALL (1927) Remarked: *"This differs from typical* Lydipnis *in being less depressed and without carinae, but seems most nearly allied to that genus".*

In our opinion this species is not a tornid. Its general appearance is that of a skeneid. The convex whorls, impressed sutures of the protoconch, smooth shell, prosocline aperture, and continuous peristome with a thickening near the umbilicus place it close to the genus *Cirsonella* Angas, 1877. *Cirsonella* characteristically has the operculum only very slightly, or not at all, behind the peristome. The margin of the inner lip edge of this species has a ledge that probably serves as an opercular stop. The spiral threads around the umbilicus place this species close to *Cirsonella extrema* Thiele, 1912 from the Antartic and to *C. australis* Angas, 1877 (WARÉN, 1992).

By its general form this species could be considered closely related to species of the genus *Skenea* Fleming, 1825, e.g., *Skenea larseni* Warén, 1993 and *Skenea trochoides* (Friele, 1876), but the shape of the protoconch and the umbilical thickening distinguish it. Thus this species is treated as *Cirsonella margaritiformis* (Dall, 1927).

Genus *Mikro* Warén, 1996
Mikro cerion (Dall, 1927) (Figures 118A-C)

Vitrinella cerion Dall, 1927. *Proceedings of the United States National Museum* 70(2667): 125. [Type locality: Off Georgia, 30.73°N; 79.43°W. Depth: 805 m].

Type material: Lectotype (Fig. 100A-C) in USNM (108433).

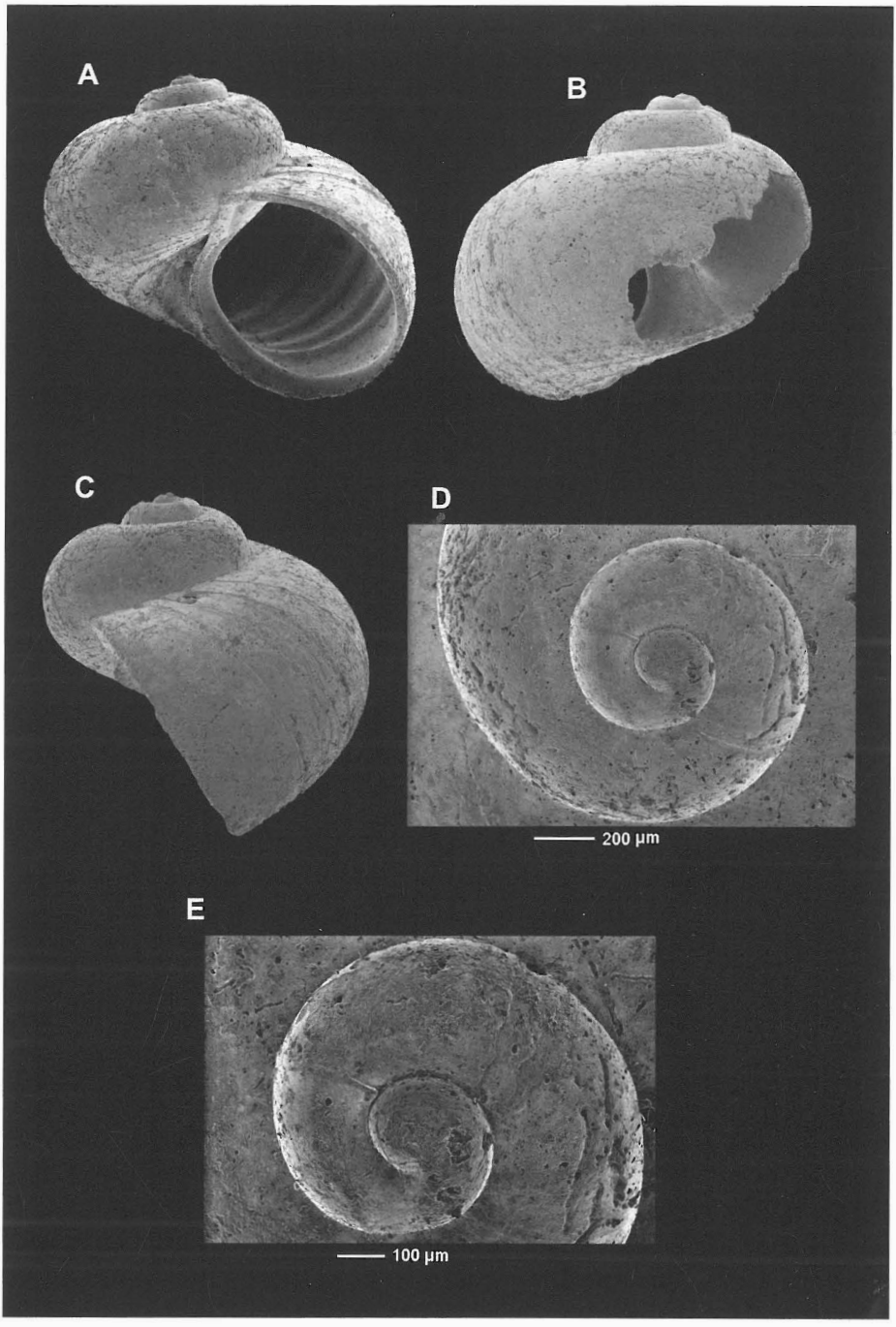
Description: In DALL (1927).

Maximum reported size: 1.8 mm.

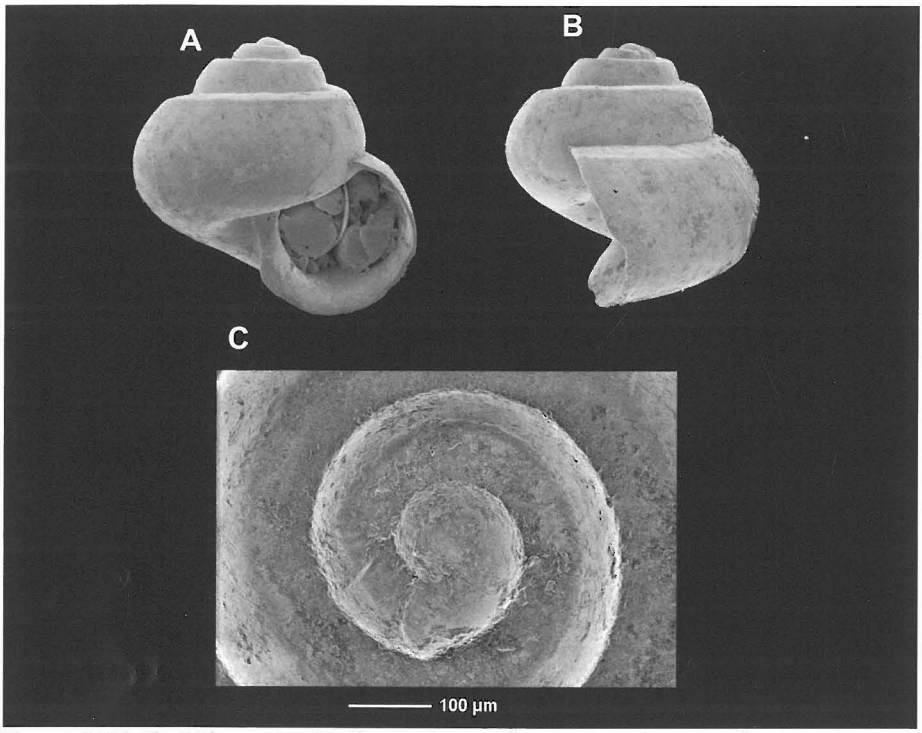
Distribution: Only known from the type material, from Georgia, USA.

Remarks: DALL (1927) mentions: *"The general form recalls that of* Helix chersina *Say"*. After the examination of the photographs of the lectotype of *Vitrinella cerion* deposited in USNM, we reached the conclusion that it is not a *Vitrinella*. The smooth, bulbous and short protoconch (barely ½ whorl), the teleoconch apically keeled on the first whorl and angled apically on the following, the rounded aperture, the orthocline outer lip, and the strongly prosocline inner lip impel us to consider its placement in *Mikro* Warén, 1996, which is characterized by *"Very small, skeneid-like gastropods with smooth protoconch, apically keeled first teleoconch whorl and intraumbilical keel"*.

The bathymetric range of the species included in this genus is between 200 and 1100 m, and its distribution is known in Southern Iceland and the Mediterranean. The genus *Mikro* was placed provisionally in Skeneidae by WARÉN (1996), and its systematic position is not known with certainty, but it was placed in



Figures 117A-E. *Cirsonella margaritiformis* (Dall, 1927). A-C: lectotype, 4 mm in diameter (USNM, 108146); D-E: protoconch. (SEM's by Yolanda Villacampa, USNM).
Figuras 117A-E. Cirsonella margaritiformis *(Dall, 1927). A-C: lectotipo, 4 mm de diámetro (USNM, 108146); D-E: protoconcha. (Fotografías al MEB de Yolanda Villacampa, USNM).*



Figures 118A-C. *Mikro cerion* (Dall, 1927). A-B: lectotype, 1.6 mm in diameter (USNM, 108433); C: protoconch. (SEM's by Yolanda Villacampa, USNM).
Figuras 118A-C. Mikro cerion *(Dall, 1927). A-B: lectotipo, 1,6 mm de diámetro (USNM, 108433); C: protoconcha. (Fotografías al MEB de Yolanda Villacampa, USNM).*

Archaeogastropoda. This appears well founded, based on the presence of sensorial papillae on the cephalic tentacles. For these reasons we consider that the correct name is *Mikro cerion* (Dall, 1927). Other species known in the genus *Mikro* are: *Mikro giustii* (Bogi & Nofroni, 1989) from the Isle of Capri, Mediterranean Sea and *Mikro globulus* (Warén, 1996) from southern Iceland.

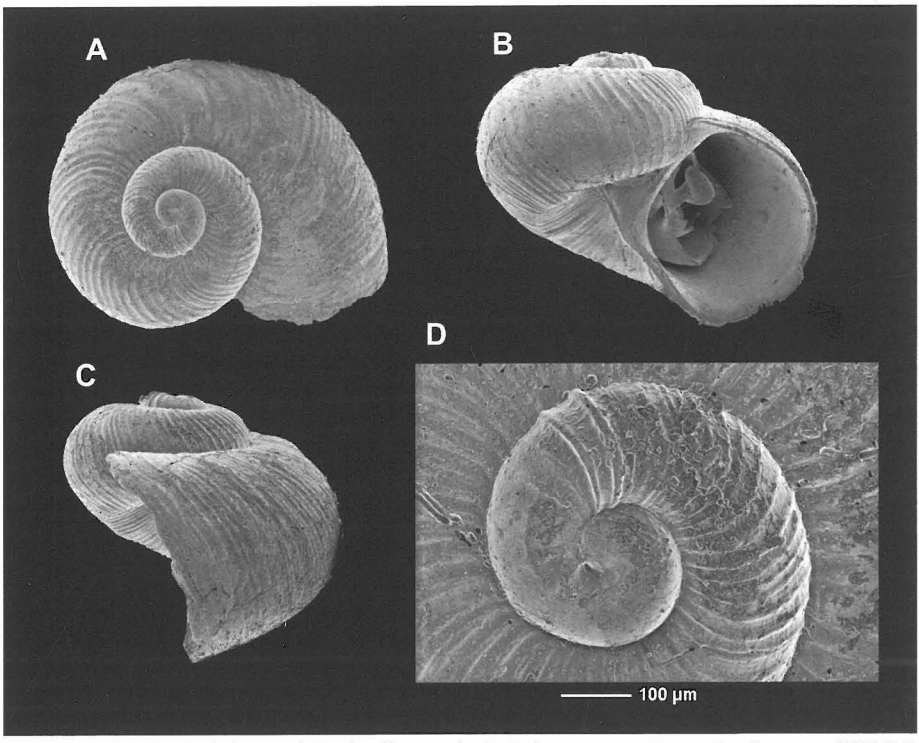
Genus *Xyloskenea* Marshall, 1988
Xyloskenea rhyssa (Dall, 1927) (Figures 119A-D)

Vitrinella rhyssa Dall, 1927. *Proceedings of the United States National Museum* 70(2667): 125. [Type locality: *Albatross* sta. 2668, off Fernandina, Florida [actually off Georgia], 30°58'N, 79°38'W, 294 fathoms (529 m)].

Type material: Lectotype in USNM (108127b).

Description: In DALL (1927).
Dimensions: lectotype, 2.1 mm.
Distribution: Only known from the type material: 30.98°N; 79.64°W.

Remarks: The morphological characters of *Vitrinella rhyssa* are very similar to those of the genus *Xyloskenea* Marshall, 1988. This genus was provision-



Figures 119. A-D. *Xyloskenea rhyssa* (Dall, 1927). A-C: lectotype, 2.1 mm in diameter (USNM, 108127b); D: protoconch. (SEM's by Yolanda Villacampa, USNM).
Figuras 119. A-D. Xyloskenea rhyssa *(Dall, 1927). A-C: lectotipo, 2,1 mm de diámetro (USNM, 108127b); D: protoconcha. (Fotografías al MEB de Yolanda Villacampa, USNM).*

ally placed in Skeneidae, having many species in bathyal depths, world wide, and is usually associated with sunken wood. Conchologically close species include *Xyloskenea costulifera* Marshall, 1988 from New Zealand (the type species of the genus) and *Xyloskenea naticiformis* (Jeffreys, 1883) from off southwestern Iceland to off Portugal (WARÉN, 1996: 202, figs. 3A-D).

Xyloskenea translucens (Dall, 1927) (Figures 120A-F)

Lydiphnis translucens Dall, 1927b. *Proceedings of the United States National Museum* 70(2667): 124. [Type locality: Off Georgia].
Circulus translucens (Dall, 1927).

Type material: Lectotype and paralectotype in USNM (108434).

Description: The original description in DALL (1927: 124) is as follows: "*Shell minute, translucent white, the spire flattened, with three moderately rounded whorls; axial sculpture of incremental lines only; spiral sculpture of a thread slightly in front of the suture and another beyond the periphery on the base; these are hardly prominent enough to be called* carinae; *the umbilical pit is wide and shallow, the umbilicus itself minutely perforate; aperture*

rather wide, rounded, oblique, the margin thin, continuous, straight near the umbilicus. Height, 1.5 mm; diameter, 2 mm".

The protoconch (Figs. 102E-F) is about 210 μm in maximum diameter and is ¾ of a whorl, of which the first half has 4-5 spiral ribs the remaining part is smooth. A strong varix separates the protoconch from the teleoconch.

Habitat: Dredged from 805 meters depth on a broken coral, coarse sand, and broken shell bottom.

Distribution: Only known from the type material.

Remarks: DALL (1927) commented: *"Notwithstanding its small size it has the shell characters of the genus* (Lydiphnis). *The incremental lines are rather pronounced".*

In our examination of the shell of *Lydipnis translucens* we carefully noted the depressed spire and the bicarinate shell as well as the protoconch sculpture.

Based on these characters, *L. translucens* closely resembles species of *Xyloskenea* Marshall, 1988 such as *Xyloskenea naticiformis* (Jeffreys, 1883) and species of *Ventsia* Warén & Bouchet, 1993 such as *Ventsia tricarinata* Warén & Bouchet, 1993 in both protoconch and teleoconch characters. These two genera can be distinguished only by the radula, being very similar in shell and soft parts and considered closely related. Another related genus is *Trenchia* Knudsen, 1964, type species *T. wolffi* Knudsen, 1964, the species of which have a similar shell and radula, but their protoconch and teleoconch differ in being smooth (WARÉN & BOUCHET, 1993). It must be mentioned that *Xyloskenea naticiformis*, the species with the greatest similarity, was tentatively referred to *Tranchia* by MACLEAN (1992). WARÉN (1996) prefers a placement in *Xyloskenea* based on the similarities in protoconch sculpture and size.

Taking all the above, as well as the characters of the protoconch and teleoconch, into consideration, we consider that *Lydipnis translucens* must be placed in the genus *Xyloskenea*, thus the combination *Xyloskenea translucens* (Dall, 1927).

The genus *Xyloskenea* is comprised of numerous species in abyssal and bathyal depths, world wide, and in every case where the substratum is known, it is associated with sunken wood. Closely related genera are *Trenchia* Knudsen, 1964 (on sunken wood, southwestern Pacific) and *Ventsia* Warén & Bouchet, 1993 (hydrothermal vents off Fiji) (WARÉN, 1996).

"Vitrinella" massarita Dall, 1927

Vitrinella massarita Dall, 1927. *Proceedings of the United States National Museum* 70(2667): 125. [Type locality: *Albatross* sta. 2668, off Fernandina, Florida [actually off Georgia], 30°58'N, 79°38'W, 294 fathoms (529 m)].

Type material: In USNM (108137) (three specimens).

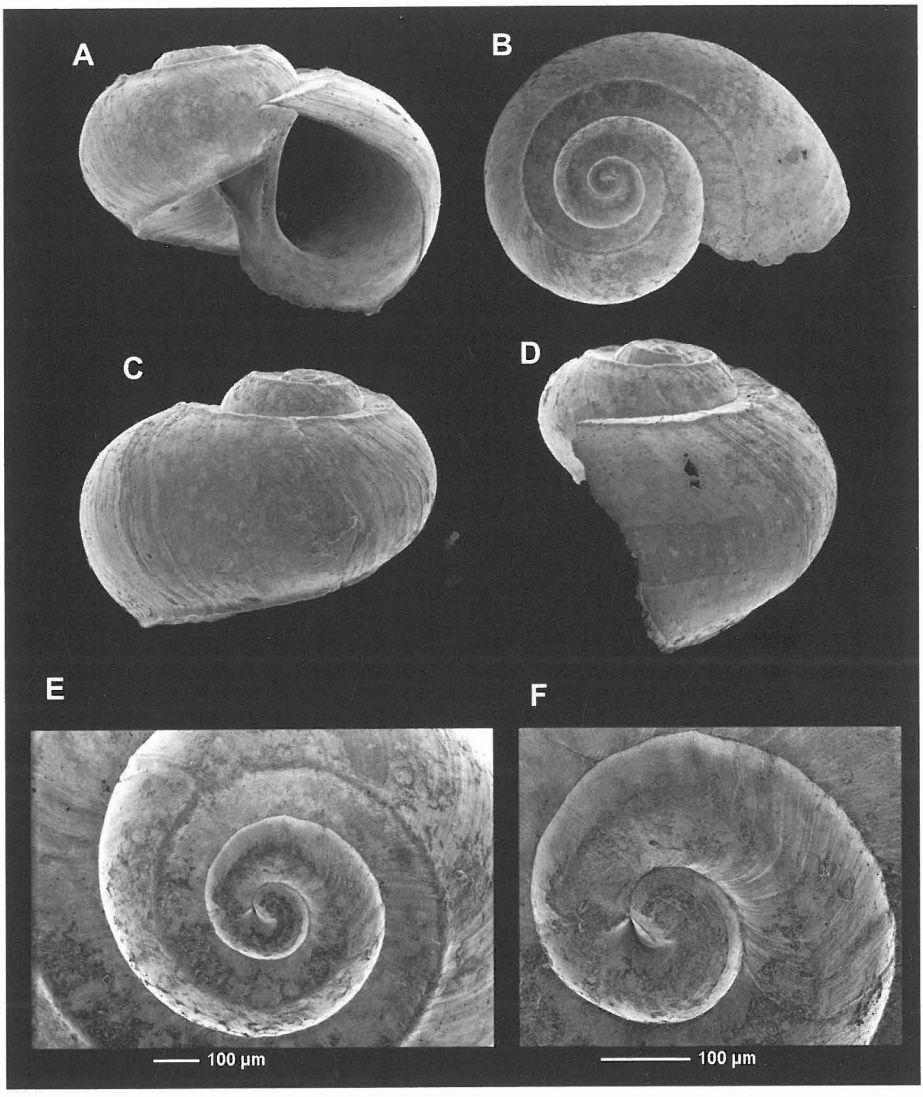
Description: DALL (1927).
Maximum Reported Size: 1.7 mm.

Distribution: USA: Georgia: DALL (1927)
Depth: 538 m.

CONCLUSIONS AND COMMENTS

In the present work, which is focused on the recent fauna of the family Tornidae, subfamilies Circulinae, Teinostomatinae, Torninae and Vitrinellinae, the following 13 genera were studied:

Circulus (4 species), *Teinostoma* (27 species), *Tornus* (2 species), *Anticlimax* (8 species), *Aorotrema* (2 species), *Cyclostremiscus* (14 species), *Cochliolepis* (9 species), *Episcynia* (1 species),



Figures 120A-F. *Xyloskenea translucens* (Dall, 1927). A-D: lectotye, 2.0 mm in diameter, (USNM, 108434); E-F: spire and protoconch. (SEM's by Yolanda Villacampa, USNM).
Figuras 120A-F. Xyloskenea translucens *(Dall, 1927). A-D: lectotipo, 2,0 mm de diámetro, (USNM, 108434); E-F: espira y protoconcha. (Fotografías al MEB de Yolanda Villacampa, USNM).*

Parviturboides (1 species), *Pleuromalaxis* (1 species), *Solariorbis* (16 species), *Vitrinella* (15 species), and *Vitrinorbis* (1 species).

In total, about 2700 specimens and shells were examined. This is a large number of shells, but if we consider that the number of species included in the work is about 100, it may seem less imposing. Furthermore, if we consider the fact that some of them are common, and that we have studied large lots such as *Cochliolepis parasitica* (more than 340 shells), *Vitrinella anneliesae* (about 290 shells) or *Parviturboides interruptus* (about 250 shells), it is clear that many

other species were available only in small numbers. For example, almost 20 species were known from only 1 shell, and, in a little more than half of the total (57 species), each was represented by less than 9 shells.

This scarcity may be due to various causes: 1-the small size of most of the species; 2- the habitat (unknown for most of them) which could be in crevices among rocks or symbiotic with other organisms; 3- the small number of malacologists who give attention to micromolluscs; 4- the difficulty of finding these minute specimens in old collections, many times lost or suffering from problems in conservation due to fungi, humidity, acidic glass, etc.

Nonetheless we were able to study 101 species of Tornidae in the Caribbean and neighboring regions. Of this total, 86 were previously known, and 23 are described as new to science; 2 more are presented as "sp." because of doubts about their taxonomic validity or inadequacy of material.

A lectotype is here designated for each of the following species: *Teinostoma reclusum*, *Teinostoma solidum*, and *Parviturboides interruptus*, all in the MCZ, *Solariorbis petitii* in the MNHN, *Episcynia inornata* in the NHMUK, and *Cochliolepis parasitica* in the USNM.

A new name is proposed: *Vitrinella solaris* nom. nov. pro *"Cyclostrema" thomasi* Pilsbry, 1945 non *Vitrinella thomasi* Bartsch, 1918.

Three neotypes are designated: for *Teinostoma megastoma* and *Teinostoma semistriatum* in MCZ, and for *Circulus* orbignyi *in the MNHN*.

Some types from the Dall and K.J. Bush collections, all in USNM, are imaged for first time by SEM: *Teinostoma minuscula* (holotype); *Vitrinella diaphana* (d'Orbigny, 1842); *"Vitrinella" carinifex; Pseudorotella floridensis, Vitrinella georgiana, Lydiphnis margaritiformis, Vitrinella cerion, Vitrinella rhyssa, Lydiphnis hendersoni,* and *Lydiphnis translucens*. Also *Cochliolepis parasitica* and *Vitrinella tincta*.

From the examination of the types of DALL (1927), we concluded that *"Vitrinella" carinifex, Vitrinella cerion, Vitrinella rhyssa, Vitrinella georgiana, Pseudorotella floridensis, Lydiphnis margaritiformis* and *Lydiphnis translucens* are not tornids but skeneids included in the genera *Cirsonella, Micro* and *Xyloskenea*, thus creating the new combinations: *Cirsonella floridensis, Cirsonella georgiana, Cirsonella margaritiformis, Mikro cerion, Xyloskenea rhyssa*, and *Xyloskenea translucens*. We examined types of all these species except *Vitrinella massarita* and could not suggest a generic placement only for *"Vitrinella" carinifex*.

Many types of species belonging to different families were also studied in order to ascertain that they could not be placed in the Tornidae. Sometimes shell morphology is sufficient to allow placement in genus and family. On other occasions this determination is not easily made. For this reason, we have presented an annotated list of species which can be included in the Tornidae and of others which were excluded because they were fossil species or probably from other groups. This ancillary information is presented to provide future researchers with all the possible information on the species of this group and taxa with which they have been confused.

The following species, previously considered in synonymy, are treated as valid species:

Teinostoma nessaeum and *Teinostoma obtectum* are not synonyms of *Teinostoma biscaynense*.

Cyclostremiscus trilix is not a synonym of *Cyclostremiscus pentagonus*.

Cyclostrema thomasi is not a synonym of *Vitrinella filifera*.

On the other hand, *Teinostoma clavium* is herein considered a synonym of *Teinostoma semistriatum*.

Two species previously placed in the genus *Cyclostremiscus*: *Cyclostremiscus caraboboensis* and *C. schrammii* are placed in the genus *Tornus* on the basis of the similarity of the morpholog-

ical characters of their shells with species of this genus in the West coast of Africa.

In relation with the bathymetric range, the tornids usually do not live in very deep water, most species inhabiting bottoms between the subtidal level and the first 30 meters of the infralitoral level. But in relation to the depth data of empty shells collected and in most bibliographic records, the conclusions could be different, appearing in deeper water, probably due to the orography of the bottom and marine currents. Of the species studied, 65 have been found between 0 and 60 m, and 18 more have been found also in circalitoral and bathyal levels, one of them (*Teinostoma reclusum*) having been recorded from 1170 m. For many species the bathymetry is unknown due to the dearth of bottom samples and predominance of beach drift in collections. The group of species of the genus *Cyclostremiscus* including *C. dalli, C. pentagonus, C. trilix,* and *C. hendersoni* seem to have a deeper bathymetric range, all of them reaching between 500 and 800 m.

APPENDIX

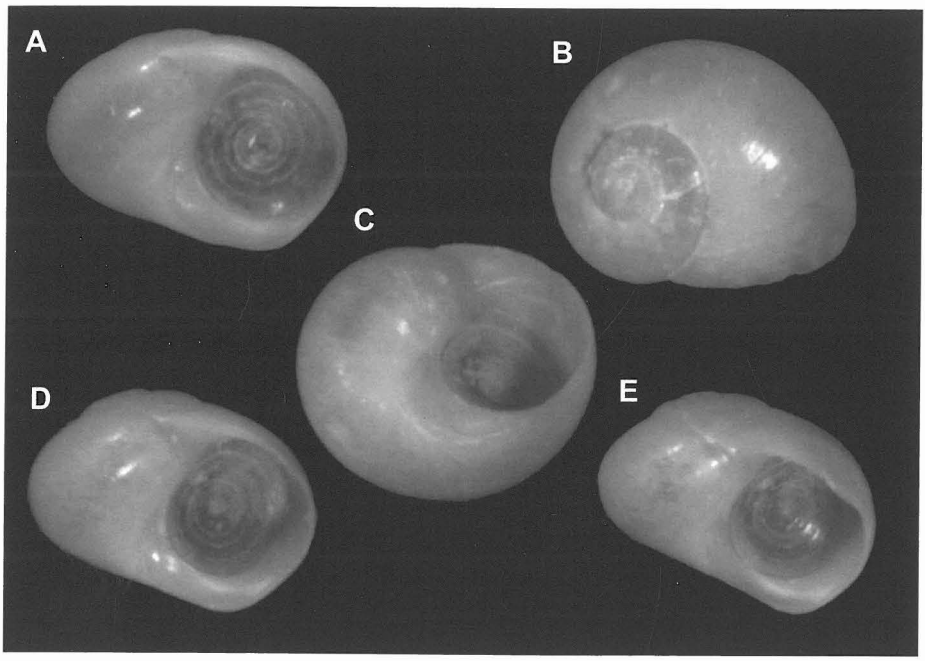
SPECIES THAT WERE INCLUDED IN TORNIDAE AND NOW BELONG TO OTHER FAMILIES

Family LIOTIIDAE Gray, 1850
Genus *Cyclostrema* Marryat, 1818

Cyclostrema cancellatum Marryatt, 1818
Cyclostrema fulgidum Jeffreys, 1883
Cyclostrema rugulosum G.O. Sars, 1878
Cyclostrema valvatoides Jeffreys, 1883
Cyclostrema pompholyx Dall, 1889 (is now placed in the genus *Parviturbo*)
Cyclostrema turbinum Dall, 1889

Family TURBINIDAE Rafinesque, 1815
Subfamily SKENEINAE Clark, 1851
Genus *Ganesa* Jeffreys, 1883

Ganesa proxima Tryon, 1888
Ganesa bushae Dall, 1927
Ganesa conica Dall, 1927
Ganesa depressa Dall, 1927
Ganesa valvata Dall, 1927
Ganesa diaphana A.E. Verrill, 1884
Ganesa striata Bush, 1897
Ganesa convexa Bush, 1897
Ganesa verrilli Tryon, 1888
Ganesa ornatam A.E. Verrill, 1884
Ganesa dalli A.E. Verrill, 1882
Ganesa abyssicola Bush, 1897



Figures 121A-E. *Dillwynella modesta* Dall, 1889. A-E: syntypes, 1.4, 1.6 mm (MCZ 007657).
Figuras 121A-E. Dillwynella modesta *Dall, 1889. A-E: sintipos, 1,4, 1,6 mm (MCZ 007657).*

Genus *Granigyra* Dall, 1889

Granigyra limata Dall, 1889
Granigyra radiata Dall, 1927
Granigyra spinulosa Bush, 1897

Genus *Dillwynella* Dall, 1889

Dillwynella modesta (Dall, 1889) (Figures 121A-E)

Dillwynella modesta Dall, 1889. *Bull. MCZ*, 18: 362-363, pl. 21, figs. 3-3a. [Type locality: Blake sta. 215, off St. Lucia, 226 fathoms].

Type material: Three syntypes, MCZ (007657).

Genus *Molleriopsis* Bush, 1897

Molleriopsis abyssicola Bush, 1897
Molleriopsis sincera Dall, 1889

Genus *Leptogyra* Bush, 1897

Leptogyra verrilli Bush, 1897
Leptogyra inconspicua Bush, 1897
Leptogyra eritmeta Bush, 1897

Family LEPETELLIDAE Dall, 1881

Genus *Choristella* Bush, 1897

Choristella leptalea Bush, 1897
Choristella brychia Bush, 1897

Family ODOSTOMIIDAE Pelseneer, 1928
Genus *Cyclostremella* Bush, 1897

Cyclostremella humilis Bush, 1897

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BIBLIOGRAPHY

ABBOTT R.T. 1954. *American seashells*. D. Van Nostrand Company, Inc., Princeton, NJ, xiv + 541 pp, 40 pls.

ABBOTT R.T. 1974. *American seashells: the marine Mollusca of the Atlantic and Pacific coasts of North America*, 2nd ed. Van Nostrand Reinhold Company. New York, 663 pp, 24 pls.

ABBOTT R.T. & DANCE S. P. 1982. *Compendium of seashells: a color guide to more than 4,200 of the world's marine shells*. E. P Dutton, New York, x -I- 411 [+ 1] pp.

ABSALÃO R.S. 2009. New small deep-sea species of Gastropoda from the Campos Basin off Brazil. *American Malacological Bulletin*, 27: 133-140.

ABSALÃO R.S. & PIMENTA A.D., 2005. *Moluscos marinhos da Apa do Archipelago de Santana, Macaré, RJ.* Ciencia Moderna, Rio de Janeiro. 84 pp.

ADAM W. & KNUDSEN J. 1969. Quelques genres de Mollusques prosobranches marins inconnus ou peu connus de l'Afrique occidentale. *Bulletin Institut Royal des Sciences Naturelles de Belgique*, 44(27): 1-69.

ADAMS A. 1850. Monographs of *Cyclostrema*, Marryat, and *Separatista*, Gray, two genera of gasteropodous mollusks. *Proceedings of the Zoological Society of London 1850*: 41-45.

ADAMS C.B. 1850. *Monograph of Vitrinella, a New Genus of New Species of Turbinidae* 10 pp. Author, Amherst, Massachusetts.

ADAMS A. 1866. Monographs of the genera *Cyclostrema, Adeorbis,* and *Teinostoma. Thesaurus Conchyliorum*. Sowerby, G.B. (ed.) 3: 249-262.

AGUAYO C.G. 1949. Tres nuevos moluscos marinos de las costas de Cuba. *Revista de la Sociedad Malacológica "Carlos de la Torre"* 6: 93-96, pl. 4.

AGUAYO C. & BORRO P. 1946a. Nuevos moluscos del Terciario Superior de Cuba. *Revista de la Sociedad Malacologica "Carlos de la Torre"* 4(1): 9-12, pl. 1.

AGUAYO C. & BORRO P. 1946b. Algunos moluscos Terciarios de Cuba. *Revista de la Sociedad Malacologica "Carlos de la Torre"* 4(2): 43-49, pl. 3.

AGUAYO C. & JAUME M.L. 1936. Sobre algunos moluscos marinos de Cuba. *Memorias de la Sociedad Cubana de Historia Natural "Felipe Poey"* 10(2): 115-122.

ALTENA C.O. van R. 1966. Vitrinellidae (marine Mollusca Gastropoda) from holocene deposits in Surinam (Dutch Guiana). *Zoologische Mededelingen*, 41: 233-241.

ALTENA C.O. van R. 1975. The marine mollusca of Suriname (Dutch Guiana) Holocene and Recent. Part III. Gastropoda and Cephalopoda. *Zoologische Verhandelingen*, 139: 1-104, pls. 12.

ANDREWS J. 1977. Shell and Shore of Texas. University of Texas Press. Austin, United States. *Journal of Molluscan Studies*, 47: 248-2

ANDREWS J. 1994. *A field guide to shells of the Florida coast*. Gulf Publishing, Houston. 182 pp.

ARANGO R. 1880. *Contribucion a la Fauna Malacologica Cubana*. 137-280, 1-35. G. Montiel: Habana. 15 Jul.

BIELER R. & MIKKELSEN P.M. 1988. Anatomy and reproductive biology of two western Atlantic species of Vitrinellidae, with a case of protandrous hermaphroditism in the Rissoacea. *The Nautilus*, 102(1): 1-29.

BOUCHET P. & ROCROI J.P. (Ed.); Frýda J., Hausdorf B., Ponder W., Valdés Á. & Warén A. 2005. Classification and nomenclator of gastropod families. *Malacologia*, 47(1-2): 397 pp. ConchBooks, Hackenheim, Germany.

BOYKO C.B. & CORDEIRO J.R. 2001. Catalog of Recent type specimens in the division of invertebrate zoology , American Museum of Natural History . V . Mollusca , part 2 (class Gastropoda [exclusive of Opisthobranchia and Pulmonata], with supplements to Gastropoda [Opisthobranchia], and Bivalvia. *Bulletin of the American Museum of Natural History*, 262: 3-158.

BUSH K.J. 1885. List of the shallow-water Mollusca dredged off Cape Hatteras by the "Albatross" in 1883. *Annual Report of the United States Commissioner of Fish and Fisheries*, 1883: 579-595.

BUSH K.J. 1897. Revision of the marine gastropods referred to *Cyclostrema, Adeorbis, Vitrinella,* and related genera; with descriptions of some new genera and species belonging to the Atlantic fauna of America. *Transactions of the Connecticut Academy of Arts and Sciences*, 10: 97-144, pls. 22-23.

CAMPBELL L.D. 1993. Pliocene molluscs from the Yorktown and Chowan river formations in Virginia. *Virginia Division of Mineral Resources, Publication* 127, 1–259.

CLARKE H.C. 1962. On the composition, zoogeography, origin and age of the deep-sea mollusk fauna. *Deep Sea Research and Oceanographic Abstracts*, 9(7-10): 291-306.

CLENCH W.J. & TURNER R.D., 1950. The western Atlantic marine mollusks described by C.B. Adams. *Occasional Papers on Mollusks*, 1(15): 233-403 incl. pls. 29-49.

COOLEY N.P. 1978. An inventory of the estuarine fauna in the vecinity of Pensacola, Florida. *Florida Marine Research Publications*, 33: ii+119.

CORGAN J.X. 1968. New name for *Vitrinella tenuisculpta* Aguayo y Borro (Gastropoda). *Nomenclatural Notes. Journal of Paleontology*, 43: 1298.

COSEL R. VON 1986. Moluscos de la región de la Ciénaga Grande de Santa Marta (costa del Caribe colombiano) *Anales del Instituto de Investigaciones Marinas de Punta Betín*, 15-16: 79-370

DALL W.H. 1889a. Reports on the results of dredgings, 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'. *Bulletin of the Museum of Comparative Zoology*, 18: 1-492, pls. 10-40.

DALL W.H. 1889b. A preliminary catalogue of the shell-bearing marine mollusks and brachiopods of the south-eastern coast of the United States, with illustrations of many of the species. *Bulletin of the United States National Museum*, 37: 221 p., pps. 1-74.

DALL W.H. 1892. Contributions to the Tertiary fauna of Florida, with especial reference to the Miocene silex-beds of Tampa and the Pliocene beds of the Caloosahatchie River. Part II. Streptodont and other gastropods, concluded. *Transactions of the Wagner Free Institute of Science of Philadelphia*, 3 [i-vii]: 201-473, 1 fold-out map, pls. 13-22.

DALL W.H. 1889. Report on the results of dredning by the U. S. Coast survey steamer "Blake". XXIX. Report on the Mollusca, part II. Gastropoda and Scaphopoda. *Bulletin of the Museum of Comparative Zoology*, 18: 1-492, pls. 10-40.

DALL W.H. 1903. Contributions to the Tertiary fauna of Florida with especial reference to the Silex Beds of Tampa and the Pliocene Beds of the Caloosahatchie River including in many cases a complete revision of the generic groups treated of and their American Tertiary species. Part VI. Concluding the work. *Transactions of the Wagner Free Institute of Science of Philadelphia*, 3(4): i-xiv, 1219- 1654, pls. 48-60.

DALL W.H. 1927. Small shells from dredgings off the southeast coast of the United States by the United States Fisheries steamer *Albatross* in 1885 and 1886. *Proceedings of the United States National Museum*, 70(2667): 1-134.

DÍAZ MERLANO J.M. & PUYANA HEGEDUS M. 1994. *Moluscos del Caribe colombiano. Un catálogo ilustrado*. Colciencias. Fundación Natura. Invermar. Santa Fé de Bogotá, 291 pp, 74 pls.

EMERSON W.K. & JACOBSON M.R. 1976. *The American Museum of Natural History, Guide to shells*. Alfred A. Knopf, New York. 482 pp, 47 pls.

ESPINOSA J., FERNÁNDEZ-GARCÉS R. & ROLÁN E. 1985. Catálogo actualizado de los moluscos marinos de Cuba. *Reseñas Malacológicas*, 9: 1-90.

ESPINOSA J. & ORTEA J. 2001. Moluscos del mar Caribe de Costa Rica: Desde Cahuita hasta Gandoca. *Avicennia* (Supl. 4): 1-77.

FABER M.J. 1995. New data on mollusk species described by Gordon W. Nowell-Usticke. *De Kreukel* 31: 59-69.

FABER M.J. 2007. Marine gastropods from the ABC Islands and other localities 20. *Solariorbis semipunctus* Moore, 1965 (Gastropoda: Vitrinellidae), first records for Florida, USA and Curaçao. *Miscellanea Malacologica*, 2(4): 84. Figs. 1-3.

FISCHER P. 1857. Études sur un groupe de coquilles de la famille des Trochidae. *Journal de Conchyliologie*, 6: 42-53, 168-176, 284-288, pl. 10.

FISCHER P. 1880-1887. *Manuel de conchyliologie et de paléontologie conchyliologique ou histoire naturelle des mollusques vivants et fossiles suivi d'un appendice sur les Brachiopodes*. Savy, Paris, xxiv + 1-1569 + 23 pls., facing pl. explanations. [1-112 (1880); 113-304 (1881); 305-416 (1882); 417-608 (1883); 609-688 (1884); 689-896 (1885); 897-1008 (1886); 1009-1369 (1887)].

FOLIN L. DE 1870. Vera-Cruz et Carmen. *Les Fonds de la Mer* 1: 181-191, pls. 23, 25-56 Savy: Paris.

FRETTER V. 1956. The anatomy of the prosobranch *Circulus striatus* (Philippi) and a review of its systematic position. *Proceedings of the Zoological Society of London*, 126: 369-381.

FRETTER V. 1984. *Prosobranchs*. In: Wilbur *et al.* (eds.). The Mollusca, Vol. 7, Reproduction. Academic Press, New York and London, p. 1-45.

FRETTER V. & GRAHAM A. 1962. *British prosobranch molluscs: their functional anatomy and ecology*. Ray Society, London, xvi -I- 755 pp.

FRETTER V. & GRAHAM A. 1964. Reproduction. In: Wilbur, K. M. and C. M. Yonge (eds). Physiology of Mollusca, Vol. 1. Academic Press, New York and London, p. 127-164.

FRETTER V. & GRAHAM A. 1978. The prosobranch molluscs of Britain and Denmark. Part 4 — Marine Rissoacea. *Journal of Molluscan Studies, Supplement* 6: 153-241.

GABB W.M. 1873. On the Santo Domingo Miocene and its Fossils. *Proceedings American Philosophy Society*, 12: 571-573.

GABB W.M. 1881. Descriptions of new species of fossils from Pliocene Clay Beds between Limon and Moen, Costa Rica, together with notes on previously known species from there and elsewhere in the Caribbean area. *Journal of the Academy of Natural Sciences of Philadelphia*, 8: 349-380, 4 pls.

GARCIA E.F. 2002. More discoveries from a collecting expedition off the Louisiana coast. *American Conchologist* 30(1): 6-7, 10.

GARCÍA-CUBAS A. 1970. Ecologia y distribución de los micromoluscos recientes de la Laguna Madre, Tamaulipas, Mexico. *Universidad Autonoma de Mexico, Instituto de Geologia, Boletin* 86: 1+1v+1-44, 2 foldouts tables, 8 pls.

GARCÍA-CUBAS A. 1971. Estudios oceanográficos y biológicos de reconocimiento en la Bahía de Guaymas. *Instituto de Biología, Universidad Nacional Autónoma de México*. 87 p., tablas, figs. y mapas.

García-Cubas A. & Reguero M., 1990. Moluscos del sistema lagunar Tupilco-Ostión, Tabasco, México: Sistemática y Ecología. *Anales del Instituto de Ciencias del Mar y Limnología, Universidad Nacional Autónoma de México*, 17(2): 309-343.

García-Cubas A., Escobar-De la Llata F., González L. V. & Reguero M. 1990. Moluscos de la laguna Mecoacán, Tabasco, México: Sistemática y Ecología. *Anales del Instituto de Ciencias del Mar y Limnología, Universidad Nacional Autónoma de México*, 17(1): 1-30.

Gardner J. 1948. Mollusca from the Miocene and lower Pliocene of Virginia and North Carolina. Part 2. Scaphopoda and Gastropoda. *U.S. Geological Survey Professional Paper*, 199-B: i-iii, 179-310, pls. 24-38.

Gofas S., Pinto Afonso J. & Brandão M. 1985. *Conchas e moluscos de Angola*. Universidad de Agostinho Neto / Elf Aquitaine. Angola. 139 pp.

Graham A. 1982. *Tornus subcarinatus* (Prosobranchia, Rissoacea), anatomy and relationships. *Journal of Molluscan Studies*, 48: 144-147.

Guppy R.J.L. 1866. On the Tertiary Mollusca of Jamaica. *Quarterly Journal of the Geological Society of London*, 22(1): 281-295, pls. 16-18.

Hickman C.S. & McLean J.H. 1990. Systematic revision and suprageneric classification of trochacean gastropods. *Natural History Museum of Los Angeles County, Science Series*, 35: 1-169.

Holmes F.S., 1858-1860 [published in parts]. *Post-Pleiocene Fossils of South Carolina*. Russell and Jones, Charleston, 1-98 p, 14 pls. [R. E. Petit offers a collation of this rare serial work: Title page (dated 1860); verso: name of printer and engraver. Dedication page; verso: Preface and acknowledgements. [i] - xii - Introduction, [i]-v - Index; v verso: Errata, 1-64, pls. 1-10 - Cover for Nos. 1 & 2 with printed date of 1858. "3, 4 + 5" plus "2 plates to a number" added in pen; 65-98, pls. 11-14 - Cover for "Nos. 6 and 7" with printed date of 1859.].

Houbrick J.R. 1967. Notes on *Cyclostremiscus schrammii*. *The Nautilus*, 80(4): 131-133.

Houbrick J.R. 1968. A survey of the litoral marine molluscs of the Caribbean coast of Costa Rica. *Veliger*, 11: 4-23.

Jacot A.P. 1921. Some marine shells of Beaufort and vicinity. *Journal of the Elisha Mitchell Scientific Society*, 36: 129-145, pls. 11-13.

Jaume M.L. & Borro P. 1946. Novedades en moluscos marinos Cubanos. *Revista de la Sociedad Malacologica "Carlos de la Torre"*, 4(1): 13-22, pl. 2.

Jeffreys J.G. 1865. *British conchology, or an account of the Mollusca which now inhabit the British Isles and the surrounding seas. Vol. III. Marine shells, comprising the remaining Conchifera, the Solenoconchia, and Gasteropoda as far as Littorina*.]. van Voorst, London, 393 (+ 1) p., 8 pls.

Jeffreys J.G. 1883 On the Mollusca procured during the "Lightning" and "Porcupine" expeditions 1868-70. Part VI. *Proceedings of the Zoological Society of London, 1882*: 88-149.

Jong K.M. de & Coomans H.E. 1988. *Marine gastropods from Curaçao, Aruba and Bonaire. Studies on the Fauna of Curaçao and other Caribbean Islands*, 69. E.J. Brill. 261 pp, 47 pls.

Johnson C.W. 1934. List of marine Mollusca of the Atlantic coast from Labrador to Texas. *Proceedings of the Boston Society of Natural History*, 40(1): 1-204.

Johnson R.I. 1989. Molluscan taxa of Addison Emery Verrill and Katharine Jeannette Bush, including those introduced by Sanderson Smith and Alpheus Hyatt Verrill. *MCZ Publications on Mollusks, Occasional Papers on Mollusks*, 5: 1-143.

Keen A.M. 1960. In R. C. Moore (ed.), *Treatise on Invertebrate Paleontology, Part I, Mollusca 1. Mollusca - general features, Scaphopoda, Amphineura, Monoplacophora, Gastropoda - general features, Archaegastropoda, mainly Paleozoic Caenogastropoda and Opisthobranchia*. Geological Society of America & Univ. Kansas Press, Boulder, CO and Lawrence KS, xxiii + pp. 1-351.

Kurtz J.D. 1860. *Catalogue of Recent marine shells, found on the coasts of North and South Carolina*. Portland, David Tucker.ME 9 pp.

Lange-De-Morretes F. 1949. Ensaio de catálogo dos moluscos do Brasil. *Archos Mus. Paraná*, 7(1): 3-216.

Lee H. G. 2009. *Marine shells of northeast Florida*. Jacksonville Shell Club, Jacksonville, 204 pp., 19 pls.

Lyons W.G. 1989. Nearshore marine ecology at Hutchinson Island, Florida: 1971-1974. XI. Mollusks. *Florida Marine Research Publications*, 47: i+iv, 1-131.

Marshall B.A. 1988. Skeneidae, Vitrinellidae and Orbitestellidae (Mollusca: Gastropoda) associated with biogenic substrata from bathyal depths off New Zealand and New South Wales. *Journal of Natural History*, 22: 949-1004.

Maury C.J. 1922. Recent Mollusca of the Gulf of Mexico and Pleistocene and Pliocene species from Gult states. Part 2: Scaphopoda, Gastropoda, Amphineura, Cephalopoda. *Bulletins of American Paleontology*, 9(38): 33-172.

MELLO R.L.S. & PERRIER, L.L. 1986. Polyplacophora e Gastropoda do litoral sul de Pernambuco, Brasil. *Cadernos Ômega da Universidade Federal Rural de Pernambuco* 2: 107-144.

MIKKELSEN P.M., MIKKELSEN P.S. & KARLEN D.J. 1995. Molluscan biodiversity in the Indian River Lagoon, Florida. *Bull. Mar. Sci.*, 57: 94-127.

MOORE D.R. 1964. *The family Vitritiellidae in South Florida and the Gulf of Mexico*. Ph. D. dissertation. University of Miami, Coral Gables, FL, xi + 235 (+ 2) pl.

MOORE D.R. 1965. New species of Vitrinellidae from Gulf of Mexico and adjacent waters. *The Nautilus*, 78(3): 73-79, pls. 7-8.

MOORE D.R. 1969. *Cyclostrema miranda* Bartsch, a synonym of *Tornus subcarinatus* Montagu. *The Veliger*, 12(2): 169-170.

MOORE D.R. 1972. *Cochliolepis parasitica*, a non parasitic marine gastropod, and its place in the Vitrinellidae. *Bulletin of Marine Science*, 22(1): 100-112.

MORRIS P.A. 1973. *A field guide to shells of the Atlantic and Gulf coasts and the West Indies*. Hougton Mifflin Co., Boston. 330 pp, 76 pls.

NORDSIECK, F. 1968. *Die europäischen Meeres-Gehäuseschneken*. G. Fischer, Sttutgart. 273 pp.

NOWELL-USTICKE G.W. 1959. *A Check List of the Marine Shells of St. Croix, U. S Virgin Islands*. Lane Press, Burlington. 90 pp., 4 pls.

NOWELL-USTICKE G.W. 1971. *A Supplementary Listing of New Shells (Illustrated) Revised Edition. to be Added to the Check List of the Marine Shells of St. Croix*. Author: San Croix, Virgin Islands, 32 pp., 6 pls.

ODÉ H. 1969. *Cochliolepis parasitica* Stimpson. *Texas Conchologist* 5(7): 73-74.

ODÉ H. 1987a. Distribution and records of the marine Mollusca in the northwest Gulf of Mexico, families Skeneidae, Vitrinellidae. *Texas Conchologist*, 23(4): 110-121.

ODÉ H. 1987b. Distribution and records of the marine Mollusca in the northwest Gulf of Mexico, family Vitrinellidae. *Texas Conchologist*, 24(1): 21-40.

ODÉ H. 1988. Distribution and records of the marine Mollusca in the northwest Gulf of Mexico, family Vitrinellidae. *Texas Conchologist*, 24(2): 59-72.

OLIVER J.D. & ROLÁN E. 2011. The family Tornidae (Gastropoda, Rissooidea) in the East Atlantic, 2. Circulinae. *Iberus*, 29(1): 9-33.

OLSSON A.A. & HARBISON A. 1953. Pliocene Mollusca of southern Florida. *Monographs of the Academy of Natural Sciences of Philadelphia*, 18: 1-457 + 65 pls.

OLSSON A.A. & MCGINTY T. L. 1958. Recent marine mollusks from the Caribbean coast of Panama with the description of some new genera and species. *Bulletins of American Paleontology*, 39: 1-58, pls. 1-5.

ORBIGNY A. D' 1842. *Mollusques Histoire Physique, Politique et Naturelle de l'île de Cuba*, 2. Arthus Bertrand, Paris. pp 1-112, pls. 1-7.

ORTIZ-CORPS E. 1985. An annotated checklist of the Recent marine Gastropoda (Mollusca) from Puerto Rico. *Memorias del Quinto Simposio de la Fauna de Puerto Rico y el Caribe* ii + 220 pp.

PARKER R.H. 1959. Macro-invertebrate assemblages of central Texas coastal bays and Laguna Madre. *AAPG Bulletin*, 43: 2100-2166.

PARKER R.H. & CURRAY J.R. 1956. Fauna and bathymetry of banks on continental shelf, northwest Gulf of Mexico. *Bulletin of the American Association of Petroleum Geologists*, 40(10): 2428-2439.

PFEIFFER L. 1839. Bericht ber die Ergebnisse meiner Reise nach Cuba im Winter 1838-1839. *Archiv für Naturgeschichte* 5(1): 346-358.

PFEIFFER L. 1840. Uebersicht der im Januar, Februar und März 1839 auf Cuba gesammelten Mollusken. *Archiv für Naturgeschichte*, 6(1): 250-261.

PFEIFFER L. 1850. Die Schnirkelschnecken nebst den zunächst verwandten Gattungen. *Systematische Conchylien-Cabinet* 1: 1-32, pls. 12*, 85, 87, 89, 93, 96, 102-106, 110-112, 114.

PFEIFFER L. 1854. Zur Molluskenfauna der Insel Cuba. *Malakozoologische Blätter* 1: 170-213.

PILSBRY H.A. 1939. A new Floridan Cyclostrema. *The Nautilus*, 53: 53, pl. 8.

PILSBRY H.A. 1946. The type specimens of C.B. Adams's Jamaican species of *Vitrinella*. *MNotulae Naturae of the Academy of Natural Sciences of Philadelphia*, 1162: 1-5, figs. 1-6.

PILSBRY H.A. 1953. Pliocene Mollusca of Southern Florida. Part III-A. The Vitrinellidae. *Monographs of the Academy of Natural Sciences of Philadelphia*, 18: 411-438, pls. 49-56.

PILSBRY H.A. & AGUAYO C.G. 1933. Marine and freshwater mollusks new to the fauna of Cuba. *The Nautilus*, 46: 116-123, pl. 6.

PILSBRY H.A. & MCGINTY T.L. 1945a. "Cyclostrematidae" and Vitrinellidae of Florida. Part 1. *The Nautilus*, 59(1): 1-13, pls. 1, 2.

PILSBRY H.A. & MCGINTY T.L. 1945b. "Cyclostrematidae" and Vitrinellidae of Florida. Part 2. *The Nautilus*, 59(2): 52-59, pl. 6.

PILSBRY H.A. & MCGINTY T.L. 1946a. "Cyclostrematidae" and Vitrinellidae of Florida. Part 3. *The Nautilus*, 59(3): 77-83, pl. 8.

PILSBRY H.A. & MCGINTY T.L. 1946b. Vitrinellidae of Florida, Part 4. *The Nautilus*, 60(1): 12-18, pl. 2.

PILSBRY H.A. & MCGINTY T.L. 1950. Vitrinellidae of Florida: Part 5. *The Nautilus*, 63(3): 85-87, pl. 5.

PILSBRY H.A. & OLSSON A.A. 1945. Vitrinellidae and similar gastropods of the Panamic Province. Part I. *Proceedings of the Academy of Natural Sciences of Philadelphia*, 97: 249-278, pls. 22-30.

PILSBRY H.A. & OLSSON A.A. 1952. Vitrinellidae of the Panamic Province: II. *Proceedings of the Academy of Natural Sciences of Philadelphia*, 104: 35-88, pls. 2-13.

PONDER W.F. 1988. The Truncatelloidean (=Rissoacean) radiation- A preliminary phylogeny: Prosobranch phylogeny. *Malacological Review*, Supplement, 4: 129-164.

PONDER W.F. 1994. The Malacofauna of Hong Kong and Southern China III (ed. B. Morton). *Proceedings of the Third International Workshop on the Malacofauna of Hong Kong and Southern China, Hong Kong, 13 April – 1 May 1992*. Hong Kong University Press, 1994.

PONDER W.F. & WARÉN A. 1988. Classification of the Caenogastropoda and Heterostropha — a list of the family-group names and higher taxa. *Malacological Review*, Supplement 4: 288-317.

PORTER H.J. 1974. *The North Carolina marine and estuarine mollusca: An atlas of Occurrence*. University North Carolina Institute of Marine Science, Morehead City, North Carolina, 351 pp.

PRINCZ D. 1973. Los moluscos gasterópodos y pelecípodos del estado de Nueva Esparta, Venezuela. *Memoria, Sociedad de Ciencias Naturales La Salle*, 33: 169-222.

PRINCZ D. 1977. Notas sobre algunos micromoluscos de la plataforma de Guyana. *Memoria, Sociedad de Ciencias Naturales La Salle*, 36(108): 283-293.

PRINCZ D. 1978. Los moluscos marinos del Golfo de Venezuela. *Memoria, Sociedad de Ciencias Naturales La Salle*, 109: 51-76.

PRINCZ D. 1982. Lista y bibliografia de los gasterópodos marinos vivos de los mares de Venezuela, Trinidad e Islas de Sotavento. *Boletín de la Sociedad Venezolana de Ciencias Naturales*, 37: 103-147.

PRINCZ D. 1986. *Bionomie des micromollusques benthiques du nord-est du Venezuela*. Tesis de Doctorado, Université de Bretagne Occidentale, Brest, 176 pp.

RADWIN G.E. 1969. A recent molluscan fauna from the Caribbean coast of southeastern Panama with special reference to those from north Saint Petersburg. *Monographs of the Academy of Natural Sciences of Philadelphia*, 8: 411-438, pls. 49-56.

REDFERN C. 2001. *Bahamian seashells. A thousand Species from Abaco, Bahamas*. Bahamiansehlls.com Inc. Boca Raton, 280 pp, 124 pls.

REED J.K. & MIKKELSEN P.M. 1987. The molluscan community associated with the scleractinian coral *Oculina varicosa*. *Bulletin of Marine Science*, 40: 99-131.

REGUERO M., GARCÍA-CUBAS A. & ZÚÑIGA G., 1991. Moluscos de la laguna Tampamachoco, Veracruz, México: Sistemática y Ecología. *Anales del Instituto de Ciencias del Mar y Limnología, Universidad Nacional Autónoma de México*, 18(2): 289-328.

RICE W.H. & KORNICKER L.S. 1965. Mollusks from the deeper waters of the northwestern Campeche Bank, Mexico. *Publications of the Institute of Marine Science*, 10: 108–172.

RICHARDSON C.L. 1986. Polygyracea: Catalogue of species (Parts 1, Polygyridae; 2, Corillidae; 3 Sagdidae). *Tryonia*, 13: 1-139, 1-4, 1-38.

RIOS E.C. 1975. *Brazilian marine mollusks iconography*. Museu Oceanografico, Fundação Universidade do Rio Grande, Rio Grande, 331 pp, 91 pls.

RIOS E.C. 1994. *Seashells of Brazil*. Fundaçao Cidade do Rio Grande, Rio Grande, 345 pp, 113 pls.

RIOS E.C. 2009. *Compedium of Brazilian Sea Shell*. Universidade Federal Rio Grande, 668 pp.

ROBINSON D.G. 1991. *The systematics and paleoecology of the prosobranch gastropods of the Pleistocene Moín formation of Costa Rica*. Doctoral dissertacion, Tulane University, New Orleans, Louisiana. 748 pp.

ROBINSON D.G. & MONTOYA M. 1987. Los moluscos marinos de la costa Atlántica de Costa Rica. *Revista Biología Tropical*, 35: 375-400.

ROLÁN E., FERNÁNDEZ-GARCÉS R. & RUBIO F. 1997. Una nueva especie de Anticlimax (Gastropoda: Vitrinellidae) de Cuba. *Iberus*, 15: 31-34.

ROLÁN E. & RUBIO F. 2002. The family Tornidae (Gastropoda, Rissooidea) in the East Atlantic. *Supl. Reseñas Malacologicas*, SEM: 1-98.

RUBIO F. & RODRÍGUEZ BABÍO C. 1991. Sobre la posición sistemática de *Pseudorbis granulum* Brugnone, 1873 (Mollusca, Archaeogastropoda, Skeneidae) y descripción de *Pseudorbis jameoensis* n. sp. procedente de las Islas Canarias. *Iberus*, 9(1-2): 203-207.

RUBIO F. & ROLÁN E. 1998. Una nueva especie de *Tomura* (Gastropoda, Heterobranchia, Cornirostridae) del Caribe. *Iberus*, 16(1): 119-123.

RUBIO F. & ROLÁN R. 2009. Sobre la posición sistemática de *Teinostoma azorica* Dautzenberg & Fischer, 1896. *Noticiario SEM*, 52: 55-56.

SAGRA R. DE LA. 1831. *Historia Económico-Política y Estadística de la Isla de Cuba.* Arazoza y Soler. 12 Tomos. Segunda parte, Historia Natural. Atlas de Zoología, Tomo VIII. Paris. Librería de Arthus Bertrand.

SARASÚA H. 1970. Prosobranquios marinos nuevos para la fauna de Cuba (Mollusca: Prosobranchia). *Poeyana*, 72: 1-20.

SCHWENGEL J.S. & MCGINTY T.L. 1942. Some new and interesting marine shells from northwest Florida. *The Nautilus*, 56: 13-18, pl. 3.

SMITH E.A., 1871. A list of species of shells from West Africa, with description of those hitherto undescribed. *Proceedings of the Zoological Society of London, 1871*: 727-739.

SMITH E.A. 1890. Report on the marine molluscan fauna of the island of St. Helena. *Proceedings of the Zoological Society of London* 1890: 293, pl. 24, fig. 5. Type locality: St. Helena]

SMITH M. 1937. Further notes upon Tertiary and Recent mollusks from Florida together with descriptions of new species. *The Nautilus*, 51(2): 65-66, pi. 6.

STIMPSON W. 1858. On *Cochliolepis parasiticus*. *Proceedings of the Boston Society of Natural History*, 6: 307-309.

STIMPSON C.T. 1887. Contributions to the Mollusca of Florida. *Proceedings of the Davenport Academy of Natural Sciences*, 5: 45-72.

SYKES E.R. 1925. On the Mollusca procured during the "Porcupine" Expeditions, 1869-70. Supplemental notes, part V. *Proceedings of the Malacological Society of London* 16: 181-193, pl. 9.

THIELE J. 1929-1935. *Handbuch der Systematischen Weichtierkunde*. 2 vols. 1154 p., 584 figs.

TREECE G.D. 1980. Bathymetric records of marine shelled Mollusca from the Northeastern shelf and upper slope of Yucatan, Mexico. *Bulletin of Marine Science*, 30(3): 552-570.

TRYON G.W. 1887. *Manual of Conchology (second series). 3 Helicidae: - vol. 1.* Academy of Natural Sciences: Philadelphia. xii + [1]-313 + 63 pls.

TRYON G.W. 1888. Monograph of the families Neritidae, Neritopsidae, Adeorbiidae, Cyclostrematidae, and Liotiidae. *Manual of Conchology* 10. Academy of Natural Sciences: Philadelphia. 3-160, pls. 1-36.

TUNNELL J.W. & CHANEY A.H. 1970. A checklist of the mollusks of Seven and One-Half Fathom Reef, Northwestern Gulf of Mexico. *Cont. Marine Science University Texas.*, 15: 192-203.

VANATTA E.G. 1904. A list of shells collected in western Florida and Horn Island, Mississippi. *Proceedings of the Academy of Natural Sciences of Philadelphia*, 55: 756-759.

VANATTA E.G. 1913. Descriptions of new species of marine shells. *Proceedings of the Academy of Natural Sciences of Philadelphia*, 65: 22-27, pl. 2.

VERRILL A.E. 1882. Catalogue of marine Mollusca added to the fauna of the New England region, during the past ten years. *Transactions of the Connecticut Academy of Arts and Sciences*, 5: 451-587, pls. 42-44, 57-58.

VERRILL A.E. 1884. Second catalogue of Mollusca recently added to the fauna of the New England coast and the adjacent parts of the Atlantic, consisting mostly of deep-sea species, with notes on others previously recorded. *Transactions of the Connecticut Academy of Arts and Sciences*, 6: 139-294, pls. 28-32.

VOKES H.E. & VOKES E.H. "1983" [1984]. *Distribution of shallow-water marine Mollusca, Yucatan Peninsula, Mexico*. Mesoamerican Ecology Institute Monograph 1, Middle American Research Institute Publication, 54: viii, 183 pp, 50 pls.

WARÉN A. 1991. New and little known "Skeneimorph" gastropods from the Mediterranean Sea and the adjacents Atlantic Ocean. *Bolletino Malacologico*, 27(10-12): 149-248.

WAREN A. 1996. New and little known mollusca from Iceland and Scandinavia. Part 3. *Sarsia*, 81: 197-245.

WARÉN A. & BOUCHET P. 1993. New records, species, genera and a new family of gastropods from hydrothermal vents and hydrocarbon seeps. *Zoologica Scripta*, 22: 1-90.

WARÉN A. & BOUCHET P. 2001. Gastropoda and Monoplacophora from Hydrotermal vents and hydrocarbon seeps; new taxa and records. *The Veliger*, 44(2): 116-231.

WARMKE G.L. & ABBOTT R.T. 1961. *Caribbean seashells: a guide to the marine mollusks of Puerto Rico and other West Indian Islands, Bermuda and the Lower Florida Keys*. Livingston Publishing Company, Wynnewood, PA. 348 pp., 44 pls.

WASS M.L. 1972. A check list of the biota of lower. Chesapeake Bay. *Va. Inst. Mar. Sci. Spec. Sci. Rept.* No. 65, 290 p.

WEISBORD N.E. 1962. Late Cenozoic gastropods from northern Venezuela. *Bulletins of American Paleontology*, 42(193): 1-672, 48 pls.

WILEY G.N., CIRCÉ R.C. & TUNNELL J.W. JR. 1982. Mollusca of the rocky shores of east central Veracruz State, Mexico. *The Nautilus*, 96: 55-61.

WOODRING W.P. 1928. Miocene mollusks from Bowden, Jamaica. Part II: Gastropods and discussion of results. *Carnegie Institution of Washington. Publication*, 395: vii + 564 p., 40 pls.

WOODWARD M.F. 1898. On the anatomy of *Adeorbis subcarinatus*, Montagu. *Proceedings of the Malacological Society of London*, 3: 140-146, pl. 8.

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Dendrodoris limbata (Cuvier, 1804)

Sinonimias

Doris limbata Cuvier, 1804, *Ann. Mus. Hist. Nat. Paris*, 4 (24): 468-469 [Localidad tipo: Marsella].

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Ros J. 1976. Catálogo provisional de los Opistobranquios (Gastropoda: Euthyneura) de las costas ibéricas. *Miscelánea Zoológica*, 3 (5): 21-51.

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Synonyms

Doris limbata Cuvier, 1804, *Ann. Mus. Hist. Nat. Paris*, 4 (24): 468-469 [Type locality: Marseille].

Doris nigricans Otto, 1823, *Nov. Act. Ac. Caes. Leop.-Car.*, 10: 275.

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Only Latin words and names of genera and species should be underlined once or be given in italics. No word must be written in UPPER CASE LETTERS. SI units are to be used, together with their appropriate symbols. In Spanish manuscripts, decimal numbers must be separated with a comma (,), NEVER with a point (.) or upper comma (').

• References in the text should be written in small letters or Small capitals: Fretter and Graham (1962) or FRETTER AND GRAHAM (1962). The first mention in the text of a paper with more than two authors must include all of them [Smith, Jones and Brown (1970)], thereafter use *et al.* [Smith *et al.* (1970)]. If an author has published more than one paper per year, refer to them with letters: (Davis, 1989a; Davis, 1989b). Avoid op. cit.

The references in the reference list should be in alphabetical order and include all the publications cited in the text but only these. ALL the authors of a paper must be included. These should be written in small letters or Small capitals. The references need not be cited when the author and date are given only as authority for a taxonomic name. Titles of periodicals must be given IN FULL, not abbreviated. For books, give the title, name of publisher, place of publication, indication of edition if not the first and total number of pages. Keep references to doctoral theses or any other unpublished documents to an absolute minimum. See the following examples (please note the punctuation):

Fretter V. and Graham A. 1962. *British Prosobranch Molluscs*. Ray Society, London, 765 pp.

Ponder W.F. 1988. The Truncatelloidean (= Rissoacean) radiation - a preliminary phylogeny. In Ponder W.F. (Ed.): Prosobranch Phylogeny. *Malacological Review*, suppl. 4: 129-166.

Ros J. 1976. Catálogo provisional de los Opistobranquios (Gastropoda: Euthyneura) de las costas ibéricas. *Miscelánea Zoológica*, 3 (5): 21-51.

• Figures must be original and provided preferably in electronic format and adjusted to page format and column size. These should be one column (57 mm) or two columns (121 mm) wide and up 196 mm high, or be proportional to these sizes. Two columns format is recommended. It is essential that all figures be supplied in their original format (e.g. photographs as high-grade .jpg or as .tif files, graphs as Excel spreadsheets or CorelDraw files), as the files inserted into WORD documents cannot be used for printing. Digital images must be given their final printing size with a resolution at least 300 dpi for colour and halftones, and at least 600 dpi for black/white.

Take into account possible reduction in lettering drawings; final lettering must be at least 2 mm high. In composite drawings, each figure should be given a capital letter; additional lettering should be in lower-case letters. A scale line, labelled with SI units, must be used to indicate size; magnification ratio must be avoided as it may be changed during printing. UTM maps are to be used if necessary. Figures must be submitted on separate sheets, and numbered with consecutive Arabic numbers (1, 2, 3,...), without separating 'Plates' and 'Figures'. Legends for Figures must be typed in numerical order on a separate sheet, and a Spanish translation must be included. Follow this example (please note the punctuation):

Figure 1. *Neodoris carvi*. A: animal crawling; B: rhinophore; C: gills.

If abbreviations are to be used in illustrations, they should be included in the figure captions.

Authors wishing to publish illustrations in colour should consult with the editor and will be charged a contribution of 30 € per page. They should otherwise follow the same standards as black and white prints.

If the authors want to send Figures in printed format, it is essential to supply good quality originals. Half-tone images must be of good contrast, and should be submitted in the final printing size. When mounting photographs in a block, ensure spacers are of uniform width. Remember that grouping photographs of varied contrast results in poor reproduction. Computer graphics must be printed on high quality white paper with a laser printer.

• Tables must be numbered with Roman numbers (I, II, III,...) and each typed on a separate sheet. Headings should be typed on a separate sheet, together with their English translation. Complex tables should be avoided. As a general rule, keep the number and extension of illustrations and tables as reduced as possible.

• Manuscripts that do not conform to these instructions will be returned for correction before reviewing.

• Authors submitting manuscripts will receive an acknowledgement of receipt, including receipt date, and the date the manuscript was sent for reviewing. Each manuscript will be critically evaluated by at least two referees. Based of these evaluations, the Editorial Board will decide on acceptance or rejection. Anyway, authors will receive a copy of the referees' comments. If a manuscript is accepted, the Editorial Board may indicate additional changes if desirable. Acceptable manuscripts will be returned to the author for consideration of comments and criticism; a finalized manuscript must then be returned to the Editor, together with a CD containing the article written with current Windows (but not a .docx format generated by Word 2007, mainly used under Windows Vista) or Macintosh word processor. Dates of reception and acceptance of the manuscript will appear in all published articles.

• Proofs will be e-mailed to the author for correcting errors and must be returned corrected within one week. At this stage no stylistic changes will be accepted. Pay special attention to references and their dates in the text and the Bibliography section, and also to numbers of Figures and Tables appearing in the text.

• Fifty reprints per article and a .pdf file will be supplied free of charge. Additional reprints must be ordered when the page proofs are returned, and will be charged at cost. NO LATER orders will be accepted.

La Sociedad Española de Malacología

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La *Sociedad Española de Malacología* se fundó el 21 de agosto de 1980. La sociedad se registró como una asociación sin ánimo de lucro en Madrid (Registro Nº 4053) con unos estatutos que fueron aprobados el 12 de diciembre de 1980. Esta sociedad se constituye con el fin de fomentar y difundir los estudios malacológicos mediante reuniones y publicaciones. A esta sociedad puede pertenecer cualquier persona o institución interesada en el estudio de los moluscos.

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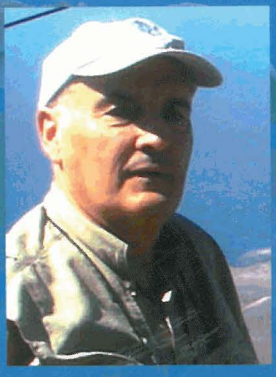

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