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SEARCH AND SEIZURE

By Constance E. Boone

HALLEY COMET TRIP PROVIDES SHELLING TIME IN SOUTH AMERICA

Several members of the Houston Conchology Society joined the large group that left Houston March 29, 1986, bound for Chile to view Halley's Comet. The trip was sponsored by the Houston Museum of Natural Science. It afforded us the opportunity to visit the ancient Inca ruins at Machu Picchu near Cuzco, Peru, and to see Santiago, Chile before going to the comet site city, La Serena, on the Pacific coast.

Some of us were able to tie additional trips to the journey and visited Easter Island and the Galapagos also.

Helen Cornellisson, Luana Huggins, and I went prepared with some shelling equipment just in case we had the chance to do a bit of collecting.

In Santiago I made the opportunity to go behind the scenes to see the collections at the Museo Nacional de Historia Natural, and thus I was able to see what kinds of shells might be available at La Serena. Part of the Philippi collection is housed here but is locked in a separate room and not incorporated into the general collection. I did get to see a bit of it.

We drove the 295 miles north from Santiago to La Serena in buses, travelling through the mountains and desert to the fertile Elqui Valley where grapes, flowers, and vegetables are grown and then on to the Pacific Coast.

La Serena is a town of some 96,000 inhabitants and is known variously as the City of the Bell or City of Carnations. It dates back to the mid 1500s. The main reason for coming here was to view the comet under favorable conditions. A site had been staked some two hours up into the hills away from La Serena so that telescopes could be set up and photos could be taken with the minimum of distracting lights.

The order of each evening was to have dinner, bundle up in as many clothes as you could put on, gather your equipment for viewing and photographing and then ride the buses to the site. There we were issued blankets to sit on or wrap in, told to select our spot (in the dark) and settle in for the night. Knowledgeable astronomers informed us about the fabulous sky of stars and the comet. You could stay all night, or you could come back on the 2 a.m. bus and get back to bed about 4 a.m. Those of us not that sold on learning more and more about the heavens came back home after seeing the comet. The Southern starfield was very interesting. However, the comet was not its best the week we were there.

The days were complete with tours to the city, the port at Coquimbo, the Cerro Tololo Observatory, and the iron mine near La Serena.

As soon as I could, I began to make arrangements for a day of

shelling. Our visit to the port at Coquimbo, some 8 miles south of La Serena, convinced me that we could find shells at beaches if we could get there. There was a horseshoe shaped beach along the bay which could be reached by walking several blocks from our hotel. Many participants did go to this beach, but not many shells were found there. It was a heavy sand beach. I wanted to get out of the city and travel to other beaches.

On Sunday, April 6 I arranged to have a taxi and driver. Since the driver spoke only Spanish, the tour company recommended I employ a guide who spoke English. We were provided with Patricio, who had once been an exchange student in Michigan. He was a delightful young man whose enthusiasm for our project helped to make the day worthwhile. The taxi driver spent most of his time polishing his car, and I am quite sure he thought the three American senoras were crazy. However, when we finally did leave him at the end of the day, he promised to take us again if we came back, which he hoped we would do, and he promised also to know English by the time we returned. We found the people in Chile very pleasant.

The morning started at 9 a.m., with Helen, Luana, and I in shelling clothes and with collecting bags and equipment. We went first to Punta Teatinos, 11 km north of La Serena. This was a sand beach curving into a rocky boulder area and was a picnic beach for Chileans, we were told. This time of year was not the time for people to be on the beaches. The water was rough and very cold.

We roamed the beach and picked up shells in the drift line. Many, many pairs of Mesodesma donacium (Lamarck, 1818) were found, and live young ones washed in with the waves. This is a mactrid that really looks like a four-inch Donax. It is a favorite food item in this part of the world and is found also in Peru. We also found other bivalves.

It was obvious that we were not going to be able to wade in the surf, and the huge, rugged boulders looked forbidding since they were splashed with strong waves. The best we could do was scrape littorinas and acmaeas from the higher boulders and examine the many middens of shells left by divers and picnickers. We were able to gather a number of Fissurella, sometimes fresh with algal mats and some with Scurria attached. There were many, many empty shells of Concholepas concholepas (Bruguiere, 1789) which I had already known to be a favorite food source in Chile and Peru. This strange member of the Superfamily Muricacea is called "loco" by the natives. There were empty turbos and tegulas and bundles of Semimytilus algosus (Gould, 1850). We collected Thais chocolata (Duclos, 1832). I think the live shells from among the barnacles on the rocks are Collisella orbignyi (Dall, 1909) and Littorina peruviana (Lamarck, 1822), a Zebra striped shell about the size of our littorina.

We left this beach and headed back to the port at Coquimbo to find it was market day. Every kind of fruit and vegetable available from the valley was for sale, as well as clothing, etc. We walked along the waterfront to see what the fishermen might have, but we saw only the huge mats of barnacles brought in for food. They butcher these by slicing across the tops and extracting the 1 1/2 inch orange animals

which are bagged and sold. We understand they make a good stew when cooked with onions and other vegetables. However, we did examine the algal mats the barnacles were in and found large mytilids. These are eaten also, but there were many left for us to collect. The discards on the beach included Calyptraea trochiformis (Born, 1778), a shell reaching four inches. I did find some live young ones on the mussels. Everywhere we saw valves of the beautiful Argopecten purpuratus (Lamarck, 1819). I hoped to get some pairs of this scallop which is dredged for food, but we were not ever at the port on a day when the scallop boats came in. They were much in demand for food. There were no pairs discarded that we could find.

I asked to go to the fish market to see what shells might be offered for sale. This is a project I always include in my visits to foreign places. It is a way to pick up some interesting specimens.

There were several bivalves offered: Mesodesma donacium, Aulacomya ater (Molina, 1782) (a large mytilid), and Gari solida (Gray, 1828), about a four-inch bivalve. I kept asking for "loco," and it was there I discovered that this species is being conserved for three years. The stall lady said her husband (the fisherman) would be heavily fined if he brought any in to the market. We certainly saw a lot of fresh shells on the beach at Teatinos, but the market is closed. We were told the supply was being decimated, and the ban on collecting was to let the small ones grow up.

I asked for "lepas", the name they give the several species of large Fissurella, but they did not have them that Sunday in the stalls. The fisherman's wife promised that she would have her husband bring me some the next day.

We left the market and drove high up on the point to see the Lighthouse. There were some middens of large Fissurella left by divers. Helen retrieved a six-inch Fissurella maxima Sowerby, 1835.

We drove to another beach named Playa Totoralillo, 27 km south of La Serena, a camping beach which we understood is heavily populated with Chileans during warmer months. On one side of the point was a rubble of rocks and boulders that seemed reachable, so we headed to this area first. We began to collect live Tegula atra (Lesson, 1830), Thais chocolata, and Prisogaster niger (Wood, 1828), a plentiful turbo. We found more littorinas and Acmaea on the boulders. I found at least four species of chitons: Chiton cumingsii Frembly, 1827; Chiton granosus Frembly, 1827, and ?Enoplochiton niger (Barnes, 1823). One species I have not identified is a dark black Chiton, somewhat shiny but with blue dots that show up when viewed under the lens.

We drove to the point, walked the debris line, scoured the rocky rubble to find sea urchins and more tegulas and turbos. A sample of rubble brought home will give me more species.

We were ready for lunch since we had not brought any, and we figured our driver and guide were ready for this break also. Patricio said there was a nice resort beach some 10 km farther on if we wanted to go there. We thought Guanaqueros (42 km from La Serena) was picturesque

and much like one of our beach resorts. Chileans had beach houses here and came here to relax and fish. We ate lunch in a restaurant on stilts that was crowded with families out for a Sunday meal. Patricio ordered a mixture of typical foods, and we had fish empanadas, several kinds of fish (the names I have now forgotten), vegetables and a dessert of cream and fruit. It was the best meal we had the whole time at La Serena.

After lunch we headed down to the beach in front of the restaurant to check the drift line loaded with Tagelus dombeii (Lamarck, 1818). We also found Protothaca and Oliva.

I had asked Patricio about oysters. I knew there were not supposed to be any endemic here, but he told me that they raised oysters in this bay. There was even an oyster bar, and I bought a couple of specimens. The owner had planted the Japanese oyster, Crassostrea gigas in the bay and harvested it for sale. Other such beds are reported in the area.

Finally, we headed back to the hotel, getting there at 6 p.m. It had been a wonderful day.

The next day I made two taxi trips back to see the fisherman's wife at her stall. I finally did get some "lepas," several kinds of the large Fissurella. I also examined the clumps of barnacles she had in a wheelbarrow to butcher for sale. There I found a few tiny shells I think are Mitrella and some Hiatella solida (Sowerby, 1801). The mytilids all had juvenile mytilids in the mats and hairs on the shells. There were live young Crepipatella dilatata (Lamarck, 1822) and some larger empty ones. There was a Chama pellucida Broderip, 1835 and something that looks like a Trophon. I'm not through examining the material. I simply brought it in and put it in alcohol to bring home.

In July I took some pictures of a few of the Fissurella and some of the other shells to the Los Angeles County Museum of Natural History. I am grateful for the help given me by Dr. James H. McLean, curator. I know that I have Fissurella latimarginata (Sowerby, 1838), Fissurella crassa Lamarck, 1822, Fissurella maxima Sowerby, 1835, and Fissurella limbata Sowerby, 1835. Some of the Fissurella from the middens may be other species, but some are worn and may be hard for me to identify.

Dr. McLean identified two shells that Helen and Luana had begged from a fisherman at a lunch stop en route to La Serena the first day as Chorus gigantea (Lesson, 1829), a muricacean. (We were not on the same bus.) Helen has given her specimen to the Houston Museum of Natural Science, as well as other shells from her trip. I collected a small specimen of this species on the beach dead, but with operculum still inside.

To put the area we collected in your mind, most of Chile and the southern part of Peru are in the Peruvian faunal province. The shells are not generally colorful, and there is still much to be studied about the area. Literature is somewhat hard to get for references.

Fig. 1. Chorus gigantea (Lesson, 1829) collected from a fisherman by Helen Cornellisson at a beach lunch stop en route to La Serena, Chile in April, 1986.

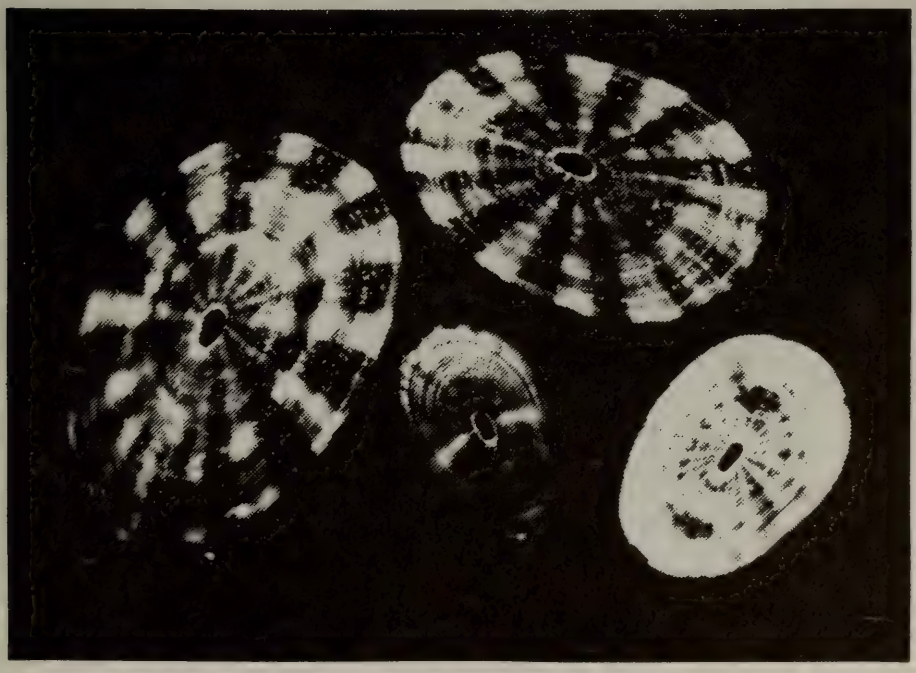

Fig. 2. Fissurellas collected in the middens between the rocks at several beaches near La Serena, Chile, in April, 1986 by Constance E. Boone. Left and upper top specimens are Fissurella maxima (Sowerby, 1835). The small rayed specimen in the middle is Fisurella latimarginata (Sowerby, 1838), and the one on the right is Fissurella limbata (Sowerby, 1835).

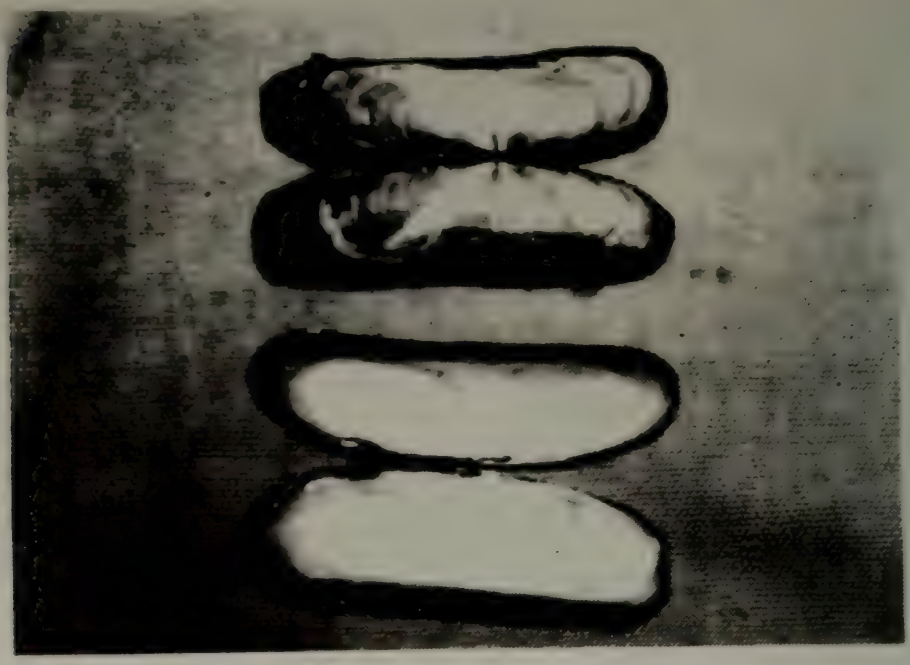

Fig. 3. Tagelus dombeii (Lamarck, 1818) littered the beach at Guanaqueros, Chile, Pacific coast north of Santiago.

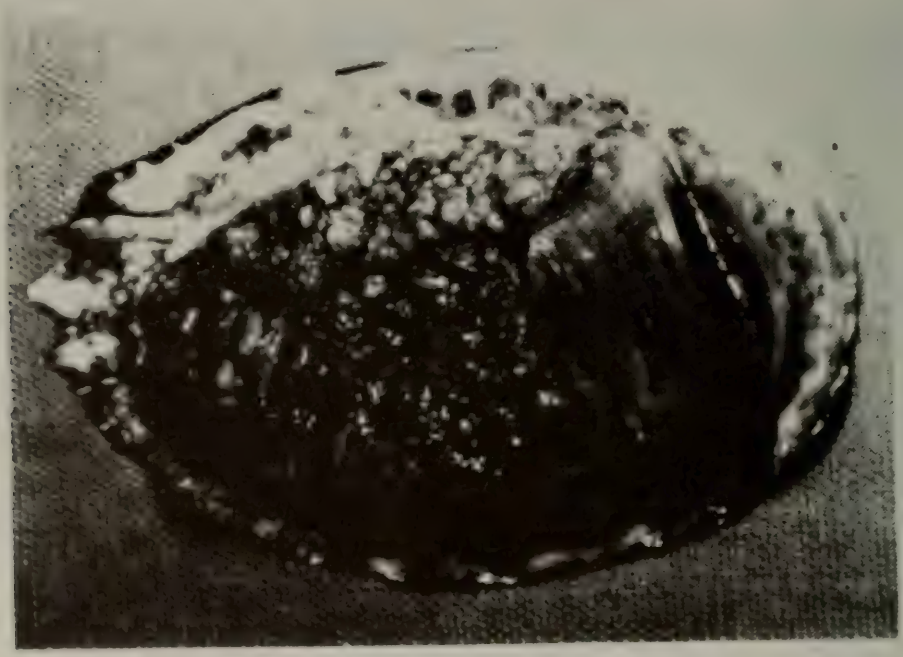

Fig. 4. The underside of a live Concholepas concholepas (Bruguiere, 1789) reveals the placement of the thaid-like operculum that cannot begin to close up the large cavity of this deep limpet-like shell. The animal serves as a major food source in Chile and Peru. This specimen was purchased from the fish market at the beach in Peru.

We left La Serena for Santiago and then by plane for our brief stay at Easter Island. Most of our time was spent seeing the marvelous statues. However, just below our hotel was a cove with big boulders and tide pools that we examined. A small sample provided us with some of the endemic species.

Shelling on Easter Island is not banned at this time.

I picked up a bit of rubble from one of the coves we saw on our tour of the island, and this sample has given me some of the smaller endemic shells. One day at lunch at a beach, several of us spent our time turning rocks and peering in crevices. We found Nodilittorina pyramidalis pascua Rosewater, 1970, and Planaxis akuana Rehder, 1980 abundant on rocks. Hipponix shells were everywhere in the rubble, but we found none live. There are several species. There were plenty of live Nerita morio (Sowerby, 1833), and some of us collected Conus miliaris pascuensis Rehder, 1980. It pleased me to find live Euchelus alarconi Rehder, 1980, and one live Strombus maculatus Sowerby, 1842. We also got a few Neothais nesiotes (Dall, 1908). I believe I have some specimens of Pascula citrica (Dall, 1908).

We were not lucky enough to collect Cypraea. When we arrived at Easter Island we were given leis made with hundreds of Planaxis and many Cypraea. Two endemic Cypraea are found here, Cypraea englerti Summers and Burgess, 1965, and Cypraea caputdraconis Melvill, 1888. Most are found at night.

I knew that Dr. Rehder had worked with a collector on the island, and my personal collection has some Cypraea found by Benito Alarcon Fuenzalida so I asked to meet him. This ardent collector came to talk with me an hour or so and brought some of his shells. He is indignant that the island is building a new museum and not interested in displaying shells from the island. He tirelessly collects, many times at night, and provides scientists with material. I was able to get some species from him I did not have, and I purchased some Cypraea.

By now, we had several containers of shells to transport with us. Each night I tried to put my material away in alcohol so it would not be smelly. Not only did I have a roommate who was not a sheller, but we still had a long way to go before this trip was finished.

I did not anticipate gathering more shells, as collecting is forbidden on the Galapagos. Those of you who have shells purchased in earlier years must covet them. A few shells still show up on the market, but they are from old collections.

On Galapagos, every time we disembarked to go view the birds and other animals, those of us who were shellers could not help looking at the shell debris and peering into crevices to see live shells. We saw many of the rather rare and lovely Cancellaria haemastoma Sowerby, 1832. Drift held many pairs of the rare Cardita varia (Broderip, 1832). The docks were covered with oysters.

One day one of the young Dutch naturalists (graduate students who come out to work for a year at a time) came up to our group with a purple

shell he had never seen before. It was my delight to talk to them about Janthina janthina which had washed up there. He carefully put it in a crevice to retrieve and tell the next group about this beautiful shell. The naturalists did not know the species of shells, which is a shame. There are knowledgeable collectors living on the islands who have worked with scientists. They could tell the naturalists what species they are seeing.

There are two more collection stories to relate.

We arrived back at Guayaquil, Ecuador from the Galapagos in a heavy rain. Not to be daunted, however, in my pursuit of shells, I checked into the hotel and asked the clerk to engage a driver for me to go to the fish market to seek live shells. It was already late in the day, and it was raining hard. I started off alone with the man who could speak no English, but I got across to him in my weird Spanish that I wanted "caracoles vivos" (live shells) "por scientifico collection" (for scientific collection). We went to the river where there were a few stalls open. I was able to purchase some live Arca, although the man thought I was really looney since they were sold for food, and I bought only 6 of the small arks.

I told the driver I wanted "othra classe," and we headed off into a really run down area of buildings near the river where he said he had friends who had shells. After driving through puddles in rutty streets that seemed to be filling up rapidly with water, and after stopping at several houses where he honked and tried to get response, we finally found a man who answered the query and said he had shells. What he brought out was a large bag of mytilids. I didn't have the heart to turn down the lot as he stood there offering them to me in the rain. I just paid for them and told the driver I was ready to go back to the hotel. I did wonder what would happen if we really did stall in the street. I didn't really remember the name of the hotel. We did get back, and I selected some of the mussels and gave the rest to the driver to eat. Later at home, I found I had been lucky in my selection. The mussels were different, I believe, and also on them were different Crepidula. This area was in the Panamic Province.

We had to return to Lima, Peru, because our cheap airfare on Air Peru called for us to return to Lima each leg of the trip. Since I had an afternoon there, I immediately engaged a driver and taxi, and we went to Miraflores on the beach to the fish stalls. This driver spoke very little English, but he carried with him a little dictionary. We managed to communicate, so he understood I wanted live shells for my scientific collection.

At the market, every kind of fish and sea life was sold. It was clean, and the people were very nice to me. The women were extracting meat from Thais chocolata and mytilids. They had no Fissurella here for sale, but they had Mesodesma donacium. There were large mytilids and some bivalves which I bought in case they were different. I asked for "locos," but they said they did not have any. I must have looked very disappointed, because as I walked to the taxi one lady came running after us with four live specimens. They were probably meant to be her dinner.

On the way back to the hotel, the taxi driver helped me buy more alcohol at the Farmacia. He seemed very proud to have been of help for the American senora. Later that day he took me to the archeological museum.

Halley might have been somewhat of a disappointment to us, because the viewing during our week in Chile was not the very best, but the star field in the Southern Hemisphere was marvelous. Best of all, the bits of shelling we did were very satisfying.

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BOOK REVIEW

By H. Odé

Submerged Lands of Texas: Corpus Christi Area. Sediments, Geochemistry, Benthic Invertebrates and Associated Wetlands. Bureau of Economic Geology, The University of Texas at Austin, Austin, Texas, 1983. 153 pp.

id: the Galveston - Houston area, 1985, 145 pp.

In these two important publications, available from the Bureau of Economic Geology at Austin ($12.50 per volume) an up-to-date review of the immediate coastal fauna is given. The information about mollusks is given in tabular form without illustrations of the shell. It is apparent that considerable progress in this field has been made since the pioneering study of R. H. Parker in 1959 and 1960. Many of the species which over the years were reported for the first time for Texas fauna in the Texas Conchologist can now be found in these tables.

Five more of these descriptive inventories of the Texas coast are planned (Brownsville, Harlingen, Kingsville, Port Lavaca, Bay City-Freeport, and Beaumont-Port Arthur areas).

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THE EUROPEAN GARDEN SNAIL, HELIX ASPERSA, IN AUSTIN, TEXAS: NURSERY STOCK, FRESH VEGETABLES, AND GASTROPHILES

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The European garden snail, Helix aspersa, has been introduced throughout the world (Kew, 1893). Occurrence of this species is well-known in the United States (Hanna, 1966; Dundee, 1974) with records being concentrated in coastal and southern areas. H. aspersa has been reported from several Texas localities (Strecker, 1935; Pratt, 1964; Metcalf, 1968; Dees, 1970; Mead, 1971; Dundee, 1974; Neck, 1977a,b). It was reported from Austin by Neck (1977b) who remarked that, "Occurrence is spotty; populations are characteristically low density and restricted to urban areas." Subsequent observations have not changed the validity of this statement, but information concerning entry routes into Austin and public reaction have prompted this report. Below I discuss methods of entry into Austin and public interest, including active encouragement of H. aspersa.

METHODS OF INTRODUCTION

On 14 September 1979 one nearly-unbanded specimen of H. aspersa was found on the soil in a potted plant at an Austin nursery. Unfortunately no record was made of the identity or origin of the plant. This specimen measured 26.15 mm in height and 31.2 mm in width with 4.1 whorls.

On 23 January 1984 I was given an immature H. aspersa which was found inside a stalk of celery purchased at a local health food store. The specimen was alive and became active even after having been in a refrigerator for "several weeks, probably at least a month." The shell measured 16.6 mm in height and 18.5 mm in width with 3.4 whorls.

Establishment of a viable population of H. aspersa from a few snails on nursery stock is possible while such a successful fate for snails in vegetables is unlikely (unless the basal portion of the celery is placed in a compost area, allowing subsequent escape of the snail). Distribution of H. aspersa via nursery stock has been reported previously (Mead, 1971). Establishment of permanent populations in Austin, however, remains a rare event due to climatic restraints, as reported by Neck (1977b).

PUBLIC REACTION

Most people encountering a H. aspersa in a residential yard would either kill it or ignore it. However, one resident of Austin has actively encouraged a population in his yard for eight years since discovering it when he moved into his current residence. H. aspersa

is encouraged in this yard by use of compost in a tight clay soil base, limited supplemental watering, and planting of numerous herbaceous plants (which provide protection from desiccation.) The resident reports that H. aspersa feed on fresh green shoots in the spring but, otherwise, do not seem to feed on fresh plants. Most often, they are observed to feed on fresh dead plant material. Animals have been less common in 1984 and 1985 than in previous years, apparently in response to severe winter cold and extreme summer drought periods. Snails are active during ambient temperatures as low as about 7 C (45 F).

ACKNOWLEDGEMENT

I thank Brian Ogburn for comments regarding H. aspersa in his yard.

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BARNACLES OF THE NORTHERN GULF

Annotated Guide to the Barnacles of the Northern Gulf of Mexico by Stephen R. Gittings, George D. Dennis, and Harold W. Harry. 1986, 36 pages, softcover, 16 plates of black and white illustrations, Marine Information Service, Sea Grant College Program, Texas A&M University, College Station, Texas 77843-4115, $3.00.

The forty-nine species of thoracican barnacles (the goose and acorn barnacles) of the northern Gulf of Mexico are keyed and illustrated in this useful and inexpensive guide. The guide contains an annotated list of those species, with areal range, bathymetry, substratum type and other data. It includes a list of 16 species found in the southern Gulf of Mexico but not in the northern Gulf, directions for collecting and examining specimens, and a list of references for further study of particular groups.

The drawings are well done and easy to use to identify barnacles you might encounter in the northern Gulf area. Every local beachwalker should invest in the purchase of this guide.

Constance E. Boone

BOOK REVIEW

Seashells of the Philippines by F. J. Springsteen and F. M. Leobrera. 1986, 377 pages, 100 plates, Carfel Seashell Museum, Manila, Philippines. U.S. $70.00.

This long-awaited book with its 100 color plates of the seashells, land, and fresh water shells of the Philippines will certainly be in demand by collectors. Literature from the Philippines has been difficult for the average collector to locate, and there have been hundreds of deep water netted shells showing up on the markets, often without names.

Over 1,700 species are illustrated. Some are not given specific names, but the book does not attempt naming new species. The arrangement is not completely systematic, admittedly so. Most major families are covered. Those interested in such a family as Turridae will be pleased to see many species illustrated and named. Several professionals assisted the authors in nomenclature. Some names are not familiar to me since older names or choices of other names for shells we thought we knew have been listed. Some of this is explained, and we are sometimes given the current thoughts on nomenclature of species by different authorities. We are also told what the local dealers call the shells versus the correct names.

The discussion of the islands--geography, habitats, etc.--is interesting. This is obviously a book put together by people familiar with the areas discussed and by people avidly interested in the shells.

I see no point in pointing out a few glitches, because I have yet to see a book that doesn't have them. The book will be discussed widely. Others may differ with my views, but I feel you will have to have this book if you are into acquiring shells from the Philippines. The color plates are clear, many shells are depicted you have not seen in other recent books, and the authors have tried to be very honest in their presentation.

The book has been variously priced in the United States. The $70.00 figure listed above was the original price for advance orders from Carfel and included seamail. A recent price quote is $80.00 with postage added. American dealers usually quote $80.00 or $85.00 with postage added.

Constance E. Boone

NOTES FROM MEMBERS

While straightening up our garage, with special attention to boxes of shells, and remembering Mrs. Hanks' left-handed Busycon spiratum plagosum, I decided to check my whelks. I found what I thought were two right-handed left-handed whelks. Dr. T. E. Pulley did confirm that I had freak dextral Busycon perversum. He wanted to know where I found them. I told him "in the garage," and this seemed to disappoint him. I really don't know where they were found, but I believe the larger one with its operculum came from the bay at Sanibel Island, Florida. The lesson to shellers should certainly be: When collecting, check your shells to see if you have something strange and different, and be sure to note the data. Otherwise that rare shell will be of less importance to your collection, even if it is rare.

Helen Eberspacher

A recent article by Joe Graedon in the Post stated that Avon's Skin-So-Soft bath oil is reported to repel flying insects, although the Avon Company certainly didn't plan the product for that use. In fact, the company cautions against using the product directly on your skin if you are sensitive to different lotions, etc. The article stated that people used it for going to the beach, going hunting, and going fishing to ward off insects. It was even suggested for keeping fleas off pets by using it diluted and as a spray.

Helen Eberspacher

The intensive news coverage of the exploration of the wreck of the Titanic leads to an interesting question. It was stated that the ship rests on the sea bottom at a depth of about 12,500 feet. Photographs displayed on T.V. show several organisms, and it was stated that some were "deep water coral." It was also stated that "organisms" had consumed practically all the wood in the ship. My questions are these: were any mollusks observed, and did any mollusks, in particular teredinids, participate in the consumption of the wood?

H. Odé

TEXAS CONCHOLOGIST, Vol. XXIII, No. 1, October, 1986

OYSTERS OF THE NORTHWESTERN GULF OF MEXICO

Harold W. Harry
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Three species of oysters of the family Ostreidae are known to be living in the northwestern Gulf of Mexico, and a fourth is present as a subfossil. Two more oysters of the family Gryphaeidae are known to occur in deeper water, offshore.

Recently, Hofstetter (1977) published a long paper on Crassostrea virginica, summarizing the work in Galveston Bay in it during the last twenty years. But it is not mentioned in a paper by Breisch and Kennedy (1980), which lists nearly 4,000 references to oysters, mostly of that species, as they relate to Chesapeake Bay.

Crassostrea virginica (Gmelin, 1791)

This one is of commercial importance in the economy of the area, but it is limited to brackish water, scarcely extending beyond the jetties. Yet a few of them have been found in the shallower depths of oil platforms, expecially near shore, and fossil ones are very common in samples from offshore. It is not mentioned that the purple color of the adductor muscle scar, which is very common here, only appears when the oyster is about 25 mm in maximum size. Our oysters never have pinnixid crabs, although they are common in other bivalves (particularly Atrina species, which wash in at the first storms of the winter). Ours nearly always have Nematopsis sp. growing in them, whereas Labyrinthomyxa sp. or Dermocystidium, much harder to find, is something to be contended with since it is nearly always present and abundant in the warmer parts of the year. The peculiar palmate form of C. virginica whereby the shells are extended as grooves on the left valves while the right one merely fills the grooves, is not mentioned, but this occurs well above Cape Cod, Mass. Whether Diplothyra, Cliona or Polydora (which we have in the shells) are present in the northern form is not obvious, nor is the fact that we do not in our Gulf area have Asterias, Eupleura or Urosalpinx, but Thais hemastoma is quite common. The blackening of the shells in this area, quite common, is left unexplained.

Ostreola equestris (Say, 1834)

Menzel (1955) wrote and published his doctoral thesis about this, our second oyster. Galtsoff and Merrill (1962) also wrote about it. This is indeed dominant offshore. It seems not to be able to withstand brackish water and does not enter the bays except in the driest of conditions. Offshore, it is abundant, and almost a hundred records are based on it in the Houston Museum of Natural Science.

Depth (in Fms)	No. of Lots
0-10 (and inshore)	52
10.5-20	11
20.5-30	20
30.5-40	9
40.5-50	1
50.5-60	2
60.5-70	2
70.5-80	0

Many of the shells of this species may be fossil also. Of this we can not be sure, and we note that there are also a few black specimens among the lot.

Dendostrea frons (Linne, 1758)

This species is known from very few records in the northwestern Gulf of Mexico. When Gunter (1951) wrote about it on oil platforms these were near shore, and this was new to the area. Both Dendostrea frons and Ostreola equestris were present, and he has since sent some of each to the U.S. National Museum where I studied his specimens (USNM 595174, Ostreola equestris, 2 specimens; USNM 595175, Dendostrea frons, 5 specimens). Evidently this species is rare in the Gulf. More recently, I have studied it from an oil platform 38.5 miles southeast of Port O'Connor, where it was attached to the spines of Spondylus americanus, at 50-100 feet depth. The specimen is deposited at the Houston Museum of Natural Science.

In the Houston Museum of Natural Science, there are only a few from the northwestern Gulf of Mexico, one lot of a few worn valves from 130 miles southeast of Cameron, Louisiana (27°56.5' N., 92°02' W.) in 215 feet of water. The other is supposedly from the Rockport Laboratory, a very extensive lot, with calcareous algae on the shells' exteriors, and they were growing not on mangrove but on wood. A penciled note shows that this is from dubious locality, evidently of a very dry summer in that area, but maybe from anywhere. There are several lots of this species from various localities in the Caribbean. Forbes (1971) wrote a paper on this species, but it does not address the strange question of why there are so few specimens in the northwestern Gulf. Perhaps the shells of this deteriorate very quickly after the animal is gone?

Cryptostrea permollis (Sowerby, 1871)

The fourth species consists of 10 valves, of which 8 are the left one, and 2 are right. They show no erosion, nor any external growth, nor attachment. The umbonal area has a distinct protoconch in all cases, and about half of these valves are prosogyrous, the rest opisthogyrous. Some chambering is present in one which is broken. These have the peculiar umbo which is not in line with the anterior and posterior margin, but all are colored dark brown. One valve has a bored hole, near the ventral margin. They are all about the same size, 32 to 38 mm long. I can make nothing more of them than that they are Cryptostrea permollis. The lot is said to come from near the

ferry landing, at Port Aransas, and is in the Houston Museum of Natural Science. Perhaps this was among the fossils which come from that region.

Parahyotissa mcgintyi Harry, 1985

The two species of Gryphaeidae depend on SCUBA diving, since both are from deep water. Parahyotissa mcgintyi Harry, 1985, was first discovered from the mounds, or reefs, which are near the edge of the continental shelf (Fig. 1). During the 1960's and 1970's, when SCUBA diving was first popular, the reefs there became very popular with students, and although they needed to descend to 70 or 80 feet to gain the topmost reef, they did so in large numbers. One result was that many of these oysters were finally deposited in the Houston Museum of Natural Science, which now has them from the following places, in quantity:

East Flower Garden Reef
West Flower Garden Reef
Stetson's Reef
Eighteen Fathom Reef
Claypile Reef

This is one of the most abundant oysters on offshore oil platforms, of which there are literally thousands in the waters, chiefly off Louisiana. These all have vermiculate chomata, the moire luster, and large, round muscle scars which are exceedingly tenacious. Most are tan colored inside, but red and purple color washes their exteriors when they are not worn. It seems never to be arranged in stripes. Ode's (1980) new species is one of these. None grow as large as Hyotissa hyotis.

Neopycnodonte cochlear (Poli, 1795)

The initial record (Harry, 1985) of Neopycnodonte cochlear was from a point near Hospital Reef, in lower Texas. Three more lots have been found, hidden among lots of Ostreola equestris, in the Houston Museum of Natural Science. These records are as follows:

1. 27° 58' N., 91° 46' W., at 55 fms, 138 miles SSE of Cameron, Louisiana. Van Veen grab sample.
2. 28°5'18" N., 90°59'30" W., at 51 fms, 94 1/2 miles SW of Southwest Pass, Mississippi River. Van Veen grab sample.
3. 27°53'15" N., 93°19' W., at 25-28 fms, by a diver, at Twenty Four Fathom Reef.

More recently, two specimens were brought to me by Rodger Melton, merely attached to the spines of Spondylus americanus from oil platforms near the East and West Flower Garden Reefs. These oysters are so inconspicuous that they might easily be overlooked. I am particularly pleased with the small muscle scars, the chomata, which are neopycnodontine (Fig. 2), and the right valve, which shows tuck marks. The vesicular shell structure is also evident at low magnification.

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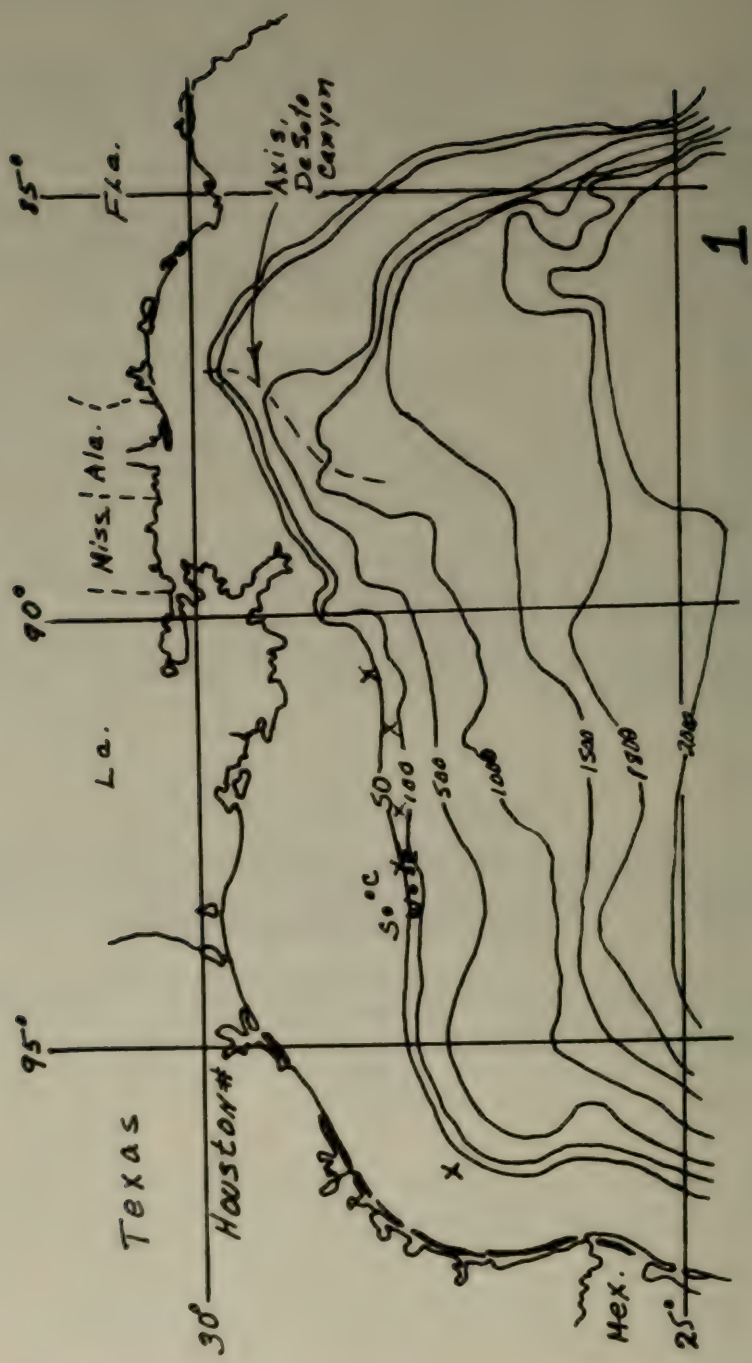
Explanation of the Plates

Figure 1. Generalized view of the northwestern Gulf of Mexico. E - East Flower Garden, C - Claypile, S - Stetson's, W - West Flower Garden, X - Location of Neopycnodonte cochlear.

Figure 2. The shell of a specimen Rodger Melton brought to me from an oil platform near East and West Flower Garden Reefs, of Neopycnodonte cochlear.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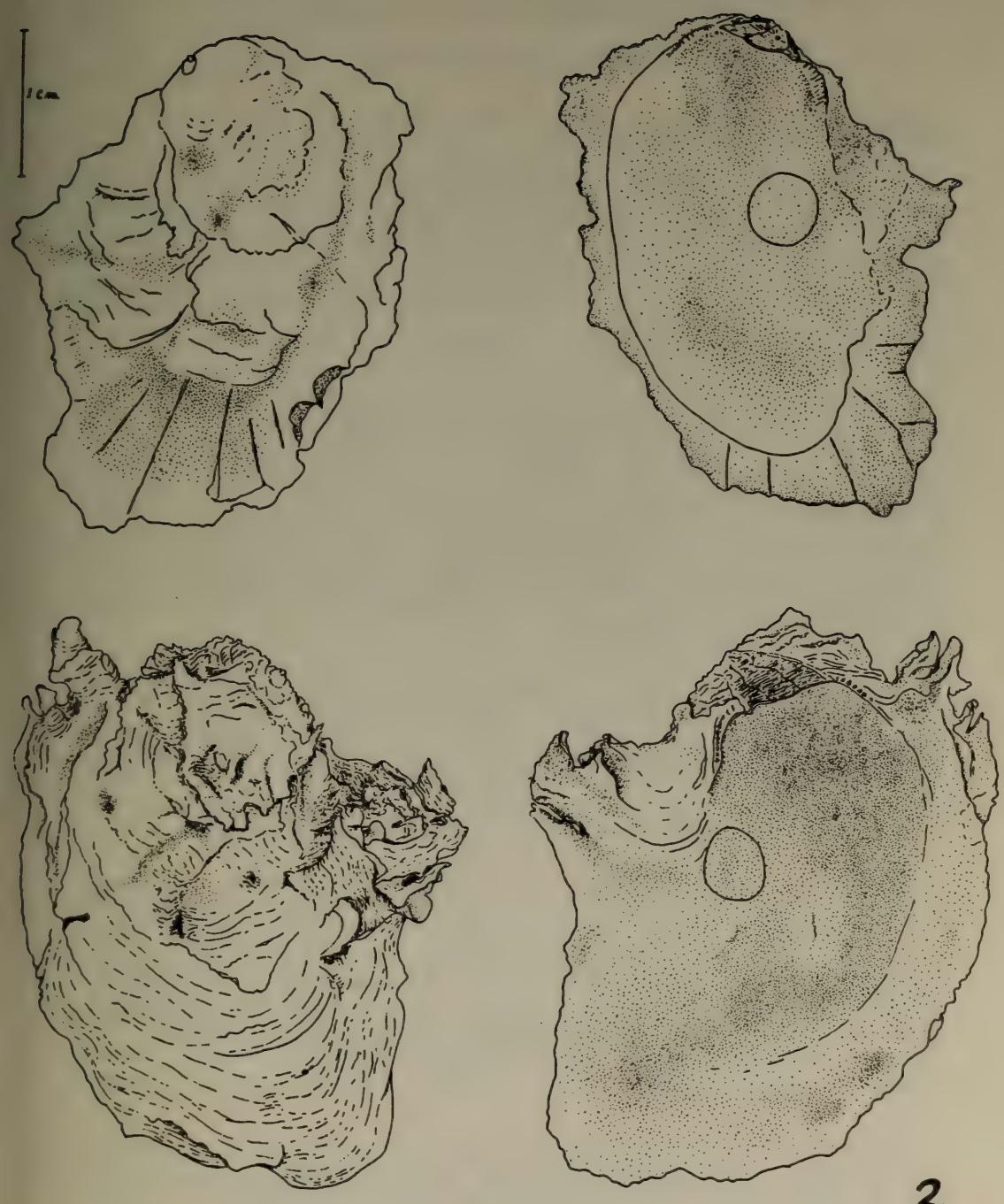
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TEXAS CONCHOLOGIST, Vol. XXIII, No. 1, October, 1986

MONOGRAPH

By H. Odé

DISTRIBUTION AND RECORDS OF THE MARINE MOLLUSCA IN THE NORTHWEST GULF OF MEXICO

(A Continuing Monograph)

Family RISSOIDAE Gray, 1847

It is a rather thankless task to try to get some order in this and several closely related families, all grouped together in the Superfamily Rissoacea Gray, 1847. Many of these families have not been intensively studied. Coupled with the fact that the offshore fauna of the northwest Gulf of Mexico is but poorly known, the uncertainties of classification and identification are formidable. In the following I will adhere only superficially to the text of Abbott (1974) but state often where a different view is to be preferred.

As usual I have gathered information from several diverse sources, which are quoted when necessary. E. Coan gave in the Veliger, Vol. 6(3) 1964, pages 164-171 a brief outline of the contents of the Rissoidae and provided some biological data for the various families constituting the Rissoacea. Most enlightening was the recent work by W. F. Ponder: "A Review of the Genera of the Rissoidae (Mollusca: Mesogastropoda: Rissoacea)" in Supplement 4 of Records of the Australian Museum, 12 Feb., 1985, 221 pages. Wherever possible I have followed his arrangement. I must thank our editor for directing my attention to this valuable study.

The small size of most of the reported material is probably the reason that most of it is considered unusual. However, for some of the species the number of specimens per lot is impressive. Alvania acuticostata, Alvania auberiana and Amphithalamus vallei sometimes occur in countless numbers per location. All specimens from such lots, however, are easily contained in a single gelatine medicine capsule. We find strong relationships with rissoids in the eastern Pacific.

It is here the place to point out some differences between the presentation of genera and species followed here as proposed by Ponder and that followed by Abbott. Abbott (1974), following Coan (1964), separates the Rissoinidae from the Rissoidae, includes Amphithalamus in the Rissoidae, but Barleeia in a special subfamily in the Rissoinidae. Ponder (1985) puts Rissoina in the Rissoidae (in a subfamily Rissoinidae) but includes both Amphithalamus and Barleeia as genera in a separate family Barleeidae. Other important differences exist, mainly in the arrangement of the various rissoinid genera and will become apparent in this write-up.

In the N.W. Gulf of Mexico occur the following rissoid genera: Alvania, Onoba, Benthonella, Rissoina, Zebina, Schwartziella, Folinia and Stosicia. The genus Microdochus Rehder, 1943, considered by Coan and Abbott as a subgenus of Cingula Fleming, 1818, has lost its name

to the older Elachisina Dall, 1918 and must on account of its internal anatomy, according to Ponder, be placed in a new family. Finally, Crepitacella Guppy, 1867 must be changed into Microstelma A. Adams, 1863 and its status as a rissoid genus is uncertain: "it may not be a rissoid" (Ponder 1985, p. 97). The genus Nannoteretispira Habe I have removed to the Aclididae.

Genus Alvania Risso, 1826

Abbott (1974) discusses only several of the 21 Atlantic coast species and merely lists the remainder. I suspect that many of these are merely synonyms of a few species. One of them, the so-called A. aberrans C. B. Adams, belongs to another genus in a group of genera in the Rissoininae. The nuclear whorls in our 4 species allow to make specific distinctions but show that our species are related.

89. Alvania auberiana (d'Orbigny, 1842)

This quite common offshore species is found in many types of environment (sandy bottoms, shelly bottoms, and coral and algal reefs) along the Texas and Louisiana coasts. It has a somewhat glassy, rather swollen shell of not more than 2 mm in size. Its color varies from very light tan (coral reefs) to brown (sandy bottoms). Mature specimens have a thickened outer lip. The width of the narrow umbilical slit is somewhat variable. Abbott (1974) states that the nuclear whorls are smooth, but close inspection reveals that on the second whorl a very slight carina develops, becoming more pronounced toward the end of the whorl. It is located at the periphery of the whorl and close to the post nuclear whorl below. In some specimens a fainter carina can be seen halfway the last part of the last nuclear whorl, thus relating this species closely to A. acuticostata Dall. The post nuclear whorl starts rather suddenly. This species also occurs in the mudlump fauna (Pleistocene) of the Mississippi Delta and once a single specimen was collected from beach drift at South Padre Island. Ponder (1985) gives as synonyms of A. auberiana d'Orbigny: Rissoa minuscula Verrill and Bush, 1900 and Rissoa lipeus Dall, 1892.

Records HMNS Survey Collection: 51 lots, of which 9 contain live collected material.
Depth range: 0 - 55 fms; alive: 17 fms - 40 fms.
Geographical range: Florida, Texas, and the Caribbean; Bermuda (Abbott, 1974).
Maximum size: 1.8 mm. Not a single specimen among the several thousand from the N.W. Gulf of Mexico reaches 2 mm.

90. Alvania spec. indet. A

In the HMNS collection are two lots of a much smaller Alvania, which has a nucleus considerably different from auberiana, but which appears to be similar to it in its post nuclear development. We possess only immature material of less than 1 mm in size and I estimate that fullgrown

material will barely reach the size of 1 mm. The nucleus consists of only a single rather flat whorl which gradually changes into post nuclear growth. The faint spiral carinae of auberiana are not present but gradually the axial ribs appear. The nucleus stands out because of its dark tan color.

Records HMNS Survey Collection: 2 lots of rather juvenile shells, both probably alive when collected.
Depth range: 67 fms.
Maximum size: 0.8 mm.

91. Alvania acuticostata Dall, 1889

This interesting and not rare species has been taken at many locations, sometimes in large numbers. The nucleus of this species is clearly related to that of A. auberiana. It is formed by 3 - 3 1/2 whorls, the upper one of which is quite smooth. On the lower half of the last nuclear whorl are two finely tuberculated carinae or spiral ridges. The upper half of the whorl is very finely axially ribbed. Abbott (1974) states that there is no umbilicus. Although that is true for a few specimens in any population in our collection, by far the major portion of our material shows a quite narrow open umbilical slit.

The outer lip is thickened in maturity. In fresh material the nucleus is of darker color than the remainder of the shell. The figure given by Abbott (1974) does not quite conform with our specimens in that the axial ribs on the body whorl are not directed truly axially, but bend forward when they reach the base. This was previously reported under the name Rissoa sp. B, Texas Conchol. Vol. 9, p. 61 (#78). It should also be stated that Ponder 1985 refers to this species under the name originally given to it by Dall: A. xanthias acuticostata Dall. Abbott (1974) has apparently separated xanthias Watson from Dall's subspecies.

Records HMNS Survey Collection: 18 lots, no live material but 2 lots quite fresh at 76 - 95 fms.
Depth range: 50 - 165 fms.
Geographical range: Off North Carolina to Mississippi to Barbados (Abbott, 1974).
Maximum size: 2.8 mm.

92. Alvania precipitata (Dall, 1889)

This species is very similar to acuticostata in appearance, but probably is not closely related. The nuclear shell is quite different, the ribs are more numerous, and the shell is considerably smaller. As is often the case, the nucleus of acuticostata, the larger of the two species, is smaller than the nucleus of precipitata. The latter is shiny and polished and thus lacks the carinae and sculpture of the nucleus of acuticostata. Abbott (1974) states that the

species has a thin outer lip. However, in our material are specimens with a thickened outer lip. A further useful difference between the two species is the greater number of spiral grooves on the base of precipitata. It is quite a bit less common than acuticostata. In view of the discrepancy in size (Abbott cites 2.4 mm) there remains considerable uncertainty about our identification.

Records HMNS Survey Collection: 6 lots, no live material.
Depth range: 8 feet - 55 fms.
Geographical range: Gulf of Mexico to Florida Straits (Abbott, 1974).
Maximum size: 1.2 mm.

Genus Onoba H. and A. Adams, 1854

In the Texas and Louisiana offshore region live two species belonging to this genus, as defined by Ponder (1985). One is an Onoba s. s. which is characterized by closely spaced spiral sculpture. Little is known about the genus. The other small species lives exclusively on the coral and algal reefs, and its occurrence in the N.W. Gulf is surprising, because the subgenus Manawatawhia Powell, 1937, to which we assign it, is only known from New Zealand.

93. Onoba (Onoba) aculeus Gould, 1841

This totally unexpected species was taken in two lots, one from off Freeport, Texas, the other from off Cameron, Louisiana. Many of the specimens in the latter lot possess a, for this species, large shell with somewhat tabulated whorls and show a small but open umbilical slit. The small shiny nucleus is swollen and is formed by slightly more than one whorl. The surface of the post nuclear whorls is lined with numerous, crowded, and somewhat wavy spirals. The upper corner of the aperture is detached. In one lot several specimens possess below the suture numerous but faint axial riblets. It is my belief that this is a southern form (subspecies?) of aculeus Gould of the Northeastern U.S.A.

Records HMNS Survey Collection: 2 lots, no live material.
Depth range: 55 - 140 fms.
Geographical range: Nova Scotia to New Jersey (Abbott, 1974).
Maximum size: 4.0 mm.

94. Onoba (Manawatawhia) spec. indet. A

This extremely minute gastropod occurs on the Flower Gardens and two other adjacent coral reefs. Its generic position was until Ponder's review totally unknown to me. The type of the subgenus Manawatawhia was described by Powell from New Zealand and is figured in Powell's "Shells of New Zealand," 5th revised edition of 1976 and in Ponder's 1985 "Review of Genera." Our material is extremely minute, but mature and is elongate with somewhat keeled and ribbed

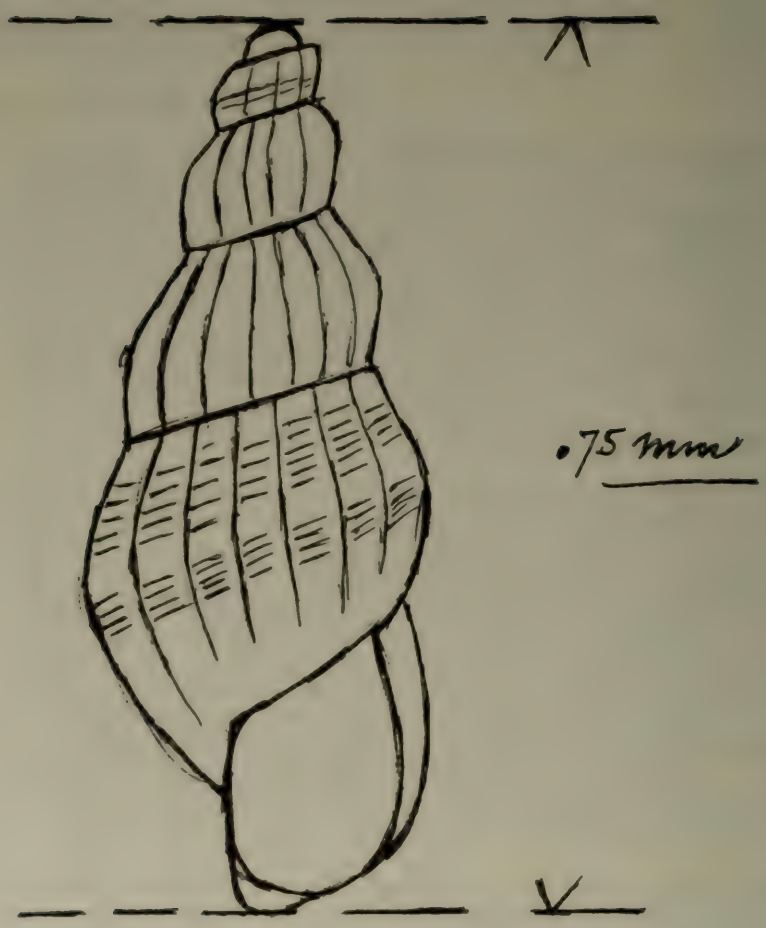

Fig. 1. Sketch of Onoba (Manawatawhia) spec. indet. A.

whorls. A sketch prepared from one specimen is shown in fig. 1

Records HMNS Survey Collection: 3 lots, no live material.
Depth range: 15 - 30 fms.
Geographical range: Only known from New Zealand.
Maximum size: less than 1 mm.

Genus Elachisina Dall, 1918

Elachisina Dall, 1918 has priority over Microdochus Rehder, 1943. It is a small genus whose shells resemble somewhat a fat Onoba. Ponder (1985) has studied the internal anatomy and found it so different from that of the rissoids that he will propose a separate family for it. Until this is published we will report it where Abbott classified it, i.e., close to Onoba.

95. Elachisina floridana (Rehder, 1943)

A single specimen was taken off the Louisiana coast at a depth of 55 fms. It conforms in all particulars with Abbott's description. The nuclear whorls, about 1 1/2 - 2 are flat and smooth.

Records HMNS Survey Collection: 1 lot, consisting of a single fresh specimen, probably alive when collected.
Depth range: 55 fms.
Geographical range: Florida Keys and Gulf of Mexico to Puerto Rico (Abbott, 1974).
Maximum size: 1.5 mm.

At this point I may correct an error in the preliminary list (Tex. Conchol., Vol. 9, p. 61, #83). Onoba sp. D turns out to be a juvenile land snail. Apparently, when the sample, after washing and cleaning, was set to dry outside in my backyard, a snail crawled into it. Such errors are not as rare as one might think. An example where it led to an unwarranted description is the genus Anaplocamus Dall (see Abbott, 1974, p. 79).

Genus Benthonella Dall, 1889

A single species of this deep water genus has been collected off the Texas coast in very deep water. Our material looks old and worn.

96. Benthonella gaza Dall, 1889

This is a rather thin shelled, deeply sutured species with a flat nucleus and an open umbilicus. There is hardly any surface sculpture. On the earliest post nuclear whorls there are very faint axial riblets visible which completely disappear on the later whorls. The nucleus is brown and carries a single carina. Such carinae are characteristic

for the Rissoidae. Ponder's (1985) discussion of the genus Benthonella and his figures leave no doubt about the generic identity of our material. There is, however, in my mind some doubt about the identity of the genus Costaclis Bartsch, 1942, which in shape is quite close to Benthonella and also possesses riblets which disappear on the mature whorls. (Compare figs. 661 and 1438 etc. in Abbott, 1974.)

Records HMNS Survey Collection: 2 lots, no live material.
Depth range: 450 - 500 fms.
Geographical range: Off Georgia to Cuba and the Gulf of Mexico (Abbott, 1974).
Maximum size: 3.1 mm.

Genus Rissoina d'Orbigny, 1840

In the treatment of the rissoinid genera we shall follow Ponder (1985) whose classification and observations fit the N.W. Gulf of Mexico far better than other discussions. The rissoinid genera we will treat are: Rissoina, Zebina, Schwartziella, Folinia, Stosicia, and Microstelma. The latter may not be rissoid. The great variety of rissoinid species obtained in the survey was definitely a surprise. Striking is the relationship of some of our species with Eastern Pacific ones. The type of the genus Rissoina inca d'Orbigny comes from Peru. Many species display an extremely variable surface sculpture, so that in a single species one encounters practically smooth to very densely ribbed specimens. In accord with this fact, Ponder has reduced the number of so-called subgenera based mainly on shell characters, drastically, so that for the N.W. Gulf of Mexico there only remain Rissoina s. s. and Phosinella Morch, 1876. The three species of Rissoina s. s. which are found in the N.W. Gulf of Mexico used to be classified as Zebinella Morch, 1876. They have an elevated turbinate nucleus of about 2 to 3 whorls. The species are often not easily separable, and I am not convinced that some are truly distinct. The same variability in surface sculpture is also present in the genus Folinia Crosse, 1868.

The subgenus Phosinella differs from Rissoina s. s. merely by the strong cancellate sculpture of the shell. There is, however, within the species very little variability in form and sculpture. For views different from those expressed here and other data about rissoinids the reader may consult Olsson and Harbison (1953) and Desjardin (1949, in Journ. de Conchyl., Vol. 89).

97. Rissoina (Rissoina) multicostata (C. B. Adams, 1850)

This, our most common Rissoina, lives along the entire Texas and Louisiana coast in several types of environment. It is only quite rarely taken on the beaches (near Sabine Pass, Texas). It differs from decussata and striosa by its smaller size and deeper suture. The first post nuclear whorl is keeled, but this keel disappears on later whorls. Whereas the sculpture of decussata and striosa seems quite variable, that of multicostata seems to be more stable. The

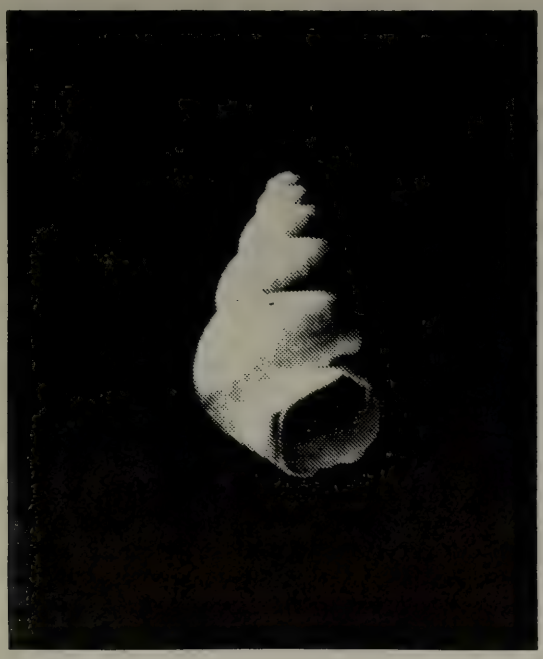

Fig. 2. Benthonella gaza, 3.1 mm, from dredge and Van Veen grab samples at 500 fms from unctuous, gray mud 105 miles Southeast of Freeport, Texas June 17, 1967 by H. Geis and S. Stubbs.

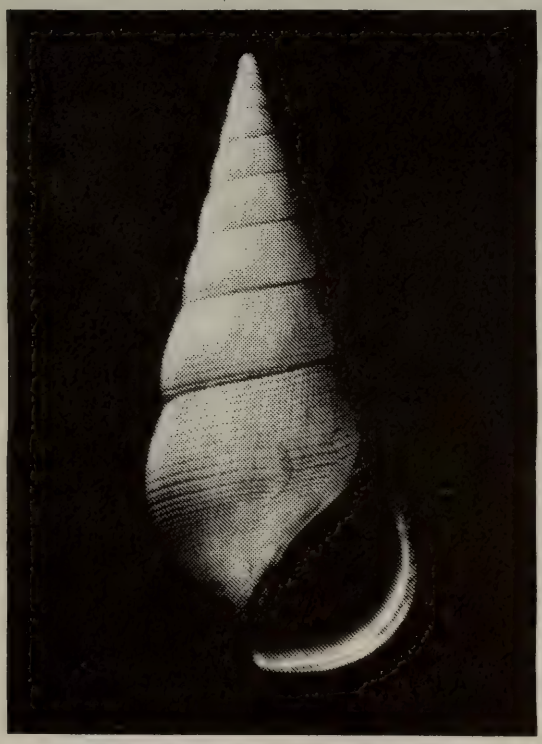

Fig. 3. Risoina decussata, 9.6 mm, dredged in 30-40 fms at Stetson Bank, 74 miles SSE of Galveston, Texas by T. E. Pulley and Paul McGee in 1963.

operculum is yellow and horny. Our material carries a remarkable likeness to Rissoa affinis C. B. Adams, as figured by Clench and Turner (1950) in a rather poor, over-exposed photograph. According to Olsson and Harbison (1953) R. affinis is synonymous with striatocostata d'Orbigny. The shell figured as striato-costata by Olsson and Harbison, however, is quite different. The name affinis perhaps could be applied to several lots of slightly different looking shells. They are larger and somewhat coarser than typical multicostata (maximum size 6.5 mm). However, I prefer to list them as multicostata.

Records HMNS Survey Collection: 29 lots, of which 8 contain live collected material and 7 lots, no live material, resembling "affinis" C. B. Adams.
Depth range: 6 - 35 fms.
Geographical range: Southeast Florida, Texas and the West Indies (Abbott, 1974).
Maximum size: 5.2 mm and 6.5 mm.

98. Rissoina (Rissoina) decussata (Montagu, 1803)

This, by far the largest of our rissoinas, is enormously variable. C. B. Adams named several closely similar forms, now considered synonyms: albida and princeps, and I suspect that there are many more. In the typical form in the N.W. Gulf of Mexico there are hardly any axial riblets, but rows of small pits arranged in a decussate pattern, the merest remnant of a highly reduced pattern of vertical ribs and horizontal spirals. Ponder figures a densely ribbed specimen. In our material one can only in the first two or three post nuclear whorls discern traces of true axial ribbing. The keel on the first post nuclear whorl is not as outspoken as in multicostata, and the nucleus is that of typical Rissoina.

Records HMNS Survey Collection: 17 lots, no live material.
Depth range: 10 - 51 fms.
Geographical range: North Carolina to Texas to the West Indies (Abbott, 1974).
Maximum size: 9.7 mm.

99. Rissoina (Rissoina) striosa C. B. Adams, 1850

Under this name I list here with some hesitation a number of relatively large rissoinas, mostly found together with specimens of decussata. These shells correspond quite well with the picture of striosa as given by Clench and Turner (1950) and which must be considered as the type. The difference between striosa and decussata is that most specimens of striosa show clear axial ribbing and barely any decussate pattern of pits. In our material there is one abnormally large specimen, fairly strongly ribbed, with a decussate pattern of pits between the ribs. For this reason I consider it somewhat doubtful that striosa and decussata are

specifically distinct. Striosa also occurs in the mudlump fauna of the Mississippi delta.

Records HMNS Survey Collection: 9 lots, no live material.
Depth range: 11 - 36 fms.
Geographical range: Southeast Florida and the West Indies (Abbott, 1974).
Maximum size: 10.8 mm, but mostly about 7.2 mm.

The subgenus Phosinella Morch, 1876 contains small gastropods with strongly cancellate sculpture, having a typical rissoinid aperture with thickened outer lip. There are deep sutures and a small nucleus of about 2 1/2 whorls. A fasciolar bulge rotates around the base. In the N.W. Gulf of Mexico live two species of Phosinella which differ in the intensity of sculpture and fineness of pattern. Abbott names the more coarsely sculptured one P. cancellata Philippi and the more finely one sagraiana d'Orbigny. McGinty has described another much larger species from Barbados and Panama, and Olsson and Harbison have named fossil material from Florida P. fargoi. I am quite uncertain about the proper names of both species in the N.W. Gulf of Mexico, because most authors give contradictory descriptions. Somewhat arbitrarily I have chosen the name cancellata for the coarse material and the name fargoi for the finer, because I have never seen a good photograph or description of sagraiana. There is a difficulty with the synonymy of pulchra C. B. Adams. The figure of the type (Clench and Turner, 1950, pl. 33, fig. 370, unfortunately overexposed), shows a shell which may be "fargoi" rather than cancellata, so that I believe that pulchra is the correct name for the fossil material from Florida.

100. Rissoina (Phosinella) cancellata Philippi, 1847

This common and widespread species occurs in many of the offshore environments all along the Texas and Louisiana coasts. It has a deeply excavated suture and a rather small, smooth nucleus of 2 whorls, after which the sculpture starts suddenly. The sculpture is formed by strongly elevated spirals and axials, which become somewhat knobby where they cross. An obvious difference with the related fargoi is the outline of the sutural groove. In cancellata this groove is far more angular than in fargoi. Live material is rare. Then the shells are shiny and glassy and show a very light brown color band below the suture. The operculum is yellow and horny with an eccentric nucleus. This species also occurs in the Pleistocene mudlump fauna.

Records HMNS Survey Collection: 30 lots, of which 2 contain live collected material.
Depth range: 8 feet - 70 fms.
Geographical range: Florida, South Texas and the West Indies, Brazil, Bermuda (Abbott, 1974).
Maximum size: 5.2 mm.

101. Rissoina (Phosinella) fargoi Olsson and Harbison, 1953

For lack of any significant descriptions and figures of P. sagraiana, which Abbott states occurs in Texas, we name this species P. fargoi. We reported it in the past as P. pulchra C. B. Adams (see Tex. Conchol. Vol. 9, p. 61) which is probably correct, because I believe, but cannot verify, that pulchra is not synonymous with cancellata but with fargoi. Hence fargoi should be abandoned in favor of pulchra C. B. Adams.

This species is easily separated from cancellata; it is much more finely cancellated and rounder at the suture. Probably its environment is also different from that of cancellata; it occurs also on the calcareous reefs, whereas cancellata prefers sand and shelly bottoms. Both species are seldom taken together.

Records HMNS Survey Collection: 15 lots, no live material.
Depth range: 12 - 70 fms.
Geographical range: Described as Pliocene fossil from Florida; Jamaica (for P. pulchra).
Maximum size: 5.8 mm.

Genus Schwartziella Nevill, 1881

The small species in Texas are quite characteristic. Ponder has split them off from Rissoina because of a different operculum and radula. They also lack an anterior canal in the aperture. In many respects they closely resemble the genus Zebina but differ in having strong axial sculpture, while Zebina is smooth and colorless. Ponder recognizes a single subgenus Pandalosia (Laseron) which differs from Schwartziella s. s. in having a strong basal fold and a relatively large, elongate protoconch.

102. Schwartziella (Schwartziella) catesbyana d'Orbigny, 1842

This species is well known from the south Texas coastal bays and has been reported by most authors describing the Texas fauna. For a record of this see Ode, Tex. Conchol. Vol. 6 (4) and Vol. 7(2). It is the largest of the 4 Texas species and is rather smooth. There is an internal tooth on the outer lip. Its nucleus is not as highly coiled as that of S. fischeri Desjardin. The outer lip is considerably thickened. In offshore waters quite rarely another much smaller species is found (outside the calcareous environment) which we believe to be S. chesnelii.

Records HMNS Survey Collection: 5 lots, of which 1 contains live collected material.
Depth range: 0 - 5 fms.
Geographical range: North Carolina to Texas to Brazil; Bermuda (Abbott, 1974).
Maximum size: 4.0 mm.

103. Schwartziella (Schwartziella) chesnelii (Michaud, 1830)

Abbott states that S. catesbyana does not live on offshore reefs. In the N.W. Gulf of Mexico it is replaced in deeper waters outside the reefs by a small species. These shells resemble, except for one character, the figure of Rissoa scalaroides C. B. Adams, which Desjardin has put into synonymy with chesnelii. The difference is that our material is less densely ribbed than the specimen figured by Clench and Turner (1950) on plate 33, fig. 6. Differences between catesbyana and our material are: 1) Full grown material is considerably smaller than catesbyana and its overall shape is more slender; 2) The internal tooth is barely developed. Until we stand corrected we have labelled this material "chesnelii Michaud".

Records HMNS Survey Collection: 7 lots, of which one contains live collected material.
Depth range: 30 - 55 fms.
Geographical range: "Appears to be limited to Jamaica" (Abbott, 1974).
Maximum size: 3.2 mm.

104. Schwarziella (Pandalosia) fischeri (Desjardin, 1949)

A figure of this rather rare species is shown in Warmke and Abbott (1961). In 1953 it was described as a Pliocene fossil from Florida by Olsson and Harbison and given the name floridana. Their very complete description covers our material exactly (see p. 325), and it is figured on plate 48, fig. 8. Characteristics for the species are 1) the coronated whorls and 2) a basal chord or fold on the base of the shell, which is clearly visible in the published figures. The nucleus forms a somewhat narrow and elevated coil of about 3 - 3 1/2 whorls. In mature specimens the basal chord is better developed than in juvenile shells.

Records HMNS Survey Collection: 3 lots, of which 2 contain probably live collected material.
Depth range: 10 - 62 fms.
Geographical range: Cuba and Bermuda (Abbott, 1974).
Maximum size: 3.3 mm.

105. Schwartziella (Pandalosia ?) elegantissima d'Orbigny, 1842

This beautiful and very interesting species is not rare on the offshore coral reefs, where we have collected it alive. In 1850 C. B. Adams compared this species with multicostata to which it bears indeed some superficial resemblance, although both species are quite different. S. elegantissima differs considerably from the other schwartziellas in that it is densely spirally striated between the riblets. This spiral sculpture is not mentioned by Ponder, but referred to by Olsson and Harbison (1953). Another character not in accord with Schwartziella is the very much thickened outer

lip which in some specimens shows very densely spaced striae perpendicular to the edge. The operculum is yellow and horny, with a small spiral eccentric near the inner lip. The nucleus is as in typical Pandalosia, that is elongate and 3 1/2 whorls. Also the body whorls are rather inflated.

Records HMNS Survey Collection: 9 lots, of which 3 contain live collected material.
Depth range: 6 - 70 fms, but mostly between 6 - 30 fms (alive).
Geographical range: Cuba (d'Orbigny, Moll. de Cuba, Tab. XII, figs. 27-29).
Maximum size: 3.9 mm.

Genus Stosicia Brusina, 1870

Small shells, rather solid with spiral or reticulate sculpture, without an umbilicus. They resemble in many respects shells of Phosinella, such as nucleus, surface sculpture and excavated suture but they lack the somewhat flaring (semilunar) aperture of Phosinella. Stosicia s. s. is only spirally sculpted but the subgenus Isseliella is strongly cancellate. In the N.W. Gulf of Mexico there is a single species.

106. Stosicia (Isseliella) abberans C. B. Adams, 1850

This somewhat uncommon species is still another link between the Texas offshore fauna and that of the eastern Pacific. Close relatives live in the Panamic faunal province (S. serrei (Bavay, 1922)) and others in south Australia and the tropical west Indo-Pacific. The original author recognized its aberrant nature in the name he gave it and only more than 100 years later it could be related to other faunal elements. The figure in Clench and Turner's paper of 1950 (Rissoa aberrans, pl. 33, fig. 10 and page 249) shows probably a beach rolled specimen.

Records HMNS Survey Collection: 6 lots, no live material.
Depth range: 8 - 51 fms.
Geographical range: West Indies to Brazil (Abbott, 1974).
Maximum size: 4.6 mm.

Genus Zebina H. and A. Adams, 1854

These are small gastropods with little or no sculpture on an almost smooth and shiny shell. The nucleus consists of 2 to 3 somewhat swollen whorls without sculpture. In the survey collection there are surprisingly two species, only one of which is well known. This is the fairly common Z. browniana of the south Texas coastal bays; the other is a neglected C. B. Adams species which we have provisionally given the name Z. eulimoides C. B. Adams.

107. Zebina browniana (d'Orbigny, 1842)

This species is commonly collected with R. catesbyana in the Texas coastal bays. It is a smooth shell, rather flatsided, but often somewhat oval in shape. There is an excellent figure in Ponder, 1985 (fig. 136G). It has a tooth inside the outer lip at exactly the same spot as R. catesbyana and a smaller slight pimple at the inner base of the lip. It is not found offshore where it is replaced by Z. eulimoides C. B. Adams.

Records HMNS Survey Collection: 4 lots, no live material.
Depth range: 0 - 2 fms.
Geographical range: North Carolina to the West Indies; Bermuda (Abbott, 1974).
Maximum size: 4.2 mm.

108. Zebina c.f. eulimoides C. B. Adams, 1850

This species superficially resembles Z. browniana, but there are many points of distinction. Those are: 1) eulimoides is quite a bit more slender than browniana; 2) no specimen is ever slightly oval in shape. All shells form a perfectly straight circular cone, with at its base a rather flaring rissoinid aperture; 3) there are no teeth in the aperture; 4) there is a finely incised spiral somewhat above the suture and also finely incised opisthocline axial grooves on the whorls. These grooves are often so fine that one must orientate the specimen in a favorable position under the microscope to observe them. From Adams' description, as reproduced by Clench and Turner (1950), it is apparent that he described a relatively immature and probably beach rolled specimen. "Axis moderately curved" and "aperture scarcely effuse" can only be juvenile characters. The fullgrown material even when not reaching maximum size has a perfectly straight axis and an effuse aperture. However, the spiral line and the lack of teeth make it very probable that this species should be called "eulimoides C. B. Adams".

Records HMNS Survey Collection: 7 lots, no live material.
Depth range: 25 - 215 feet.
Geographical range: Jamaica.
Maximum size: 5.5 mm without nuclear whorls (+/- 5.8 when complete?).

Genus Folinia Crosse, 1868

It was a great surprise to discover no less than three species of this genus in the survey material. They differ considerably in surface sculpture not only between species but also within a single species. The same variability we have noted for some species in Rissoina.

The most common species is fairly uniform in surface features: quite smooth, like species in Zebina and bears an obvious and very close relation to the West American Folinia histia Bartsch. I suspect that

one of the photographs in Clench and Turner's (1950) documentation of the C. B. Adams species from Jamaica shows an immature specimen before development of the enormous outer lip.

The shell is very variable and obviously related to either F. bermudezi (Aguayo and Rehder) or lepida Woodring, 1928, which is the second species. A third species is a rather larger and slender shell which is extremely close, if not the same, as the Panamic F. ericana Hertlein and Strong. The most visible character of this genus is the most expanded and thickened outer lip and the basal fold. The aperture has an anterior and a posterior channel.

109. Folinia c.f. histia Bartsch, 1915

This quite remarkable species I classified first as a Zebina because it lacks almost all surface sculpture. It is easily recognized by the enormously developed outer lip which forms a veritable ridge around the aperture. In mature specimens a fat chord spirals around the base. I believe that an immature specimen was described by C. B. Adams as Rissoa vitrea from Jamaica (see Clench and Turner, 1950, p. 357, pl. 33, fig. 1). The figure shows an immature shell with only the inception of the spiral chord, which can be seen to the side of the pillar, where the photo is badly overexposed. A slight excavation in the lowest part of the outer lip, forming the anterior canal can also be seen. In fresh specimens a faint spiral quite close to the suture can be seen.

Records HMNS Survey Collection: 7 lots, no live material.
Depth range: 18 - 63 fms.
Geographical range: Panamic Province?; Jamaica?
Maximum size: 3.4 mm.

110. Folinia c.f. lepida (Woodring, 1928)

In our collection are two lots, each of a single shell from rather deep water, of a Rissoina which, until Ponder's review became available, was completely unknown to me. It is a rather slender form with a large flaring but typically rissoinid aperture - usually called "semilunar". The most obvious fact about this shell is that the very fine horizontal striae are clearly continued over the outer, thickened, lip, which has become completely crenulated. Its nucleus is rissoinid but less highly coiled than in Schwartziella. The variability of this species must be quite large, because in one specimen there are quite clear axial ribs, but in the other, ribs are not present and the surface of the body whorl is finely decussate. The shape of both specimens, their size and structure of the outer lip are quite identical. As we have mentioned the variability of surficial properties is probably common in some rissoinids (those denoted as Zebinella Morch). For the time being I consider both specimens, although at first glance quite different, to be the same species and report them as F. lepida (Woodring,

1928), described from the Pleistocene (not Miocene) of Jamaica. It is suggested here that possibly all 3 species reported from the Western Atlantic F. lepida (Woodring, 1928), F. xesta (Woodring, 1928), and F. bermudezi (Aguayo and Rehder, 1936), are identical. (See also Nautilus Vol. 51, p. 35.

Records HMNS Survey Collection: 2 lots, one of which consists of a glossy fresh shell.
Depth range: 30 - 55 fms.
Geographical range: Pleistocene Jamaica (lepida, xesta); Southeast Florida, Bermuda (bermudezi) (Abbott, 1974).
Maximum size: 3.8 mm.

111. Folinia c.f. ericana (Hertlein and Strong, 1951)

In the survey collection finally there is another species, obtained from off Louisiana that is clearly related to an Eastern Pacific one. This, the most slender of all rissoinids here, is quite heavily axially ribbed and possesses intercostal spaces that are minutely striated. The outer thickened lip is heavily developed and carries fine striations, but is not as obviously crenulated as that of the previous species (lepida). The axial riblets continue into the suture, which in consequence appears quite wavy. I prepared a little sketch (fig. 4) which may be compared with figure 140F given by Ponder.

Records HMNS Survey Collection: 1 lot, no live material.
Depth range: 30 fms.
Geographical range: Unknown.
Maximum size: 5.5 mm.

Fig. 4.. Sketch of suture of Folinia c.f. ericana.

Genus Microstelma A. Adams 1863

Ponder, 1985 has unearthed two earlier names for Crepitacella Guppy, and hence the shells originally known generically as Dolophanes Gabb experience another name change. Species of this little known genus live mainly in very deep water. They are small shells with either shouldered whorls or very deep sutures and inflated whorls. A typical

character of the genus is the presence of riblets on the early whorls, which fade out on the later whorls. Abbott, 1974 mentions 4 species and figures two of them, and Ponder (1985) figures a number of world-wide species and fossils. Crepitacella was thought to be restricted to the Gulf of Mexico and the Caribbean, but Microstelma was described from Japan.

112. Microstelma c.f. leucophlegma (Dall, 1881)

> I have placed the only 4 specimens in the collection under this name, but realize that they are smaller than Dall's figured specimen and have a slightly deeper suture. M. vestalis Rehder is clearly related but possesses a much larger body whorl (more than half the shell) and a differently shaped spire. Under strong magnification one can discern some spiral lines. There are 2 smooth shiny nuclear whorls and the umbilicus is a mere slit. They are from very deep water.

Records HMNS Survey Collection: 1 lot, no live material.
Depth range: 800 fms, south of Galveston.
Geographical range: In deep water off Cuba (Abbott, 1974).
Maximum size: 2.0 mm.

(To be continued)

BOOK REVIEW

By H. Odé

Seashell Treasures of the Caribbean by Lesley Sutty, edited by R. Tucker Abbott, 128 pages, 139 color plates, E. P. Dutton, New York, $19.95. ($21.95 with autographed, numbered bookplate from American Malacologists, P.O. Box 1192, Burlington, MA 01803).

I obtained this collection of exquisite color photographs of some of the rarer Caribbean seashells by advance subscription for $21.95. The book is well worth the money. Several of the enumerated species are not listed in Abbott's American Seashells, 1974, notably some cones. It struck me that many - if not a majority - of the figured shells do live offshore Texas, mostly on the coral reefs. As an example, I may mention Gobraeus circe Morch. Shells with exactly the same color pattern as the one figured (p. 109) live on the offshore Texas coral reefs; a white form was also reported by McLean (1951) from the Virgin Islands (see New York Acad. Sci.: "Scientific Survey of Porto Rico and the Virgin Islands," Vol. 17, part 1, Pelecypoda). Another example is Murex consuelae which lives on the Flower Gardens. A few other species can even be considered abundant in the N.W. Gulf of Mexico, as for instance: Polystira albida, which is a widespread and common sand bottom dweller. There are a few proofreading omissions in the book: the species name in caption 1 should be Pleuroploca aurantiaca, the captions for figures 22 and 23 are reversed and the name Hindisclava should be Hindsiclava.

All in all, this book is a necessary and very beautiful addition to the library of any student of Western Atlantic mollusks.

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The TEXAS CONCHOLOGIST is the official publication of the Houston Conchology Society, Inc., and is published quarterly at Houston, Texas. It is distributed as part of the dues to all members.

The Society holds regular meetings the fourth Wednesdays of the following months: August, September, October, January, February, March, April, and May. The meeting is held the third Wednesday in November. Meetings are held in the Azalea Room of the Houston Garden Center in Hermann Park just east of the Houston Museum of Natural Science, beginning at 7:30 p.m.

The TEXAS CONCHOLOGIST is published October, January, April and July. It is mailed postpaid to regular members in U.S. postal zones. Overseas members will be charged additional postage. Only one copy will be mailed a family membership.

Dues extend from the beginning of the fiscal year of June 1 through May 31. However, the July issue of the TEXAS CONCHOLOGIST each year is the fourth quarterly due on the regular dues year beginning June 1 of the previous year. Memberships will be accepted throughout the year but will receive quarterlies of that fiscal year. Members receive meeting Newsletters and have all other privileges provided by the Society's by-laws.

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The TEXAS CONCHOLOGIST accepts contributions for publication from amateurs, students, and professionals, subject to approval by the Editor. Manuscripts should be typed, double spaced and should be in the hands of the Editor the first day of the month preceding publication dates. Photos accompanying such material are welcomed.

NEW HALL OF MALACOLOGY TO OPEN AT THE HOUSTON MUSEUM OF NATURAL SCIENCE

The all new Strake Hall of Malacology will open February 7 at the Houston Museum of Natural Science for the "Splendors of the Sea" Gala sponsored by the Museum Guild. There will be a Museum Member's Opening on Sunday, February 8 from 5:30 to 7:30 p.m. The exhibit will be open to the public on Monday, February 9.

Referred to as one of the Museum's best-kept-secrets, the exhibit will display some of the holdings of mollusks from the collections at the Museum. This will be a major worldwide exhibition featuring major families of shells, such as Conidae, Volutidae, Cypraeidae, Muricidae, and Pectinidae, to name a few. These will be displayed aesthetically, following the installation of the collection of gems and minerals. However, light and color will enter into the mollusk displays, as well as Videos and transparencies to emphasize that mollusks are living animals.

The Museum's Collection grew under the twenty-five year tenure of the late Executive Director Dr. T. E. Pulley, a malacologist. His own study and teaching collection formed the core for the research collection that is housed at HMNS. Further encouragement and support from the Museum and Dr. Pulley helped to generate continuance of the efforts of a group of dedicated collectors, most of them members of the Houston Conchology Society, Inc., to put together the invaluable research material comprising some 25,000 lots of mollusks from the Northwest Gulf of Mexico. This was led by Harold Geis and Dr. Helmer Ode. Dr. Ode continues to monograph the survey material in Texas Conchologist. Since the collections at the Museum are properly, systematically arranged, although not all cataloged, the material is available to scientists. The Museum regularly makes loans of mollusks for scientific studies to professionals and other major institutions. The Northwest Gulf of Mexico mollusk survey is one of the best of the world.

The Strake Hall of Malacology will be divided into two major sections. The shells in the center of the hall will be artistically displayed by families, and some very large shells will be featured. This area will exphasize the worldwide collections in the Museum.

Most of the classic rarities, and many of the unique new discoveries will be displayed. In addition to marine species, there will be exhibits of some land and freshwater shells. Of the estimated 50,000 or more species of world-wide shells known from sea, land, and fresh water, the exhibit will feature over 2,000 shells. All are from the Museum's collections, given through the years by interested collectors who hoped for such an exhibit at the Museum.

The second portion of the exhibit will be educational in nature, to be named for Betty and Larry Allen whose endowment provided the monies to prepare the exhibit. Included in this wall will be many stories of shells, as well as scientific information about the phylum Mollusca.

There will be two videos of live shells and numerous graphics to remind you that these are all living animals. Classification, a growth series of Busycon perversum, color variations, poisonous mollusks, Texas shells and habitats, shell-less mollusks such as the nudibranchs seen through transparencies, the story of cephalopods such as Nautilus, octopuses, and squids, and discussion of endangered, threatened, and harmful mollusks will be part of the education panels. There will also be a display introducing you to the history of mollusks in literature and art and uses of mollusks through the ages.

Developed in the second half of the seventeenth century, the science of the study of mollusks is called Malacology. Long before that, the curiosities of shells commanded interest for the European collectors of natural objects. And, before that, pre-historic cultures used shells in cults and worship, as food, as tools, as adornment, as symbols of chiefdom, and as objects inspiring art.

Aristotle (384-322 B.C.) recorded his observations on the habits of mollusks in his "History of Animals." There were shells found in the ruins of Pompeii that came from seas other than the Mediterranean, an indication that they were traded.

Middle Age manuscripts were filled with motifs of animals, including shells. During the 15th and 16th centuries, there was an enormous interest in natural history when traders and discoverers to far-flung islands and areas of the world brought home new shells. Royalty demanded the shells; painters included shells in their works of art.

The interest in shells reached full bloom in Europe. Describers and artists were hired, often by royalty, to prepare books on shells. Some exceedingly beautiful books with drawings printed from plates with the shells painstakingly hand painted were produced. The malocological library at HMNS contains many of these early books and is one of the finest malacological libraries in the South.

Today, interest in shells continues. New uses for the animals--especially in medicine--generate research. New species are still being identified throughout the world, even from the Museum's collection. Two new species recently discovered in HMNS material by a professional studying a special family will be named soon. So, in spite of the long history, Malacology is a growing and enduring science.

Executive Director Truett Latimer has noted that with the opening of this new hall the Museum continues its five-year renewal plan. This exhibit will share with Houston the beautiful resource hidden in the Museum's collections, he stated.

Acting curator, Constance E. Boone, wants to emphasize that this is really the story of the soft-bodied invertebrate animals which are, for the most part, able to produce the fantastic homes we call shells. The shells have caused most members of the Society to adopt the hobby of shell collecting. This exhibit should be of help to you, even though it will not display every shell from the collections at HMNS and certainly will not cover every species in each family. It is meant to inspire you to learn more and to appreciate the diversity of shells.

SEARCH AND SEIZURE

By Constance E. Boone

A WEEK AT MANZANILLO, MEXICO

Four HCS members had the opportunity to spend a week in December at Manzanillo, Mexico, and this is the story of how we tried to find shells.

Manzanillo is in the State of Colima, below Puerto Vallarta. It is easy to fly to this resort area from Houston, with only one brief stop at Guadalajara. There are many clubs around the bays, so no one actually stays in Manzanillo itself. The airport is some distance from the city and the clubs because of the mountains ringing the bays. Transportation by buses and taxies makes touring and shopping easy enough.

Before we went, all four of us stated that we weren't interested in collecting a lot of shells. Three of us--Helen Cornellisson, Barbara Hudson, and Constance Boone--had just returned from the Pacific trip with many shells. Luana Huggins, the fourth member of this group, kept saying she had no more room for shells. We had been offered the chance to stay at Club Maeve by Sunny and Bob Sappington who have a time share condominium arrangement there. They are in Saudi Arabia for two years.

Though the Sappingtons had said they didn't find many shells at Manzanillo, we understood from them that they really hadn't concentrated on collecting. This is a nice resort where you can play and relax, and this we did intend to do.

HOWEVER, the four of us who are dedicated collectors ALSO thought we would find shells. So, when we checked in, one of the first questions I asked at the desk was how to arrange for a vehicle and driver-guide to take us to shelling places. I explained that we wanted to find our own live shells for scientific purposes (blowing up this as big as I could!), and I stated I wanted someone willing to take us to secluded bays, etc. The desk clerks couldn't understand what we wanted to do; they claimed no one has ever asked them about going somewhere along the coast to collect their own live shells. They knew about diving; they knew about visiting local beaches; they knew about shopping and sightseeing. They just didn't know about finding shells. We asked if they ate shells. Yes, they did eat "clams," so we felt sure we could find some. We were finally directed to a travel agency in town that advertised it would plan anything tourists wanted to do. So we headed there the next day.

Ah, yes, we were assured we could rent a "mini-bus" and a driver to take us to beaches, and we were assured we would have an English-speaking guide who knew all about where we could find shells (to the tune of about $80.00). However, we were also told that we were the first customers who had requested such a trip. They never did really understand what we were going to do. I'm sure they looked at these four very adult ladies and wondered what on earth we were going to be able to do.

A nice young man named Francisco showed up in a big, unairconditioned bus the next morning--late because they wouldn't let him in the gate at first since he didn't belong to the tour agency the club employed. The bus was meant to carry some 40 people! The four of us and the driver headed to a beach nearby that is visited by the locals. We had explained that all he had to do was to take us to some bays where there were live shells, and we would do the rest. We saw sand flats exposed near mangroves, but after excitedly running to check them out we discovered no trails, no shells. The drift line held a small rubble of shells but nothing worthwhile. The driver said he collected live shells in the water by diving. That we couldn't do. Later on we found out that he meant oysters and some Murex (Hexaplex princeps) which they eat.

We asked to go to other beaches, so we drove down to Bahia Navidad to see the clams Francisco mentioned. What we saw when we got there were thousands of empty Pinna rugosa shells, apparently tossed up after a storm. Francisco stripped to swim trunks and did some diving, but all he came up with was three live but smashed Pinna shells. I examined the mangroves and found a few nerites, littorinas, and small oysters on the stems. We then pointed across the bay and saw what looked like a cove that had rocks near the water and asked to go there. We did go to a cove where Francisco had collected mollusks to eat, and found chitons on the rocks and a few Thais, a few limpets, some small Littorina and Planaxis, not much else. Francisco went out diving, but what he brought in was much the same except the chitons were bigger and some were different species and he had a few big (but broken by prying off the rocks) Ascistromesus mexicanus, the largest limpet of all. We would certainly have liked to have had this species in good condition! You see, he was gathering the shells for food, not for collections. The chitons the Mexicans in that area call cockroaches, and they enjoy eating them. Francisco took all we gathered to eat at home and brought back the empty shells the next day.

On the way back to town, still aiming to please these ladies, Francisco said he knew where there were a lot of shells--a factory that cleaned and worked on shells for the shop we saw in town. He offered to take us there. In that big bus, we crept up the dusty hill on narrow streets restricted by construction of a new water line and crowded part of the way with a parade of gaily dressed children in a holiday festival on the way to church. When we finally got to the factory, it was closed because it was after 6 p.m. Since Francisco lived somewhere near there, he knew the worker inside and got permission to have us enter, to see but not to buy since the owner was not there. Each of us set aside a few shells. Francisco promised to come pick us up early the next morning and take us back to the shop. We did go back, picked out more shells, and awaited the owner who never came. Francisco had a tour to take that day, so he said to bring the shells and we would try to find the owner at his home on the way back. What we purchased was a conglomerate of shells imported from other areas along the Mexican coast. We did learn they did not live at Manzanillo. That "factory" had shells from all over the world. The owner cleaned the shells, polished most, and sold them all along the coast. He owned the shell shop in town also. Anyway, for the first time I saw Busycon and Fasciolaria, both from the Yucatan, so highly

polished they looked like fine highly glazed China. They had East Pacific black abalones polished also. I wonder just what the workers got paid to sit there and polish the shells? We saw one lady with a bowl of shells, each under one inch, hand feeding the shells against a buffer. Those pretty, polished little shells you see in handicraft--this is what she produced. Well, we did find the owner and bought the shells, for very small sums. Had we known how little, we would have purchased more. As it is, the club's raffle table will benefit a bit.

The next day we decided to see what was on the beachfront---almost no shells at all! You were lucky if you found a Donax valve or a Pitar valve.

So we decided to take the offered bus tour to see the sights. This included going back to Bahia Navidad and going out to an island for lunch. There we were offered oysters which were housed in a pen at the restaurant. Most beach front restaurants did offer oysters.

We decided to make one more trip with Francisco. We did get a different bus, supposed to be airconditioned but Francisco was very reluctant to put on the air. Since it was the same bus we had had on the sightseeing tour when we had the air conditioning blow up at the filling station (the hose broke and smoke poured through the bus), we felt the hose had never been fixed. We just opened windows.

We went north of town to see the beaches, found some spectacular views, had a good fish lunch, even ate cerviche (marinated and tasty), and found a few shells. At the power intake beach we saw divers out collecting oysters in pristine water. They were going down to get Striostrea prismatica (Gray, 1825) on rocks in the deep water at the rock point and putting them in nets suspended inside inner tubes. I bought several clumps to bring home. Francisco negotiated, caught the oysters thrown to him by the divers, and threw back the money from me.

At one beach with rocks at one end Francisco went out in the heavy surf and dove for Calyptraea spirata (Forbes, 1852), Purpura, and mussels. We picked up shells in the drift line that seemed better than at other beaches.

That's it. We tried. The visit was nice and relaxing, and it seems funny now that we said we didn't really want to collect a lot of shells. I find it hard to believe that there were so few for us to collect. I have a collection of dredged shells from that area from some years ago, and it is marvelous in its diversity and desirable shells.

TALES OF A TRIP TO THE INDIAN OCEAN

Our First Pacific Adventure

By Emily and Bill Oakes

This was a shelling experience I had thought about, wished for, but never thought possible for us. Then in January, 1986, we were told there might be a group going to Broome, Western Australia, and we were invited. We waited all year and suddenly it was September 27 and our day of departure. Eight of us left Houston for Los Angeles to meet the other four people that were to make up our group. One lady from St. Louis did not make it to Los Angeles because of a plane delayed by stormy weather. With the help of our leader's wife in San Diego, and a miracle, we met up with her three days later in Perth, Western Australia.

Eleven of us left LA for Singapore via Tokyo. We stayed two nights in Singapore, then went on to Perth, had two nights in Perth, then finally got to Broome. I have wanted to go to Broome since Merle Kleb and Connie Boone told me about it several years ago. We expected many shells.

There are two low, low tide periods there a year, one in the spring and another in the fall. The water level drops as much as 28 feet.

We shelled several spots around Broome, on the Indian Ocean, and collected species we never thought we would ever see alive. One area which had been productive to others before is now closed. Several species we had hoped for we didn't see at all.

I loved the shelling and the fellowship, but my next favorite thing was seeing sights that can only be seen over there.

There was a Baobab tree in the parking area outside our rooms. We saw a kangaroo and several wild parrots in the wild. There were many termite hills taller than we were. One evening there was a large fruit bat hanging in the Baobab tree. I felt as though I was part of a National Geographic program. We spent ten days in Broome and did not want to leave.

Our next stops were Bali and Thailand via Darwin. The shelling was not as good as expected, but the scenery was beautiful. On Bali the whole area is green and terraced to prevent erosion. White and red poinsettias and Bougainvilla are in abundance. Orchids grow out of trees and are found in all sorts of pots and planters everywhere.

Our trip was 24 days long, included twelve flights and staying in eight cities, not to mention layovers.

We had a wonderful time, but it took three weeks to recuperate. Jet lag is everything I've heard and read about it and more.

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Another Visit to Broome, Western Australia

By Merle Kleb

Tuesday October 7, 1986 eight of our group packed lunch and left at 4 a.m. for a collecting trip to Deep Water Point, a trip of about 150 kilometers northeast of Broome. It was to be about a three hour trip over rough, unpaved roads, to stay all day, and to collect the evening low tide and return sometime around midnight. Helen Cornellisson and I decided not to go on this (we thought) arduous excursion. I had injured my knee in a fall two days earlier, getting on the boat after we got caught by the tide. It was painful, and I wanted to give it a rest. Helen had decided that she didn't care to make that hard trip. It meant sitting on benches in a van and hitting the ceiling when we hit ruts.

After a morning of rest and relaxation, Helen and I decided to take a tour of Broome to find out something about this quaint little old pearling town. Our tour guide, Pamela of Jabiru Taxi Company, picked us up at our hotel door at 1 p.m. She told us that William Dampier first visited this area in 1688 when he beached his ship 'Cignet' for repairs and cleaning. Dampier returned eleven years later in the 'Roebuck' with a crew of fifty men and boys with hopes of becoming wealthy in the pearl industry. He soon became discouraged as water was difficult to find and the natives were most unfriendly. Two hundred years later Broome became the largest pearling industry in the world known as the "Port of Pearls." In 1883 the town was officially named Broome after the State's Governor, Sir Frederic Napier Broome. Natural pearl was eagerly sought, but it was in the shell that profit lay. Western Australia once supplied eighty percent of the world's demand for pearl shell, and by 1910 Broome became the international center. Broome is still the only town in Australia that has a pearl shell carving industry.

Our first stop was at Gantheaume Point, an historical beach area near Broome. It is strikingly beautiful with its red-orange sandstone rock formations contrasting with the vivid aqua to deep turquoise color of the Indian Ocean. Dinosaurs roamed about this area some one hundred thirty million years ago as is evident by the footprints which are visible only at extreme low tide. However, a cement cast of these prints is on display at the top of the cliff.

Also at the top of the cliff is a lighthouse that serves as a beacon and landmark to ships arriving and leaving the Port of Broome. There is a perfectly round pool that gathers fresh sea water at high tide. The pool was dug in the early days of Broome by a man named Patrick Percy whose wife Anastasia was physically handicapped. Each day Percy took his wife to the pool to soak in the sun-warmed salt water which helped relieve her pain. Thus the pool is known today as Percy's Pool and/or Anastasia's Pool. It is a spectacular sight to watch the waters of the rising tide splash up and over the edge of the cliff and roll into the pool.

Pamela showed us the different colors of sandstone that is powdered

and made into paints used by the Aborigine. We were allowed to take small pieces of the red, yellow, and white ochre. The four prime colors used in Aboriginal paintings are red, yellow, white and black. The stone is very soft and crumbly and would be easily ground into a powder. Few plants grow in this poor soil, but we photographed a couple of the unusual flowers. One was a species of beach morning glory.

A sign is posted prominently on the Point by the Fisheries Department. It displays a map of the coastal area from Saddle Hill south to Riddell Point, stating that the area is closed to shelling from shore to 1500 meters offshore. It further states as follows: "The taking of marine shells, except oysters, by any means, is prohibited in the area shown on above map and known as "The Stables and Riddell Beach," signed by B. K. Bowen of Fisheries Department. These areas are some where we were allowed to collect shells on a trip in September, 1983. Over collecting has brought about this closing; hopefully it will be only temporary as the shells we found there were exciting and lovely.

Pamela told us that a mini-series for television had been filmed at Gantheaume Point and was finished only recently. The film is to be called "Flight Into Hell." Part of the series was filmed at Cable Beach and Riddell Beach which we also visited. We later met "Old Tommy," an Aborigine, who also appeared in the film. He was sitting on the ground in Chinatown, the original townsite of Broome. Hopefully, we may be able to see the series here in the States.

Cable Beach is popular for swimming and picnicking for the residents as well as visitors. It is a lovely, clean, white sand beach that got its name because it was the terminal for the submarine cable laid between Broome and Java in March 1899. The original old cable house is now used as the court house.

Our tour included a visit to two local churches; Our Lady of Peace and The Anglican Church of the Annunciation. Both have altars made of mother-of-pearl shell. Other furnishings were adorned with religious symbols made of mother-of-pearl shell which were most beautiful.

Three corrugated metal buildings still stand that are original buildings in Broome dating to 1883. These buildings are pictured on some of Broome's postcards.

We visited the Japanese Cemetery where many Japanese pearl divers are buried. Many divers died in those early pearling days. Some were free divers, some used the old heavy diving suits with copper helmets. Many lives were lost in the acquisition of pearls and pearl shell.

Later in our tour, we passed an apartment house where some of the old brass diving helmets had been converted into outdoor lanterns, a shining reminder of Broome's past.

We took a drive through the Aboriginal Community. The Australian Government has built housing projects specially for these people. Their housing is free, and they are given a monthly allowance. Pamela said that most spend their allowance on booze. The government also

gives the Aborigines free food. They don't HAVE to do anything. Few work. Few use their housing for shelter. They sit outside, and most do their cooking outside. Many Aborigines choose to live in the Outback. They wander into town for supplies and to visit and/or drink.

Broome has a population of about five thousand, among which there are Japanese, Chinese, Filipinos, Singalese and Malays. It is a barren area, part modern, part primitive. Few trees and plants exist except those planted and nurtured by residents. A most unusual tree grows in Broome. It is known as the Boab. Its life span is estimated by carbon tests to reach one thousand years. Its few branches and huge squatty trunk give it the appearance of having been pulled up and planted upside down.

Broome gives me a feeling of being a pilgrim in a foreign land. It is new yet old. It is arid and the ever present red dust stains your clothes. But Broome's coast and its beautiful water makes me long to return.

Broome, W. Australia, October 3, 1986

By Barbara Hudson

Our two vehicles left the motel in Broome at 1 p.m. headed for Quondong. The low tide was around 4:30 that day. Unfortunately, we missed our turnoff and went many miles out of the way. The roads are newly redone and changed. After we turned back and found the right road, it was too late for the low tide shelling at Quondong. We ended up on the road to Barred Creek. At first we stopped on a high cliff, overlooking the ocean. Only the most nimble tried to go down. Don and Merve then found a road down to an estuary. It was a long walk in soft sand to the water, so I chose to walk along the thin stream of water, picking up beach shells - single valves of pretty pectens, etc. I collected an odd-shaped little shell (see drawing) which Merve thought was a fossil. Constance ran across the shell in an article by John F. Singleton in the July, 1983 (#4), issue of Australian Shell News. It was called an oddment from Eighty Mile Beach (near the Broome area) named *Separatista blainvilliana* (Petit, 1852). Although it is small, I treasure it.*

One of my favorite pastimes on a beach is to look through beach drift for small shells. I had two opportunities to play in and collect beach drift on this Fall, 1986 trip. I have several small bags of drift from Quondong Beach (West Australia). Later on in the trip, while several others in our group collected on small rocks in front of the Bali Beach Hotel, I sat on the beach going through the drift. Two hours or more passed quickly and I didn't realize my hands were sunburned like lobsters. I came home with peeling hands and white arms, but I found a small plastic container of Pacific emerald nerites, and lots of other tiny shells I treasure.

* Editor's Note: In trying to check out the name derived from Austra-

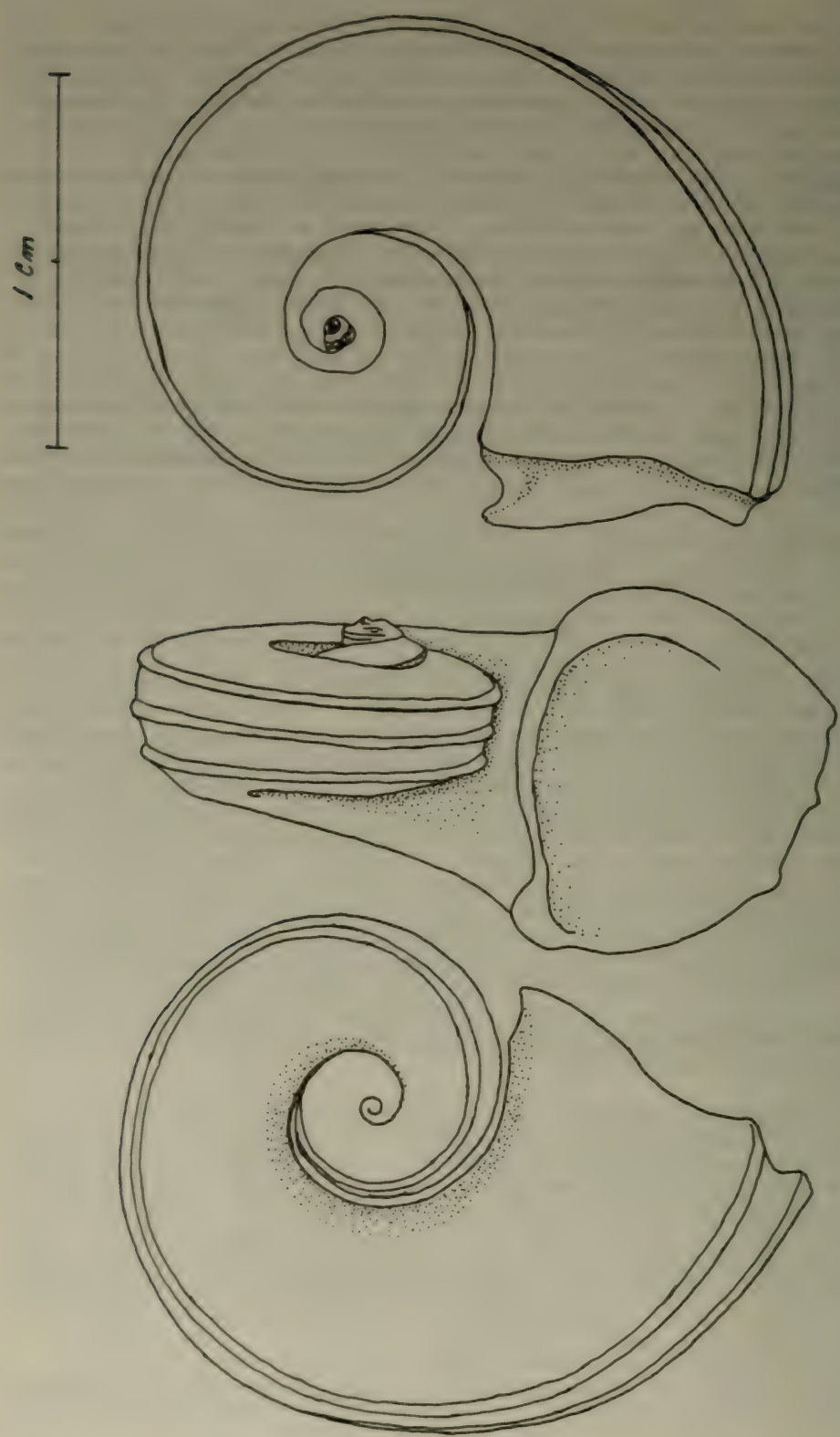

Fig. 1. This is the shell collected by Barbara Hudson at Barred Creek near Broome, Australia. It has been labelled Separatista blainvilliana (Petit, 1852) in Australian Shell News.

Illustration by H. W. Harry

lian Shell News, I have been confronted with some slightly confusing information.

In the malacological library at the Houston Museum of Natural Science, I was able to see the original description by Petit de la Saussaye in Volume 1851a 2:22, of Journal de Conchyliologie, with Plate 1, Fig. 5 depicting the shell described new as Trichotropsis blainvilleanus. My best interpretation of the description is that it was pellucid with a subtriangular aperture, bicarinate and with a "sub rosacee epidermide." Petit stated that the locality he was given, Iles Mariannes, could not be guaranteed. Now, how did Separatista get into the name? Thiele lists Sectio Separatista Gray, 1847 under Lippistes Montfort, 1810, all under the Family Trichotropidae. The genus Trichotropsis in Abbott includes the two-keeled hairy shell, Trichotropis bicarinata of Arctic Seas of North America. The shell that Barbara found was translucent when cleaned, slightly tan-rosy, and has the general shape of the Trichotropsis in Abbott but is much flatter. Petit's plate shows a shell with a much more extended spire than Barbara's shell. Petit also list the size as "7 mill 1/2 to 10 mill." Barbara's shell is much larger in width. See the drawing by Dr. Harry. Anyone able to give us better information is asked to contact the Editor.

Tying It All Together

By Constance E. Boone

Your Editor also participated in the trip to Broome, Bali, and Thailand, along with the others from this club--Merle Kleb, Barbara Hudson, Emily and Bill Oakes, Lauretta Marr, Helen Cornellisson, Ruth Goodson, and our leader Don Pisor of San Diego. Each club member was asked to write about something they liked or didn't like about the trip. The responses you have already read. Helen was called away on a family emergency, so I report her remarks.

My task is to tie the whole thing together and to fill in some details.

We went on the trip under the planning and guidance of Don Pisor. Several of us have travelled with him before, and three of us had gone to Broome with him in 1983. Each time we have been met in Broome by Merv Cooper, a tour guide and collector (and dealer) from Perth, Western Australia. When you go with Merv, you are sure to have some adventures, and this time was no exception.

One of the big events is to go out to the sand bar in Roebuck Bay at the lowest daytime tides (the last trip included a night visit to the bar which only a few went on and that ended up with the small boat hitting a rock). This time our first visit out to the bar involved the following: the night before when the tides were still high, the fellows went out to anchor the bigger boat offshore in the area near the dock; then the next morning someone had to swim out to that boat and get the smaller boat to bring in to shore to ferry us out to the bigger boat and we had to slog through mud and water to even get to

the small boat because the tide was already very low; then we roared out to the bar some five miles offshore and were again ferried in the smaller boat to the bar to collect. We were told we had an hour and a half to roam the exposed bar. We had visions of volutes and Syrinx aruanus, the gastropod that grows to be the largest in the world. In fact, the thing that almost did us all in was our demand from Merv that he locate at least eight big Syrinx for those in the group who did not have this in their collection. Emily and Helen had done quite a bit of measuring of the ones at the Houston Museum of Natural Science and had brought carryon luggage deemed large enough to carry their specimens home. Each person planned to bring several home! Therefore, Merv left us all on the sand bar and headed off for parts unknown (actually to a far sand bar where he hoped to find Syrinx big enough to please us).

Everybody ran and scattered. Plenty of Oliva lignaria were found in trails. Most everyone found Amalda elongata which has such a colorful animal. Last time we only saw a couple taken by divers. The same "pieces of pork" that irked us last time when we found these in so many trails and ignored them were still there. THIS TIME, it immediately came to my attention that these white, blobby things looked exactly like what I had collected in the Red Sea last year and which Dr. Harold Harry wrote about for us in Texas Conchologist -- Philine. So I picked up some and stuck them in a bottle to examine back at the hotel. I discovered they were Philine. These were smaller than the Red Sea specimens, and have been described as Philine angasi (Crosse and Fischer). I showed the fragile little bubble-like shell extracted from the pork-like animal--completely enveloped like Sinum--to the others, and I hope everybody got home with some. It is not usual to be able to collect Philine. I have never seen so many. There were "thousands" in trails on that one bar.

Both Amoria damoni and Amoria grayi were found, either in humps or travelling in tide pools with their beautiful animals exposed. A few small Melo amphora were collected also.

A number of interesting turrids were collected, a few Terebra were found, and there were some good bivalves, the most notable being Fimbria souverbii. Big sand dollars, sea biscuits, and crinoids abounded. A few Syrinx were found, but not huge ones.

After about 45 minutes or less, I looked down and panicked! Swirling around my feet was rapidly rising water. In a matter of seconds the sand bar was completely covered, and there we were with no way to get to the boat. To keep the small boat from sinking in the sand (this had happened on the earlier trip) it had been taken out to the larger boat and tied there. Merv was nowhere to be seen. His son, Rodney, came running over to Don and handed him his Video camera (Don had one also) and said he was going to swim out and get the small boat and for us all to start as quickly as we could wading out to the bigger boat. He planned to come back and ferry us if he had time. Well, most of the party ended up wading and swimming out to the boat. Only a few rode in, along with the cameras and shells. Believe me, not one of us was willing to give up our pictures or our shells! Water was up to people's necks very quickly. It was a scary time. But everyone did

Fig. 2 Broome, West Australia is still a thriving port for pearl shells. Pearls are cultured; pearl shells are exported and sold for carving and ornaments. The pearl luggers come into the town's dock regularly.

Fig. 3 Emily Oakes comes into camp carrying a Tridacna found at the 28 ft. tidal low at Deep Water Point near Broome, West Australia.

Fig. 4 At Bali the group sailed out on a shelling expedition in colorful outriggers.

Fig. 5 A day's trip to an island off Phuket provided the shells seen above - most collected by "sea gypsy" divers.

make it back to the boat, exhausted.

Where was Merv? Well, he finally showed up, sans bucket, sans Syrinx. He had to swim out to the boat without them. He had found several large Syrinx but had to drop them when he saw from a distance what was happening. There was a wind that day that pushed the tides in earlier.

Yes, we did go back to the sand bar the next day---insisting on going earlier. We had longer on the bar, but we did watch that tide very carefully. Some of us were afraid to go very far off on the bar simply because we couldn't run to get back if the same thing happened.

For me, there were not many new shells, but there were some new experiences. I had not collected a West Australian Cypraea tigris, and this time I got a lovely one at Coconut Wells. Merv had mentioned that some showed up at this location. I was all alone looking down into a tide pool on that reef area when I saw my specimen with full mantle covering it as it climbed up the side of the rock. I jumped in that pool not caring if it was over my head or not. I wanted that shell. This time also, on the reef were some very blue Cypraea annulus. Though common, these were exceptionally pretty, and I hope they stay blue.

Both Quondong and Coconut Wells produced a good variety of Broome shells. The area near the docks on Roebuck Bay abounded with Chicoreus stainforthi, several species of Cypraea, Haliotis, and many others. We have plenty to clean!

Some of us had wanted very much to have this trip extended to Bali and Thailand even though we knew there might not be very many shells to collect ourselves. The sightseeing was fantastic, the shopping marvelous. It is quite true that we saw few shells, and most were common species.

In Bali we did a lot of touring. We all bought products of wood carvings, materials and clothing, and shells. And we had a funny experience trying to get shells. Our local guide and shell dealer had arranged for us to have outriggers to go out one day to shell. We loaded up and were supposed to be heading for an island we could see offshore. Well, the seas were rougher than expected. The guide got deathly seasick. We ended turning back to a shoreline north of our hotel. That area was full of algae on the rocks and not much, except a few olives, was found. Then we had the long trip back to our hotel.

We had dreams of shells at Phuket. Don had arranged for us to go out to an island and had a crew of "sea gypsies" hired to do some diving for us. We spent the day on the island and found that the current was so strong most of us couldn't snorkel. It was extremely difficult except for the most hardy. The "sea gypsies" claimed they found the hooka equipment was working with difficulty in the strong current. We did get some shells like three species of Lambis, some large Conus litteratus, Trochus niloticus, Tectus pyramis, and other common Indo-Pacific shells. The snorkelers at the end of the day found calm seas, just before dark, and got some beautiful Astrea rhodostoma and many Haliotis varia.

Fig. 6 When the shelling proved frustrating, HCS members were attracted to a shell shop luring customers with a huge Epitonium. Emily Oakes, Bill Oakes, and Ruth Goodson pose.

Another day we went by van to another beach to shell and got caught in an all-day downpour and had a hairy time crossing the sudden stream coursing down to the sea from the hills and trying to get out with the van up the muddy hill. Needless to say, not many shells were found, but, diehards that we were, a few Cypraea were found.

The flats in front of our hotel were exposed every day, and we trudged many a mile on them. The best finds were a few fresh dead Murex poppei. There were some nice bivalves here, but we had to get them before the natives could. This area is well picked every day.

We then spent time in the shell shops that were rather numerous. Phuket wholesales shells to many parts of the world. Chicoreus ramosus abounds, several species of Tridacna appear in all sizes and colors. It is here you can buy some rare cones, like Conus phuketensis, Conus bengalensis, and Conus thailandis.

We ended up in Bangkok seeing the sights and buying silks and jewelry. If Helen had written her story she would tell you how intrigued she was with the trip through the canals where we saw the way of life of the people on the river. She couldn't believe the sight of a young boy brushing his teeth in the river water, but it was common to see the children bathing, the women washing clothes, the men dipping up water from the river. The traffic included small boats taking hot food for breakfast from house to stilt house along the river, and boats carried groceries of all kinds to the people living on the river. All along the river we saw magnificient temples. This, too, we had gone to see on this trip.

COLLECTING NOTE

HCS member Darwin Alder started the New Year off right on Sunday, January 4, 1987 when he collected 2,000 epitoniums on the Gulf beach at Quintana below Freeport, Texas. He says they were not live. He also collected live tellins, Dinocardium, and live Busycon.

In December he collected at San Jose Island across from Port Aransas and got about 40 fresh Phalium granulatum.

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A SECOND RECORD OF AN INTRODUCED APPLE SNAIL, POMACEA CANALICULATA, FROM THE LOWER RIO GRANDE VALLEY OF TEXAS

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The freshwater operculate family Pilidae occurs worldwide in subtropical and tropical areas (Emerson and Jacobson 1976). The genus Pomacea Perry, 1810, ranges from South America northward to the southern United States, where Pomacea paludosa (Say, 1829) is part of the native fauna of Florida and Georgia (Harper 1936). Introduced populations occur in Alabama (Hubricht 1962). Although Burch (1982:19) listed records from only Florida, Georgia and Alabama for P. paludosa, Malek and Cheng (1974:66, figure 4-15 n) illustrate a specimen from Louisiana.

Dall (1889) reported two species of Pomacea, as "Ampullaria depressa Say" and "Ampullaria calignosa Reeve," from "Texas." These records were listed by Singley (1893) who also reported that "Texas" as used by Dall (1889) included the area from "the Mississippi delta to the Rio Grande and ... to Yucatan." More detailed localities for these alleged Texan records have not been forthcoming. Strecker (1935) did not present these or any other records of Pomacea from Texas.

Fullington (1978) reported Pomacea paludosa from three Texas counties: Cameron, Harris and Matagorda. All specimens were part of the Cheatum collection now located at the Dallas Museum of Natural History. The specimens were collected by Hildebrand and at least one of the records dates to 1936 (Cheatum in Fullington 1978:66). However, Majors (1964) did not report any specimens of Pomacea from Cameron County even though she centered her study around Harlingen which is the reported locality for the Cameron County record (DMNH 1099). Elizabeth C. Majors was a graduate student of Elmer P. Cheatum at Southern Methodist University when she did her survey of Cameron County nonmarine molluscs. Whether the Pomacea collection was made subsequent to the report by Majors (1964) or was inadvertently omitted is unknown.

I collected one adult fresh dead shell of Pomacea sp. at Arroyo Colorado State Park, Cameron County, Texas, on 21 February 1985. The shell was located on the surface of a flood debris deposit consisting mostly of dead water hyacinths, Eichhornia crassipes. The flood debris originated from runoff surges during a three-day deluge (16-19 September 1984) which dumped up to 20 inches of rain on eastern Cameron County. Interestingly, Hurdle (1973) reported water hyacinth was utilized as a substrate for oviposition by P. paludosa.

Of the three lots referred to P. paludosa in the Dallas Museum of Natural History, the Arroyo Colorado specimen resembles the Cheatum shell from Harlingen in both shell form and color more than it resembles the Harris and Matagorda specimens. Both specimens have a non-depressed apex with 12 rufous brown bands (at least on the body whorl) over an olive green background. Both shells are large and are of similar shape (see size data in Table 1). The Arroyo Colorado specimen exhibits a slight malleation of the body whorl which is not present in the Harlingen specimen.

Both the Harlingen and Arroyo Colorado specimens are believed to represent a population of Pomacea canaliculata (Lamarck, 1822) which is native to Argentina and Bolivia (Pain 1946; Lopes 1956). P. canaliculata is unknown from Brazil (Lange de Morretes 1949) or Guyana (Pain 1950). The Cameron County shells differ from Pomacea paludosa from Florida in that P. canaliculata has a more prominent apex and much more deeply incised suture (channel between whorls); in addition, the P. canaliculata shells are much larger. In comparison to P. canaliculata, shells from aquarium shops in Austin, identified as Pomacea cuprina, are very much smaller, have a sharper apex, and has almost non-existent sutures but very strong whorl shoulders. Pomacea flagellata (Say, 1829) from Guatemala is larger even than P. canaliculata, but has a low apex, shallow sutures, and non-existent whorl shoulders.

The population from which the Arroyo Colorado specimen is derived may be the same as the Harlingen shell. The Arroyo Colorado locality of the recent specimen is downstream from Harlingen. Ultimate origin of the population probably involves an aquarium release and may involve an outdoor pond or a resaca (abandoned channel of Rio Grande which is kept full of water). Northern Argentina is at approximately the same latitude as southern Texas, and P. canaliculata may be able to survive winter conditions of this area. P. canaliculata has been in the aquarium trade for several decades (Innes 1951), although species with smaller shells and less voracious appetites (directed toward aquarium plants) e.g., P. cuprina, have become more popular.

An aquarium-release origin for this particular specimen (Arroyo Colorado) is not likely, because no shell growth pattern alteration is evident. Transfer from buffered aquarium water to the highly alkaline and slightly saline waters of the drainage area of the Arroyo Colorado would cause an alteration of shell appearance as growth processes were affected.

The Harris and Matagorda specimens in the Dallas Museum of Natural History appear to represent specimens of P. paludosa. These specimens may represent introduced populations, strand debris, or native populations (initially founded by floating specimens from the southeastern United States). The occurrence of beach drift specimens of Pomacea sp. (spp. ?) in Texas was noted by Andrews (1971:144). A marine drift origin of the Cameron County Pomacea is unlikely because of the difficult route from the Gulf of Mexico through Brazos Santiago Pass into and northward up the Laguna Madre to the Arroyo Colorado. The Arroyo Colorado shell was found in an upstream - originating flood debris raft; the shell itself contained no bryozoans or other marine fouling

fauna which would indicate an oceanic voyage.

Table 1. Measurement of Harlingen (DMNH 1099) and Arroyo Colorado (Neck collection) Pomacea canaliculata.

Character	Harlingen	Arroyo Colorado
Height	46.7 mm	54.5 mm
Diameter	42.8 mm	49.1 mm
D/H ratio	.926	.901
Aperture height	33.4 mm	38.0 mm
Aperture diameter	25.8 mm	28.1 mm
Aperture D/H ratio	.772	.739
Aperture H/Shell H ratio	.715	.697
Whorls	6	6

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SEMINAR---THE WONDERFUL WORLD OF SHELLS---HMNS

A seminar, titled "The Wonderful World of Shells," will be conducted on Saturday, March 7, 1987, at the Houston Museum of Natural Science. Labelled an Adult Science Seminar, the leader will be Constance E. Boone, acting Curator of Malacology at the Museum.

The seminar will be held from 9:30 a.m. to 4:30 p.m. at the Museum and will cost $30.00 for Museum members, $50.00 for non-members. Deadline for registration is February 21, 1987. Call the Education Department at the Museum 713 526-4273.

Included in the seminar will be a history of shell collecting and discussion of the science of Malacology. Participants will learn how, when, and where to collect, how to clean shells, methods for making and curating a collection, basic taxonomy and systematics, hints on buying and trading, discussion of edible mollusks, and notes on conservation. A visit to the new Strake Hall of Malacology and to the off-limits areas of the research collections will provide participants with an overview of shell collectibles. The malacological library, judged to be the finest in the South, will be shown to participants.

Several members of the Houston Conchology Society will assist in conducting this seminar -- Helen Cornellisson, Emily Oakes, Richard Yuill, Luana Huggins, Dr. Harold W. Harry.

TEXAS CONCHOLOGIST, Vol. XXIII, No. 2, January, 1987

MONOGRAPH

By H. Odé

DISTRIBUTION AND RECORDS OF THE MARINE MOLLUSCA IN THE NORTHWEST GULF OF MEXICO

(A Continuing Monograph)

Family BARLEEIIDAE Ponder, 1983

A family of rather small hydrobiid like marine mollusks. In the N.W. Gulf of Mexico are two genera: Amphithalamus Carpenter and Barleeia Clark. This is the first time that Barleeia is reported for the Western Atlantic. Before I discovered that Ponder had placed both genera in this family, I had wondered about the fact that two such similar genera should be placed by Abbott in two different families, while both genera display "pitted nuclei".

Genus Barleeia Clark, 1853

These are small gastropods which resemble Amphithalamus without the shelf area. They are inconspicuous shells and perhaps for that reason have not been recognized in the Western Atlantic. They probably are rare. We have only two lots, one of two specimens, the other of 45, both taken off the Mississippi delta (27 57.8' N - 92 01.8' W).

113. Barleeia spec. indet. A

This small species has somewhat the appearance of a small Zebina, but in many respects is quite different. It is slightly keeled, and its sides are hardly inflated and are almost flat. Ponder created the subgenus Pseudodiala for such forms but states (Ponder, 1985 p. 100) that he considers Pseudodiala as a synonym of Barleeia.

The suture is rather deep without giving that impression and the nucleus is very flat and small. Apart from a few pits I have not been able to see the "thimble pitted nuclear whorl" mentioned by Abbott. There is no umbilicus but only a minute depression near the inner lip. No sculpture is visible even under magnification except for a slight keel. Our material is old and lacks color except for one specimen in the lot of 45 specimens, which is very light brown.

Records HMNS Survey Collection: 2 lots, off Louisiana.
Depth range: 3 - 55 fms.
Geographical range: Unknown.
Maximum size: 2.5 mm.

Genus Amphithalamus Carpenter, 1865

Abbott's generic description covers our species quite well. The large, rather flat nucleus is finely pitted, the pits being arranged in a closely spaced spiral pattern. The post nuclear whorls show a very faint keel somewhat below the periphery. The umbilical area is quite characteristic for this genus. In the N.W. Gulf of Mexico live two species, one of which appears to be undescribed. Amphithalamus is also Pacific with 3 species from Baja California to Panama.

114. Amphithalamus vallei Aguayo and Jaume, 1947

This is a fairly common species in the calcareous reef area, where we have collected it at many locations. I can add but little to the short but complete characterization by Abbott, 1974. In juvenile material there is no shelf area close to the umbilicus, and the suture appears quite pronounced. The shell shape of such material - say a nucleus of 1 1/2 whorls and a single post nuclear whorl - appears to the eye more slender than full grown material. Gradually with age a shelf forms and constricts the upper part of the aperture. In many specimens a ridge forms bordering this shelf so that it appears that there is a bridge closing the open space in a somewhat scalaroid shell.

Records HMNS Survey Collection: 14 lots, of which 3 contain live collected material.
Depth range: 9 - 55 fms; alive 12 - 24 fms.
Geographical range: Florida Keys, Bahamas to Lesser Antilles (Abbott, 1974).
Maximum size: 1.3 mm.

115. Amphithalamus spec. indet. A

In our material there occurs a second very small species that is not a juvenile form. It is very small (hardly 1 mm in size) and somewhat pupoid in shape. It has a fully developed shelf area, which is never that far advanced in specimens of vallei of the same size. That fact convinced me that it represents a fully different species. It is never of a brown color, but is glassy white.

Records HMNS Survey Collection: 3 lots, no live material, all from the calcareous reef environment.
Depth range: 24 - 75 feet.
Geographical range: Unknown.
Maximum size: +/- 1 mm.

Family ASSIMINEIDAE H. and A. Adams, 1856

This has a small hydrobiid-like shell, with a relatively large body whorl. There is no umbilicus. There are smooth whorls without sculpture. It is usually intertidal or in brackish water. In Texas there is only a single species.

116. Assiminea succinea (Pfeiffer, 1840)

This species can be found on mudflats in the coastal bays around Galveston Island. They are small yellowish shells with large body whorls. There is about 1 1/2 nuclear whorls, which imperceptably becomes post nuclear. In fresh specimens one can observe a microscopic single spiral raised thread just below the suture. Typical in mature specimens, there is a white callus over the parietal wall. There is no umbilicus. It was also taken from a sample collected on a mudlump in the Mississippi delta.

Records HMNS Survey Collection: 12 lots, of which 4 contain live collected material.
Depth range: 0 - 2 fms (intertidal, brackish to saline).
Geographical range: Massachussetts to Texas and to Brazil, Bermuda (Abbott, 1974).
Maximum size: 2.9 mm.

Family RISSOELLIDAE Gray, 1850

A family of quite small gastropods of hydrobiid appearance. In Texas and Louisiana there is one species in the genus Rissoella Gray, 1847.

117. Rissoella c.f. caribaea (?) Rehder, 1943

The rather extensive material we have conforms in general reasonably well with the description provided by Abbott. There is a weak keel bordering the umbilicus, which is not narrow but open. The main difficulty in identifying this species is three discrepancies. In the first place our material derives from a depth in general considerably in excess of 6 fms. In the second place, its shape is much more elongate than that shown by Abbott's figure, and lastly the apex is so typical and different from that of other rissoids that I cannot understand why such a character would not have been mentioned for caribaea.

The apex is somewhat hollow (pitlike) because the very beginning of the nucleus is buried under the later parts of the nucleus, so that the whorls seem to rise out of the shell itself. Such apices I have seen in some pyramidellids but never in rissoids. There is no doubt that our material under discussion is truly rissoellid. Most of our material barely reaches 1.2 mm in size.

Records HMNS Survey Collection: 14 lots, of which two contain rather fresh material.
Depth range: 8 1/2 - 70 fms.
Geographical range: (for caribaea) Florida to Puerto Rico (Abbott, 1974).
Maximum size: 1.2 mm.

Family OMALOGYRIDAE P. Fischer, 1885

These are minute shells of planorboid shape with an operculum with central nucleus. In the N.W. Gulf of Mexico there is a single undescribed species in the genus Omalogyrus Jeffreys, 1867.

118. Omalogyra spec. indet. A

On the offshore coral reefs and on the calcareous algal reef a small species lives that is probably undescribed. We have 9 lots of the species but not many specimens. They are so minute that most specimens are lost when washing the samples. In handling this material with a brush, care must be taken to avoid electrical surface charges. I have lost several specimens which "jumped" away and out of the tray under the microscope!

Our species is by no means as complicated in surface sculpture as the species figured by Abbott (1974). The sculpture consists mainly of some radial riblets and some faint spiral keels. Its size is well under 1 mm, and it must be the smallest gastropod of the area. The aperture is not round but somewhat angular, because of the presence of the faint spiral keels. The New Zealand Zerotula ammonitoides Powell comes quite close in shape and surface pattern, but apparently is a much larger shell as Powell places it in the Architectonicidae.

Records HMNS Survey Collection: 9 lots, some containing live material.
Depth range: 12 - 55 fms.
Geographical range: Unknown.
Maximum size: 0.8 mm.

Family ACLIDIDAE Sars, 1878

In this family are brought together a number of rather small to minute gastropods of elongated shape, exhibiting various types of surface sculpture. It is possible that most are assembled here because it was difficult to place them somewhere else. We differ in our enumeration somewhat from Abbott's treatment in that we recognize Graphis, and have added Nannoteretispira to the Aclididae. Thus we treat here the genera Aclis, Graphis, Schwengelia, Bermudaclis, Nannoteretispira and Henrya, all of which have one or more species in the N.W. Gulf of Mexico. Most of these species, except Graphis and Henrya, are quite rare. However, their rarity is to some degree an artifact due to collecting techniques poorly suited to retrieve such small shells from bottom samples. Most are needle shaped and have a cross section of a fraction of a square millimeter. Hence they are easily washed away through the mesh of our sieves. In spite of the fact that we were aware of this during our collecting, most specimens reported here were observed by lucky coincidence. The only way to collect this material systematically would be by gravity separation in fluids of high dens-

ity, and that we did not do.

Genus Aclis Loven, 1846

Small to minute gastropods, often many whorled with slightly swollen nuclear whorls. In the N.W. Gulf of Mexico are three species of uncertain or unknown identity.

119. Aclis (Aclis) eolis (?) Bartsch, 1947

Only a single lot of this species is present. The shell can be recognized by 3 spirals on the lower part of the base. In shape our specimen, whose apex unfortunately is missing, resembles very much species 1436 (Aclis striata Verrill), figured in Abbott, 1974. There is a narrow umbilicus.

Records HMNS Survey Collection: 1 lot, no live material.
Depth range: 30 - 40 fms.
Geographical range: Off the Lower Florida Keys (Abbott, 1974).
Maximum size: 2.3 mm (larger when complete).

120. Aclis (Hemiaclis) lata (?) (Dall, 1889)

In the subgenus Hemiaclis are collected some small, mostly quite smooth shells, usually with an open umbilicus. One of our species resembles in general proportions A. lata Dall very much, and this is the reason we list it here under that name. It has an open and deep umbilicus and a quite small but bulbous nucleus.

Records HMNS Survey Collection: 1 lot of 4 specimens; no live material.
Depth range: 51 fms.
Geographical range: Off Georgia to West Florida and the West Indies.
Maximum size: 2.1 mm.

121. Aclis (Hemiaclis) spec. indet. A

We have a single quite remarkable lot of 2 small shells. They are widely and deeply umbilicated; on closer inspection, it turns out that they are perfectly scalaroid; i.e., successive windings are not contiguous but are separated by an extremely thin empty space. Thus, the shell resembles a coiled helical spring. The umbilicus is bordered by a slight keel.

Records HMNS Survey Collection: 1 lot, no live material.
Depth range: 60 fms.
Geographical range: Unknown.
Maximum size: 1.2 mm.

Genus Schwengelia Bartsch, 1947

These are elongated needle shaped shells, spirally lirate and with a strong shoulder. In mature specimens the outer lip flares trumpet-like. Nucleus is small and smooth.

122. Schwengelia hendersoni Dall, 1927

This small species is fairly widespread in the N.W. Gulf of Mexico. The description as given by Abbott (1974) fits it very well. The heavy spiral ridges slowly disappear on the last whorl. There is a narrow umbilical slit. It also occurs in the mudlump fauna of the Mississippi delta.

Records HMNS Survey Collection: 9 lots, no live material.
Depth range: 27 - 70 fms.
Geographical range: Both sides of Florida (Abbott, 1974).
Maximum size: 3.7 mm.

Genus Bermudaclis Bartsch, 1947

These are minute elongate shells without umbilicus. There is sculpture of spiral threads crossed by weak growth lines. In the calcareous reef environment there are two species.

123. Bermudaclis bermudensis Dall and Bartsch, 1911

This minute shell is well figured by Abbott, 1974. The whorls are somewhat flattened, giving this shell a somewhat pupoid appearance. Our specimens all came from calcareous environment and coincide exactly with material authenticated by Dr. Don Moore.

Records HMNS Survey Collection: 4 lots, one containing live material.
Depth range: 12 - 40 fms.
Geographical range: Bermuda (Abbott, 1974).
Maximum size: 2.5 mm, but a larger specimen is broken.

124. Bermudaclis c.f. tampaensis (?) Bartsch, 1947

We have a single specimen of a similar but different species which we have given this name. More material is necessary to have certainty about this identification. It is an almost smooth shell with a slight keel below the suture.

Records HMNS Survey Collection: 1 lot, no live material.
Depth range: 8 1/2 fms.
Geographical range: Tampa Bay, Florida (Abbott, 1974).
Maximum size: 1.4 mm.

Genus Graphis Jeffreys, 1867

These are minute, needle shaped shells without an umbilicus and with

reticulate sculpture. In my opinion, they are closer to Bermudaclis and Nannoteretispira than Aclis. In the N.W. Gulf of Mexico there are two species, one of which appears to be undescribed.

125. Graphis underwoodae Bartsch, 1947

This minute species was reported some time ago by me from Texas (Tex. Conchol. Vol. 6, 34 and Vol. 7, 53). It is apparently widespread along the coast. The specimen figured in the Tex. Conchol. is an abnormally large one; the bulk of our material is smaller. It is sculptured by closely spaced, slightly S-formed riblets and a deep suture. It was reported "from shallow brackish water near mangroves" (Abbott, 1974), but it is found along the entire Texas coast: beach Galveston (San Luis Pass); Port Aransas Causeway and at Port Isabel (algal scrapings).

Records HMNS Survey Collection: 9 lots, some of it quite fresh.
Depth range: 0 - 167 fms.
Geographical range: Tampa Bay, Florida (Abbott, 1974).
Maximum size: 3.2 mm.

126. Graphis spec. indet. A

We have a single specimen of a second species in the collection. This is a large species, but our specimen is not fullgrown. Its suture is less deep than that of the previous species and its surface less conspicuous. At this moment little more can be said and more material must be collected.

Records HMNS Survey Collection: 1 lot.
Depth range: beach at Coast Guard Station, South Padre Island.
Geographical range: Unknown.
Maximum size: 1.5 mm.

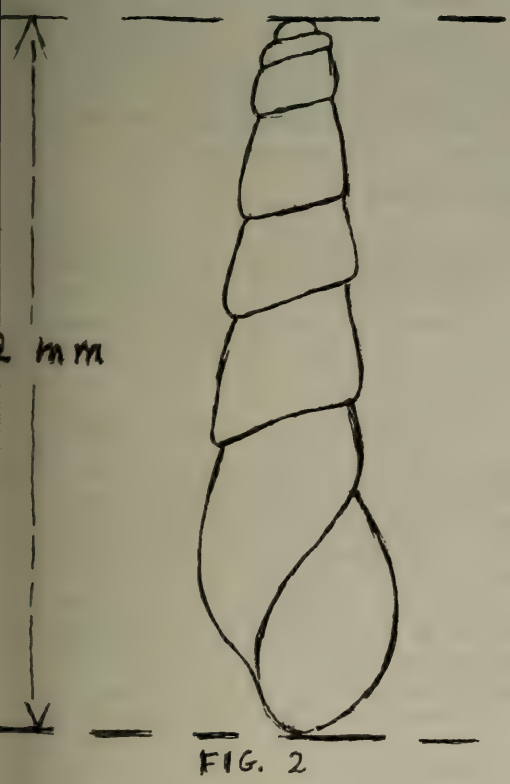
Genus Nannoteretispira Habe, 1961

These are minute needle shaped shells with an aperture not unlike that of Aclis and Schwengelia. The type was described from Japan. The genus is also known from the West Coast of the U.S.A. and the Panamic Province. Another species from the Atlantic coast of Panama was described as a Nodulus. Abbott, 1974 places the genus in the Rissoidae, but the shape of the aperture and the somewhat bulbous nucleus make placement in the Aclididae preferable. In the N.W. Gulf of Mexico there are two undescribed species.

127. Nannoteretispira spec. indet. A

This quite minute shell conforms well with the generic characteristics mentioned by Habe and Abbott (1974). Also Olsson and McGinty's description of the Panamic species fits in general. Our species is quite inconspicuous because of its minute size, and its shape for such a small shell is

Fig. 1. Schwengelia hendersoni, 2.95 mm, trawled by the Bureau of Commercial Fisheries Sept. 1, 1966, in 50 fms, 69 mi. SSE of Freeport, Texas.



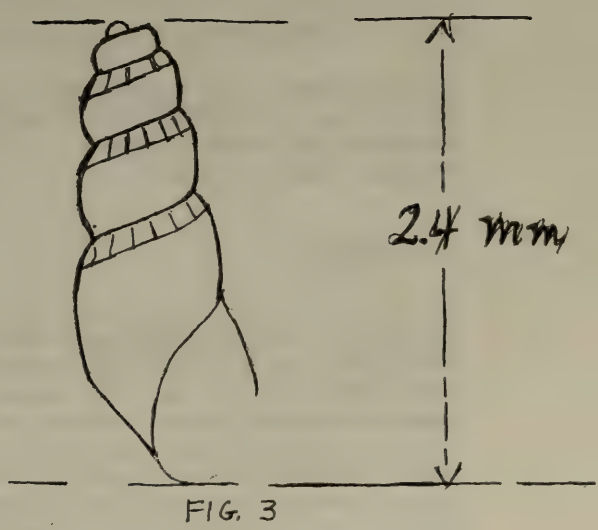


Fig. 2. Sketch of Nannoteretispira spec. indet. A.

Fig. 3. Sketch of Nannoteretispira spec. indet. B.

remarkable. It possesses a very deeply excavated suture. There is no surface sculpture. We possess only two specimens, one of which was probably collected alive, since it still has a fresh, clear, glassy shell, slightly tan in color, and the animal remains in the shell.

We have added a sketch of the species.

Records HMNS Survey Collection: 2 lots, one of which probably collected alive.
Depth range: 23 - 70 fms.
Geographical range: Unknown.
Maximum size: 1.2 mm.

128. Nannoteretispira spec. indet. B

Among the extensive material of Henrya I discovered a second species of Nannoteretispira which is of great interest because it shows structural detail relating it to Bermudaclis. Below the suture there is a spiral keel so that part of the whorl between suture and keel forms a small shelf. This shelf is closely and radially ribbed. The aperture and the nucleus are as in the previous species. Superficially the specimen also resembles a somewhat coarsely shaped Henrya. It is possible therefore that Graphis, Henrya, Bermudaclis and Nannoteretispira form a closely knit group, somewhat apart from Aclis, Hemiaclis, etc. This must be a really rare shell because among the hundreds of Henrya it was the only specimen present.

We have added a sketch of this species.

Records HMNS Survey Collection: 1 lot, no live material.
Depth range: 0 fm (beach at jetty, St. Joseph Island).
Geographical range: Unknown.
Maximum size: 2.4 mm.

Genus Henrya

Originally I had some doubt that Henrya was correctly placed in the Aclididae (see Tex. Conchol. Vol. 6, 35), but now I believe that they are closely related to other small aclids. Along the Texas coast they are widespread and not particularly rare. Bartsch, 1947 described no less than three species ranging from Yucatan (H. goldmani) over Florida (H. morrisoni) to the Bahamas (H. henryi). To judge from the highly variable Texas material, I believe we deal here with a single rather variable species that occurs throughout the entire Caribbean area. There is, however, a second species not described by Bartsch, which is quite different.

129. Henrya goldmani Bartsch, 1947

This widespread little species is mainly found at the inlets of the more saline coastal bays in Texas. There is great

variability in the size and shape of these shells, probably caused by the varying conditions of temperature and salinity of the environment. Some are slender as Graphis; others in the same population more pupoid. Most usual is a form which is rather slender and tapers gradually towards the apex. But there also occurs a large pupoid form and a very small pupoid form. We have not interpreted these as different species.

The nucleus consists of a single whorl, rather flat, and often gives a turbinate impression; there is an extremely minute pimple as beginning. The shape of the mouth is not as in other aclids, more as in Hydrobia. Surprisingly, in gerontic specimens, there is a slight fold discernable on the columella.

Records HMNS Survey Collection: 34 lots, of which 3 contain live collected material.
Depth range: 0 - 2 fms.
Geographical range: Yucatan, Mexico, and if the other species are identical also Florida and the Bahamas (Bartsch).
Maximum size: 2.2 mm.

130. Henrya spec. indet. A

A second, undescribed, species is present in small quantities among our material. I reported this species in the Texas Conchologist 1969, Vol. 6(4), page 35. In shape it is quite different from goldmani, in that it has a strongly shouldered whorl and when not too much worn in beach drift a sequence of closely spaced costae. It is much smaller than goldmani.

Records HMNS Survey Collection: 4 lots, no live material.
Depth range: 0 - 2 fms.
Geographical range: Unknown.
Maximum size: 1.3 mm.

Family IRAVADIIDAE Thiele, 1928

It is somewhat ironical that the only true Onoba in the Northwest Gulf of Mexico is a totally unexpected species, so far only known from the New England states. The two species I believed to be "true Onoba are now both in different families; one was described by Thompson (1968) as a brackish water species in a new genus Onobops in the Hydrobiidae and the other I could recently identify after seeing the article by Ponder (1984) in Malacologia Vol. 25(1), 21-71, "A review of the genera of the Iravadiidae (Gastropoda: Rissoacea) with an assessment of the relationships of the family." The Iravadiidae are formed by a complex of hydrobiid-like snails which differ in some respects from true hydrobiids and rissoids (see Ponder (1984), page 24). Ponder, whose arrangement we adopt here, placed a number of genera in the family, only one of which concerns us.

Genus Ceratia H. and A. Adams, 1852

The discovery of this genus in the N.W. Gulf of Mexico extends the presently known distribution from Western Europe and the Mediterranean to the Western Atlantic; it has lived there probably at least since Miocene times because Pilsbry in 1922 described a species as Hebetaclis from the Miocene of the Dominican Republic (Ponder, 1984). The genus Hyala H. and A. Adams appears to be very close.

131. Ceratia spec. indet. A

This common Onoba-like gastropod of the Texas and Louisiana coast cannot be identified with any species described so far from the Western Atlantic. It very closely resembles in shell characters Ceratia proxima (Forbes and Hanley), pl. 18 A-C in Ponder's paper (1984), from Great Britain, which is a marine subtidal gastropod of the continental shelf. Our material comes exactly from the same environment, 6-85 fms on the offshore shelf. There is no trace of an umbilicus. (The similar Onobops has one.) Live collected specimens are often encrusted by a very thin layer of dark rusty brown material, like iron rust, probably some bacterial growth product. The nuclear whorls are smooth and rounded in contrast to the nucleus of Onoba which shows some structure. Juvenile material has less deep sutures than mature specimens. Older shells show the spirals much better than juveniles. This species has been collected along the entire Louisiana and Texas coast, and has also been obtained from the mudlump fauna. It was previously reported as Onoba spec. A (Tex. Conchol. Vol. 9, 61). The distribution of genera in this family raises an interesting problem. Almost all genera in this family are tropical Pacific ones (Indonesia, Japan, Australia, New Zealand), but the two genera Ceratia and the very similar Hyala are Western European ones. They resemble very closely a species in the N.W. Gulf of Mexico, which is known to harbour many pacific elements. I suggest that Ceratia succeeded by means of the Gulf stream to cross the Atlantic perhaps already several million years ago.

Records HMNS Survey Collection: 22 lots of which 4 contain live collected material.
Depth range: 6 - 85 fms; alive at 15 - 50 fms.
Geographical range: Unknown.
Maximum size: 2.3 mm, but mostly under 2 mm.

(To be continued)

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The TEXAS CONCHOLOGIST accepts contributions for publication from amateurs, students, and professionals, subject to approval by the Editor. Manuscripts should be typed, double spaced and should be in the hands of the Editor the first day of the month preceding publication dates. Photos accompanying such material are welcomed.

TEXAS CONCHOLOGIST, Vol. XXIII, No. 3, April, 1987

SEARCH AND SEIZURE

BY CONSTANCE E. BOONE

STRAKE HALL OF MALACOLOGY

The opening of the Strake Hall of Malacology at the Houston Museum of Natural Science was celebrated at the "Splendors of the Sea," a benefit gala sponsored by the Museum Guild, and at the Museum's reception for members, donors, and guests the first weekend of February. Over 2,000 persons attended these events.

Since then, thousands of Houstonians and out-of-town visitors have enjoyed the new display of mollusks. The big *Tridacna gigas* is now in place, the two Art and History cases have been finished and added, and an aquarium has been placed on the south outside wall of the hall. Several Houston Conchology Society members are docents for tours of the hall and report great public interest in the displays. Over 2500 shells are exhibited, all from the museum's collections. The transparencies and two videos help emphasis that the marvelous shells shown were made by living animals in the phylum Mollusca.

We present some photos from the exhibit, but, if you haven't visited the museum lately, now is the time to go!

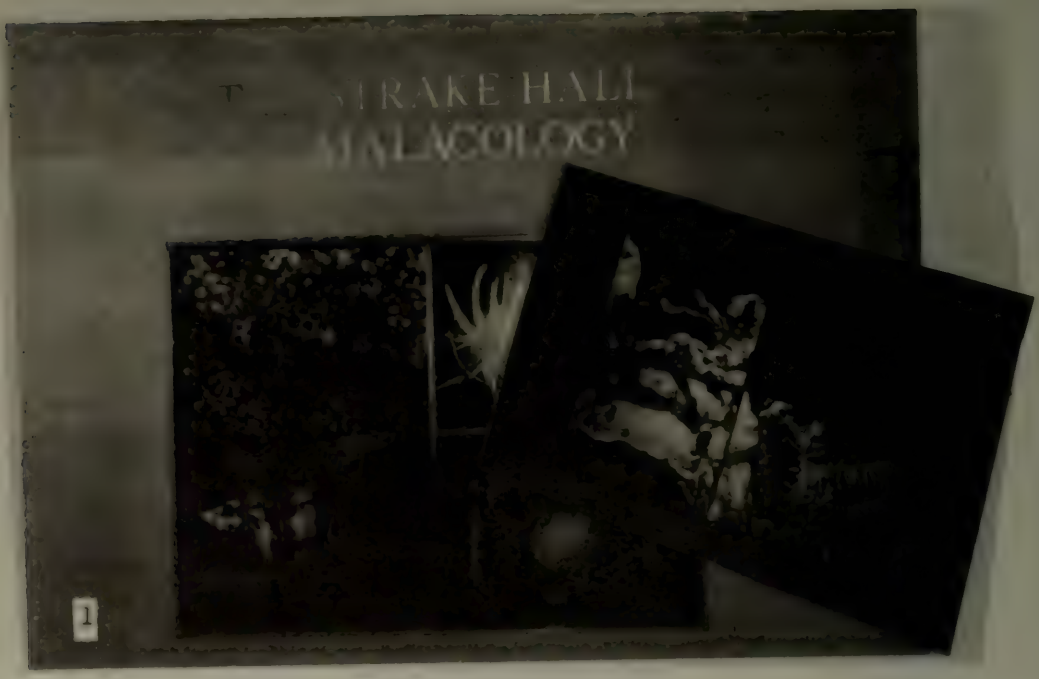
EXPLANATION OF FIGURES

Fig. 1. The entrance panels with large transparencies of live mollusks welcome visitors to the new hall at the Houston Museum of Natural Science.

Fig. 2. One of the pillar cases in the central maze area of the hall features a 26 1/2 inch *Pinna nobilis* from the Adriatic. The adjacent case features a selection of shells in three families--Cymatidae, Xenophoridae, and Buccinidae.

Fig. 3. The wall called Science of Shells honors Betty and Larry Allen whose monetary donation paid for construction of the exhibits in the new hall. Two cases of Texas shells are among those featured.

Fig. 4. Also part of the educational wall is the popular growth series of *Busycon perversum*.



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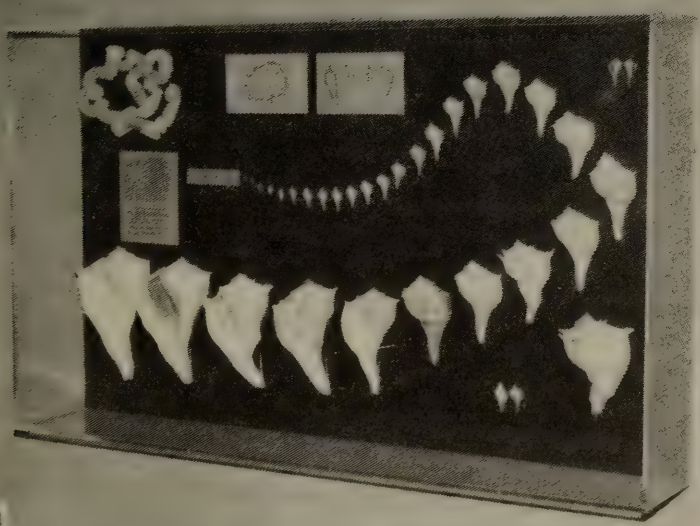

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AN ORGY IN THE CARIBBEAN

By John L. Kosut

Contrasts have always held a facination for me. How often while sitting at a desk in an office building in downtown Houston have I thought that in a mere 60 minutes I could be strolling on the sand in Galveston, inhaling the aroma of the sea and hearing the gulls laughing overhead. As I walked the beach looking for shells, even that special environment, the variable meeting place of land and sea, became a barrier to me, for I began to wonder what mollusks must be out there beyond the line of demarcation between wet and dry. With cutoffs and snorkle I was able to break through the barrier, but only briefly and often only deep enough to tantalize me. For the most part the realm of the ocean remained a castle into which I could peek only by jumping on my tiptoes.

All this changed when two of my friends invited me to take SCUBA lessons with them. There followed an in-depth course which met twice weekly alternating in the classroom and the pool. Gradually, over a period of six weeks, my classmates and I were guided from trepidatious novices to competent divers by experienced, certified instructors.

Now I could begin to satisfy for myself that persistent curiosity regarding unseen molluscan life. A part of that mysterious world was revealed to me during a dive near Paradise Reef off the southwest coast of Cozumel on November 27, 1981. Conditions here of clear water and an easy flowing current are perfect for drift diving. All that's required of the diver is a simple adjustment of his equipment to establish neutral bouyancy and he will be wafted along on an underwater sightseeing tour. As I rolled over onto my back, the sunlight crystallized on each little peak of water on the surface above me, reflected off the smooth sandy bottom up onto the powder blue hull of our dive boat, heightening my sensation of being suspended in space.

I roamed over perhaps 6 acres (2.4 ha) on this particular dive in water 20' to 40' deep (6.1 to 12.2 meters) and found an area of about 3 acres (1.2 ha) strewn with *Strombus costatus* Gmelin, 1791. In almost every instance the mollusks were in pairs with an average distribution of one pair every 3 square yards (2.5 square meters), apertures down, their shells otherwise having a random orientation to each other. Gently approaching each pair and turning the shells over, I learned that they were indeed mating, the male's white spaghetti-like penis retracting to its respective shell upon their being disturbed. R. Tucker Abbott says its' "a long, open-grooved prong-like penis on the right side of the 'back'."

I felt priviledged to be given the opportunity to witness

the mating process of S. costatus, but for the rest of its reproductve story, I report the observations of Robert Robertson. He monitored the development of S. costatus eggs to embryos and finally to the veliger stage in bowls in the Lerner Marine Laboratory in Bimini, Bahamas in June and July of 1958. The eggs are arranged in a coil within a long double-walled tube which on extrusion by the female is sticky. The tube soon forms a mass and assumes a somewhat kidney shape as a result of moulding by the aperture and becomes covered by sand grains. Dr. Robertson unraveled two such egg masses collected near the laboratory and measured one at 13.2 meters (43 1/2 feet) long and the other about 15 meters (49 feet) long. Based on an average of 14 eggs per mm on 4 or 5 eggs per coil, he calculated 185,000 and 210,000 eggs for the two masses respectively. As they developed, he noted the first cleavage took place 3 hours after the eggs were laid, the second occurred 4 hours after being laid, the third in 4 1/2 to 5 hours, and the fourth in 6 to 7 hours. After 45 hours, ciliated embryos were rotating in their capsules, and by 70 hours, cream-white veligers with smooth transparent shells were developed, but still rotating in the capsules. By 100 hours they hatch and swim and by about 220 hours they die in the lab bowls.

At the conclusion of his article, Dr. Robertson presents a mystery. "It seems that post veliger specimens of Strombus less than an inch (25.4 mm) in length are very rarely collected in the Bahamas. This apparent scarcity of juveniles, which is common to other marine invertebrates as well, poses a problem as to where this stage in the life history is passed."

References:

Abbott, R. Tucker, 1960. The genus Strombus in the Indo-Pacific, Indo-Pacific Mollusca, Vol. #2.

Robertson, Robert, 1959. Observations on the spawn and veligers of conchs (Strombus) in the Bahamas, Proc. Mal. Soc. London, Vol. 33, pt. 4, pp 164 - 171,1 pl).

Fig. 1. Strombus costatus collected at Cozumel, Mexico.

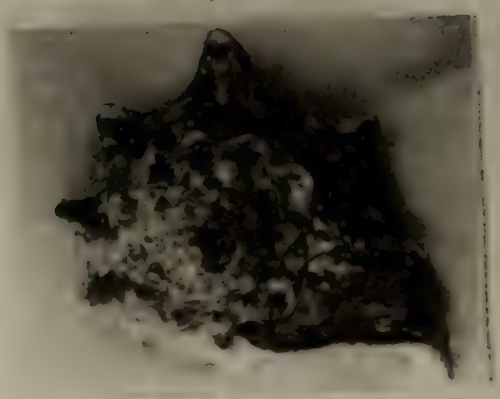

Fig. 2. Apex view of Strombus costatus.

Photos by the author.

A RETURN TO VENICE

BY SANDRA CLARK

Ten years ago, my husband and I went to Italy on business (he works in Milan several weeks a year). We planned a long weekend in Venice as a respite from a busy schedule. After registering at our hotel, we noted there was a concert nearby at five o'clock (music is a big attraction in Venice). But first, we decided to see if there were any shells on the Lido. We boarded the vaporetto about three o'clock, figuring we had plenty of time. After we got off the boat we walked down a lovely boulevard to the beach. We were greeted by a very low tide - sandbars galore! Jim, carrying my shoes, examined the drift, while I searched in the shallows. Unprepared as we were, we collected quite a few shells new to us - and - missed the concert.

In 1983, Jim was to give a paper at a conference in Venice, on the Lido. This time we were more prepared. We stayed at the Hotel Des Bains which is right on the beach. It is very much "Turn of the Century" - elegant and ornately decorated. The rooms,however, were smaller than comparable hotels we've stayed in. It was toward the end of October, and thus there were few people there - we had very good service in the dining room (a sight to behold). The food in Italy is one of our great joys. The variety of seafood, much of it local, is staggering and is deliciously prepared. This is no place to be on a diet, particularly if you are adventuresome eaters, which we are. The first time we were there we had noticed many of the locals in the water collecting shellfish for consumption.

The next morning we went to the main island to sight-see and to eat. As we walked down the narrow streets, the seafood offerings of the various restaurants were displayed invitingly in front. We selected one place at random and went in to order. There were selections of marinated mussels, squid, and clams of all kinds, particularly "Cannelecchi": Solen marginatus. This has got to be one of the taste treats of all time! We asked the waiter for more and, after quite a wait, received a whole plateful of broiled Cannelecchi in garlic butter sauce. So entranced was I with the Cannelecchi that I took a picture of the empty shells on the plate! After consuming this, the entree of Pasta a fruitto del mare and a bottle of wine, we contentedly waddled out to sight-see. No matter how many times one has been to Venice there's always something new to see and the old familiars are always good to see again. Later on that week, I took a photo walking tour to bring home some of our memories of the trip.

That night, there was a storm of major proportions. We awoke to a crystal clear sky (a rare event in Venice) and a view of snow-capped mountains in the distant Alps. The beach was strewn with shells, many alive or near-dead. Many people were out enjoying the weather - and crunching

my valued shells. One particular species: Solecurtus strigillatus, had eluded me as an entire pair. I finally found one - smashed! In all, we found 34 species of mollusks; some were live or near-dead, but most were good beach specimens. Space is too limited for a description of all the species found, but some are worth noting.

Natica maculata is very abundant, as is Natica stercusmuscarum. Many specimens of these two species were found. It's amazing that apparently there is no inbreeding between such similar species. Ostrea edulis edulis is an interesting oyster. It likes to glue a small shell on it's right valve, usually Nassarius mutabilis or Nassarius reticulata mamilata. This last species is an avid carnivore and is found only in the Adriatic. Another species, Scapharca cornea, also is found in the Adriatic, but was introduced from the Indo-pacific. Acanthocardia tuberculata, with a myriad of color forms and Solen marginatus were by far the most numerous on the beach. The most common clams used for culinary purposes include: Chamela gallina gallina, Tapes decussatus, geographicus, and rhomboides, Venus verrucosa, Callista chione, Modiolus barbatus, and of course, Solen marginatus. The predominant rock species were Monodonta articulata and Patella caerulea. The former was easy to remove, but the latter, a limpet, we just let alone - a beach specimen sufficed. Gastropods were few and far between except for Murex brandaris, another common edible, the nassarias and the naticas.

This was one of the most thoroughly enjoyable trips we've taken; good food, productive shelling, a congenial atmosphere and all of the magnificent sights that Venice has to offer. Venice is a place we would recommend to anyone - we're certainly planning to return.

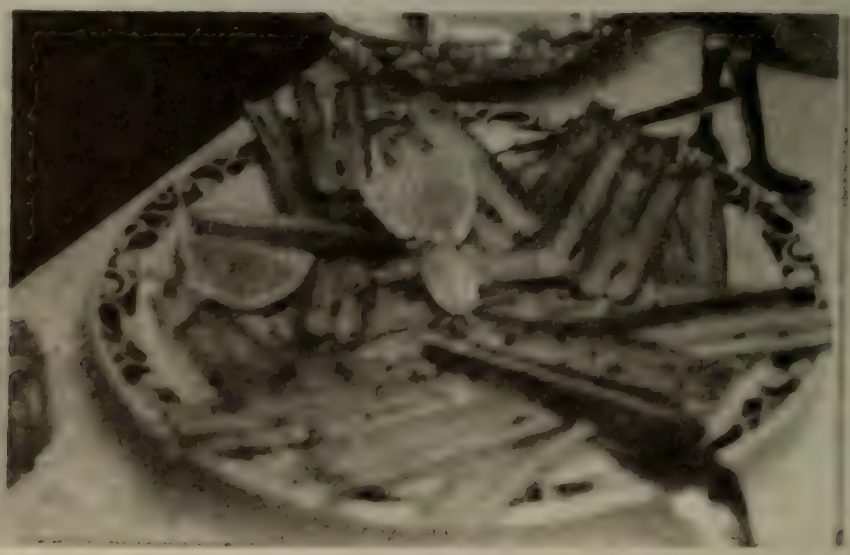

Fig. 1. The empty shells of Solen marginatus on my plate in Venice evidence quite clearly that the animals were very tasty.

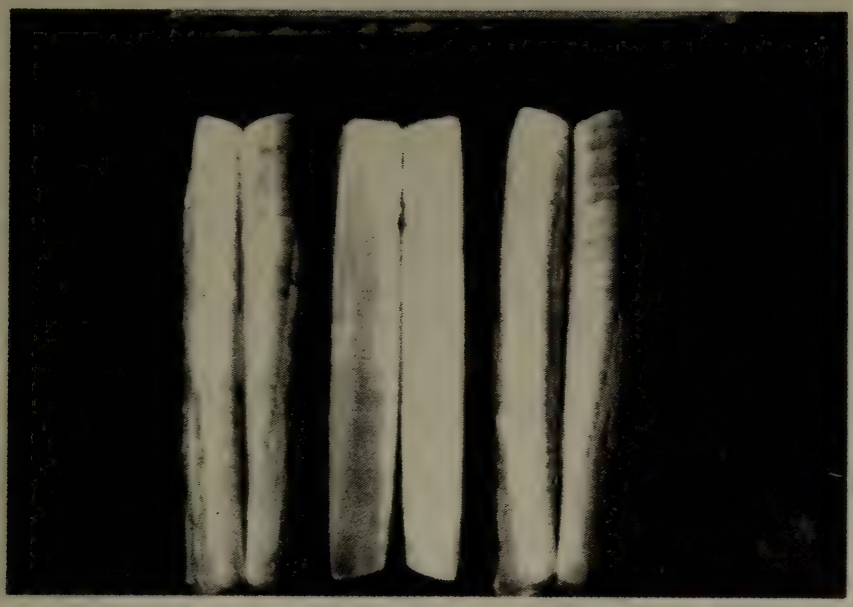

Fig. 2. Solen marginatus from the beach at Venice.

Fig. 3. Natica stercusmuscarum, left, and Natica maculata, right, collected on the beach at Venice in 1983.

Photos by the author.

SPECIES FOUND IN VENICE

Nassarius reticulata mamilata	(Risso, 1826)
Nassarius mutabilis	(Linn., 1758)
Hexaplex trunculus	(Linn., 1758)
Natica maculata	(V. Salis, 1793)
Natica stercusmuscarum	(Gmelin, 1791)
Dosinia lupinus	(Linn., 1758)
Crassostrea angulata	(Lam., 1818)
Ostrea edulis	Linn., 1758
Cyclope neritea	(Linn., 1758)
Monodonta articulata	Lam., 1822
Mondodonta turbinata	(Born, 1778)
Mactra corallina	(Linn., 1758)
Mactra corallina lignaria	Monterosato
Tapes decussatus	(Linn., 1758)
Tapes geographicus	(Gmelin, 1790)
Tapes rhomboides	(Pennant, 1777)
Chamela gallina gallina	(Linn., 1758)
Solen marginatus	(Pennant, 1777)
Macoma tenuis	(Poli, 1795)
Calyptraea chinensis	(Linn., 1758)
Epitonium clathrum	(Linn., 1758)
Pecten glaber	(Linn., 1758)
Tellina albicans	(Gmelin, 1790)
Scapharca cornea	(Reeve, 1843)
Acanthocardia tuberculata	(Linn., 1758)
Solecurtus strigilatus	(Linn., 1758)
Glycymeris pilosa	(Linn., 1758)
Murex brandaris	Linn., 1758
Pholas dactylus	Linn., 1758
Patella caerulea	Linn., 1758
Venus verrucosa	(Linn., 1758)
Callista chione	(Linn., 1758)
Modiolus barbatus	(Linn., 1758)

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Die europaischen meeres-gehausesschmecken (prosobranchia). Gustav Fisher Verlag, Stuttgart.

WORM GOOP GOULASH

THE YUILL LOG

The tides were low, the wind was high, the sun was warm, and the shelling was fantastic! On the last day of January, about twenty HCS shellers met at Quintana Beach near Freeport and were rewarded with a bountiful selection of shells.

The trip had been triggered by the fabulous shelling that Darwin Alder had early in January following favorable low tides. Emily Oakes and Connie Boone noted the good high tides followed by extreme low tides the last week of January and suggested a last winter fieldtrip. My major professor, Dr. Frank Fisher, and I needed to reconoiter some beach access roads for a field trip for a Rice class the following week. So on Thursday the 29th, we stopped at the Quintana jetty about 11:00 a.m. nearly two hours after the scheduled low tide. The tide was out - way out - so we started scouting the base of the jetty for interesting marine critters. After diddling around for almost an hour we were getting ready to leave for San Luis Pass and points north when I spied the black discoloration of the "worm goop" just 50 yards down the beach. The stuff we shellers technically call "worm goop" (rhymes with soup) is actually the secreted tube of a polychaete annelid (earth worm cousin known as Diopatra cuprea. These parchment-like worm tubes, with tiny shells cemented all around, are good indicators of wentletraps since Epitonium commonly wash ashore in great numbers when the worm beds are churned up by winter winds and waves.

By the time we spied the worm tube debris, the tide was coming back in, but in about twenty minutes Dr. Fisher and I had collected about 75 Epitonium angulatum. It later suprised a few people that this was the first time I had ever collected this common Texas wentletrap.

Now, in case you are getting confused (I know I am), I'm still talking about Thursday before the the big HCS field trip. Well, Thursday night after tucking the kids in bed, I got down on my knees and prayed to the god-of-the-seas-Neptune--and the shell fairy--Venus--to please leave those shells on Quintana Beach for just two more days. It must have worked because on Saturday the worm goop was still there and so was a potpourri of shells.

In addition to abundant wentletraps, various club members found olives, cancellate cantharus with operculum, Thais and Polinices both with opercs, at least one live Busycon perversum, hinged pairs of alternate tellins and Taylor's pink tellins, incongrous and blood arks, disk dosinas, a few giant atlantic cockles, and numerous paired false angel wings. Since I was satiated with about another 50 E. angulatum, I concentrated on looking for the rarer Mitchell's wentletrap--to no avail. Several club members

Fig. 1. Pat McElroy collects epitoniums from the worm tubes at Quintana.

Fig. 2. Close up of worm tubes and Epitonium angulatum at Quintana Beach.

Photos by the author.

found pieces of Amaea mitchelli, but no one found a whole shell, to my knowledge. On Thursday, I had found a weathered Murex fulvescens, but did not notice any collected by our intrepid shellers.

Lauretta Marr and her Shell-sheller husband, Ron, successfully worked the edge of the surf for over 100 E. angulatum. Lauretta also alertly scouped up some drift at the waters edge. I have worked up just a small portion of this and found at least three wentletrap species-- E. angulatum, E. albidum, and E. multistriatum. Also in this drift, are small mud snails, Nassarius acutus, immature Donax, and various small bivalves including Mulinia lateralis.

As the morning wore into lunch time, the tide had turned and the sea was busy reclaiming its bounty. Some happy shellers gathered on the boardwalk at the Quintana county park to rest in the sun and eat lunch. The caretaker's house was open, so we could wander in and see the small but nicely displayed collection of shells commonly collected at Quintana and Bryan Beaches.

We had a chance to leisurely compare notes on what we found, take a few snap shots and plan the rest of the day. As the group sat around admiring the bootie of the day, I chomped down on my peanut butter and jelly sandwich, pulled the tab off another cold D.P. and exclaimed, "Ya know . . . it dudn't git any better than this!"

Richard Yuill

NEW GULF VOLUTE

A new volute has been named by Drs. Emilio F. Garcia and William K. Emerson in Apex, Vol. 2 (1), 1987 from off Yucatan, Mexico.

Scaphella macginnorum was collected in the winter of 1970 by the late Thomas McGinn of Cut Off, Louisiana, dredged in deep water off Cabo Catoche, Yucatan Channel, Mexico. A single dead adult of this large unknown volute was found. In 1972 a juvenile specimen was dredged in the same general area. No additional specimens have been found.

The holotype is 157.8 mm in length, with 5 1/2 slightly convex whorls. The protoconch measures 8 mm in width. It has been deposited in the American Museum of Natural History. It resembles the form Scaphella dubia kieneri, differing in that it has no spots, has a larger protoconch, and does not develop inflated whorls at an early stage of growth.

Apex is a new publication of the Belgian Society of Malacology.

TEXAS CONCHOLOGIST, Vol. XXIII, No. 3, April, 1987

MONOGRAPH

By H.Ode

DISTRIBUTION AND RECORDS OF THE MARINE MOLLUSCA IN THE NORTHWEST GULF OF MEXICO

(A Continuing Monograph)

Family HYDROBIIDAE Troschel, 1857

No other mollusc family illustrates as convincingly the modern lack of interest in systematics in biology. Of the about 12 species along the Texas - Louisiana coast 5 can be commonly collected in the coastal bays. For only three of them can the trivial name be stated with any confidence. Four of them were discovered after World War II. In 1968 F. G. Thompson made a study of the hydrobiids of the Florida Peninsula (The Aquatic Snails of the Family Hydrobiidae of Peninsular Florida, 268 pages, University of Florida Press, Gainesville). Of the 35 species described 23 were new and of the 10 genera used, 5 were new. It is not impossible to believe that the number of species in the coastal plains west of the Mississippi Delta to the Mexican border is equally as large.

The Hydrobiidae form a large world wide family about which our knowledge is worse than fragmentary. Until recently, generic descriptions were mainly based on shell characters, but those have proven to be quite unreliable. As far as I know, there are no truly marine species but a number of genera contain species which live in brackish water and can tolerate large and rapid changes in salinity. Along the coast of northwest Gulf of Mexico live a number of species in coastal bays where the salinity is subject to large changes. Other species live in the fresh water of the rivers. [See list in Tex. Conchol., Vol. 6 (5) 51 - 52 and 55 - 56]. It happens that these fresh water species are sometimes dredged in the bays; on occasion dead shells can be collected in beachdrift on the beaches near the coastal passes. Offshore dredge samples rarely contain hydrobiid fragments, but those are mostly Pleistocene fossils or when collected off Freeport or Galveston, adventitious by the Colorado and Brazos Rivers or Trinity and San Jacinto Rivers, respectively.

Unfortunately it will be impossible to give here a reasonable account of our hydrobiid material because so far nobody has done any work on this family in our area.

Hydrobiids tend to be very small, somewhat elongate conic with a paucispiral operculum. My experience with the species in this region obtained from salt water environment is that their shape is quite variable in such respects as slenderness, width of umbilicus, formation of aperture,

etc. Especially some structural details of the aperture appear to be unstable. However, other properties such as depth of suture and overall shape seem to be more constant.

In this discussion I will also list some of the fresh water hydrobiids of the survey collection. These were obtained in bay dredgings and from beachdrift, but no particular effort was made to collect freshwater species in their natural habitat. The reader is warned that some of our labels are attached for convenience rather than for any other reason. I will follow here, as far as possible, the arrangement in Andrew's book Sea and Shores of Texas (1977). Texadina and Littordinops are placed in a family Littoridinidae Thiele, 1929 and Vioscalba placed in a family Stenothyridae Fischer 1885. No documentation for such and arrangement is given. Such changes without a word of explanation, whether correct or not, should be avoided. Most of the Texas species we discuss here belong in the subfamily Hydrobiinae Troschel, in which the genera are grouped into so called "tribes", i.e. more or less closer related groups of genera. Of these at least three have representatives in our area: the Heliobia tribe with Texadina; the Onobops tribe with Onobops; the Hydrobia tribe with Pyrgophorus and Littoridinops. In all probability many as yet unreported species live in the coastal plains and most of the reported fresh water species await correct generic assignment. The common Vioscalba is not placed here because I do not know its modern placement within Thompson's scheme. It should be noted that Littoridina in Thompson's arrangement is not closely related to Texadina.

Genus Texadina Abbott and Ladd, 1951

In Texas there are probably three species which belong in this genus. One is the very common and widespread T. sphinctostoma, the type of the genus. Another is the species mistakenly described as Odostomia barretti and cited in Abbott, 1974 as "Hydrobia booneae Morrison". Another species which I suspect will finally belong here is reported farther on as Littoridinops. Together with the common Vioscalba louisianae, Littoridinops monroensis and a rare Onobops, these species constitute the living fauna of brackish and slightly brackish bay waters. I suspect that all other reported material here are fresh water species brought in by the rivers.

132. Texadina sphinctostoma Abbott and Ladd, 1951.

This species is the most common Texas hydrobiid living in brackish water to salt water. It is particularly common along the mid- Texas coast (San Antonio Bay (type) and Matagorda Bay). There is hardly any surface sculpture which shows only minute

growth incrementals. The nucleus is minute and slightly flattened. Fresh dead material without the greenish brown periostracum has a silky sheen. When mature this is a somewhat spindle shaped species. Very small juveniles are right circular cones with a narrow umbilicus at the base, which is soon closed by a callus. But later, when the parietal wall of the aperture grows separate from the body whorl and is not appressed against it, as happens in many specimens, producing a protruding aperture, it may appear that there is a narrow umbilical slit. Some beachworn specimens were figured in the Texas Conchol., Vol. 5 (5) page 51, and in Andrews 1977, p.83. Such specimens give a misleading picture of the shell of the living animal because the lower part of the aperture is missing. In the living animal the lower part of the aperture is extremely thin and hardly, or not at all, calcified consisting almost of pure periostracum. It breaks away as soon as the animal dies. When the aperture is complete the shell resembles T. barretti much more closely. In some specimens one can see under high magnification a spiral line below the suture. It appears that T. sphinctostoma is somewhat unstable in shape. In any large population occur shouldered specimens, almost keeled individuals, clearly misshapen ones, slender and fat ones.

Records HMNS Survey Collection: 48 lots, of which 12 contain live collected material. Beach material can be found from South Padre Island to Sabine Pass. Alive in many bags: Corpus Christi to Vermillion Bay (La). Rarely adventitious offshore (Freeport).
Depth range: 0 - 2 fms on mud bottoms.
Geographical range: Mexico (east of Vera Cruz) to Mississippi.
Maximum size: 3.7 mm (usually about 3.0 mm).

133. Texadina barretti (Morrison, 1965)

On the basis of a number of characters I must concur with D. W. Taylor (in Andrews, 1977) that this is a Texadina. This is a somewhat more slender, very regularly shaped species, widespread along the Texas coast, where it lives in the coastal bays. A photograph of a specimen taken alive in Galveston Bay was published in the Tex. Conchol. Vol. 8, page 4, 1971. Characters in common with T. sphinctostoma are: the silky sheen in cleanly washed specimens, the faint spiral below the suture, the small nucleus. In a fair number of specimens the parietal wall of the aperture is detached from the body whorl. Differences are: the perfect conical shape, the shallow suture, the always complete aperture which is slightly more elongate and the slightly lighter

brown color. In juvenile specimens there hardly is an umbilicus and in mature specimens there is at most a shallow depression. The figure referred to shows that in some mature specimens the body whorl descends somewhat as in T. sphinctostoma. This descent may be a property of brackish water species because it is also strongly present in a third species, which for the time being I have classified as Littoridinops.

The trivial name of this species was changed from barretti (two t's) to booneae (in honor of our editor!) because an Odostomia barreti (single t) was described a century ago in the Journal de Conchyliologie. However, because the spelling was different there was in my opinion no need for a name change. This was finally also the opinion of the expert nomenclatorial committee to whom the problem was submitted. By official opinion, the correct trivial name is barretti (Morrison, 1965). A history of this affair is in the Texas Conchologist: Vol. 15 (4), 83; Vol. 16 (1), 32 and Vol. 16 (2), 40.

Records HMNS Survey Collection: 36 lots, of which 7 contain live collected material. In beachdrift all along the Texas coast from Port Isabel to Sabine Pass. Alive in the Galveston and Matagorda Bay systems at many locations.
Depth range: Mud bottoms in coastal bays 0.2 fms.
Geographical range: Heron Bay, Mississippi (type) to South Texas
Maximum size: 3.7 mm (usually about 3.0 mm).

The next two species illustrate quite clearly the difficulties in classification of the hydrobiids. Both species appear to be related using only shell characters, but one appears close to Texadina while the other has very clearly a true "hydrobia" form. I have classified them both as Littoridinops.

Genus Littoridinops Pilsbry, 1952

This is a very difficult genus when dealing with empty shells, and it may well be impossible to identify any species with certainty. There is considerable variation not only between species but also within species as is apparent from the lengthy characterisation in Thompson (1968). We have assigned two species to Lt. D. W. Taylor in Andrews (1977), also reports two, as yet unidentified species from the Corpus Christi area, only one of which could possibly be identical with those I reported in the Texas Conchologist Vol. 7, page 82. On the basis of slight and probably insufficient evidence, I name one species L. monroensis (Frauenfeld, 1863). All our material under discussion here has a remarkable shell character. Both

species, at first sight quite dissimilar, display when mature a low but unmistakable internal varix close to the lip.

134. Littoridinops spec. indet. A

This highly interesting species displays when mature not only an internal but also an external varix at more or less the same spot the internal varix is located. In specimens collected when the varix was in formation when the animal died, the outer lip appears to flare out, but soon the aperture in specimens reaching full maturity becomes normal again.

This is rather a small species, although a few specimens may reach 4.0 mm, mostly below 3 mm, somewhat thick shelled with a very shallow suture and looking both in color and in habitus somewhat like a pupoid T. sphinctostoma. Very fresh material is somewhat glassy greyish white with a quite thin olive greenish periostracum. Many specimens are slightly keeled. I have collected this species along the entire Texas coast in beachdrift (South Padre Isl. along causeway, Rockport, and Sabine Pass). It was dredged in Matagorda Bay at several locations, three of which yielded fresh and probably live collected material (Indianola). Also recent from the mudlumps in the Mississippi Delta. This is the same as Littoridinops spec. indet. A reported in the Tex. Conchol. Vol.7,page 82. In Matagorda Bay it is often mixed with T. sphinctostoma with which it shares the strong descent of the outer whorl. There is no doubt that this is a brackish water inhabitant.

Records HMNS Survey Collection: 18 lots, of which 3 contain very fresh material.
Depth range: 0 - 2 fms. on mud bottoms in coastal bays.
Geographical range: along entire Texas coast and in Louisiana.
Maximum size: 4.0 mm (usually 2.8 - 3.0 mm).

135. Littoridinops c.f. monroensis Frauenfeld, 1863.

This species was described more than a century ago from some material sent from Lake Monroe in Florida to Vienna. Pilsbry 1889 (Proc. Acad. Nat. Sciences, Philadelphia, 87 - 88, plate 3, figs. 17 - 19) discussed the species and mentioned an important fact stated by Frauenfeld: "naht gerandet" or "suture with an edge" which indeed is true in some of our material (see fig. 61 C and D which says "a common brackish water variety," Thompson 1968, p. 68). Very instructive in figure 51 of Thompson's book which

shows the variation possible within this species. Exactly the same variation is displayed within our material collected at the various passes along the Texas coast. The distribution map, fig. 11, in Thompson 1968, confirms the suspicion I had about this species: because it often can be found in beachdrift near the passes leading into the Galveston and Matagorda Bay systems, I believe that it lives in the very lower reaches of the coastal bayous. This belief found some confirmation when I discovered the only live collected specimen dredged from Red Fish bayou (Lavaca Bay). This is a fairly squat shaped shell with deep suture and a narrow but deep umbilicus which may be monroensis.

Harry (1968) was the first to report this species from Galveston under the generic designation of Lyrodes. Because of its deep suture and larger size this species does not resemble the previous one closely, but it is clearly related as can be seen from the quick similar development of a weak internal varix, the nucleus and essentially its overall shape.

Records HMNS Survey collection: 11 lots of which 1 contains live collected material. Only on Matagorda and Galveston beaches.
Depth range: 0 - 2 fms on mud bottoms?
Geographic range: Florida in fresh or slightly brackish water.
Maximum size: 4.5 mm.

Onobops Thompson, 1968

The type of this genus was described from South Florida, and another species was originally classified as Onoba and comes from brackish water in Chesapeake Bay. These small gastropods are at first glance very similar to true Onoba and I was quite suprised to find a "true Onoba " in a brackish water bay.

136. Onobops spec. indet. A

Only a single specimen was collected alive from East Matagorda Bay. On comparison with the Onoba-like Ceratia from offshore locations (most at a depth of 20 - 70 fms.) it is quite clear that both species are fully different. The aperture of Onobops is much more rounded than that of Ceratia. There is a narrow umbilical slit and the spiral sculpture is clearly visible. The suture is rather deep and the whorls are well inflated, more than in either of the two Florida species. Unfortunately, the nucleus of our single specimen is defective. Our specimen resembles O. crassa Thompson somewhat, but more material is

needed before a more trustworthy identification can be made.

Records HMNS Survey Collection: 1 lot, collected alive.
Depth range: 1 - 6 feet.
Maximum size: 1.8 mm.

Genus Vioscalba Morrison, 1965

In this genus some barrel shaped small hydrobiids of quite different shape are classified. A close relative to the only know recent form in the N.W. Gulf of Mexico lived in the Florida Pliocene. This genus does not belong in the Hydrobiinae, but its correct placement in Thompson's scheme is unknown to me (Amunicolinae?).

137. Vioscalba louisianae Morrison, 1965

This quite different species is fairly common along the Texas and Louisiana coasts. It possesses a somewhat barrel shaped small shell with a rather flat and depressed nucleus. Very young material is widely umbilicated and has the appearance of a rather thick shelled zonitoid land snail. But quite soon when the ultimate whorl starts developing the growth takes place in such a manner as to elongate the shell and to narrow or even close the umbilicus. Its color when alive is grayish, not brown. The genus already occurred in the Florida Pliocene, because the so called Probythinella protera Pilsbry, 1953 (in Olsson and Harbison 1953, p. 444, pl. 64, fig. 6) clearly is a Vioscalba closely related, if not the same species.

It is remarkable that also in this species the outer whorl is descending and one can ask whether this is a property of brackish water hydrobiids. However, in the western European Sabanaea ulvae I have never seen it.

V. louisianae is common in beachdrift along the entire Texas coast from South Padre Island to Sabine Pass; it has been taken alive in the Matagorda and Galveston Bay systems.

Records HMNS Survey Collection: 31 lots of which 6 contain live collected material.
Depth range: 0 - 1 fms on mud bottoms in coastal bays.
Geographical range: Texas and Louisiana (type locality Barataria Bay).
Maximum size: 3.0 mm.

Genus Pyrgophorus Ancey, 1888

This is a circum-Caribbean genus, whose membership in the U.S.A. are restricted to South Florida and the lower Texas coast. Members of the genus can be beautifully spirally ornamented with a spine-bearing keel, but sometimes are smooth (see Thompson fig. 59). Thompson has discussed the nomenclatorial history of this genus (page 37 - 38). The only Texas species was described as a Pyrgulopsis Call and Pilsbry, a genus of keeled shells with type P. nevadensis Call and Pilsbry. The latter is not congeneric with P. spinosus. Ancey invented the name Pyrgophorus for a subgenus of Pyrgulopsis. It is now used as a full genus for several circum-Caribbean species.

138. Pyrgophorus spinosus (Call and Pilsbry, 1886)

In 1886 Call and Pilsbry described in the Proc. Davenport Acacemy Nat. Sci., Vol. 5, p. 14, pl. 2, figs. 17 - 19., a small ornamented hydrobiid as Pyrgulopsis spinosa, from Comal Creek, Guadeloupe River drainage system. This is a beautifully ornamented shell with rather inflated and clearly tabulated whorls. Below the tabulation there are a number of rather weak spirals. The tabulation is caused by a strong keel some distance from the suture which carries strong knobs, almost spines. We found 3 lots of this species in the survey collection; one consisting of three specimens collected alive in the Aransas River near the Welder Refuge at Sinton (not far from Corpus Christi). Another came from beachdrift at Port Mansfield mixed in with a lot of Calipyrgula; the last one is a single juvenile specimen, already clearly keeled and tabulated, dredged from East Matagorda Bay. One of the difficulties in the identification of this species is the common occurrence of smooth shells, which are difficult to separate from L. monroensis. Although mostly living in purely fresh water it appears that members of this genus can live in slightly brackish water. D. W. Taylor states (in Andrews, 1977) that the species is widespread in the Corpus Christi area and cannot be separated when smooth from Littoridinops.

Records HMNS Survey Collection: 3 lots, one of which contained live collected material.
Depth range: a fresh water species.
Geographical range: southern half of Texas coastal plains.
Maximum size: 3.4 mm.

Genus Calipyrgula Pilsbry, 1934

I know very little about this genus except that it was

erected to contain some Pliocene fossils from California. These were rather smooth shells resembling the Florida genus Hyalopyrgus (Thompson (1948) p. 45). Leonard and Ho (1960) assigned two species in the South Texas Pleistocene to this genus (Nautilus, Vol 73, p. 110 - 113, pl. 11, figs. 1 - 3 and ibid. p. 125, pl. 12, figs. 1 - 3) but state clearly that they have grave doubts about the correctness of this assignment. Another similar and smooth species is know from the Oklahoma Pleistocene. Even if the improbable is true, namely that our material is true Calipyrgula its exact relationship to other hydrobiids may remain obscure. It is perhaps impossible to make a case for Morrison's genus durangoella to which the species Hydrobia seemanni Frauenfeld belongs. This species has been reported for Texas.

139. Calipyrgula circumstriata Leonard and Ho, 1960

This species has never been found alive but could be discovered one day in its natural habitat in South Texas or Mexico. So far the only material obtained is from beachdrift at Port Mansfield and rarely from Port Aransas or South Padre Island. The shells can be immediately recognized, and I refer to a figure in the Nautilus, vol. 73, p. 125, pl. 12, figs. 1 - 3. We have reported this species earlier in the Texas Conchologist, Vol. 7 (5), p. 82.

Records HMNS Survey Collection: 5 lots, no live material.
Depth range: probably a pure fresh water species.
Geographical range: In Rio Grande drainage system.
Maximum size: 3.5 mm.

In the remainder of our material there are several more species which, however, we have no way of identifying, until more data are available about the anatomy of the animals. Among them are shells resembling "Paludestrina diaboli" and "Amnicola comalensis" (Pilsbry and Farris: Mollusca of the Southwestern States II, Proc. Acad. Nat. Sci. Phila., 1906, p. 170 - 171), and a relatively large spherical Horatia (?) and a few lots of a very small deeply sutured hydrobiid.

Family TRUNCATELLIDAE Gray, 1840

A family of small gastropods which live amid decomposing seaweed or amid flotsam on the beaches. The family is unique among marine mollusks in that the animals upon reaching maturity secrete a calcareous septum inside the shell about the 5th whorl. The upper 5 whorls are then lost due to resorption of the lime at the location of the septum. Clench and Turner have discussed the Western Atlantic species in Johnsonia, Vol. 2, # 25 (1948) and probably oversplit the group. Abbott (1974) recognizes

only two species in the genus in the Western Atlantic and lists under "other species" a 3rd one which Clench and Turner synonymize with one of Abbott's discussed species. For the sake of uniformity we list the only N.W. Gulf of Mexico species by the name Abbott (1974) uses. The animals in this genus have a somewhat turbinate nucleus and a paucispiral operculum. Suprisingly Clench and Turner do not figure the operculum of a single species.

140. Truncatella caribaeensis Reeve, 1842

Abbott believes that the shell reported by Clench and Turner (1948) as T. pulchella was incorrectly identified and should be named as above. It is not rare along some of the beaches in South Texas. In the survey collection there is no material obtained in offshore dredging. It has been rarely obtained in the bays (once in Matagorda Bay). It is not uncommon at Port Aransas and further south, but quite rare at Galveston where it has been found only once. The ribbing on this species is variable in intensity. Most specimens are rather smooth but in a few the ribbing is more strongly developed.

Records HMNS Survey Collection: 7 lots, of which 2 contain live collected material.
Depth range: only beach material.
Geographical range: South half of Florida to Texas; Bermuda, West Indies (Abbott, 1974).
Maximum size: 6.3 mm in truncated specimens. Considerably larger when 5 early whorls are retained.

Family CYCLOSTREMATIDAE Fischer, 1885

This family of small gastropods, also known as Liotiidae, Gray 1850 is representated by a number of interesting genera in our area. Most have members either in deeper water or on the coral and algal reefs. They possess a multispiral operculum. In many genera the shell substance shows a peculiar "vermicular" sculpture. The following gerera are present Cyclostrema, Liotia, Sansonia, Arene and Macrarene. The small skeneid species which Abbott has aligned as a subfamily we treat here as a separate family.

Genus Cyclostrema Marryat, 1818

Small, flatly coiled white gastropods with typical liotiid sculpture, i.e. very closely spaced somewhat wavey striations as background on a highly sculptured surface. A single species in our area.

141. Cyclostrema amabile (Dall, 1889).

In the survey collection are a number of lots collected on the Flower Gardens where it lives, and some from other locations off the Texas and Louisiana coasts. According to Abbott the species is missing in Florida and lives only in restricted areas in the Caribbean. It is discussed in Johnsonia, Vol. 2, # 27. Juvenile material <1 mm looks like a small serpulid worm tube. The circumferential knobs only appear after a certain size is reached, but in maturity they disappear again. There exists considerable variability in the placement of the aperture. In most specimens the placement of the disc of the shell is in the middle of the circular aperture (as in the figure in Johnsonia) but in some it is like in C. cancellatum. However none of such specimens has the radial ribbing and all have the thickened lip of C. amabile. It should be noted that inside the umbilicus there are some quite sharp teeth.

Records HMNS Survey Collection: 8 lots, one containing live collected material.(All from coral and algal reefs)
Depth range: 15 - 55 fms.
Geographical range: Cuba, Puerto Rico, Barbados (Abbott, 1974)
Maximum size: 6.2 mm.

Genus Liotia Gray, 1847

A genus of rather thick shelled gastropods with the typical surface sculpture of the family. There is a thickened circular outer lip, a deep umbilicus and usually cancellate sculpture. Abbott lists only a single West Atlantic species that never was figured; moreover it comes from much deeper water than our species.

142. Liotia spec. indet. A

A fairly local inhabitant of the offshore Texas coral and algal reefs. In basic pattern it is similar to fenestrata Carpenter of the eastern Pacific but it differs in the reduction of that species' cancellate sculpture to only a single circumferential row of elongate pits. It is a very striking shell and easily recognized by its washed out reddish brown color.

Records HMNS Survey Collection: 8 lots, no demonstrably live collected material.
Depth range: 18 - 36 fms.
Geographical range: Flower Gardens and adjacent reefs. Found nowhere else.
Maximum size: 8.6 mm.

Genus Sansonia Jousseaume, 1892

One species of this interesting genus is not rare on the offshore coral and algal reefs. Another name of this genus is Mecoliotia Hedley, 1899, and as such it was reported in the Texas Conchologist Vol. 9, p.48. Recently Ponder, 1985 cited another synonym suprisingly close to Hedley's name: Microliotia Boettger, 1901. This name was invented for a shell of the famous mid-European Miocene fauna. Both Thiele (1928) and Wenz (1939) placed these genera in the Rissoacea, where according to Ponder,1985 they belong on the basis of radular characters (either Vitrinellidae or Pickworthiidae). Until this matter can be definitely settled we will retain Sansonia in the place where Abbott (1974) located it.

143. Sansonia tuberculata (Watson, 1886)

This small pyramidal species is quite easily recognized. As stated above, it is in many characters divergent from liotiid gastropods. A completely different type of nucleus, and a complete absence of the typical liotiid surface scratches. Whether it should be put together with vitrinellids is another matter. It is another example of a species in the Western Gulf, whose closest relatives are Pacific rather than Atlantic.

Records HMNS Survey Collection: 8 lots, no demonstrable live collected material. Unfortunately I have been unable to locate a single specimen among the many in the collection that has an observable operculum. Mecoliotia bermudezi Clench and Aguayo described from the Pleistocene of Cuba is the same (see Nautilus Vol. 49, p. 91 - 93, pl. 5, fig. 3).
Depth range: 18 - 55 fms. (Flower Gardens, Hospital Rock off Corpus Christi, and off Louisiana.
Geographical range: Off Miami, Florida to Cuba and Puerto Rico (Abbott, 1974).
Maximum size: 2.0 mm.

Genus Arene H. and A. Adams, 1854

This genus is well represented in the N.W. Gulf of Mexico, but some species are quite rare. Typical Arene is quite different from the more common subgenus Marevalvata Olsson and Harbison,1953. Macrarene Hertlein and Strong, 1951, which Abbott (1974) also considers as a subgenus, is in shell characters so different that we have listed it as a full genus (see also Keen 1971). To Arene and Marevalvata belong some globose and thick shelled gastropods, often reddish in color; true Arene has a rather smooth underside and in the umbilicus there is a row of very sharp spines, which are missing in Marevalvata. The aperture of Arene is

less round and thinner than that of Marevalvata.

144. Arene cruentata (Muhlfeld, 1829)

This is the most common Arene in the N.W. Gulf of Mexico where it often is mixed with other species of the genus. Its shell is practically colorless, a slight offwhite ashy color. Even fragments may often be recognized by the presence of very sharp spines within the umbilicus. The aperture is less round than in Marevalvata. Our lots come from the Mississippi Delta to off Brownsville, Texas.

Records HMNS Survey Collection: 9 lots, no live collected material.
Depth range: 51 - 63 fms.
Geographical range: South East Florida and the West Indies. Gulf of Mexico (Abbott, 1974)
Maximum size: 5.2 mm.

145. Arene (Marevalvata) tricarinata (Stearns, 1872)

This quite different species was only collected once. It is a species with quite tabulated whorls and it is colored by small red speckles on a creamy white background. The nucleus is small and red. Only a single lot of 6 specimens taken off Cameron (La.).

Records HMNS Survey Collection: 1 lot, no live material.
Depth range: 40 fms.
Geographical range: North Carolina to South half of Florida to Brazil (Abbott, 1974).
Maximum size: 3.6 mm.

146. Arene (Marevalvata) variabilis Dall, 1889.

This species is not common in the N.W. Gulf of Mexico. It is a creamy white colored species with rather strong scaly knobs. It was collected from off Cameron (La.) to off Port Aransas, Texas and was also taken from the mudlump fauna.

Records HMNS Survey Collection: 4 lots, no live collected material.
Depth range: 55 - 70 fms.
Geographical range: North Carolina to Florida and the West Indies, Brazil.
Maximum size: 5.8 mm, but fragments of larger specimens are present.

147. Arene (Marevalvata) briareus (Dall, 1881)

This and the species ennumerated after it must be, in spite of their different appearence, quite closely related. Briareus is a very scaly and knobby

species, whose original figure in Dall, 1889 (Blake Report) is not very representative of this species. Briareus is the name of a mythological giant with 100 arms, hence it should be left unchanged, and the name refers to the many scale like spines on the shell. In this and the next species juveniles appear to be quite heavily knobbed. In briareus these knobs soon develop into strong even hollow spines, but in bairdii they grow into continuous rounded chords. Also in mudlump fauna.

Records HMNS Survey Collection: 7 lots, no live collected material, between S.W. Pass, Mississippi Delta and West Flower Gardens.
Depth range: 50 - 55 fms.
Geographical range: North Carolina to Florida and Yucatan (Abbott, 1974)
Maximum size: 4.8 mm.

148. Arene (Marevalvata) bairdii (Dall, 1889)

A rather uncommon Arene, which resembles a somewhat smooth briareus. In the Blake Report Dall (1889) has extensively discussed both species. Also occurs in mudlump fauna.

Records HMNS Survey Collection: 4 lots, no live collected material. Along entire Louisiana and Texas coast (S.W. Pass, Mississippi to Hospital Rock, off Corpus Christi).
Depth range: 31 - 51 fms.
Geographical range: North Carolina to Key West, Florida (Abbott ,1974).
Maximum size: 6.0 mm.

Finally we note here that the species reported as Arene spec. A (Tex. Conchol., Vol. 9, p. 48) is a Sequenzia and will be discussed later.

Genus Macrarene Hertlein and Strong, 1951.

This is still another Pacific surprise in the N.W. Gulf of Mexico. These are small shells with large winglike protuberances along the periphery of the shell. Several have been reported for the Panamic faunal province but none so far for the Western Atlantic.

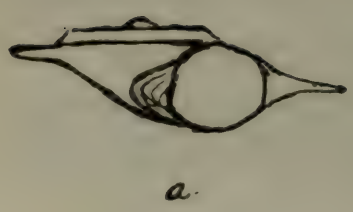
149. Macrarene spec. indet. A

Our material consists mostly of old worn juvenile material and one mature specimen. These are quite flat shells that possess enormous, sometimes upturned triangular wings which make the shell look like a children's toy windmill. It is widely umbilicated. The shell substance shows the typical "vermicular" liotiid sculpture. One of our quite small juveniles

(1.3 mm diameter) shows its wings already clearly and was undoubtedly collected alive off Cameron (La.) in 55 fms.

Records HMNS Survey Collection: 4 lots, 3 off Louisiana and one off Texas on an algal biohermal reef.
Depth range: 31 - 55 fms.
Geographical range: so far unknown for the Western Atlantic.
Maximum size: 14.1 mm.

(To be continued)



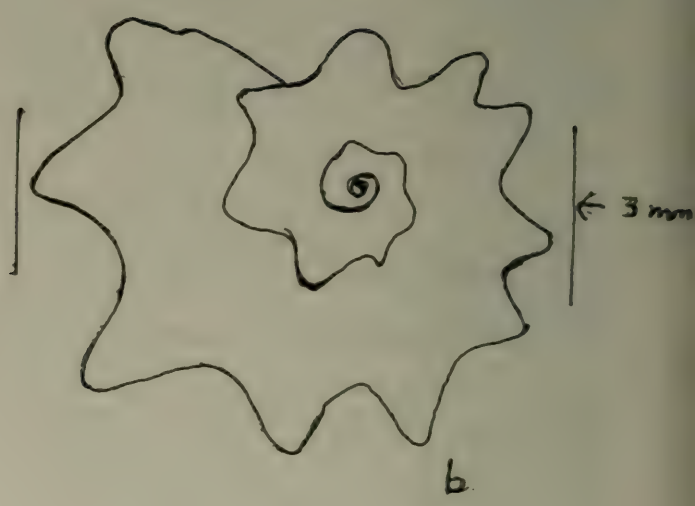


Fig. 1. A 3 mm juvenile specimen of Macarene spec indet A is drawn, with a, side view, and b, top view.

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TEXAS CONCHOLOGIST, Vol. XXIII, No. 4, July, 1987

SEARCH AND SEIZURE

BY CONSTANCE E. BOONE

SHELLERS BEWARE!

Shellers beware! This was the sentiment expressed recently by the well-known authority on Muricidae, Dr. Emily Vokes of Tulane University, when she returned a couple of shells to our member Emily Oakes.

Emily O. had brought me two small dead muricids from separate collecting trips. One from Caye Chapel, Belize, we identified as Eupleura sulcidentata. If we were correct, this would prove to be a range extension. The other small black juvenile muricid was from Harbour Island, Bahamas, and we couldn't place it at all. Dr. Vokes confirmed the identification of the Eupleura and said it would be a range extension if we could be absolutely sure it came from Belize. The other little juvenile she said was an Indo-Pacific shell.

Emily O. had collected the dead Eupleura in the drift line at Chapel on our trip in April, 1985, and, to my knowledge, it was the only one found. The owners of Caye Chapel had been dredging along the shore to make the beach wider, and many shells were dumped on the beach. On neither of the other two trips now made to Caye Caulker and vicinity have we collected another specimen of this Eupleura.

Emily O. does not know where she managed to collect the little black juvenile muricid except it was in her dead shells from the beaches at Harbour Island.

Dr. Vokes told us a personal collecting story to prove her point of "Shellers beware." She and her husband collected some Nassarius from beach drift at Cozumel. They then tried to identify them with Caribbean fauna and failed. The final conclusion was that they were of Indo-Pacific origin. Upon looking more closely at the specimens, they became aware that each shell had a hole in the same area. The shells had come from a tourist's string of shell beads!

Another story connected with our club goes right along with the above tale. Mary Ann Curtis came to my door this Spring with a shell carefully wrapped up in tissue and asked me to identify it. She added that she HOPED IT WAS WHAT SHE THOUGHT IT WAS. It had been found at Galveston and given to her by a fellow worker.

The shell was a Turritella from the Pacific. Questionally, I looked at Mary Ann and guessed she hoped it might be the coveted Amaea mitchelli, the brown and white epitoniid occasionally found on our beaches and much prized by collectors. Sorry, Mary Ann, you will have to keep

looking. Your Turritella probably fell out of a shell bin in one of the shops over the Gulf of Mexico at Galveston, or it may have been one of the shells salted there by some collector who thought he was adding something to the beach for another collector to gather. Stories have appeared in our newspapers of collectors doing just that!

The practice of salting the beach makes me cring in horror. I have NEVER forgotten the first field trip I made with this club. I was a guest on that Sunday visit to Sargent Beach so long ago. I remember how eagerly I strode north on that beach to find shells. I began to find some really nice ones and was so excited until I found one with a note that said "I don't live here. I come from the Pacific." Another said "I live offshore." And so on. The beach had been salted for the field trip! I was furious---so much so that I said I didn't want to have anything to do with that kind of club.

Oh, well, it was meant in fun. I know who did it, and we laugh about it now.

I still do not like the idea. As a collector and student of the true fauna of beaches I visit, I don't want to be confused anymore than necessary. I'm as eager as anyone to find something new or unusual, but caution has to enter into the picture in view of the tales told above.

I remember a Texas collector who found a California Haliotis on the beach at Galveston and who then insisted to Dr. Pulley that the shell MUST sometimes live there.

I remember Berkeley Glass, late husband of member Leola Glass, who teased me by taking a Melongena corona from his car (Leola had left it there from a trip to Florida) and dropped it ahead of me as I walked the beach at Galveston. I guessed that pretty quickly, however.

On Tuesday, June 23, Bob McElroy came to the Department of Malacology, Houston Museum of Natural Science, to get his wife who volunteers there. "Let's go to the beach," he said to Pat. She laughed and said she didn't have tennis shoes or jeans, but Bob persisted. He had his! Then he said, "How much money have you got?" Pat said she had $5.00, and they decided that was enough for two hamburgers and fries, with $2.00 left over for an emergency telephone call if one was needed.

Off to Quintana Beach below Freeport, Texas, they went, getting there at dusk. The tide was very low. They found live arks, big Thais with egg cases, and live Epitonium. What a nice way way to end a long, busy day working!

Emily and Bill Oakes, with daughter Nancy McPhaul and grandson Will McPhaul, spent the week of June 19-25 at Sea Isle, West Beach, Galveston, Texas. The tides were low late in the afternoons. They collected many, many shark's teeth, a goodly number of sand-dollars, saw some small live Polinices duplicatus, collected dead Busycon and Thais, and picked up colorful Donax.

This writer and Helen Cornellisson joined them on June 24-25 and when they told the Oakes about the report of Epitonium at Quintana it was decided that everyone would go to that beach for the late afternoon tide. Starting at the jetty, the shellers found a few live Epitonium in the woody drift which also had some worm tubes mixed in with lots of land snails, arks, small glassy tellins, etc. They wandered on down the beach towards the park parvilion where Bill had parked the van. A very black cloud threatened them, and lightning was scary to the walkers. Emily said we had better hurry to the van. I cut across the high tide line to the ramp area, and as I did so I spotted the huge mass of worm tubes and woody debris in which I immediately spotted several Epitonium. In a few seconds Emily and I gathered many good live specimens. We got a total of over a hundred that day, and Nancy got her first Epitonium.

We lost Helen! She had gone down the beach ahead of us, walking rather fast. We couldn't see her anywhere, and the rain was pelting down. She didn't turn up inside the pavilion; she couldn't be spotted on the beach in our sight. Nancy swore she had seen her on the top of the jetty in the opposite direction, so we took off to check that out. No, she wasn't there. Kiddingly, we said she was probably warm and dry in some "beer joint." About that time Bill looked up the jetty area where there is a concession stand, and sure enough there was Helen waving to us. She had hitched a ride in out of the storm with a nice young man. He did buy her a coke. We really weren't far wrong in our kidding remarks.

As I write this, I wonder if Emily and Nancy went back on Friday to see if the worm goop was still there. Helen and I had to come home.

DUES FOR VOLUME XXIV

Please forward your dues for the membership year of the Houston Conchology Society, 1987-88, now to Treasurer Pat McElroy, 5202 Bryanhurst, Spring , Texas 77379. This will entitle you to receive the four issues (October, January, April, and July) of our quarterly, Texas Conchologist, in Volume XXIV. The October quarterly will not be mailed to those members failing to pay dues by the September meeting.

We remind you that we accept dues only for the fiscal year period, June to June. If you paid dues for the last year this Spring and did not receive the quarterly issues of Volume XXIII, please let the Circulation Manager or Editor know.

REPRINTED FROM THE HOME FORUM - THE CHRISTIAN SCIENCE MONITOR

(March 15, 1985, page 34)

"Seashell People"

If you don't happen to know what an African olive is, don't let it ruin your day. Nobody in Africa knows what it is, either. Well, practically nobody.

And if you can't describe a "true tulip" or a "left-handed, lightning whelk," you can still pass yourself off as a perfectly normal person living in a reasonably normal place. Kansas City, for instance.

But one shouldn't push ignorance, however excusable, to the point of smugness. There is always the chance you might not stay in Kansas City forever. In a moment of confused indiscretion you could wander into a travel agency and end up on a Florida beach. If that happens, it would be to your advantage to have a modicum of education, whelk-wise, tulipwise, and olivewise.

For your information, words such as the above are uttered by Florida shell gatherers. To be accepted into the community of those who pick up shells a smattering of the vocabulary is sufficient, because these people are of a gentle and unsuspicious nature. Although acceptance is no great problem, mutual understanding of the language is helpful.

For instance, a couple of friendly, wet-footed beach people might invite you to their house to show you their "cowry." It would be nice if you knew they weren't talking about a place to keep cows. Or if the lady says, "How do you like my Scotch bonnet?" it doesn't mean her gull-stained, floppy hat from K mart.

Shellers travel usually in pairs, with almost permanently bent-over heads, giving the appearance of one walking with an anchor hung around his neck. They carry sacks, or just paper bags, and they walk in an aimless fashion, scuffing sand with their sneakers and seldom looking up.

The most unusual aspect of shellers is that it is difficult to distinguish the male from the female, even a short distance away. This is due to a similar roundness of body, tapering to undistinguished legs, and a similarity of costume.

The middle of the person is covered by baggy shorts that were bought on sale and do not fit. On the upper portion there is a loose jacket-blouse, faded in front and back but holding the original color under the armpits. Hats are any contraption that shades a peeling nose from the sun. The same type is worn by either sex.

The confusion in gender, sometimes voiced by strangers, is not considered a faux pas, since there is no particular reason to make the distinction.

Last winter I went under cover to study the sheller's world at close range.

It can safely be said that shell collecting is not done for profit. The rewards are so small dollarwise as to be dubious. Thus, the activity does not attract members of the Mafia or other organized crime. Usually goods have to be rare to have great value, and rareness is the outstanding quality shells do not have.

Oh, an African Glory of the Sea once sold for $1,200, according to an undisclosed source, but shortly thereafter an oil rig dug up thousands of them and the bottom, so to speak, fell out of the market.

Another shell which is now considered to be in the "big price" market is the junonia. I contacted a person who sold one for $35. But then, she admitted it took her six years to find one that good, so that averages out to a return of less than 50 cents a month, or maybe around 6 cents a day. That's not considered good even in Taiwan.

So profit isn't the motive. Apparently it's done simply for the sake of finding an item. After 40 million years, you are the one who picked it up. Or else it is pleasing to look at — though not always. Many shells could be returned to the ocean without great loss to the art world.

But some people are big collectors. They might have shells numbering in the thousands in cases around their living rooms. Suddenly walking into this plethora of calcium knickknacks can be awe inspiring.

But then, not all displays inspire awe. Take the display of one large Florida horse conch on the coffee table. It could be there for its rarity, its size, its color, or just the fact it was found on a 40th wedding anniversary.

In one case, an item (Florida murex) was displayed because the wife had knocked it off the shelf by sneezing in a shellcraft store, and had to buy it. The chip end was hidden by adding a plastic base, which brought the total investment to $29. Something not to be sneezed at in shell economics.

I have concluded that the value of shell collecting is not in the shells. It is in the people who collect them. They are beautifully sweet people who love even the scuffy passer-by. Even I have succumbed to a small shell display. I have three albino spiny cockles (chipped), two angel wings, a sea urchin, and four shark's teeth. Value? Seven cents. But a three-year-old gave them to me in exchange for my drawing a picture of her.

Guernsey Le Pelley

TEXAS CONCHOLOGIST, Vol. XXIII, No. 4, July, 1987

THE RECENT HCS FIELD TRIP TO CAYE CAULKER, BELIZE

By Constance E. Boone

For three trips we were tantalized by tales that Cypraea could be found on red mangrove roots at Caye Caulker, Belize. The natives called the shells the mangrove shells, and occasionally they produced some for sale, but none of us had ever found one alive.

Frankly, I discounted the information. I suspected the natives were collecting them from the reef. I did wonder why we never found living Cypraea of any kind, but I know the reef off Caulker is a long one and we only visit parts of it on our trips. Emily Oakes did come home with a very dead one from the mangroves from the bay side when our boatman, Raul, took us there on the first trip. However, there was massive construction for a future runway. Emily's shell was very chalky and old. I suspected it had just floated back there.

On the trip in May, 1987, we were stirred to extraordinary measures to prove the truth of the "mangrove shell." A couple of the club members visited a "gift shop" in a home near our little motel and came back excitedly with an underwater photograph of a living Cypraea on mangrove roots. Needless to say, I hurried over to meet Ellen McRae, the photographer, who is a transplanted Oregonian married to a native of Belize. She proved to be most knowledgeable of the fauna of the cayes and is studying the Thalassia grassbed ecosystem. Her photograph of the live Cypraea zebra (this is the species being found) was taken among the mangroves at St. George's Caye, closer to Belize, but she stated that they were found also at Caye Caulker.

So we made several stops near mangroves on our daily trips. However, it was the persistence of our leader, Richard Yuill, that paid off with the discovery of a single live specimen among the mangrove roots of a stand of the trees at the north end of the island near the cut where the water flowed swiftly back and forth from bay to open ocean. To hear him tell it, he snorkled between the roots and spotted the shell and them had a blankety-blank time getting through the roots to retrieve the shell.

Next day Elizabeth Smith examined every mangrove clump she could get into along the shoreline of Caulker and got a fresh dead specimen, from the same clump of mangroves Richard had examined with luck.

So the next day we all went to the cut to snorkel among the mangroves. The clump Richard had examined with success was the only one with fairly clear water. The others were full of silt and floating debris---and small inch-long round brown jelly fish that stung. We found no more Cypraea.

To finish this story, I report that Richard and I have done some research of the literature on Cypraea, seeking to learn whether it has been reported that Cypraea zebra (or any other species) can be found on mangroves. Dr. Burgess makes no mention of this as a habitat in his recent Cypraea book. I recalled an article by Ellen Crovo on the differences of Cypraea cervus and Cypraea zebra in the Florida Keys. R. Tucker Abbott's American Seashells, 1974, lists this reference for Crovo's report: The Veliger, Vol. 13. Crovo did mention that the two Florida species could sometimes be found on red mangrove roots.

These finds have to be the highlight of the recent trip to Caye Caulker for fourteen club members, but many other very nice shells were found. Of the three trips made by club members, this trip had the best weather, less bugs, and probably produced the most shells. A number of new finds were made; many shells found dead before were now found alive.

Emily Oakes described the first trip in April, 1985, in Texas Conchologist, Vol. XXI, No. 4, July, 1985, and listed 69 species found. About one-third of those were dead, many from the drift line at Caye Chapel.

The second trip, October, 1985, brought new records, and we reported in the Texas Conchologist the collection of live Lopha frons, the Coon Oyster, on roots of the same mangrove roots we found the Cypraea on this year.

On the recent trip, club members saw so many Turbinella angulata we became selective to the point of refusing most of the specimens. How many big ones could we bring home! We visited the grass flats at Long Reef Shoals and at low tide spotted hundreds of the chanks. It was egg laying time, and we picked up and held mama chanks extruding the big disk egg strands. The strands were found anchored to coral and fish traps also.

Those who wanted them found nice Strombus gigas. Since the meat is food for the natives, Lauretta Marr and Ruth Goodson allowed Raul to make tiny holes in the dorsal side of the apex to cut the muscle to easily extract the meat. They said it didn't hurt the shells for their cabinets. Ruth said she would just plug up the hole with something.

Only a few shells listed by Emily in Texas Conchologist were not found this time. Significantly, no Cymatium femorale was found, although found on both other trips. There was the usual abundance of Phyllonotus pomum and egg masses were observed. Strombus raninus was plentiful in the grasses near the cut.

Let's talk, however, about the new finds. Leslie Crnkovic was a dedicated sheller who scoured the reefs and grasses.

On our last visit to the reef he found two live Strombus gallus, the first seen at Caulker. He also collected one live Cypraea cinerea. Only dead ones had been seen before. Lauretta found one live juvenile Strombus pugilis. Only dead ones had been collected on the other trips. Richard and Mary Martin found live Marginella guttata, found dead before.

Knowing that Natalie Howard, who originally led us all to Caye Caulker, had once found at Caye Chapel live Xenophora conchyliophora I constantly looked for one. Dead ones had been collected and reported by Emily on her trip. It was with great glee that I came to the boat at Chapel one day and displayed the one live specimen I had collected. Believe it or not, three other ones were collected later in the grasses and rubble at the reef----by Leslie, Mary Martin and Doris Hermann. They all said their specimens leaped out to them as they snorkeled because all the shells were overturned with the brown aperture facing them so that they saw them. I wonder if they have any idea what good finds these were?

This was an eager bunch of collectors, bent on getting everything they could find. We barely got settled in the first night and had a bite to eat when Bob McElroy said he was going to fire up his Coleman lantern and go out near the pier to collect. Several others followed. The Melongena melongena were as abundant as ever, a few Cymatium nicobaricum were found under the pile of dead Strombus gigas. Best of all, everybody found live Marginella apicina on the grass stems at low tide. We had only found dead ones before.

On the visit to Caye Chapel to check out the drift line, we were disappointed in the amount of material to examine. Knowing that the drift always held dead specimens of Neritina virginea and Smaragdia viridus, it made me try once more to find them live in the grasses. This time sieving in the thin grasses just offshore was successful to prove live ones there, as well as living Elysia, all green like the grass.

We have always wondered why we found a few dead Nerita but none aliv·, however, there are no rocks on shore. One day Elizabeth Smith walked along the shore on Caulker and examined some cement bulkhead blocks that were abandoned and broken up and just offshore. On them she found nice large live Nerita fulgurans, which we had only seen dead. Therefore, Richard, Tom Whelan and I headed down to find some specimens for our collections. We found also Nerita tessellata, Nerita peloronta (one juvenile), and N. versicolor. Also on the bulkhead near shore we found live Littorina zigzac and Nodilittorina tuberculata, the first only dead before, the second a new find.

Deanna Smith probably got acquainted with everyone on the island. She acquired several shells from the natives, including one very dark live Fasciolaria tulipa. Ruth Goodson and Lauretta Marr visited around also, and acquired some shells by purchase. Ruth's prize was a very nice specimen of the rare Conus granulatus! Supposedly this was found at St. George's Caye.

Leslie spent his evenings chasing hermit crabs in shells around our motel. Maybe he acquired a goody or two in this fashion that I haven't seen. Also Leslie borrowed Cheryl Clark's cooker, bought some popcorn kernels at the little store and spent the last night popping corn to provide packing material to get his fragile shells home. He did this in the middle of his bed. We are told the bed caught on fire! Let's hope we are welcome back to Tropical Paradise Hotel! (I think we are the only shellers who go to Caulker). Pat McElroy will tell you the tale about how she "walked on water" to get back to the boat after spotting a "six foot nurse shark" under one of the reef rocks.

None of us found a live Charonia variegata on this trip although Raul found one for us on the second trip. Several helmets were found. Mary Martin was the first one to find one, a small but lovely Cassis madagascariensis at the reef. I found a fresh dead Cassis flammea at the reef. The latter two are additions to our list. Tom Whelan left us a couple of days to sail out to the Blue Hole and other parts of the reef for some spectacular diving. He came back with a nice Cassis tuberosa.

The following list of shells reflects additions to Emily's list. It includes names for the Cerithium she listed as species, and the name for the chiton found. It also includes the Charonia found only on the second trip and so designated. The shells are from the running list kept by Richard and me. We do not include purchases. Those shells found also on the second trip and not reported are indicated. Thus we add 49 to Emily's list, for a total of 118.

Key

3	Found only on this third trip
2	Found only on the second trip
B	Found on both the second and third trips

3 Hemitoma octoradiata (Gmelin, 1791)

3 Lucapina eolis Farfante, 1945

B Fissurella barbadensis (Gmelin, 1791)

B Acmaea pustulata (Helbling, 1779)

B Astraea caelata (Gmelin, 1791)

3 Nerita versicolor Gmelin, 1791

3 Nerita peloronta Linnaeus, 1758

3 Nerita tessellata Gmelin, 1791

3 Nodilittorina tuberculata (Menke, 1828)

B Batillaria minima (Gmelin, 1791)

B Cerithium atratum (Born, 1778)

B Ceritium muscarum Say, 1832

B Diastoma varium (Pfeiffer, 1840)

B Hipponix antiquatus (Linnaeus, 1767)

B Crucibulum striatum Say, 1824

3 Strombus gallus Linnaeus, 1758

B Cypraea spurca acicularis Gmelin, 1791

3 Cypraea zebra Linnaeus, 1758

B Cypraea cinerea Gmelin, 1791

3 Morum oniscus (Linnaeus, 1767)

3 Cassis madagascariensis Lamarck, 1822

3 Cassis flammea (Linnaeus, 1758)

3 Bursa granularis Roding, 1798

B Mitra barbadensis (Gmelin, 1791)

B Thais deltoidea (Lamarck, 1822)

3 Muricopsis oxytatus (M. Smith, 1938)

B Coralliophila abbreviata (Lamarck, 1816)

B Engina tubinella (Kiener, 1835)

B *Latirus carniferus* Lamarck, 1822

B *Marginella guttata* (Dillwyn, 1817)

B *Conus mus* Hwass, 1792

B *Conus regius* Gmelin, 1791

B *Conus spurius* Clench, 1942

3 *Elysia* sp.

B *Stenoplax floridana* (Pilsbry, 1892)

B *Arcopsis adamsi* (Dall, 1886)

B *Chlamys ornata* (Lamarck, 1819)

3 *Diplodonta* sp.

3 *Chama sarda* Reeve, 1847

3 *Americardia media* (Linnaeus, 1758)

B *Laevicardium laevigatum* (Linnaeus, 1758)

B *Mactra fragilis* Gmelin, 1791

3 *Tellina laevigata* Linnaeus, 1758

B *Arcopagia fausta* (Pulteney, 1799)

B *Periglypta listeri* (Gray, 1838)

B *Lima lima* (Linnaeus, 1758)

3 *Lima scabra* (Born, 1778)

3 *Lima pellucida* C.B. Adams, 1846

B *Linga pensylvanica* (Linnaeus, 1758)

Fig. 1 You might call this "Find the shell" puzzle! There is a live Cypraea zebra in the center of the picture of red mangrove roots under water. The photo was made by Ellen McRae, a biologist and a photographer, at St. George's Caye out of Belize. This photo was proof to HCS members that the Cypraea could be found live on mangroves and led us to search for the species on Caye Caulker.

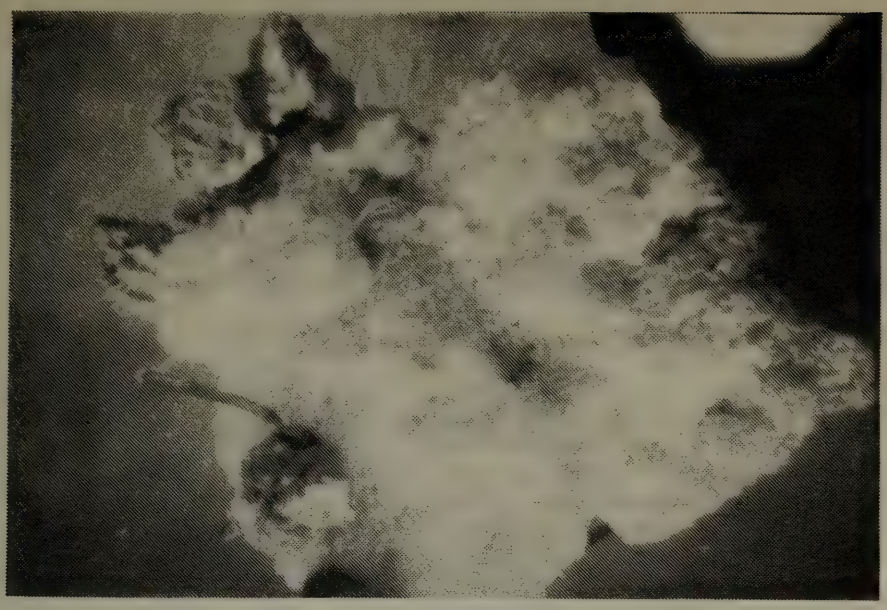

Fig. 2 This mass of egg cases taken under water at Caye Caulker, Belize on the HCS field trip in May was laid by a number of Phyllonotus pomum (Gmelin, 1791). These Apple Murex are common in the grasses. The fishermen do not like these mollusks so they destroy the egg masses when they find them. They claim that the mollusks eat small lobsters and small Strombus gigas which are fished commercially.

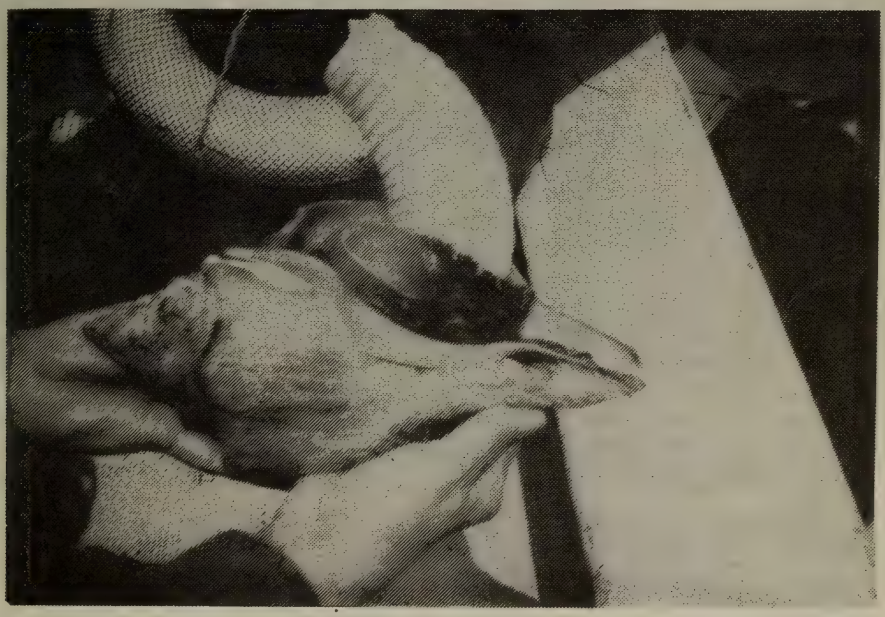

Fig. 3 A number of Turbinella angulata (Lightfoot, 1786) were found on the HCS field trip to Caye Caulker, Belize. Many were laying egg strands, as was the specimen exhibited above. The multi-disked capsules were often attached to coral rubble or fish fences. Juveniles emerge as miniature chanks, but the smallest chanks we found were several inches in length. On none of the trips made to Caye Caulker by HCS members have juvenile chanks in the inch size been located. They hide very well in the grasses and sand.

TEXAS CONCHOLOGIST, Vol. XXIII, No. 4, July, 1987

MONOGRAPH

By H. Odé

DISTRIBUTION AND RECORDS OF THE MARINE MOLLUSCA IN THE NORTHWEST GULF OF MEXICO

(A Continuing Monograph)

Family SKENEIDAE

Abbott arranged this group of minute deep water gastropods as a subfamily of the Cyclostrematidae. I believe that they should be treated as a full family as Keen (1971) does, because they do not appear to be related at all to the Cyclostrematidae. There is no vermicular sculpture in the shell substance, and the nucleus is quite different. In the N.W. Gulf of Mexico we have the genera Lissospira and Ganesa. As a temporary measure, we also place here the genera Parviturbo and Gottoina. The latter was placed by Dall in the Fossaridae. In all probability the latter two genera belong in a family separate from the Skeneidae.

Genus Lissospira Bush, 1897

A genus of poorly known very deep water gastropods which Abbott (1974) treats as a subgenus of Ganesa Jeffreys, 1883. In our area lives in the relatively shallow water of the coral reefs a very small species in considerable quantity.

150. Lissospira spec. indet. A

In the past we have reported this species as Skenea [Tex. Conchol. Vol. 9, 60, (1973)], but it is far more likely that its name should be Lissospira. It has the typical form of a smooth thin shelled and deeply sutured skeneid, with an almost circular aperture. Seen from above the shell is somewhat featureless and glassy white. On the underside, however, are clearly visible spirals. There is a rather narrow but open umbilicus. All other species of this genus reported by Abbott (1974) derive from rather deep water, but ours is from 15 - 36 fms.

Records HMNS Survey Collection: 17 lots, no demonstrable live collected material. I have been unable to locate a single specimen with operculum. Only on coral and algal reefs.
Depth range: 15 - 36 fms.
Maximum size: 1 mm.

151. Lissospira spec. indet. B

In the collection is another extremely minute skeneid shell, which is smaller and flatter. It can hardly be seen with the naked eye. It has a narrow umbilicus and a large circular aperture. It is probable that its extreme small size is the reason we have only a single specimen. Previously reported (Tex. Conchol. Vol. 9, 60) as Skenea spec C.

Records HMNS Survey Collection: 1 lot, probably live collected.
Depth range: 30 fms.
Maximum size: ~ 1/2 mm.

Genus Ganesa Jeffreys, 1883

Small, mostly smooth, somewhat naticoid, umbilicated deep water gastropods, about which hardly anything is known. In our area a single species.

152. Ganesa spec. indet. A

Two lots of a quite smooth, deeply and openly umbilicated species have been taken. They are quite small shells, rather thin, and very deeply sutured. The shells are glassy white and shiny. Reported earlier (Tex. Conchol. Vol. 9, 60) as Skenea spec D.

Records HMNS Survey Collection: 2 lots, no live material.
Depth range: 140 - 167 fms.
Geographic range: The genus Ganesa is known from the Eastern Tropical Pacific and Galapagos Islands; also from Florida (294 fms) and the North Atlantic.
Maximum size: 1.3 mm.

In the following we will ally with the Skeneidae the genera Parviturbo and Gottoina. The latter is usually placed in the Fossaridae.

Genus Parviturbo Pilsbry and McGinty, 1945

A number of small to minute solid, narrowly umbilicate gastropods are placed in this genus. The shells have a small smooth nucleus and whorls which are ornamented by heavy spiral threads. The genus Parviturboides, which in shell shape resembles Parviturbo very much, does not belong here at all but in the Vitrinellidae. In the survey collection only a single species.

153. Parviturbo c.f. rehderi Pilsbry and McGinty, 1945

We have only a single lot of this very small species, which conforms rather well with Abbott's description

of it except for one fact: It was not collected intertidally, but at a depth of 4 - 8 fms, one specimen alive at a limestone lump off Padre Island. Since it is close in shell characters also to Parviturboides it remains possible that our material is an undescribed Parviturboides. Between the spiral chords are very fine axial striae, much finer than those in the common P. interruptus, which is also far more inflated than what we call P. rehderi. I cannot settle this matter until I can compare my material with true rehderi. Previously (Tex. Conchol. Vol. 9, 60) reported as Parviturbo spec B.

Records HMNS Survey Collection: 1 lot, containing live collected material.
Depth range: 4 - 8 fms.
Geographical range: South half of Florida to Panama; 1 1/2 mi. off Padre Island north of Port Isabel.
Maximum size: 1.5 mm.

154. Parviturbo c.f. granulum (Dall, 1889)

Dall described this quite small Parviturbo as a Cyclostrema from Samana Bay, Dominican Republic. Cyclostrema was a century ago more or less a "catchall" genus for little understood small species. (Bull Mus. Comp. Zool., Vol. 18, p 33, 395 = Blake report Vol 2). It is one of a group of very small spirally ribbed gastropods which only much later were properly described by Pilsbry and McGinty in the Nautilus, Vol. 59, p 52 - 59, 1945. Still they are not well known. Their shape is trochoid with clear spiral ribbing. Granulum carries at least 12 well developed spirals on the body whorl. Abbott (1974) does not list this species.

Records HMNS Survey Collection: 3 lots, no live material.
Depth range: 26 - 50 fms off Louisiana and Freeport, Texas.
Geographic range: Samana Bay, Dominican Republic.
Maximum size: 1.3 mm.

Genus Gottoina A. Adams, 1863

If one sees the figure of G. bella Dall in the Blake Report (plate 8, fig. 10) it is difficult not to see the strong resemblance to Parviturbo. I have decided to place this "subgenus of Fossarus" as a genus in its own right close to Parviturbo because Dall (Blake Report II, p. 273, 1889) writes: "I hesitated for some time as to whether this species should be described where I have placed it, or under Cyclostrema. In the absence of the operculum and the soft parts, it is evident that the question as to its proper classification can only be decided provisionally and with due reserve."

155. Gottoina compacta Dall, 1889

This is a very common and widely distributed species in the N.W. Gulf of Mexico of which we have many lots, several with a great many specimens. Although several specimens give the impression that they were collected alive, I cannot demonstrate this by either the presence of an operculum or other means. This is unfortunate because it remains thus impossible to settle its true relationship. This species occurs along the entire Texas and Louisiana coast and has also been collected in the mudlump fauna. Once a specimen was taken on the beach at the coast guard station at South Padre Island. That beach was notorious for the many adventitious shells derived from shrimpers cleaning their decks when coming into port.

Records HMNS Survey Collection: 24 lots, no demonstrably live collected material.
Depth range: 10 - 55 fms.
Geographical range: Off North Carolina and the Florida Keys in 49 - 107 fms (Abbott, 1974).
Maximum size: 2.2 mm.

Family Vitrinellidae Bush, 1897

In this family are brought together a large number of quite small, rather flatly coiled gastropods. Fretter and Graham in 1962 used the name Circulidae, for which at present there is no compelling reason. Few studies of the animals have been made [Woodward, 1899, Proc. Malac. Soc. London 3, 140 - 146, pl 8); Fretter, 1956, Proc. Malac. Soc. London 126 (3), p 369 - 381, figs. 1 - 5; Moore, 1972]. Thus it is unfortunately true that the genera are mostly erected on shell characters. Consequently it may be expected that the family content is somewhat heterogeneous.

As source material for the following discussion I have used the books of Keen (1971) and Abbott (1974) and have been guided by the various papers of Pilsbry with coauthors which appeared in the Nautilus and Proc. Acad. of Nat. Sci., Philadelphia. Also papers by other authors (Vanatta, Moore, etc.) were consulted. One of the difficulties in treating a little known family is the reluctance of various workers to use new generic designations, so that many different forms are fitted in a few catagories such as Vitrinella, Solariorbis, Teinostoma, etc.

In general the nucleus and the teleoconch are not clearly separated although that is not true for the genera Parviturboides and Aorotrema. The aperture is without a thickened lip; the umbilicus is in many genera open, and

the operculum is multispiral. Ornamentation and surface sculpture vary widely. Corgan (Ph.D. thesis L.S.U., 1967) states that some species are heterostrophic.

In my treatment of this family I will deviate considerably from the standard arrangement of Abbott (1974). It is customary to divide the family in two small subfamilies, Vitrinellinae Bush and Teinostomatinae Cossmann. Both Keen (1971) and Abbott (1974) do this, but place several genera in different subfamilies. I disagree with this particular division for a number of reasons.

It is by no means clear on what basis the split into two subfamilies is made. Abbott (1974) gives no information and Keen (1971) states about the Vitrinellinae: "Mostly lenticular, variously sculptured, umbilicate," and for the Teinostomatinae: "Base partially to entirely sheathed by callus." In a collection of several thousand specimens of various species of Teinostoma in the subgenus Idioraphe, one finds sometimes a few pathological specimens with open umbilicus. Those specimens resemble very much certain pathological specimens of Vitrinella species in which the upper lip of the aperture overrides the previous whorl. Moreover there is a subgenus of Teinostoma, - Pseudorotella - in which the juveniles all have a wide open umbilicus and hardly can be differentiated from true Vitrinella. Finally I may mention that the filling of the umbilical area by a callus in other genera of Vitrinellidae can be quite variable. Cyclostremiscus suppressus occurs with wide open to completely filled umbilicus. Hence the umbilical callus should not be emphasized as a taxonomic character. In my opinion, a more logical arrangement for the Vitrinellidae is as follows (only genera in the N.W. Gulf of Mexico are listed):

1. VITRINELLINAE - with genera Vitrinella, Teinostoma, Pseudorotella, Episcynia. Relatively thin shelled, with no or little surface ornamentation; that is, at most some spiral striae.

2. SOLARIORBINAE - with genera Solariorbis, Anticlimax, Vitridomus. Thicker shelled, often dome-shaped, with much stronger surface ornamentation.

3. CIRCULINAE - with genera Cyclostremiscus, Pachystremiscus, Cymatopteryx, Vitrinorbis. Rather thick shelled, often with heavy ornamentation of clearly defined keels and spiral ridges.

4. PARVITURBOIDIDAE - with genera Parviturboides and Aorotrema (probably not in Vitrinellidae). Teleoconch separated abruptly from nucleus. Shell trochoid with strong spiral ridges.

Particulars about the placement of various species in these genera will be discussed later on. In our region there are no less that 38 of these small species, some of which are undoubtedly new and at this moment cannot be named.

A number of species formerly placed in the Vitrinellidae are now placed elsewhere (see Abbott, 1974): Cochliolepis and Macromphalmia in Tornidae; Cyclostremella in the pyramidellacea. Calodisculus is retained here in the Architectonicidae from which Abbott (1974) removed it.

Genus Vitrinella C. B. Adams, 1852

Minute, glassy - when dead opaque white - rather depressed shells, widely umbilicated. Shells in the nominate subgenus have an umbilicus bordered by a thread or a keel, those in the subgenus Vitrinellops Pilsbry and McGinty have a smooth umbilicus not bordered by a keel. I do not believe this to be a significant distinction because there are intermediate cases. The species is the N.W. Gulf of Mexico show hardly any surface ornamentation. Correspondence of our species with those defined by Pilsbry and McGinty for Florida is poor.

The difficulty of a proper arrangement in this family is clearly demonstrated by such species as "Vitrinella" regularis of the eastern Pacific and Teinostoma altum of the Pliocene of Florida which all are Pseudorotella halfway between Vitrinella and Teinostoma. Much more study, especially of the soft parts is needed for much of the Atlantic material. We may note here that Abbott (1974) lists 19 species for the western Atlantic (2 of which are also listed in other genera) and that Keen (1971) lists 19 species for the Panamic Province. In the N.W. Gulf of Mexico only three species occur in the coastal bays; all others have been dredged offshore. Vitrinella texana Moore we have removed to the genus Vitridomus Pilsbry and Olsson.

156. Vitrinella helicoidea C. B. Adams, 1850

This is the type of the genus described from Jamaica (see Clench and Turner, 1950). It is not a common shell, and has been taken mainly on beaches south of Corpus Christi but is rarely dredged offshore. The shell appears to me quite variable in consequence of the fact that in juveniles the umbilicus is proportionally narrower that in mature specimens. The latter are rather flat shells with a wide umbilicus. I have split our original material of the species in two well defined different groups.

When carefully comparing specimens it was found that there were two types in the material. One rather flat, large and widely umbilicated, the other more

elevated, smaller with a narrower umbilicus and somewhat heavier built shell. The depth ranges for both groups turned out to be quite different: the former occurs from zero (beach) to 23 fms, and the other from 60 - 161 fms. It is unlikely, in case we deal with a single species, that it would be missing in the 23 - 60 fms depth range. Although it is possible that both are the same, I will report the deep water group as Vitrinella spec. indet. A. The other group has mainly been taken in beach drift: South Padre Island, Port Aransas and Matagorda. Once dredged off Padre Island. Also in the mudlump fauna of the Mississippi Delta.

Records HMNS Survey Collection: 4 lots, no live material.
Depth range: 0 - 23 fms.
Geographical range: North Carolina to Florida, Texas, West Indies, Bermuda (Abbott, 1974).
Maximum size: 2.5 mm.

157. Vitrinella spec. indet. A

This, perhaps only a deep water form of helicoidea, has been taken only below 60 fms. Its differences with helicoidea were stated above.

Records HMNS Survey Collection: 11 lots, no live material.
Depth range: 60 - 161 fms.
Geographical range: unknown.
Maximum size: 2.2 mm.

158. Vitrinella hemphilli Vanatta, 1913

Only three lots of this species were collected. One consists out of several hundred live collected specimens obtained from a submerged piece of wood riddled by small teredinid borings dredged offshore Freeport in 28 fms. In most of the abandoned tubes (also many small live teredinids) lived hundreds of Parviturboides interruptus and Vitrinella hemphilli. Two other lots, probably collected alive, are also present, one of which was collected in Matagorda Bay. This species is slightly horn colored with a barely visible keel around the umbilicus which is deep and round. It is not as flat as the others in the genus and also the growth incrementals are more irregular and more sharply defined.

Records HMNS Survey Collection: 4 lots, two of which contain live collected material.
Depth range: 2 feet to 40 fms.
Geographical range: Cedar Keys, Northwest Florida.
Maximum size: 1.8 mm.

159. Vitrinella (Vitrinellops) floridana Pilsbry and McGinty, 1946.

This is a widespread and common species found in all coastal bays of Texas (Christmas Bay to the Mexican Border) where often live material can be dredged. It is also often and regularly taken from beachdrift and shallow offshore water. It is essentially a featureless shell without any noteworthy characters. Widely umbilicated, quite flat - only the nucleus and first winding stick out somewhat - and with rounded whorls. As in many other of the small Vitrinella species the upper part of the outer lip projects over the lower part. In juveniles the umbilicus appears proportionally narrower than in older specimens. We have noticed that very rarely (in about 2 spec. in a thousand or so) the last winding almost overrides the previous one which gives the shell the impression of a Teinostoma. This and some pathological characters of Idioraphe indicate close relationship.

These small snails cannot be mistaken for land snails, because the initial whorls are much smaller than those of land snails. In offshore waters along the Texas - Louisiana coast the species is fairly common but is slightly different in shape. I am hesitant to separate it as a different species although there are constant differences in shape. These are: the offshore form is considerably smaller, overall somewhat flatter, and the aperture is slightly different in shape (see fig. 1). I became aware of this difference because the offshore material is always smaller. Bay material may reach 2 mm (usual is 1.3 - 1.5 mm); offshore material is about 0.9 - 1.1 mm, but very rarely reaches over 1.5 mm. The overhang of the upper part of the outer lip appears to be larger in the offshore form. Only further study can determine whether this is a different species.

In our material are two lots (from 24 and 152 fms) in which specimens appear to have a heterostrophic nucleus. In the past, Corgan (1967) has reported a heterostrophic specimen of Vitrinella from the mudlump fauna, and he has described and named it. But his name has not been validated (Ph.D. thesis). Our material is different from Corgan's. There is strong doubt in my mind about the true heterostrophic character of the nucleus, and it is possible that we deal with a pathological case in early development. More material is needed for a final conclusion.

Records HMNS Survey Collection: 26 lots (offshore form) of which 8 contain live collected material; 43 lots (bay form) of which 8 contain live collected material

(Christmas Bay, Matagorda Bay).
Depth range: 0 - 25 fms (one lot from 152 fms is abnormal)
Geographical range: Southeast Florida to Texas (Abbott, 1974).
Maximum size: 2.1 mm (bay form); 1.7 mm (offshore form).

160. Vitrinella thomasi (Pilsbry, 1945)

A single, probably live collected, but damaged, brown glassy specimen is in our collection. It shows quite well the small riblets originating from a ridge close to the suture and extending half way the whorl. It must be quite rare because we have only a single lot. This species was originally described as Cyclostrema thomasi by Pilsbry (Nautilus Vol. 59, p. 60, pl. 6, figs. 7, 7a, 7b).

Records HMNS Survey Collection: 1 lot, probably collected alive, but now damaged; from Galveston West Bay (Christmas Bay).
Depth range: 3 feet.
Geographical range: Florida to Texas (Abbott, 1974).
Maximum size: ± 1.0 mm.

161. Vitrinella spec. indet. C

This is one of the most remarkable small vitrinellids present in the Survey Collection. Many specimens are densely ribbed in an irregular manner not related to the growth increments (50 - 70 per whorl). The ribs sometimes end halfway on the whorl and others divaricate to fill the space. Sometimes the ribbing is strong enough so that one can see minute undulations at the periphery of the shell. In a number of specimens the ribbing is quite subdued and in a few specimens can only be observed on the wall of the umbilicus. The shell has the usual glassy appearance, is quite flat and very widely umbilicated. This probably is the species that Andrews has called Vitrinella texana.

Records HMNS Survey Collection: 7 lots, no live collected material, all offshore Texas.
Depth range: 12 - 36 fms.
Geographical range: unknown.
Maximum size: 2.3 mm.

162. Vitrinella spec. indet. D

From deep water (55 fms) comes a single specimen of another unknown Vitrinella. It is a perfectly planorbid shell with deep suture. When viewed both from above and from below it is concave. The aperture is almost circular except for a small area where it attaches to the previous whorl. The shell

is glassy opaque and its shape essentially like that of Abbott's (1974) figure of Omalogyra atomus (#737). However, our species has more whorls, is larger, and there can be no doubt it is a true Vitrinella. A similar species, not quite the same, is V. margarita Pilsbry and Olsson in the Eastern Pacific.

Records HMNS Survey Collection: 1 lot, no live material.
Depth range: 55 fms.
Geographical range: unknown.
Maximum size: 1.6 mm.

(To be continued)

Fig. 1 Two forms of Vitrinella floridana from the Northwest Gulf Survey material are drawn. Line A represents the larger overhang of the offshore form. Line B represents the bay material. The bay material may reach 2 mm; offshore material is usually 0.9 to 1.1 mm and rarely reaches over 1.5 mm.

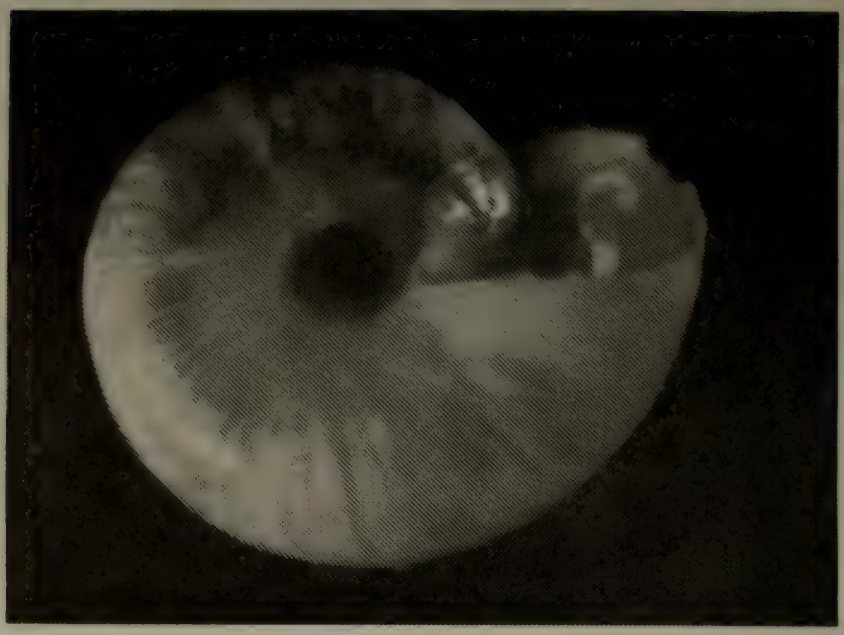

Fig. 2 Vitrinella helicoidea, ventral view, 2.5 mm, dredged in 150 fms by Harold Geis and S. Stubbs July 18, 1967 85 miles southeast of Freeport, Texas.

Fig. 3 Vitrinella helicoidea, dorsal view, 2.5 mm, collected by diver Harold Geis at a limestone lump 1½ miles off Padre Island, 35 miles north of Port Isabel, Texas, September 25, 1966.

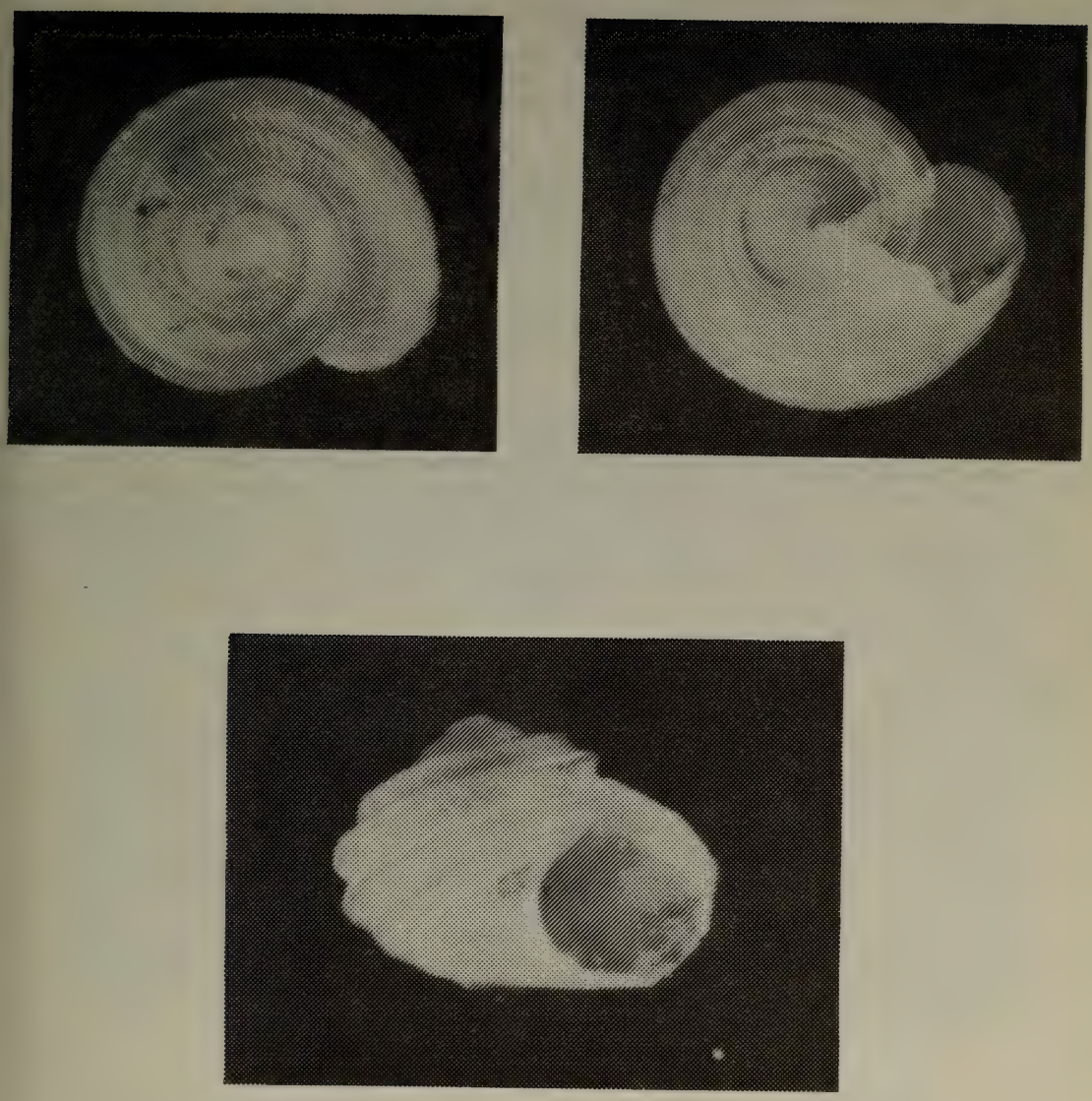

Fig. 4 Parviturbo c.f. rehderi, 1.5 mm, collected at a limestone lump 1½ miles off Padre Island, 35 miles north of Port Isabel, Texas, by diver Harold Geis September 25, 1966.

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DEW DEPOSITION AND COMPARATIVE DISTRIBUTION OF NATIVE AND NONNATIVE TERRESTRIAL GASTROPODS IN SOUTHERN TEXAS RESIDENTIAL YARDS

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Many species of terrestrial gastropods in residential yards are nonnative species which are better adapted to environmental conditions in yards than the native species present in the natural communities of the area. Most often the native fauna is devastated during the house construction period. Many nonnative species enter yards via nursery stock, while most native species are not established in nursery stock and have limited or no migration routes to these yards.

While much has been published on nonnative snails and their macrogeographic distribution (Hanna, 1966; Dundee, 1974), little is known concerning the microdistributional characteristics of these species. Even less is known about competitive relationships between native and nonnative species. The purpose of this report is to document the microdistribution of several macrosnails with especial attention concentrated on two species of Polygyra. This study will assist in an initial understanding of the dynamics of microdistribution of urban snails in the study area.

STUDY SITE AND METHODS

The study area was located in a residential yard in an older neighborhood of Brownsville, Cameron Co., Texas, in which residences were constructed in the 1920's. The survey site was a series of bricks which served to outline the front porch of a house. The front of the house and the long axis of the garden faced southwest. A survey of the snails present under the bricks was taken on 20 December 1970. The bricks were divided into four sections: SE - line of bricks with axis perpendicular to southeast direction; eS - eastern portion of line facing southwest direction; wS - western portion of line facing southwest direction; and NW - line of bricks with axis perpendicular to northwest direction.

RESULTS

A total of six snails (3 native and 3 nonnative) were observed in the area (Table 1). Two species, Helicina orbiculata (Say, 1818) and Rabdotus alternatus (Say, 1830) were represented by a single snail and provide no data suitable for distributional analysis. A third species, Bradybaena similaris (Ferussac, 1820), was more abundant in the SE and eS sections although total number of snails is only seven. The introduced achatinid, Lamellaxis gracilis (Hutton, 1834), was present throughout the garden border but was common in wS and abundant in NW.

The two species of Polygyra exhibited very different microdistributions. The native Polygyra texasiana (Moricand, 1833) was equally common in all portions of the site. In fact, P. texasiana was the only species which had such an even distribution. In contrast, the nonnative Polygyra cereolus (Von Muhlfeld, 1818) was found only in wS and NW and was common only in NW.

DISCUSSION

Snail abundance was much greater in the NW section of the garden than in other portions. Several field observations revealed that the NW area is the most mesic portion of the study area. Primary source of moisture in this area is dew deposition which is substantial in warm seasons in the Brownsville area. Source of the moisture differential is variation in length of time of dew deposition on the different parts of the garden. Morning sun causes relatively quick evaporation of dew in the SE and eS areas. Dew evaporation occurs somewhat later in wS but is substantially delayed in NW. Intense solar insolation on NW is delayed until early afternoon on many days. Such an increased period of dew presence increases the length of activity periods of snails in NW when compared to those in other sections. Also increased is the likelihood of an active snail returning to a favored diurnal microhabitat without severe desiccation. Post-dawn levels of surface moisture and local ambient relative humidity is higher during most time periods and is above critical thresholds for a longer period of time.

The difference in microhabitat preference of the two species of Polygyra parallels the native geographical distribution of these two species. P. texasiana is found in the eastern two-thirds of Texas and Oklahoma eastward into Arkansas, Louisiana, and Alabama (Cheatum and Fullington, 1971; Hubricht, 1985:148). P. cereolus ranges along the Gulf Coast from Florida westward to Texas where the limit of its native occurrence is about as far south as Corpus Christi (Pratt, 1981). Introduced populations of P. cereolus are known from coastal areas further south and inland urban sites in central and east central Texas (Pratt, 1981; Hubricht, 1985:147). Levels of relative humidity and increased dew deposition and duration are also greater in coastal than inland portions of Texas. Inland populations of P. cereolus occur in human-impacted areas which generally receive supplemental water.

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Table 1. Occurrence of terrestrial gastropods in various portions of study site. Introduced species are noted by an asterisk (*).

	SE	eS	wS	NW	total
Helicina orbiculata	1	0	0	0	1
*Lamellaxis gracilis**	3	4	17	69	93
Rabdotus alternatus	1	0	0	0	1
*Polygyra cereolus**	0	0	4	18	22
Polygyra texasiana	8	13	10	12	43
*Bradybaena similaris**	2	4	0	1	7
total	15	21	31	100	167

BOOK REVIEW

Living Terebras of the World, by Twila Bratcher and Walter O. Cernohorsky. 1987. American Malacologists, Inc., 240 pp., 6 color, 68 black and white plates, 36 text figures. $54.50.

A thorough and extensive review of the living *Terebra* of the world, this new book by two dedicated students of Terebridae is one that you will want to have on your bookshelf. The authors recognize 268 species. No new species are named in the book. All type specimens are illustrated, and enlargements in black and white demonstrate the variable patterns of members of the family. There are six color plates, but the monographic treatment employing the use of explanatory black and white plates is the meat of the book. The authors are frank to state that more work will have to be done on live animals and that changes may result when that is accomplished. At this time, they have divided the family into four genera--*Terebra*, *Hastula* (*Hastula* and *Impages*), and *Terenolla*. Material from the Houston Museum of Natural Science's Northwest Gulf of Mexico collection was studied by the senior author who identified material for us. The book will be ordered for HCS.

Constance E. Boone

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HOUSTON CONCHOLOGY SOCIETY

Epitonium angulatum

OCTOBER, 1987

The TEXAS CONCHOLOGIST is the official publication of the Houston Conchology Society, Inc., and is published quarterly at Houston, Texas. It is distributed as part of the dues to all members.

The Society holds regular meetings the fourth Wednesdays of the following months: August, September, October, January, February, March, April, and May. The meeting is held the third Wednesday in November. Meetings are held in the Azalea Room of the Houston Garden Center in Hermann Park just east of the Houston Museum of Natural Science, beginning at 7:30 p.m.

The TEXAS CONCHOLOGIST is published October, January, April and July. It is mailed postpaid to regular members in U.S. postal zones. Overseas members will be charged additional postage. Only one copy will be mailed a family membership.

Dues extend from the beginning of the fiscal year of June 1 through May 31. However, the July issue of the TEXAS CONCHOLOGIST each year is the fourth quarterly due on the regular dues year beginning June 1 of the previous year. Memberships will be accepted throughout the year but will receive quarterlies of that fiscal year. Members receive meeting Newsletters and have all other privileges provided by the Society's by-laws.

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The TEXAS CONCHOLOGIST accepts contributions for publication from amateurs, students, and professionals, subject to approval by the Editor. Manuscripts should be typed, double spaced and should be in the hands of the Editor the first day of the month preceding publication dates. Photos accompanying such material are welcomed.

TEXAS CONCHOLOGIST, Vol. XXIV, No. 1, October, 1987

LA PAZ AND LOS CABOS

By Pat McElroy

On Wednesday morning, August 19, 1987 we left Houston, Texas at 7:00 a.m. bound for La Paz, Baja, California.

After doing a lot of checking, we had found that there is not an easy route to fly to La Paz from Houston. A person has to fly to Mexico City and then to La Paz, or fly to Tucson, Arizona, and then to La Paz, or go through California and then to La Paz - all three ways cost close to $300.00 airfare.

We decided to fly to Los Cabos on the tip of Baja and then figure out the best way to get to La Paz after we arrived. This cost us $174.00 each round trip. We flew Aeromexico with two stops - one in Monterrey and one in Mazatlan. We arrived in Los Cabos at 8:55 a.m. and found there was a bus from San Jose del Cabo leaving for La Paz at 9:30 a.m. We hurridly collected our luggage, found a cab, and went to the bus station.

We arrived at 9:25 a.m. with time to spare. The trip by bus to La Paz cost $5.50 U.S. dollars for the <u>two</u> of us and took a little over 2 hours.

We arrived in La Paz before noon, checked into the Palmira Hotel, and had the rest of the day for shopping and beachcombing.

La Paz is on a big bay. The bus trip was an enjoyable ride, because the scenery was beautiful with the coastline and the mountains and gave us a chance to see the natives in their habitats.

One of the many interesting points was the number of loose cattle all along the way on the roads that the bus driver never seemed to slow down for. There were rocks all along the highway that fall from the mountain side.

The big difference in how green the countryside was in the hills as you left the arid flat lands to climb into the mountains.

The bus driver stopped many, many times to pick up or let off passengers, and yet we made excellent time.

We recommend the bus trip especially since it saved money in travel expense as well as it was fun.

La Paz is an old city built on the bay. It is a clean city, has clean beaches, and has a good variety of shopping. The natives love the water and were in the water at all hours of the day and night. As usual in this part of Mexico, there were no shell shops and no one seemed to

know anything or care anything about shells or shell collecting.

Hotel Palmira is a pretty hotel, with nice clean rooms, nice restaurant, in a pretty setting on the right end of town toward the best beaches.

The entire month of January and February have already been reserved by the Canadians who come in the winter. The summer rate is $38.00 per day, and summer rates run from May through September.

After talking to a lot of people we found a taxi cab driver who seemed to know some beaches that were isolated and better for shell collecting, approximately northeast of La Paz. We went with him to Balandra Beach, which was a big cove with long beach areas and a rocky point.

The rocky point was the best area we found for collecting. We collected live Cyprea annettae, Conus nux, and Pinctada, We also collected fresh dead venus clams, nerites, olives, olivellas, and miters which we have not yet identified. We hunted hard and turned over a lot of rocks before finding our Cypraea and many cones.

We went to Tecolote Beach which was a long sandy beach with rocky points at each end. We didn't get to pick a time to coincide with low tide for this trip, and this could be a great area during low tide. Near some of the beaches there was growth similar to mangroves and looked like swampy brackish water areas. We spent so much time exploring the two beaches, we did not get time to check this area.

The brown pelicans were unafraid of people and were always near. Quite often while we were in the water, large Rooster Fish would chase small schools of fish, often coming so near you could see the large dorsal fin of the Rooster Fish breaking water.

Before getting to these beaches, the road appeared to be dead ended; you could see tire tracks - it was almost just a clearing through the bottom land. These beaches were very out of the way, you felt like you were going to the end of the earth, and, of course, you had. This is not an area where many tourists appear to go.

These beaches were popular places for the natives to spend the day and feast on clams. There were several families who were gathering the clams and then they cooked them over the rocks. We were the only tourists.

The clams could be found on all the menus and were sold by the fishermen in town.

A beautiful view from these isolated beaches was the island offshore that appeared to be very mountainous. Also you could see the La Paz ferry as it made the crossing from Mazatlan. We talked to several people who had made the ferry trip. They did not recommend it as it was overcrowded and takes approximately 16 hours.

Next we went to Calinda Aquamarina, San Jose del Cabo. We arrived Saturday by bus. It is a beautiful place. The room cost $43.00. They are clean and on the beach.

The beach turned out to have a steep slope - very grainy sand - hard to walk in. There was a pounding surf. You saw few people in the water - maybe one or two - everyone stayed near waters edge but not in it.

We took flashlights and went out after dark and collected washing in dead Turritellas. There was very little collecting on this beach. We got up early for sunrise and walked the beach and went out late evening and at night but only collected turritellas and some small things past El Presidente Hotel.

We took a taxi to the nearest sheltered beach - but the beach was full of people and had no shells.

We took a bus for $0.35 over to Cabo San Lucas which is about 30 miles away. Riding the bus is a fun experience - you buy your ticket ahead of time to get a seat - then they sell to as many people as they can pack into the aisle. It is crowded, but then it's a cheap way to travel.

After checking out beaches near Cabo San Jose this year and Cabo San Lucas last year, (also in August), the best place is Cabo San Lucas.

A good place that looked like it would have good beach access was a hotel named Cabo San Jose , sort of between the two towns. The beach near it looked like it would have sheltered coves and rocky areas.

The water in August is dangerous on the end of Baja. It was extremely hot - it was probably 117 to 120 in the shade. You have to go out early and come in and stay in during the middle of the day. The early mornings were pleasant - but by 8:30 to 9:30 a.m. you were ready to get off the beach and into a cool spot. The water, however, was cold, and we had to snorkel in rough currents.

Both San Jose and San Lucas have some shopping and super mercados well stocked with bottles of distilled water, cold drinks and all kinds of fruit juices. We were able to buy alcohol, although higher than in Texas.

Would we go back? You bet! Having been at high tide, we'd like to go at low tide. The flats, we are told are empty then and shells pop up in trails.

SHELLING THE BEAUFORT SEA

By Richard Yuill

Oh somewhere in the frozen north
where the Arctic tundra grows,
Where Prudhoe Bay is pumpin' crude
and cold Mariah blows.
Rich Yuill took an August stroll
along the Beaufort Sea,
For a sheller shells on any beach
wherer' he or she may be.

He clomped along the gravel beach
neck bent and shoulders stooped.
He walked and looked and looked and walked.
'till his little legs were pooped.
For a Beaufort Beach is hard on shells
and the Arctic shells are few.
After twenty minutes, maybe more,
he had only picked up two.

So our boy pressed on to the "DEW" line camp
where our country's radar sings,
Where Brant and Canada geese make a summer nest,
and their chicks stretch scrawny wings
But the conchs find it hard to raise little conchs
on wintry shores all frozen 'n' icy
'Cus the summer warms the water to six degrees "C"
And folks, that's not too spicy.

As the old boy trudged towards Oliktok Point,
the wind clocked thirty knots.
He checked the drift for shell debris
and found two rusty pots.
We hard nosed shellers don't care what we find,
And a sheller is what I am.
Hark! *Astarte borealis*, a *Natica*,
and perhaps a razor clam!

Oh somewhere in the frozen north
little Arctic foxes play,
And Polar bears have lots of fun
on a long Arctic summer day.
But even if this southern boy
lives on the be *real* old,
He'll never miss the frozen north
'Cus, Prudhoe Bay, you're just too damn COLD!

(Ed. note: Richard Yuill's trip to Prudhoe Bay for three weeks in July and August was a contract project for a client needing to know the water quality in reserve mud pits of production wells. The client needed the data for the state of Alaska. Richard left Houston with an inflatable boat and paddles. He had been told the pits were 200 ft. long. He went equipped with long johns, ski cap, rubberized hunting boots, flannel shirts, and a down jacket - plenty he thought! Well, Richard found the pits to be 1400 ft. long, and, though it was summer, the wind was fierce and cold. He struggled to get out in the water to get his samples. He had no helpers. He scrounged the worker's cabins to get heavier clothing and hip boots. There was a time he wasn't sure he would complete that project.)

"Law of Nature"

Commonly called a Cowrie
But Cypraea to you and me.
The first attraction was to it's shell
But now it's the animal we want to know well.

Also known as the Jewel of the Sea,
It can be easy to find or a great rarity.
This seems to be a universal case
Whether looking for a shell or that one special face.

By Jean Holman

KEY WEST

By Jean Holman

The July, 1987 AMU meeting in Key West, Florida was a wonderful experience for a first time attendee and amateur collector! The setting was the beautiful Casa Marina Hotel which boasted of its own private beach. Malacologists from around the world attended, with Karen Gowlett-Holmes of the South Australia Museum in Adelaide, Australia having the honor of being the one who traveled the farthest to come. Others came from China, Germany, Scotland, Belgium, Brazil, Venezuela, Uruguay and Peru.

I arrived on Sunday in time to register and visit alittle before the "President's Reception." I have to confess that before I arrived I did feel a certain amount of trepidation being a novice shell enthusiast among such an august assemblage. But our very esteemed Constance Boone was as usual gracious and thoughtful, making sure that I was introduced all around. Without exception the people I met were wonderful, friendly and very encouraging about my interest in shells.

There was quite a mixture of activities: the reception the first evening, the "Conch Train Tour" around the island (locally known as THE CONCH REPUBLIC!), field trips which were geared towards special interests, the book auction, dealer exhibits - not to mention the wide range offered in the immediate area such as shopping, dining out, swimming and snorkling, visits to the Key West Aquarium and much more! These alone could keep anyone going the entire visit, but the real "meat" were the talks that began every day at 8:00 a.m. Malacologists from all over came to present information on their current field of research and to glean information from others.

From an amateur's standpoint, I was impressed with the professionalism and genuine attention given to these volunteer talks. The AMU meetings are an outstanding opportunity for the scientific community to pass along results of hard work and long research among those who can best appreciate their endeavors. It is also a chance to enjoy a sense of camaraderie among shell lovers of all degrees.

My personal favorite was the book auction which was enlivened by the spectacular wit of Richard Petit of Myrtle Beach, South Carolina. His knowledgable and humorous repartee' while auctioning several hundred books kept everyone laughing! I bought two "pre-owned" books written by Dr. Tucker Abbott who did me the honor of rededicating the inscriptions to me - over 25 years after he originally signed them!

Going to Key West was a first for me in another big way also. Everyone who knows me is aware that collecting seashells is a lifelong consuming interest. It started

because I loved the beauty of shells and wanted to display them in my home. What began as maybe ten shells has grown into hundreds! My mother and brother are always on the lookout for any shell that I don't have yet, (as well as anything else with a shell on it), and for the most part my shells have either been bought, given to me or found on the beach.

You will probably be amazed that after 10 years of avid collecting I had never myself collected a *live* mollusk. Going to the beach to collect to me meant that I would be able to find beach specimens (or shell shops!).

I broke down in Key West with the encouragement of Connie Boone and tried it out. My first opportunity was off of the hotel beach where there lived an abundance of *Nerita versicolor*. I spotted a couple with a gorgeous pink and red hue to them instead of the usual grey and black. I put them in a clear Tupperware bowl with water and carried them around for days. They had broad "faces" with little black eyes under their tentacles on either side of their shell and they crawled around and were so cute! Obviously I couldn't drown them in the alcohol I brought for the purpose and ultimately I let these first couple go.

Then on our collecting field trip I managed to find a few *Astrea americana* in the kelp beds, as well as a *Fasciolaria tulipa*, a *Strombus raninus* and a *Vasum muricatum*. These too I brought back and put in the Tupperware bowl with water. The Hawk-wing stared at me wanting back out and I felt terrible about yanking him from his home. I wrapped a towel around the bowl so that I didn't have to see him looking at me with his big eyes on the end of his eye stalks.

After much inner debate, I decided to take them home with me instead of letting them go. I didn't have any specimens that I actually collected myself and I needed to start somewhere. They survived the trip home - and being lost with my luggage for a day - in the water I left in the bowl before I sealed it. I was happy they survived the trip for an obvious reason spelled S-M-E-L-L, but I simply couldn't kill them myself after we had been through a trip together and all. I had to beg my husband and our friend (and fellow club member) Gary Olson to put them all out of their misery for me, but Skip laughed saying I had to do it myself. Gary finally boiled them and I managed to get them cleaned up and put out the shells.

Since then I have live collected again once, and it was easier for me, although they were mussels. It may be because I've cooked other bivalves as food for years that it didn't bother me at all . . . or it may be because I couldn't see their eyes.

FLORIDA KEYS 1987

By Lucy Clampit

When Jerry and I were in Ft. Lauderdale for the COA convention in July, 1986, our friends, Dave and Lucille Green, convinced us to ride down to the Keys with them. We only had a few hours, so we didn't have time to shell. We just enjoyed looking at the beautiful water and dreamed. When we started planning a trip for this summer, the Keys seemed to be the logical place to go. The tide tables indicated that the lowest tides would be between July 7th and 13th. So, we made our plans and invited our friends who live in Florida to join us.

On Tuesday the 7th we flew to Miami, rented a car and drove down to Key West. Jerry and I spent the remainder of Tuesday and all day Wednesday sight-seeing on Key West. A trolley ride proved to be very interesting and informative, and, of course, we had to have a drink at Ernest Hemingway's bar. The huge Schefflera plants with their long red blooms were very pretty and the festivities and characters on the dock were much more colorful than the famous "Key West sunset."

Thursday morning we drove back to the Pelican Motel on Grassy Key to meet Dave, Lucille, and their daughters who had driven down from Orlando. They brought Linda Koestel, a friend from the Central Florida Shell Club. Marty Gill from Brooklyn and his friend B.J. Larson from Miami also joined us. The tide was going out, so we were all anxious to get to the beach.

Dave wanted to look for cowries under the rocks on Missouri Key, so that was our first stop. Upon arrival, we fanned out in all directions. We turned rocks, snorkled, hunted in the grass and searched the sandbars. Dave did find a Deer Cowrie (*Cypraea cervus*) under a rock. Group members found 3 kinds of *Cyphoma* (*C. gibbosum*, *C. macgintyi*, and *C. signatum*) on searod gorgonians. Hawk-wing Conchs (*Strombus raninus*) and True Tulips (*Fasciolaria tulipa*) were found crawling around in the grass in very shallow water.

I spent a lot of time searching the grass and sandbars. Among my live finds were two types of Star Shells (*Astraea phoebia* and *A. tecta americana*). A few live Jasper Cones (*Conus jaspideus*) were making tiny trails on exposed sandbars. There were also lots of dead shells, and many were in great condition. I found an almost perfect Alphabet Cone (*Conus spurius*) in the middle of an exposed sandbar along with a nice White-spotted Marginella (*Marginella guttata*). There were several Milk Moon Shells (*Polinices lacteus*), Colorful Atlantic Naticas (*Natica canrena*) and what may be two types of Pen Shells; Tiger Lucina (*Codakia orbicularis*); Pennsylvania Lucina (*Linga*

pensylvanica); Ark shells; a tiny, lemon yellow jewel; some small rose-striped Tellin-like shells, and several others that I have not identified.

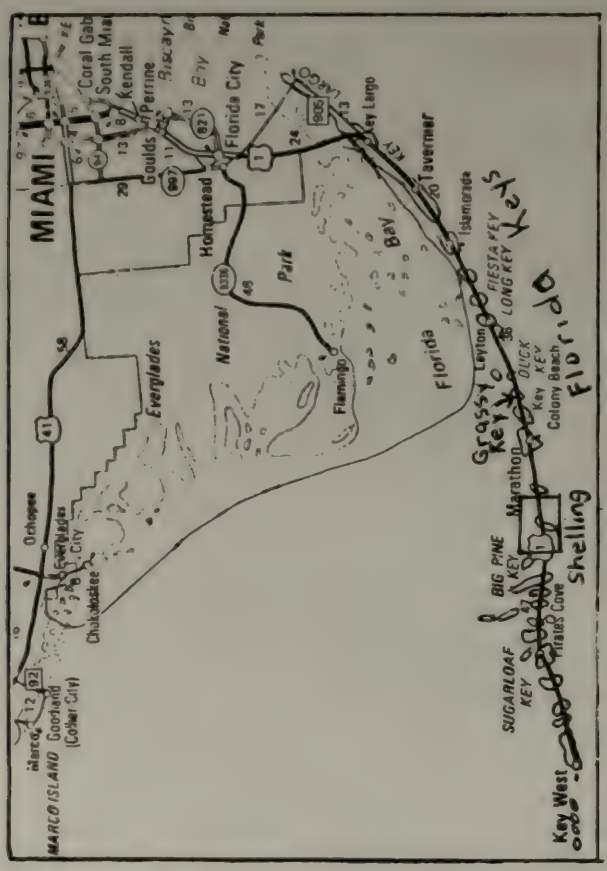
By early evening the tide was on its way in, so we decided to make a quick stop at Little Duck Key on the way back to the motel. We stopped at a very small park, but we didn't find much. I don't think it would have been productive even at lowest tide. Time to go to the room, clean up, eat and play Trivial Pursuit.

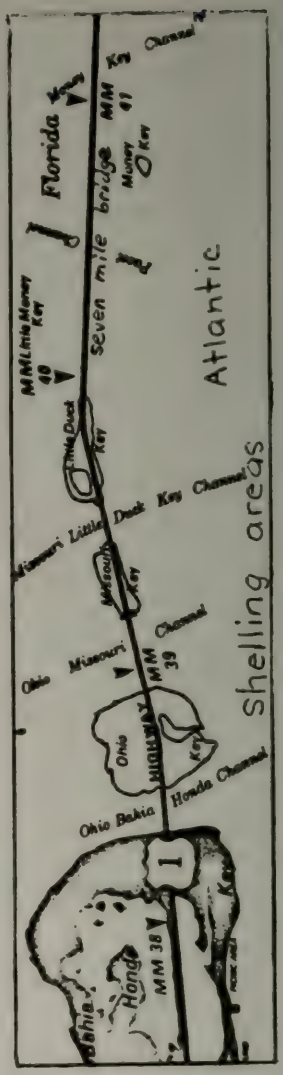
Friday afternoon we decided to try the east end of Grassy Key on the Gulf of Mexico side. (All of our other collecting was done on the Atlantic side of the Keys.) There was a lot of silt, and water visibility was poor. Major finds were True Tulips and a Vasum. The blades of several grass clumps had little Star Shells perched on the ends and looked like flowers. The shells are juveniles of Astraea phoebia.

Since this area wasn't very productive, we decided to try the east end of Ohio Key. This area was rocky and we had to walk carefully. On the rocks we found some Chitons, Limpets, Cerithium, and Tessellate Nerites (Nerita tessellata). Except for Vasum, we didn't find much while snorkeling. Dave had brought a hand dredge which Jerry and I used in a sandy area. The sand was so fine that it was almost like flour. The pockets between grassy areas yielded a few small but live Jasper Cones, a live Nassa snail, a tiny pink Trivia and a few other small things.

Missouri Key had proved to be so productive the day before that we decided to check it out again. We found live but immature Queen Conchs (Strombus gigas) this time. Since it is illegal to collect them, we resisted temptation. Most of what we collected we had also found on Thursday. I found enough dead, immature Hawk-wing Conchs to have a small growth series.

On Saturday morning our friends Tom and Mary Ann Berkey and their daughter Anne from Coral Springs, Florida, joined us, and they brought their boat. They planned to camp on Little Duck Key, so we decided to collect on the east end across the highway from the campground. This, also, proved to be a fairly productive area. Group members collected more live Cyphoma, Tulips and Hawk-wings and found live but immature Queen Conchs. I found a dead but beautiful little Partridge Tun (Tonna maculosa) stranded on an exposed clump of grass. As I waded around the key in the shallow water, I found an area with several fresh dead Hawk-wing and immature Queen Conchs. The shells still contained foul smelling meat, but there didn't seem to be any other mollusks, alive or dead, in this area. There were live, seemingly healthy, conchs crawling around just a few yards away.





The upper map shows the section of the Keys that we shelled.

The lower map shows the most productive areas.

Linda, Dave and Jerry went to Money Key in the boat with Tom. While snorkeling, they found many more Hawk-wings. Tom found a live, large Milk Conch (Strombus costatus), and Jerry found a beautiful, mature Queen Conch, but he resisted temptation and left it. Jerry also found a small, live Horse Conch (Pleuroploca gigantea) and an old Helmet shell. Lucky Dave found another nice Deer Cowrie under an old lobster trap. Collecting was best on the west and southwest sides.

While they were at Money Key, Lucille, Marty, B.J. and I checked some beaches in Marathon. Key Colony Beach was covered with houses, and there was no access to the beach. Coco Plum Beach looked better. It even had a jetty. We did find shells, but most of them contained hermit crabs. We picked up a few with the best shells. Lucille found a couple of Murex shells. The only live mollusk we found resembles a small Cerithium, but I don't think it is. I do not exaggerate when I say there were thousands of them on the beach and in the shallow water.

Most of the group had to go to work on Monday, and Jerry and I had a plane to catch Sunday night. Since the tide would not be low until late Sunday afternoon, we packed Sunday morning and headed back to Miami.

We really had a great time and are ready to go back. Missouri Key was the best collecting location. Not only did we find mollusks, but we found Sea Biscuits, at least three kinds of urchins and large, colorful starfish. The water, fish and coral were beautiful everywhere. Of course, there were so many places that we didn't have time to try or a boat to get there. We found more things than I have mentioned, but I haven't identified everything, especially the tiny shells and bivalves.

For anyone planning to collect in the Keys, we recommend wearing dive boots. We decided they were much better than our usual tennis shoes and socks for walking on the rocks and in the grass. Gloves are necessary for turning rocks. A long, colored t-shirt over the bathing suit protects the back. And, some members of our group discovered that balding heads need to be covered. Don't forget the sunscreen!

The weather seems to be better in the summer and there are usually some good low tides. When the tide was at its lowest, the water was shallow enough to wade a half-mile out in some spots. The farther out you go, the more live things you find. However, you have to be careful in the currents and fire coral. A snorkeler out in deeper water might feel more secure with a small inflated raft (with oars) tied to his belt. And, remember it can be a long way back to the beach carrying your loot. One day I let myself get so hot, tired and dehydrated that I had to sit on the sand bar for a while before I could start the long trip back.

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FRESHWATER BIVALVES OF ARTIFICIAL AND NATURAL CREEK PONDS IN EAST CENTRAL TEXAS

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Diverse freshwater bivalve faunas were characteristic of various river ecosystems of eastern Texas (Strecker, 1931). Substantial environmental impact upon these faunas has involved water pollution and reservoir construction (Neck, 1982). These reservoirs contain fewer species than free-flowing rivers, but often support very dense populations (Neck).

Additional anthropogenic habitats also exist in this area. Innumerable small bodies of water have been constructed for water sources for livestock (small ponds), flood prevention (Farquhar et al., 1980), or merely as a result of removal of soil and subsoil for fill ("borrow pits"). Nothing is known of the bivalve fauna of ponds in Texas except for brief reports by Frierson (1917, 1923). The unionid fauna of a similar pond in Kansas was reported by Murray (1960).

The primary purpose of this study was to determine which bivalve species are able to establish and maintain populations in small ponds. Secondary purposes were, with observations and literature survey, to determine possible methods of entry into the ponds and to examine biological characteristics which allow species to function in pond habitats.

Study Area and Methods

The study area was a 1500-acre tract of post oak woodlands and improved pastures in Van Zandt and Henderson counties in east central Texas. Bivalve faunas of 15 ponds of variable origin were surveyed by dragging rakes and nets along pond bottoms during periods of low water levels. Notes were made concerning size, origin and relative location to Purtis Creek, which is a tributary of Cedar Creek of the Trinity River drainage. During severe droughts, flow of Purtis Creek may become subterranean or non-existant between permanent ponds. Such low levels of water flow could be a recent phenomenon following alteration of local aquifer conditions by water mining and land cover alteration. Surveys were made on the following dates: 5 Sept. 1978, 4 - 5 Aug. 1980, 19 Feb. 1981, 11 Mar. 1981, and 30 July 1984.

Results and Observations

A total of five bivalve species was found in 10 of the 15 surveyed ponds (Table 1). Anodonta imbecilis Say, 1829, was present in only three ponds and was not abundant in any. Uniomerus tetralasmus (Say, 1830) was the most abundant species and also was found in the largest number of ponds. Ligumia subrostrata (Say, 1831) and Toxolasma texasensis (Lea, 1857) were less abundant than U. tetralasmus, but developed high density populations in some ponds. The single species of fingernail clam, Sphaerium partumeium (Say, 1822), was observed in only a few ponds but was usually common when present.

Species compositions of the different ponds were quite variable. Only one pond (#8) contained all five species, although two other ponds (#7 and #15) contained all four unionid species. The single pond (#8) with all five species is located out of the floodplain of Purtis Creek, but supported a relatively dense fish population and had the most diverse pond-margin flora of all ponds. Two of the three ponds with four species are located in the floodplain of Purtis Creek.

Differential abundance of bivalves with reference to reducing substrate (as indicated by strong sulfur smell of black organic layer within pond 7 in the floodplain of Purtis Creek) indicated that L. subrostrata may be more resistant to anoxic conditions than U. tetralasmus and T. texasensis. One area of pond 7 (located within the floodplain of Purtis Creek) contained a small pool with a black organic-rich substrate with a strong odor of sulfur. This area contained 21 T. texasensis (11 males: 10 females), 2 U. tetralasmus, and 27 L. subrostrata (11 males: 16 females). Another low area (with some water and no sulfur layer) contained 15 T. texasensis (9 males: 6 females) and 18 U. tetralasmus. All of the above counts are of live individuals.

Descriptions of typical individuals recovered in this study are presented to document local phenotypes of these species in east central Texas. Shells of U. tetralasmus from these ponds possessed no rays on the periostracum and had whitish nacre. Posterior end was directed ventrally but was not extremely drawn out as in declivus Say, 1831. Internally, a very low ridge runs posterio-ventrally from the pseudocardinal teeth. Lack of growth ridges on shells of U. tetralasmus indicates that shell deposition is rather continuous, i.e. these ponds are not often completely dry. L. subrostrata possessed greenish rays except in the largest shells which are uniformly dark brown. The posterior end points dorsally (in both males and females). Nacre is whitish with pink to purple undertones. The ridge running from the pseudocardinal teeth is more strongly expressed than in U. tetralasmus. T. texasensis possess

whitish nacre with iridescent highlights with limited light salmon nacre present in the central dorsal area of some individuals. Shells of A. imbecilis are light brown with only limited expression of greenish rays. S. partumeium were a brownish red in color.

No physicochemical data were recorded for these ponds but the water tends toward acidic levels. Valves of U. tetralasmus and T. texasensis exhibit shell etching with some internal redeposition of shell material occurring at the umbo. Variation in degree of shell etching in U. tetralasmus from different ponds was evident. Shells of S. partumeium below water level were noticably softer than shells above the water level.

At times of low water levels, the bivalves of these ponds are more susceptible to predation. Smaller individuals, especially T. texasensis and small U. tetralasmus, are eaten by raccoons, Procyon lotor. Larger individuals, especially U. tetralasmus, are very susceptible to predation by great blue herons, Ardea herodias. In pond 13, 32 of 47 dead T. texasensis valve pairs were broken while only 13 of 83 dead U. tetralasmus and one of 8 dead L. subrostrata were broken. Evidence of utilization of L. subrostrata by humans for fish bait was observed at several ponds.

One collection of bivalves from Purtis Creek at FM 316 (upstream of all pond sites) revealed a fauna dominated by L. subrostrata. Total bivalve count was as follows: L. subrostrata - 11; T. texasensis - 8; A. imbecilis - 5. Lack of U. tetralasmus in this sample may indicate that U. tetralasmus is uncommon in the creeks of this area and has become more abundant following widespread pond construction.

Discussion

The repetitive occurrence of a limited number of species of bivalves in the ponds surveyed in this study indicates that only a few species are able to colonize and survive in small ponds in east central Texas. Occurrence of the same unionid species in ponds in Louisiana (Stern and Felder, 1978) and of related unionid species in Kansas (Murray, 1960) indicates that a predictable pond mussel fauna characterizes this habitat over much of the south central United States. A discussion of methods of entry into these ponds and biological characteristics of surviving species is presented below.

Origin of Pond Bivalve Populations

Definite information regarding the origin of these pond bivalve populations was not discovered during this study.

However, several possibilities have been considered and are discussed below.

1) Bivalves in ponds may represent species which were present in the drainage prior to impoundment of water; however, most ponds in drainages are above the floodplain of Purtis Creek. This possibility is not a likely origin for clams in borrow pits which were created without regard to natural drainages. Certainly bivalves in floodplain ponds (#7, #15) are derived from naturally-occurring populations.

2) Bivalves could also enter ponds as attached glochidia during flood events when fish may disperse from stream to pond. Such an occurrence would appear unlikely for most ponds constructed in drainages because these are generally out of the normal floodplain. Several borrow pits with bivalves could have received founding individuals in this manner. As these small ponds without runoff-collecting abilities are especially susceptible to desiccation, one can assume that periodic introduction of those species present would be required.

3) Movement of bivalve species via waterfowl phoresy has been assumed to be common (Kew, 1893) on rather limited observations. Most published observations of bivalves on waterfowl have involved fingernail clams (Kew, 1983) and would indicate such an immigration method is more likely for S. partumeium than the unionids found during this study. However, Frierson (1899a, b) reported that he had "twice . . . killed wild ducks with unios attached to their toes and . . . seen what I believed to be unios hanging from the feet of others flying overhead." (Italics are those of Frierson, 1899b). Unfortunately, Frierson (1899a) gave no size or species details on these observations. Elsewhere, Frierson (1899b) remarks that he was "not ... then interested in the study of Unionidae." Therefore, one cannot be sure that unionids were involved, although fingernail clams would be difficult to observe on overhead flying waterfowl.

4) Unionids could have been introduced into these ponds via glochidia on stocked fish. No stocking records are available for these ponds, although such activities undoubtedly occurred in ponds which contain fish and lie above the floodplain of Purtis Creek. Introduction of unionids via stocked fish from hatcheries has long been assumed to occur (see Johnson, 1970:387), but I know of no published surveys of bivalves in fish hatchery ponds other than those which involved problems in fish parasitism (Murphy, 1942). However, several bivalve species have been found in such ponds in a central Texas fish hatchery (Neck, unpub. data).

5) Bivalves could have been deliberately introduced into these ponds by humans for various purposes. Likely purpose would be for future utilization as fish bait. Utilization of unionids as fish bait in the study area has been documented above. Such an origin of these pond bivalve populations is possible (even probable) but almost impossible to document. S. partumeium is certainly too small to be considered useful as fish bait.

Biological Characteristics of Pond Bivalves

Species without some of the following biological characteristics could not survive in temporary or greatly fluctuating ponds, unless they have dependable methods of dispersal. Much has been written concerning transport of freshwater bivalves via waterfowl, and a quick review of the pertinent literature was presented above.

1) Bivalve species present in these ponds must be able to withstand highly variable water conditions concomitant with alterations in water level. During periods of no rainfall and lack of strong winds, the water in these ponds will tend to stratify. Physiological studies on L. subrostrata have revealed survival of anoxic periods and toleration of severe ion depletion (Dietz, 1974; Scheide and Dietz, 1982). Juveniles of S. partumeium are able to aestivate in moist vegetational mats even though adults may be reproducing at the same time in deeper water (Way, et al., 1980).

2) Bivalves in small ponds may also face the threat of total desiccation of their habitat. U. tetralasmus is well-known to withstand complete desiccation of ponds for several months (Simpson, 1898:283; Strecker, 1908; Isely, 1914; Coker, et al., 1921:100; Frierson, 1923). Simpson (1989:283) also reported on the ability of L. subrostrata to withstand periods of desiccation. Van Der Schalie (1940) reviewed the reports of resistance to habitat desiccation in unionids and found that "at least four species [U. tetralasmus, T. texasensis, L. subrostrata, and Amblema plicata] have been observed living through dry periods by aestivating." Significantly, three of the above species were abundant in ponds surveyed in this study. A. plicata is common in many Texas reservoirs but is not found in small ponds (Neck, unpublished data). The only unionid species found in these ponds, but not reported above to withstand desiccation (A. imbecilis), is very uncommon in these ponds. L. subrostrata is known to utilize atmospheric oxygen for respiration (Dietz, 1974). At least some intertidal bivalves are able to utilize atmospheric carbon dioxide for operation of the succinate pathway

(anaerobic respiration) during periods of stress and/or low oxygen tensions (Ahmad and Chaplin, 1984).

3) A loss of dependency of a fish-host-dependent glochidial stage would also be expected of unionids in such habitats, but would also reduce migratory opportunities. Such a facultative dependency has been reported for several unionid species, including A. imbecilis (see review of literature by Fuller, 1974), although recent investigations have cast doubt on the phenomenon. Tucker (1928) demonstrated experimental infection of A. imbecilis on green sunfish (Lepomis cyanellus) and suggested that fish parasitism could be facultative in this species. Fish hosts of the same four unionid species found in ponds during the current survey were reported by Stern and Felder (1978) from two ponds in Louisiana. Previous records were summarized by Fuller (1974), except those for U. tetralasmus which were unknown until the report by Stern and Felder (1978).

4) Species tolerant of such ecological conditions would be expected to tend toward hermaphroditism. Such a condition is known to occur in A. imbecilis (Sterki, 1898; Van Der Schalie, 1970), but simultaneous hermaphroditism has been documented as the major reproductive mode for only five (Van Der Schalie, 1970) of the over 200 species of unionids in North America (Burch, 1975). Kat (1983) reported that the ratio of male: female gonadal tissue in A. imbecilis varies among populations with different habitats and population densities.

Summary

A survey of bivalve molluscs present in small ponds in east central Texas revealed four unionid species and one fingernail clam. Possible methods of entry of these species into ponds include natural phoresy and human-mediated means. Biological characteristics of species able to survive in these ponds in this geographical area include physiological tolerances, adaptable breeding systems, and phoretic capabilities.

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Table 1. -- Freshwater bivalves of ponds at study site, Henderson and Van Zandt counties, Texas. A. i. = Anodonta imbecilis; U. t. = Uniomerus tetralasmus; L. s. = Ligumia subrostrata; T. t. = Toxolasma texasensis; S. p. Sphaerium partumeium.

		Bivalve Counts					
Pond #	Area	A.i.	U.t.	L.s.	T.t.	S.p.	Species #
1	.34						0
2	.07						0
3	.49		18		5		2
4	.09		7				1
5	.01						0
6	.07		42				1
7	.13	3	22	9	42		4
8	.35	1	5	21	37	22	5
9	.02			13	2		2
10	.02						0
11	.18		15		3		2
12	.01						0
13	.04		45	4	27	18	4
14	.04		11				1
15	.03	1	1	27	21		4
Total Ponds (15)		3	9	5	7	2	-
Total Individuals (442)		5	166	94	137	40	-

MONOGRAPH

By H. Ode'

DISTRIBUTION AND RECORDS OF THE MARINE MOLLUSCA IN THE NORTHWEST GULF OF MEXICO

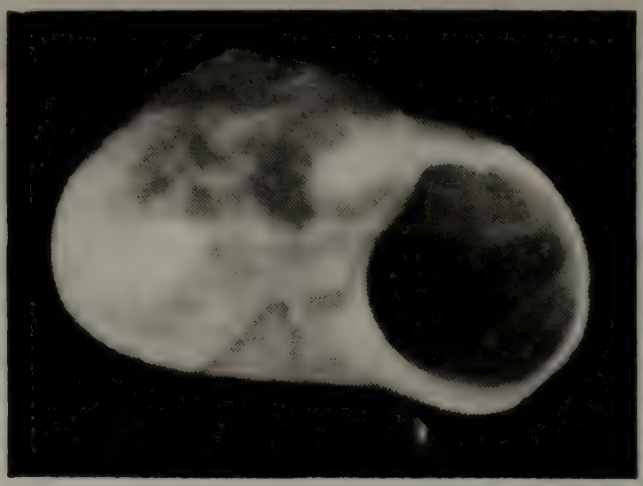
(A Continuing Monograph)

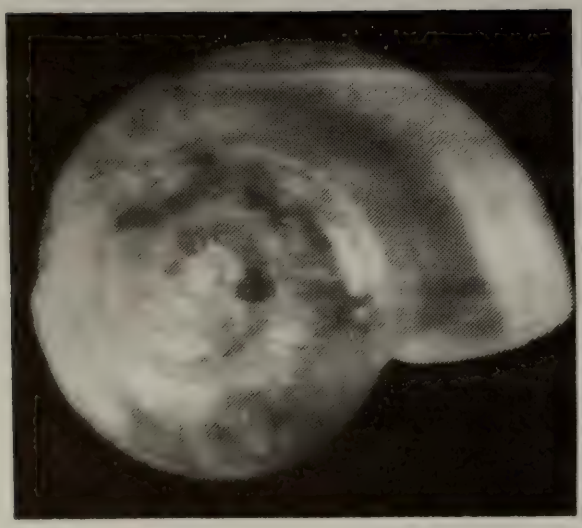
Family VITRINELLIDAE Bush, 1897 (continued)

Genus Pseudorotella Fischer, 1857

Before we treat this difficult group, it is necessary to give some explanation, because in the treatment of the teinostomatids we will differ considerably from Abbott's book. It is unfortunate that Teinostoma politum was selected as type species of that genus, because it is an aberrant group, not living in the Western Atlantic. In Teinostoma I will discuss here only those species which belong to the subgenus Idioraphe Pilsbry, 1922. This subgenus has small smooth species with umbilicus filled by a callus, also when immature, and with a callosity over the top of the shell. The higher, globose species with often a small and sometimes even and incomplete umbilical callus, which are usually placed in the subgenus Pseudorotella Fischer, will be separated here from Teinostoma and placed in a full genus Pseudorotella Fischer. There are some compelling reasons for doing this: 1). All species which we assign to Pseudorotella have a rather open umbilicus in their juvenile stages, and only later fill it up by a callus. 2). All these species are somewhat trochoid in shape; none is flatly coiled and none ever is overglazed by a callus. 3). All species in the Teinostoma s.s. and Idioraphe group have a filled umbilicus even in early juvenile stages, are flatly coiled and reach in maturity a what I call "cryptospira" stage; that is they are heavily overglazed by a callus on top. Dall, in his paper on the small shells of the Albatross dredgings, also had Pseudorotella as a full genus, but later workers, unfortunately, never adopted the idea. Corgan in 1967 coined a new and superfluous genus and, in any case, a not validated name. The difficulty is that Fischer assigned to Pseudorotella a type (P. semistriata Orb.) which in the recent literature has never been discussed or figured. Abbott (1974) lists this species, but does not figure it.

The following species belong to this genus, - perhaps not all truly different - which is well represented in the N.W. Gulf of Mexico: parvicallum, goniogyrus, incerta, alta, reclusa, solida, floridensis, cocolitoris, semistriata and minuscula. Six of these species have been collected in our region. There is at least one species in the Eastern Pacific: Vitrinella regularis C.B. Adams from Panama (see plate 28, fig. 2 in Pilsbry and Olsson, 1945 in the Proc.





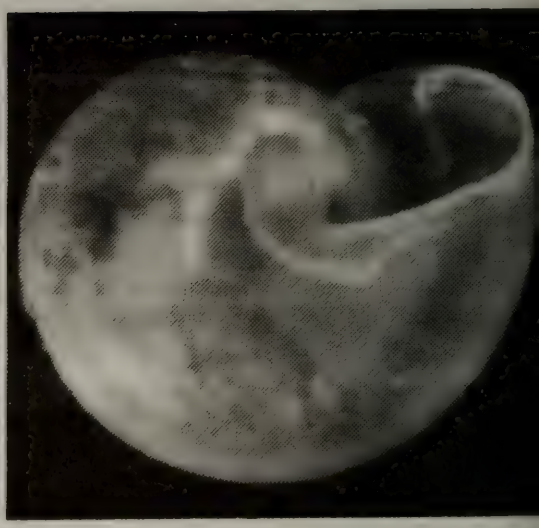


Fig. 1 *Pseudorotella parvicallum*, 1.5 mm, collected by diver H. Geis at a limestone lump off Padre Island, 35 miles north of Port Isabel, Texas on Sept. 25, 1966.

Acad. Nat. Sci. Phila Vol. 97) Also Keen (1971) lists a number of species.

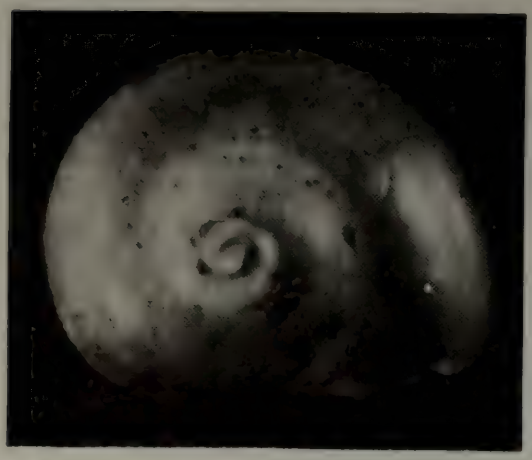
163. Pseudorotella parvicallum Pilsbry and McGinty, 1945

This widespread species is often dredged alive along the Texas coast and a few specimens are known from the beaches. (South Padre Island, Harbour Island, Aransas Bay and Matagorda Beach). Juveniles are much flatter than mature ones and have an open umbilicus which later completely fills. In any population one can find a number or specimens with a tendency towards a keeled periphery indicating a close relationship with the flatter P. goniogyrus Pilsbry and McGinty, which ranges from somewhat keeled to sharply keeled. Originally, Pilsbry placed these keeled species in a subgenus Ellipetylus, but later he - correctly in my opinion - rejected the name. It may be noted that the trivial name parvicallum does not change its ending when transferred to a genus of different gender. This is a typical offshore species common in the range of 8 - 30 fms off the Texas coast.

Records HMNS Survey Collection: 42 lots of which 5 contain live collected material.
Depth range: 8 - 50 fms; alive 10 - 28 fms.
Geographical range: Florida (Abbott, 1974)
Maximum size: 1.9 mm.

164. Pseudorotella goniogyrus Pilsbry and McGinty, 1945

In the original identification by Pilsbry and McGinty there was a species P. incerta, which is slightly keeled. Abbott left that one out when he used the key in his book and for good reason. In the extensive material we have available there is a gradual change from slightly keeled specimens (incerta) to sharply keeled ones (goniogyrus). In populations of many specimens one encounters almost rounded to very sharply keeled peripheries. The species is closely related to P. parvicallum; it is much more compressed. The part of the whorl above the keel is somewhat domeshaped recalling the form of Anticlimax. As in parvicallum, juveniles have an open umbilicus which only closes in maturity. In the rare instances that it remains open the shape of the umbilicus is as in Vitrinella s.s. This is another Pliocene fossil of Florida which has survived in the N.W. Gulf of Mexico and in this case also in Florida. The species is widespread along the Texas and Louisiana coasts. Also in the mudlump fauna. The eastern Pacific analogue of goniogyrus may well be P. percarinatum Pilsbry and McGinty, 1945 from Peru.



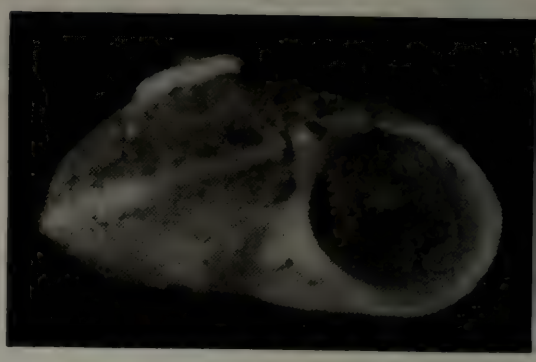


Fig. 2 Pseudorotella goniogyrus, 2 mm, collected by orange peel grab in 11 fms by the Bureau of Commercial Fisheries 40 miles south of Galveston, Texas April 17, 1966.

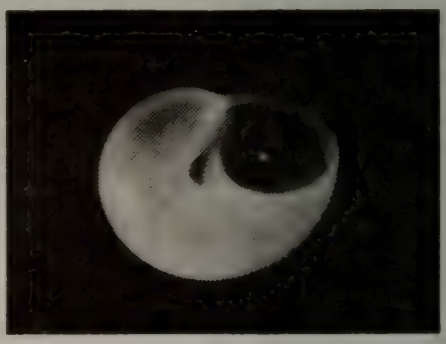


Fig. 3 Pseudorotella c.f. reclusa, 2.65 mm, collected by divers operating off USS Haynesworth DD 700 in 25 - 28 fms 113 miles southeast of Galveston, Texas October 7, 1967.

Records HMNS Survey Collection: 39 lots, of which two were collected alive.
Depth range: 8 - 55 fms; alive at 23 - 32 fms.
Geographical range: Florida (Abbott, 1974)
Maximum size: 1.8 mm (usually 1.3 - 1.5 mm).

165. Pseudorotella alta Pilsbry, 1953

This not uncommon species has been found in offshore waters all along the Texas and Louisiana coasts. Of all Pseudorotella it most resembles a small helicoid landsnail. Like all of the species in the genus, juveniles have a wide open umbilicus which is often closed in maturity, but in some populations even the largest specimens keep an open umbilicus, which is of the type of Vitrinella s.s. The species has been well described and figured by Pilsbry (in Olsson and Harbison, 1953) and little can be added to it here. It is apparently another Pliocene species that has survived in the North Western Gulf of Mexico. A closely related form in the Eastern Pacific (Panamic) is "Vitrinella" regularis C. B. Adams. (See Pilsbry and Olsson 1945, Proc. Acad. Nat. Sci. Phila. Vol. 97, pl. 28, fig. 2. Text Vol. 104, 1952). P. alta has a few times been collected on the beach (Galveston, Matagorda), also in the mudlump fauna. I suspect that P. cocolitoris Pilsbry and McGinty is the same. The shell figured as Solariorbis sp. B by Andrews 1977, p. 92 looks suspiciously like a few P. alta.

Records HMNS Survey Collection: 23 lots, no live material.
Depth range: 6 - 76 fms; also twice taken from beachdrift.
Geographical range: unknown.
Maximum size: 2.0 mm.

166. Pseudorotella solida Dall, 1889

From very deep water we have a single lot of this little known species which was described as Ethalia solida, Blake Rep. II, p. 362. Our specimen is quite similar to Dall's figure and his description fits our specimen well. The peculiar form is caused by the rapid descent of the body whorl. In essence, its shape is so much like that of P. parvicallum that I am inclined to believe that it is the deep water form of parvicallum. However, it is much thicker shelled and it should be noted that the aperture is somewhat different from that of parvicallum. In spite of the large size, implying some age, the umbilicus is not completely closed.

Records HMNS Survey Collection: 1 lot, no live material.
Depth range: 140 fms.

Fig. 4 Pseudorotella carinicallum, 2 mm, dredged in 25 fms by the Bureau of Commercial Fisheries 55 miles southeast of Freeport, Texas December 7, 1966.

Geographical range: Off Georgia, 440 fms; off Fernandina, Florida, 294 fms; Florida Straits, 310 fms (Abbott, 1974).
Maximum size: 2.0 mm.

167. Pseudorotella c.f. reclusa Dall, 1889

This interesting species has only been taken, sometimes alive, from the coral and algal reefs offshore Texas and Louisiana. Those specimens have a golden brown multispiral operculum. They are slightly tannish, ivory white, with rather thick shells which only in full maturity close the umbilicus, which in juveniles is wide open and internally grooved. Our specimens are slightly more rounded at the periphery than Dall's figure indicates and also the aperture in our material is rounder. I believe that this species should be in a yet to be named subgenus of Pseudorotella. It was reported earlier (Tex. Conch. Vol. 9, p. 62, 1973) as Teinostoma megalostoma (sic!).

Records HMNS Survey Collection: 7 lots of which two contain live collected material.
Depth range: 5 - 55 fms; alive at 24 - 31 fms.
Geographical range: Off North Carolina to Florida Keys and Yucatan 12 to 640 fms. (Abbott, 1974).
Maximum size: 3.2 mm.

168. Pseudorotella (Annulicallus) carinicallum Pilsbry and McGinty, 1946

The trivial name of this species should end on m, not s, as the authors have it. Only two lots of this remarkable species were obtained. I transferred it to Pseudorotella, because its upper surface is never glazed over by a callus. No juveniles are available to show that there is an open umbilicus in early stages. Our material conforms well with the description by Pilsbry in Olsson and Harbison(1953, p. 412). In our specimens the umbilical area, filled completely by a callus, is circled by a rather squarish ridge. On top there is a spiral ridge below which the apex is sunken. It should be noted that the upper spiral starts rather late and that immature specimens will not show one. The Eastern Pacific analogue of the species is P. ochsneri Strong and Hertlein, 1939.

Records HMNS Survey Collection: 2 lots, no live material.
Depth range: in 23 - 25 fms off Freeport.
Geographical range: South half of Florida to 70 feet; Bocas, Panama, (Abbott, 1974).
Maximum size: 2.0 mm.

Genus Teinostoma H. and A. Adams, 1853

As stated in the discussion of Pseudorotella, we restrict this genus to those species which are flat, have a full umbilical callus also when juvenile, and are overglazed by a callus over the top. Teinostoma s.s. does not occur in the Western Atlantic, but there are a number of species in the subgenus Idioraphe Pilsbry, 1922. As in many other groups studied so far for the N.W. Gulf of Mexico teinostomatids correspond but poorly with the recent species in Florida, but resemble those described from the Pliocene fauna of Southern Florida much better. Concerning the Panamic fauna I can make no statements yet. In the N.W. Gulf of Mexico there are 6 species of which only two live in Southern Florida.

A difficulty in identifying species in Teinostoma is the considerable change in shape during growth of the shell and the change in proportion of height to diameter during development. Juveniles start out with a relatively large ratio, which diminishes during growth, because the diameter increases more that the height, but in some species during maturity when the surficial callus is deposited over the top the ratio increases again. In all species of Idioraphe a socalled "cryptospira" stage is reached. It is easily seen in those specimens which died under circumstances causing the vitreous shell material to become milky white or tan in color. In live collected or very fresh material the "cryptospira" stage can only be established by looking under the correct lighting conditions in the microscope, because the underlying whorls shine through the clear glassy material of the surficial callus. The subgenus Idioraphe is poorly represented in the Eastern Pacific.

169. Teinostoma (Idioraphe) tectispira Pilsbry, 1953

It was discovered that the material reported earlier in the Texas Conchologist (Vol. 6, p. 3. 1969; Vol.9, p. 61, 1973) as T. biscaynense is in reality a mixture of three species. My attention was directed toward such a possibility by Abbott's information about the range of T. megastoma C. B. Adams which is "North Carolina to the Western Caribbean," i.e. Jamaica from where C. B. Adams described it (see Clench and Turner, 1950). Many of the species not reported for Southern Florida and often not living there, but present on the Yucatan platform and in offshore waters off the Carolinas, occur often also along the Texas coast. Careful inspection of our rich teinostomatid material established at once that the material in the past identified as T. biscaynense is in fact a mixture of three rather similar species. The separation was only possible because so much

material was present. As is usual, it is not easy to correlate Texas teinostomas with those described from the recent fauna of Florida; correlation with Pliocene species from the St. Petersburg area is more satifactory. Two of the three species are small and rather flat, the third one is, when mature, much larger, rather fat, but flat on top and often strongly "humpbacked." By this I mean that its highest point is not the nucleus but a point on the body whorl about 1/4 turn from the aperture. It is caused by the overglazing of the shell by a callus.

The smallest species is labeled here T. tectispira Pilsbry. This is a small disclike shell with a slightly dome shaped whorl, sometimes with a low hump as shown in plate 50, fig. 6b in Olsson and Harbison (1953). Its aperture, seen in side view, is long and oval. It can be separated from its closest relative, the other small species, by looking at it bottom up: then the aperture is slightly rounded but that of the other is almost a square and its umbilical callus is much thinner than that of tectispira. One of these species undoubtedly is T. biscaynense. For the sake of definiteness we will call the second species T. biscaynense and the first T. tectispira but the reader must realise that this is more or less guess work. In general T. biscaynense shows a more minute elevation at the apex and often has the overglazing on the suture of the body whorl somewhat depressed so that even in the "crystospira" stage one can see the suture as a discoloration. The third species will be discussed under its own heading.

Records HMNS Survey Collection: 30 lots of which 3 contain live collected material, only from the beaches and the coastal bays (South Padre, Matagorda, San Luis Pass, Matagorda Bay, East Matagorda Bay and Galveston West Bay). Also collected in the mudlump fauna, but probably is recent.
Depth range: 0 - 3 feet.
Geographical range: Only known from the Pliocene of Southern Florida.
Maximum size: 1.6 mm.

170. Teinostoma (Idioraphe) c.f. biscaynense Pilsbry and McGinty, 1945

With some hesitation we assign the above label to this species. In a mixed set of material one can immediately pick out this species when looking at it bottom up. Many other view it is suprisingly close to the previous species. Large specimens grow larger than those of the previous species. For other

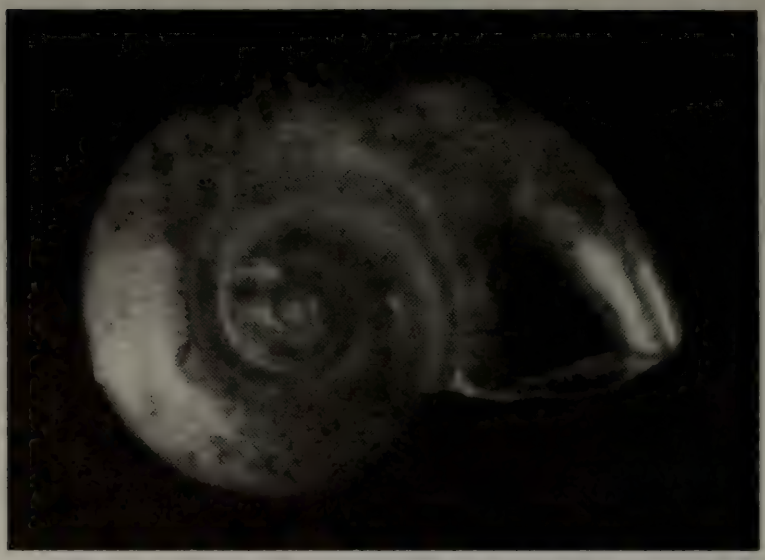


Fig. 5 Idioraphe megastoma, 1.9 mm, collected by diver H. Geis in 8 fms 32 miles ESE of Galveston, Texas November 8, 1964.

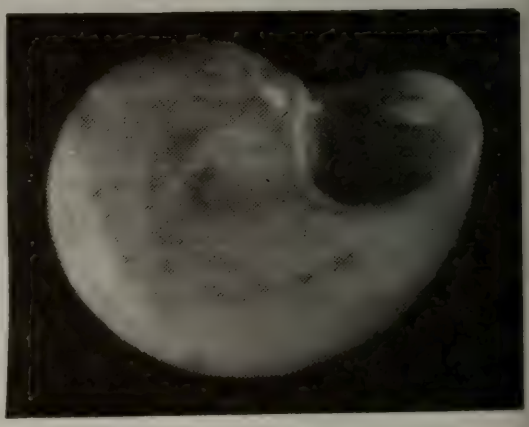


Fig. 6 Idioraphe lerema, 1.5 mm, dredged in 25 fms by Bureau of Commercial Fisheries 55 miles southeast of Freeport, Texas December 7, 1966.

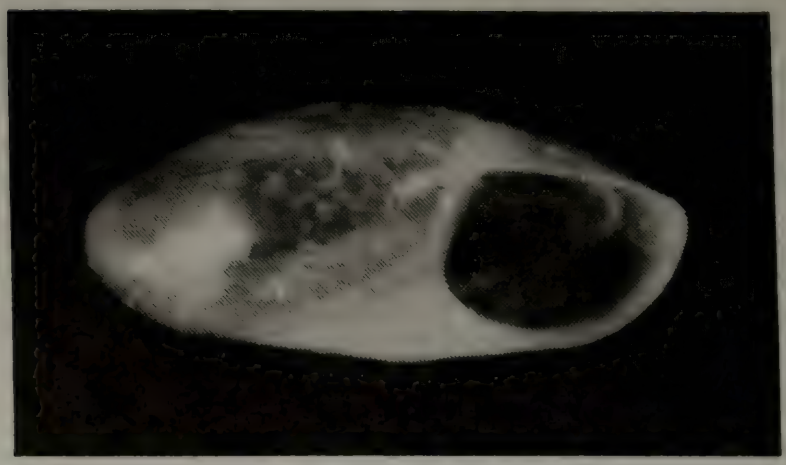
information we refer back to the discussion of T. tectispira. T. biscaynense has a dark brown multispiral operculum.

Records HMNS Survey Collection: 18 lots of which two contain live collected material. One broken specimen at 9 fms at Galveston is probably adventitious. Mostly from beaches (South Padre Island, Matagorda, Galveston and Matagorda Bay and Christmas Bay).
Depth range: 0 - 3 feet.
Geographical range: Florida to Texas (Abbott, 1974).
Maximum size: 1.8 mm.

171. Teinostoma (Idioraphe) megastoma (C. B. Adams, 1850)

This is the species that in Texas faunal lists usually gets reported as biscaynense. It reaches a much larger size than both previous ones, is much fatter and what is important lives exclusively offshore. It was only once collected in bay environment, on a small beach at Indianola in Matagorda Bay, where more non-bay species have been collected (probably from a fossil beach ridge?). Juveniles are quite flat on top and are fat looking. Early in life the new whorl overrides the previous one quite high, and this causes a much wider aperture than in both previous species. In juveniles the umbilicus is already completely filled by a callus but in this species one can find - rarely - specimens in which it has remained at least partially open. This and the fact that in Vitrinella one may find specimens -(also rarely)- in which the last whorl overrides the previous one indicates that Vitrinella and Teinostoma are not far apart. In many specimens the last whorl is somewhat expanded toward the aperture. Thus the general shape in many mature specimens becomes somewhat elliptical. This is not the species, which in Vol. 9 of the Tex. Conchol. (p. 62) 1973, I listed as T. megalostoma (sic!). The latter is now listed under Pseudorotella. The figure in Vol. 6 of the Texas Conchol. (p. 97) is not correct. The three small rather white specimens to the left may be biscaynense but the two fresher and larger specimens are definitely megastoma. Also the figure of biscaynense in Andrew's book is this species. It is a rather fresh specimen, just mature, which has reached its "cryptospira" stage, i.e. it is completely but not thickly overglazed and has not yet become clearly humpbacked, although this could only be seen clearly in a side view.

This is by far the fattest of all Texas small teinostomas. In spite of its size the umbilical callus is one of the least developed in Texas small teinostomas. The species is typical offshore: off



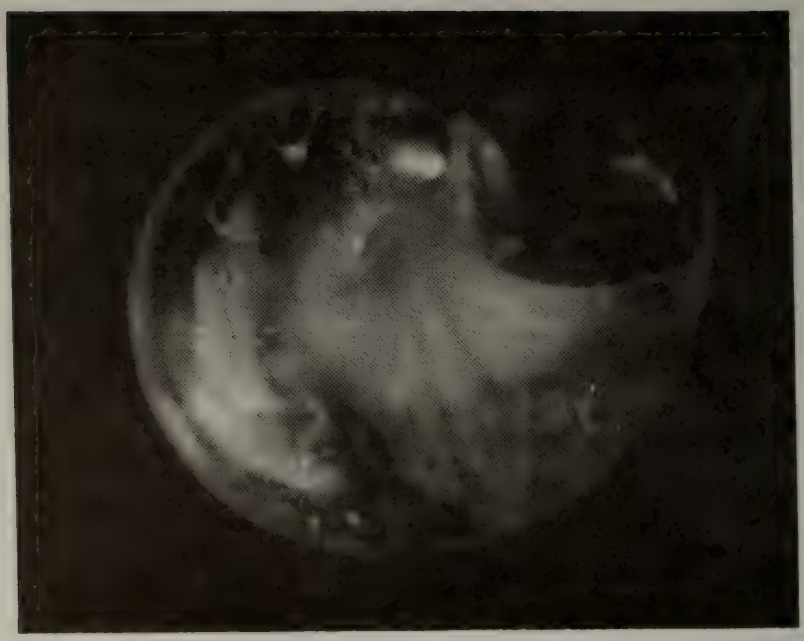


Fig. 7 Idioraphe cryptospira, 2 mm, grab sample from 140 fms 102 1/2 miles southeast of Freeport, Texas by H. Geis and S. Stubbs July 18, 1967.

Galveston, Heald Bank and Ship Shoal, Louisiana and in beachdrift, from South Padre Island along the entire Texas coast. Also taken in the mudlump fauna.

Records HMNS Survey Collection: 36 lots, of which 3 contain live collected material.
Depth range: 8 - 67 fms; many lots from beachdrift; alive at 0 - 23 fms.
Geographical range: North Carolina to the Western Caribbean (Abbott, 1974).
Maximum size: 2.5 mm (usual size of beach material: 1.8 - 2.0 mm).

172. Teinostoma (Idioraphe) lerema Pilsbry and McGinty, 1945

This, the smallest of all Texas Teinostoma, is fairly widespread along the Texas coast; in the bays it is usually mixed with either tectispira or biscaynense. Its shape is very flat and the last whorl expands considerably in width toward the aperture. Taken alive in Matagorda Bay and Christmas Bay and in 8 fms in offshore waters off Galveston. It also occurs as probably Pleistocene fossils on Heald Bank (old brown semicrystallized shells) and fresh looking specimens were collected on Stetson Bank. It should be noted that the spelling "leremum" is incorrect. The figure in Andrew's 1977 does not represent this species but might be a worn Pseudorotella.

Records HMNS Survey Collection: 23 lots of which 4 contain live collected material.
Depth range: 0 - 26 fms; alive at 2 feet - 8 1/2 fms.
Geographical range: Lower keys to Texas (Abbott, 1974).
Maximum size: 1.4 mm (usual .8 - 1.0 mm).

173. Teinostoma (Idioraphe) cryptospira Verrill, 1884

This is a rare species in the N.W. Gulf of Mexico of which there are only 4 lots in the survey collection. It lives very much deeper thatn all the other species of the genus. The shell is shaped like a regular discus, quite flat and regular. The umbilical callus is very small and the callus line on top is much more spirally curved than in tectispira or biscaynense. This was reported as Teinostoma sp. indet. C in Vol. 9 Tex. Conchol.

Records HMNS Survey Collection: 4 lots, of which 1 contains live collected material.
Depth range: 51 - 167 fms.
Geographical range: North Carolina to the West Indies, 30 - 150 fms (Abbott, 1974).
Maximum size: 1.9 mm.

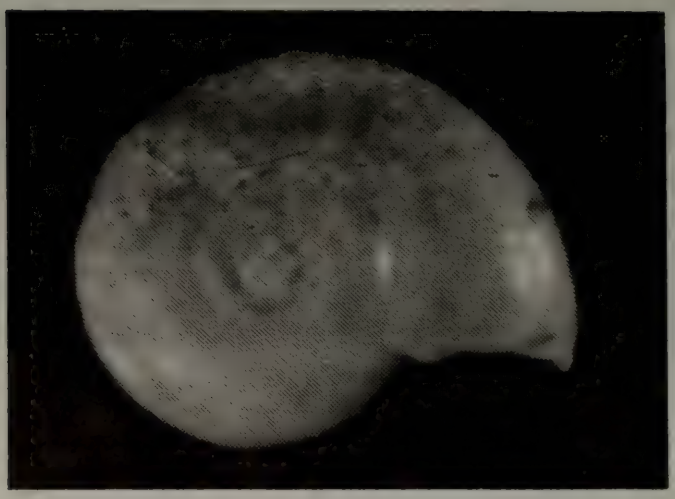


Fig. 8 Idioraphe avunculus, 2 mm, collected by orange peel grab 40 miles off Galveston, Texas in 11 fms by the Bureau of Commercial Fisheries April 17, 1966.

174. Teinostoma (Idioraphe) avunculus Pilsbry, 1953

This species was described as a Pliocene fossil from Florida. It shows definite relationship with the genus Pseudorotella in which Pilsbry placed it: it is higher spired than all other Idioraphe of the region and the umbilical callus is not smooth as in Idioraphe, but deposited in "wave-like" pachets. Nevertheless, I place it here because there is clear indication that in a few specimens - most material is rather worn - there is a very thin callus over the top. In some can be seen under correct lighting small reflecting striae over the suture. Only obtained from offshore, but shallow, dredgings. It could be a Pleistocene fossil.

Records HMNS Survey Collection: 6 lots, no live material.
Depth range: 6 - 10 fms.
Geographical range: Pliocene of St. Petersburg, Florida.
Maximum size: 1.8 mm (size of fossil given by Pilsbry: 2.3 mm).

At this point I may speculate briefly about the correspondence of the molluscan fauna in general and the vitrinellid fauna in particular with that of the Florida Pliocene and the Eastern Pacific (Costa Rica, Panama, Colombia, Ecuador). The closing of the Isthmus and the emergence of Florida changed the habitat in the Eastern Gulf over the Florida shelf but in the Western Gulf the situation remained largely as it was. The Mississippi River continued to bring in large volumes of particle loaded water that mainly flowed to the South West. Colored plumes of water can still be seen clearly on NASA photographs. It is probable that this screen of water acted as an impediment to the dispersal of the more modern Southern Florida molluscan fauna into the N.W. Gulf. Moreover the high content of clastics in the Mississippi water does not favor the Florida fauna. It is possible that water temperatures played a role. The most northerly coral and algal reefs are at the southern edge of the Texas shelf and were probably "seeded" from the Yucatan platform, not Florida. Their fauna is considerably different from the fauna of such prominences as Stetson Bank and Claypile Dome on the shelf which are Miocene shale uplifts harbouring an "old" fauna. In fact, the entire shelf area from the mouth of the Mississippi to the Rio Grande was essentially shielded from outside influences in the last million years or so. This, in my opinion, is the reason that in this stretch of coastline still live so many older forms and species related to Eastern Pacific species.

Genus Episcynia Morch, 1875

Only a single species in the N.W. Gulf of Mexico, which is immediately recognized by the finely serrated keel around the periphery.

175. Episcynia inornata (Orbigny, 1842)

Deeply umbilicated by a rather narrow umbilicus. Usually opaque white, but sometime glassy. Rather unusual and quite rarely on the beach, so far only in South Texas. Fresh material has a periostracum that is fringed, but we have not seen any in Texas material. Some specimens have lost the serrations around the periphery or intervals of serrations, leaving a rounded periphery. Apparently the serrations are cemented on by the animal when the main whorl is already in place. E. multicarinata is probably the same as this species, but very few specimens in our collection show a base with "strong radial riblets" (a character of multicarinata). In a few mature specimens some radial ribbing starts to develop. In juveniles the base is quite smooth. In our collection also is a specimen that with the same diameter is twice as high as the others and with a quite narrow umbilicus. I consider it pathological. There are 3 Eastern Pacific species.

Records HMNS Survey Collection: 28 lots, no live collected material.
Depth range: 8 - 70 fms. One lot from along South Padre Island causeway.
Geographical range: Texas and the Greater Antilles.
Maximum size: 3.3 mm (broken, if complete about 4 mm).

Genus Anticlimax Pilsbry and McGinty, 1946

The original name for this genus was Climacia, which was found to be preoccupied. Thus the name was changed to Climacina. When that name proved to be preoccupied too, in desperation the genus was baptised Anticlimax. Flat based, dome shaped shells, and carinate periphery. Aperture in mature specimens triangular.

176. Anticlimax (Subclimax) pilsbryi McGinty, 1945

This beautiful domeshaped species is not common in dredged material or in beachdrift. It is a rather substantial shell, ornamented with closely spaced spiral grooves. The base carries about ten oblique low radial wavelets, and the umbilicus is filled by a partial callus. In mature specimens the aperture changes shape because the lower corner is produced to a point away from the shell, and the entire aperture

gets surrounded by a threadlike thickening, typical in Subclimax and Vitridomus. There is an Eastern Pacific analogue (Costa Rica)(A. willetti).

Records HMNS Survey Collection: 12 lots, no live collected material, most from the bars: Galveston West Bay, Matagorda Bay, Aransas Pass and South Padre Island. Also from offshore at a limestone lump off Padre Island and at 50 fms. This probably is adventitious or fossil.
Depth range: 0 - 50 fms.
Geographical range: Southeast Florida to Texas (Abbott, 1974).
Maximum size: 3.1 mm.

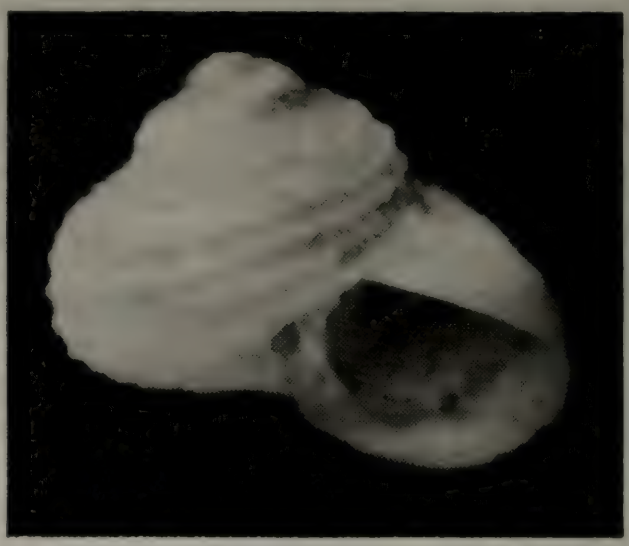
Genus Vitridomus Pilsbry and Olsson, 1945

Widely umbilicated, bluntly carinated at periphery, domeshaped body whorl, and somewhat sunken apex. So far only known from the Eastern Pacific.

177. Vitridomus texana (Moore, 1965)

Originally described by Moore as Vitrinella texana (Nautilus Vol. 78, page 76, 1964). A single specimen was collected at the South Padre Island Causeway Bridge. Another fragmentary specimen was dredged offshore Galveston in 24 fms. It is quite different from Anticlimax in that the elevation of the apex is lower than the highest point of the body whorl. It is a rather rare species. So far, it was know only from Port Aransas. The specimen from South Padre Island shows on its underside some fine spirals near the periphery and some radial riblets. The umbilicus is wide without a callus. On the upperside there are a number of fine threadlike spirals close to the suture which is rather deep. The aperture is somewhat trumpetlike with a small ridge around it. Such reinforcement is typical for Subclimax and Vitridomus. As in Anticlimax the final shape of the aperture is only assumed in mature shells. Andrews (2nd edition, 1977) figures a Vitrinella species for this species. The correct figure can be seen in the original paper of Moore in the Nautilus. As far as I know this species has never been found alive. To be noted here is that "domus" is of the feminine gender in Latin, and hence texana, not texanus. There are two Eastern Pacific species for the genus.

Records HMNS Survey Collection: 2 lots, one from beachdrift along South Padre Causeway, and another from offshore Galveston at 24 fms.
Depth range: 0 - 24 fms.



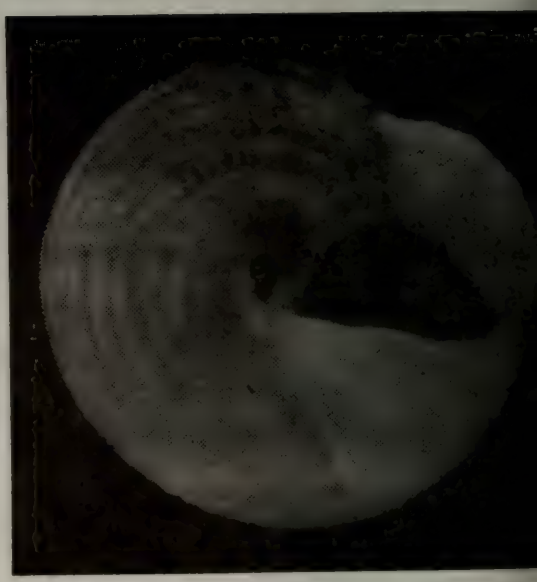


Fig. 9 Parviturboides interruptus, 2 mm, dredged in 10 fms by Bureau of Commercial Fisheries 21 miles south of Galveston, Texas on September 1, 1966.

Geographical range: Texas (Abbott, 1974).
Maximum size: 2.1 mm.

Genus Parviturboides Pilsbry and McGinty, 1950

This genus occupies a quite separate spot in the Vitrinellidae, and I believe that it does not belong in the family. Moore has studied the animal of P. interruptus in detail and found that it belongs in the Rissoacea. Detailed comparisons with other genera in the family are highly desirable. In his Ph.D. thesis Corgan (1967) placed Parviturboides in its own family. The complete separation of the nucleus (about two whorls) from the abrupt beginning of the teleoconch is not found in other small vitrinellids except Aorotrema, another doubtful member, but probably not related to Parviturboides. Also the turboid shape of Parviturboides is unique in the family. In the Northwest Gulf of Mexico a single species. There are several Panamic species.

178. Parviturboides interruptus (C. B. Adams, 1850)

This widespread little snail is abundantly dredged alive in coastal waters off Texas and Louisiana and also has been taken alive on the beaches at Mustang and Padre Island. Two lots only were collected in Matagorda Bay. C. Boone collected a number of live specimens under a rock near the coast guard station at South Padre Island in 1981. It is regularly taken in large numbers offshore, and once from a waterlogged piece of wood full of teredinid borings where it lived in great profusion in empty bore holes together with the rare Vitrinella hemphilli. A figure of this species was published in the Tex. Conchol. Vol. 7, p. 65, 1971. There are several synonyms. Also in the mudlump fauna.

Records HMNS Survey Collection: 43 lots of which 17 contain live collected material.
Depth range: 0 - 32 fms. One lot of probably adventitious shells from 70 fms. Alive at 0 - 26 fms, but the majority ffrom 15 - 25 fms.
Geographical range: South half of Florida, Texas and the West Indies.
Maximum size: 1.9 mm.

Genus Aorotrema Schwengel and McGinty, 1942

This rather strange genus is another socalled vitrinellid genus in which the protoconch and the teleoconch are sharply separated. For this reason Corgan places it close to Parviturboides, but this remains highly questionable and a decision must await study of the soft parts. The nucleus

consists of at least two whorls and appears to be heterostrophic. For that reason perhaps Aorotrema ought to be aligned with Cyclostremella. For the time being I will leave it in the Vitrinellidae. These minute shells are strongly carinate, with keels at the top and periphery of the whorls so that the whorl becomes strongly tabulate. Umbilicus funnel shaped.

179. Aorotrema cistronium (Dall, 1889)

This small species was described by Dall as Cyclostrema cistronium in the Blake Report, Vol. II, p. 394, and reported from off North Carolina in 22 - 63 fms. This easily recognized species with two enormous flange-like keels, between which and on the underside are numerous fine spiral lines of punctations is somewhat unusual offshore. The species has only once been taken from the bays but never from the beach (Galveston West Bay, probably Pleistocene). Corgan unwisely reported it under a new name from the mudlump fauna, from where we also have it in the survey collection.

Records HMNS Survey Collection: 11 lots, of which 2 contain live collected material.
Depth range: 7 1/2 - 51 fms; alive at 12 - 25 fms.
Geographical range: off North and South Carolina, 22 - 63 fms. Also Pliocene (Abbott, 1974).
Maximum size: 2.0 mm.

(To be continued)

FROM THE EDITOR

A special offer of the Ode Monograph on Northwest Gulf Mollusca is made for a limited time. Starting with the list of references in Vol XI, No. 1, through the report on bivalves and proceeding to gastropods to the current volume, we can provide sets at the extremely reasonable price of $35.00, plus $5.00 postage for delivery in U.S. zones. Postage for seamail delivery outside U.S. postal zones is $10.00. Send checks and orders to the Editor.

Search and Seizure, the Editor's column, will return in future issues. Articles submitted by other members provided abundant copy for this large issue. We are very pleased to have such material. Keep it coming.

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TEXAS CONCHOLOGIST, Vol. XXIV, No. 2, January, 1988

MY FIRST CLAM CHOWDER

By Flora Young

I woke to the sound of rain on the air conditioner and was afraid the field trip would be called off or ruined. As a new member the field trips were a highlight of each month. Growing up in West Texas doesn't provide much opportunity to collect sea shells, especially ones containing the original builder, and today we were to be looking for Mercenaria mercenaria in or near Christmas Bay.

My sister, Margaret Day, was visiting from Fort Stockton, Texas, and we bought waders after checking with Bob McElroy, Field Trip VP, about the kind to buy. None of the waders looked the right size, so we bought three different sizes and hoped they would fit.

The sun came out, the rain stopped for a while and we met with other club members under the Galveston end of the San Luis Bridge. I was glad to see there were other optimists in the group, because the forecast was for 40% chance of rain.

Bob, Pat McElroy and Mary Martin were very helpful in showing us what to look for and how to do the "Belize Shuffle" so we could locate the shells in the muddy bottom of the bay. The shells were embedded in mud in water about three feet deep and we dug them up with our fingers. The water was too muddy to see the bottom, and the tide was higher than expected. I found that a watch pinned to your collar doesn't stay dry under those circumstances.

Pat McElroy said Dr. Pulley used to make clam chowder after the field trips and was always glad to take home the ones no one else wanted. When I asked about recipes and how to prepare them, Pat said to steam the shells until they opened, cut off the black parts, cut the meat into small pieces and use lots of onions and potatoes. Everyone shared their shells with me, and I came home with nineteen, some pretty big--as much as 4 or 5 inches across.

I had never cooked clam chowder before and figured these clams were probably the freshest I would ever have, so I called Connie Boone for more information. She said Dr. Pulley also used carrots, celery, butter, and milk to make a rich soup, and a food processor to cut up the meat.

My husband, Cecil, said he would cut off the black parts and dice the meat fine. After several tries he found that the easiest way to clean them was to split them as if you were fixing butterfly shrimp and rinse them under running water. During this time Margaret's face showed her doubts about the taste of anything that you dug out of mud from Galveston Bay.

As it cooked, the mixture began to smell better and better

and finally was done. Cecil and Margaret were definitely waiting to see if I was willing to try it first. My sample led to a bowl full, and they joined me. The flavor was surprisingly good. There was only one problem; some of the meat was tender but sometimes we would find a piece of meat that had the texture and flavor of an old inner tube. Before I try it again I would like a food processor and more instruction on clam anatomy.

John Day, Margaret's son, thought the whole day sounded "real cool", but the final comment was Cecil's when I suggested taking the rest of the chowder to our son's dog and cats, "I don't think they'll eat it."

DR. PULLEY'S CLAM CHOWDER RECIPE

Scrub with a stiff brush about a dozen clams (*Mercenaria mercenaria*). Place them in a large pot with 2 cups of water and bring to a boil. Reduce heat and steam slowly until the clams have all opened and the meat breaks cleanly from the shell. Save the broth.

Remove the clam muscles and the tough part of the foot. These parts will have to be ground or chopped into very fine pieces in a food processor. Cut through the main body of the clam and rinse to remove much of the green material in the digestive gland. This is mostly diatoms (one-celled plants), and it need not be removed if you don't mind the color it gives the chowder. Chop up the remaining body meat. This part can be cut with a knife on a chopping board, since it is not as tough as the muscles and foot.

Peel and cube 4 or 5 medium size California or red potatoes and bring them to a boil in salted water. Boil them for 10 minutes, and then pour off the water. Leave them covered; they will be added to the chowder later.

Now fry 6 strips of bacon until crisp. Remove the bacon and add a chopped onion to the grease. When the onion has become semi-transparent, add enough flour to give the mixture the consistency of thick cream. Brown the flour over low heat while stirring constantly.

When the flour is lightly browned, stir in enough of the clam broth to make a thick gravy. Add all of the clam meat. Cook this for 10 minutes while stirring constantly.

Add the potatoes and enough milk to thin the mixture to proper chowder consistency. Bring it back almost to boiling, but don't boil it after the milk has been added. Crumble the bacon and add it to the chowder.

Add salt and black pepper to taste, and place a pat of butter in each bowl as it is served.

BOOK REVIEW

By H. Ode'

New Caribbean Molluscan Faunas by Edward J. Petuch. 154 pages, 28 plates in black and white. Coastal Education and Research Foundation, Charlottesville, Virginia, 1987. $32.50.

In this well printed and well illustrated book no less than 109 new species of mollusks are described. I find the title misleading because the book only is a well edited list of descriptions of new species, the majority of which are in such "collectors' families" as Conidae [24 new species!], Muricidae [19 new species!], Olividae [8 new species], Volutidae [4 new species] and other sought after groups.

While investigating the contents of this book I realized that it exemplified exactly what Prof. Jay Gould has called the thorny and impenetrable thicket of formal taxonomy because it emphasizes the single species - in this case the new and undescribed species - and gets away from the subject it mentions in its title. It is unfortunate indeed that Petuch has not emphasized and exemplified more his statements about the relict faunas in the Caribbean region and given the reader at least a fleeting glimpse of the total faunas of these "relict" areas.

Depending on where one works, that area is always one of the most interesting regions of the ocean, -in this case the Western Atlantic. Several years ago I wrote that the Texas-Louisiana shelf area is unsurpassed in variety of environment. Petuch makes the same statement for Florida. A discussion of this matter would be more interesting than the naming of 24 new cones or three new species of Modulus, many of which can hardly be called species but are not more than morphs arising within the rather elastic bounds of natural variability. To study why such morphs arise would be of importance, how long in time they last and how large their geographical range is, if there are differences in biology etc. - all are problems worthy of detailed attention. Especially Petuch's statement that the socalled Caribbean fauna is an agglomeration of faunas which are considerably different in many smaller basins deserves a far more complete treatment than a mere statement because I strongly suspect that it might be true. But a few "new species" of some showy groups of mollusks cannot dispel any reasonable scepticism about the statement.

All in all, 30 families are listed. The question arises whether the species in the other ± 170 families in the Caribbean are subject to the same variation. And finally, there is the problem that caught my attention many years ago and that so far nobody has really tackled. What are the precise relations between the Panamic and the Caribbean faunas? Concerning the choice of families to investigate

faunistic relationships by Petuch I may remark that in my opinion such relationships are better investigated by a study of the smaller gastropods. Petuch only considered those families that produce giants.

I found it difficult to understand the author's concept of species. In hardly any description of these 109 species is the animal mentioned or opercula shown. This may be unavoidable in many cases because no animal is obtained, but in the present case much material was trawled. I myself have always stayed away from most families Petuch treats here because of the often almost unsuperable taxonomic difficulties created over many years by over enthusiastic shell collectors.

The omission of mention of the viewpoint of others is a serious defect of this publication. For instance, Houbrick in his article on the genus Cerithium (Johnsonia, Vol. 5 (50), 1974) is very explicit in assigning C. biminiense Pilsbry and McGinty to C. lutosum and even figures a specimen of the socalled C. lindae Petuch on pl. 42, fig. 8. Petuch considers both as endemics different from each other and from C. lutosum. If every small local race is promoted to an "endemic" species then the number of gastropods will increase twenty fold.

Undoubtedly a number of these species described by Petuch will be new but most taxonomists with a less restricted species concept will have difficulty with this publication.

Finally, I must take issue with a statement by Petuch in Chapter 1. Not being a professional malacologist, I am not in need of a defense against the allegation of "arrogant pronouncements of knowing everything there is to know about the systematics of Caribbean mollusks." Such polemics are out of place in any book on mollusk taxonomy. Petuch ought to realize that disagreement about scientific matters is a sign of good health and that species will last a long time. Everyone realizes that new names will be added to faunal lists for many years to come but such lengthening does not constitute the discovery of "entire new faunas."

All in all, this is a disappointing book that will raise many eyebrows, because so many more important problems vie for the attention of too few malacologists.

SHAKING AND BREAKING

By Darwin G. Alder

The further one drives, the longer one walks, the more one bends, stoops, shakes, and breaks, the greater the possibility of finding shell treasures.

Over the years that I have been shelling, I have explored the majority of the locations around the Gulf of Mexico, from inside the nearby border with Mexico, to the tip of Key West.

I have several favorite shelling spots and areas. One of my most favorite is that portion of Texas around Port Aransas and Corpus Christi. Many beautiful and varied shells are found in the beach drift, the open ocean, and the protected bays.

In the area indicated above, I have found the following shells:

Sea Whip Simnia	Baby Ear
Mitchell's Wentletrap	Pear Whelk
Flame Auger	Lightning Whelk
Atlantic Distorsio	Eastern Murex
Angulate Wentletrap	Apple Murex
Brown-banded Wentletrap	Virgin Nerite
Giant Atlantic Cockle	Stepping Shell
Yellow Cockle	Horse Conch
Scotch Bonnet	White Crested Tellin
Tun Shell	Bay Scallop
Common Atlantic Auger	Striped False Limpet
Sundial	Rock Shell
Quahog	Cayenne Keyhole Limpet
Winged Oyster	Coquina Clam
Atlantic Pearl Oyster	Jewel Box (valves)
Disk Dosinia	West Indian Worm Shell
Moon Snail	Morton's Egg Cockle
Dove Shell	Melampus
Plicate Horn Shell	Boat Shell
Janthina	Slipper Shell
Alternate Tellin	Lucine
Lettered Olive	Bubble Shell
Fighting Conch	Incongrous Ark
Banded Tulip	Periwinkle
Cross-barred Venus Clam	Sunray Venus Clam

1987 was a very good year for shells. It started out with about 2,500 assorted wentletraps at Quintana Beach. St. Joseph's Island yielded numerous tun shells, some still living. The West Coast of Florida was good for a number of different shells: tulips, cones, fighting conchs, sunray venus clams, winged oysters, pear whelks, lightning whelks, prickly cockles, giant atlantic cockles, simnias, scallops, olives, murex, wentletraps, and horse conchs. In the summer, trips to South Texas and upper Mexico were very

profitable. Near the Rio Grande, I found numerous sundials, tellins, dosinias and about 5/6 of a flame auger. Near Lauro Villar Beach in Mexico, I found six live Eastern Murex, probably brought in by fishermen. The last part of August and the first week in September I was in California. I collected over 50 different species for my collection: top shells, razor clams, pismo clams, limpets, chitons, periwinkles, mussels, and scallops. My live shelling was done with a camera. (Ed. note: Shelling is banned in California. Darwin got a license as with that in hand you can collect some edible species, but Darwin took dead shells with permission from park rangers, he says.)

When I shelled the outer beaches of St. Joseph's Island and Padre Island in October,I shook many pounds of sea whip and found over 400 simnias. They ranged in color from light yellow to orange to burgundy. The ones with the reddish tint were the most uncommon. Individuals would have a mixture of colors on occasion, which would indicate that they had fed on different colored sea whips and were quite mobile. Many other shells fell out of the clumps of sea whip, sargassum and other materials. Some were live and some had hermit crabs. There were over 10 different species. Sea Rim State Park, about 10 miles south of Sabine Pass is a good place to find a lot of small wentletraps, especially brown-banded wentletraps.

The more one shakes and breaks, bends, stoops, flies, drives and walks, the greater the chance of finding sea treasures.

(Editor's Note: In this issue, we publish two articles by members who used common names throughout their discussions. We encourage members to use our very good club library to begin to learn the Latin names and to use them in lists. Darwin's story listed Stepping Shell, and we had to ask him what this was since we never use that common name. When we found out it referred to Pedipes mirabilis we had to chuckle since that little shell is one of our favorite shells. It looks like a little red berry; it leaps along with its foot; it has a strange grinning-tooth aperture. It can be found alive under rocks on the jetties from Port O'Connor South to South Padre at the splash zone. It seems to have several common names! Janice originally wrote that when she went on the shelling trip to the Bahamas she didn't know the difference between a Marginella and a Marginata. We had to call and ask what a Marginata was and found out it was a plant. So we changed the story to list two shell names as she had not indicated that Marginata was a plant! The rest of her names were common names taken from a simple shell guide).

SHELLING IN ELEUTHERA, BAHAMAS

By Janice Dellar

I have been an avid beachcomber on a dozen Caribbean islands for the past 15 years. I have enjoyed collecting shells for their beauty but never bothered with identification. Deciding it was time to see what a shelling expedition was all about, on July 4, 1987 I flew to Ft. Lauderdale to meet with other shellers. We were traveling to Eleuthera with Pete Bright of Kirk Anders Travel, and guide, Bob Pace, an avid collector from Florida. What a motley group!! There were 21 of us . . . ages ranged from 18 to 70 from Washington State to Maryland to Florida.

After checking into our "far from plush, but clean" hot pink motel, we all grabbed our snorkel gear and crossed the street to the beach. We occupied all nine rooms-each was a 2 bedroom/1 bath apartment with porch (renting for $50.00/night and sleeping up to 4). That afternoon my roommate came back with a 12" Triton's Trumpet in perfect condition, found just sitting on the sand in about 6 ft. of water. That was an encouragement to all of us.

The island is generally flat and arid. Palm trees are few and found mostly on the beaches. The people are very friendly. One day we had all the cars at the gas station filling up. A local was sorting out pineapples in the trunk of his car. We had just discovered that pineapples were $3.00 each at the grocery store, so I asked him if he would sell us some . . . he said he had just picked them at Spanish Wells at the northern tip of the island about an hour away, and he was on his way to sell them, BUT he said he would give us some. He gave us 9 and absolutely would not take any money. They were sweet as sugar.

Upon arrival we went to the grocery store to get produce, etc. Were we shocked to find outrageous prices - lettuce was $2.00/head, sodas $.50/can, and oranges $4.00/bag. Fortunately, most of us brought food and cooked in our kitchens most of the time. A very simple dinner out was $15.00. The village of Rock Sound is very small . . . the T-shirt lady sells her wares from a suitcase in her living room. "Sam The Mango Man" stopped by every afternoon to sell mangos picked in Spanish Wells. Every other day the owner of the motel brought each of us a loaf of homebaked Bahamian bread, and once she brought us a fresh pineapple pie. Maid service consisted of having someone leave a stack of clean linens at our door once.

Every morning at 8:30 we would pile in 5 cars with our cooler full of sodas and lunches and head to a different spot. The first day was devoted to sightseeing and collecting chitons where the Atlantic meets the Caribbean. The first person in the water to snorkel came nose to nose with a shark, but it soon left (and so did he). Those who

snorkeled farther out were to see many sharks during the week.

Over the next few days we went to similar locales . . . there was beach walking, rock turning, tree snail collecting, shallow water wading, and shallow and deep snorkeling . . . something for everyone.

We had show 'n' tell and ID clinics every afternoon. We would stay out shelling until everyone was ready to go, which would be about 2-3:00. Then we would all race home and check out the water in front of the motel, because, if nothing else, murexes and tulips could always be found there.

I can't begin to tell you how much I learned about shells that week. When I arrived I didn't know the difference between a Marginella and a Trivia, but by week's end I not only knew the difference, I found some.

The following is a partial list of some of the shells we found: milk and queen conch, helmet, tun, hairy triton, true and banded tulips, lace and apple murex-in white, orange, red, brown, and black, cones (jasper, stearn's, mouse, crown, sozon's), gaudy natica, white spotted and orange marginella, netted olive (stunning with mantles out and siphons up truckin' across the sand), bleeding tooth, 4-toothed and tessellate nerite, smooth Atlantic tegula, flamingo tongue, atlantic bubble, worm-shells, common dove shells, trivia, chitons, tree snails, zebra ark, pen shell, pearl oyster, ribbed mussel, cockles, tellins, limpet, top shell and many others.

The one week package from Ft. Lauderdale . . . everything but meals- was $650. It can be done for $200 less on your own, but the camaraderie and friendship made the trip. Many of the shellers had been to Costa Rica and Santa Domingo earlier in the year with Pete.

Now that I have been bitten by the bug, I'm ready to go again.

TEXAS CONCHOLOGIST, Vol. XXIV, No. 2, January, 1988

FRESHWATER MUSSEL SHELLS FROM A ROCK SHELTER IN TERRELL COUNTY, TEXAS, CONTAINING MUMMIFIED HUMAN REMAINS (41TE307)

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Archeological salvage operations to preserve mummified human remains from a rock shelter in Trans-Pecos Texas (41TE307) also recovered a few freshwater mussel valves. The shelter is located in the upper portion of Big Canyon on the Wroe Ranch in eastern Terrell County (Geddis Canyon NW 7.5' USGS quadrangele map). Radiocarbon assay of plant materials present in the rock shelter have been dated at 1320 to 1380 A.D. (Solveig Turpin, personal communication). As both the tested plant materials and the mussel shells discussed below were associated with the mummy, the above date applies to all three subjects.

IDENTIFICATION AND DESCRIPTION OF SHELLS

The collection consists of five valves (three right and two left) of Cyrtonaias tampicoensis (Lea, 1838). Valves are in an excellent state of preservation. A near complete complement of periostracum is present with remnants of the ligament apparatus present. Areas of missing periostracum are minor in extent and are encountered often in living individuals of this species. Whitish nacre with iridescent highlights is present. No valves form an original pair. The three right valves are entire except for minor nicks on the ventro-posterior margin. Both of the left valves are broken. The more complete valve was broken at some time in the past with additional modern breakage points present. The other left valve contains no portion of the dorsal margin but probably represents an individual which was larger than the more complete shell. None of the breakage points of the second valve portion are modern.

This collection of Cyrtonaias tampicoensis contains valves which are substantially larger than those seen in modern populations in the area (see Table 1 for measurements). Shells of C. tampicoensis observed at Fate Bell Shelter (41VV74) in adjacent Val Verde Co. are also substantially smaller than the Wroe Ranch Rock Shelter sample. Additionally, the posterior pseudocardinal tooth of the right valves is a massive triangular structure as opposed to the generally more gracile shaped teeth in shells of C. tampicoensis. Interestingly, Lord (1968:294) mentioned "very large" shells of this species from Moorhead Cave, Val Verde Co. but provided no measurements.

Examination of a collection of this species from the Pandale crossing of the Devil's River, Val Verde Co. (The University of Texas at El Paso - MALB 3390), reveals a triangular-shaped pseudocardianl tooth of moderate size. Shells are smaller than the rock shelter shells; largest valve is 98.1 mm in length. The Pandale specimens have less calcareous deposits on the external valve surface than the rock shelter shells (possibly due to younger age).

All three right valves exhibit an oval depression with several layers of nacre missing, although the absent layers represent a minor portion of the total thickness of the shell. One right valve has a smaller depression slightly dorsal of the major depression. The long axis of these oval depressions is along a line from the umbo to the ventral "corner" of the (slight) posterior extention of the shell. One of these oval depressions consists of a series of concentric "rings" due a reduced area of shell removed from the more interior of the shell layers.

The single left valve which still contains that central dorsal portion of the shell does not possess such a micro-depression. This valve does have the remnants of an ellipitical hole which is not modern in origin. The original hole measured approximately 10 x 14 mm. Subsequently, the dorsal portion of the area containing the hole became detached from the major portion of the shell.

HUMAN UTILIZATION OF SHELLS

The margins of the remnant hole in left valve 1 are rough-edged. They resemble holes in freshwater mussel shells known from Arkansas, Illinois, and Travis Co., Texas (Sayles 1935:82, plate XXIII, fig. f; Matteson 1953: fig. 2; Jelks 1962:77, fig. 33B) more than the smaller, smooth-edged holes (apparently drilled) known from freshwater mussel shells in central and southwestern Texas, including Val Verde Co. (Jackson 1938:103, plate XIX, fig. 2A, B; Lord 1978:292, fig. 74; Story and Shafer 1965: fig. 26). Shells with rough-edged holes are generally believed to represent hafted tools, especially hoes, while shells with smooth-edged holes are believed to have been utilized as ornaments, especially rattles and necklaces. One shell with a rough-edged hole found in a Hopewell site in Illinois has been interpreted as a hoe utilized as the "index finger would be inserted in the hole" (Matteson 1953:135).

Interestingly, the original hole in the left valve is at a point "roughly opposite" the depression in the right valves. Such a hole could be drilled or punched through an intact pair of valves held in the left hand (or held down on a substrate by the left hand) by a tool worked by the right hand. The applied force could easily force the tool

through the living animal and onto the inner face of the right valve once the left valve was penetrated. Limpkins poke their bill between the operculum and shell wall of apple snails (Pomacea sp.) during the act of predation and often produce a "tiny hole" on the inside of the opposite whorl (Snyder and Snyder 1969).

The above suggestion for the origin of the intriguing damage patterns to valves of Cyrtonaias tampicoensis is conjecture at this point. However, most valves of freshwater mussels from archeological sites in Texas are missing portions of the posterior margins. Such mussels appear to have been opened by breaking of the thin portions of the shell and then forcing them apart manually. However, the posterior margins of these shells are largely intact with only, minor nicks present. None of the shells are burned as was noted for freshwater mussel shells in sites in the Tennessee River Valley (Morrison, 1942).

These shells could easily have been collected as "dead" shells and utilized as tools, ornaments, or eating utensils. Transport of intact, living specimens from the place of origin to this upland rock shelter seems unlikely because of the long distance involved and considerable weight possessed by living mussels. If collected alive and eaten, the animals were probably consumed at the margin of the source waterbody.

ORIGIN OF SHELLS

Source of the mussel shells is unknown but can be restricted to either the Rio Grande or the Pecos River. Big Canyon drains via Lozier Canyon to the Rio Grande. However, the Pecos River via tributaries of Independence Creek (on the other side of the divide) is actually closer distancewise, and is the more probable source of these shells.

SUMMARY

Several large valves of the freshwater mussel, Cyrtonaias tampicoensis, have been recovered from an upland rock shelter in Terrell County, Texas (41TE307). The valves are in an excellent state of preservation. Probable use of the valves by the human inhabitants of this shelter was as tools. Most likely origin of the shells was the Pecos River drainage.

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Table 1. Shell measurements of the freshwater mussel *Cyrtonaias tampicoensis* from the Wroe Ranch rock shelter (41 TE 307). All measurements in mm.

Shell	Length	Height	Depression*
Right Valve 1	102.1	65.45	6.45
Right Valve 2	118.0	74.0	8.45
Right Valve 3	127.5	76.0	12.3
Left Valve 1	--	60.75	--
Left Valve 2	--	--	--

* Length of long axis of depression of inside of shell.

SEARCH AND SEIZURE

BY CONSTANCE E. BOONE

Finding Pholas campechiensis

Field trip participants to Quintana Beach in September, 1987, had the rare opportunity to add small, live specimens of Pholas campechiensis to their collections if they were interested enough to break open pieces of soggy driftwood.

This writer initiated the efforts to retrieve specimens from the wood after noting that there was really not much else of interest in the drift line but there was quite a bit of driftwood. With several new members on the field trip, it seemed important to find species to discuss. It is well known that the only way to collect the several shipworm species, Teredo, is by breaking open wood and examining the pallets and tubes, and it is known that Martesia species will occur in the wood. From time to time this writer has recovered other species from such wood, including Pholas species. It was, however, delightful to find Pholas campechiensis in a number of pieces of wood and to have some of them be live specimens.

The specimens we found were all small, like one to one-and-a-half inches. This species can grow to be four inches, and participants on the November field trip to Bolivar at High Island were urged to note the hundreds of three-and four-inch valves of this species that were on the Gulf beach there. We did not find live specimens at High Island, and I know of none that have been dug there alive in the clay banks. Occasionally, one can retrieve pairs of valves stuck in the clay just offshore when the tides are very low.

Several of us have dug live specimens of Pholas campechiensis on Texas shores. They are never common, and they usually occur in sticky, black mud where we also dig Cyrtopleura costata, Barnea truncata, and Petricola pholadiformis.

Leola Glass and I tell the horror story of our collection of the above named species in the muddy flat on the Gulf side near the Bolivar ferry. One winter day we left our husbands snug in the car with libations to keep them warm while we donned waders, took shovels and headed for the wide expanse of mud flats exposed after a norther. We soon found we could not advance without hauling pieces of planks from the drift line to help us stay above the mud. Otherwise we sank almost to "China." From past experience, we began to layer off sections of the mud with our shovels in efforts to retrieve specimens of pholads. We had no idea we would find all three --- Cyrtopleura costata, small ones, many, many about three inches; Barnea truncata, nice ones but scarce, and a very, very few live Pholas campechiensis, two inch to two-and-a-half-inch specimens.

We were very pleased. Of course, there were many of the false angel wings also in rather shallow burrows.

When we finished, we slithered out, sometimes crawling on hands and knees to get out of the mud. You can imagine what we looked like. It was a very cold day. We were bundled up pretty well with layers of clothings and stocking caps. We were so muddy that we looked like pigs fresh from wallows. Needless to say, our husbands wanted no part of us and refused to let us get in the car. The bad part of it was that we had no water nearby to wash off in. The tide was way out that day. We peeled off the waders and layers of clothes and used newspapers to wipe off as much of the sticky mud as we could, but we still weren't fit to do anything more but go home and take baths!

Since that time, some of us have dug Pholas campechiensis in the muddy flat at Port O'Connor on club field trips. Several of us have checked out driftwood on beaches up and down the Texas coast and found specimens.

Because of it's significance, we repeat here Dr. T.E. Pulley's article in Texas Conchologist, Vol. 1 (Nos. 4,5,6, 1965, page 3, January, 1965):

"Pholas campechiensis is very rarely collected alive, and it is not known exactly where its normal habitat might be. When Ruth Turner published her monograph on the Pholadidae in Johnsonia, only one tiny specimen collected alive was available in all the museums of the world; and it was taken from a piece of rotten driftwood."

"The pholads are unusual bivalves, because one of the adductor muscles has migrated out of the shell to a position just dorsal to the hinge. In this exposed position, the adductor muscle is protected by several accessory plates or shell pieces. Study of these accessory plates is necessay for determining relationships of species within the family, but for Pholas campechiensis these plates are almost unknown."

"The strongest part of the shell of Pholas campechiensis is the reinforced ridge which forms the hinge; and at times these pieces form the most abundant part of shell debris on Bolivar Peninsula. It is not likely that a species could be so common as dead and broken specimens, if its normal habitat is in rotten wood."

"I think that it is most likely that Pholas campechiensis normally lives in deep burrows in the mud in offshore waters of the Gulf. Only after the animal has been long dead, is the bottom eroded sufficiently to let the shells escape from the burrows and be thrown on the beach. Of course, by this time, the fragile accessory plates are lost."

In Part I, Pholadinae in "The Family Pholadidae in the Western Atlantic and the Eastern Pacific," Johnsonia, Vol. 3, No. 33, May 17, 1954, Dr. Ruth Turner put Pholas campechiensis in the subgenus Thovana. At that time Dr. Turner had not seen live or even preserved specimens of this species, she stated. She did report specimens taken from wood on South Carolina and Florida Gulf beaches. These were young specimens.

In January of 1964, Mrs. Tom Kister, then a member of the Houston shell group, a part then of the Outdoor Nature Club, collected several live, three inch specimens of Pholas campechiensis from a log at San Luis Pass, Galveston, Texas. She donated one complete specimen to Dr. Pulley, and this specimen is now cataloged at the Houston Museum of Natural Science. It is complete with all parts.

The HMNS collection contains several live-taken juveniles from driftwood at Bryan Beach, Bolivàr, and Port Aransas, Texas.

Dr. Turner wrote in Johnsonia that the animal uses the shell as a tool in boring in clay and wood, the shell manipulated by muscles and aided by the foot, siphons, mantle, water and sand grains. She said the burrows could be deep and roomy, and she stated the animals could move up and down in them. It is always amazing to know this animal with such a fragile shell can make deep burrows and move up and down. We have a terrible time digging one out without breaking the shell.

Her account included a report on examining a pint of drift collected by Dr. Pulley at High Island. There were fragments of the umbonal areas of at least 100 specimens in that drift. This portion of the shell was said to be very strong and the last destroyed by waves.

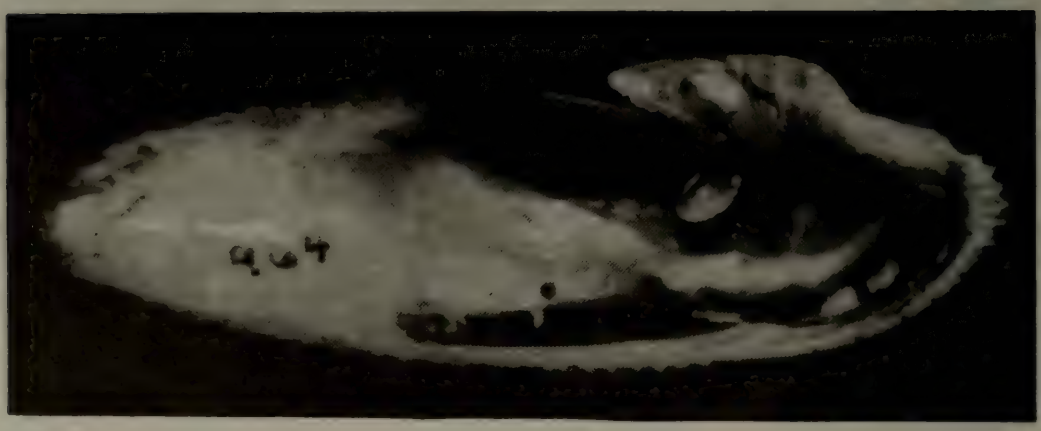
Since the accessory plates of this pholad are so important to identification it would be well for members to check out Johnsonia and review the monograph.

It is important that you know to preserve the plates with your specimen in order to have it complete for your collection. The divided protoplax, the calcareous flat dorsal plates that rest on top of the anterior adductor muscle, is easy to see when you have a live specimen. However, the thin, chitinous, narrow plate that covers the gap between the two valves on the dorsal margin posterior to the umbos, called the metaplax, is not so easy to spot and preserve. Straddling the protoplax, the dorsal plates described above, is a bridge called the mesoplax, that is calcareous and that protects the posterior portion of the anterior adductor muscle.

Most valuable to quickly spot the difference in this pholad from Cyrtopleura, perhaps are the septate umbonal reflections, curved back shell extensions complete with shelly props or divisions. We do not know how often since 1954 reports of live-taken specimens of this pholad have been made, but the 1974 edition of American Seashells discusses it as uncommon. It's range is the Western Atlantic (North Carolina to Brazil) and also from the Eastern Atlantic (Senegal and Liberia). Since no type was found when Dr. Turner did her monograph, she made the Gulf of Campeche the type location.

So, HCS members, this is truly an uncommon, and even rare, shell to add to your collection. Put the small ones you find in wood in alcohol if they are live specimens, and add some of the large valves from High Island to your collection. Hope to dig live ones eventually. You'll probably have specimens very few other collectors have in their collections!

Fig. 1 A small Pholas campechiensis dug from a piece of waterlogged driftwood by Sandy Clark was photographed by her on the wood. It exhibits the two-part protoplax sitting on the adductor muscle of this animal at the umbonal area. This specimen was found at Quintana during the September field trip.



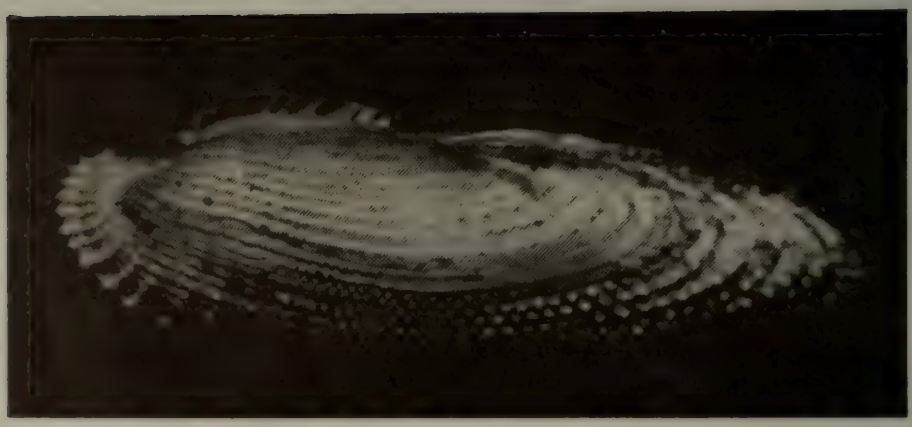


Fig. 2 Pholas campechiensis in the Houston Museum of Natural Science collection, a three-inch specimen collected live by Mrs. Tom Kister in January, 1964, from a log at San Luis Pass, Texas. Note the spoon-like projection extending from under the umbo in the inside view of a valve. This is found in both valves and these projections are called apophyses. The outer view of a valve clearly shows the reflected roll at the umbo and exhibits the props or divisions in this reflection.

MONOGRAPH

By H. Ode'

DISTRIBUTION AND RECORDS OF THE MARINE MOLLUSCA IN THE NORTHWEST GULF OF MEXICO

(A Continuing Monograph)

Family VITRINELLIDAE Bush, 1897 (continued)

Genus Cyclostremiscus Pilsbry and Olsson, 1945

Small rather solid looking shells, usually with several well developed carina and sometimes with axial riblets. In our area occur a number of species, three of which are widespread, living either in the bays or in close proximity to the beaches. Little is known about their biology.

Abbott places C. suppressus in the genus Circulus. Comparison with C. jeannae shows that these two species are very closely related and considerably different from C. pentagonus. In my opinion they are not Circulus but sufficiently different from pentagonus to deserve a separate subgeneric designation.

180. Cyclostremiscus pentagonus (Gabb, 1873)

This is the most common of all N.W. Gulf of Mexico vitrinellids. It can often be taken from beach drift on the outer Texas beaches, and it is regularly dredged both in the bays and in the shallow offshore waters. Fresh material looks shiny. This species is easily recognized by its tabulate form and the little nucleus which is elevated and quite sharp. We discussed the species earlier in the Tex. Conchologist Vol. 6, p. 83 - 84, 1969.

Abbott states (1974) that the umbilicus is grooved within. This is true for only about half of the Texas material. In many specimens the inner walls of the umbilicus are practically smooth. This grooving occurs in all manner of intensity from smooth to hardly visible to deeply incised. The variability in the grooving of the umbilicus corresponds to a variability in the number of carinae on the underside of the shell. Some of these clearly grooved shells we have reported in our preliminary list of 1973 (Tex. Conch. Vol. 9, p. 61) as variety A, but no special taxonomic significance should be attached to that label. An often used name for this species is C. trilix (Bush). In the Panamic Province the species is known under the name C. tricarinatus (C.B.

Adams) which I believe is the same species and which also has a number of synonyms.

Three lots of rather fresh specimens of a slightly different form were obtained from deep water at a depth well beyond the normal range of pentagonus. This form differs from the usual pentagonus in being densely spirally ornamented by closely spaced spiral grooves all over its surface. There are two strong carinae, one at the periphery and one below it, and a rather weak one is on top. The suture of this form is deeper than that of the shallow water form because the tabulation slopes down towards the suture, while it is horizontal in the shallow water form of pentagonus. We may note here that in the Vitrinellidae it is usual that species living in deeper water have in general the stronger spiral sculpture. We have collected C. pentagonus in Aransas Bay but not in Matagorda Bay; also in East Matagorda Bay and Galveston West Bay. It is common in beachdrift, and all along the Texas and Louisiana coasts it is often dredged in water to 30 fms, some rare specimens to 55 fms.

Records HMNS Survey Collection: 70 lots, of which 5 contain live collected material.
Depth range: 0 - 55 fms; alive at 0 - 24 fms.
Geographical range: Off North Carolina to Florida; Texas and the West Indies (Abbott, 1974).
Maximum size: 3.5 mm.

181. Cyclostremiscus (Ponocyclus) beauii (Fischer, 1857)

A fragment of an enormous specimen was dredged offshore Freeport, Texas. This incomplete shell already measured 12 1/2 mm and when complete may well have reached 15 mm in diameter, which is twice the size Abbott (1974) gives (1/3 inch). It looks old and worn and could be a Pleistocene fossil. Further material must prove its present occurrence in the N.W. Gulf of Mexico. The unexpectedly large size of the species suggests to me that its placement in Cyclostremiscus may be incorrect, but where to place it elsewhere is anybody's guess. There is another shell of normal size.

Records HMNS Survey Collection: 2 lots, no live material.
Depth range: 4 to 25 fms.
Geographical range: North Carolina to Florida and the West Indies, Brazil. (Abbott, 1974).
Maximum size: 12 1/2 mm (broken).

182. Cyclostremiscus suppressus (Dall, 1889)

I believe that Abbott (1974) was mistaken when he placed this species in Circulus. As stated above, it is not closely related to C. pentagonus but shows many similarities to C. jeannae. In mature specimens of suppressus and jeannae the underside of the shell differs considerably, but in juveniles they are extremely close. The reason for this is the filling up of the umbilicus by a callus in suppressus in the same manner as in some apparently unrelated species in the genus Pseudorotella. In the extensive material at my disposal there are many specimens whose umbilicus is completely filled by a callus. Others have a fairly open umbilicus (the latter is figured by Abbott). This variability of the umbilical callus must be a late development in the evolution of the genus and in my opinion should be used with restraint for taxonomic purposes. Whether it is related to changing of living conditions upon entering coastal environment should be investigated.

Both jeannae and suppressus are flat topped species and show vague radial elements in sculpture on the underside of the shell. They should be subgenerically different from C. pentagonus. Pilsbry and McGinty, Nautilus Vol. 59, p. 82, 1946, state that the species ". . . is somewhat related but not at all closely." In this I believe they are in error. Both species are closely related. I discussed this species in the Tex. Conchol., Vol. 6, page 14, 1969.

Records HMNS Survey Collection: 20 lots, of which 1 contains live collected material. Only in the coastal bays from South Padre Island, to Galveston West Bay and Timbalier Bay, Louisiana.
Depth range: 0 - 14 fms; alive : 2 feet, Matagorda Bay.
Geographical range: South half of Florida to Texas (Abbott, 1974)
Maximum size: 2.4 mm.

183. Cyclostremiscus jeannae (Pilsbry and McGinty, 1945)

This species is closely related to C. suppressus but easily separated from it. It replaces suppressus in deeper offshore waters. Very rarely taken in beachdrift (see Tex. Conchol. Vol. 6, page 2, 1969, Matagorda). Its top is quite flat and the carinae are more rounded than in C. pentagonus. There are some vague radial wavelets on the underside of the shell. The umbilicus is never filled by a callus as in suppressus. Fairly common on Stetson Bank, and also in the mudlump fauna. The eastern Pacific

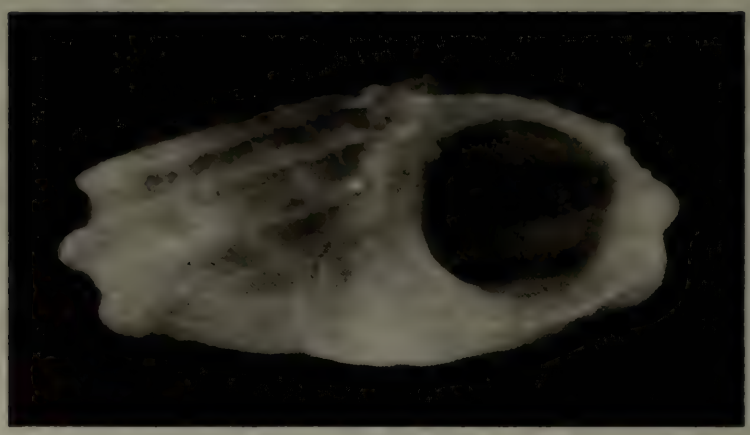
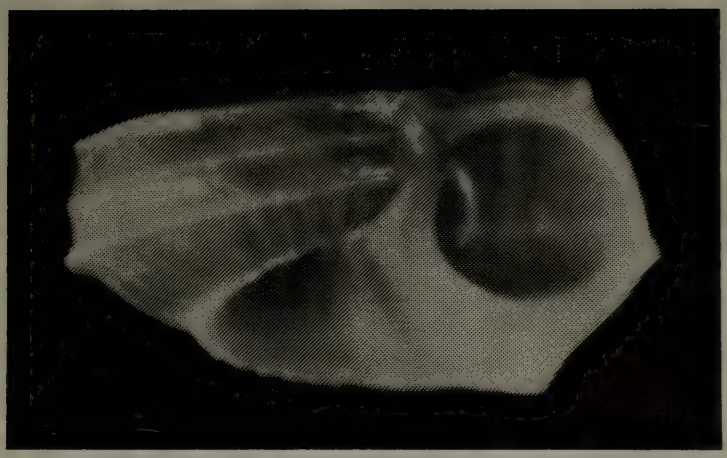


Fig. 1 Cyclostremiscus suppressus (Dall, 1889), dredged about 30 feet at the end of the Galveston jetty in sandy, shelly mud by Harold Geis, April, 1965. Size 2.4 mm.



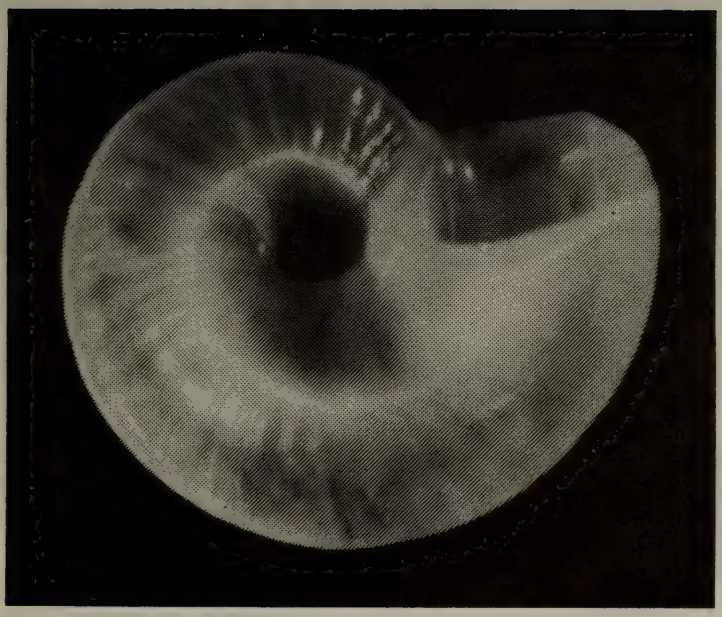


Fig. 2 Cyclostremiscus jeannae (Pilsbry and McGinty, 1945), dredged at Stetson Bank in 30-40 fms, 74 miles SSE of Galveston, Texas, by T. E. Pulley and Paul McGee in 1963. Size 2.2 mm.

analogue of this species is C. bartschi Strong and Hertlein, 1939.

Records HMNS Survey Collection: 36 lots, of which 3 contain live collected material; all along Texas and Louisiana coasts.
Depth range: 8 - 70 fms; alive 23 - 50 fms.
Geographical range: South half of Florida to Texas; Costa Rica and Panama (Abbott, 1974).
Maximum size: 2.3 mm.

184. Cyclostremiscus cubanus Pilsbry and Aguayo, 1933.

This minute species is closely related to suppressus and jeannae. It has three strong keels; between the umbilicus and lowest keel and then between the 2 lowest keels are very clear radial excavations. Originally in the survey collection was some material from the Flower Garden, which unfortunately became misplaced and the only material at present available to me is a single small specimen from 7 fms obtained on a shelly bottom off Galveston.

Records HMNS Survey Collection: 1 lot, no live collected material.
Depth range: 7 fms.
Geographical range: Varadero, Matanzas, Cuba (Abbott, 1974).
Maximum size: ± 1 mm.

Genus Pachystremiscus Pilsbry and Olsson, 1945

I believe that Pachystremiscus should be accorded full generic rank. It belongs in the group related to Cyclostremiscus. In it is classified a single minute species, which has, as often is the case, a single analogue in the Panamic Province. According to Keen the apertural margin is thickened.

185. Pachystremiscus ornatus Olsson and McGinty, 1958

This probably is the smallest Vitrinellid in the Northwest Gulf of Mexico. It is only known from the Flower Gardens where a few specimens were picked from coral rubble. The shells are white in color. They have very fine spiral striae and knobby ornamentation.

Records HMNS Survey Collection: 2 lots, no live collected material.
Depth range: 8 - 10 fms.
Geographical range: Florida and the Caribbean (Abbott, 1974).
Maximum size: under 1 mm.

Genus Vitrinorbis Pilsbry and Olsson, 1952

Flat, lenticular shells, strongly keeled at the periphery and widely umbilicated, ornamented with spiral grooves of densely placed punctations. In the N.W. Gulf of Mexico two quite different and as yet undescribed species.

186. Vitrinorbis sp. indet. A

This very beautiful species can be immediately recognized by its enormous keel and flat lenticular shape (see fig. 3). It is an uncommon species because we have only two lots, each of a single specimen. On the upper and under surface are many spirals of closely spaced punctations. The strong keel projects in front of the aperture. This indicates a close relationship with the Panamic genus Miralabrum Pilsbry and Olsson, which in Keen (1971) is listed as a subgenus of Cyclostremiscus. It is possible that the genus Discopsis de Folin and Perier, which is insufficiently characterized in Abbott (1974), is closely related. Originally I believed this species to be Discopsis omalos, but our specimens are so close to figure 390 in Keen (Vitrinorbis) that I transferred the species to Vitrinorbis. In my opinion the genera Miralabrum, Vitrinorbis and Cymatopterix and possibly Discopsis form a closely knit group which is related to the Circulus-Cyclostremiscus group of species.

Records HMNS Survey Collection: 2 lots, no live collected material.
Depth range: 36 - 55 fms.
Geographical range: unknown.
Maximum size: 2.8 mm.

187. Vitrinorbis sp. indet. B

In the survey collection are 5 lots of this very beautiful minute shell (see fig. 4). Some specimens give the impression of having been collected alive. The body whorl rises higher than the nucleus, which is placed in a hollow. The keel is rather sharp. This species is much smaller, and of considerably thinner build than the previous one, and, in my opinion, it is quite uncertain that it is of the same genus as spec. indet. A. However, I am at a loss to place it elsewhere.

Records HMNS Survey Collection: 5 lots, one of which contains very fresh material.
Depth range: 24 - 82 fms.
Geographical range: unknown.
Maximum size: 1.3 mm.

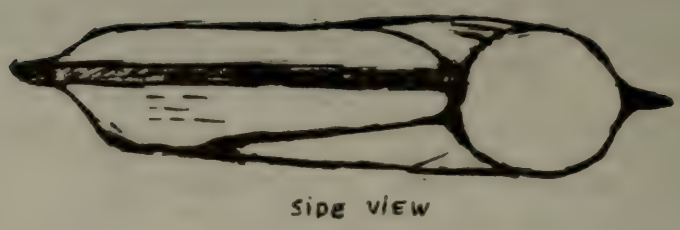


Fig. 3 *Vitrinorbis sp. indet A.*

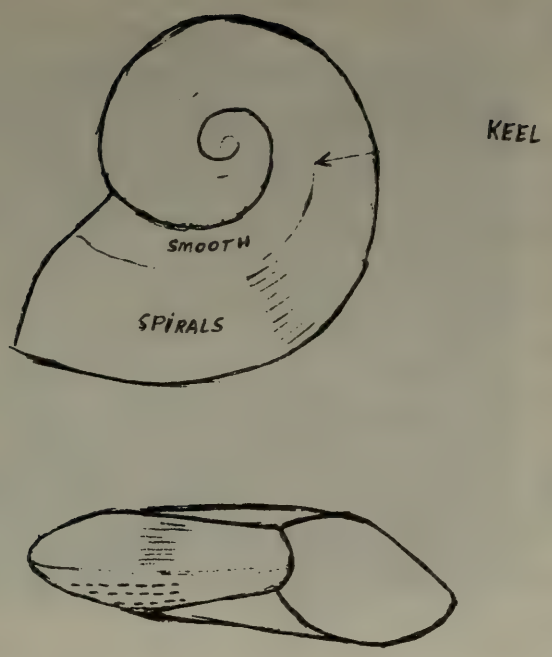


Fig. 4 Vitrinorbis sp. indet B.

Fig. 5 Cymatopterix sp. indet A.

Genus Cymatopterix Pilsbry and Olsson, 1946

Keen defines this quite small genus as: "discoidal, middle keel broadly expanded." It is perhaps better to say that it is a ledge rather than a keel. In Keen (1971) this small shell is placed as a subgenus under Lydiphnis (Melvill). This may be correct, but I venture the suggestion here that this minute shell also is rather close in general shape to Vitrinorbis as defined here. Cymatopterix is only known from the Eastern Pacific (Southern Mexico to Ecuador).

188. Cymatopterix sp. indet. A

We have only a single minute shell of this rare genus. A small sketch of this species is attached here (fig. 5). Its periphery is surrounded when viewed from above by a rather broad ledge. Its surface sculpture consists out of spiral striations. The top is quite flat with the nucleus smoothly imbedded in the later whorls and situated below the level of the body whorl. The color of our only specimen is white.

Records HMNS Survey Collection: 1 lot, no live collected material.
Depth range: 75 fms, off western Louisiana.
Geographical range: unknown.
Maximum size: 1.0 mm.

Genus Solariorbis Conrad, 1865

This genus is represented by several species in the N.W. Gulf of Mexico which appear to form a rather heterogeneous complex. The most widespread species which sometimes enters the bays is a domeshaped one with open umbilicus of variable width. It is placed here in the subgenus Systellomphalus Pilsbry and Olsson, 1941, which is considerably different from the main stock of the genus. A number of other species rather different in general structure, not domeshaped, but all have more or less the same type of umbilicus, belongs here but their relationship is rather unclear. Most species have a sculpture of spirals composed out of minute punctations, but the nucleus is smooth.

189. Solariorbis (Systellomphalus) infracarinata Gabb, 1881

This is an easily recognized species, widespread throughout the Texas coastal bays and shallow offshore waters. (Christmas Bay, Matagorda Bay, Aransas Bay) It is often found in beachdrift along the entire Texas coast and also is common in offshore dredgings to 26 fms. In some respects it is rather variable, especially in the type of ornamentation

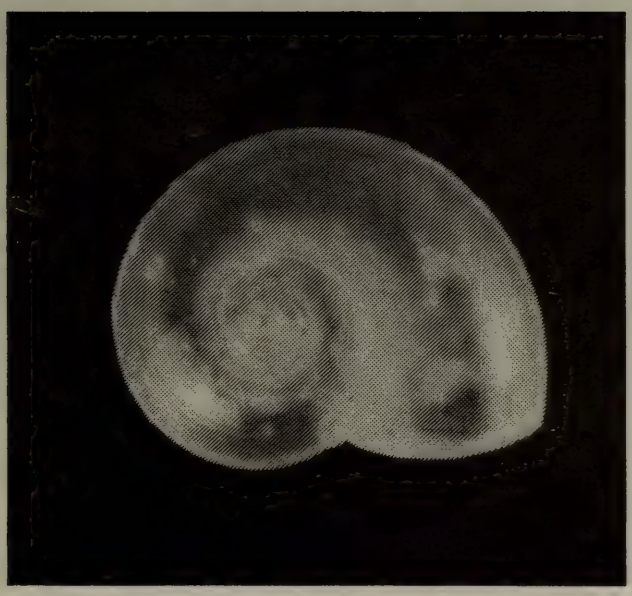


Fig. 6 Solariorbis infracarinata Gabb, 1881, from dredge and trawl samples, sandy, shelly mud, 53 1/2 miles SSE of Galveston, Texas, February 15, 1966. Size 2 mm.

within the grooves between the keels. In the deepest groove at the underside of the shell there are sometimes radial riblets, whereas in others the groove is smooth. Also in some specimens a few radial wavelets are present on the early shell, and are missing in others. Above the upper peripheral keel often some incised spirals are visible. One of the important characters of this genus is the callosity that develops on the columellar part of the aperture and which always narrows the umbilicus.

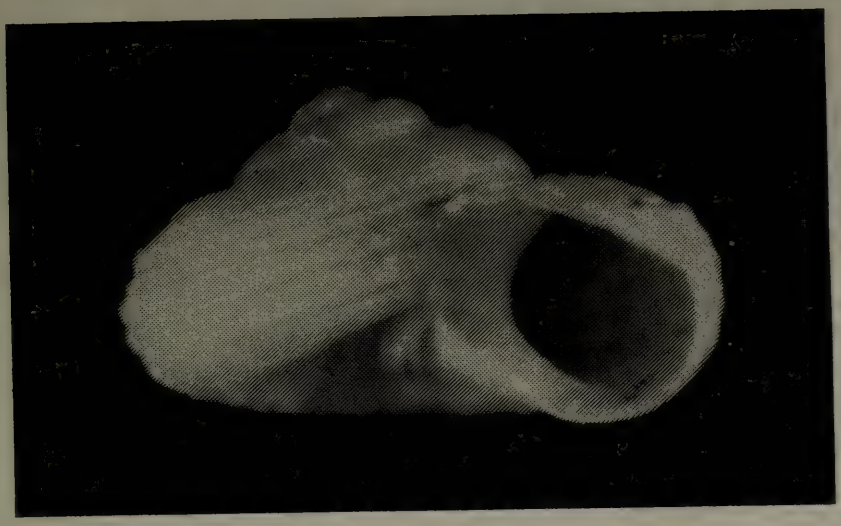
Most of our material comes from shallow offshore waters; some comes from the bays, where it is less common than most other vitrinellid species. The statement in the Tex. Conchol. Vol. 6, page 3, 1969, that S. infracarinata and S. blakei are absent in offshore waters is erroneous. Both species are regularly dredged. Its eastern Pacific analogue is Solariorbis (Systellomphalus) elegans Pilsbry and Olsson, 1952. We may note here that the subgenus Systellomphalus differs very much from the main content of the genus.

Records HMNS Survey Collection: 35 lots of which three contain very fresh material.
Depth range: 0 - 26 fms; alive 0 - 8 fms.
Geographical range: South half of Florida and Texas, Caribbean (Abbott, 1974).
Maximum size: 2.3 mm.

190. Solariorbis blakei Rehder, 1944

Widespread along the Texas coast, but never in such numbers as infracarinata. Most beach material, which can be found along the entire Texas coast, is worn and has lost its pattern of very fine spiral ornamentation. In fresh material these spirals are clearly visible. Also the radial riblets on the early whorls are most of the time quite clear. Most specimens are rather flat and depressed but sometimes specimens with a more elevated whorl are encountered, that give the impression of being another species. Most of those come from waters offshore Louisiana (Claypile dome and the mudlump fauna). In all probability this is tha same as "Vitrinella" shimeri Clapp, 1914 described from the Pleistocene of Boston, Mass. (Nautilus, Vol 28, 38 - 40, 1914) but until comparison with the type can be made I will retain the trivial name blakei.

Records HMNS Survey Collection: 31 lots, of which two contain live collected material (Galveston West Bay and Matagorda Bay). Also in the Laguna at South Padre Island and in shallow offshore waters. Somewhat unusual in beachdrift.



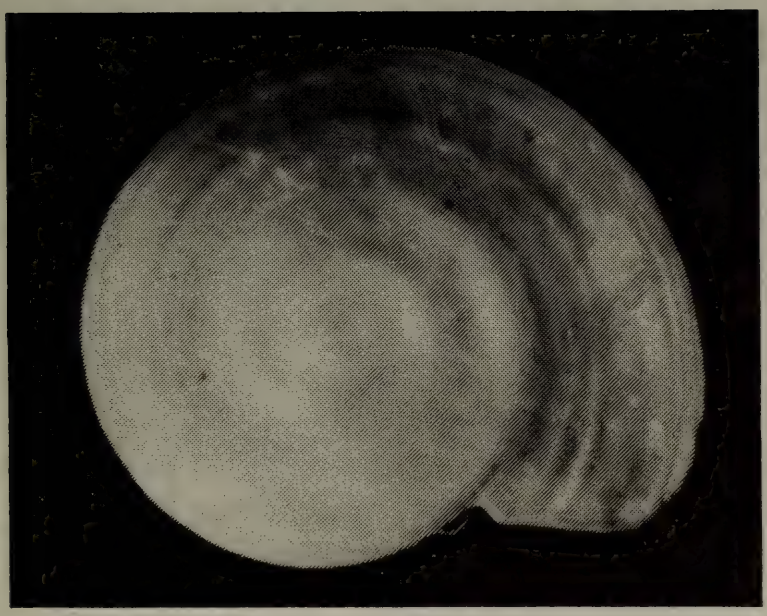


Fig. 7 Solariorbis mooreana Vanatta, 1904, taken by diver Harold Geis at Southwest Buoy, Heald Bank, 31 miles ESE of Galveston, TExas. 1965. Size 2.1 mm.

Depth range: 0 - 36 fms; alive: 2 feet. One broken, deeply sutured specimen at 51 fms.
Geographical range: South Carolina to Texas and the Caribbean (Abbott, 1974).
Maximum size: 1.6 mm, but usually 1.0 - 1.2 mm.

191. Solariorbis c.f. semipuncta (Moore, 1965)

In the collection are 4 lots of a densely punctated, heavily built, quite flat on top, small species which I believe is this species reported by D. Moore from Campeche Bank, Mexico. If one would split the genus Solariorbis into different subgenera, the subgenus of this one also would be different from the previous two species. I cannot believe that S. infracarinata and S. semipuncta even belong in the same genus. Unfortunately all our material is of rather poor quality and we must await fresher shells for more definite identification.

Records HMNS Survey Collection: 4 lots, no live collected material, from algal reefs and clay uplifts off Texas and Louisiana.
Depth range: 10 - 55 fms.
Geographical range: Campeche Bank, Mexico (18 meters). Haiti (Abbott, 1974).
Maximum size: 2.6 mm.

192. Solariorbis mooreana Vanatta, 1904

This is an exclusively offshore species, which never enters the bays. It does not fit the general trend in Solariorbis in that it resembles Cyclostremiscus when fullgrown. It is a quite variable species whose mature stages are different from juveniles. Mature specimens are heavily spirally ribbed and no punctations can be seen. Juveniles, however, are lightly spiralled and punctated . Very rare in beachdrift (High Island, Galveston, Port Aransas, Port Isabel); see Tex. Conch. Vol. 6, p. 3, 1969). Some of our material from offshore dredging looks old and may be of Pleistocene age (Heald Bank). In the survey material are two specimens somewhat more trochoid in shape than usual and with somewhat narrower umbilicus. Previously I reported those as S. sp. C. (Tex. Conch. Vol. 9, P. 61, 1973) but I now believe they are merely a form of mooreana.

Records HMNS Survey Collection: 13 lots, no live material.
Depth range: 6 - 11 fms.
Geographical range: Texas (Abbott, 1974).
Maximum size: 2.5 mm.

(To be continued)

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TEXAS CONCHOLOGIST, Vol. XXIV, No. 3, April, 1988

SPLITTING HAIRS AND OTHER MISADVENTURES OF LESLIE AND DARWIN

By Darwin Alder

Our misadventures took place in mid November of 1987. We two noble shellers had prepared to leave Houston Friday night and return Sunday night for a sojourn to San Jose Island and the Corpus Christi area. Leslie Crnkovic pulled his boat and Darwin went along for the fun of it.

They were going down US 59 when the first of many events took place. A car with two women came up along side of them, and the women informed them of the fact that the license plate and rear light had fallen off the trailer. This happened before the Brazos River crossing, not even 20 miles from Darwin's apartment.

Undaunted, or nearly so, they decided to brave further things in the way, or road hazards, or the Texas Highway Patrol and continue their "ill-fated" journey.

To their complete wonderment, no further mishap occurred that night. They spent the night at Leslie's dad's trailer house, and prepared for the looting and pillaging of San Jose Island the next morning.

That was not to be . . .

It was drizzling Saturday morning. However, our two valiants got ready to go to San Jose Island. Leslie was going to try to launch the boat using the hoist at the Marine Institute. The law enforcement said "no" to that idea, but said he could use the regular boat ramp. All the fisherpeople were amused by this turn of events, but were reasonably polite and well-behaved.

Leslie and Darwin put the boat in the water. Then Darwin proceeded to show some of his prowess but ended up tipping the boat over and filling it half full of water. The motor- that supreme work of engineering- had not been attached so it did not get wet. Our brave adventurers attached the motor and tried for ten minutes to get it started. That was clue #2 to end this journey! However, success! They were seabound, two sailors on the Port Aransas Channel, headed for San Jose Island. Towering two foot swells assailed them as Darwin sat very still in front of the boat, trying not to recreate the earlier event. Disaster struck about 100 yards out in the water. The motor entered the world of the deceased, never to start again.

Our two foolhardy mariners looked up and realized just how big the oil tanker was that was bearing down on them. Luckily, Fate in the form of another boat towed them out of the way in time. They were now marooned on the San Jose Island dock. At this point, rescue showed up in the guise

of the Guardian of the Waterways, the U.S. Coast Guard, which kindly assented to tow them back across.

To add insult to injury, the fisherpeople who had seen the splendid departure now saw the ignominious return of the valiants, firmly in tow. The fisherpeople were very amused. The best part of the return adventure was that no tickets or citations were issued.

Leslie and Darwin, sore, wet, and dejected, retired for food and rest before trying another sortie into the wilds of Corpus Christi.

It would be nice to report no further problems, but this is not the case. On the shores of the Laguna Madre our two shellers found many ragged sea hares. Darwin elected to split them to see if there were any shells inside. No luck at all.

Sunday morning dawned. At 5:30 they awoke and then found themselves inundated from a overflow of clear water (luckily) from the commode. That was truly a cold and wet experience.

Our now not-so-valiant adventurers got everything cleaned up and went shelling. They shook sea whip, overturned rocks, shuffled through sand and mud and water, and came up with great rewards in spite of their misadventures.

DR. PULLEY'S OYSTER STEW

Try to get freshly opened oysters. The 10 ounce jars in the supermarket are usually tasteless. It is best to buy oysters in the shells and learn to open them yourself.

Drain a pint of oysters and save the juice. Melt a half stick of butter in a heavy aluminum pot and add a bunch of chopped green onions. Use the green onion tops also. When the onions have simmered a few minutes, add the drained oysters. Continue to cook slowly until the oysters have contracted into a plump body with frilly edges. Add a little chopped parsley and the juice which was drained from the oysters. Continue heating until the juice has just begun to boil. Add about a pint of milk and continue to heat while stirring constantly. Do not bring back to a boil, but do get the stew quite hot. Season with Lowrey's Seasoned Salt, black pepper and a dash of sherry.

SEARCH AND SEIZURE

BY CONSTANCE E. BOONE

COLLECTING NOTES

The club's field trip to Port O'Connor, Texas, in February, 1988, provided some interesting collections for about 10 members. The tides were extremely low for the week end trip, the water was glassy and made travelling to Matagorda Island very easy, and there were enough shells to make us all happy.

Our field trip chairman, Bob McElroy, had made arrangements for our visit with the Texas Parks and Wildlife rangers, who now control and supervise visitors to Matagorda Island. He also arranged for David H. Hadley, Jr. (P. O. Box 487, Port O'Connor, Texas; telephone 512 983 4473) to take us to the island for $20.00 apiece round trip. Hadley has a duck hunting and fishing boat which can accommodate only small groups at a time, but since the boat can go in very shallow water and moves quite fast with a good motor, the trip to the island is made in about 30 minutes, especially in calm seas. We made two trips. Once you are at the dock, the rangers take you in a pickup truck and deposit you at intervals on the Gulf Beach,

The beach was fairly empty of fresh drift lines of shells, but there were some shells found by checking through the sand high up on the beach. There were plenty of fresh Dinocardium robustum valves, and some live pairs were found. Bob and Pat McElroy were the last of be deposited on the beach and walked the fartherest south. They came back with one live Architectonica nobilis and many fresh shells. A few whole Phalium granulatum were found. Harry Sharpe collected several live Simnialena marferula from strands of sea whip coral washed up on the beach. There were a few live Atrina, and the usual collection of arks and Dosinia was made. It was again a delight to be on a beach with so few other people!

All of us found tests of the heart urchin ——ours is Moira atropus. We were amazed to see hundreds in the upper drift line. When we all gathered and discussed this phenomenon, Darwin Alder said that he had encountered thousands dead in the drift at St. Jose Island north of Port Aransas, Texas, this winter. This brings to my attention that this echinoderm must also be dying off in the recently noted demise of sea urchins in the Caribbean and the Gulf of Mexico.

Other species of this invertebrate do exist, even worldwide, and several of us have collected it in far away places, such as West Australia. The first time I saw one alive was in the sand at San Luis Pass, Galveston, Texas some 25 years ago

when I dug three from sand cracks. Living, the animal seemed to be almost bright yellow and covered with long spines laid back on the dorsal side and shorter spines fitted closely to the rest of the animal. Defrocked of spines and left as a skeleton on the beach, the fragile test resembles a heart with lobes.

At Jamaica Beach one Saturday in March when the tide was extremely low after a norther blew in, a number of the heart urchin tests were recovered.

The second day of the Port O'Connor trip found those of us who stayed on at the little bay area near the small jetty and along in front of the beach in town. The tide was so low we trudged for miles in the sandy mud and collected buckets of crabbed Busycon. A few live specimens were found. The sand bars were loaded with Mercenaria mercenaria texana, and several members collected the smaller ones to make clam chowder. It was interesting to find a number of the shells marked with the zig zag lines of the form notata, very pretty specimens. A few of the specimens had blue borders inside. We also collected live Ensis minor, Ostrea equestris, Macoma constricta (not common live), Sinum perspectivum, Mactra fragilis, small Dinocardium, Crepidula plana, Pedipes mirabilis, Assiminea succinea, Anachis ostreicola, just to mention some of our list. There were plenty of holes for Cyrtopleura costata, and probably other pholads, but we dug only one or two holes as we had done this before and the clay can break shovels. We did dig a number of live Petricola pholadiformis.

As mentioned before, I had the occasion to be on the Galveston beaches recently, leading a field trip for the Houston Museum of Natural Science on March 19th. It was 32 degrees and the tides were low all day on the island and in the bays. Therefore, collecting was good at many places.

We collected over 50 species paired or whole, both live and dead, and identified some 12 species from valves only. At San Luis Pass on the bay sand bars there were many Abra, both Tellina iris and Tellina versicolor, Epitonium rupicola and Epitonium angulatum, Polinices duplicatus and egg cases, and Crepidula plana in old shells. On the beach front there were many Dosinia, Atrina, Dinocardium, several arks, Epitonium egg strands in debris, lots of Tellina alternata, a crab shell with several live Crepidula fornicata piled up on it, Martesia and Teredo in wood, and many pairs of Raeta plicatella.

We stopped at Jamaica Beach so that shark teeth could be collected by the youngsters. (Thank goodness, one was found. I am no good at this. All I see is shells). The debris line was very, very good. A pair of Agriopoma texasiana was found. One Janthina showed up. Several pairs

of Diplodonta were collected.

It was disappointing to see that the City of Galveston now requires one to pay $3.00 to get to the jetty at the ship channel. As we went in, the gateman asked if we were going fishing. I said "no" and asked why he wanted to know. He said they had no provison for you to go in and out. If you went out to get bait, for instance, you would be charged $3.00 to get back in. We hope that gets remedied!

We stopped at one of the inlets just off the seawall and collected a few Cerithidea and some absolutely huge, high Polinices live. The final stop was made in Offats Bayou to collect live Ischadium recurvum under the rubble.

Darwin Alder called me recently to tell me he had been back to St. Jose Island one Sunday in mid-March when the winds were blowing from the south, and he collected a couple of quarts of Janthina. He continues to go back to the Port Aransas and Corpus area for some very good collecting.

Let me hear from you about your collecting in Texas and anywhere else you are able to go to collect. The readers of TC do like to hear about your experiences. Believe it or not, several of us have received calls from other states from collectors who read articles in this quarterly and wanted to know more about how to go about going to the places we write about!

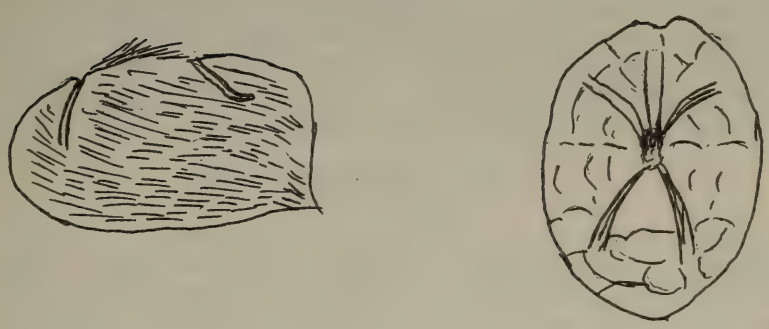

Fig. 1 Heart urchin found in Texas

TEXAS CONCHOLOGIST, Vol. XXIV, No. 3, April, 1988

URBAN REFUGIA WHICH SUPPORT DENSE POPULATIONS OF *Euglandina singleyana*

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In this day of relative environmental enlightenment, extensive interest has been generated in organisms whose very survival as species are threatened by human impact. Most interest in rare, threatened, and endangered species has involved vertebrate species, particularly birds and mammals. Nevertheless, interest has been shown in various invertebrates, including land snails (see Neck 1984b).

Recently, suggestions have been made that *Euglandina singleyana* (W.G. Binney, 1892) could or should be considered as a rare or endangered land snail. *E. singleyana* occurs in scrub and riparian woodlands of a large area of Texas from the lower Pecos River through the Edwards Plateau and down the floodplains of the San Antonio and Guadalupe Rivers near the coast.

This predatory species feeds on other land snails and is found under rocks and logs in relatively mesic microhabitats. Areas inhabited by *E. singleyana* vary from mesic Coastal Plain woodlands to xeric Chihuahuan scrub habitats. Concentrations of more than three to five individuals at one site are uncommon. Singley (1893) reported that *E. singleyana* "is not a common species," although Strecker (1935:18) reported "several specimens" under a single log. During a period of several years of collecting in the central Texas area, three sizable populations have been located and observed. The following report is an analysis of these populations in order to ascertain factors which allow the development of large concentrations of living *E. singleyana*.

NEW BRAUNFELS SITE

The first dense population was located in Landa Park, a municipal park in New Braunfels, Comal Co., Texas. The site occurred on shallow soils overlying Edwards Limestone. The area is a gently sloping part of the scarp immediately above the Comal fault, a major fault of the Balcones Fault Zone. At the base of the slope emerge the Comal Springs which form the Comal River. Woody vegetation of the immediate site is dominated by plateau live oak, *Quercus fusiformis*; cedar elm, *Ulmus crassifolia*; chinaberry, *Melia azedarach*; ashe juniper, *Juniperus ashei*; mesquite, *Prosopis glandulosa*; Texas buckeye, *Aesculus pavia* (*pavia-flavescens* intergrading population); and prickly pear,

Opuntia lindheimeri. Other woody associates present include anaqua, Ehretia anacua; Texas persimmon, Diopyros texana; wafer ash, Ptelea trifoliata; Mexican buckeye, Ungnadia speciosa; Texas mountain laurel, Sophora secundiflora; net-leaf hackberry, Celtis reticulata; and spiny hackberry, Celtis pallida. The open area where the snails were located supported numerous species of annual forbs but is dominated by the introduced Johnson grass, Sorghum halepense.

Individuals of Euglandina singleyana were found readily available at this site under proper cover which in this site is provided by railroad crossties, miscellaneous boards, and a few rocks and cinder blocks, i.e., refuse from the surrounding human society. Numerous adult-sized snails were observed at this site each time it has been examined. Initial location of this colony occurred 6 May 1970. Eight live adults were removed at this time. Although these were all of the adults seen, impact to the population was minimal as 22 living snails were found at the site on 9 July 1971. Several subsequent visits revealed at least five living adult-sized snails and usually many more (as late as 12 June 1976). Egg clutches are also commonly found at this site.

The associated snail fauna presents an unusual mixture of species. Only one minute species, Helicodiscus singleyanus (Pilsbry, 1890), was found, apparently due to transformation of the original woodland into an open field situation. However, several species with a restricted geographic range are present as a result of the geographic position of this locality. These restricted species include one polygyrid, Polygyra hippocrepis (Pfeiffer, 1848), and two urocoptids, Microceramus texanus (Pilsbry, 1898), and Holospira goldfussi (Menke, 1847). Other species present are Helicina orbiculata (Say, 1818), Glyphyalinia umbilicata (Cockerell, 1893), Rabdotus mooreanus (Pfeiffer, 1868), Thysanophora horni (Gabb, 1866), Polygyra mooreana (Binney, 1857), Polygyra texasiana (Moricand, 1833) and Praticolella berlandieriana (Moricand, 1833).

AUSTIN SITE I

The second site which has been found to support dense populations of E. singleyana is located along the edge of residential yard which is located within the southern portion of Austin, Travis County. Underlying the surficial black clay soil is Austin Chalk. Field survey of 7507 Elm Forest was accomplished on 25 April 1976. Although the yard itself had been converted into St. Augustine grass, Stenotaphrum secundatum, with a plateau live oak cover, substantial native vegetation was present on the outskirts of the yard. Dominant woody vegetation of this adjacent area is Texas sugarberry, Celtis laevigata; plateau live

oak; and ashe juniper. Also present are skunkbush sumac, Rhus aromatica; Texas kidneywood, Eysenhardtia texana; and poison ivy, Rhus toxicodendron. Substantial amounts of chalk fragments, wood, and metal debris occurred on the surface and in the upper layers of soil.

Dense concentrations of E. singleyana were located under boards which covered rich soil with live oak leaf litter. This accumulation resulted from several years accumulation of leaves which had been deposited to form a slow-acting compost pile. Six adults and two juveniles were found living; an additional 12 adult and 3 juvenile dead shells (all fresh) were discovered. Several eggs were found underneath one of the lower boards.

A highly diversified gastropod fauna occurs in this small artificial habitat. Species found living included the following: Helicina orbiculata, Gastrocopta contracta (Say, 1822), Strobilops texasiana (Pilsbry & Ferris, 1906), Helicodiscus singleyanus, Limax (Lehmannia) valentianus (Ferussac, 1823), Deroceras laeve (Muller, 1774), Milax gagates (Draparnaud, 1801), Glyphyalinia umbilicata, Zonitoides arboreus (Say, 1816), Rumina decollata (Linnaeus, 1758), Opeas pyrgula Schmacker & Boettger, 1891, Polygyra texasiana, and Praticolella berlandieriana. Dead shells only were found of Mesodon roemeri (Pfeiffer, 1848) and Rabdotus dealbatus c.f. ragsdalei (Pilsbry, 1890).

AUSTIN SITE II

A second residential site in Austin with dense populations of Euglandina was located during surveys of Austin area snails. This site, at 2007 Sharon, supports the remnants of a cedar elm woodland with substantial modification due to residence construction and planting of ornamental plants. Snails were found under a pile of bricks, rocks, wood, plywood, and metal which was located against a rock wall. The refuse pile is located on a middle terrace of Johnston Branch which floods occasionally.

A snail survey on 16 November 1985 revealed 5 adult and two immature living Euglandina singleyana as well as 3 adult and 5 immature dead shells. Also discovered were 4 adult and 8 immature dead shells of Euglandina rosea (Ferussac, 1821), an introduced species which is native to the southeastern United States from South Carolina to eastern Louisiana. E. rosea has established populations in Texas in the last two decades (Fullington and Pratt 1974; Harry 1983). Previously, 4 living specimens of E. rosea had been removed from this population at the Austin II Site (Neck 1984a).

Associated snail species included Helicina orbiculata, Limax flavus Linnaeus, 1758, Limax (Lehmannia) valentianus, Glyphyalinia umbilicata, Zonitoides arboreus, Rumina

decollata, Mesodon roemeri, Triodopsis cragini Call, 1886, and Helix aspersa Muller, 1774.

DISCUSSION

These three populations provide an opportunity to learn something about limiting factors which act in natural habitats to prevent such population concentrations. Under natural conditions Euglandina singleyana is an uncommon species (Singley 1893). All natural habitats are wooded areas with downed wood present as cover to protect individual snails from overheating and desiccation. Such cover is likely the major factor which limits population levels of E. singleyana in natural habitats. This cover also allows greater concentrations of the operculate land snail, Helicina orbiculata, which appears to be the major food source for wild populations of E. singleyana (Neck, unpublished observations). H. orbiculata has a very widespread geographical range and normally is very common. Therefore, food is not likely to be more than a secondary limiting factor. Refuse piles allow accumulation and concentration of soil moisture which is critical for E. singleyana. Particularly susceptible to desiccation are the eggs and young snails which lack the greater reserve water storage capabilities of larger snails.

The occurrence of locally dense populations of E. singleyana in two urban localities does not indicate that this species is normally able to withstand, much less benefit from, the ravages of urbanization. Note that two of the populations were temporary, even within the short time span of observation. The fresh condition of all shells of Euglandina singleyana at Austin Site I indicates that the population accumulation was a recent phenomenon. Population decline at Austin Site I was caused by a subsequent "cleanup" of the area by the resident. The New Braunfels population decline was due to a reduction of surface refuse which provided cover. Natural succession may have played a part in this decline also. Later successional stages with less weedy forbs may produce less organic debris which can be converted into snail biomass which is suitable for the predatory activities of E. singleyana.

Much of the natural habitat of Euglandina singleyana has been cleared, underbrushed, or otherwise impacted. Populations have been restricted to narrow canyon habitats which have suffered less alteration. While population levels of this species have declined, there is no present need for official listing of this snail on a protected species list.

ACKNOWLEDGEMENT

I thank Richard J. Frisbie and David H. Riskind for the opportunity to investigate the populations of Euglandina singleyana in their yards.

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SOME NOTES ON THE ECOLOGY AND BEHAVIOR OF A POPULATION OF *Cerithium litteratum* IN A SHALLOW WATER CORAL REEF LAGOON

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Abstract

Cerithium litteratum, like other species of this genus, is noted for clumping in the shallow-water lagoon areas. This phenomenon is believed to be linked to preventing desiccation. Does *Cerithium* also derive some benefit from predation and increased reproductive potential? Mark-recapture methods provide some information on the movements of snails over a 4-day period. Observations on feeding and predation are also discussed.

Introduction

Why does *Cerithium litteratum* (Born, 1778) clump into colonies? The mollusk considered the most abundant or at least the most visible in three areas of the lagoon of Enmedio Reef off East Mexico is found from shallow pools in sandy and rocky areas, through *Thalassia* beds, and into the *Acropora palmata* areas (Tunnell, 1974). Can it be a defense against desiccation, an anti-predatory device, or a way of increasing reproductive potential? Through this preliminary study, I examined how many individuals make up a shallow-water population and also some of the behavior and movement patterns within a population. I attempted to determine the main food source and the leading predators of *Cerithium litteratum* near the offshore Isla de Media within the Enmedio Reef lagoon.

Methods and Materials

The study site consisted of an acre off the northwest side of Isla de Media (19 07'N, 95 57'W), Veracruz, Mexico. The location is on the leeward side within the lagoon of a small typical Caribbean island. The area remained subtidal throughout the period studied from June 18-22, 1987. The depth ranged from 48-150 cm and was approximately 11.5 meters from the lower tide line. The substrate of coral rubble/sand was bordered to the north with a fairly large bed of *Cymopolium barbatia* with a scattering of *Galaxaura squalida* that intergraded into *Thalassia* beyond. To the south was a virgin stand of *Rhipocephalus phoenix*.

Cerithium litteratum is known to exist in three zones within the Enmedio Reef vicinity: sand/coral rubble, *Thalassia* bed, and in *Acropora palamata* (Tunnell, 1974).

The colony of Cerithium litteratum that I chose to study was an assemblage of assorted sizes ranging from 8 - 24 mm (Fig 1). It was located in a single cluster bordered on the north and south by dead, sediment-covered coral boulders. The boulder to the north was approximately 30 sq cm on the surface and 20 cm in height. Most of the surface was covered by 12 Echinometra lucunter. The boulder to the south was approximately 30 cm, about 8 cm high and was sparsely populated with polychaetes, 2 Echinometra, and several individual Cerithium (Fig. 2).

The 243 snails were removed to the shore, dried, measured, and marked with a dot of enamel on the apex of the shell and returned to the original location. Three of the shells were found to be inhabited by hermit crabs and were returned to the cluster but not marked. Another slightly larger colony of C. litteratum was discovered approximately 45 cm southwest of the marked colony. Several solitary, large, and encrusted cerithiums were seen on boulders but no other large obvious clusters were in the vicinity.

Discussion

Geographical Distribution and Ecology

The success of Cerithium litteratum can be attested to by its distribution throughout the tropical and temperate Western Atlantic (Fig. 3). It is found as far north as the coast of South Carolina, throughout the Caribbean, south to Eastern Brazil, and as far east as Bermuda. It is found at depths to 35 fms. It does not reach the west coast of Africa as does C. guinaicum and C. atratum but does appear to have variation in structure, size and color between and within populations, in some cases referred to as "semiferrugineum forms" (Houbrick, 1974A).

C. litteratum feeds primarily on detritus, algae and carbonate sediments. Houbrick (1974A) found the dominant algae in the stomachs of a population from Boca Raton, Florida to be Enteromorpha and Chaetomorpha. Although few snails were seen to be feeding diurnally, movement within the clumps of snails appeared to occur periodically when they were being removed for marking. Perhaps they were feeding on the greenish algae on the apex of most of the cerithiums up to about 20 mm. Most snails above this size in this region were so thoroughly encrusted with deposits of Homotrema rubrum that many of the color patterns were not distinguishable. The overcast weather on the fourth day could have contributed to the association of C. litteratum with Cympolia and Galaxaura. If the association of C. erthraconense, C. ruppelli, and Clypeomorus monitiferus with living viable algal cells are truly symbiotes as has been suggested by Berner et al. (1986B) perhaps being exposed to sufficient sunlight near the

surface is sufficiently nutritous. Berner et al. (1986A) found endozoic algae within the hepatopancreas and gonads of Strombus tricornis. These organs are located with the apex of the shell thus allowing only 10-15% of available light to penetrate. This was not found to be part of the actual gut content. Similar organs were used in the cerithiums (Berner et al., 1986B) but neither the ages nor the sizes were mentioned. Perhaps the algae were a carry-over from the veliger larval stage since growth in a pelagic existence is crucial and food demands may not be met consistently.

Observations in the subtidal area showed this particular population of C. litteratum to be most dependent on Cymopodium barbatia and Galaxaura squalida. Whether the snails were actually feeding on the tissues or detritus could not be determined. Several G. squalida were seen to be inhabited by groups of snails moving about on its branches. One such 7x8 cm clump yielded 11 snails between 11 and 22 mm in size. Individuals were seen in the branches of Cymopodium barbata also. Houbrick (1974B) mentioned that C. lutosum seem to grow rapidly for 2-3 months after settling from pelagic larval stages. Since no smaller cerithiums were seen in the clumps, perhaps they were feeding and remained at the feeding site continuously. This would seem to be a definite advantage if the snail is to avoid predation in the early stages.

Clumping as an Antipredation Measure

Observations at the study site and the absence of shell fragments in beach litter led me to presume predation of Cerithium litteratum is not severe. Snails are known to derive protection from predators by their shell structure, tight fitting opercula, mucus or acid secretions and narrow apertures. Vermeij (1978) considered cerithiums to be a weedy and opportunist annual with none of these advantages. I believe that Cerithium find some protection from predation in the shallowest parts of their range by clustering. Fishes are known to have preferences in the choice of gastropods for their diet, but many are forced to feed opportunistically (Randall, 1967). Therefore, feeding pressure by fishes might have a very sporadic effect such as only when conditions (i.e., temperature, depth, abundance) are met for them to feed on that prey item. All fishes that rely on gastropods for as much as 10% of their diet are included in Table 1 (Randall, 1967). Any fishes that consumed less than that were omitted and considered to consume gastropods accidentally while feeding on algae. Large clusters might offer the same protection that birds and other social animals derive from their colonial existence. Hickman et al. (1984) suggests that large groups aid in protection by overwhelming or confusing the predator. Perhaps C. litteratum is, in fact, acting as a social animal in the shallowest portion of its habitat to

derive protection from fishes, crabs and even occasional predatory snails.

Moulton (1967) concluded that clustering in a population of cerithiums off the coast of Australia's Heron Island at low tide was done to prevent desiccation. He marked and measured a cluster of 1377 individuals ranging in size from 6-15.5 mm. The intertidal area was exposed for substantial periods of time at low tide. He found that by manipulating the water level to simulate the depth of the tides, he could cause them to clump or to scatter and feed (Moulton, 1967). While the Enmedio study site was never observed to be exposed at low tide, I can only speculate that it may be within the critical limit to warrant such activity by the snails - perhaps it is only emergent at neap tide.

I believe that the snails of the Enmedio subtidal derive added protection by making themselves an unpredictable resource as to site and cluster size variations, and that this is just as crucial to their survival as the chances of desiccation. Based on the Lincoln Index (Schemnitz, 1980), the population contained approximately 1862 individuals. The size of the individuals in the cluster, like those within the Australian study (Moulton, 1967) indicate sizes (8-24 mm) less than what are considered mature specimens (34-36.1 mm, Houbrick, 1974B).

Over the 4-day period, marked individuals moved from a minimum of 115 to a maximum of 240 cm from their original location. They not only changed place but the size of cluster also changed (Table 2a & 2b). This could result either from changes in current or by actual movement by the snails, but nevertheless accomplishes the same ends.

Since few pieces of Cerithium are found in drift on the island, I would assume that predators include the following: various fishes that swallow them whole; crabs that only break the lip and eat out the soft inside, thus allowing the hermit crabs to inhabit the shell; and occasional naticids that might be able to occupy the site when water temperatures are lower than what is found in June.

The two species of fish that I believe have the largest impact on the cerithiums of the shallow lagoon within the study site are the wrasse, Halichoerus bivittatus, and Labrisomus nuchipinnis. Numerous individual H. bivittatus swam about above the groups of snails without appearing to notice them, but when I returned marked individuals to the original cluster the first day of the study one such fish became curious enough to follow each snail to its resting place before losing interest. On one occasion, the fish immediately picked at the enamel dislodging it from the shell. Even though the fish never caught an individual snail, I am convinced it would have if the size had been

within a range it could handle. Labrisomus nuchipinnis in the West Indies is known to feed on gastropods 1/10 its body size (Randall, 1967). Analysis of gut content of 22 L. nuchipinnis indicates that 16.5% of its diet is composed of gastropods, including C. eburneum. Other suspected fish predators include the demersal porcupine fish species that were shown to have fed on C. litteratum (Randall, 1967) even though they have not been seen in the shallowest zone of the lagoon (see Table 1).

Crab predation might be indicated because a few shells with broken apertures have been seen inhabited by hermit crabs in the study area. Callinectes is known to try to break the apex of steep spired shells, such as Cerithium, with a twisting motion, thus only eating the softer interior and leaving the shell otherwise intact (Vermeij, 1978). Callinectes marginatus were observed in the vincinity of the study site. Mucus secretions by Cerithium are thought to be important in preventing dessication and as a predator defense mechanism against Callinectes by Littorina irrorata and Cerithidea scalafiformis. This was especially important when they moved about above the water line on plant stems at Goose Bay in Florida's St. Mark's National Wildlife Refuge. Callinectes was shown to prefer snails with a size ration of 4.25-4.50. Smaller ones were discarded and larger ones could not be handled efficiently. These crabs ate about four snails a day and were effective in picking them off of the Thalassia blades at high tide (Hamilton, 1976). I do not consider crabs to be a serious population-limiting mechanism in this shallow area, however; various predatory gastropods known to be in the area may pose a threat but have not been seen to be a problem since no drilled Cerithium shells have been seen in the immediate vicinity to indicate such predation. Naticids have been shown to be the primary predator of Cerithium lutosum and Neritina virginea in deeper water but seem to be inhibited by higher water temperatures and variations in salinity within the bays (Jackson, 1972).

Reproduction

Social organisms are known to be in close proximity and are thought to derive increased reproductive success because of the frequent encounters within the population (Hickman et al., 1984). Reproductive potential in this unpredictable habitat might also be linked to clumping. Moulton (1967) considered clumping to have no connection to reproduction since the individuals within a clump were found to be sexually mature males with viable sperm and the females were found to contain unripened eggs. Because females can store sperm and use them over a period of time (Houbrick, 1974A), this could be the best means of putting them in close proximity to males or sperm that are deposited within the sand before the sperm are actually needed for fertilization. It is believed that fertilized eggs are

laid in strings in the sand and that the snails do not copulate (Houbrick, 1974A). Some colonies of Cerithium have been virtually wiped out by being an intermediate host to a trematode that affects migrating shorebirds (Moulton, 1967). This infestation causes parasitic sterility and might limit the reproductive potential. Shorebirds are absent from this site and would not appear to cause a problem.

Conclusions

From this preliminary study, I sampled from a population of Cerithium litteratum of some 1862 individuals. Based on observation and literature (Moulton, 1967), the main reason for clumping was largely due to preventing dessication. Random movements and changes in cluster size allow the snails to derive some protection from predators by making themselves into an unpredictable resource.

No exclusive predator of Cerithium litteratum was found. Predation is thought to be shared by fishes such as Halichoeres bivittatus and Labrisomus nuchipinnis that are large enough to swallow them since they are know to feed on Cerithium litteratum (Randall, 1967) and are found in the study area. Crushed shells in beach drift may indicate predation by Callinectes or other crabs in the vicinity. Drilled specimens may, likewise, indicate predation by other gastropods such as Polinices, but the low numbers indicate that the effect is thought to be minimal.

As feeding was only observed on the final day of the study, I can not determine the main source of nutrition. The movement within clusters possibly allows the snails access to detritus in addition to food/ nutrition obtained from Galaxuara squalida and Cymopolium barbatia. Otherwise, the movements seem to have no immediately identifiable significance.

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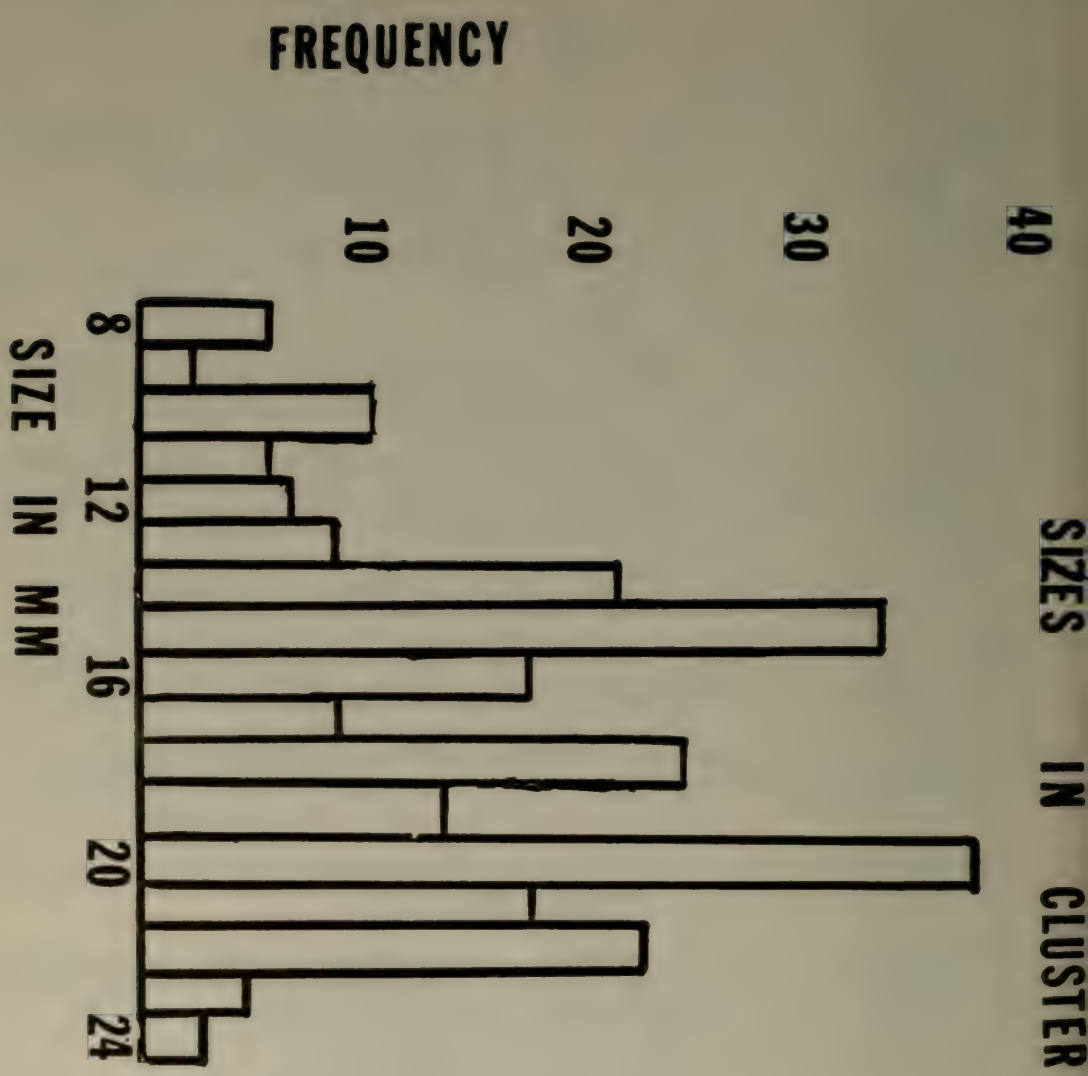

Fig. 1

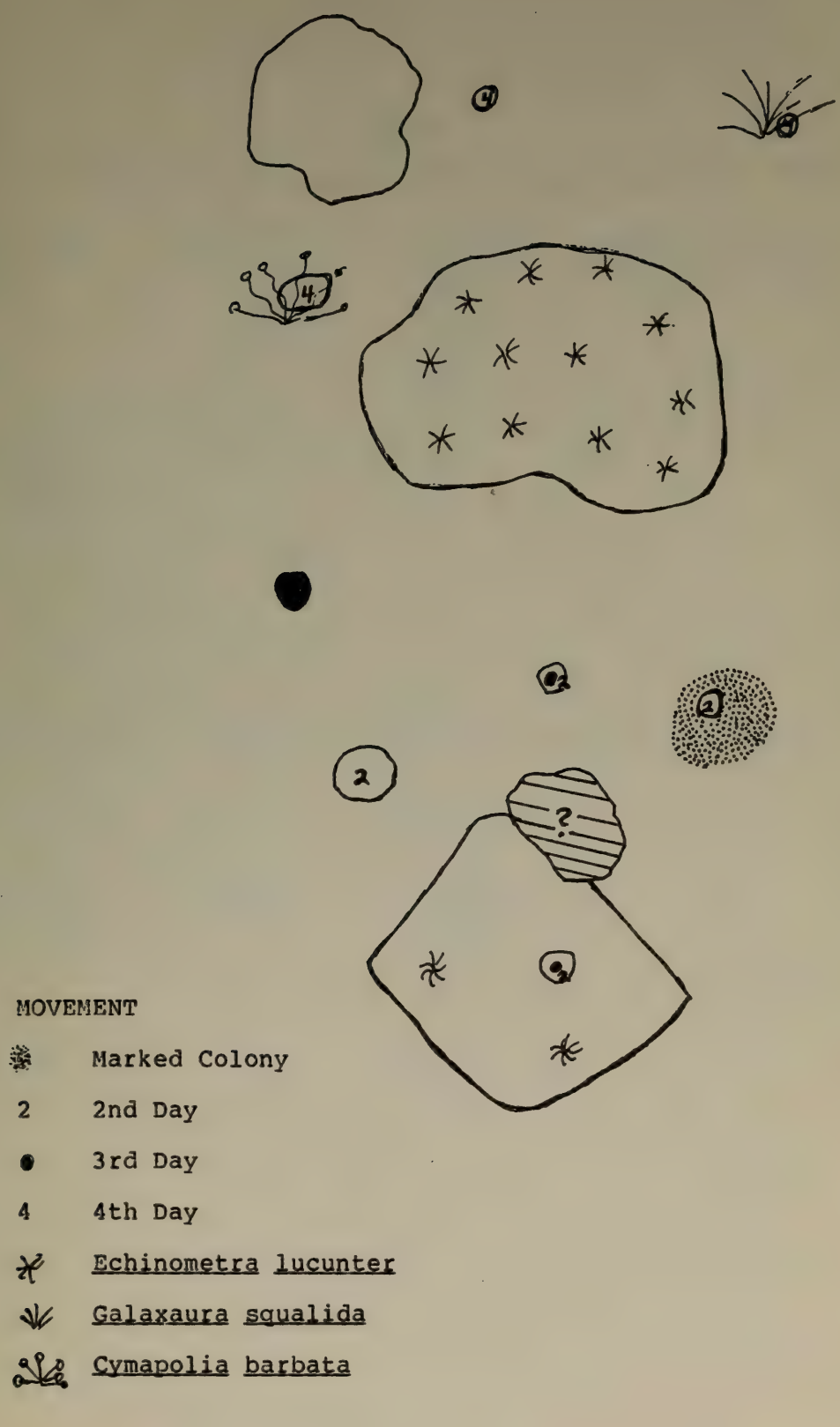
4
4
4
2
2
?
MOVEMENT
Marked Colony
2 2nd Day
3rd Day
4 4th Day
Echinometra lucunter
Galaxaura squalida
Cymapolia barbata

Fig. 2

TABLE 1

Recaptured Snails over 4 Day Period

site	Day 0 mark/unmark	Day 2 mark/unmark	Day 3 mark/unmark	Day 4 mark/unmark
1.	240/0	3/10	-	-
2.	-	7/49	2/8	-
3.	-	6/63	8/73	-
4.	-	26/162	-	-
5.	-	-	19/169	-
6.	-	-	-	7/133
7.	-	-	-	10/159
8.	-	-	-	1/21

TABLE 2

Cluster size/Distance *Cerithium* moved from original marked cluster location.

0 Day	2nd Day	3rd Day	4th Day
240/0	13/0	10/45	
	56/45	81/45	140/225
	69/45	288/120	169/225
	188/90		22/240

Distance in cm.

TABLE 3

Predation on Gastropods by Fishes based on Randall (1967)

Species	% gastropod in diet	*Cerithium* present	Reported Found In Enmedia
?*Diodon holocanthus* (Balloon fish)	67.7	yes (*litteratum*)	no?
Chilomycterus antennatus (Bridled burrfish)	56.0	yes	no?
Calamus penna (Sheephead porgy)	50.0	no	no?
?*Trachinotus fulcatus* (Permit)	47.8	yes (*C. sp*)	yes
Diodon hystrix (Porcupine fish)	31.3	yes (3 sp)	yes
**Labrisomus nuchipinnis* (Hairy blenny)	16.5	yes (*eburneum*)	yes
Gerres cinereus (Yellowfin mojarra)	14.5	no	no?
Halichoerus garnoti (Yellowhead wrasse)	13.5	no	no?
**H. bivittatus* (Slippery dick)	12.4	yes	yes
Calamus bejonado (Jolthead porgy)	11.1	no	yes
Bodianus rufus (Spanish hogfish)	10.4	no	no?

MONOGRAPH

By H. Ode'

DISTRIBUTION AND RECORDS OF THE MARINE MOLLUSCA IN THE NORTHWEST GULF OF MEXICO

(A Continuing Monograph)

Family CAECIDAE Gray, 1850

This is a family of unusually formed small gastropods. Most species start out as extremely small planorbid shells. When they start growing they form a curved tube, often curved in two directions like a helical spring or ram's horn. In some genera after some time a septum is formed and the early shell is lost. The septum carries a protuberance, the socalled mucro, which is considered to be of importance in the classification. A third stage follows after formation of another septum and the final shell is a slightly curved tube either smooth or with surface sculpture of circular rings or longitudinal striae. Sometimes one can find shells in which the second stage is still connected to the third stage. Then the diameter of the tube suddenly increases. The animal can close off the open end of the tube by a horny multispiral operculum. Recent investigations (Moore, 1962) have shown that these animals belong in the Rissoacea. In the N.W. Gulf of Mexico many species occur, usually classified in the single genus Caecum. This is subdivided on the basis of shell characters, into several subgenera.

As with so many other groups of molluscs in the N.W. Gulf of Mexico, the caecids are closely related to those in the Panamic Province and to the Pliocene fauna of South Florida as described by Dall (1890) and Olsson and Harbison (1953). The correspondence with the caecid fauna of the Virgin Islands as reported by Mitchell-Tapping (1979) is poor. Many of the species reported there are unknown or quite rare in our area. I reported briefly on this family in the Texas Conchol. Vol. 2 (1), 1965.

Sources: Dall, 1890; Trans Wagner Free Inst. Sci., Vol. 3 part 1, p. 1-200, plts 1-12. Also 1892, ibid part 2 pp. 201-473.
Moore, D., 1962; Bull. Mar. Sci. Gulf and Caribb., Vol. 12, No. 4, 695.
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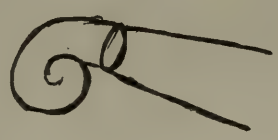
Keen, A.M., 1968; Veliger, Vol. 10, No 4, pp 389-439, plts 55-59, 171 text figs.
Mitchell-Tapping, H.J., 179; Nautilus, Vol. 93 (2-3), pp 103-105.

Genus Caecum Fleming, 1813

Species of this genus live in several types of environment: coral reefs, sand and mud bottoms, coastal bays, etc. Keen (1971) separates Caecum in several other genera, but Abbott (1974) considers only subgenera. It is possible that there should be two genera, as there are two different types of veliger shells: In Caecum s.s. and Micranellum the first growth starts out still wound against the original veliger shell. In Brochina the veliger shell starts already to unwind. See sketch below.

Caecum s.s.



Brochina

In our area the following subgenera whose distinctiveness is probably overemphasised can be distinguished on shell characters as follows:

Caecum s.s.: Principal sculpture consists of strong circular rings; aperture circular and hardly thickened in the adult.

Micranellum Bartsch, 1920: Circular annulations much more numerous and finer than in Caecum.

Elephantulum Carpenter, 1857: Most conspicuous sculpture is longitudinal mucro. Sometimes combined with fainter annulations, mucro often large and pointed.

Brochina Gray, 1857: Slender, thin and almost smooth species with a small mucro.

Fartulum Carpenter, 1857: Very small, smooth; aperture nonconstricted and inclined to axis of the tube.

Meioceras Carpenter, 1858: Shell swollen in the middle, smooth, aperture constricted.

To judge from the number of bored specimens of caecids among the many thousands in the survey collection they must form a staple food for predatory gastropods. (Natica?)

Species in Caecum s.s. are difficult to identify properly. Mitchell-Tapping has reported from the Virgin Islands such species as C. regulare Carpenter, C. gurgulio Carpenter, and C. donmoorei Mitchell-Tapping, 1979, which in many respects are similar to such species as C. cinctum, C.

pulchellum, C. sp. indet. B and C. bipartitum, which are reported here. It appears likely that in general the muddy environment of the coastal bays and the shallow offshore waters on the Texas-Louisiana shelf harbour a fauna different from that of the Virgin Islands.

193. Caecum (Caecum) cinctum Olsson and Harbison, 1953

This is the common species found abundantly in the Texas coastal bays, especially south of Matagorda, but less common in East Texas and Galveston Bay, although it is locally abundant in Christmas Bay. In the past this species was always reported as C. pulchellum, but that species is not a Texas bay species and has only been taken offshore. C. cinctum has in general a stronger more developed straighter shell than C. pulchellum and at the aperture its diameter appears to be slightly smaller than at some distance before it. Also the annulations appear to diminish in strength toward the end instead of increasing as in pulchellum. The mucro is small but well visible on the outside diameter of the plug. In spite of the small size numerous specimens have fallen victim to predatory snails. The figures in Andrews (1971, 1977) are typical cinctum.

Records HMNS Survey Collection: 30 lots, of which 5 contain live collected material.
Depth range: 0-1 fms. Alive in all Texas coastal bays. One lot from 11 fms, 30 miles north of Port Isabel, is probably adventitious.
Geographical range: Only known from the Pliocene of South Florida (Olsson and Harbison 1953, 318, pl 45, figs 3, 3a, 3b).
Maximum size: 2.8 mm. Sometimes when the second stage remains connected to the third stage specimens may be larger. I have seen such a specimen which was fully curved through half a circle.

194. Caecum (Caecum) pulchellum Stimpson, 1857

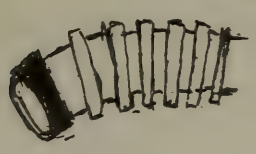
This small species is known under many names and is sometimes reported as C. regulare Carpenter, which has been considered (Corgan, 1967) as a different species. In the Texas-Louisiana area it does not enter the bays but remains restricted to offshore shell bottoms (20-30 fms), the coral reefs and the shale domes, and in the mudlump fauna. Abbott reports pulchellum from the grassbeds in sheltered bays and lagoons of southern Florida. I have not seen any material from the more sediment rich coastal bays and estuaries in the Carolinas. This is a very variable species. Especially the spacing of the annulations may be different not only between populations but also within populations. This

species often occurs together with C. bipartitum, which, however, is different and not as Abbott suggests a form of pulchellum. There is no varix. There is, however, another species in the area, also variable in length, annulations and diameter which possesses a varix. In that species the shape of the annulations is square.

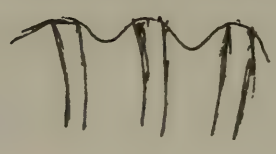
Records HMNS Survey Collection: 34 lots of which 11 contain live collected material.
Depth range: 10-55 fms; alive 17-55 fms.
Geographical range: New Hampshire to Brazil (Abbott, 1974).
Maximum size: 2.4 mm.

195. Caecum (Caecum) sp. indet. B

This is a difficult species to identify among the mass of highly variable C. pulchellum. From this material we have separated a rather coarsely annulated species which resembles the Eastern Pacific C. quadratum Carpenter closely. It differs from the general stock of pulchellum in having coarse, rather square ribs and a small but quite visible varix, which in most specimens is formed by the merging of three rings.



Caecum sp. indet. B



C. pulchellum

The lengthwise profile of this species is quite different from that of pulchellum. It occurs in the same environment as pulchellum: sand bottoms off Freeport, off Cameron (LA). Stetson Bank, etc.

Records HMNS Survey Collection: 5 lots, of which 1 contains live collected material.
Depth range: 23-40 fms; alive 30 fms (at "18 fms lump").
Geographical range: Unknown.
Maximum size: 2.5 mm.

196. Caecum (Caecum) bipartitum Folin, 1870

This is one of the most common and widespread caecids along the Texas coast, where it lives in many types

of environment (calcareous reefs, Pleistocene shell banks, sand and mud bottoms). It often resembles rather small C. pulchellum but there are some definite differences: it's color is brown, flecked with lighter tan mottlings; it has an oily sheen; the annulations are, when present, round in crossection and not ridgelike as in pulchellum. The shell is thin walled and there is no terminal varix. The most remarkable thing about bipartitum is the often abrupt change in sculpture, hence the name. The change is always from annulations to lack of annulations. However, sometimes the change is quite gradual. One can see - rarely - very faint longitudinal striae in areas where the annulations have almost disappeared. There is a thin periostracum. Although it lives rather close to shore - at the end of the Galveston and Freeport jetties- the species has never been taken on the beach, but offshore in 8-25 fms on shelly and muddy bottoms it is widespread and common.

Records HMNS survey Collection: 41 lots, of which 19 contain live collected material.
Depth range: 5-36 fms; alive at 5-25 fms.
Geographical range: Offshore Texas and the Western Gulf of Mexico (Abbott, 1974).
Maximum size: 1.8 mm.

197. Caecum (Micranellum) textile Folin, 1867

This is a rather rare species that has only been collected a few times in the bays and never offshore. Dead material only is known from Aransas Bay and Matagorda Bay. I have reported this species in the Texas Conchol. Vol 2 (1), 1965 as follows: "Among the material of Caecum pulchellum [now changed to C. cinctum] from Port Aransas a slightly different form, more strongly curved and with more ribs occurs." This is indeed a quite different form with many more crowded and low annulations, more curvature in the tube and a a more uneven diameter. The species is real close to Micranellum lohri Strong and Hertlein from Panama. I have never seen it in offshore dredgings. This may be a Pleistocene fossil.

Records HMNS Survey Collection: 6 lots, no live collected material.
Depth range: Only known dead from beachdrift in Aransas Bay and at Indianola.
Geographical range: Florida keys and the West Indies (Abbott, 1974).
Maximum size: 2.2 mm.

198. Caecum (Micranellum) condylus Moore, 1969

In the material from the Flower Garden reef one specimen of Caecum condylyus was collected. This specimen is now in the paratype collection of the U.S. Nat. Mus. in Washington, D.C. Unfortunately, no other specimens of this species were taken. It is to be noted that I have corrected the name to condylus because the Greek word kordulos is a noun.

199. Caecum (Meioceras) nitidum Stimpson, 1851

This well known and often reported species has never been dredged alive in offshore waters nor found alive in the bays. From along the Corpus Christi Causeway to Padre Island we have a very fresh specimen, brown and shiny with darker flecks, which may have been collected alive. Dead shells of this species can be collected in large numbers in all southerly Texas coastal bays and somewhat less common east of Matagorda Bay and uncommonly in Galveston Bay. It is possible that this is a Pleistocene fossil. This species is very rarely dredged in offshore waters (Heald Bank). The species has a large number of synonyms (see Abbott, 1974). The plug in this species is small, lopsided with a mucro on the high side.

Records HMNS Survey Collection: 12 lots, no live material.
Depth range: 0 (beach) - 7.5 fms.
Geographical range: South Florida and the Gulf Coast to the West Indies and Brazil (Abbott, 1974).
Maximum size: 3.1 mm.

200. Caecum (Meioceras) cornucopiae Carpenter, 1858

This small species is quite rare on the Texas-Louisiana shelf area. It is only known from the coral reefs (Flower Gardens) and Stetson Bank. From C. nitidum it differs in being much smaller and much less swollen in the middle. Its color pattern is about the same. Reported earlier (Tex. Conchol. Vol 9,p. 62, 1973) as Meioceras sp. A.

Records HMNS Survey Collection: 3 lots, no live material.
Depth range: 5-20 fms.
Geographical range: Bahamas, Southeast Florida and West Indies around coral reefs (Abbott, 1974).
Maximum size: 1.9 mm.

201. Caecum (Meioceras) cubitatum Folin, 1868

This is the common offshore Meioceras of the shelf area, where it is fairly widespread over sandy,

shelly bottoms. It possesses a shiny, thin, slender and slightly curved tube, suddenly enlarged near the end and then tapering to a constricted aperture. The apical plug is rather flat with a small pimplelike mucro on the side. Even among these quite minute shells I have seen many traces of gastropod predation (circular bore holes on the side).

Records HNMS Survey Collection: 27 lots of which 8 contain live collected material.
Depth range: 20-76 fms on sandy shelly mud; alive 23-55 fms. Mostly from Port Aransas to Cameron (LA) below 20 fms.
Geographical range: North Carolina to Texas to Brazil (Abbott, 1974).
Maximum size: 1.8 mm.

202. Caecum (Fartulum) ryssotitum Folin, 1867

This is a rather uncommon species in the N.W. Gulf of Mexico. The description in Abbott, 1974 is excellent and fits our material exactly. The species has been collected twice alive at south Padre Island: once from beachdrift near the Coast Guard station and once by divers from drift between rocks of the jetties. Some other material looks old and is from rather deep water off the Lousiana coast (displaced material?) and some is rather fresh from the offshore coral reefs (Flower Gardens).

Records HMNS Survey Collection: 8 lots of which two contain live collected material.
Depth range: 0-55 fms: alive at 0-3 1/2 fms.
Geographical range: Texas and the West Indies to Brazil.
Maximum size: 2.3 mm.

We come now to three closely related species which I cannot place with certainty but have given the labels "floridanum," "imbricatum," and "insularum." The first of these lives exclusively on the offshore coral reefs; the second lives close inshore on sand bottoms; and the last one, contrary to Abbott's statement of "shallow warm oceanic water around small islands" in somewhat deeper water off Texas and Louisiana. All three are closely related but do not seem related to other species in the subgenus.

203. Caecum (Elephantulum) floridanum Stimpson, 1851

This species lives exclusively on the coral reefs and algal bottoms below them. None of the material in the survey collection corresponds in all particulars with Abbott's diagnosis. Important for classification here are the position and shape of the

apical plug, the arrangement and shape of the annulations and, lastly, the color of the shell.

What I call here floridanum does not resemble Abbott's figure of this species, but is closer to figure 1a, plate 45 of Olsson and Harbison's book on Florida Pliocene fossils. It's plug is recessed, and there is a terminal varix with two or three widely spaced following rings. All later rings are very close together and very much flattened. Live collected material is non-white but a very light tan in color with a row of darker brownish dashes on the outer circumference of the tube. I believe that Olsson and Harbison (1953) err when they place this species in Caecum s.s.

Records HMNS Survey Collection: 11 lots, of which two contain live collected material.
Depth range: 8-55 fms; alive 8-15 fms.
Geographical range: North Carolina to Brazil (Abbott, 1974).
Maximum size: 4.1 mm.

204. Caecum (Elephantulum) c.f. imbricatum Carpenter, 1858

Superficially this species resembles floridanum, to which it is undoubtedly closely related, but there are many points of difference. These are: the terminal varix is less developed; in many specimens the color dashes are more intense; the apical plug is not recessed; the annulations are fewer in number, but the longitudinal striae are much stronger; many specimens have an "oily sheen," never seen in floridanum. None of our material resembles in any way figure No. 875 in Abbott, 1974. Remarkably all our material has been taken on sandy and shelly bottoms and none of it comes from the coral reefs. The socalled "imbricatum" of Andrews, 1971 and 1977 is not this species but cooperi. I reported this species earlier (Tex. Conchol. Vol. 9, p. 62, 1973) as Caecum sp. C.

Records HMNS Survey Collection: 5 lots of which 1 contains live collected material.
Depth range: 5-14 fms on sandy shelly bottoms off Texas. Alive 5 fms at end of Galveston jetties.
Geographical range: Florida to Texas. Bahamas and West Indies (Abbott, 1974).
Maximum size: 3.6 mm.

205. Caecum (Elephantulum) c.f. insularum Moore, 1970

This is a rare species found once offshore Texas and

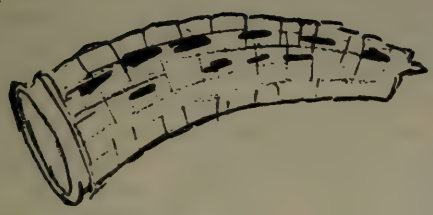
once offshore Louisiana. It lacks the development of the terminal varix at the aperture and is smaller than floridanum. It has, however, the typical color pattern of these three closely related species. These three species probably should be classified in the subgenus Elephantanellum Bartsch, 1920, a subgenus that Abbott, as I am inclined to believe, incorrectly synonymized with Elephantulum.

Records HMNS Survey Collection: 2 lots, one of which contains quite fresh material.
Depth range: 25 (off Freeport) - 40 fms (off Cameron, LA).
Geographical range: Puerto Rico and Virgin Islands (Abbott, 1974).
Maximum size: 3.1 mm.

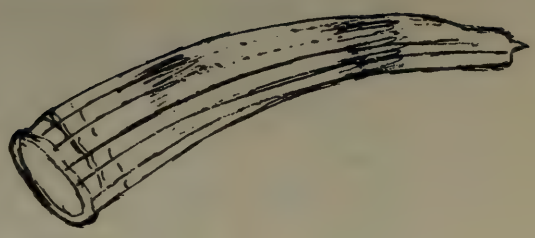
206. Caecum (Elephantulum) cooperi S. Smith, 1860

This is the most common caecid on the Texas and Louisiana coast. It belongs also in Elephantulum but in my opinion the previous three species have little to do with the four species I am going to discuss now.

C. cooperi is characterized by strong longitudinal ridges, sometimes crossed by a weak system of grooves between them. In that manner a cancellate sculpture is created which, however, is quite different from that of the species I have called imbricatum Carpenter. In many specimens of cooperi - but by no means all - the plug is slightly recessed and the mucro on it fairly well developed. There is a completely different color pattern than in imbricatum. This pattern consists of vague faint brown blotches which more or less form rings around the tubes. Fresh material is light tan in background color. Imbricatum is offwhite and even sometimes somewhat greenish in color and has rows of somewhat arrowshaped narrow dashes along the long direction of the tube. Sometimes in cooperi there is a minute varix. Abbott (1974) states that "raised rings are prominent near the aperture." This at best is true for a small percentage of specimens. Most of our material is to some degree cancellated, especially when it is old and worn. Many specimens, in particular the smaller sized ones, are only longitudinally ridged and shiny. C. cooperi is closely related to cycloferum, plicatum and clava, but differs from floridanum, imbricatum and insularum. In a sketch I have tried to bring out the differences between both groups of species.



C. imbricatum



C. cooperi

C. cooperi lives on sandy bottoms along the Texas and Louisiana coasts. Beach worn specimens are occasionally found in beachdrift along the entire Texas coast, but mainly in the south.

Records HMNS Survey Collection: 61 lots of which at least 16 contain live collected material.
Depth range: 0-40 fms, on sandy bottoms; alive 8-30 fms.
Geographical range: South of Cape Cod to West Florida; and Texas (Abbott, 1974).
Maximum size: 3.2 mm. Abbott (1953, 1974) cites 4 to 5 mm, copied by Andrews, but it never reaches that size in Texas. Usual is about 2.5 mm.

207. Caecum (Elephantulum) cycloferum Folin, 1867

A single specimen of this large species with very heavily developed varix was dredged off Louisiana. The longitudinal ridges continue over the enormous varix. The species also occurs in the South Florida Pliocene fauna: Caecum coronellum Dall, 1892 (see Olsson and Harbison, 1953) plate 45, figs. 5, 5a).

Records HMNS Survey Collection: 1 lot, no live material.
Depth range: 55 fms, off Cameron, LA.
Geographical range: Southeast United States and West Indies (Abbott, 1974).
Maximum size: Not measured because specimen is broken.

208. Caecum (Elephantulum) clava Folin, 1867

Strongly ridged longitudinally, with a clublike ending. Mucro rather flat, triangular; sometimes the shell continues for a short distance beyond the thickened portion of the anterior. The longitudinal ridges are not oriented precisely in the direction of the length of the tube, but very slightly wind around it. The number of these grooves is variable; in

fresh material there are fine radial striae between the longitudinal ridges.

This species lives mainly in a muddy environment: the shale domes of the Louisiana coast (Stetson Bank, Claypile Dome, Cameron (LA). It is possible that the biology of this species is somewhat different. It is never collected in large numbers as so many other species of caecids and most samples contain only a few specimens. I suggest that the remarkably thickened anterior portion of the shell acts as an anchor in soft muddy substrate and prevents the animal of sinking too deeply into the mud.

Records HMNS Survey Collection: 11 lots of which 2 contain live collected material.
Depth range: 15 fms (Stetson Bank) - 55 fms (off Cameron, LA).
Geographical range: Texas and the West Indies (Abbott, 1974).
Maximum size: 3.6 mm.

209. Caecum (Elephantulum) plicatum Carpenter, 1858

This species only occurs in calcareous environments (f.i. Flower Gardens) and in deep water off Cameron (LA).

There are strong longitudinal ridges, a well developed varix and at the other end a low but massive mucro. The color is a light brown, mottled with offwhite when alive. Dead shells are snow white.

Records HMNS Survey Collection: 7 lots of which 2 contain live collected material.
Depth range: 10-55 fms; alive 24-36 fms.
Geographical range: Florida and the West Indies; Bermuda (Abbott, 1974).
Maximum size: 3.7 mm.

210. Caecum (Brochina) johnsoni Winkley, 1908

In the past this species was reported as Caecum glabrum but that species is West European and considered by most workers to be different. C. johnsoni can be found in fine drift along the entire Texas coast. At Port Aransas and further south it is often alive on clumps of oysters. Also widespread in Matagorda Bay, East Matagorda Bay and Christmas Bay. With Caecum cinctum these are the only species in Texas that have adapted well to coastal bay environment. Offshore this species is replaced by a smaller somewhat different one.

The shell is a round tube with many growth incrementals. The apical plug is spherical with a rough surface and the mucro can still be seen where it forms a kind of knob on the side of the hemisphere; its highest point is below the midpoint of the dome. (See sketch below).

C. johnsoni

There is no varix at the aperture. In most populations there are strongly curved specimens with small but increasing diameter probably "second stages" and much thicker ones, less curved and with constant diameter, "third stages." Operculum flat, horn colored. Abbott states: "spiral turns not visible." This is not so in my material. In a large specimen with large operculum there are at least 12 turns of the spiral visible.

Records HMNS Survey Collection: 22 lots of which 5 contain live collected material.
Depth range: 0-2 fms.
Geographical range: Massachussets to North Carolina (Abbott, 1974).
Maximum size: 3.0 mm.

211. Caecum (Brochina) sp. A

Caecum johnsoni is replaced offshore in many type of environments off Texas and Louisiana by a smaller, purely cylindrical species covered by a beautiful golden brown periostracum with a silky sheen to it. As is often the case, the offshore form is smaller and more slender than the coastal bay form. In a few

specimens faint traces of a low varix can be seen. This species is completely smooth and when the periostracum is in place - and that is in most specimens available to me - no trace of annulations or growth lines can be seen.

It is possible that this is merely the offshore form of C. johnsoni but it does look so different to me that I will leave it for the moment unnamed. The operculum in this species has the property mentioned by Abbott for johnsoni: no spiral turns are visible. Perhaps it is possible that this should be named johnsoni and the common bay form something else.

Records HMNS Survey Collection: 29 lots of which 14 contain live collected material.
Depth range: 8-32 fms; alive 8-27 fms.
Geographical range: Unknown.
Maximum size: 2.1 mm.

There are three other species of Brochina in our area which are difficult to identify. In many respects they are in good agreement with Abbott's diagnosis, but differ in a few.

212. Caecum (Brochina) vestitum Folin, 1870

This species, which in the past (Tex. Conchol. Vol. 9, p. 62, 1973) I reported as C. veracruzanum Folin - a synonym, is in good agreement with Abbott's diagnosis except in the properties of the aperture: in our material the varix is well developed and not slight and in none of my material is there the slightest indication of "incipient annulations at the anterior end." The tube of the shell is well curved, shiny and completely smooth; only with high magnification growth incrementals become visible. All of our material comes from calcareous environment and 1 lot from Stetson Bank and none from sandbottoms. A very similar looking figure is given by Keen, 1968, text figure 80 named Caecum semilaeve Carpenter. But she states "annulations weak and irregularly developed."

213. Caecum (Brochina) c.f. carolinianum Dall, 1883

This is another fairly widespread species whose identification is troublesome. In several respects it does not conform with Abbott's diagnosis, but I find it difficult to give it any other name. In this case the structure of the varix is exactly as stated by Abbott (1974) but now the discrepancy is in the plug, which is different in the second and third stages. In the second stage the plug is indeed "sunk

in at the posterior end of the shell and with a sharp hornlike projection." In the third stage, however, it is a very low oval without a projection. Fresh material is covered by a golden brown periostracum. Until I stand corrected I will report this material as carolinianum. This species has been collected only offshore, both on sandy shelly bottoms off Texas and in the calcareous reef environment at greater depth.

Records HMNS Survey Collection: 15 lots, 2 containing live collected material.
Depth range: 7-85 fms; alive 8 fms.
Geographical range: North Carolina to Southern Florida (Abbott, 1974).
Maximum size: 3.2 mm.

214. Caecum (Brochina) heladum Olsson and Harbison, 1953

A number of lots contain Brochina with longitudinal sculpture. Often this sculpture is subdued and not strong. There is little doubt that the majority of the lots of this material is a different species closely related to and, as I believe, the same as C. heladum, originally described from the Pliocene of Florida. It is, however, possible that C. heladum grades imperceptibly in what I have named carolinianum. In one lot from Stetson Bank there are shells which grade from strong longitudinal sculpture all the way to almost smooth and somewhat shiny surface.

It is possible that C. heladum is the same species as C. tenuicostatum described by Folin, and reported by Mitchell-Tapping (1979) from the Virgin Islands.

Although we have a considerable number of specimens with operculum it remains doubtful that any were collected alive.

Records HMNS Survey Collection: 19 lots, none alive, mostly off Galveston and West Louisiana in mud bottoms.
Depth range: 8-25 fms.
Geographical range: West coast of Florida (Abbott, 1974)
Maximum size: 3.4 mm.

(To be continued)

Conus milneedwardsi

An ode to the milneedwardsi
Whose name could cause you to sigh
I asked for MIL-NEE
WARD-ZEE, you see
But found it was Mr. Edwards plus "I".

By Jean Holman

(Ed. note: Actually, Jean it was Milne-Edwards as his proper name!)

(Author's note: . . . You see what I mean!)

DR. PULLEY'S SEAFOOD CREOLE

This can be made with shrimp, crabs, or both. It is much like gumbo, but it has more tomato and does not start with a roux.

Heat enough olive oil (cooking oil or vegetable shortening can be substituted) to cover the bottom of a heavy pot. Add the following chopped vegetables:

3 medium onions
3 large sticks celery
1/2 pound okra, cut in sections
1 large green pepper

Cover the pot and cook these vegetables slowly for 15 or 20 minutes. Stir occasionally. When the onions begin to look clear, add a large can of tomatoes. Break up the tomatoes, and let the pot come to a slow boil. You may need to add water to make a thick soup consistency. Add the shrimp or crab meat. Season with salt, pepper, a bay leaf, and a little chili powder. Simmer slowly for about 20 min., turn off the fire, and stir in 2 or 3 teaspoons of gumbo file' powder. Serve over rice, and have a shaker of file' powder available for those who may wish to add a dash to the top of their serving.

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Epitonium angulatum

JULY, 1988

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TEXAS CONCHOLOGIST, Vol. XXIV, No. 4, July, 1988

SEARCH AND SEIZURE

By Constance E. Boone

AMERICAN MALACOLOGICAL UNION ANNUAL MEETING

For twenty years I have been attending the annual meeting of the American Malacological Union, the professional society for malacologists. This year's session at Charleston, South Carolina, in June was the fifty-fourth annual meeting of this organization begun in 1931 by a group of professionals and serious amateurs whose special interest was mollusks. As always, I came home with new ideas and new information, which is what prompts me to belong to this society and to work for it as an officer.

This year's symposia ranged from the history of malacology, to reports on applications of nucleic acid techniques, to the study of molluscan evolution (a mind-boggling exercise in science for me but a new tool in the study of mollusks), and to systematics and evolution of nonmarine mollusks.

There were some double sessions, and sometimes I had a hard time choosing what I wanted to hear as some of the other marine and non-marine papers covered things I am interested in. Fortunately, the sessions were close together, and if I chose carefully I was able to hear a bit of everything. Probably this proves that I am not a specialist, but I am a student of all Mollusca.

Trying to understand how DNA analyses help in the study of relationships of mollusks was difficult, but researchers like Dr. M.G. Harasewych, Curator at the Smithsonian Institute and convenor of the symposium, feel very strongly about the applications available to malacologists and the need to use these tools in determining phylogeny in mollusks.

The historians, led by Wim Backhuys of the Netherlands, included Dr. Eugene V. Coan whose talk lauded the role of the amateur in the development of malacology in the Western United States and reminded everyone again that the AMU was actually called a union in order to bring together both professionals and shell club members (often amateurs) who could help the professionals do field work and who often became authorities themselves. That is still very much true today. I have come home with requests for Texas material needed by professionals and a student for upcoming studies.

I am glad I did not miss the video taped in situ from manned submersibles to see several species of cephalopods from the bathypelagic and benthopelagic realms of the deep sea. Presented by Dr. C.F.E. Roper and Dr. M. Vecchione of the Smithsonian, the importance of this video to scientists

was the opportunity to see how the deep-water cephalopods behaved in nature. Most of such animals brought up rarely in trawl nets arrive too damaged to be useful.

Also, Dr. James H. McLean, curator at the Los Angeles County Museum of Natural History, showed some fascinating new species of slit-limpets in the Family Scissurellidae from the hydrothermal vents. He also introduced us to members of a new family of Fissurellacea from the vents.

Then, to top all this off, I report that at the banquet Dr. Harasewych presented a video of participating in scouring the deep in a small manned submersible off the Atlantic Coast of North America where he found a bonanza of live Pleurotomaria, including a new species that will be named soon in Nautilus. Can you imagine a laboratory dish full of live, colorful and large slit shells from the Atlantic, those rare and elusive animals we know little about and have thought were scarce? Seeing how they gathered these, using a vacuum tube operated from inside the sub, was unbelievable. We asked how many were recovered, but Dr. Harasewych declined to give a number. We do know there were many and that several species were collected. Of course, there were rare Callistoma and other species collected also, but the slit shells made everyone ooh and ahhh!

What I came away with concerning land mollusks was that there are still a lot more to find and describe. Dr. Alan Solem continues to work in Australia and discover new species, as well as to study adaptations of survival "from monsoon jungles to desert fringes," the subject of his talk.

We learned from Dr. Tucker Abbott that his popular book on world land shells will be ready in about a year and that it will cover over 1,000 of the most beautiful, most unique and the largest land shells. He said that estimates now by professionals indicate that there might be over 50,000 land shells in the world. This would certainly increase the overall total of estimates of all species of world shells. We have been led to think in recent years there might only be about 60,000.

There were so many other papers of interest to me, but I just want to emphasize that attending the AMU sessions can be very rewarding to the serious student of mollusks.

There was a mid-week break with field trips to a fossil pit, to nearby streams and land, and on a trawler to dredge offshore. Charleston offered history to the visitor. Many members went to Fort Sumter and to plantations. We had an impressive auction of books and literature on mollusks, directed by President Richard E. Petit, and I paid a whopping price for a book on unionids which I already own

(paid $5.00 for it some twenty years ago!) but needed to obtain for a professional working on Texas unionids.

Next year's meeting will be a joint meeting with the Western Society of Malacologists. It will be held June 26 thru 29 at Los Angeles, California, when Dr. McLean will serve as AMU president. He has announced the following symposia: "Systematics and Evolution of Western North American Land Mollusks," "Pelagic Gastropods," and "Scaphopod Biology." You will have the chance to visit the Los Angeles County Museum of Natural History where some events will be held. Field trips are planned for Friday, June 30.

Mark your calendar to go to California next June. Accommodations at the University Hilton will only cost $62 single, $72 double, $82 double and $92 quadruple occupancy. Most sessions will be at Davidson Conference Center across the street, and the museum is nearby.

"TERMINOLOGY" OF QUAHOGS

Market names which Mercenaria are sold under are as follows:

"Chowders"---These are the largest and cheapest of the clams and are usually made into New England-style chowder (with milk-cream), Manhattan-style chowder (with tomatoes) or minced, diced or ground for other food uses.

"Cherrystones"---Medium-sized, medium priced and sometimes served on the half shell. They are the popular New England clam bake size.

"Littlenecks"---These are the smallest, tenderest and the most expensive. They are usually served steamed with clam broth and garlic butter.

(Information from the Recreational Shellfish Guide produced by the South Carolina Wildlife and Marine Resources Department. This publication also stated that this clam is the most overlooked shellfish delicacy in South Carolina. More than 95% of the commercial clam production in South Carolina is shipped out of state in the shell, some later returning to grocery shelves disguised as Manhattan or New England clam chowders. In Texas we ignore this clam most of the time for food, and we know of no commercial operations.)

Constance Boone

MONOGRAPH

By H. Ode'

DISTRIBUTION AND RECORDS OF THE MARINE MOLLUSCA IN THE NORTHWEST GULF OF MEXICO

(A Continuing Monograph)

Family TORNIDAE Sacco, 1896

Shells in this family of small vitrinellid - like gastropods used to be considered vitrinellids. However, in many respects the animals have a different anatomy and thus they are set aside not only in a different family but even superfamily: Tornacea Kuroda, Habe and Oyama, 1971. The genus Tornus is unknown from the N.W. Gulf of Mexico, and only two other genera live in our area.

Genus Cochliolepis Stimpson, 1858

Flat, widely umbilicate shells, either smooth and unadorned, or with dense spiral sculpture. Whorls overlapping strongly, so that only nucleus and initial whorl are visible on top. These small gastropods live in association with polychaete worms. This is one of the few genera not represented in the Eastern Pacific.

215. Cochliolepis parasitica Stimpson, 1858

This species, another of the many Texas socalled Carolinian species, was first described by Stimpson who discovered it under the scales of an annelid worm (see Abbott). The shell is extremely flat, quite openly umbilicated and shows segments separated by deep narrow grooves which follow the hardly visible growth incrementals. Each of these segments overlaps the previous winding to a slightly different extent. The circumference is almost circular and the aperture slightly oblique, and its upper margin extends further forward than the lower. Found on the beaches of Port Aransas and Galveston. Seldom in offshore dredged material. Once in Galveston West Bay and once offshore Freeport in 26 fms. Discussed and figured in the Tex. Conchol. Vol 5, page 72-73, 1969.

Records HMNS Survey Collection: 7 lots, no live collected material.
Depth range: 0 - 26 fms.
Geographical range: South Carolina to Texas and the West Indies (Abbott, 1974).
Maximum size: 4.2 mm.

216. Cochliolepis striata Dall, 1889

This is the largest Texas species in the genus, reaching to over 10 mm in size. Like the other species it is quite circular in circumference and widely umbilicated and somewhat heavier in build than parasitica. The nucleus is different from that in parasitica. It is globular with the overlapping body whorl almost touching it. This species is immediately recognized by the heavy spiral striations which become clearer with age. It can be found at South Padre Island, Aransas Pass and all of the Freeport and Galveston beaches close to the passes. Seldom dredged offshore (once in 25 fms offshore Freeport). For figure see the Tex. Conchol. Vol. 5 (6), p. 62, 1969. Also known from the Pliocene of Florida.

Records HMNS Survey Collection: 7 lots, no live collected material.
Depth range: 0 - 25 fms.
Geographical range: Florida to Texas (Abbott, 1974).
Maximum size: 8.5 mm but broken; if complete, well over 10 mm.

217. Cochliolepis sp. indet. A

A third species of this genus, apparently not yet described, is present in our material. One specimen was collected on the beach of St. Joseph Island from beachdrift and two others were dredged offshore Freeport. Its circumference is somewhat elliptical because the body whorl expands towards the aperture. The body whorl is more inflated, so that the suture appears to be much deeper than in the other two species. The periphery is keeled but rounded off, so that the shell appears to be domeshaped. In one of the offshore dredged specimens faint spiral striations can be seen under the microscope. This is the thinnest shell of the three species and the most fragile, which may explain its great rarity. The species shows hardly any overlap in the whorls. We reported this species in the Tex. Conchol. Vol. 9, p. 61, 1973.

Records HMNS Survey Collection: 3 lots, no live collected material.
Depth range: 0 - 23 fms.
Geographical range: Unknown.
Maximum size: 3.0 mm.

Genus Macromphalina Cossmann, 1888

In this genus belong a number of minute shells of depressed auriform shape with wide umbilicus and a surface sculpture of axial riblets crossed by spirals. The nucleus consists out of 2 to 3 glassy clear whorls forming a little pyramid on the upper surface. In that respect these shells resemble Cochliolepis closely (striata). Keen (1971) is incorrect in placing Macromphalina in the Rissoidae. These have a completely different nucleus while that of Macromphalina is the same as that of Cochliolepis. Pilsbry and Olsson (1945) used the name Chonebasis for the numerous Eastern Pacific species.

218. Macromphalina palmalitoris Pilsbry and McGinty, 1950

A widespread species but never obtained in large numbers. Often only a few juvenile are found in dredge samples. All our material is quite thin shelled, horn colored and characteristically ribbed and spirally striated. In older specimens the periphery of the last whorl becomes somewhat keeled and the last whorl descends strongly giving the shell a skew aspect. An older name for this species may be Stenotis troudei Bavay, 1907; see Journal de Conchliologie Vol 55, Stenotis troudei Bavay, 1907, p. 342-343 and figures.

Records HMNS Survey Collection: 19 lots of which 9 contain live collected material.
Depth range: 8 - 40 fms; alive 23 - 30 fms.
Geographical range: Off Palm Beach, Florida to Texas (Abbott, 1974).
Maximum size: 2.9 mm.

219. Macromphalina pierrot Gardner, 1948

A single specimen of this species, described originally as a Pliocene fossil from North Carolina, was found in 11 fms off Galveston. Since then it has been reported from the Pliocene of Florida (in Olsson and Harbison) by Pilsbry (p. 413, plate 52, fig. 6, 6a, 6b) and by Abbott for Port Aransas. Of all macromphalinas it is the least auriform and with the least surface sculpture.

Records HMNS Survey Collection: 1 lot, no live material.
Depth range: 11 fms.
Geographical range: Port Aransas, Texas, living. Pliocene of North Carolina (Abbott, 1974).
Maximum size: 1.5 mm.

Family FOSSARIDAE Troschel, 1861

This is a poorly defined family, which is in the process of losing much of its content (e.g. Gottoina, Iselica). I do not know a correct characterisation but its members have probably a rather large nucleus, and a somewhat flaring aperture when full grown. There is also a wide slitlike umbilicus, quite different from the wide open one of Macromphalina. In the N.W. Gulf of Mexico two undescribed species of great elegance and attractiveness.

220. Megalomphalus sp. indet. A

This little, somewhat globular, shell is strongly, radially ribbed, and the supposedly spiral ornamentation which is used in the definition of the genus Fossarus by both Keen and Abbott is missing. It is a white shell with a dark brown nucleus which sits as a button conspicuously on top of the white shell. The nucleus consists of a large punctilated dome with a spirally ornamented whorl below it abruptly going over in the completely ornamented shell.

The teleoconch is strongly tabulated and ornamented by densely packed, quite elevated and sharp radial ribs. There is a strong umbilical ridge within the wide open and slitlike umbilicus. There is no connection with any of the species ennumerated by Abbott (1974), but the species is clearly, if distantly, related to F. megasoma C.B. Adams from the Eastern Pacific. Reported earlier (Tex. Conchol. Vol 9, p. 62) as Macromphalina spec. indet. A.

Thiele in Handbuch der Systematischen Weichtierkunde, part 1, p. 239, figures a species closely related to our material. Our conclusion is to recognize Brusina's genus Megalomphalus as a valid genus in Fossaridae, and we use this for this NWGS species.

Records HMNS Survey Collection: 6 lots, no live but some fresh material. All lots are from coral or algal reefs and some of the Miocene shale uplifts (Stetson Bank, Claypile Dome off W. Louisiana).
Depth range: 10 - 36 fms.
Geographical range: Unknown.
Maximum size: 5.5 mm.

221. Fossarus sp. indet. A

This beautiful globular shell is very close to the previous species but differs in some important detail: 1) the whorls are perfectly spherical, not tabulated, 2) the oblique radial ribbing is much coarser, 3) the nucleus is larger, more solid, not

brown in color and its first and only whorl is not spirally striated, and, finally, 4) the umbilical ridge is much less developed than in the other species. This clearly is a different but closely related species.

Records HMNS Survey Collection: 1 lot, no live material.
Depth range: 55 fms of Cameron, LA.
Geographical range: Unknown.
Maximum size: 1.7 mm.

Superfamily ARCHITECTONICACEA

Family MATHILDIDAE Dall, 1889

I have adopted here the arrangement of Abbott (1974), who, following Kuroda, Habe and Ogama (1971), put the family Mathildidae in the Architectonicacea. If this arrangement will be confirmed by anatomical studies, some consequences for other groups of mollusks should follow.

I suggest that the genera Peristichia and Triptychus which usually have been place in the Pyramidellidae will have to be transferred to the Mathildidae. At least for one species of Peristichia found over the Texas-Louisiana shelf area it is obvious that it should on the basis of shell characters be allied to the Mathildidae. A study of the soft parts of the generic types of Triptychus (niveus) and of Peristichia (toreta) should decide the problem. The heavy development of the surficial sculpture and in particular the structure of the apertural outer lip, which is polygonal instead of rounded, are characters of Mathilda and are nonpyramidellid. For the time being, I have placed Triptychus and Peristichia in the Mathildidae.

Genus Mathilda Semper, 1865

Shell turritelliform, but heavily sculptured by strong spirals and many less important axials, giving a knobby aspect to the surface. Outer lip polygonal, nucleus heterostrophic. Mathilda is not known from the Panamic Province, but is widely distributed in the Pliocene of Europe.

222. Mathilda barbadensis Dall, 1889

This is a fairly common species on the Texas-Louisiana shelf area where it was collected in various types of environment (Pleistocene rock ridges, coral reef, Miocene Domes, and sandbottoms). Our material conforms quite well with Dall's figure and descriptions. The nucleus in our material

appeared to be somewhat larger than Dall's figure indicates. For this reason I have appended a sketch of it (Fig. 1). The species can grow considerably larger than is implied by Dall and can reach (based on fragments) close to 10 mm in length. Then it consists of about 9-10 whorls outside those of the nucleus. The smooth helical nucleus changes abruptly into the heavily sculptured later whorls. The color of most of our material is, when not bleached, a soft light brown, uniform over the entire shell. The largest specimen in the survey collection has about 8 whorls. There are two keels on each whorl of which the upper one is the strongest.

Records HMNS Survey Collection: 19 lots, no live material.
Depth range: 8 - 55 fms.
Geographical range: "Southeast Florida and the West Indies" (Abbott, 1974).
Maximum size: 7.5 mm (broken, when complete well over 8 mm).

223. Mathilda c.f. hendersoni Dall, 1927

In 1927 Dall described no less than 6 different species from only a few samples; these were never illustrated, except M. hendersoni, which was figured by Rios, (1985). Our material is not unlike that figure, but in the strongly expanding spiral is more finely beaded than Rios' figured specimen. It is also possible, although not very probable, that our material is made up out of two species because the fineness of the sculpture varies considerably. However, our material is insufficient to decide whether this is a specific difference or falls within the normal variability of the species. Dredged off Port Aransas (Hospital Rock) and from off Western Louisiana (Cameron and Mississippi Delta).

Records HMNS Survey Collection: 5 lots, no live material.
Depth range: 33 - 55 fms.
Geographical range: Off Fowey Light and Turtle Harbour, Florida, 25-50 fms Brazil.
Maximum size: 4.5 mm but fragments indicate a larger size.

Genus Triptychus Morch, 1875

Whorls sculpted by nodulose spirals. Columella with two folds.

224. Triptychus nivens Morch, 1875

In the survey collection are two lots, one a single broken shell from the Flower Gardens and the other a lot of 32 full grown specimens brought up in shell

rubble from Sonnier Bank (Three Hickey Rock in the survey). The clear glassy nucleus is rather small but of the same type as that of the other mathildids. It is suddenly replaced by a sculptured whorl of the teleoconch, which has two spiral ridges, the upper one of which is nodulose and the lower one is smooth. (See figure 2). These shells conform with the available description of the species. A close relative occurred in the Pliocene of Costa Rica (T. biseriatus Gabb) and another recent species is known from Santa Elena Bay, Ecuador (T. olssoni Bartsch, 1926, see Keen, 1971). Earlier reported as Mathilda sp. C (Ode', Tex. Conchol. Vol. 9, p. 73). Also reported from the Yucatan platform (Vokes and Vokes, 1983).

Records HMNS Survey Collection: 2 lots, no live material.
Depth range: 10 - 25 fms.
Geographical range: "Southeast Florida and the West Indies" (Abbott, 1974).
Maximum size: 5.3 mm.

Genus Peristichia Dall, 1889

Clearly elongate, spirally sculpted shells with a simple basal chord. The radial elements in its sculpture are less obvious. Nodules are radially arranged and arise where spirals are crossed by radials. Relatively thick shelled as all Mathilda with a polygonal outer lip in the aperture. Nucleus heterostrophic, in shape equal to that of Mathilda, but smaller. No columellar folds.

225. Peristichia pliocena (Bartsch, 1955)

This interesting species is widespread over the Texas-Louisiana shelf area, but occurs only in few numbers per location. It was described for the Pliocene fauna of Southern Florida and is one of the many species that has survived on the Texas shelf. Bartsch rather unwisely named a juvenile (or defective shell) Peristichia martschi (1955, plt. 2, fig. 6). Our material is exactly the same as Bartsch's figure (Bartsch, 1955, plt. 1) and description.

To me this species appears close to Peristichia but Bartsch put it in the genus Triptychus where it does not belong. Mature specimens develop a thickened outer lip of the aperture. In the original report (Ode', Tex. Conchol. Vol. 9, p. 73) it was labeled Mathilda spec. B and it was figured Vol. 9, p. 53, 1973 of the Tex. Conchol. The species P. agria Dall resembles it closely but differs in having a finer surficial sculpture. But I feel it should be carefully investigated whether both species could be

identical. A sketch of the nucleus is given in figure 3. Vokes and Vokes (1983) figure P. pliocena but label it P. agria Dall.

Records HMNS Survey Collection: 12 lots, no live collected material.
Depth range: 8 - 40 fms from coral reefs, shale domes and shelly bottoms off Texas and Louisiana.
Geographical range: Western Gulf of Mexico from Western Louisiana to Yucatan.
Maximum size: 4.5 mm.

226. Peristichia toreta Dall

Of all species discussed here this has the smallest and most elongated nucleus (see figure 4). It reminds one of some nuclei seen in turbonillids. However, there can be no doubt that this species belongs in the Mathildidae as indicated by the strong surficial sculpture and polygonal aperture. It is a rather widespread species on the Texas-Louisiana shelf, where it is mostly found on sandy bottoms. Concerning its biology nothing is known. Rarely taken from beachdrift (Galveston, South Padre Island). Andrews (1971) figures it as Turbonilla sp. F.

Records HMNS Survey Collection: 24 lots, no live material.
Depth range: 0 - 55 fms, on sand bottoms.
Geographical range: "North Carolina to West Florida," (Abbott, 1974).
Maximum size: 12.4 mm (broken, when complete about 13.5 mm taken from beachdrift at Galveston).

(To be continued)

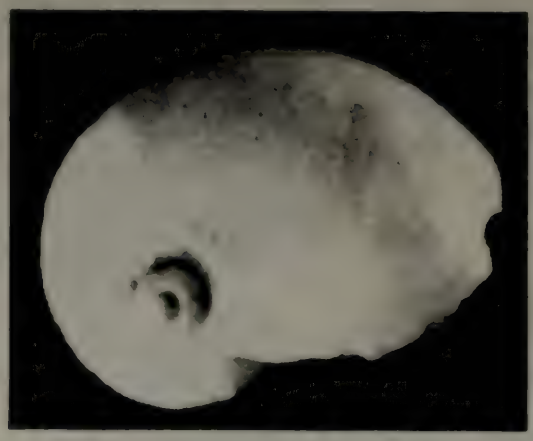
Fig. 1 Mathilda barbadensis

Fig. 2 Triptychus niveus

Fig. 3 Peristichia pliocena

Fig. 4 Peristichia toreta

Fig. 5 Megalomphalus sp. collected at "24 fm lump" 113 miles SE of Galveston, Texas, Oct. 7, 1967, by divers from aboard USS Haynsworth DD700. 2.8 mm.



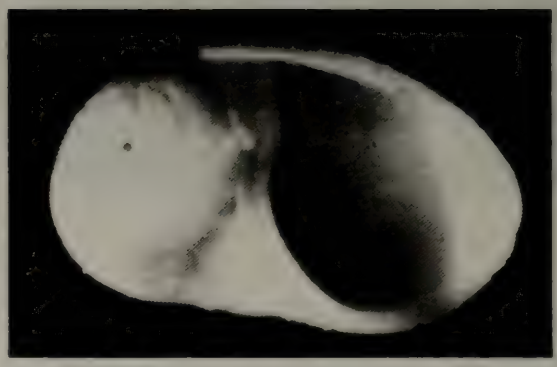
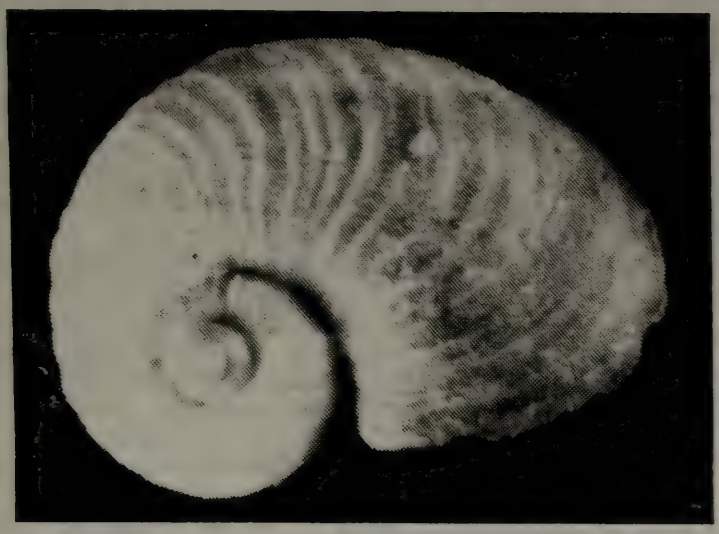
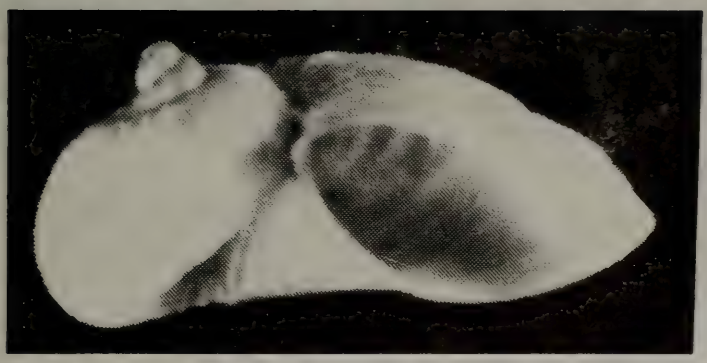


Fig. 6 Macromphalina pierrot collected by divers H. Geis and W. Pierce at the 30 mile rigs South of Galveston, Texas, Nov. 1, 1964. 1.5 mm.





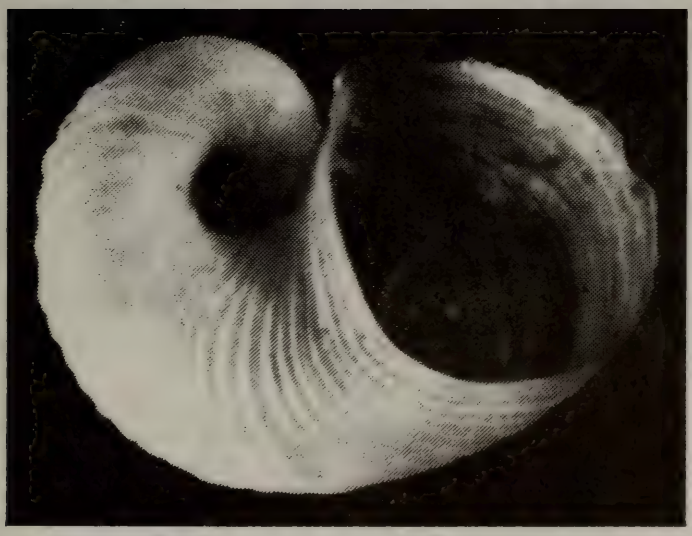


Fig. 7 Macromphalina palmalitoris collected at Stetson Bank, 74 miles SE of Galveston, Texas, by dredging in 30-40 fms, 1963 by T.E. Pulley and Paul McGee. 2.5 mm.

BELIZE: *Cypraea zebra* REVISITED

THE YUILL LOG

On May 13th, thirteen intrepid shellers embarked on a shelling adventure to our favorite hideaway in Belize--Caye Caulker. The thirteen shellers included nine Outdoor Nature Club members and four members of HCS--Tom Whelan, Lauretta Marr and her son Tom, and me.

We flew a brand new Taca Airlines 737, with Tom Whelan and me ensconced on row 13. It was not a trip for triakaidekaphobiacs! The flight was flawless, and we landed on time and made our connections to Caye Caulker with daylight to spare. The Tropical Paradise Hotel welcomed us with open arms and a new cabana.

Saturday, the 14th, our guide and friend, Raul Young took us to the mangroves for our first sortie against the local fauna. I had inflamed the group with visions of finding their first *Cypraea zebra* amongst mangrove roots like I had done on my first trip to Caye Caulker in 1987 (see Boone, *Texas Conchologist*, Vol. XXIII, No.4). But I failed to prepare the group for an encounter with mangrove mud. After an hour of floundering in the muck, braving mosquitos, and no *Cypraea*, the group was ready to move on to greener pastures--sea grass meadows of *Thalassia*, or turtle grass.

We worked the grass flats and sand flats on the north end of Caye Chapel, a private resort island just south of Caye Caulker. By one o'clock everyone was hot and ready for a break and some shade. Raul motored us to a pier, where most of us picnicked at a table under a thatched roof cover.

Raul took the opportunity to lay relaxing near the edge of the pier--a bit too near the edge. Kersplash! Raul, a good natured soul, came up smiling. He also came up with a *Cypraea zebra* in his hand. The group could not believe his "luck," but I could. Raul had the eyes of an eagle.

Everyone wanted to know where he had found this beautiful cowry. Raul explained that it was under the pier, in the open, on the mud flat. He went back to look again. "Here's another one." Splash, splash! Lauretta and I were over the side of the pier in a flash. Raul showed us how he was now checking the underside of each *Strombus* in a pile of dead queen conch. He quickly found another *Cypraea* and another before Lauretta and I each found our first.

By now, everyone was back in the water under the pier. We found more *Cypraea* in the pile of conch and several under sheets of rusty iron debris that was under the pier. Many of the cowries had incorporated the iron oxide into their shells like a reddish-brown patina over the usual brownish-black pattern. I found one *Cittatium pica*, attached to an

iron piling, with the iron rust color also bound into the normally green shell. In about 20-30 minutes, we found twelve or thirteen Cypraea zebra.

No other day was like this one, but it was a banner trip for C. zebra. Before the trip was over, Lauretta had found several more beautiful specimens under coral rubble, on the reef flat just shoreward of the breaker zones. Although I tried a few times, no C. zebra were found in the mangroves like last year.

In a broad sense, this cowry seems to live in different habitats--mangrove roots, nearshore shell rubble, and reef zone rubble. In reality the habitat requirements are quite similar. The animal appears to require cracks or crevices to hide in, or under (technically known as refugia) during the day, with access to hard substrate with a covering of algae to graze on at night. All three habitats that have produced C. zebra in Belize have shared these two factors.

The trip produced other treasures, like live Strombus pugilis from the deep sand flats and two live Cymatium femorale from the shallow grass beds. But it is hard to beat a Cypraea zebra in the rubble--unless it is two Cypraea zebra in the hand.

SHELLING IN COSTA RICA

By Mrs. Charles Roe

Our trip to Costa Rica in February was probably among the best travel experiences we have ever had - and we almost missed out on it.

The letter from Kirk Anders Travel arrived during the Christmas confusion at our house and was somehow "shuffled under" until mid-January, when it surfaced again. Reading it aloud to Charlie, I knew right away it was my kind of trip: nature, beach walking, shopping!! Charlie commented, "Well, it is right over your birthday. Maybe we could celebrate . . . "

That was all the encouragement needed to send me to the telephone to put our names on the list. We debated about getting passports since that would be about another $100 for the two of us - no one seemed to be sure whether current regulations required one or not. (things change daily in Central America). We decided to go ahead and get the passports, a good decision, because we did need them.

On February 16 we met Pete Bright and Norm Paschall in the Miami airport for our Laesa flight to San Jose. There were 18 in the group representing 7 states (Florida, Illinois, Arizona, Pennsylvania, South Carolina, Maryland and Texas). Although our plane did not leave until 2, we were served cocktails and lunch during the 2 1/2 hour flight to Costa Rica.

Early the next morning (my birthday and I was feeling very adventuresome) we started toward the coast of Guanacaste in 2 vans - a "smokers" and a "non-smokers." The countryside was in bloom but appeared dry as this was the dry season. (Many areas are impassable during the wet months of May to November). We passed coffee and banana plantations and after a few stops for pictures and lunch, arrived in Tamarindo about 4.

Most of us just dumped our baggage and headed for the beach to see what was there. In no time Norm had his favorite *Epitonium gradatum*, a *Pitar lupinaria*, and *Conus purpurescens*. We gathered live *Agaronia propatula*, cute pink *Strigilla chroma* and a few *Oliva incrassata*. Long Turritellas were everywhere, as were star shells (*Astraea buschii*).

The next morning at low tide we tried our hand at turning rocks - tough work! Charlie found one of "goals" he had set for himself, a tun shell (*Malea ringens*) and some small dead cowries in good condition (*Cypraea arabicula, C. albuginosa*, and *Jenneria pustulata*.) I found a live hairy triton (*Cymatium vestitim*) with periostracum still intact, *Cassis coarctata*, and *Morum tuberculosum*, *Thais melones*, *Leucozonia cerata*, and *Nerita funiculata* were on the rocks.

Small cones (mostly dead) - C. nux, C. purpurescens, C. brunneus, C. perplexus, C. zimenes, C. gladiator, C. regularis rolled in the tide pools. A ledge of dead shells yielded some unusual finds: Murex pinniger, Adrana cultrata, Hastula luctosa, and a still unidentified Crassispirella.

We gathered on the patio under the big banyon trees to cool off and have lunch. Then around 4 we would have "show'n tell" and try to identify our finds.

That evening 10 of us went to a nearby beach to do some "turtle watching," walking about a mile down the dark beach and waiting under the stars for a huge leatherback turtle to drag herself ashore to lay eggs - an unforgettable experience.

The next morning we drove further north to Playa Grande where we found live Murex princeps - totally encrusted! and the false tooth shell (Opeastoma pseudodon) also lime-covered. Many small shells, Columbella, Bulla, Tegula, were home to hermit crabs. Large chitons (C. stokesii) were hiding in rock crevices. One of the gals found a beautiful paper nautilus in the "trash" line.

Saturday morning around 9:30 the tide was a super low - 1.4 and about 75 yards of beach were now exposed. Live Cypraea cervinetta, iridescent and dark, were found that day along with Strombus galeatus. Charlie found #2 on his list, a Pacific horseconch (dead, but beautiful, and bright orange). Some other good shells found by members of the group were Conus patricius and Murex oxycantha, and in the high tide lines Oliva porphyria and Harpa crenata, both rarely seen in this area.

The next morning some of the group elected to stay at the hotel for some R&R or some more rock turning. The rest of us headed further north to Brasilito and Flamingo. We saw bright green parakeets and howler monkeys in trees along the road, but did not find anything new and exciting on the beach (unless something good turns up in the bottle of micro shells I picked off the rocks).

Most of the next day was spent in sight seeing as we made our way back to San Jose via Sarchi, where the colorful painted ox carts are made. We toured the factory and loaded up on wooden souvenirs (where to carry them??!).

The last day in Costa Rica was a free day in San Jose with the option of various tours. Charlie's love of geology asserted itself though, and we chose a trip to Irazu Volcano instead of a city tour. The drive up the mountainside was beautiful - pink daisy bushes 4' tall, bromeliads and ground orchids. In contrast, the craters were stark and barren although the volcano has been

inactive for nearly 25 years. The trip back included a stop at the Basilica of the Virgin of Los Angeles at Cartago and a visit to the marble and gilt National Theater (or Opera House) in San Jose - both outstandingly beautiful.

The farewell dinner that evening was a great finale to a wonderful trip. We had seen many interesting things, collected some new shells, and learned lots, but best of all, made some good new friends. As our new friend Bucky commented, "I sure wouldn't mind making the same trip again with the same people.

SHE-CRAB SOUP

Blue crabs in South Carolina are used to make something called She-Crab Soup, an entry on many of the menus and a dish served at the AMU banquet recently at Charleston. Not knowing exactly what this was, I read with interest in the Recreational Shellfish Guide produced by the South Carolina Wildlife and Marine Resources Department how this was prepared.

You need the meat of blue crabs and the hard orange crab roe found on the inside of the female's shell. This is not to be confused with the orange sponge of eggs beneath the outside of female crabs which are ready to deposit their larva. These are illegal to take there and in Texas also.

You mince one small onion, one stringed stalk of celery and saute these in a pan with one-half stick of butter (for about one pound of white crab meat you will use this for). When translucent, you sprinkle one tablespoon of flour over this and stir. This coating is supposed to help vegetables float in the soup instead of sitting on the bottom of the bowl.

Begin warming seven cups of milk and one pint of light cream in a double boiler. Pour in the crab meat but not the roe. Stir in four or five tablespoons of dry sherry, one-half teaspoon mace, a pinch of salt and a pinch of ground white pepper and several "dollops" of "wooster" sauce. When warm, add it to the milk and cream and cook over an extremely low heat for just under an hour.

The hard roe is crumbled into the bottom of the soup bowl when you serve the soup. You can add more sherry, we are told, and you can garnish with chopped parsley or light dusting of paprika. This is supposed to serve 4 to 12 people.

This is She-Crab soup. Sorry, I can't attest to the flavor. I'm allergic to crab.

Constance Boone

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1988 - 1989

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The TEXAS CONCHOLOGIST accepts contributions for publication from amateurs, students, and professionals, subject to approval by the Editor. Manuscripts should be typed, double spaced and should be in the hands of the Editor the first day of the month preceding publication dates. Photos accompanying such material are welcomed.

TEXAS CONCHOLOGIST Vol. XXV, No. 1, October, 1988

SEARCH AND SEIZURE

BY CONSTANCE E. BOONE

TEXAS CONCHOLOGIST --- TWENTY FIVE YEARS OLD

With this issue, Texas Conchologist begins its twenty-fifth year of publication, a record that the Houston Conchology Society can point to with great pride.

Tied closely to the ambitions and seriousness of the first members of this shell club, the publication began with Vol. I, No. 1, in September, 1964, with Elizabeth Eubanks as editor. It had no title and discussed aims for such a publication. At that time, the club was actually the Conchology Group of the Houston Outdoor Nature Club. A group of interested shellers had met as a study group starting in 1958 and held its first organizational meeting in May, 1959. Meetings were held informally in the homes of members, about three times annually at first.

That first issue of what was to become TC stated the following policies for the pubulication (to be discussed and voted): Publication would be ten issues per year on a monthly basis (August through May) with hope that the issues could be mailed before each meeting and serve as meeting announcements; no free advertisements would be printed; members would get the publication with payment of dues to the Conchology Group; non-members could subscribe for $2.00 a year; the Editor would be responsible for the quality of the publication and would be elected annually; the Editorial Staff would not be responsible for the validity of articles sent by collectors as it was stated that both beginners and advanced collectors did sometimes make incorrect identifications of shells; those contributing material for publication were asked to use the proper (Latin) names for the species in their reports or articles and common names alone without the scientific names would not be printed. The final policy statement suggested follows: "The entire Editorial Staff will at all times endeavor to maintain and increase the scientific merit of this publication and will try to have material in each issue that will be of interest to the beginner, local, worldwide, and more advanced amateur collector." These policies were adopted.

That first four-page issue contained the first continuing report on Texas shells, named "Notes Concerning Texas Beach Shells," written by Helmer Ode' and Anne Speers. These two continued for many years to publish a systematic report of shells found in Texas bays and on our beaches. That first number included 20 references they intended to use. Through the years, this list grew and was eventually reprinted.

Vol. I, NO. 2, published in October, 1964, was called Conchologist, and included "Mollusks in the Journals" by Dr. W.W. Sutow and a column entitled "Especially for Beginners" by Liz Eubanks.

Vol. I, No. 3, followed in November, 1964 with the same title, but by Vol. I, No. 4,5, & 6, the title had become Texas Conchologist because Dr. W.J. Clench of Harvard University had informed the editor that Conchologist had been used in the past.

It was now decided to publish only nine issues a year, but money was scarce and issues were combined that first year. "Notes and News" in the issues continued to report field trips, meetings, upcoming shell shows in Texas, and listings of members who wished to swap shells. The club was meeting in the lecture room of the new Planetarium (now part of the Houston Museum of Natural Science complex). Ernie Libby was named art editor, and Dr. T.E. Pulley was the professional consultant.

The jounal was a labor of love for the club, since members did the stenciling, mimeographing, and work to put the journal together. At that time, members of the Conchology Group paid only $1.00 dues. They were required to pay dues to the parent group, The Houston Outdoor Nature Club. Members pitched in with money or donation of materials to accomplish the task of producing this journal.

During the summer of 1965, Editor Eubanks departed to return to school and to live in Dallas. Ode' became editor, after having served as associate editor for Vol. I. Sutow and Libby began their trips to the Marshall Islands to do testing work for the Atomic Energy Commission after the nuclear bombs were dropped in that area. Articles, with pictures, began to appear detailing their exploits in finding shells and rediscovering Strombus taurus, then a rare shell. Beginning with Vol. II, No. 2, Sutow titled his column "Molluscana," and for many years this popular column continued to provide members with information he gleaned from the many journals on shells he obtained, with notes on trips to visit famous malacologists, and with uses of shells throughout the world. We have never replaced the kind of material Wat provided us, in my estimation.

The first mention of my name seems to be a note in Vol. II, No. 2, 1965, when this appeared under "Notes and News": "Mrs. H.Q. Boone said there is nothing so useful (in cleaning shells) as a large old-fashioned hairpin. Straighten out pin, bend a hook in one end, stick through the snail and pull." I was listed a new member in that issue.

By that time, Sutow's reviews of stamps with shells began, a popular subject for many of the members. The next May

the club began to exhibit shells the entire length of Sharpstown Mall, something we did for several years.

My first article was on summer shelling in Vol. II, No. 9, and then in Vol. III, No. 4, I reported on a pioneer Texas conchologist, J.D. Mitchell, for whom our Amaea mitchelli is named.

All the early issues of TC are out of print, but our library contains bound volumes of all issues.

By Vol. IV, the issues would sometimes be as much as 8 pages. In No. 9 of that volume (May, 1968,) announcements were made about the club's involvement in hosting the first American Malacological Union meeting in Texas. In that issue, we were proud to publish Dr. J.P.E. Morrison's paper on Hastula, titled "Four American Hastula Species," still the best presentation to understand the differences of the Hastula we have in Texas. That year, also, the club began its library, and I became a reporter for TC.

Announcement was made in Vol. V that the larger type we now used would mean the journal would provide 100 pages of copy per year, more than the 72 previously provided. More half-tone pictures would be employed, and the journal was printed in the print shop at M.D. Anderson.

The club withdrew from the Outdoor Nature Club in January, 1969, and became the Houston Conchology Society, Inc. We kept the library, and continued with Texas Conchologist.

In Vol. VI we first read about the trips to the Gulf of Mexico with divers on destroyers to get material for the ongoing accumulation of mollusks for the population study of the Northwestern Gulf of Mexico directed by Harold Geis and Ode', with assistance from Dr. Pulley and the Houston Museum of Natural Science. Many members were helping to sort and catalog (preliminary work) the mollusks assembled in the effort.

We also began to publish the master's thesis by Paul McGee entitled "Distribution and Ecology of Terrestrial Mollusks of the Texas Coastal Counties." Anne Speers wrote continuing articles on the uses of shells by Indians.

The first Search and Seizure column by this writer appeared in Vol. VII, No. 1, August, 1971. Later that year I became Associate Editor.

Vol. IX was a quarterly. The December issue (Vol. IX, No. 2) began Ode's "Preliminary Report of the Molluscan Fauna of the Northwest Gulf of Mexico."

Our printer at Anderson objected to the large amounts of copy in each quarterly, and Vol. X went back to 9 issues.

That did not last. We returned to quarterly with Vol. XI, and with that volume we had W.R. Keeler as editor. Dr. Ode' resigned as editor to complete the work on the Northwest Gulf Survey material. Ode' completed an Index of Vol. I-X which was published in Vol. X, No. 9. We had to find a new printer.

Ode' began the important monograph titled "Distribution and Records of the Marine Mollusca in the Northwest Gulf of Mexico" in Vol. XI, No. 2. This monograph continues today to be the main core of our quarterly.

The two-week planned exhibit of shells, titled the "Wonderful World of Shells," which we sponsored at the Houston Museum of Natural Science in May, 1977, was duly reported with many pictures of this exciting event that was very well received in the Houston area.

Dr. Ode' returned for a year as editor with Vol. XIII, No. 4, 1977, when Keeler retired. With Vol. XV, No. 1, October, 1978, Constance E. Boone assumed the duties as editor and continues today. We began the blue covers and the club logo of *Epitonium angulatum*. Through the last ten years we have frequently had large issues and included a variety of articles by professional friends of this society and printed many reports of travels to shelling spots around the world as our members sought new adventures. We added a Table of Contents for each issue. An index to the Ode' monograph Bivalvia was published in Vol. XVIII, No. 4. The publication on the gastropods of the Northwest Gulf Survey continues by Ode'.

We continue to urge members to use the correct scientific language of malacology. When Ode' retired as editor, he wrote "Without any doubt, the publication of the *Texas Conchologist* by our Society has helped our members develop their talents."

The ambitious aims by that core of members who started the publication have been met, in my opinion, but there is always room for improvement and broadening of efforts to encourage and stimulate the members in their study and enjoyment of shells. This Editor feels that it is time to seek a new editor to carry on the reporting of the interests members have in mollusks, to continue the publication of the report of the Northwest Gulf Survey, and to seek continued inclusion of material from professional malacologists. The present Constitution and By-Laws leave the task of search for a new editor to this Editor who will make recommendations to the board of the Society. If you are interested in working on TC, please let us know. Certainly, *Texas Conchologist* should continue.

MALACOLOGISTS OF TEXAS. I. JOHN K. STRECKER

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This article is the first in a planned series of biographical summaries of the malacologists of Texas. An excellent subject for the first article is John Kern Strecker, Jr., because he was the premier malacologist in Texas during the first third of the twentieth century. Even so, malacology was not the primary subject of Strecker's intellectual endeavors; most of his research concerned vertebrates, especially reptiles, amphibians, and (to a slightly lesser extent) birds. Any references below to "Strecker" refer to John K. Strecker, Jr. Biographical information on Strecker is derived from a scrapbook (maintained by Strecker's wife) in the files of the Strecker Museum and a personal interview with Walter J. Williams on 14 March 1985.

Family Background

Strecker was born on 10 July 1875, at Waterloo, Illinois, in the Mississippi riverbottoms slightly downstream of St. Louis, Missouri. His parents were John Kern Strecker, Sr., and Sallie Felicia Agnew Strecker. Paternal grandparents were Ferdinand Strecker from Stuttgart, Wurttemberg (now West Germany), and Ann Kern (from an English Quaker family). An uncle was Ferdinand Heinrich Herman Strecker who was a sculptor and tombstone letterer who became famous as a lepidopterist (Mallis 1971:294-296). Strecker moved to Waco with his parents in 1885 when he was ten years old.

EDUCATION AND UNIVERSITY LIFE

Strecker had only limited formal education (exact amount undetermined by this author, although one newspaper article reported he dropped out of school to go to work when he finished public school) and began his adult life as a stonecutter. He learned this trade from his father who worked for Wells-Gooch Co. in Waco, Texas, for 25 years before retiring in 1910.

Strecker began collecting snakes as a hobby around 1893 and eventually became associated with James Carroll who maintained an animal collection at Baylor University. On 1 August 1903, Strecker became curator of the Baylor University Museum. In the summer of 1919, he became Chief Librarian of the Baylor University library. Strecker was granted an honorary degree of Masters of Science by Baylor University at the commencement services on 10 June 1925.

SCIENTIFIC ACTIVITIES

One of Strecker's first scientific papers was a compilation of the records of the birds of Texas (Strecker, 1912). A compilation of the herpetofaunal records of Texas was published by Strecker (1915). Actually few of Strecker's papers concerned molluscs, but two major papers concerned the freshwater mussels of Texas (Strecker, 1931) and the freshwater and terrestrial snails of Texas which was published posthumously (Strecker, 1935e). The freshwater mussel paper has yet to be updated, and only a portion of the terrestrial snail fauna has been covered by a new series by the Dallas Museum of Natural History. Most of Strecker's malacological publications involved nonmarine species (Strecker, 1910, 1935d), but at least one contained a list of marine molluscs from Texas (Strecker, 1935c). One note was a review of human utilization of molluscs (Strecker, 1935b).

Murray (1973) summarized the field notes and scientific correspondence after study files of the Strecker Museum at Baylor University, and divided Strecker's study of freshwater mussels into three periods. The first period (14 October 1906 to 29 March 1908) was a time of exchange of specimens and receipt of identification of Texas specimens by specialists. A hiatus between 24 March 1908 and 11 March 1912 apparently was a time of little interest in freshwater mussels as no references to specimen exchanges or collection notes for these animals occur in the files. From 11 March 1912 until his death on 9 January 1933, Strecker was intensely interested in freshwater mussels. Field collection of freshwater mussels by Strecker began on 11 June 1906, in the North Bosque River, McLennan County, and ended on 3 April 1932 in Cibolo Creek, 21 miles north of San Antonio.

Strecker was sufficiently well-known in Waco (see sections below) that his trips to museums outside Texas and collecting trips in Texas were newsworthy enough to be printed in the Waco newspapers. Most of Strecker's field trips were taken during the week. These were short trips to sites in Mclennan County and the nearby counties of Falls and Coryell. On weekend trips Strecker would go as far as Glen Rose, Somervell County. Strecker was president of the Texas Academy of Science in 1931.

Walter J. Williams, a retired Professor of Mathematics at Baylor University, collected with Strecker when Williams was a student at Baylor University. In fact, many of Strecker's field trips were taken in a Model-T Ford owned by Williams. Strecker would collect "anything" on these field trips and "would work you to death" (Williams, pers. comm.). Strecker would strike up a friendship with someone

from an area and then go to the area for about a week. These field trips were generally supported by personal funds, although Baylor University did supply funds for a collecting trip to Texarkana. Visits to other museums were accomplished by train travel.

At least two species were named in honor of Strecker: Strecker's pearly mussel, Lampsilis streckeri Frierson, 1922; and Strecker's chorus frog, Pseudacris streckeri Wright and Wright, 1933.

POLITICAL ACTIVITIES

Strecker was very active politically. He was chairman of the McLennan County Democratic Executive Committee from 1913 until his death in 1933. He had announced as a candidate for the Democratic primary for Mayor of Waco in 1918 but later withdrew to support a political associate, Ed McCullough. He was campaign secretary for the unsuccessful attempt by President S.P. Brooks of Baylor for U.S. Senate in 1916. He became a deputy sheriff of McLennan County on 11 February 1928.

PERSONAL LIFE

Strecker (Williams, pers. comm.) was about 5'9" or 5'10" in height and weighed over 200 pounds (Williams described him as a "fat, little ole German"). Strecker married Mary Robert Boyd of Waco on 27 October 1915; both of his parents had died in July of that year. Their only child, Robert Kern Strecker, was born on 4 November 1920, but he died at the age of two months.

Strecker was a person who enjoyed a good joke and would argue or laugh with students (Williams, pers. comm.). Although most of his letters to scientific associates were strictly professional, Strecker became personal friends with Lorraine Frierson, one of the prime investigators of freshwater mussels in the first three decades of the twentieth century (Murray, 1973).

Hints of Strecker as a person are provided by a series of anecdotes. He performed "snake shows" during half time at Baylor football games. The 15 February 1908 issue of the Baylor Lariat reported that Strecker was running for "Great Dispenser of Hot Air." The official title was, "Grand Promoter, High Mogul and Chief Ramrod of the Fourth Annual Student's Circus." Strecker's humor is revealed in his recount of a field sampling experience during which his dirty field clothing or frequent change of dirty clothing caused reactions to observers unaware of the scientific purposes of seemingly strange endeavors (Strecker, 1935a).

At other times he was mistaken for an unpopular "two-gun man" and run off by a moonshiner in the mountains of Georgia.

Until Strecker bought a Ford in 1924, he had been the last faculty member to use a horse for local transportation. According to Williams (pers. comm.), Strecker smoked a pipe at a time that smoking was banned at Baylor University. Every day at about 10:00 AM, Strecker would cross the campus to a barber shop to smoke. Williams (pers. comm.) "never knew him to drink."

Strecker belonged to a large number of social organizations. He attended the First Presbyterian Church of Waco where his wife was very active. he was head consul of the Woodmen of the World and a member of the International Order of Odd Fellows, and was a 32nd degree Mason. He was a member and president of the Texas Folklore Society and the Texas Fish and Game Protective Association. He was a poultry breeder and judged show poultry at the county fair.

Strecker wrote a large number of articles in addition to his scientific papers. Many of these articles introduced scientific subjects to readers of popular science magazines and the Waco newspaper. He also wrote on Texas folklore and stamp collecting (Strecker accumulated a collection of 18,000 stamps during 40 years).

After an illness of several months, Strecker died in Waco on 9 January 1933. The Baylor University Museum was renamed the Strecker Museum on 31 January 1940.

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LITERATURE NOTES

Vol. 102, No. 3, August 29, 1988, of The Nautilus contains several articles of special interest to readers. In Search and Seizure of Texas Conchologist, Vol. XXIV, No. 4, July, 1988, we related seeing videos of the collecting of pleurotomariid gastropods by submersibles and remarked that a new species had been found. This recent issue of The Nautilus has a paper by Timothy M. Askew naming the new species Perotrochus charlestonenis which joins six other species and two subspecies of pleurotomariids from the Western Atlantic. It was collected 90 nautical miles east of Charleston, South Carolina, utilizing the submersible Johnson-Sea-Link I of Harbor Branch Oceanographic Institution, Inc., of Fort Pierce, Florida. It is a moderately large species that is regarded as a member of the species complex among which are P. midas, P. africanus, and P. teremachii. An almost full page color figure, showing four views, is included in this issue of the new species.

This issue of The Nautilus is of interest also for several other papers, including M.G. Harasewych's discussion of in situ observations of feeding by two Western Atlantic pleurotomariids, P. midas and P. amabilis, with a full page color photo of these rare species feeding.

Another paper describes a new Favartia from the Eastern Pacific, one paper describes a new species of Macrarene from Brazil, and another report recognizes and confirms the taxon Conus baccatus G.B. Sowerby III, 1877, and designates the type locality to be the Golfo de Chiriqui, Panama (Pacific). Dr. Kenneth J. Boss's paper "References to Molluscan Taxa Introduced by Linnaeus in the Systema Naturae (1758, 1767)" contains bibliographic documentation for more than 90 published resources utilized by Linnaeus as citations for mollusks in those editions and should prove invaluable to researchers and serious students of mollusks.

We have this quarterly in our library. It would be really worth your while to check it out.

Constance E. Boone

OBSERVATIONS ON A NAUGHTY BEACH By H. Ode'

In February, 1988, my wife and I accompanied some good friends on a trip to Yucatan, where we visited the famous Mayan ruins. Of course, we climbed several of the pyramids and collected at several sites some wonderful landsnails, about which I will not speak here. At the end of the trip we spent about two days on Isla Mujeres. In front of the hotel was an immaculately clean beach of limestone grit with only a few people on it and to judge from a casual glance hardly any shells. Thus it was only on the last morning a few hours before departure that we decided to make a short beach walk.

The sea close to the beach remained quite shallow (bay side) with litle wave action. On this shallow shelf were here and there patches of seaweed in between of which swam a few snorkelers. Along the tideline on the beach was a narrow band of drift which at first glance only contained some small bivalves, mostly Divaricella and Tivela. Walking some distance our party reached a spot where the beach narrowed. So far the variety and abundance of shells had been quite disappointing and I muttered to my friend: "A rather bare beach!" A minute later he came back to me grinning : "Indeed, read the sign."

Fastened to a pole was a small sign in English: "Naughty Beach" and to underline the particular naughtiness of the place was the figure of a well developed sunbathing beauty. Here the beach became rather narrow but also somewhat richer in shells. Then it became clear that malacology had lost a fine collector when my friend chose electrical engineering instead of malacology. In an amazingly short time he developed a collecting technique for small mollusks and thus discovered many small bivalves in the tideline.

Further down where the beach widened again one could see large two legged "nudibranchs" sunning themselves in the sun. The ladies, who had walked ahead because they lacked the patience for collecting the minute shells that interested us, rejoined us after awhile and asked whether we were aware of the sights above the tideline. But such is the addictive power of shell collecting that my friend could only exclaim: "Have you seen the beautiful yellow pecten that I just picked up!"

So far I had a few handfuls of small "stuff" and a little box to put them in. To give an idea of the size of the sample I took home it should be stated that the dimensions of the box were 5 x 8 x 12 cm. and that the shells first went into a plastic bag and then into the box. To prevent undue shaking of the shells I filled the entire box with fine grit taken from the tideline. At a guess the total amount of grit was probably about 100 - 150 cc.

Several days later at home, just for curiosity, I put, after washing and drying, some of this fine material under the microscope and within a few minutes it became clear that I had hit the jackpot. This grit contained a wealth of mollusks all under 2 mm in size and many not larger than 1 mm. A number of shells were perhaps slightly larger, especially some needle shaped mollusks, but most passed easily through the meshes of the finest sieve used in cleaning. The size of this sample may appear small but it took about 10 hours of intense microscope work to sort it out and many more hours to separate and order the more than 200 species present in it.

I will try to give a fairly complete list of all material contained in this handful of grit. Of course there is a rather large number of species I cannot properly identify, especially some of the minute bivalves. Many of these may be juveniles of larger forms with which I am unfamiliar. Very helpful was the following source: H. E. Vokes and E. H. Vokes: Distribution of Shallow-water Marine Mollusca, Yucatan Peninsula, Mexico; Publication 54 Tulane University, New Orleans, 183 pp, 50 plates, 1983.

Before discussing the particulars, a few general remarks should be made. In the first place the extreme diversity of such a small sample is astounding. The number of species is far larger than can be obtained in a similar sample from the Texas coast and there the number of species is far larger than in a similar sample which could be obtained, say, on the Dutch coast. See f.i. Basteria Vol. 1, pp 23-30.

In the second place there can not be any doubt that Isla Mujeres is locacted in quite a different faunal province than the Texas coast. Most species reported here are different from those that can be obtained in samples from similar ecological niches on the Texas coast, i.e. the offshore calcareous "banks" such as the Flower Gardens.

Finally, it always surprises me that so little is known about the micro mollusks of almost all faunal provinces. In spite of the large number of shell collectors and other enthusiasts, almost any handful of fine beach material in the tropics will yield after proper treatment, when put under the microscope, a harvest of difficult to identify species, some of which may be undescribed. Also the juvenile forms of many larger species are virtually unknown and often are not described in monographic summaries. For this reason all the material discussed below has been deposited in the collection of the Houston Museum of Natural Science.

Another reason to annotate the list is to record whether juveniles are present or not. Sometimes during the year countless juveniles of certain species suddenly appear only

to disappear after several days. It often happens that a short time later not a single juvenile is present in the drift but only some mature and worn beach specimens are abundant. If this type of information were more often carefully recorded more would be known about the spawning of many types of mollusks.

The most common mollusks in the sample were, at least to me, somewhat unexpected, but probably represent the true state of affairs as far as numbers are concerned (not biomass) of those mollusks living close to the shore. Practically all the usual collector's items are missing from the following short enumeration.

The most common gastropod is Tricolia bella, which occurred in countless juveniles in all sizes to mature ones. Other quite common species were Tricolia adamsi and Tricolia tessellata. The occurrence of these three closely related species raises the interesting biological question: in what respect does the mode of life of these species differ? Other abundant species were: Scissurella cingulata, Alvania auberiana, Amphithalamus vallei, Rissoella caribaea, Jaspidella blanesi, Acteocina candei, Marginellopsis serrei and "Cyclostremiscus" schrammi. The most common bivalves were Carditopsis smithii, Ervilia nitens, Tivela abaconis and Parvilucina multilineata. Many other species were common and could have been taken in much greater quantity if the sample had been larger. For the benefit of the reader I will, in the following annotated list, quote plate and figure numbers of those species figured in the above mentioned Vokes' publication. For brevity, I have omitted in the list subgeneric designations and authors.

List of species:

1. Scissurella cingulata (pl 23, fig 1). Abundant Juveniles are much more coarsely ribbed than full grown shells. Many specimens are slightly pathologically misformed.
2. Diodora cayenensis (pl 1, fig 4). One slightly immature specimen from the tideline.
3. Diodora dysoni (pl 1, fig 5). A single immature shell.
4. Diodora minuta (pl 1, fig 9). A few juveniles.
5. Fissurella nodosa (pl 1, fig 17). 2 juveniles.
6. Fissurella fascicularis (pl 1, fig 18). 2 juveniles.
7. Acmaea leucopleura (pl 2, fig 2). A few juveniles.
8. Acmaea prostulata pulcherrima (pl 2, fig 5). Many small juveniles and immature specimens.
9. Acmaea sp. A single specimen of a narrow slender and small eelgrass form.
10. Tegula fasciata (pl 2, fig 13). A single broken specimen from the tideline.
11. Tegula sp. Several juveniles of another species.

12. Pseudostomatella erythrocoma (pl 23, fig 5). One small juvenile.
13. Solariella sp. Several small juveniles.
14. Synaptocochlea picta (pl 23, fig 7). Juveniles common. Coloration quite variable.
15. Arene sp. Two juveniles.
16. Cyclostrema schrammi (pl 26, fig 3). This species was originally described by Fischer in 1857 and placed in the Trochidae, although now it would be aligned in the Cyclostrematidae. However, Olsson and McGinty 1958 removed it to the Vitrinellidae and Houbrick, 1967 gave some drawn figures (Nautilus Vol. 80). Most recently Vokes and Vokes (1983) provided the first clear picture of it, which appears quite different from the drawings by Houbrick. The abundant material available to me (about one hundred specimens in various states of wear and tear) do not resemble in the least Houbrick's figures, but is exactly similar to the figure by Vokes and Vokes. It is quite obvious that this little species is a cyclostrematid and not a vitrinellid. Inside the unbilicus in fresh specimens are sharp hooks as in Cyclostrema. Also the obvious vermiculate sculpture indicates that this species should be placed in the Cyclostrematidae, and, finally, there is a strongly developed apertural lip, perfectly round, encircling the aperture. In the original description (Fischer, J. de Conchyl. Vol. 6, p 288, 1857) Fischer states " Son peristome completement circulaire, la fait classer dans les Cyclostrema." I believe that the material figured by Houbrick is some different species and that Fischer, whose description describes our material reasonably well, was correct in placing his shell (the type appears unfortunately to be lost) in the Cyclostrematidae.
17. Cyclostrematid. 2 specimens of a very finely ribbed (± 100 riblets per whorl) and quite small species rather narrowly umbilicated. See figure 1.
18. Parviturbo sp. Several juvenile specimens.
19. Parviturbo sp. Several juvenile specimens.
20. Astraea phoebia (pl 3, fig 1). One larger shell in the tideline.
21. Astraea tecta americana (pl 3, fig 4). One larger shell in the tideline.
22. Tricolia adamsi (pl 23, fig 12). Abundant in all sizes, but mostly juveniles.
23. Tricolia bella (pl 23, fig 15). Most abundant gastropod exhibiting very varying coloring. Mostly juveniles: some have a dark carmine nucleus, others a white nucleus.
24. Tricolia tessellata (pl 23, fig 14). Abundant, mature ones nicely colored, juveniles whitish.
25. Nerita versicolor (pl 3, fig 10). A single, almost mature specimen from the tideline.

26. Smaragdia viridis (pl 3, fig 13). One specimen and several fragments.
27. Phenacolepas hamillei (pl 3, fig 12). Two specimens.
28. Alvania auberiana. The figure given by the Vokes' is not this species. A. auberiana, as it occurs in the Western Gulf of Mexico (Texas-Yucatan), is quite different (not as slender and lacks the deep suture). Abundant in all sizes.
29. Alvania sp. This is the species figured by the Vokes; it is rare in our sample (2 specimens), (pl 24, fig 2).
30. Alvania sp. A small juvenile in the same subgenus as A. auberiana.
31. Amphithalamus vallei (pl 24, fig 15). Abundant in all sizes. Golden brown in color.
32. Benthonella gaza (pl 24, fig 6). Following Vokes and Vokes, a few specimens are tentatively labeled B. gaza which I believe is a deep water species.
33. Schwartziella bryerea (pl 24, fig 7). A few beachworn specimens.
34. Rissoina cancellata (pl 24, fig 10). A single rather immature specimen.
35. Rissoina sp. A single very slender, rather small species.
36. Zebina browniana (pl 24, fig 13). Many specimens.
37. Hydrobiid. Several specimens of an unidentified species.
38. Truncatella scalaris (pl 24, fig 22). Several upper parts of rather fresh specimens.
39. Rissoella caribaea (pl 24, fig 23). Abundant in all sizes from small juveniles to mature specimens.
40. Rissoella sp. Much less common, smaller, with deep suture.
41. Omalogyrus sp. Several specimens of one of the smallest full grown mollusks known.
42. Vitrinella floridana (pl 25, fig 1). Several specimens, which look very different from Texas material, much flatter.
43. Vitrinella helicoidea (pl 25, fig 2). Several juvenile specimens.
44. Cyclostremiscus sp. A single very small juvenile, possibly an undescribed spec. See fig. 2.
45. Teinostoma sp. A single somewhat defective specimen.
46. Teinostoma sp. (possibly lerema). A single specimen.
47. Circulus sp. A single juvenile specimen.
48. Macromphalina palmalitoris. A single full grown specimen.
49. Caecum pulchellum (pl 26, fig 10). Several rather fresh specimens.
50. Caecum floridanum (pl 26, fig 12). A few full grown specimens.
51. Caecum imbricatum (pl 26, fig 13). Few, rather juvenile specimens.

52. Caecum plicatum (pl 26, fig 17). A single full grown specimen.
53. Caecum nitidum (pl 26, fig 15). Many specimens, esecially second stage fragments.
54. Caecum ryssotitum (pl 26, fig 16). Several specimens.
55. Caecum breve. A single full grown specimen.
56. Caecum sp. Several specimens. Maybe C. vestitum.
57. Vermicularia knorrii (pl 3, fig 16). A few fragments.
58. Petaloconchus erectus (pl 4, fig 14). A single small specimen.
59. Serpulorbis decussatus (pl 4, fig 19). Several fragmental specimens. There are many juvenile shells which I believe are Serpulorbis and it appears that there are two species among them.
60. Serpulorbis sp. Many juvenile shells, probably two or more species.
61. Modulus modulus (pl 5, fig 3). A few juveniles.
62. Cerithidea costata (pl 5, fig 4). A single small specimen.
63. Cerithium atratum (pl 5, fig 8). Several immature ones and many juveniles.
64. Cerithium litteratum (pl 5, fig 9). Several juvenile ones and some beachworn larger shells.
65. Cerithium sp.? A very peculiar form of which I attach a sketch (fig 3). Of the 3 specimens present 2 have a little notch in the apertural lip which I believe is natural. In the third specimen the lip is broken.
66. Bittium varium (pl 27, fig 1). One fresh mature and several old beachworn specimens.
67. Finella dubia (pl 27, fig 2). A few immature ones.
68. Finella adamsi (pl27, fig 3). A few rather fresh purely white specimens.
69. Litiopa melanostoma (pl 27, fig 4). Several immature specimens.
70. Alaba incerta (pl 27, fig 10). Several specimens of varying size.
71. Cerithiopsis sp. One specimen of a barrel shaped, vividly colored species.
72. Cerithiopsis sp. One specimen of a uniformly colored elongate species.
73. Cerithiopsis sp. Several fragments of a color banded elongate species.
74. Triphora sp. Only nuclear whorls of probably two different species (melanura and nigrocincta?).
75. Epitonium apiculatum (pl 6, fig 13). A few fragmental shells.
76. Epitonium multistriatum (pl6, fig 16). A few fragments of immature shells.
77. Melanella arcuata (pl 27, fig 19). A single specimen.
78. Melanella sp. A few specimens of a rather small species.

79. Melanella sp. A single broken specimen of a larger species, possibly conoidea.
80. Strombiformis bifasciatus (pl 6, fig 18). A single broken specimen.
81. Stilifer sp. Two specimens of a small spherical species with a stylus on top.
82. Graphis underwoodae. Three small specimens.
83. Bermudaclis bermudensis. Several specimens of various sizes.
84. Bermudaclis sp (pl 50, fig 13). Fairly common, all sizes.
85. Henrya goldmani (pl 28, fig 2). Fairly common.
86. Atlanta c.f. peronii. A few specimens.
87. Hipponix antiquatus (pl 7, fig 2). Juveniles quite common. Immature shells rare.
88. Hipponix sp. Several juveniles appear to be a different species.
89. Fossarus orbignyi (pl 28, fig 3). Several small specimens. The nucleus is dark brown.
90. Megalomphalus sp. Quite common. The same undescribed species has been taken in the Texas offshore on the the coral reefs (Flower Gardens). Thiele (Handbuch der Systematischen Weichtierkunde, part 1, p 239, figures a very closely related and quite similar species, and states that Macromphalina Cossman, 1888 is synonymous with Megalomphalus Brusina, 1871. I believe that is incorrect. Megalomphalus Brusina, 1871, is a valid genus in the Fossaridae. Especially the structure of the umbilical area is quite different from that in Macromphalina.
91. Crucibulum planum (pl 7, fig 5). A single specimen.
92. Crepidula maculosa (pl 7, fig 15). A few juveniles.
93. Crepidula plana (pl 7, fig 14). A few juveniles.
94. Lamellaria sp. A single specimen.
95. Cypraea sp. A single nuclear shell.
96. Naticids. Among the few juvenile naticas in the sample are probably two different species.
97. Thais haemastoma (pl 13). A single sinusigera phase shell.
98. Calotrophon ostrearum (pl 12, fig 15). One beachworn specimen.
99. Calotrophon andrewsi (pl 12, fig 16). One beachworn broken shell.
100. Columbella c.f rusticoides (pl 13, fig 12). Several fragments and juveniles.
101. Mitrella ocellata (pl 14, fig 6). One beachworn fragment.
102. Mitrella lunata (pl 14,fig 7). One fresh live shell.
103. Mitrella nycteis (pl 14, fig 9). Several fragments and juveniles.
104. Nassarina monilifera (pl 14, fig 10). 2 mature specimens.
105. Decipifus sixaolus (pl 14, fig 11). One broken specimen.
106. Oliva sp. A single immature specimen.

107. Olivella sp. Two fragments (not retained, poor condition).
108. Jaspidella blanesi (pl 17, fig 5). Many juveniles, all pure white.
109. Marginella eburneola (pl 18, fig 8). Several worn juveniles.
110. Hyalina sp. Several juveniles.
111. Hyalina sp. several juveniles.
112. Prumum sp. One specimen.
113. Gibberula lavalleeana (pl 28, fig 6). Many juveniles. One finds the name spelled with double and single "e."
114. Granulina ovuliformis (pl 28, fig 9). One small specimen.
115. Marginellopsis serrei (pl. 28, fig 9). Abundant.
116. Cystiscus sp. Several specimens.
117. Conus sp. Several unidentifiable juveniles.
118. Terebra protexta (pl 20, fig 13). 2 old, but small specimens.
119. Drillia sp. Several quite small juveniles.
120 - 124. About 5 species of quite small juvenile mangeliids. One of those appears to be in the genus Pyrgocythara.
125. Ithycythara sp. Two fragments of very fresh shells.
126. Stylopsis resticula (pl 22, fig 3). Many needle shaped specimens.
127. Odostomia laevigata (pl 30, fig 4). Several full grown specimens.
128. Boonea sp. Several fragments and juveniles.
129. Cingulina babylonia (pl 30, fig 19). A few juveniles.
130. Miralda sp. A single small unidentified specimen.
131. Evalea sp. A single different juvenile specimen (possibly E. emeryi).
132. Turbonilla sp. A single specimen.
133. Turbonilla sp. A single specimen.
134. Pyrgiscus sp. Three small specimens.
135. Acteon punctostriatus (pl 28, fig 11). A single small specimen.
136. Acteocina candei (pl 28, fig 14). Abundant in all sizes.
137. Tornatina inconspicua. Two small specimens.
138. Bulla striata (pl 22, fig 5). A single specimen from the tideline.
139. Bulla sp. Many small specimens recognizable by the peculiar pattern of opaque bands and blotches.
140. Atys caribaea (pl 22, fig 7). Many small specimens.
141. Haminoea succinea (pl 22, fig. 9) Several small specimens.
142. Philine sagra. A single small specimen.
143. Philine sp. A single, very small specimen.
144. Limacina inflata (pl 30, fig 20). Many small specimens.
145. Limacina bulimoides (pl 30, fig 21). One specimen.
146. Limacina lesueuri. A single specimen.
147. Clio pyramidata. Several specimens and fragments.

148. Clio sp. A few fragments.
149. Creseis acicula. Several broken shells.
150. Pedipes mirabilis (pl 31, fig 16). Three small specimens.
151. Oxynoe sp. A single specimen.
152. Berthelinia caribbea (pl 31, fig 21). Many greenish glassy "valves."
153. Nucula calcicola (pl 48, fig 2). A few small valves.
154. Barbatia cancellaria (pl 32, fig 6). Many juvenile valves.
155. Barbatia domingensis (pl 32, fig 7). Many small valves.
156. Anadara notabilis (pl 32, fig 12). A single small valve.
157. Brachidontes modiolus (pl 34, fig 1). Many small juveniles.
158. Brachidontes domingensis (pl 34, fig 2). Several fragments.
159. Crenella divaricata (pl 48, fig 5). Abundant in all sizes.
160. Crenella sp. This quite different species, probably undescribed, is common, mostly as juveniles and immature shells. A sketch of this unsymmetric species is attached (fig 4).
161. Lioberus castaneus (pl 34, fig 5). Only very small juvenile.
162. Musculus lateralis (pl 34, fig 6). Several rather immature specimens.
163. Pteria colymbus (pl 33, fig 10). A few worn fragments of juveniles.
164. Ptereid. Of this single small valve I have attached a sketch (fig 5). It is glassy, thin, horn colored with reticulate sculpture.
165. Pinctada imbricata (pl 33, fig 9). Many beachworn juveniles.
166. Isognomon bicolor (pl 35, fig 2). One fragment (not retained).
167. Chlamys ornata (pl 36, fig 2). A few quite juvenile valves.
168. Aquipecten acanthodes (pl 36, fig 4). A single not quite full grown valve from the tideline.
169. Aquipecten muscosus (pl 36, fig 5). A few juveniles.
170. Lyropecten antillarum (pl 36, fig 6). Several small specimens.
171. Plicatula gibbosa (pl 33, fig 5). One specimen from tideline.
172. Anomia simplex (pl 37, fig 1). One fragmental valve, not retained.
173. Lima caribaea (pl 37, fig 3). Several juvenile valves.
174. Lima pellucida (pl 37, fig 6). A few fragmental shells.
175. Limatula sp. Of this small quite symmetric species we have abundant material, mostly juveniles.

176. Crassostrea virginica (pl 39) A single small valve from the tideline. According to Harry, C. rhizophorae is the same.
177. Parvilucina multilineata (pl 38, fig 7). Abundant in all sizes.
178. Parvilucina blanda (pl 38, fig 6). Common, few juveniles.
179. Codakia orbicularis (pl 38, fig 8). No juveniles and no full grown valves, but only a few immature valves.
180. Codakia orbiculata (pl 38, fig 9). Abundant in all sizes.
181. Lucina pensylvanica (pl 38, fig 1). Abundant, but mostly immature.
182. Lucina nassula (pl 38, fig 14). A few valves.
183. Anodontia alba (pl 39, fig 1). One small valve.
184. Divaricella quadrisulcata (pl 39, fig 3). Abundant in all sizes.
185. Diplodonta punctata (pl 39, fig 3). A single small valve.
186. Chama florida (pl 40, fig 2). Several small juveniles.
187. Arcinella cornuta (pl 40, fig 7). Several small juveniles.
188. Lasaea adansoni (pl 48, fig 10). Fairly common, mostly juveniles.
189. Neaeromya floridana (pl 37, fig 10). One immature valve.
190. Leptonid. A single small valve with an extremely fine reticulate sculpture. See figure 6,, but the pattern is much finer than I have drawn it.
191. Leptonid. This is a quite different rather inflated species with heavy teeth. A single valve (see fig 7).
192. Unknown bivalve, possibly leptanid. See sketch fig 8. This species is remarkable for its extremely wavy growth lines. Its hinge is montacutid. We have several small valves.
193. Carditamera floridana (pl 39, fig 11). A few small valves.
194. Pleuromeris tridentata (pl 48, fig 8). Fairly common, many juveniles.
195. Carditopsis smithii (pl 48, fig 8). Abundant, often in pairs. Occurs in two colors: white and light brown.
196. Crassinella lunulata (pl 48, fig 12). A single immature hinged pair.
197. Papyridea semisulcata (pl 41, fig 4). Juveniles fairly common.
198. Americardia guppyi (pl 41, fig 6). Juveniles common.
199. Americardia media (pl 41, fig 6). A few small valves.
200. Laevicardium laevigatum (pl 41, fig 8). Several immature and some juvenile valves.
201. Ervilia concentrica (pl 39, fig 14). Only a few valves. It appears that the hinge line of E.

concentrica is somewhat heavier developed than that of E. nitens.

202. Ervilia nitens (pl 39, fig 15). Abundant and most colored a deep rose. Many juveniles and mature valves.
203. Ervilia sp. A few juveniles.
204. Tellina listeri (pl 43, fig 3). Several immature valves.
205. Tellina gouldii (pl 43, fig 6). A few immature valves.
206. Tellina lineata (pl 43, fig 10). Several beachworn valves.
207. Tellina mera (pl 43, fig 12). A few beachworn valves.
208. Tellina sybaritica (pl 43, fig 11). Three immature valves.
209. Tellina iris (pl 42, fig 9). A few immature valves.
210. Tellina similis (pl 42, fig 10). Many beachworn valves.
211. Strigilla carnaria (pl 42, fig 12). Several valves.
212. Cumingia tellinoides (pl 45, fig 2). A few fragmental shells.
213. Tagelus plebeius (pl 45, fig 4). A single small valve from the tide line.
214. Chione cancellata (pl 45, fig 13). Many juveniles and immature valves.
215. Timoclea pygmaea (pl 45, fig 13). Many juveniles.
216. Anomalocardia aff. leptalea (pl 46, fig 2). Common; mostly juveniles.
217. Prothothaca granulata (pl 46, fig 3). A single juvenile valve.
218. Tivela abaconis (pl 46, fig 4). Abundant in all sizes.
219. Parastarte triquetra (pl 48, fig 14). A few small valves.
220. Gastrochaena hians (pl 47, fig 8). A single juvenile valve.
221. Saxicavella sp. A few juvenile valves.
222. Teredo sp. A few valves.
223. Lyonsia beana (pl 47, fig 10). A single immature valve.
224. Lyonsia sp. Several juvenile valves of a species I do not recognize (Figure 9).
225. Asthenothaerus sp. Fairly common. Quite small. (Figure 10).
226. "Unknown genus, unknown species" (pl 30, fig 10). Many juvenile valves.
227. Chiton valves of several species, not identified.
228. Dentalium sp. A single specimen.
229. Cadulus quadridentatus. Several specimens.

Finally there are some "problematica." One of those, a small limpet-like shell, is figured in fig. 11.

230. Capulid? Several small glassy, smooth and shiny specimens, very thin.

There are at a guess about 20 other species in this material which I can not identify. Some are extremely small and several are undoubtedly "new" species. However, more material is required before any statement can be made.

Legend

Fig. 1 Small cyclostrematid
Fig. 2 *Cyclostremiscus sp*
Fig. 3 *Cerithium* (?) *sp*
Fig. 4 *Crenella sp* a) view inside the valve
b) juvenile seen from above
Fig. 5 Ptereid.
Fig. 6 Leptonid. Reticulate pattern finer than drawn.
Fig. 7 Leptonid.
Fig. 8 Leptonid. Extremely wavy and irregular growth lines.
Fig. 9 *Lyonsia sp*
Fig. 10 *Asthenothaerus sp*
Fig. 11 Capulid (?) a) view inside the cavity.
b) top view.
c) side view.

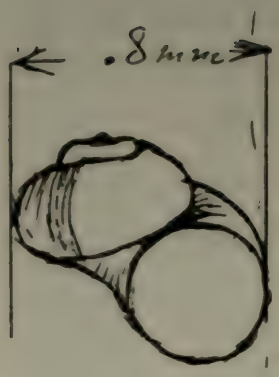


Fig. 1

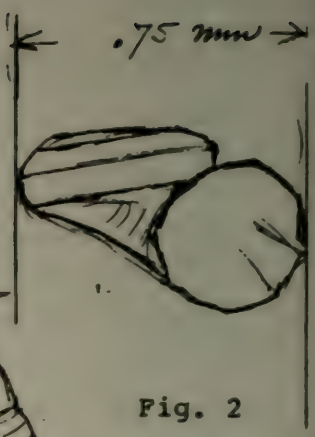


Fig. 2

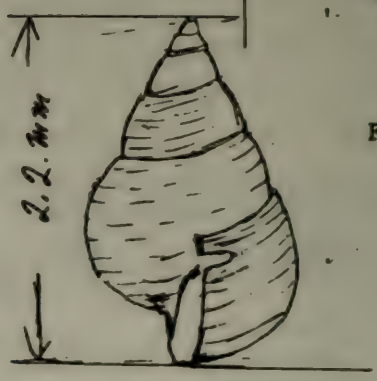
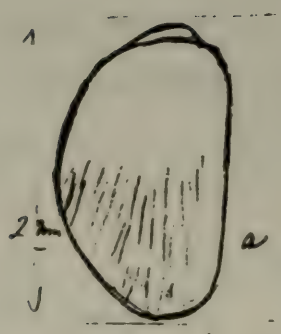


Fig. 3



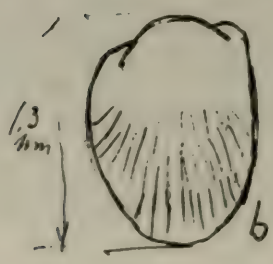


Fig. 4

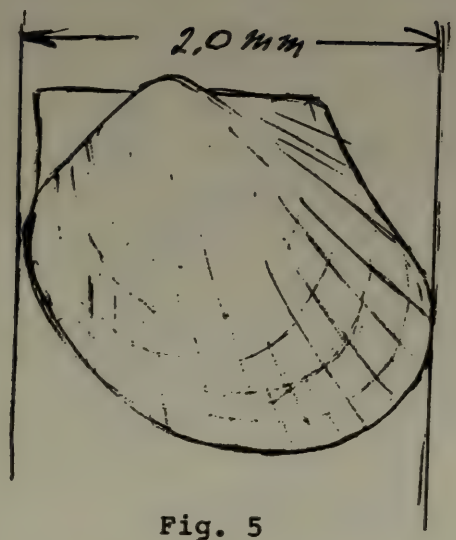


Fig. 5

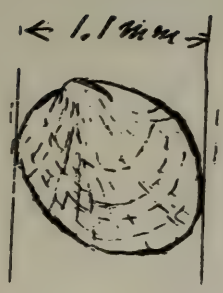


Fig. 6

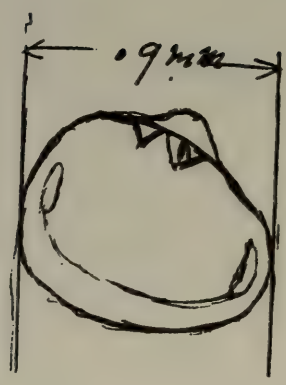


Fig. 7

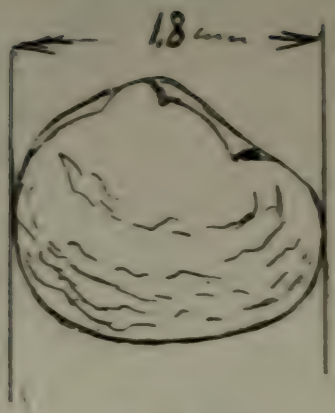


Fig. 8

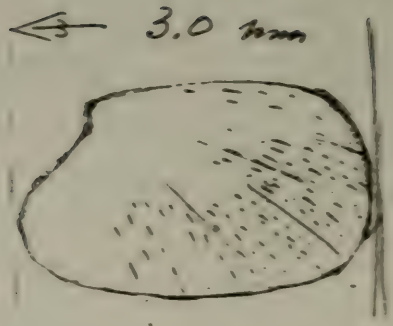


Fig. 9

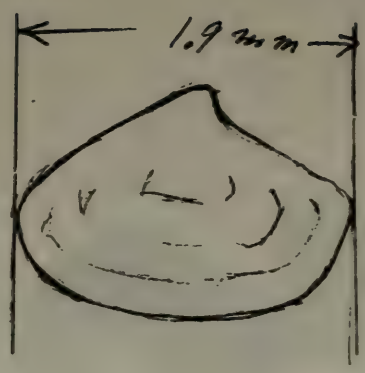


Fig. 10

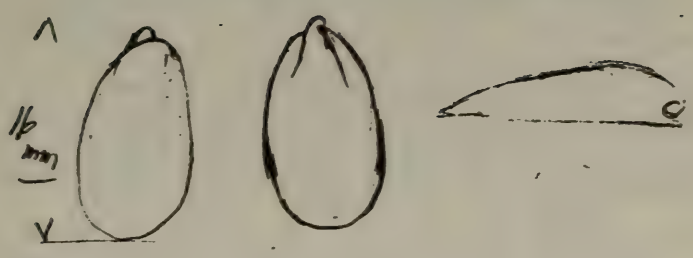


Fig. 11

UNDER THE MICROSCOPE

MARY MARTIN

BY JEAN HOLMAN

An early interest in shells and the sea was instilled in Mary Martin at a young age. Her family settled in the Houston area when she was three years old. Mary vacationed in Acapulco several times during her childhood, where she recalls watching snorkelers come back to shore with glistening trophies of coral and shells piled high on small rafts. Even at that young age, she wistfully looked at the ocean treasures and wished she could afford to buy some of them.

Her serious interest in collecting shells dates from about 1974. That year Mary's best friend moved to the Virgin Islands and began sending back shells that she had collected. At the same time another friend worked at a shell shop in the Houston area and provided a second good source for shells.

Since then her interest has grown and developed. Mary has been an active member of the Houston Conchology Society for about five years now. She is currently serving her third term as corresponding secretary. She also has served as

the refreshment chairman for over three years and she has been on the auction committee for two years. Other activities include HCS committee for the Houston Gem and Mineral Show, and of course, the "Un-Official Field Trip Pep Club!"

In May, 1987 she went with other HCS members to the best place she has ever self collected - BELIZE! While on that trip she had her first true experience with snorkeling and Mary fell completely in love with the underwater world! She went with mostly borrowed equipment but has already picked out a set of flippers in anticipation of next time!

The two worst things that have ever happened to her while collecting occurred on that trip too. One day while snorkeling, small jellyfish drove her away from the area around some mangrove trees that she was investigating. She decided to swim across a channel to leave but found it too wide and too deep. The currents were strong and she feels she actually almost drowned. Mary says, "It truly scared the tar out of me! And I know better."

Also on that trip she got a fairly good sized *Strombus gigas*. The tour guide, Raoul, had said that he would clean the shell. After he did she stored it under the bed and forgot all about it. Soon though, an "awful, *awful, awful*" smell began to pervade her room. She assumed that it must be one of her roommates's shells because she checked all of hers but the *Strombus*. That she skipped because Raoul had cleaned it, and since he was "experienced" Mary thought he had done a good job. Finally, after her roommate checked each of her own shells, Mary climbed under the bed and pulled the *Strombus* out. What a disaster! It dribbled all across the luggage! The smell was horrendous giving evidence to the fact that part of the body was still entombed in the shell. After repeated rinsings, the odor was still clinging to the shell, so Mary decided to give the *Strombus* a burial at sea. There it is hoped that warm ocean currents cleansed it and provided some lucky crab a mansion.

When asked about her favorite shell, Mary says it's a three way tie between a Paper Nautilus, a Triton's Trumpet and a Green Tree Snail. The next shells she would most like to obtain are a Golden Cowrie, *Cypraea aurantium*, and a larger Glory-of-the-Seas Cone, *Conus gloriamaris*. The *Conus gloriamaris* she currently has is 77 mm.

Mary's travel goals point towards the Pacific or Baja. She has an extensive collection of Caribbean shells and wants to expand in another ocean!

FLORIDA KEYS REVISITED

By Lucy Clampit

During our collecting trip to the Keys in July of 1987, our friend Dave Green found two Deer Cowries (Cypraea cervus), but no one else found any. Dave promised that he would show us where to find them if we would make another trip. Since we were making plans to attend the Conchologists of America convention with Sandy and Jim Clark, we decided to try for the elusive cowrie again.

Missouri Key had been the most productive area the previous year, so we decided to spend our two days collecting around it again. Dave said the cowries were under the rocks around the old bridge on the east end of the Key. The nine of us turned every rock that we could move, and our efforts paid off. Each of us found at least two nice cowries!

Other finds around the bridge included a large crabbed but perfect Alphabet Cone (Conus spurius), a pretty Jewel Box (Chama macerophylla) and a red Angulate Periwinkle (Littorina angulifera). We saw several large urchins and sea cucumbers. Sandy found some Coffee Melampus (Melampus coffeus) in a nearby mangrove tree.

While we were snorkeling around the bridge pilings, a marine patrol officer checked our collecting bags for Queen Conchs (Strombus gigas). He also warned us to stay within 100 feet of a dive flag. My glasses (in a zip lock bag) floated out of my collecting bag. Fortunately, Jim found them before I realized they were missing. I also managed to bury a swim fin in some soft mud. I figured it would fossilize there, but Jerry was able to find it the next day.

Although this trip was exactly one year later, the shells were not as plentiful. We saw fewer Cyphoma, Hawk-Wing Conchs (Strombus raninus) and True Tulips (Fasciolaria tulipa). The sandbar was not as productive, but the tide was not as low this year. I did find a lovely brown True Tulip, and there were still many immature Queen Conchs.

The four HCS shellers soundly defeated the Florida shellers in an exciting game of Trivial Pursuit. We had to have a Florida person on our team, but she didn't mind associating with winners.

PORT ST. JOE -FLORIDA - UPDATE By Sandy Clark

Many, if not most, members of the HCS have shelled the mollusk-infested waters of St. Joseph Bay - made so by the protecting arm of St. Joseph Peninsula. Still, it's always fun to show off this area to first-time visitors.

By late Thursday night, June 1988, the last of our band of thirteen arrived; of those thirteen, only three had been there before. Lucy and Jerry Clampit were our able guides, assisted in part by old-time members, Dave and Lucille Green. Low tides were late in the day, leaving the mornings and afternoons for beachcombing, relaxing and cleaning shells.

Lucy had contacted a member of the Panama City shell club who sent suggestions for the shelling spots. Although some species were ubiquitous, some locales were especially rich in certain shells. The first day, at the "Sand Bar," there were hundreds of starfish washing up on shore. Attempts to collect specimens whole were futile, however, as these critters have a way of mutilating themselves, presumably as a defense mechanism. Some of us found Olive sayana Ravenel, 1834 here, and there were a few crabbed Strombus alatus Gmelin, 1791.

St. Joseph State Park is near the end of the peninsula. The picnic area is where most of us have shelled in the past. An offshore wind kept the tide from going out, the alligator in his pond, and collecting to a minimum. There were clusters of Murex pomum Gmelin, 1791 laying eggs together, and Murex egg cases abounded. Although there were many live Fasciolaria tulipa (Linne, 1758), Fasciolaria lilium hunteria (G. Perry, 1811) were mostly small and crabbed. The grassy bottom was covered with Modiolus americanus (Leach, 1815), Atrina and sea urchins. There were lots of horseshoe crabs (some of us even tried to pick them up), Melongena corona (Gmelin, 1791) and numerous species of Bivalvia.

The next day brought us to the "Nursery" which is on the mainland opposite the State Park across the bay. Just about everyone found a large Busycon perversum (Linne, 1758), and there were some large Pleuroploca gigantea (Kiener, 1840). Laevicardium mortoni (Conrad, 1830) were quite common, especially adorning the tops of sea urchins, as were Nassarius vibex (Say, 1822) and Anomalocardia auberiana (Orbigny, 1842).

The morning of the last day we all drove to Panama City where one of the shell club members graciously opened his home and shell collection for us to view. His displays were beautiful, particularly those of my favorite family - Pectinidae. Later that day, we went to "Barbara's Place" which was fairly close to the "Nursery." Here we were on

the search for yellow and orange Argopecten irradians concentricus (Say, 1822) and enjoyed varying degrees of success. As a pleasant bonus, we also collected Marginella guttata (Dillwyn, 1817) and Marginella hematita Kiener, 1834. Almost everyone walked away with a live Busycon spiratum pyruloides (Say, 1822). In addition, I picked up a Urosalpinx perrugata (Conrad, 1846) and Columbella rusticoides Heilprin, 1887 (a bit far north, but the description fits).

A few die-hards hit the beach in the mornings. Sifting through the drift yielded some Epitonium sp., Mulinia lateralis (Say, 1822), Nuculana concentrica (Say, 1824), Anadara floridana (Conrad, 1869), and Tellina lineata Turton, 1819. I dug out some Martesia cuneiformis (Say, 1822) from rotting wood.

A good time was had by all - newcomers and old-timers alike - all now look forward next time to getting the species not yet found or the more yellow Pecten.

GRACE

Amid the profusion of shells
Is one whose clear, true line
Of beauty tells
All who see through patterns
That its opulence is absolute.
And by this we know
The Volute.

By Jean Holman

IN THE LITERATURE - MUREX By Constance E. Boone

Two important publications concerning Muricidae are available to members who study species in this family.

The long-awaited revision of Indo-West Pacific Murex which will require serious study of your collections is now available.

"A Revision of the Indo-West Pacific Fossil and Recent Species of Murex s.s. and Haustellum (Mollusca: Gastropoda: Muricidae) by W.F. Ponder and E.H. Vokes, Supplement 8 of Records of the Australian Museum, April 29, 1988, published by the Australian Museum, 160 pages, 89 figures (black and white photographs, maps, etc.) $37.00 US.

This is a revision of Indo-Pacific species of Murex and Haustellum, and several species heretofore included in Murex s.s. are transferred to Haustellum which is recognized as a separate genus. Fifty-five species-group taxa are recognized, of these 26 (6 new) or subspecies (3 new) of Murex and 17 species (1 new) or subspecies of Haustellum occur in Recent Fauna. Four fossil Murex and 6 fossil Haustellum are recognized. A subgenus of Murex is described to include 1 Recent and two fossil (one from European Tertiary). Ten new species - group taxa are named. The monograph includes biological information and comparisons made on shell. radular and anatomical data. The plates are very well done and will enable you to reidentify your material. Illustrations of protoconchs will provide additional aids to collectors of muricids.

As indicated in Texas Conchologist (Vol. XXI, No. 4, July, 1985, and Vol. XXII, No. 1, 1985), the spiny Murex collected in the Gulf of Suez, Red Sea, Egypt, by Constance E. Boone would be given a name in the above discussed monograph. Fig. 2 on page 11 of Vol. XXII, No. 1, 1985 provided by Dr. Emily Vokes, and listed as Murex sp. is now Murex forskoehlii Roding, 1798. Colonna's figure (1616) in Fabii Columnae Lyncei Purpura, etc. Rome is chosen as the type figure of the species. Location of the illustrated specimen is unknown.

The authors decided to go with Roding's name in the interests of stability and to avoid the necessity to introduce another new taxon.

"Muricidae (Mollusca: Gastropoda) of the Esmeraldas Beds, Northwestern Ecuador" by Emily Vokes in Vol. 21, Nos. 1, 2, Tulane Studies in Geology and Paleontology, July 20, 1988, 50 pages, including 6 black and white plates and 15 text-figures. $12.00 for this issue, Department of Geology, Tulane University, New Orleans, Louisiana 70118.

Twenty-one species of muricids are treated systematically, including three that are new (two fossil species confined to the Esmeraldas beds and one both from the Esmeraldas beds and in the Recent fauna of the Gulf of California.

The ancestry of species discussed will be of great interest to those of you with collections from both the Panamic area and the Caribbean. There is much information to glean from the review of nomenclature. Dr. Emily Vokes gives her opinions regarding the "black *Murex*" from the Gulf of California and Panamic are, and we noted with satisfaction the unraveling of the species complex of *Murex elenensis* from the Eastern Pacific, as well as the discussion of such species as *Chicoreus (Phyllonotus) globosus* and the similar *C. margaritensis* from the Caribbean. The Gulf of California species that has been called *M. elenensis* Dall, 1909, now becomes *Murex* (?*Hastellum*) *ruthae*, E.H. Vokes, 1988, as Dr. Vokes recognizes that the typical *M. elenensis* ranges from the type locality of Sta. Elena Bay, Ecuador, to the Gulf of Nicoya, Costa Rica. The new species appears to be confined to the Gulf of California and is taken mostly by shrimpers. It occurs also in the Esmeraldas fossil beds.

This issue is in the library of the Malacology Department, Houston Museum of Natural Science, and may be read there (contact CEB).

MONOGRAPH

By H. Ode'

DISTRIBUTION AND RECORDS OF THE MARINE MOLLUSCA IN THE NORTHWEST GULF OF MEXICO

(A Continuing Monograph)

Superfamily FISSURELLACEA

Family FISSURELLIDAE Fleming, 1822.

The socalled "keyhole" limpets constitute a large and varied group of mostly small mollusks. They posssess an opening, either on the top of the shell or a slit on the anterior slope in the margin of the shell. This large family is divided in a number of subfamilies: 1) the most primitive Emarginulinae, in which the original spiral protoconch is preserved and not resorbed (except in some puncturellas); 2) the Diodorinae and 3) the Fissurellinae, two groups which are different in their radula. In these groups the original protoconch is always resorbed. The entire process, in which the apical orifice enlarges and finally completely "eats away" the original protoconch, can be observed in growth series in the genera Diodora and Lucapina, present in the survey collection.

In the N.W. Gulf of Mexico we have the following genera: Emarginula with Nesta, Zeidora, Emarginula, Hemitoma, Rimula, Puncturella. Diodorinae with Diodora, Lucapina and Lucapinella. Fissurellinae probably do not live in our area and are not present in the survey collection.

Genus Nesta H. Adams, 1870

This rare genus is only known in three species, one each from the Red Sea, the Galapagos Islands and the Western Atlantic. It has rather depressed shells with the apical whorls at the extreme posterior end.

227. Nesta atlantica Farfante, 1947

Only a single incomplete shell is present in the survey colection. It was collected on the "18 fathom lump" in coral grit at a depth of about 30 fms by scuba divers. Unfortunately, the conspicuous marginal slit is broken off but the apex and the posterior end with the flattened margin without the shelflike extension of Zeidora are well preserved. The shell is nearly smooth without sculpture.

Records HMNS Survey Collection: 1 lot, none alive.
Depth range: 30 fms.

Geographical range: "Off South Florida to Barbados" (Abbott, 1974)
Maximum size: if complete, about 1 cm.

Genus Zeidora A. Adams, 1860

Small, glassy limpets of elongated shape. The apex is located at the edge of the finely crenulated margin. This crenulation corresponds to the densely reticulated surface sculpture. Inside the shell there is a small shelf, much as in Crepidula. In some specimens the apex does project very slightly below the margin of the aperture as Watson stated for his species Z. naufragum, which, however, differs from our species.

228. Zeidora bigelowi Farfante, 1947

This rare species reaches a larger size than has been reported by Farfante, 1947 or Abbott, 1974. Fragmental shells in the survey collection indicate a size of up to 5 mm and a complete specimen reaches 3.8 mm. Our specimens correspond in most particulars closely with Farfante's data. In general the outline of our specimens is less rectangular than the figure given by Farfante, 1947 but is slightly more oval.

Collected with other emarginulids on the offshore calcareous banks (Parker, 18 fms lump, Flower Gardens) and offshore Louisiana on a drowned reef.

Records HMNS Survey Collection: 4 lots, of which one contains probably live collected material.
Depth range: 18 - 55 fms.
Geographical range: South coast of Cuba (Abbott, 1974).
Maximuim size: probably up to 5 mm.

Before discussing the next genus, it should be noted that Zeidora does not appear to be the only limpet that has a shelf area. Among the survey material I discovered a small, quite flat, and, to me, unknown species, without anal notch, also finely reticulate, with a finely crenulated margin, exhibiting a minute shelf area, which is not much more than a thickening of the internal wall. The initial whorls are close to, but not at the margin and are clearly folded flat to one side, and are only very slightly elevated above the surface of the shell. Its taxonomic position is a riddle to me. Obtained in 55 fms off Cameron (LA).

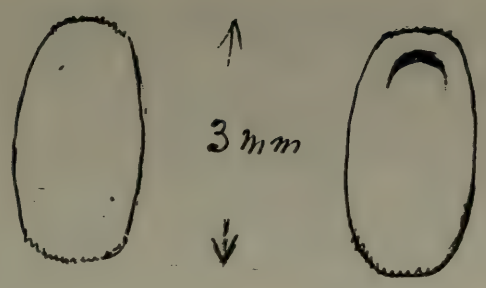


Fig. 1. Unknown species with shelf.

Genus Emarginula Lamarck, 1801

Small, white, caplike shells, rather strong with a slit on the anterior margin. The often relatively large nucleus is retained and points backwards. In the N.W. Gulf of Mexico only two species.

229. Emarginula phrixodes Dall, 1927

There are two forms of this species which resemble each other closely in the very coarseness of their sculpture, but differ in the amount of elevation and the shape of their posterior margin (see figure 2).

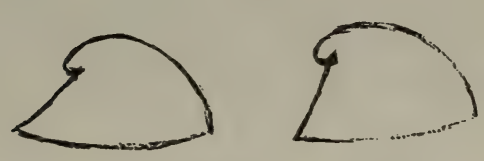


Fig. 2. Two forms of Emarginula phrixodes.

The flatter one of these must be called phrixodes Dall, because it most closely resembles the figures in Johnsonia (1947). This is the rarer of both forms in our area. The posterior slope between the apex and the margin is strongly curved and the margin projects considerably beyond the apex. In the other

form which does not appear to have been named - although in my opinion it is only an elevated form of phrixodes - the slope is far less curved and the margin is about even with the apex. Its sculpture is even more coarse than of the more depressed form. Here I will treat this fairly common form on the Texas-Louisiana coral reefs as merely a form of E. phrixodes, but a more detailed study could possibly establish that they are specifically different. Of the depressed form hardly any complete material is in the survey collection. It occurs on the coral reefs (Parker, 18 fms lump). The more elevated form has a wider distribution: it has been taken on both the coral reefs and the shale domes (Stetson, Sonnier).

Records HMNS Survey Collection: depressed form: 5 lots, of which one contains live collected material (Flower Gardens); elevated form: 8 lots, no live material.
Depth range: depressed form: 30-85 fms; alive 30 fms.
elevated form: 20-36 fms.
Geographical range: "Off North Carolina to both sides of Florida to Brazil" (Abbott, 1974).
Maximum size: depressed form: ± 4.0 mm (slightly larger if complete)
elevated form: 6.5 mm.

230. Emarginula sicula Gray, 1825

This somewhat more finely reticulated species lives in the same habitat as phrixodes, but is less numerous. Our material comes from the offshore banks (Flower Gardens, Stetson Bank, Parker Bank, and off Cameron, LA). In very young material the apical whorls are very close to the margin of the aperture and then the shells resemble somewhat those of the genus Zeidora. Most of our specimens are slighly more elevated than the figures in Johnsonia (1947) indicated. This species lives also in the Eastern Atlantic (Channel Islands to Morocco and the Mediterranean). There is a slight difficulty with our identification. None of our material even reaches the average size quoted by Parfante, 1947.

Records HMNS Survey Collection: 6 lots, none alive.
Depth range: 15-55 fms.
Geographical range: "Both sides of Florida to Barbados" (Abbott, 1974).
Maximum size: 6.4 mm.

Genus Hemitoma Swainson, 1840

Turner treats this genus in Johnsonia, Vol. 3 (39), 1959. It differs mainly from Emarginula in that fully mature specimens lack the dual notch and in the suppression of concentric sculpture. Radial sculpture is in our material

fairly well developed but extremely irregular. The assignment of certain species to Emarginula and not to Hemitoma appears to me somewhat arbitrary. E. pumila appears much closer to Hemitoma than to a species such as E. phrixodes. Farfante (Johnsonia, Vol. 2, 108) states that with doubt she included E. pumila in Emarginula. The fact that small juveniles of Hemitoma in our area have a clearly develped anal notch which completely disappears even before the animals reach maturity and the fact that E. pumila has only a small anal slit places the latter species close to Hemitoma. Moreover, the, in general, rather irregular development of surface sculpture in pumila relates it to Hemitoma. In the past I had reported our material in Hemitoma as E. pumila, but that cannot be correct.

231. Hemitoma c.f. octoradiata (Gmelin, 1791)

Material of this peculiarly developed gastropod is widespread over the offshore banks. It hardly ever shows in our area the beautiful pattern of eight radials. Its surface is quite knobbed and irregular, and the shell never grows larger than about half an inch (± 13 mm). The shelf edge reefs of the continental shelf area are probably the northernmost limit where the species can survive. Very small juveniles (1-2 mm) show the unmistakable anal notch of Emarginula, but that feature has disappeared in most specimens of about twice that size, although in rare instances it can survive somewhat longer.

Records HMNS Survey Collection: 4 lots, of which 2 contain live collected material (Flower Gardens).
Depth range: 18-36 fms.
Geographical range: "Southeast Florida to Brazil" (Abbott, 1974).
Maximum size: 13 mm.

Genus Rimula DeFrance, 1827

Small, somewhat oblong shells with radial surface sculpture. There is a fissure halfway up the anterior slope, which narrows down towards the margin. Two species are fairly widespread on the calcareous reefs in the N.W. Gulf of Mexico.

232. Rimula frenulata, Dall, 1889

This is a rather long and slender form which is somewhat variable in shape. Among our material are rather depressed forms, but also some more elevated ones. The latter, however, differ clearly from the next species, because their shape is quite different. In frenulata the posterior margin of the aperture

does not project past the nuclear whorls, but in aequisculpta which has a somewhat flattened back and whose height is relatively greater, the margin projects considerably past the initial whorls.

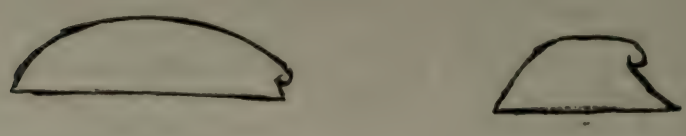


Fig. 3. Rimula frenulata. Rimula aequisculpta

This species has been taken at several locations on the offshore calcareous banks (Flower Gardens, Stetson Bank, Parker Bank).

Records HMNS Survey Collection: 7 lots, no clearly live collected material.
Depth range: 12-35 fms.
Geographical range: "Off North Carolina to both sides of Florida and the West Indies" (Abbott, 1974).
Maximum size: 6.1 mm.

233. Rimula aequisculpta Dall, 1927

This small species is clearly different from R. frenulata and, as is the case with most of these small limpets, nothing is known about its biology. From a number of locations (offshore banks off Texas and Louisiana) specimens have been obtained. It appears to be slightly more widespread than the previous species.

Records HMNS Survey Collection: 9 lots, no live collected material.
Depth range: 18-133 fms.
Geographical range: "Southeast Florida to Barbados" (Abbott, 1974).
Maximum size: 7.4 mm.

Genus Puncturella R.T. Lowe, 1827

This genus of small limpets contains those forms that have an internal septum near the apical fissure. The genus is subdivided in three subgenera all of which have been taken:

1) Cranopsis which has an anal fasciole scar on the outer shell running from the apex to the outer margin. 2) Puncturella lacks this scar and 3) Fissurisepta, in which the apical whorls are lost in the adult stage.

234. Puncturella (Cranopsis) billsae Farfante, 1947

Only a single lot of 6 specimens of this small high backed Puncturella was taken off Louisiana (27 42.1' - 93 09.1') in 85 fms. This species has a relatively large initial shell and develops an almost vertical tube giving it a very striking appearance.

Records HMNS Survey Collection: 1 lot, no live material.
Depth range: 85 fms.
Geographical range: "Both sides of Florida to Cuba" (Abbott, 1974).
Maximum size: 2.5 mm.

235. Puncturella (Puncturella) sp. indet. A

In the survey collection is a small lot of some very small limpets which I cannot identify. They are strongly ribbed and have a rather large circular apical orifice close to the apex. It is possible that these minute shells are the juveniles of another genus (Diodora?). For the time being, I will leave them unnamed. They were collected on Parker Bank.

Records HMNS Survey Collection: 1 lot, no live material.
Depth range: 36 fms.
Maximum size: 2.4 mm.

236. Puncturella (Fissurisepta) acuminata Watson, 1883

A single specimen of this most curiously funnel shaped limpet was obtained at a depth of 170 fms 35 miles southwest of S. Southwest Pass of the Mississippi River Delta. Although apparently it has a dull white color, under the microscope and with proper light the shell shows a checkered pattern of dull and shiny small squares. The initial whorls are lost in this species.

Records HMNS Survey Collection: 1 lot, no live material.
Depth range: 170 fms.
Geographical range: "South Carolina to Mexico and the Lesser Antilles 159 to 390 fms" (Abbott, 1974)
Maximum size: base 2.7 mm; height 2.5 mm.

Genus Lucapina Sowerby, 1835

These rather are flat conical limpets in which the internal callus round the aperture is not truncated. In Diodora it is truncated and often there is a slightly excavated area

behind. The orifice is rather large and is situated immediately before the apex which is placed in front of the middle of the shell. Juvenile shells often still show the initial whorls which are mostly resorbed before maturity is reached. Several species live in the N.W. Gulf of Mexico.

237. Lucapina philippiana (Finlay, 1930)

This small species may be the same as an Australian species, but if the Australian species should prove to be different the Caribbean species would have to be renamed. (Farfante, 1943). It is the smallest of the lucapinas in the Gulf of Mexico and the most finely ribbed and most elevated. In our area it is unusual: only two lots in fairly deep water off Cameron (LA).

Records HMNS Survey Collection: 2 lots, no live material.
Depth range: 55 fms.
Geographical range: "Off southeast Florida to the Virgin Islands" (Abbott, 1974).
Maximum size: 13.4 mm.

238. Lucapina aegis (Reeve, 1850)

This the most widespread of Texas lucapinas. It can be recognized by the numerous concentric elevated lamellae and somewhat pipelike ribbing. Where lamellae and ribs cross, slightly curved scales are formed. The color is very light olive green with a pattern of six to eight radial brownish color bands. The margin is finely crenulated. This species has been collected on the offshore coral banks only (Flower Gardens, Sonnier Bank, 18 fathoms lump). Abbott, 1974, states that the depth range of L. aegis is "intertidal to 10 fms." All our material is from greater depth. It is possible that the species became established in the Texas shelf area when the sea level was lower and has since adapted to deeper water.

Records HMNS Survey Collection: 7 lots, of which 2 contain live collected material.
Depth range: 10-30 fms, alive: 15 fms.
Geographical range: "Florida, Bahamas and Cuba to Brazil" (Abbott, 1974).
Maximum size: 28 mm.

239. Lucapina sp. indet. A

A single lot taken off Cameron, LA, of juvenile material that is completely different and dark pink in color is present in the survey collection. Its sculpture is very different from that of aegis:there are no lamellae, no scales and the ribs are not

"pipelike." These shells could be L. suffusa, but I have not seen material of that species of similar size. Material of L. aegis of that size still has an incompletely resorbed nucleus but this material has a completely developed large orifice at the top. It could be a small different species. More material and comparison with other material only can solve the problem.

Records HMNS Survey Collection: 1 lot, no live material.
Depth range: 40 fms.
Maximum size: 4.5 mm.

Genus Lucapinella Pilsbry, 1890

Small depressed conical shells with a larger orifice than Lucapina.

240. Lucapinella limatula (Reeve, 1850)

A rather uncommon species in our area can also be found alive on oyster shell in the bays south of the Corpus Christi area. A single dead shell was collected from Christmas Bay and a small immature dead shell was collected on on offshore shellbottom (Galveston). In the specimens collected alive at South Padre Island the internal white callus is encircled by a dark blackish ring.

Records HMNS Survey Collection: 4 lots, of which one contains live collected material.
Depth range: 0-25 fms.
Geographical range: "North Carolina to Florida and the West Indies, Brazil" (Abbott, 1974).
Maximum size: 11.0 mm.

Genus Diodora Gray, 1821

Conical limpets, with an outer sculpture of radiating ribs crossed by concentric threads or lamellae, often forming nodules where they cross. Small juveniles resemble specimens of the genus Puncturella, because they still possess the nucleus, which is somewhat twisted.

The orifice increases in size with age and long before the shell reaches maturity the nucleus is resorbed. Internally there is a ringlike callus around the orifice, which on one side is strongly truncated. Adjacent to the truncation there is a deep excavation in the shell.

The orifice in Diodora can have several shapes: a keyhole, a round oval, a somewhat triangular hole, a trilobed hole, but stays more or less constant in a species, although sometimes there are intermediate shapes. In the Western Atlantic the genus is richly represented and in the N.W.

Gulf of Mexico several species have been collected.

241. Diodora cayenensis Lamark, 1822

This widespread species lives in shallow offshore waters on shelly bottoms as deep as 32 fms, not in the bays. The largest Texas material does not exceed 30 mm and never reaches 2 inches cited by Farfante (1943). The bulk of our material is formed by rather immature specimens and was collected offshore in about 8-15 fms on sandy shell bottoms and the Pleistocene rock ridges off Freeport and Galveston. The species also lives on the base of the jetties and can be regularly found in beachdrift close to the jetties. D. cayenensis does not live on the offshore banks. Only a few dead shells were taken on Stetson Bank. The color of Texas material is almost always greenish dull brown with flecks or rays of slightly darker color; seldom light colored. Specimens from deeper water have more strongly developed sculpture and are thinner.

There are several species which resemble cayenensis superficially: D. sayi, which has a narrower base, a more excentric position of the orifice and a far more regular sculpture; D. jaumei is much flatter and has a different sculpture. Farfante (1943) states that cayenensis can be recognized because each 4th rib is slightly more heavily developed, but this is only true for mature specimens. Some fragmental shells were taken from the mudlump fauna.

Records HMNS Survey Collection: 43 lots. of which 11 contain live collected material.
Depth range: 0-32 fms; alive 8-25 fms.
Geographical range: "Maryland to south half of Florida and to Brazil; Bermuda" (Abbott, 1974).
Maximum size: 27 mm.

242. Diodora sayi Dall, 1899

Superficially this species resembles D. cayenensis, so that Dall describes it as a "variety" of cayenensis. It is truly a quite different species: coloration, sculpture and shape set it apart. The orifice is placed closer to the anterior end and the sculpture consists of almost equally strong radial ribs, which are far less nodulose than the ribs in cayenensis. The internal coloration of sayi is different because there is a black ring around the internal callus. In our specimens in the survey collection are only 6 lots, 3 of which come from Stetson Bank and one from Sonnier Bank and a last one from Claypile Dome. All these locations are Shale Domes.

Records HMNS Survey Collection: 6 lots, 2 of which contain live collected material.
Depth range: 10-30 fms (Stetson); alive 30 fms.
Geographical range: "Southwest Florida to Brazil" (Abbott, 1974).
Maximum size: 22 mm.

243. Diodora meta Von Ihering, 1927

This is a small quite different looking Diodora.It has an almost circular orifice, but its most remarkable aspect is its concave outline: It looks like a small volcano, and is, in consequence, rather flat with a steep top. It is heavily sculptured by radial ribs which alternate in size. These ribs are crossed by rather widely spaced concentric ridges. The species has been obtained only from the offshore Banks (Stetson, Parker, 18 fms lump, Sonnier and Flower Gardens). A deeper occurrence off Cameron (LA) is undoubtedly an old drowned reef.

Records HMNS Survey Collection: 7 lots, no live material.
Depth range: 10-55 fms.
Geographical range: "Southern half of Florida; Brazil" (Abbott, 1974).
Maximum size: 9.9 mm, but a few fragments of larger specimens are present.

244. Diodora jaumei Aguayo and Rehder, 1936

Farfante (1943) describes this species as "rather elevated" but neither our material or Farfante's figures show this to be the case. Abbott (1974) is correct in stating "somewhat low, prettily sculptured and beaded with squamose nodules." Our material is light buff in color, but lacks, except two small lots, the "brown freckles" mentioned by Abbott. This species has only been collected on Stetson Bank and a few locations on shelly bottoms.

Records HMNS Survey Collection: 8 lots, of which 1 contains live collected material.
Depth range: 12-26 fms; alive 30 fms.
Geographical range: "South Florida to the Lesser Antilles" (Abbott, 1974).
Maximum size: 21 mm.

245. Diodora aguayoi Farfante, 1943

It is with great hesitation that I report here two lots of shells as this species. This material conforms only partially to the description of aguayoi. The specimens are small and thin and come from deeper water. It is most probable that they

merely represent the deep water from of D. cayenensis because they have either the 4th or every 2nd rib stronger developed, sometimes on the same shell. Their apex protrudes a little and the margin is crenulated by paired denticles in most. All these characters are sometimes present in immature specimens of shallow water cayenensis. Farfante (1943) states: "this species would appear to be near to D. cayenensis complex, but actually it is not related." She states among the differences: D. aquayoi is thinner and smaller; its shape is different (protruding apex). Because our material resembles the figures given in Johnsonia rather well, I suggest that D. aquayoi is merely a deep water form of D. cayenensis. Juvenile cayenensis from shallow water of the same size as aquayoi (10-15 mm) are often quite similar in shape. They are, however, thicker shelled and their ribbing appears less developed. In general only when D. cayenensis reaches maturity its form starts to deviate significantly from that of D. aquayoi. Another point is that thinness of the shell wall and strong ribbing (well developed scales, fronds, etc.) in diodorids are in general favored by deep water habitats.

Records HMNS Survey Collection: 2 lots, no live collected material.
Depth range: 55 fms, both off Cameron (LA).
Geographical range: Bermuda, Cuba to Barbados (Abbott, 1974).
Maximum size: 13.3 mm.

(To be continued)

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TEXAS CONCHOLOGIST, Vol. XXV, No. 2, January, 1989

O'TANNENBAUM

BY JEAN HOLMAN

Although the Christmas season is past, its festive atmosphere lingers all year for anyone involved in creating special holiday displays. For the last two years I have been fortunate to be in charge of putting up the HCS Christmas Tree at the Houston Museum of Natural Science exhibit, and I want to share some of what I experienced with you.

The first year decorating the tree, 1987, I only had a month's notice. Fortunately other club members pitched in and we had a wonderful time decorating our "YULE TIDE" tree! Constance Boone supplied hundreds of jingle shells and we made jingle shell icicles two and three feet long to drape down the branches. Connie, Mary Martin and Gary Olson helped assemble ornaments (even though they had just returned from a field trip and were dead tired the night we worked on the decorations). Gary also made over 100 shell ornaments on his own which he donated for the tree. He selected a wide variety of shells and used jewelry catches which he attached for something to put the ornament hooks through. Helen Cornellison assisted in putting it up and we were all happy with our efforts. We even had a stuffed octopus wearing a Santa hat under the tree as our mascot that year!

In 1988 I wanted to have a display with a theme, especially one that would reflect both that it was being done by a shell club and also have some symbolic significance for the season. "THE LEGEND OF THE SAND DOLLAR" was a perfect choice! After hearing what I wanted to do, my mother, Betty Gessner, began immediately collecting different versions of the legend to use with the tree. She also managed to wrangle 250 snow white, gorgeous sand dollars from a florist to use making ornaments. Not only that, she and my brother, Karl Gessner, found garden stepping stones about 1 1/2 feet in diameter molded like white sand dollars to use in the display under the tree! They live in Virginia and went all the way to a shop in North Carolina to get them! My family came to visit in September bringing all of the sand dollars, the stepping stones, and loads of sea biscuits with them. I can't thank them enough for their help. They pitched in and they didn't even get to see the tree. (I sent them a whole roll of pictures but those didn't do the tree justice).

Through the year I had a lot of fun shopping for materials to use to make the ornaments. Towards the end of November I had a committee of six (Darwin Alder, Constance Boone, Skip Holman, Mary Martin, Alison McHenry and Gary Olson) meet for food and fun to get inspired and assemble

Fig. 1 Our 1988 HCS "Legend of the Sand Dollar" Tree prepared for exhibit at the Houston Museum of Natural Science. Photo by Gary Olson.

decorations. With ribbons and glue guns galore, we had a great time coming up with all sorts of designs using the sand dollars.

The ornaments varied from sand dollars decorated with bows and glittered baby's breath to plainer ones with gold cord and mini "cow bells." We did make two large blue bows with doves perched on them and glued a whole sand dollar to one sash and the five doves from inside a broken one to the other.

The centerpiece was the tree top. It started with two huge bows made of sea blue paper ribbon wrapped with silver striped ribbon to highlight all the loops. These were placed back to back and on top of this we placed a two-sided creation of iridescent baby's breath sandwiched between a huge sea biscuit on one side and three snow white sand dollars on the other. On each side we placed a large gray-blue seagull with wings wide as if gliding over the ocean. It was beautiful!

Gary and I worked for over five hours on November 30th putting up the tree. The museum supplies the tree and this year there were six others decorated by various organizations. The museum dedicated a hall by the classrooms solely for the tree display.

The first thing we did was put up the tree top to see how it would do because it was so heavy. Fortunately our tree was thick all the way up and more than strong enough to support it. It was also about nine feet tall and almost double the circumference of the tree the year before. I luckily had all the ornaments we made from both years with me even though I thought we wouldn't need them all. <u>We used everything</u>!

Both years I used blue and white for the colors so it all matched. In 1987 along with the jingle shells Connie had also donated 100 sand dollars and we strung them in sets of five with blue satin ribbon. This year we used the icicles and the sand dollar sets as garland and draped them artistically around the tree. Then we strategically placed the individual sand dollar ornaments and filled in with shell decorations. The shells are all different species individually hung and add considerably to the "beach" feeling.

We filled in on bare branches with glittered baby's breath. Underneath, I had a white heavy felt skirt that we arranged the sand dollar stepping stones around. We also interspersed those with sea biscuits, loose sand dollars and shells. To finish off I threw large flakes of glitter all over everything. It filtered down and sparkled everywhere! It certainly was the most spectacular tree there. It shimmered white and blue under the spot lights.

The glitter added a magical quality and there was so much to look at you could stare at it for awhile and not see it all. I must say we really felt like we accomplished something once it was up and we were proud of our efforts. Throughout the holidays the tree display at the museum is featured on different television news programs and also some local television talk shows. It is also advertised in the newspapers, so you certainly feel apart of the holiday celebration for the entire Houston area.

I want to thank the club for the opportunity to experience all of this! It added to my enjoyment of the holidays and much more. The excitement of planning for it all year with my family was wonderful. The fun of getting together with other club members, getting to know them better and being involved with them on this project was great. Plus, the culmination of decorating the tree and seeing it finished was very satisfying.

I hope many of you visited the museum to see the 1988 tree. We know the visitors to the museum enjoyed it!

This year I am going to "pass the baton" so that someone new can enjoy this unique experience. It truly will enrich your life far longer than the tree is up! I know that whoever is involved will have a great time and lots of pleasure in "working" on a FUN project.

Fig. 2 The bottom of our tree with the sand dollar stepping stones. Photo by Gary Olson.

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MALACOLOGISTS OF TEXAS. II. Joseph Daniel Mitchell

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The first article in this series (Neck, 1988) was a biographical summary of John K. Strecker who was the premier Texas naturalist in the first third of the twentieth century. The present article is a biography of the first native born Texas malacologist, although J.D. Mitchell was most of all an extremely well-rounded naturalist. Several biographical notes concerning Mitchell have been published (Anonymous, 1894; Cox, 1895; Hunter, 1922; N. Boone, 1960; Burke, 1978); these notes have provided most of the information presented here about Mitchell.

PERSONAL DATA

Joseph Daniel Mitchell was born at Mitchell's Point, Calhoun Co., Texas, near Point Comfort across Lavaca Bay from Port Lavaca on 22 October 1848. His father, Isaac Newton Mitchell, was a native of South Carolina. His mother, Mary Augusta Kerr, was the daughter of Dr. James Kerr (in whose honor Kerr County was named - Anonymous, 1959:635) who was the surveyor-general of DeWitt's colony. She came to Texas in 1824 with the original families of Stephen F. Austin's colony who settled at Brazoria (Anonymous, 1894:256; N. Boone, 1960). Isaac Mitchell owned a 2000 acre plantation with numerous slaves in Lavaca County, a county that he helped organize (Cox, 1895:635). Mitchell's parents were married about 1842 (Anonymous, 1894:256).

Mitchell's formal education ended at age 11 (schools attended at Galveston and San Antonio as well as Bay St. Louis, Mississippi), but he spent much of his youth around the bays and inland waters of the middle Texas coast. Educational opportunities in the Coastal Bend of Texas were limited in the 1850's, and the death of Mitchell's father in 1853 (when J.D. was only five) increased his and his older brother's responsibilities at the family farm and ranch (Cox, 1895). Later plans to attend college were interrupted by the chaotic conditions during and then following the Civil War. In 1871, Mitchell married Agnes Ward, the daughter of Captain LaFayette Ward, an early settler of Jackson Co. and a prominent rancher from southern Texas (Anonymous, 1894:257). Ten children were born to this couple (Cox, 1895:636).

Mitchell ranched in Calhoun and nearby counties after the Civil War (1867 to 1887) and had a home on Wolf's Point. Mitchell utilized progressive ranching practices in the area, e.g. windmills, fencing, and improved breeds of cattle. Mitchell brought the first windmill to the area of Texas west of the Colorado River to supply water during the frequent droughts; neighboring ranchers soon added windmills after observing Mitchell's success. He also had the first wire fence (with live oak posts) in the area in 1874, although he soon replaced the initial smooth wire with the more effective barbed wire (and demonstrated that fences were cheaper than cowboys and horses). By 1895 he owned 15,000 acres in Calhoun County and 2000 head of cattle which included Hereford, Durham, and other improved breeds (Cox, 1895:635).

J. D. Mitchell demonstrated much of the pioneering and public service spirit shown by his father. By 1887 he had become sufficiently successful so that he moved to Victoria (possibly due to educational needs of his children) where he was involved in the founding of the public school system; later, Mitchell Elementary School in Victoria was named for him (Grimes, 1968: 424, 548). In 1892, he sold 13,500 acres in Calhoun Co. to a group of Swedish settlers (Anonymous, 1894:257). He was also a city alderman in Victoria (Grimes, 1968). Mitchell was a member of the 24th Texas Legislature where he authored a bill establishing the Texas Game, Fish and Oyster Commission (N. Boone, 1960), apparently referring to a bill in 1907 that added a Game Department of the existing Fish and Oyster Commission provided that it could sell sufficient hunting licenses to pay its own way. Severe illness in 1918 caused Mitchell to move to San Antonio where he died on 27 February 1922 at the age of 73 (Burke, 1973).

NATURALIST BACKGROUND

Mitchell's interest in natural history originated during his youthful days along the Texas coast. In his published notes on the biology of the blue crab, Mitchell (1895b:368) reports, "Born on an isolated point on the Bay, and inheriting the naturalist's instincts from my mother, I made this crab (*Callinectes sapidus*) one of my earliest playthings, and it has been an interesting study since." His mother's interest in natural history was nurtured by her father (Anonymous, 1894:257).

Interested in conservation, Mitchell planted seed oysters in the bays of the Texas coast and fought for preservation of existing oyster beds. His children and grandchildren remember being taught the beauty of nature by Mitchell (N. Boone, 1960). Teaching was accomplished by utilization of "large collections of animals of all classes" in his house, where ranchers, school children, doctors, and scientists were instructed in details of Texas natural history

(Hunter, 1922). Mitchell has been described as "a fountain of accurate information for technical men and was a modest, patient and painstaking imparter of knowledge" (Hunter, 1922).

SCIENTIFIC STUDIES

Mitchell was an inveterate collector of natural history objects, and he soon corresponded with appropriate scientific workers to identify these specimens. When W.D. Hunter was about to make his first trip to Texas, he asked a number of scientists of diverse fields about sources on information about Texas natural history, and Mitchell was repeatedly cited as an invaluable source of such information (Hunter, 1922).

One of Mitchell's early scientific contacts was William Henry Dall of the U.S. National Museum, who taught Mitchell proper methods of collection, preservation, and documentation of his collection (N. Boone, 1960). One marine gastropod, Mitchell's wentletrap (*Amaea mitchelli* Dall, 1896),and one marine pelecypod, Mitchell's macoma (*Macoma mitchelli* Dall, 1895) were named for Mitchell by Dall. One freshwater mussel, *Unio mitchelli* Simpson, 1896 was named for Mitchell; the description (Simpson, 1896) was published in a larger paper by W.H. Dall (1896). This species is now recognized as *Quincuncina mitchelli* (Simpson, 1896). This author is unaware of any terrestrial or freshwater gastropods which have been named after Mitchell.

A list of Texas molluscs was published in Victoria (printed at Times Steam Print) by Mitchell (n.d., b). Although the paper is undated, the publication date was sometime in 1894 as a copy was received by the U.S. National Museum on 14 June 1894. This list contained 157 marine molluscs, 107 freshwater molluscs, and 61 terrestrial molluscs. Another molluscan list printed by Cookes's, Victoria (?) (Mitchell, n.d., a), contains no annotations and presumably antedates the longer, annotated list. An additional list was published subsequently by Mitchell (1895a). Mitchell also collected a small freshwater ram's horn snail, *Micromenetus dilatatus* (Gould, 1841), from the Guadalupe River (Anonymous, 1899), a locality that is still the southernmost record of this species (Fullington 1978:208).

Mitchell was initially employed by the United States Department of Agriculture in 1904. Mitchell's entomological studies centered on insects feeding on cactus (Hunter, et al., 1912) and cotton (Geiser, 1946). He worked on the screwworm (Bishopp, et al., 1917), cotton boll weevil, and cattle tick (Hunter and Mitchell, 1909). He also published annotated lists of the weevil and ant faunas of Victoria County (Mitchell and Pierce, 1911, 1912). Additional insect specimens collected by Mitchell

were utilized by other workers. When Tucker (1919) summarized insects known to occur on mistletoe, 26 of the 55 species discussed included specimens collected by Mitchell.

A study of the venomous reptiles of Texas (Mitchell, 1903) was described by Geiser (1948) as "one of the finest pieces of work published on the animals of Texas."

H.B. Parks presented a paper entitled, "J.D. Mitchell, Entomologist and Gentleman," on the morning of 25 January 1935 at the seventh annual meeting of the Texas Entomological Society at the Plaza Hotel, San Antonio, 24-25 January 1935, according to minutes of the meeting kept by H. J. Reinhard, secretary of the organization (King, n.d.). The minutes also state that the paper was to be submitted to the Annals of the Entomological Society of America. However, a check of volume indices for 1935 to 1946 revealed no publication in that journal.

MITCHELL'S LEGACY

Mitchell's scientific legacy comes from his publications in the early stage of scientific studies in Texas and his collections. "His collection of Indian relics, mineral specimens, bird eggs, reptiles peculiar to Texas, particular shells, both salt and fresh water, is arranged with painstaking care, showing both knowledge and a love for the work. Being a man of leisure and means, he is not hampered in his investigations, and it may be expected that much good will be the result of such study" (Anonymous, 1894:257). Following his death, Mitchell's shell collection was donated to the University of Texas; some of his natural history collections were retained by the family (C. Boone, 1966.)

Mitchell's annotated checklist (Mitchell n.d., b) is replete with interesting notes concerning his personal experience with various molluscan species. He remarked that Tagelus plebeius, Mercenaria campechiensis, and Atrina seminuda provided "good eating," but Geukensia demissa was not considered palatable. He observed that Solen viridis was found "in a cell about four inches deep, coming to the top and sometimes standing half way out of the sand to feed. It disappears quickly at the approach of danger and by a series of quick kicks, can get around quite lively in water." Thais haemastoma often crawled up on any object that projected above the water in order to take "a sun bath." Littorina irrorata was described as climbing grass stalks where it "sucks their juices" (actually L. irrorata rasps particles of the plant with its radula). Mitchell referred to Teredo navalis as the "terror of ship owners."

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Fig. 1 Amaea mitchelli (Dall, 1896), the much-sought epitoniid sometimes found on Texas beaches. It has been trawled or dredged live in the Gulf of Mexico, but almost all the beach specimens are collected dead. Photo of live-taken specimen trawled off Freeport. C. Boone collection and photo.

SEARCH AND SEIZURE

BY CONSTANCE E. BOONE

WINTER COLLECTING NOTES

Reports coming in from collectors indicate that shelling has been fairly good this winter on the Texas coast.

Although no one in the Houston area reported great finds after Hurricane Gilbert, visitors to the South Padre area have mentioned large driftlines of shells.

Virginia and John Joiner collected many pairs, some live, of Dinocardium robustum on Galveston beaches during Thanksgiving. They also found living Polinices duplicatus and many Dosinia discus.

Pat and Bob McElroy continued their collecting on the upper Texas coast after the November field trip and found live Mercenaria mercenaria texana at the water line.

The field trip to St. Jose Island in December was good and bad. The Saturday visit to the island meant members had to trudge along in the rain. Some stayed with it; others retired to Mustang and met the hardy bunch at Tarpon Inn for lunch. Some went home; some went to visit shell shops that day. Darwin Alder came in for the 6 a.m. departure of the ferry to St. Jose on Sunday, but the other members still there decided to do other things. They are now sorry. Darwin managed to collect a fairly good specimen of Amaea mitchelli! He has promised to donate the shell to the spring auction.

Darwin took club members to some of his favorite collecting spots. Everyone was able to collect live Busycon perversum pulleyi. Mary Martin was pleased to find live Anomia simplex.

Our gold star for collecting has to go to Darwin whose enthusiasm for collecting continues to drive him to the beach almost every weekend. He is currently enamoured with St. Jose and the Corpus area. No wonder! This winter he has found a rarely-collected beach Cyphoma (probably mcgintyi - it is not fresh). He has collected a live Tonna galea, live Trachycardium muricatum, and had a wonderful time recovering live Dendostrea frons and yellow pairs of Chama macerophylla from black fiber rope washed up on the Gulf beach.

The exceedingly bad drought we had (and still have as I write this) during the winter months caused many of our area lakes to drop water levels drastically. Bob McElroy

Fig. 1 Tonna galea, two live specimens taken by Bob McElroy in mud on the ship channel from Port Aransas to Aransas Pass, Texas, January 7-8, 1989. Photo by Pat McElroy.

Fig. 2 Bob McElroy's live specimens of Tonna galea being checked with Johnsonia at the Houston Museum of Natural Science Dept. of Malacology. HMNS photo.

has been collecting unionids from two lakes on his farm at Shiro. He was keeping the lives ones in tubs of fresh water, hoping to tide them over and return them to his lakes when we get enough rain to raise the lakes back to normal levels. I told him he had better be sure that the fish haven't all died also, since the unios must have certain fish to complete their life cycles. The little hatched glochidea (larval animals) must attach to certain fish (we don't know all we need to know about which fish per species) where they stay a few months (maybe weeks, in some cases) before developing into juvenile fresh water mussels and dropping to the substrate to continue growth.

The papers have been reporting the low water at such places as Lake Livingston, and I have been brought some mussels from this lake at the museum. If you aren't afraid of poison ivy, this would be a good time to collect some mussels in our streams.

Bob's hazard was worse than poison ivy. He reached into a mud crack thinking he would find a mussel in his lake, yelped loudly, and pulled up his hand. A large loggerhead turtle had clamped on a finger and wouldn't turn loose. That episode will cost him a fingernail.

Recently, some of us saw three live-taken *Architectonica nobilis* from Surfside Beach near Freeport, Texas. This species is occasionally collected on this beach, usually after storms. There has been a lot of worm goop, and epitoniums have been found.

As always, the way to collect is to go to the beach as often as you can. We hope all of you enjoy club field trips this year and learn more about Texas shells.

Darwin and Bob went back to Port Aransas the weekend of January 8-9 and both deserve gold stars for the collections they made. Bob collected a live, 5 inch, perfect, adult *Tonna galea* and a smaller one. Many live *Argopecten irradians amplicostatus* were found in the grasses - all sizes. They located a bed of *Atrina seminuda* and dug large ones. Some *Ischnochiton papillosus* were found on the pen shells. Live *Lucina pectinata*, *Trachycardium muriatum* and many *Busycon perversum pulleyi* were seen. They also collected small shells from algae covered rubble in the bays, not yet seen by this writer and to be identified.

The club's library needs to be used more. Make a New Year's resolution to become more knowledgeable about our local fauna. Bring your specimens to the meetings. We like to see what you find, and we can help you with identifications.

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MONOGRAPH

By H. Ode'

DISTRIBUTION AND RECORDS OF THE MARINE MOLLUSCA IN THE NORTHWEST GULF OF MEXICO

(A Continuing Monograph)

Superfamily MELANELLACEA

Family MELANELLIDAE Bartsch, 1917

This family, largely composed of supposedly parasitic gastropods, is badly in need of a thorough revision. In general I will follow here Abbott (1974) - although there will be considerable differences - not so much because his presentation is clear and simple, but rather because some uniformity of treatment at this stage of lack of real knowledge is an advantage. Also Olsson and Harbison (1953) employ the same nomenclature.

In the Blake Report Dall (1889) used the label "Eulimidae" and, not without justification, complained about the unreasonableness of attaching to a group of largely white and vitreous shells a name which implies they are black. To be noted here is that Keen (1971) uses the time-honored "Eulimidae" and also in many other respects differs from the nomenclature employed by Abbott (1974).

In the N.W. Gulf of Mexico live several genera: Melanella, Sabinella, Strombiformis, Haliella and Niso.As can be expected there are many ties with the Pliocene fauna of Florida and the fauna of the Panamic Province. Source material for this family is quite limited and hopelessly outdated. We have used:

Tryon, 1887; Manual of Conchology, Vol. 8
Dall, 1890; Trans. Wagner Free Inst. Sci.,Vol. 3, part 1
Bartsch, 1917; Proc. U.S. Nat. Mus., Vol. 53 (2207), pp. 295 - 356
Verrill and Bush, 1900; Trans. Conn. Acad. Arts. Sci. Vol. 10
Dall, 1927; Proc. U.S. Nat. Mus. Vol. 70 (2667), pp. 1 - 134.
Pilsbry and Aguayo, 1933; Nautilus, Vol. 46, p. 117
Lyons, 1977; Nautilus, Vol. 92 (2) pp. 79 - 83
Rios, 1985; Seashells of Brazil, pp. 1 - 328, 102 plates

Genus Melanella Bowdich, 1822

In this genus the large number of reported and often poorly described and not critically compared species makes identification extremely hazardous. Even common and

widespread species are difficult to identify with certainty. The number of described species is large: in Abbott are listed 27 species for the Carolinian and Caribbean Provinces and in Keen (1971) 32 species for the Panamic Province alone.

Although one might suspect that these large numbers are artificial because these parasites could vary considerably with their individual host (completely unproven), analysis of our material suggests otherwise. In the relatively small area of the Texas-Louisiana shelf more than 27 species of the family live, of which 15 belong to the genera Melanella and Polygireulima. Unfortunately, the biology of these animals is completely unknown. Often the host is an echinoderm and the little glassy shells may even live inside the gut of holothurians (see Tex. Conchol. Vol. 6 (9), p. 95, 1970).

In the genus Melanella traditionally are brought together shells with a straight and shells with a curved spire. Balcis Leach, 1852 was invented for the latter, but Gardner, 1948 discovered that the type of Melanella is a curved shell, so that Balcis has become a synonym of Melanella. (See Olsson and Harbison, 1953, p. 331). Thus for the straight spired melanellas one must use another designation. Available is Polygireulima Sacco, 1892, based on a Miocene species from Italy. This will be used here as a full genus.

All species which are more or less curved are listed here as Melanella. In the N.W. Gulf of Mexico all these species are glassy; none displays a color pattern, and when dead the shell become white opaque, but hardly ever chalky. It was the opinion of Bartsch (1917) that these curved species merge without discontinuity into the straight spired ones, so that there can be no valid reason to label the straight spired species with a different generic label. I believe that this is in error. Although there may be straight spired melanellas, the majority of straight spired material is in many respects different. The shell wall is thicker, and when dead the shells become chalky. Moreover, several display color patterns which are never seen in Melanella. Also there are structural differences. Soft parts have hardly ever been studied.

Abbott (1974) puts all material that displays color-banding in the genus Strombiformis, a procedure with which I disagree. The criterion here must be that mentioned by Thiele (1928), namely that Strombiformis has a radula and Melanella not; in this context this implies that Polygireulima is without radula. Some polygireulimas display a color pattern: subcarinata and hemphilli for instance.

It is here not the place to work out in detail a preliminary classification based on our extensive material. Many species I cannot name. It is sometimes possible to indicate closely corresponding species either in the Florida Pliocene fauna or in the recent Panamic fauna. The nomenclature will be rather conservative, but I will treat Polygireulima as a full genus. Of many species a little sketch will be presented, emphasizing their most important features.

246. Melanella arcuata C.B. Adams, 1850

This common species has been taken both on the beach (South Padre Island, Matagorda, Galveston) and in offshore dredgings (off Freeport, Galveston) along the entire Texas-Louisiana coast (off Timbalier Island). It is also known from the coral reefs and Stetson Bank. Most of our material is more slender than the figures of M. arcuata which I can find, (Blake Report and Abbott, 1974) and perhaps should be named otherwise. Our material resembles some species described by Bartsch (1917) from the Eastern Pacific rather well.

A figure of Texas beach material was published in the Texas Conchologist Vol. 7, p. 17, 1970. Also Andrews (1971) has excellent figures. There is a light horn colored, very thin operculum present in some specimens. It is possible that our material includes two species but I am unable to separate both forms consistently (long and slender with outer lip not flaring and more stocky with outer lip somewhat flaring and less curvature in the spire). This species has a small nucleus and thus is rather sharply pointed. Some time ago A. Speers collected at Port Isabel live specimens by straining the contents of a sea cucumber gut.

Records HMNS Survey Collection: 27 lots of which 7 contain live collected material.
Depth range: 0 - 51 fms; alive 0 - 25 fms.
Geographical range: "North Carolina to the West Indies" (Abbott, 1974).
Maximum size: 3.6 mm (usually 2.0 - 2.5 mm).

247. Melanella gibba de Folin, 1867

Only three lots of this fat and curved Melanella were taken, all in calcareous environment (Flower Garden and off Cameron, La). The shape of this fat species is somewhat different from that of other melanellas.

Records HMNS Survey Collection: 3 lots, no live material.
Depth range: 10 - 50 fms.

Geographical range: "North Carolina and the Gulf of Mexico" (Abbott, 1974).
Maximum size: 4.0 mm.

248. Melanella sp. indet. A

One of the difficulties identifying melanellas is that one does not know whether the material is juvenile or mature. Specimens of this very small species - which are not juvenile of M. arcuata - could conceivably be juveniles of a rather larger species. However, in the survey collection are 8 lots containing only small specimens. The curvature is already noticeable after three whorls, which is early, and the apical angle is rather large. The aperture is somewhat flaring. This species has a thin yellowish operculum. In general habitus it resembles superficially a hydrobiid. Without further study it is impossible to give a definite label to this material. A sketch is presented in Fig. 1.

Records HMNS Survey Collection: 8 lots of which 5 contain live collected material.
Depth range: 4 - 40 fms; mostly off the Pleistocene rock ridges off Freeport and Galveston. Also off Cameron, La. in 40 fms; alive 4 - 40 fms.
Geographical range: Unknown.
Maximum size: 2.1 mm.

249. Melanella sp. indet. B

This slender, small, often strongly curved Melanella appears to be different from arcuata. The outer lip of the aperture does not flare out beyond the curved outline of the spire. An outline of this species is sketched in Fig. 2. Abbott (1974) cites M. elongata Bucquoy, Dollfuss and Dautzenberg, 1888, from North Carolina and the Florida Keys, and probably this name should be applied to this material.

Records HMNS Survey Collection: 10 lots, one of which may have been collected alive.
Depth range: 1 fm (Freeport jetty) - 55 fms off Louisiana. Alive: 25 fms, off Freeport.
Geographical range: Unknown.
Maximum size: 3.1 mm.

250. Melanella sp. indet. C

A small, short, rather fat species, somewhat resembling sp. indet. A, but with much less curvature in the spire. In Fig. 3 the curvature is not shown because it is not in the plane of the drawing. It differs from sp. indet A in having a much deeper suture, a more compressed spire and is slightly

pupoid. More material is needed for the evaluation of this species which I cannot identify. Earlier (Tex. Conchol. Vol. 9, p. 73, 1973) reported as Melanella sp. E.

Records HMNS Survey Collection: 6 lots, no live material.
Depth range: 9 - 36 fms, all from calcareous reefs off Galveston and Louisiana.
Geographical range: Unknown.
Maximum size: 2.0 mm.

251. Melanella sp. indet. D

This species is in many respects quite close to what I have called M. arcuata, but differs in some respects from that species. In the first place, its nucleus is quite coarse and the following teleoconch increases more rapidly in size than in arcuata. It appears to be somewhat thicker shelled, and its suture may be somewhat shallower. I have set it apart as sp. D. Most material comes from calcareous environment (Hospital Rock, Flower Gardens), from offshore Galveston at 24 fms and offshore West Louisiana at 55 fms.

Records HMNS Survey Collection: 8 lots, no live material.
Depth range: 15 - 55 fms.
Geographical range: Unknown.
Maximum size: 2.7 mm.

Genus Polygireulima Sacco, 1892

In this genus I collect a number of species with straight spires which are fairly thick shelled and possess sometimes color patterns. The outer margin of the aperture projects forward but in the genus Strombiformis this margin is straight. There are three groups in this genus: 1) Polygireulima s.s. having rather large, thick straight sided shells, mostly without color or at most some slight brownish flecks; 2) small, brown colored species, not in Strombiformis, for which I use here the subgeneric designation Eulimostraca Bartsch; 3) species which have a clearly developed anterior canal for which a rather subgeneric designation must be invented. When the material for Polygireulima s.s. is examined in detail, it it discovered that there are two lineages in it - species with an extremely small nucleus followed by slowly increasing whorls of the teleoconch so that these specis appear to be needle sharp and species with a much coarser and knobbier nucleus.

252. Polygireulima (Polygireulima) intermedia (Cantraine, 1835)

This is a large white species that occasionally washes ashore along the Texas-Louisiana coast. It lives offshore Galveston on sand bottoms and apparently does not enter the coastal bays. A few dead shells were collected along the South Padre Island Causeway. Also present on Stetson Bank and in the mudlump fauna off Louisiana. Abbott (1974) is not clear about the differences with P. jamaicensis C.B. Adams and presents a figure (1336) for intermedia that is indistinguishable from the figure of the lectotype of jamaicensis given by Clench and Turner (1950). I believe that intermedia and jamaicensis are identical and that jamaicensis is used for Caribbean material while intermedia is used for material from the East Coast and Europe. I have not been able to detect any differences between the two "species." Since intermedia is the older name it should be used, but it may be noted that some workers in Europe use the label lubrica Monterosato for intermedia. The species has been well figured by Andrews (1971, 1977). Vokes and Vokes (1983), however, give two considerably different figures for jamaicensis and intermedia.

There are other species of Polygireulima which resemble intermedia closely. There is one group of lots, admittedly somewhat heterogeneous in composition, that I have named hypsela. These are more slender shells, with finer nucleus and somewhat differently shaped base. It is far from certain that this material is uniform, but I cannot split it in a satisfactory manner. A sketch of P. intermedia is appended (fig. 4).

Records HMNS Survey Collection: 25 lots of which 3 contain live collected material.
Depth range: 0 - 60 fms; alive 8 - 23 fms.
Geographical range: New Jersey to Brazil; Bermuda, Europe (Abbott, 1974).
Maximum size: 12.5 mm (may have reached ± 14 mm, because top is broken).

253. Polygireulima (Polygireulima) hypsela Verrill and Bush, 1900

This is a more slender species than intermedia, with a finer nucleus (see Fig. 5). The body whorl in this species is relative to the overall size slightly larger than in the previous species. Our material does not look uniform, but I cannot satisfactorily analyse it. Comparison with type material is necessary.

Records HMNS Survey Collection: 12 lots of which 1 contains live collected material.
Depth range: 8 - 25 fms, most on sand bottoms off Galveston; also Stetson Bank and Heald Bank.
Geographical range: "Bermuda and Havana, Cuba" (Abbott, 1974)
Maximum size: 7 mm.

254. Polygireulima (Polygireulima) conoidea Kurtz + Stimpson, 1851

This is a common melanellid in the N.W. Gulf of Mexico, but is rarely found on the beaches and in the coastal bays (Timbalier Bay, La.) and along the causeway at Aransas Pass. Also known from the mudlump fauna off Louisiana. It apparently lives commonly on sandbottoms in 8 -26 fms off Galveston and Freeport. The shells are immediately separated from those of P. intermedia by the somewhat keeled body whorl and the compressed base (see Fig. 6). The magnitude of its nucleus is somewhat variable.

Records HMNS Survey Collection: 24 lots of which 2 contain live collected material.
Depth range: 0 (beach) - 51 fms; alive : 8 - 26 fms.
Geographical range: "Florida and the West Indies" (Abbott, 1974).
Maximum size: 5.2 mm.

255. Polygireulima (Eulimostraca) subcarinata d'Orbigny, 1842

This small melanellid, recently discussed by Lyons (1978) resembles a very small conoidea but its nucleus and initial whorls are much finer than those of conoidea. It is closely related to P. hemphilli, but there are considerable differences. P. hemphilli has a rounded base, P. subcarinata is subangular, and also its post nuclear whorls are more straightly conical than in hemphilli, where the profile of the spire is slightly oval (see figs 7 and 8). In fresh specimens the color is a shiny brown - not the reddish chestnut brown of hemphilli - and there is a dark brown band around the periphery, (not at the suture). P. subcarinata has the same distribution as hemphilli, but enters the bays quite rarely. We have collected it at South Padre Island, along the Causeway and alive at Churchell Bayou of Christmas Bay, Galveston - only once from beachdrift at Galveston West Beach. All other occurrences are offhshore in the Freeport, Galveston area - once alive on Heald Bank.

Records HMNS Survey Collection: 28 lots of which 5 contain live collected material.
Depth range: 0 - 32 fms; alive 1 - 23 fms.
Geographical range: North Carolina, both coasts of Florida, Yucatan, West Indies.
Maximum size: 22 mm.

256. Polygireulima (Eulimostraca) hemphilli (Dall, 1884)

Abbott (1974) lists this species under Strombiformis where it does not belong. It is a small Eulimostraea closely related to subcarinata. Its color is a uniform deep chestnut brown (when fresh) with a darker band at the suture. The sutural bands in Polygireulima are caused by the touching of two layers of colored vitreous material at the suture so that the shell appears darker there. In 1884 Dall described this species as an Eulima and assigned it questionably to Leiostraca (= Strombiformis) which it is not. Thus it will preoccupy M. hemphilli Bartsch from the Pacific. On the average P. hemphilli is slightly larger than P. subcarinata, more rounded at the base and darker in color. Often the first post nuclear whorl appears slightly swollen. It possesses an operculum. It is probable that the Pliocene M. conchita Olsson and Harbison is, if not the same, very closely related. Our material also shows often a slight overhang of the previous whorl as shown in figure 11, plate 59 of Olsson and Harbison's treatise. This is the only melanellid that enters the Texas coastal bays in large numbers and lives at many locations (Matagorda Bay, Christmas Bay and the Laguna Madre at South Padre Island). Also rarely in beachdrift along the Texas coast and dredged fairly commonly offshore (Galveston and Freeport) in water to 25 fms depth. P. hemphilli in Texas does not reach the size it reaches in Florida, where according to Perry and Schwengel and Abbott it can reach 5 mm. In Texas I have never seen material exceeding 3 mm, which is the size Tryon (1887) quotes. The figure of Eulima c.f. hemphilli in Rios (1985) is a Strombiformis and not Eulimostraca hemphilli.

Records HMNS Survey Collection: 32 lots, of which 8 contain live collected material.
Depth range: 0 - 26 fms; alive 2 feet - 8 fms (offshore Galveston).
Geographical range: "West coast of Florida, Brazil" (Abbott, 1974). The occurrence in Brazil must be considered doubtful.
Maximum size: 2.8 mm.

Finally I list here two species of a subgenus yet to be named. They are characterized by the presence of an anterior canal. My material is insufficient to decide

whether this canal is already present in juvenile shells. I believe that it is gradually formed during the maturing of the animal.

257. Polygireulima (unnamed subgenus) fusus Dall, 1889

One specimen of this remarkable species was taken in fairly deep water off Texas. It has exactly, as in the original figure, reproduced by Abbott (#1392), a narrow aperture ending in the channel-like anterior canal. Our single specimen is not as slender as the figure and consequently the inclination of the suture is not as steep. Dall described it as Eulima (Leiostraca) which it is not. From Polygireulima it differs in the nuclear spiral near the suture.

Records HMNS Survey Collection: 1 lot, probably live collected.
Depth range: 60 fms.
Geographical range: "Off Fernandica, Florida, Gulf of Mexico and the West Indies, 294 - 640 fms." (Abbott, 1974).
Maximum size: 2.9 mm.

258. Polygireulima (unnamed subgenus) sp. indet. A

Another species of the same subgenus is present in several lots from calcareous environment (Flower Garden Reef). It differs from P. fusus by its slightly swollen nucleus. The shell wall is thicker than in fusus and thus an extra spiral parellel to the suture can be seen. Also the anterior canal is broader and shorter than in fusus. It is figured in fig. 16.

Records HMNS Survey Collection: 3 lots of which 1 contains live collected material.
Depth range: 13 - 30 fms; alive: 30 fms.
Geographical range: Unknown.
Maximum size: 3.3 mm, but fragments indicate a larger size.

Genus Sabinella Monterosato, 1890

This genus is characterized by the somewhat inflated whorls and in some species by the expanded and flaring outer lip, which is present only in fully mature specimens. In the N.W. Gulf of Mexico probably 3 species.

259. Sabinella patula Dall and Simpson, 1901

Only two lots of this species were obtained, one composed of several specimens, only one of which has an unbroken complete aperture. The other lot contains only a single broken specimen. The spire of

S. patula is rather slender; the nucleus is not fine. The species was described as an *Eulima* and Abbott (1974) lists it - incorrectly I believe - as a *Strombiformis*.

Records HMNS Survey Collection: 2 lots, no live material.
Depth range: 76 - 167 fms, off Texas.
Geographical range: "Off Georgia to the West Indies; 2 - 440 fms." (Abbott, 1974)
Maximum size: 5.1 mm, but probably grows larger.

260. *Sabinella sp. indet. A*

This not uncommon species differs from *S. patula* by its coloration but is placed in this genus because of its slightly inflated whorls which resemble those of *S. patula*. Although we have a good number of lots no material has shown a widely expanded aperture. This is a rather small sized species living on the Texas-Louisiana shelf area on muddy, shelly bottoms. Its host is, as for practically all melanellid species discussed here, unknown. Most specimens are light brown colored, shiny when fresh, and show a color a pattern only when they start to discolor slightly. Then, when the shell begins to bleach, a faint brown spot can be seen where the outer lip connects with the body whorl and also a faint coloration can be seen on previous whorls where the old varices of previous apertures are present. They show up as slight radial brown lines with a small faint brown dot above it. The nucleus is extremely fine so that the spire is sharply pointed. This serves as a clear character to separate this species from the next. The species is figured in fig. 9.

Records HMNS Survey Collection: 15 lots of which 4 contain live collected material.
Depth range: 8 - 40 fms; alive 23 - 25 fms, mostly on sandy bottoms off Freeport and Galveston.
Geographical range: Unknown.
Maximum size: 3.2 mm.

261. *Sabinella sp. indet. B*

This species resembles *S. sp. indet. A* closely, but differs in several important aspects: 1) its nucleus is much coarser. 2) its color is white, never brown colored, and not shiny. 3) It is overall slightly smaller and probably somewhat thicker shelled. 4) It lives exclusively in calcareous environment. It is here figured in fig. 10 (Flower Gardens).

Records HMNS Survey Collection: 15 lots, no live material.
Depth range: 13 - 60 fms, but mostly in the 25 - 40 fms range, both off Texas and off western Louisiana.
Geographical range: Unknown.
Maximum size: 3.2 mm.

Genus Strombiformis DaCosta, 1778

Very slender elongate shells with many whorls. When fresh they are glossy and vitreous and display color patterns. The nucleus is very small, hence the shell is sharply pointed. The sutural groove is often completely overglazed by clear vitreous material. The outer margin of the aperture is hardly, or not at all, projecting forward. In the N.W. Gulf of Mexico live 6 species which are supposed to be parasites, often holothurians, but of most species nothing is known about their biology. It is remarkable that such parasites should possess a radula (Thiele, 1928 and Olsson and Harbison, 1953).

It has been stated that Strombiformis is invalid because its type is a land snail. If true, the name should be replaced by Leiostraca H. and A. Adams.

262. Strombiformis bifasciatus (d'Orbigny, 1842)

A widespread and common species reaching up to 8 mm in length. These are quite elongate, somewhat spindle shaped polished and shiny shells, banded by two dark brown bands, one just below the suture and the other below it just skirting the upper angle of the aperture. The nucleus is very small but somewhat domeshaped and consists of no more that two whorls . The outer lip of the aperture is straight and vertical. In fresh material there are faint color dashes at spots where growth was periodically interrupted, indicating previous outer rims of the aperture. The color of bifasciatus is light tan and not white as Abbott states. I have not been able to see an operculum.

This species has usually been reported as S. bilineatus Alder, 1848. It is my belief that this name should be restricted to European material and that our material is properly labeled as above by the old d'Orbigny name (see Tryon's 1887 description). Investigation of the biology might decide the matter. S. bifasciatus is found on all Texas outer beaches from South Padre Island to Sabine Pass, but does not enter the coastal bays except that it was once taken in 8 feet in Timbalier Bay, La. It is common offshore Freeport and Galveston in 8 - 26 fms. Also in the mudlump fauna off Louisiana.

Records HMNS Survey Collection: 28 lots of which 9 contain live collected material.
Depth range: 0 (beach) - 26 fms; alive 0 - 25 fms.
Geographical range: "North Carolina to West Indies" (Abbott, 1974).
Maximum size: 7.2 mm.

263. Strombiformis auricinctus Abbott, 1958

This name was introduced by Abbott for a shell which used to be known as Melanella acuta Sowerby, which however is different and from the Eastern Pacific (see Keen, 1971, No. 691, p. 443). In the N.W. Gulf of Mexico it is a rather unusual species which differs so much from other species in the genus that I am inclined to put it close to Melanella. It has a strongly forward projecting outer lip and fresh material is quite vitreous, but has a single dark red brown band around the periphery and often a brown spot at the base of the columella. It is much less slender than most other members of Strombiformis. Until more definite information becomes available I will leave it in Strombiformis. The species only occurs in calcareous environment (Flower Gardens and off West Louisiana).

Records HMNS Survey Collection: 7 lots, no live material.
Depth range: 10 - 36 fms.
Geographical range: "North Carolina to Florida and the West Indies" (Abbott, 1974).
Maximum size: 4.6 mm.

264. Strombiformis sp. indet. A

This widespread species has a quite different color pattern than all other species of this genus in our area. Its basic colors are tan and white and on this background are bands of reddish brown, both spiral and vertical, so that the species resembles the Eastern Pacific S. townsendi Bartsch very closely. It appears to be slightly fatter. (Compare Abbott, 1974, fig. 1399 with fig. 11 of this paper). Its color pattern consists of a single brown band interrupted at irregular intervals by a vertical dash of the same color, deposited at spots of interrupted growth (old varices). In this species the outer apertural lip is hardly projecting forward and the nucleus is coarser than in S. bifasciatus. This may be the species that Maxwell Smith illustrated as Melanella intermedia (plate 33, fig 11) which is not that species. Most of our material comes from the Freeport-Galveston area between 7 - 26 fms from sand and muddy sand bottoms. Also from Stetson Bank and Clay Pile Dome.

Records HMNS Survey Collection: 21 lots, of which 6 contain live collected material.
Depth range: 6 - 26 fms; alive 12 - 25 fms.
Geographical range: Unknown.
Maximum size: 6.4 mm.

265. Strombiformis sp. indet. B

This is a deeper water species and one of the largest melanellids of the Texas coast. It has a dull greyish brown color and a single brown band close to the suture; on the body whorl sometimes two bands are present, the lowest of which is obliterated under the growing whorl. In this respect this species is easily distinguished from S. bifasciatus where the second band remains visible. But of all species in our area this is closest to bifasciatus with which it shares the property that the outer lip of the aperture does not project forward. The species also resembles S. dalli Olsson and Harbison from the Florida Pliocene. A sketch is presented in figure 12.

Records HMNS Survey Collection: 3 lots, no live material.
Depth range: 50 - 110 fms.
Geographical range: Unknown.
Maximum size: 13.4 mm.

266. Strombiformis c.f. biconica Gardner, 1948

This rare species is only present in one lot (mudlump fauna off La.) and may not be recent. It differs from all other species of the genus in our area in that it has a body whorl, which, although not quite half the shell size , is nevertheless relatively much larger than in other species of the genus, giving the shell its biconic appearance. Its nucleus is fairly coarse. In our material full grown shells become less biconic than juvenile ones. It was figured - I believe an immature specimen - by Olsson and Harbison, 1953, plt. 59, fig 6 from the Pliocene of Southern Florida and described from the Miocene of the Carolinas. Figured in figure 13.

Records HMNS Survey Collection: 1 lot, no live material.
Depth range: the mudlump fauna off Louisiana is supposedly derived from water deeper than 35 fms.
Geographical range: Miocene of the Eastern U.S.A. and Pliocene of Southern Florida.
Maximum size: 9.6 mm.

267. Strombiformis sp. indet. C

A very different, quite small species is present in only two lots. Like the previous one it is strongly biconic, but differs in its small size, extremely fine nucleus, rather deep suture (unique for Strombiformis). It is figured in figure 14. We possess only two single specimens and must await more material for a more complete analysis.

Records HMNS Survey Collection: 2 lots, no live material.
Depth range: 8 - 9 fms; both offshore Texas.
Geographical range: Unknown.
Maximum size: 2.3 mm.

Genus Haliella Monterosato, 1873

Originally erected for a Mediterranean species and also known from the Eastern Pacific. Now also known from the offshore Texas coral reefs. These are elongated small shells with an obscure fold on the columella.

268. Haliella sp. indet. A

This is a rather large species in the family, but unfortunately all our material is fragmentary. It was collected from coral rubble on the Flower Gardens and shows quite clearly the columellar twist characteristic for the genus (see also figure 1407 in Abbott, 1974). From several fragments I have composed a figure (fig 15). This species is white, unadorned, quite glassy and under the microscope one can see faint growth incrementals crossed by very faint spirals. In the past I have reported this material as Hemiaclis sp. E (Tex. Conchol., Vol. 9, p. 14, 1973).

Records HMNS Survey Collection: 1 lot, no live material.
Depth range: ± 16 fms.
Geographical range: Unknown.
Maximum size: Not measured, but at least 10 mm.

Genus Niso Risso, 1826

Elongate conical shells which when mature have a deep umbilicus. The glossy surface usually has color markings. In the N.W. Gulf of Mexico occur 4 species, two of which also live in the Eastern Pacific. The biology of these species is unknown.

269. Niso aeglees Bush, 1895

This widespread species used to be known as N. interrupta (Sowerby, 1834) which is a somewhat different Eastern Pacific species. N. aeglees lives all over the shelf area of the Texas-Louisiana coast on sandy bottoms. It has also been obtained in the mudlump fauna off the Mississippi Delta. These are straight-sided, very shiny, as the name implies, conical shells, which when mature are deeply umbilicated. Sometimes juveniles have only a shallow groove where the umbilicus is. Others have an open umbilicus. The species does not enter the bays. In the countless bay samples taken for the survey never a trace of it was found, but Andrews (1971) reports it for Aransas Bay. The shallowest location in the survey collection is at the base of the Freeport jetty, but such a location is suspect (may be trawler shells).

Records HMNS Survey Collection: 45 lots, of which 6 contain live collected material.
Depth range: 8 - 70 fms; alive 20 - 35 fms.
Geographical range: "North Carolina to Texas and the West Indies and Brazil" (Abbott, 1974).
Maximum size: 13.2 mm. Andrews cites 18 mm, which is the size cited by Keen (1971) for N. interrupta.

270. Niso lomana Bartsch, 1917

Closely related to aeglees, but larger with a wider tip angle and deeper suture, even slightly notched. The whorls are somewhat inflated and thus the shell is not straight-sided. N. lomana lives in much deeper water than aeglees, 60 - 140 fms, but one lot comes from the algal reef below the Flower Gardens at 36 fms. Also found in the mudlump fauna (LA).

Records HMNS Survey Collection: 9 lots, of which one contains a probably live collected specimen.
Depth range: 60 - 140 fms; alive at 60 fms.
Geographical range: Only reported from the Panamic faunal Province (number 751 in Keen , 1971).
Maximum size: larger than aeglees but the only undamaged specimen measures 7.2 mm. Fragments of much larger specimens are present.

271. Niso sp. indet. A

A single specimen of a small species, somewhat resembling Niso baueri Emerson of the Panamic Province was taken off Texas. Unfortunately, the nucleus is broken off and more material is needed for a better identification.

Records HMNS Survey Collection: 1 lot, no live material.
Depth range: 40 fms.
Geographical range: Unknown.
Maximum size: 2.2 mm.

272. Niso sp. indet. B

A single specimen of a rather large Niso can at this moment not be identified. It is a straight sided specimen with a slight groove at the suture, straw yellow in color. There is a whitish band around the periphery, in the middle of which there is a narrow brown line. Its shape is that of aeglees, but it is probably not that species because size and coloration are so different. Perhaps this is recent N. wilcoxiana Dall, 1889.

Records HMNS Survey Collection: 1 lot, no live material.
Depth range: 182 fms, off the Mississippi Delta.
Geographical range: Unknown.
Maximum size: 19.5 mm.

(To be continued)

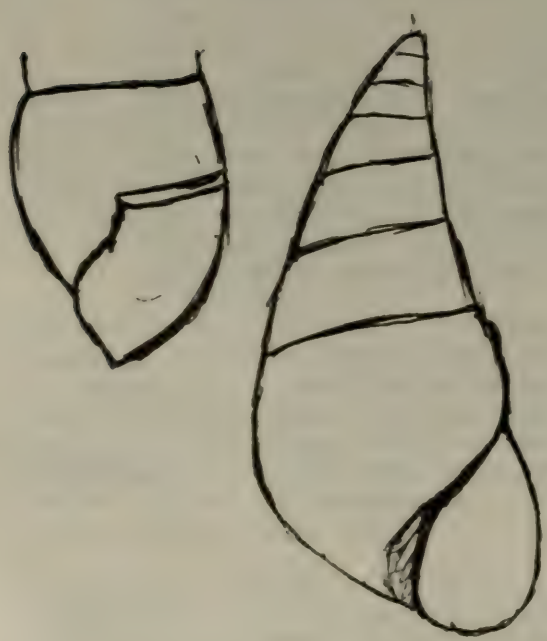


Fig. 1 Melanella sp. indet. A

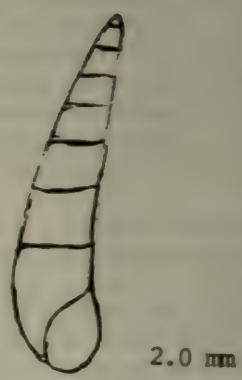


Fig. 2 Melanella sp. indet. B

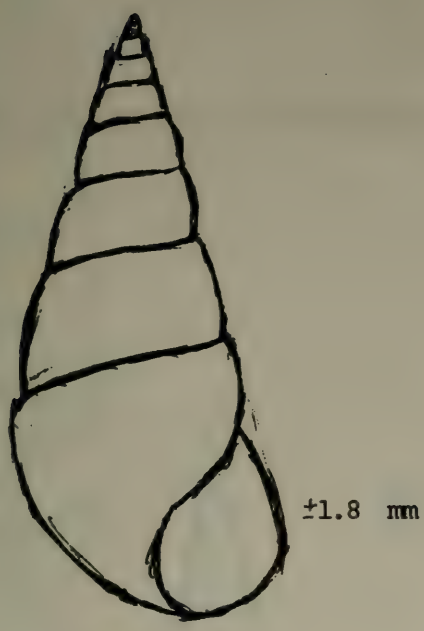


Fig. 3 Melanella sp. indet. C

Fig. 4 Polygireulima (Polygireulima) intermedia

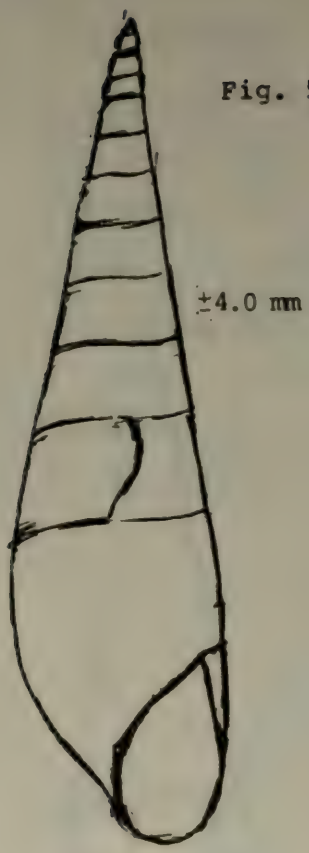


Fig. 5 Polygireulima (Polygireulima) hypsela

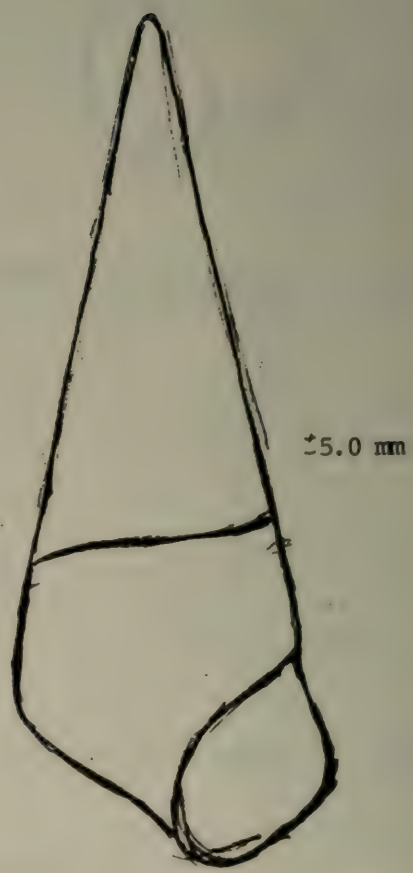
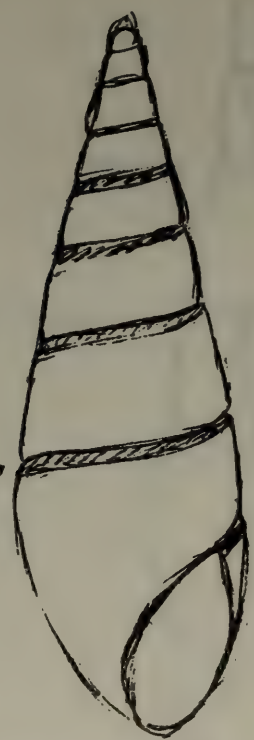


Fig. 6 Outline of P. (Polygireulima) conoidea

Fig. 7 Polygireulima (Eulimostraca) subcarinata

2.0 mm



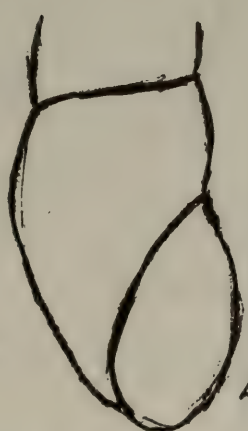
dark brown color band

Fig. 8

Polygireulima (Eulimostraca) hemphil

3.2 mm

a



b

Fig. 9 Sabinella sp. indet. A a) side view; b) front view of aperture

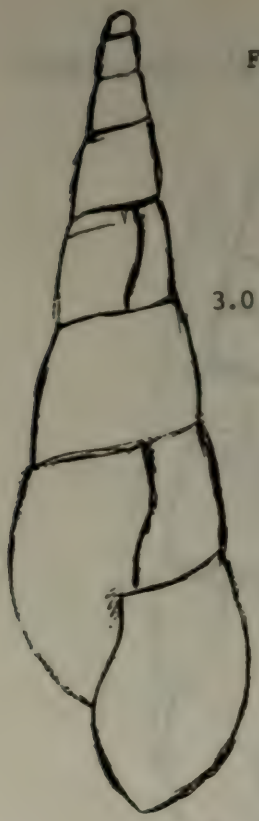


Fig. 10 Sabinella sp. indet. B

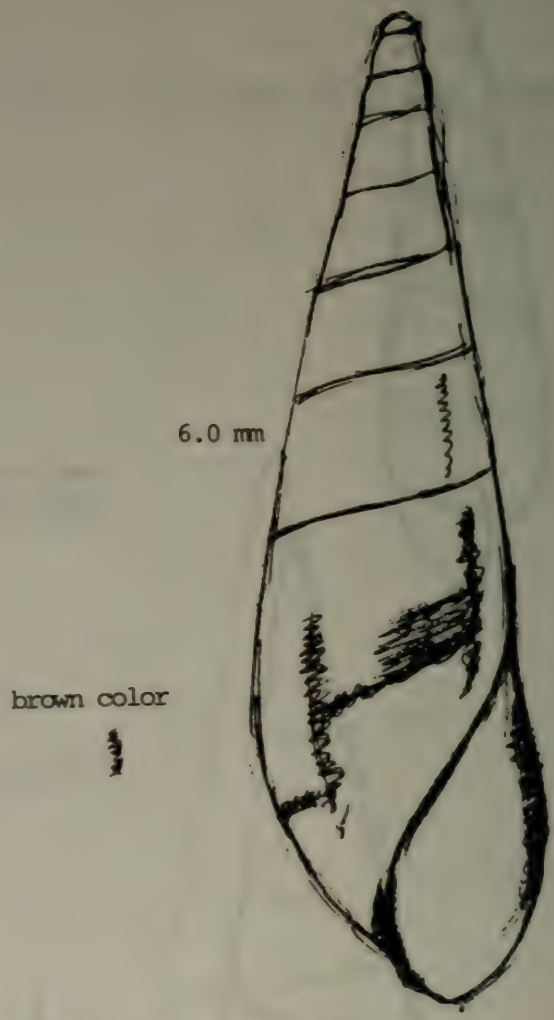
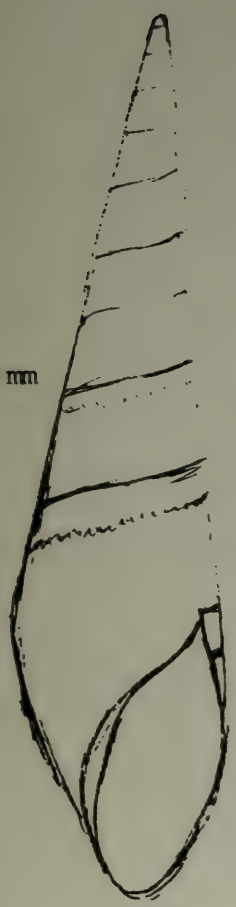


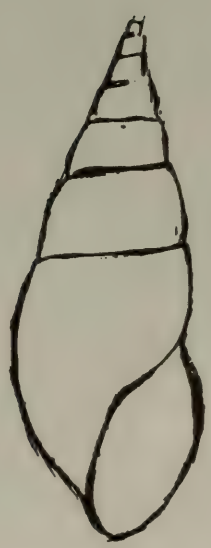
Fig. 11 Strombiformis sp. indet. B showing color markings

Fig. 12 Strombiformis sp. indet. B



9.0 mm

Fig. 13 *Strombiformis* c.f. *biconica*



2.3 mm

Fig. 14 *Strombiformis sp. indet. C*

Fig. 15

Haliella sp. indet. A, front view into aperture. Composite drawing from fragments.

Fig. 16 *Polygireulima* (unnamed subgenus) *sp. indet. A*

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SEARCH AND SEIZURE

By Constance E. Boone

NOTES ON HOW IT IS DONE

Search and seizure, of mollusks, that is!

Through the years of this column we have reported searching and seizing mollusks from around the world. It has never failed to amaze me to observe the ingenious methods of obtaining mollusks that have been employed by many peoples.

Taught to do this first here in Texas, we learned here to go at low tides, especially after northers in deep winter, to go after summer hurricanes, to watch for trails, to learn which holes meant burrows of mollusks, all the things you know about in your own home area.

When we began to travel, we learned to watch the natives search and seize, mostly for food. In Mexico, at Guaymas, we observed the Indian children sit in the sand at water's edge at San Carlos every day and scoop up small *Heterodonax* for their supper. We had not spotted the habitat for these 1/2-inch shells used for soup much like our *Donax*.

In Panama (West Coast) we saw the natives spreading lime in the holes of the enormous *Solen rudis* to capture these succulent bivalves. In fact, I bought a couple from one of the men, afraid to ask for more because I knew it was to be his supper. I knew I would never be able to dig these active bivalves myself---they burrow in too deep and can even go sideways!

In Panama, too, we did our first collecting at night, by lantern, and thus saw and captured a live *Umbraculum* with a soft, jellied animal that was fluorescent at night.

In Florida one summer on the West Coast near Panama City I finally tried out my nylon-netted fishing net, swishing it through the grasses in shallow water, to recover my first live *Smaragdia viridis*, the lovely little Emerald Nerite.

Another hand dredge, made from a paint roller and screen, was given to me to use in Vanua Levu, Fiji, where I retrieved some beautiful *Terebra* from the sand. Here also I snorkeled for the first time. The thrill of seeing live *Cypraea* underwater has never been equaled.

In the Philippines, I walked along with the natives using large wooden push nets to gather up every living creature from the grasses for their suppers. I was amazed to see how little they did get, many urchins, holothurians, and a few mollusks.

Once in Australia, on the Barrier Reef, we participated in

an experiment to lower the bundle of nylon netting like the Philippine fishermen use with such success in deep water, sometimes getting rarities never seen before but more often getting only a few shells or common ones. Our experiment ended in disaster as the net broke the line and was lost. I have never yet seen shells brought up in this manner. The fishermen in the Philippines guard their operations pretty thoroughly.

Recently in Madagascar we observed the natives going out every day in pirouges at low tide to the edge of the reef, saw them patiently trudge hour after hour along the rubble and sand patches inside the reef, poling ahead with long sticks, sometimes with metal points, to capture mollusks, octopus and other edible sea creatures. Most of us on that memorable trip were unable to match the natives' abilities. They were adept in finding the Bull Helmet, the gorgeous red-mouthed *Cypraecassis rufa*. Only three of our party, including Bill Oakes, were able to get specimens. Every day the natives had many. From what I can understand, they did not eat these but collected them for sale in the shell markets. However, we did get to prove one thing. The question of whether this species has an operculum was settled when we did recover tiny horny operculums in live specimens.

The search and seizure of these marvelous animals continues to intrigue me. Share with us some of your adventures in the world of Mollusca. The game is far from over!

OBSERVATIONS ON A FORBIDDEN BEACH By H.Ode'

The success in collecting micro species of mollusks as I described previously (Texas Conchologist, Vol. 25 (1) pp 10-25) prompted me to try again the next time I visited an unknown beach. Hence when visiting Corona del Mar in Southern California the little sample box (5x8x12 cm) was brought along. An enormous advantage in collecting micro shells is the short time it takes to get them on the beach and the fact that it can be done in almost total darkness. This time during a stroll along a small rocky shore with my grandchildren at dusk I filled the box with some fine grit and took it home.

Two days later visiting the same spot again in the morning of a bright sunny day there was a guard on duty and when I asked whether many people would swim in this ocean in, for me, rather cool weather he laughed and said he was not a lifeguard but was there for information to the public and to see that the beach was left undisturbed - meaning no shell collecting! I did not inform him that two days earlier I had taken about 450 cc of sandy grit. I carried the forbidden fruit home!

The results of two days of microscope work are interesting enough to warrant a brief report, although perhaps the sample was not as rich in species and specimens as the sample from Yucatan, referred to above. Also this sample clearly shows that the ideas about the composition of the molluscan fauna in most places in the world as presented in popular shell books are terribly biased toward the gigantic species (everything over one half inch).

In working through the material I was now somewhat at a disadvantage because my experience with the Pacific fauna of the North American continent is rather limited and hence the identification of some of the juvenile material listed here must be considered uncertain. There are some groups for which I have not yet developed an "eye." (Acmaeidae).

Many years ago (Ode', Tex. Conchol. Vol. 11 (3). pp 69-71) when I discussed Abbott's monumental compilation I stressed the aspect of practical use of the book. I questioned: "How easy is the book in use, especially for someone with a good knowledge of mollusks but unfamiliar with a particular fauna?" I found out. For shells of "normal" size, that is half and inch and larger, it works great. However, for material in the microrange it is almost useless. The main reason for this unsatisfactory state of affairs is that micro mollusks have hardly been studied at all.

Most surprising was the discovery of some species only reported in the literature for outside the U.S.A. I had believed, somewhat naively, that so close to Los Angeles the fauna of the inshore zone would be very well known.

By far the most common gastropods were small juveniles of Crepidula species and countless Tricolia variegata which almost all were juveniles. It is remarkable that juveniles of Tricolia were also abundant in the Yucatan sample collected in February . This could mean that Tricolia spawns in wintertime both in Yucatan and Southern California. Further abundant species were Amphithalamus, Teinostoma, and Littorina (2 species).

Among the bivalves the most common were two species of Mytilus (all very small ± 1 mm), and to me quite surprisingly, Milneria kelseyi (all sizes), Lasaea adansoni (all sizes), and Hiatella arctica (all small juveniles smaller than 2 mm).

Crawling on the rocks were countless trochids, but only very few juveniles of those were found in the sample. On the other hand, of the myriad Littorina seen, many turned up in the grit under the microscope. Among the rocks were a good many boulders and pieces drilled by what I presume are pholads. However, the number of pholads (fragments and juveniles) was very small.

Of course there was much interesting material that could not be identified. Of some I have prepared sketches. Almost all material, except a few entries whose quality was too poor, was deposited in the Houston Museum of Natural Science. To save some typing, authors and dates have been omitted in the list, but I have added the species number of Abbott's 1974 book within brackets so the reader may easily find a more complete description than I can give in these brief notes.

Interesting are the differences in the rubbish discarded from the Yucatan sample and the California one. From the latter it consisted largely of many clear quartz grains, balanoids unknown to me, and fragments of agglutinated sandgrains, probably from nest (I guess) of perhaps Hiatella or Sphenia. There also were many bryzoa. In the Yucatan sample all "rocks" were fragmented coral; there were more calcareous algae, foraminifera and echinoid fragments.

The species list follows:

1. Sinezona rimuloides (20) common.
2. Puncturella sp. A single small specimen.
3. Fissurella volcano (133) Very common; many small (± 1 mm) juveniles.
4. Acmaea pelta (148) 2 juvenile specimens.
5. Acmaea conus (152) Abundant.
6. Acmaea limatula (153) Few in drift; abundant on rocks.
7. Acmaea paleacea (161) Several specimans.

8. Acmaea sp. Many juveniles with a checkerboard pattern of light brown dots. Internally there is no colored margin.
9. Acmaea (?) sp. Several extremely small cap shaped shells. The top is close to the margin of the shell. Color dark brown and sometimes with white spots.
10. Norrisia norrisi (374) Two juvenile and one large specimen from the tide line.
11. Tegula gallina (382). One specimen.
12. Tegula aureotincta (384). One specimen.
13. Tegula funebralis (385). Very common on the rocks; 2 specimens.
14. Tegula c.f. eiseni (386). 3 small juveniles.
15. Arene (?) sp. Several specimens. I cannot identify these shells, which are widely umbilicated. The aperture is not rounded but quite angular. (See fig. 1).
16. Parviturbo acuticostatus (461). Fairly common.
17. Parviturbo stearnsii (466). A single small specimen.
18. Tricolia compta (514). Abundant.
19. Tricolia variegata (515). Abundant, mostly very small.
20. Tricolia sp. A single glassy shell of even light brown color with closely set spiral grooves.
21. Lacuna unifasciata (538). Fairly common. Fresh juveniles.
22. Littorina planaxis (553) Abundant.
23. Littorina scutula (554). Abundant.
24. Alvania acquisculpta (611). Fairly common.
25. Alvania almo (615). One specimen.
26. Amphithalamus lacunatus (655). Abundant.
27. Nannoteretispira kelseyi (659). 2 specimens.
28. Barleeia californica (706). Common.
29. Barleeia subtenuis (708).Fairly common. Suprisingly similar to Amphithalamus in color and shape, but missing the apertural ledge and larger.
30. Vitrinella sp. Two small spirally ribbed specimens.
31. Vitrinella sp. A single somewhat defective specimen, rather narrowly but deeply umbilicated. Smooth.
32. Teinostoma supravallatum (carinated form). Abundant in all sizes.
33. Teinostoma supravallatum (smooth form). Abundant in all sizes. The obvious differences between both forms ought to be a warning to those who generate species on the minutest differences in the shell shape. Carpenter, 1864, named this T. invallatum.
34. Vitrinorbis (?) sp. One very small specimen, widely umbilicated with a strong keel at the periphery. (See fig. 2).
35. Caecum californicum (871). Very common, several alive.
36. Caecum crebricinctum (873). Two specimens.

37. Caecum orcutti (890). Common.
38. Caecum occidentale (891). Common.
39. Omalogyrus (?) sp. A single very small species in one of the smallest genera known. The specimen is not broken but the last whorl becomes detached. There is a wide umbilicus. Possibly undescribed. (See fig. 3).
40. Rissoella sp. One specimen. The is the smallest Rissoella I have ever seen (.7 mm).
41. Rissoella sp. Several glassy clear shells with deep suture.
42. Cyclostremella c.f. californica (741). One specimen.
43. Cyclostremella (?) sp. One small specimen.
44. Serpulorbis squamigerus (967). Several fragments. Also larger clumps observed in tideline.
45. Vermetids. Two unidentified shells with nucleus exposed.
46. Modulus catenulatus (979). A few dark colored worn fragmental shells, almost fossil looking.
47. Cerithiopsis sp. Several specimens. A rather slender species reminding one of C. fusiformis of the Western Atlantic.
48. Cerithiopsis carpenteri (1051). A few incomplete shells.
49. Seila montereyensis (1127). Uncommon, only fragments.
50. Triphora pedroana (1136). One specimen, some fragments.
51. Metaxia sp. One specimen and one fragment. Unfortunately the nucleus is missing but I am sure this is a Metaxia and not a Cerithiopsis. Metaxia is a right handed genus in the Triphoridae. Probably given a name by Bartsch.
52. Opalia funiculata (1198). One specimen, some fragments.
53. Epitonium tinctum (1234). Several specimens, none of which except one, shows the brown subsutural band.
54. Aclis sp. 5 specimens the largest about 1 1/2 mm in length.
55. Hipponix c.f. pilosus. Fairly common. It is not possible to assign this material to H. antiquatus because it is slender and regularly grooved. It might be that this is due to their immature state (?). Very small juveniles are quite different (see fig. 4). They are smooth with depressed apex and shallow umbilicus.
56. Mixture of juvenile specimens of Crepidula onyx and Crepidula excavata. I am unable to separate the very juvenile specimens (0-2 mm) of these species. Abundant.
57. Crepidula adunca (1562). A single specimen.
58. Crepidual aculeata (1563). A single juvenile just starting to develop spines.

59. Crepidula mummaria (1571). A number of very flat glassy juveniles.
60. Acanthina spirata (1877). 2 fresh specimens.
61. Ocenebra interfossa (1914). One juvenile, several fragments.
62. Nitidella carinata (2104). A few specimens, many fragments.
63. Parametaria dupontii (2086). A single juvenile.
64. Mitrella sp. Quite common, many juveniles.
65. Mitrella sp. A single specimen.
66. Aesopus sanctus (2165). 2 defective specimens.
67. Decipifus gracilis (2177). One specimen and several fragments. Somewhat unexpected because this species is only mentioned for Baja California and further south in Mexico [see figure in Keen (1971)].
68. Amphissa versicolor (2180). One specimen and several fragments.
69. Olivella pedroana (2563). One large old specimen and one very small fresh juvenile.
70. Hyalina taeniolata (2762). One specimen, many fragments.
71. Cystiscus politulus (2768). 5 specimens and fragments.
72. Cystiscus sp. A very small cylindrical species. Length only 1.2 mm. (See fig. 5).
73. Conus californicus (2803). Two worn specimens.
74. Kurtziella plumbea (3251). Two specimens. The only turrids found in the sample.
75. Odostomia c.f. helga (3491). The odostomias, mainly named by Bartsch, must be reviewed to weed out the scores of unnecessary names. Here I can do no better than write names based on comparison with figures. Common.
76. Odostomia astricta (3492). A single defective shell.
77. Odostomia pulcherrima (3509). Common.
78. Odostomia tenuisculpta (3545). A single specimen.
79. Odostomia vancouverensis (3587). Several small specimens of a deeply sutured rather tabulated species in excellent agreement with figure 3587 in Abbott as far as shape is concerned. Our specimens are slightly spiral striated.
80. Iolaea eucosmia (3617). One specimen.
81. Miralda aepynota (3624). Two specimens.
82. Ividella navisa (3629). Fairly common.
83. Peristichia hermosa (3657). Only a single 6 mm large specimen. For figure see Keen (1971). Reported only from Baja California. I believe that Peristichia is in the Mathildidae.
84. Pyrgiscus tenuicula (3757). Several specimens and fragmental shells.
85. Pyrgiscus sp. One specimen. Cream with a dark brown spiral band. Probably a color form of tenuicula.
86. Chemmitzia c.f. stylina (3685). Like for so many species in this genus there are many synonyms.

87. Acteocina c.f. magdalensis (3928). Quite uncertain identification. Abbott only lists Pacific species.
88. Philine bakeri (3966). A single minute shell (1.0 mm).
89. Diaphana c.f. californica (3999). A very small specimen which may be this species.
90. Haminoea virescens (4021). 3 small specimens.
91. Pedipes unisulcatus (4098). A single fresh specimen.
92. Siphonaria brannani (4115). Three specimens.
93. Williamia peltoides (4117). Only a few fresh but small specimens.
94. Physa sp. Two specimens, probably from the small stream emptying in the cove.
95. Barbatia bailyi (4968). Only a few fragments. (Not retained).
96. Philobrya setosa (5034). Common.
97. Mytilus edulis (5039). Abundant. All extremely small.
98. Mytilus californianus (5042). Abundant. All very small.
99. Brachidontes adamsianus (5046). Fragments common.
100. Leptopecten latiauratus forma monotimeris (5188). Many, mostly small fragmental shells.
101. Anomia peruviana (5233). A single juvenile valve.
102. Limaria c.f. hemphilli (5244). Probably fairly common. Small fragments usually of the hinge area.
103. Diplodonta c.f. sericata (5373). Two juveniles which may be this species.
104. Phlyctiderma (Pegmapex) c.f. phoebe. A single valve. I had considerable difficulty in locating its true position. Its hinge, although clearly diplodontid with a bifid cardinal, is quite different from others in the family because of the large shelf like arrangement for the hinge (see Keen, 1971).
105. Chama pellucida (5388). Several small valves. Abbott (1974) gives a range from Oregon to Chile, but Keen (1971) does not mention it.
106. Pseudochama exogyra (5397). A few worn valves and juveniles.
107. Lasaea adansoni (5408). Abundant.
108. Lasaea cistula (5410). A few small valves. Identification uncertain; quite different from adansoni.
109. Leptonid. A single valve, shaped as a Nucula and beautifully iridescent on the outside.
110. Kellia suborbicularis (5412). Several juveniles.
111. Bornia c.f.retifera (5413). One complete specimen and some defective valves.
112. Mysella sp. A small valve in shape close to the Atlantic M. planulata.
113. Mysella sp. A single valve elliptical in outline.
114. Glans subquadrata (5486). Small valves common.

115. Milneria kelseyi (5509). This remarkable clam develops the "brood pouch" only later in life. Immature specimens do not have it and it develops only in adulthood. Juveniles look different. Abundant in drift. (See fig. 6).
116. Tellina c.f. modesta (5690). A small juvenile valve.
117. Tellina meropsis (5693). A single valve.
118. Tellina sp. A small Tellin with rather heavy development of the hinge.
119. Semele sp. A number of small juveniles I cannot identify because I am unfamiliar with the many eastern Pacific species.
120. Gari edentula (5775). Two complete specimens.
121. Chione californensis (5868). Four small valves.
122. Tapes philippinarum (5900). Two very small valves.
123. Pupillaria (?) sp. Two valves and some fragments of this very peculiar species. A close relative was reported by Vokes and Vokes (1983) from Yucatan as "genus (?) species (?)." (Plt. 50, figs 10, 10a) and I reported identical material in the Texas Conchologist [Vol. 25, (1)]. The hinge of this material is venerid, and I believe the species is petricolid. The pacific material has brown zig-zag markings and obvious surface sculpture. (See fig. 7).
124. Sphenia fragilis (5990). Many fragmental shells.
125. Hiatella arctica (6019). Juveniles are very abundant. In shape they are elongate and thin.
126. Penita penitella (6043). Several juveniles and fragments.
127. Chitonidae, etc. A large number of shell pieces of chitons was taken, but no effort was made to identify them. There are about 4-5 different species.

Of course there were very poor fragments of still about 20 other species which were not retained (Nassarius, Acteon, and several unidentifiable genera). Further collecting at this spot will undoubtedly bring to light these and many other species.

Figure 1. Arene (?) sp.

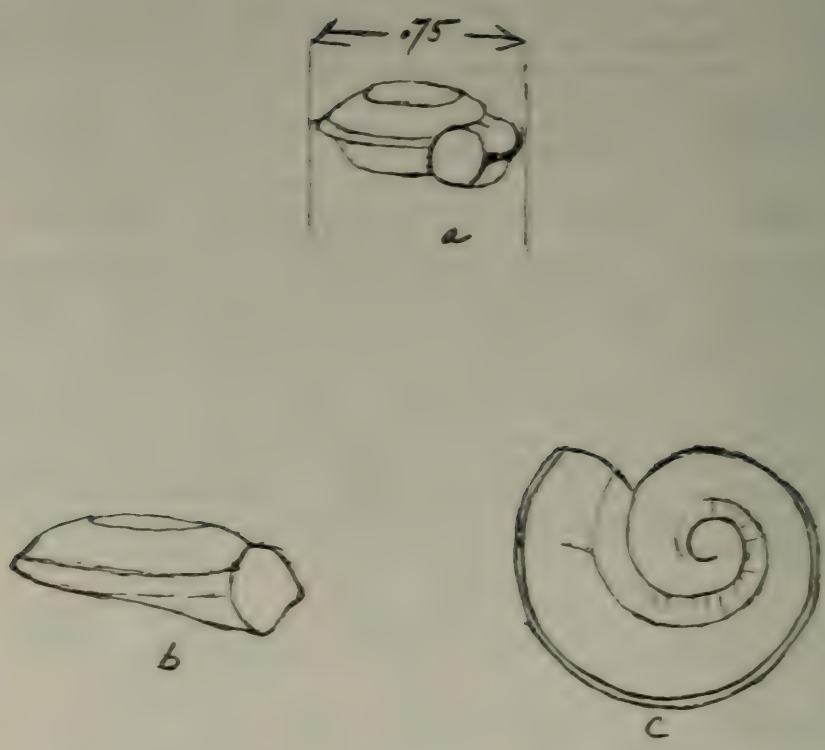


Figure 2. Vitrinorbis sp. A and B side views; C top view.

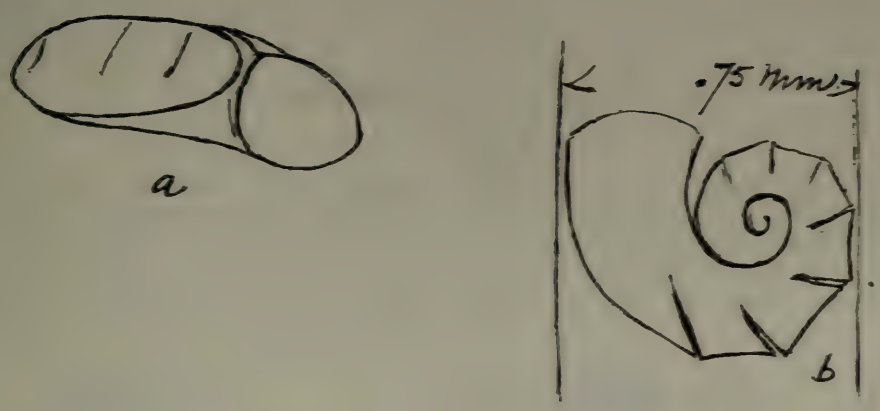


Figure 3. Omalogyrus (?) sp. A side view; B top view.

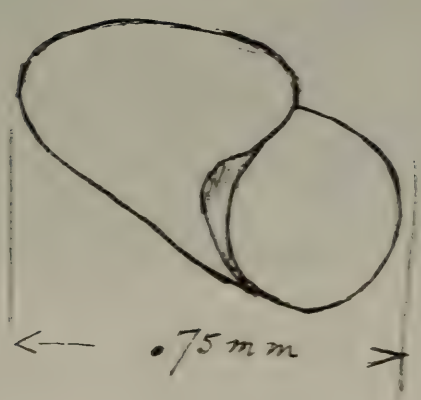


Figure 4. Hipponix pilosus. Completely smooth nucleus.

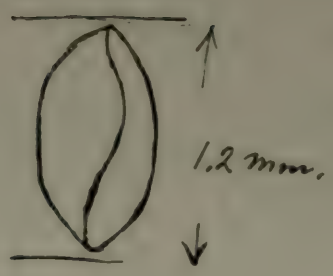


Figure 5. Cystiscus sp.

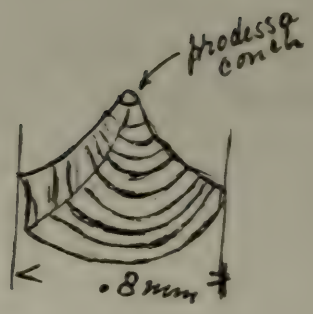


Figure 6. Milneria kelseyi. Juvenile valve.

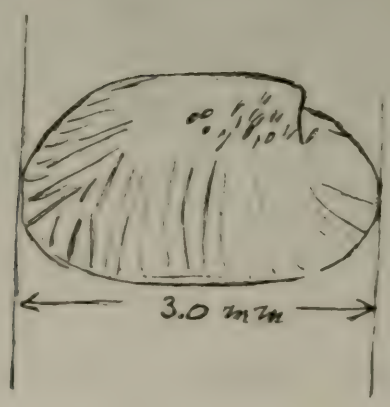
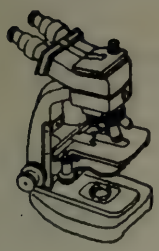


Figure 7. Rupellaria sp.



UNDER THE MICROSCOPE

By Jean Holman

BOB AND MARIAN JORDAN

A serious shell collector doesn't materialize out of thin air. It takes the tang of ocean breezes, an inviting low tide and an eye for a pretty bauble. Throw in the catalyst of a five week stay in Fiji in 1980 and Bob and Marian Jordan seemed to be destined to be two of the more avid shell collectors.

The birth of their interest in shells was much earlier though. Bob grew up in the Miami, Florida area. He attended the University of Miami and paid his way through college by hunting and selling alligators and snakes! While at the university, he joined the R.O.T.C. and was commissioned in the coast artillery. He transferred to the Air Force when World War II started because he wanted to fly and he flew throughout the war.

Bob's family was in the furniture business in Miami and he had an uncle in the floorcovering business. From what he saw of the carpet business he liked it, and after the war Bob traveled for 25 years on the road as a mill

representative. At one time he covered seven states! He then worked for a few years on the retail side of the business until Marian convinced him to retire.

He now has more time to devote to his three major interests: shell collecting, stamp collecting, and growing hibiscus. When Bob was 14 he began collecting stamps from around the world. He has assembled a vast collection and points out that there are many countries which have issued a "shell" series. He added another shell stamp to his collection at the HCS auction this year!

Bob and Marian are members of the Houston Hibiscus Society and have hundreds of hibiscus! They love tropical plants and eventually want to move to Hawaii where they could raise tropicals without the use of a greenhouse.

Marian got her Masters degree in English, and started her career as a teacher. She taught for 10 years, English, History and Spanish to Junior and Senior High School students. But due to the changing times she wanted to quit teaching. Her love of the academic atmosphere kept her in a school environment though and she has been at Rice University for 24 years in administration as assistant to the Provost. She likes the constant learning and stimulus of the school as well as being around professors and students all day.

Marian, originally a "city girl from Dallas" has been happily transformed into a "beach bum" by Bob. Both of their careers have given them the time to take a five week vacation every year and they enjoy warm climates, blue waters, deep sea fishing and gorgeous beaches. They first showed a little interest in shells on an early trip to Key West where they picked up a couple of conchs. On another trip to Cozumel they picked up a few more. They started alternating vacations between the Caribbean and Hawaii and of course acquired a few more shells. Then a friend recommended Fiji to them which he said was what Hawaii looked like fifty years earlier before all the development. So in 1980, for five weeks, they stayed on a small island by the beach in Fiji where an inland river met the ocean.

When they first got there, they spent a lot of time beach collecting and swimming. They progressed to wearing goggles and tracking olives by their sand trails. They had seen other people way out on the reefs because when the tide went out you could go up to two miles out wading through tidal pools. One morning they decided to walk the reef too, so they put on their tennis shoes to protect their feet from the coral and started as the tide was going out.

This was magnificent Fiji, but this was not Marian's day. Actually it started before the trip when someone at school

brought her an article all about poisonous snakes and how the most deadly and venomous ones lived in Fiji. This information lurked in her subconscious waiting only for her imagination to trigger it.

The first thing that happened to her when she got in the water was that she stepped into a nursery of baby octopuses. It seemed to be a large nest and they began crawling all over her shoes, ankles and legs. They were about 6" to 8" long, and although they didn't harm her, they certainly shook her up a bit.

However, Marian was brave and determined so she kept going. After this she kept a more wary eye out for sea creatures and couldn't help but think about the article and, of course, the snakes. Meanwhile, Bob was having fun looking at all of the pretty shells and was working his way out getting further and further from Marion.

The specter of poisonous fangs loom large in her mind when she saw a sea worm that's about a foot and a half long. In her rush to get away from the "snake" she stepped on a huge sea cucumber that squirted water all the way into her face! She screamed so loud that they could have heard her all over the island and it was the first time Bob saw her "walk on water!" She ran, and didn't stop, not even for the beach, and kept running all the way up to the bar!

It was here in Fiji that Bob saw blue starfish for the first time, describing them as "electric blue" and really beautiful. They were also allowed to visit an island that few outsiders were ever given the opportunity to see. You have to get special permission to go there, and even then the natives are shy. The beach had never been shelled before and was covered with cowries, bivalves and all sorts of mollusks. While there they didn't see any people but could hear dogs barking in the background. Marian was stiff the next day from being in the stooped collecting position so long!

On the occasion of this trip, Marian had bought a book titled "HOW TO GET LOST AND FOUND IN FIJI." Hint number one was: "You will bring back shells." Hint number two was: "You will put all of your stinky shells on top so that customs won't unpack your carefully packed treasures." The customs agents are supposed to open your box, get one whiff - phew, and close it back up again. According to Marian that was exactly what happened!

As you can well imagine they came back with wonderful memories, a lot of shells and a love of shelling. They have been serious collectors ever since and this has enhanced their trips to other islands. Another favorite vacation spot is St. Thomas where they often rent a

Japanese cottage as their home base while there. They then take day trips to other islands and work various beaches.

On one day trip, they went to a small British Virgin Island which had no accommodations and a windsock as an airport. They were deposited on the beach and were told that the pilot would return later that day to pick them up after they had a chance to explore and shell collect. The day passed and yet no sign of the pilot to retrieve them. Other planes came and went but not their plane.

Bob and Marian began to wonder what to do when their pilot finally arrived. He explained that the plane had broken down and that he wouldn't be able to do anything until the next day. Then he walked off leaving them standing with no place to stay and no place to go. Well, you can imagine how this went over. Marian, in a blaze of determination, dragged Bob to another plane and forced their way inside. They waited awhile, patiently, until the pilot of this plane got in, and then calmly explained to him that they were hijacking the plane! Something in Marian's tone of voice must have convinced him because he said, "You're not getting out are you?"

After several minutes of intense negotiation, the hijacking proceeded. The pilot finally flew them back to St. Thomas, but expressed his exasperation when he only slowed the plane down and unceremoniously dumped them out!

When they were still unfamiliar with the area of St. Thomas they had all sorts of things happen to them. Once when they were beach collecting, Marian was walking the "trashline", Bob was closer to the water. She didn't notice anything at the time, but a few hours later she had hundred of welts all over her legs. She counted over 250 bites on one leg! She had been bitten by sand flies and never felt anything. These almost microscopic flies come out early in the morning and late in the afternoon, and apparently the people there are all aware of their schedule because they would explain to Marian after seeing her bites that "you shouldn't go on the beach before 9:00 a.m. or after 4:00 p.m." When the temperature during the day gets warm enough they become sluggish and go back to where ever they stay till it cools off again. Marian tried 15 different pharmacies for remedies and finally ended up carrying a huge bottle of alcohol to relieve the stinging!

These are only a few of their many experiences shelling. Since then they have had many adventures. Bob and Marian have traveled to Hong Kong and mainland China, to Hawaii and back to the Caribbean. They have an extensive collection which is comprised of both dealer specimens and self collected trophys. Bob's favorite family is *Cypraea*, but they really love them all!

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HOLOCENE NONMARINE MOLLUSCS FROM THE LEVI ROCK SHELTER, TRAVIS CO., TEXAS

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Investigations of Holocene and Pleistocene faunas of Central Texas are rather limited and have been restricted to remains of vertebrates. Several molluscan paleofaunas have been obtained by the author from various archeological and paleontological settings in and around Austin, Texas, and the Hill Country to the west of that city. Herein is reported the paleomolluscan fauna from an archeological site in a rock shelter in western Travis County.

STUDY SITE

The Levi Rock Shelter (41TV49) is located in a limestone cliff which forms the left bank of Lick Creek in western Travis County. The site is located about two kilometers south of Texas Highway 71. Lick Creek is a tributary of the Pedernales River, but the lower portion of this creek is inundated by Lake Travis, a reservoir impounded by Mansfield Dam on the Colorado River.

Archeological investigations at the Levi Rock Shelter have revealed artifacts that have been attributed to the earliest known human cultures in central Texas (Alexander, 1963). However, the interpretation of the cultural significance of this site has been questioned by other workers. Nevertheless, the existence of skeletal remains of extinct Late Pleistocene/early Holocene vertebrates, e.g., dire wolf, provide evidence of the antiquity of some of the strata present in the Levi Rock Shelter.

The Levi Site was expected to produce a meaningful paleomolluscan fauna because of the age of the site, the setting in a protected environment, and previously published comments. Initial excavations at the site had revealed abundant snail and mussel shells (Alexander, 1963). The only species identified were *Rabdotus mooreanus* and *Lampsilis teres*. Many shell remains were charred and were believed to represent food sources for the aboriginal inhabitants of this site.

METHODS AND RESULTS

Modern Vegetation

The Levi Rock Shelter is located in the Balcones Fault Zone which forms the boundary between the Balconian and Texan

biotic provinces (Blair, 1950). However, the rivers and creeks of this area allow western extensions of species and communities which are characteristic of the Austroriparian Biotic Province of the southwestern United States including eastern Texas (Dice, 1943; Blair, 1950).

The modern vegetational communities of the Lick Creek area reflect this interesting blend of plant species of diverse biogeographical origins (surveyed on 26 October 1977). The creekbed itself supports isolated clumps of sawgrass (Cladium jamaicense) in the joints of the limestone bedrock. The bottom of the talus slope is vegetated with Texas persimmon (Diospyros texana), Texas oak (Quercus buckleyi), bald cypress (Taxodium distichum), mountain juniper (Juniperius ashei), deciduous yaupon (Ilex decidua), agarita (Berberis trifoliolata), Torrey yucca (Yucca torreyi), plateau live oak (Quercus fusiformis), and Texas wintergrass (Stipa leucotricha). The talus slope and canyon walls support growth of boneset (Eupatorium havanense), horehound (Marrubium vulgare), twisted-leaf yucca (Yucca rupicola), Texas sugarberry (Celtis laevigata), poison ivy (Rhus toxicodendron), silktassel (Garrya lindheimeri), American beautyberry (Callicarpa americana), little walnut (Juglans microcarpa), Arizona walnut (Juglans major), sycamore (Plantanus americanus), bushy bluestem (Andropogon glomeratus), cedar elm (Ulmus crassifolia), dwarf palmetto (Sabal minor), dewberry (Rubus trivialis), Mexican buckeye (Ungnadia speciosa), Virginia creeper (Parthenocissus quinquefolia), Mexican plum (Prunus mexicanus), rusty blackhaw (Viburnum rufidulum), switch grass (Panicum virgatum), Indian grass (Sorghastrum nutans), passionvine (Passiflora lutea), Texas ash (Fraxinus texensis), and beargrass (Nolina lindheimeri). The flat limestone upland is a harsh environment for plants and is dominated by beargrass, prickly pear (Opuntia lindheimeri), evergreen sumac (Rhus virens), Torrey yucca and mountain juniper.

Modern Molluscs

Initial surveys have revealed a very depauperate modern mollusc fauna. Freshwater snails include Physella virgata, Planorbella trivolvis, and Gryaulus parvus. No native bivalves were observed, although fingernail clams (Family Pisidiidae) may be found periodically in the isolated pools. The non-native Asiatic clam (Corbicula fluminea) is common in the downstream portion of Lick Creek that is inundated by Lake Travis. Soil samples were collected from areas of thicker alluvial soil with downed wood on 26 October 1977 to determine presence of terrestrial gastropods (see recovered species in Table 1).

Fossil Molluscs

Initial personal observations at the Levi Rock Shelter revealed sediments containing numerous shells of Rabdotus mooreanus. Individual shells were entire, missing the apex, or exhibited a hole in the body whorl. Most of the sediments in the rock shelter were moderately to heavily calcified. Calcium carbonate precipitate covered many of the R. mooreanus shells. Some shells were attached to the back wall of the shelter by the precipitate. In addition to the common R. mooreanus, a few shells of Polygyra texasiana were visible.

A series of soil samples (actually almost entirely calcium carbonate precipitate and fine clay material) was received from Herbert Alexander who was excavating the site during the fall of 1977. These soil samples were screened through a nested set of soil sieves (#8, #16, and #30). Molluscan material was recovered from eight of ten samples (see Table 1). Calcareous endocarps of Texas sugarberry (hackberry "seeds") were recovered from all levels except 7A, 8A and 10 (the first two of which contained no molluscan shell remains). Shells were noticeably covered with calcium carbonate precipitate in levels 8B, 14, and 15. None of the shell remains recovered from the current samples were charred.

Interestingly, a fossil Vallonia parvula was recovered from the modern soil sample. V. parvula lives no closer than the Eastern Caprock Escarpment today (Neck, 1984). Additional fossil records of V. parvula are known from Travis County (Neck, unpub. data).

DISCUSSION

Only limited provenience data were supplied to the author (see Table 2). Therefore, only generalized conclusions can be drawn from the data reported in Table 1. In general. the samples contained relatively few shell remains and represent very low diversity assemblages. The highest diversity assemblages are exhibited by the lower levels.

Entry route for most shells recovered from the Levi Rockshelter involves deposition as flood debris in slackwater from the Pedernales River and rising water within Lick Creek. Periodic major thunderstorms produce heavy runoff events, especially in restricted creek canyons. The rockshelter itself is a very poor habitat for land snails under present climatic regimes particularly considering the southerly exposure of the rock shelter. Certainly, Rabdotus mooreanus would not be expected in such an environment, and must involve either downslope movement (considered rather unlikely) or human transport (considered

likely, even probable, for the reasons discussed in the previous paragraph.

Interestingly, Rabdotus mooreanus was recovered from only two of the lower levels (12 and 15) except for a few nondiagnostic fragments which were found in level 5 (and are referable to R. mooreanus by size alone). Shells with missing apices may indicate use of the living snail as food, although essentially all Rabdotus spp. from archeological contexts observed by this author have been entire shells. Shells of Cerion spp. from archeological sites from the Caribbean are generally lacking apices, but the small aperture and greater number and more tightly coiled whorls of Cerion prevent the easy extraction of the animal without the apex being removed (Gould, 1971). Shells of Rabdotus spp. with a hole in the body whorl may represent shells which were strung on plant fibers as a necklace or bracelet (Martin, 1933; Mayhall, 1939; Scheutz, 1961). Certainly the long narrow leaves of beargrass would be suitable for stringing the snails together.

Presence of moderately diverse assemblages in level 12 and, especially, in level 15 indicates the likelihood of a climatic regime with much less moisture stress than the modern climate. This amelioration of moisture stress would directly reduce the moisture stress experienced by organisms living in the Lick Creek drainage. Such a climate would also allow development of more closed woody plant communities which would reduce direct solar insolation and would produce leaf litter and downed wood which further conserves available soil moisture.

Several snails recovered from the Levi Rockshelter do not presently live in western Travis County. Gastrocopta armifera occurs in the Great Plains and montane areas of the Rocky Mountains; Texas records of living G. armifera are restricted to the Eastern Caprock Escarpment, Texas Panhandle, and Guadalupe Mountains. Two species, Gastrocopta pentodon and Strobilops aenea, occur in mesic woodlands (generally in riparian habitats) in east central Texas but have not been reported from Travis County (Neck, 1976, ms.; Hubricht, 1985). The habitats required by these species contain more dependable soil moisture levels than presently occurs in western Travis County.

Polygyra texasiana (recovered from only level 15 from the Levi Rockshelter) is well-known from Travis County, but has a complex habitat occurrence along the Balcones Fault Zone. In eastern Travis County, P. texasiana is found in habitats over the entire range of elevation from Colorado River floodplains to upland prairie habitats that have sufficient cover in the form of rock or downed wood. However, in the western portion of this county, P. texasiana is found only in restricted mesic floodplain woodlands, of the Colorado River (essentially all inundated by several reservoirs) and

a few major creeks. No sign of modern *P. texasiana* was found in Lick Creek because of the xeric nature of soil accumulations in this drainage.

The habitat changes indicated by the change in land snail faunas through time at the Levi Rockshelter indicate increasing temperature and decreasing moisture regimes which have restricted woody plant cover and reduced soil moisture levels. No time scale is available for this climatic change, but the most likely time period recorded in this rockshelter is the Holocene (last 10,000 years).

Table 1. Molluscan shell remains recovered from the Levi Rockshelter (41TV49). All samples were taken from square E. Species with an asterisk (*) were recovered from modern soil sample and are living in the immediate vicinity of the Levi Site. Other living species recovered include *Euconulus trochulus*, *Polygyra mooreana*, *Biomphalaria havanensis* and an unidentifiable succineid.

	Sediment Layer										
Species	5	7A	7B	8A	8B	10	12	13	14	15	Total
*Helicina orbiculata**					X		X				2
*Pupoides albilabris**										X	1
*Gastrocopta pellucida**								X			1
*Gastrocopta procera**								X		X	2
Gastrocopta pentodon			X								1
Gastrocopta armifera										X	1
*Gastrocopta contracta**			X		X		X	X		X	5
Strobilops aenea										X	1
*Strobilops texasiana**			X		X		X	X			4
*Helicodiscus eigenmanni**					X	X	X	X	X	X	6
*Helicodiscus singleyanus**			X		X	X	X		X	X	6
Deroceras laeve									X	X	2
*Glyphyalinia umbilicata**					X		X		X	X	4
Hawaiia minuscula						X	X				2
Rabdotus mooreanus	X						X			X	3
Polygyra texasiana										X	1
Pisidium nitidum										X	1
Total species - 17	1	0	4	0	6	3	8	5	4	12	-

Table 2. Limited provenience data suppllied to author for samples summarized in Table 1. B.D. - below datum.

Square	Sample #	B.D.	Coordinates
E	5	24"	X3, Y1
E	7A	36"	X2, Y2
E	7B	36"	X4, Y3
E	8A	36"	X1, Y1
E	8B	36"	X4, Y2
E	10	50-54"	X1, Y3
E	12	-	X2, Y1
E	13	72"	X2, Y3
E	14	78"	X2, Y3
E	15	80"	X4, Y1-Y2

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MONOGRAPH

By H. Ode'

DISTRIBUTION AND RECORDS OF THE MARINE MOLLUSCA IN THE NORTHWEST GULF OF MEXICO

(A Continuing Monograph)

Superfamily TRIPHORACEA

Family TRIPHORIDAE Gray, 1847

Slender, both dextral and sinistral gastropods with spiral, often strongly beaded, sculpture. Many recent species display characteristic color patterns, such as bands or flecks.

Most remarkable about many species are the extra openings near the aperture. These are formed either by the closing of the posterior canal so that a hollow tube is formed on the partial closing of an anal notch, leaving a hole near the suture. In one species, (*Triphora*) the tube formed by the posterior canal is so long that continued growth of the shell will envelop it and let the non-resorbed part stick out of the growing shell. Usually *turristhomae* displays two of these abandoned canals. These extra holes may have inspired the name *Triphora* or "three holer" related to the Latin foramen = opening, although the spelling is really incorrect. Unfortunately, Triforidae also validly exists (Eocene fossil).

Recent work (Marshall, 1983) has placed the Triphoridae in a separate superfamily Triphoracea (Marshall prefers Triphoridae) which is only distantly related to the Cerithiopsiacea. Although the latter have an outer sculpture resembling that of the Triphoridae, the nucleus is quite different and there exist important anatomical differences. The genus *Metaxia* Monterosato, 1884, usually placed in the Cerithiopsidae, is on the basis of nucleus and anatomy triporid. Recent species are numerous around Australia. Marshall (1983) has divided them in many genera on the basis of nuclear and radular properties. It is apparent that those Atlantic species that live in the N.W. Gulf of Mexico are all closely related and have not evolved the generic variety of their Australian counterparts. Again there is excellent correspondence with the Pliocene fauna of Southern Florida, and there can be little doubt that very close analogues exist in the Panamic fauna.

In the following we will consider here the dextral genus *Metaxia*, and the sinistral genera *Triphora* and *Inella*. Most of the species of *Metaxia* and *Triphora* have planktotrophic (i.e. acutely spired) nuclei, while a few and the species *Inella* have lecithotrophic nuclei (large,

blunt and short spired nuclei, indicative of colder water). As sources I have used:

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Olsson and Harbison, 1953; Monogr. 8, Acad. Nat. Sci., Philadelphia.
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Warmke and Abbott, 1961; Caribbean Seashells, Livington Publ. Co., 346 pages.

Genus Metaxia Montersato, 1884

Slender, dextral shells with strongly ribbed nuclear sculpture with about 5 spirals. In the N.W. Gulf of Mexico live 4 recent species. Type by subsequent designation (Cossmann, 1906) Metaxia rugulosa (C.B. Adams, 1850).

273. Metaxia exilis (C. B. Adams, 1850)

This is a fairly common species off the Texas Louisiana coast, which was described by Dall (1889) as Cerithiopsis metaxae var. taeniolata from the Carolina coast. Our material resembles quite well the figure by Clench and Turner(1950), plt. 38, fig. 8. Comparing Adams' description of Cerithium exile with Dall's description (Page 256) of taeniolata it would appear that two different species were discussed. The reason for this is that exilis occurs in two color varieties: the majority are slender, white shells with a narrow brown band, deep suture, strong sculpture and brown nucleus (taeniolata Dall). The remainder are: brownish red, paler at the apex, whitish at the nodules just as described by C.B. Adams (exile). Quite characteristic is "the single narrow brown band appearing in the interspaces between the ribs just in front of the suture" and ". . . the four nuclear whorls are dark brown forming a styliform dark tip to the shell, with a sudden change to normal color at the junction" (taeniolata). Both color varieties ar invariably mixed. The nucleus is planktotrophic. Most of our material comes from the coral reefs and miocene shale domes such as Stetson Bank but is not limited to these. Rarely on sand and shelly bottoms.

Records HMNS Survey Collection: 19 lots of which 3 contain live collected material.
Depth range: 6-55 fms; alive.
Geographical range: Off North Carolina, 15-52 fms; Jamaica.
Maximum size: 6.2 mm.

274. Metaxia abrupta (Watson, 1880).

Although this species appears somewhat similar to M. exilis it is not closely related. Its nucleus is lecithotrophic, i.e. only two whorled, quite coarse and somewhat bulbous. Nevertheless it is a typical triphoric nucleus: two clearly visible spiral ridges on the last whorl, above which there is fine ribbing. This species is quite well figured by Dall (1889) (plt. 20, fig 5) showing rather decussate sculpture which is less beaded than in M. exilis. The suture is deep and channel like. This species is in sculptural detail perhaps closer to the type of the genus M. rugulosa than the other species in our area, but it has a more open and wider suture and is much more slender. It occurs mainly on the coral reefs, shale domes (Clay Pile) and shelly and muddy bottoms off the Texas-Louisiana coast. Also in the mudlump fauna.

HMNS Survey Collection: 15 lots of which three contain live collected material.
Depth range: 12-51 fms; alive 24-51 fms.
Geographical range: "Off North Carolina to the West Indies, 15 to 100 fms" (Abbott, 1974).
Maximum size: 6.3 mm.

275. Metaxia rugulosa (C.B. Adams, 1850)

This species is closely related to the two previously cited species, but is less slender and has a narrower suture than both. When fresh it has a beautiful color pattern: a coffee brown band on the sutural depression and a slightly whiter band formed by whitish beads around the periphery of the whorl against a slightly cream background. Its nucleus is as in exilis: about three to four finely ribbed, very slender whorls of slightly darker color than in the following teleoconch. Only when dead do the shells become snow white. Sculpture in this species is formed by very wavy spirals because the beads are linked by eccentric connections. Found south of Freeport on Pleistocene beach ridges in 8 fms and on Miocene shale domes: Stetson Bank and Three Hickey Rock south of Cameron, La.

Records HMNS Survey Collection: 9 lots one of which contains live collected material.

Depth range: 8-30 fms; alive on Stetson Bank at ± 25 fms.
Geographical range: "Caribbean, Gulf of Mexico, 20-70 fms, common. Bermuda (syn. bermudensis Verrill and Bush, 1900)" (Abbott, 1974).
Maximum size: 6.1 mm.

276. Metaxia sp. indet. A

A single lot of a deep water species was obtained in 55 fms off Louisiana. This is a quite slender straight conical shell with a rather squarish excavated suture and a somewhat blunt four-whorled planktotrophic nucleus. The sculpture of the teleoconch is formed by three beaded spirals, the middle one of which is largest. The teleoconch starts with two spiral rows of beads, and a third row is slowly inserted just below the suture over the first 3 - 5 whorls. The nucleus is probably darker than the teleoconch (our material is bleached). The first whorl of the nucleus is domeshaped, the second one shows some ribbing, the third one is finely ribbed and shows the onset of two spirals, and the fourth whorl shows two spirals with above it the characteristic ribbing of Metaxia. This species differs from the other three in that the suture is square but shallow and the whorls are not inflated.

Records HMNS Survey Collection: 1 lot, no live material.
Depth range: 55 fms, off Cameron, La.
Geographical range: Unknown.
Maximum size: 4.3 mm.

277. Metaxia sp. indet. B

There is still another species in the N.W. Gulf of Mexico of which we, unfortunately, possess only two lots each of a single specimen. It is very clearly related to M. exilis but its coloration is completely different. Since I assume that the coloration in these species is specific (which is unproven and probably not so) I report this specimen as a different species. Its nucleus is white, but the teleoconch coffee brown and its excavated suture darker brown. Structurally it is very much as in exilis, perhaps not as slender. More material is required to settle its exact identity, but it suspiciously resembles M. diadema Bartsch of the Panamic Province.

Records HMNS Survey Collection: 2 lots, each of a single somewhat defective but quite fresh shell.
Geographic range: Unknown.
Maximum size: 3.1 mm (incomplete).

Genus Triphora Blainville, 1828

Marshall (1983) has split this genus in about 30 different "genera." Because almost all N.W. Gulf of Mexico material belongs to a single group we will use only two subgeneric designations. Olsson and Harbison (1953) defined the subgenus Cosmotriphora with type melanura. This species displays the same nuclear characters as most other N.W. Gulf of Mexico species. An identical nucleus is also present in the subgenus Nototriphora Marshall, 1983 but there are slight differences in radula. Thus several of the following species could be Nototriphora, but for simplicity I have them all grouped as Cosmotriphora. A more detailed study than I am at present able to make is necessary to decide what subgenus to use.

Two species are placed here in the subgenus Monophorus Grillo, 1877, which was defined for the European perversus. It is unfortunate that both Monophorus and Cosmotriphora have practically identical nuclei and that their differences can hardly be seen with a conventional microscope and can only be observed in electron micrographs taken from well preserved material (differences in granulations of the upper dome of the nucleus. There are also radular differences). Perhaps a significant difference is that in size. Nototriphora and Cosmotriphora do not exceed 8-9 mm but Monophorus can reach twice that size.

It must be stated here that poor quality material, even slightly worn and bleached shells, is often extraordinarily difficult to identify. A clear view of the nucleus is necessary and for reliable visual observation electron micrographs are invaluable. Very little is known about possible color variations. Usually it is assumed that the striking color patterns of Triphora are specific, but I doubt that this is always true.

Most striking is the occurrence of several Pliocene forms from Southern Florida in the present Texas fauna. This is also observed for the Family Cerithiopsidae. Apparently this Pliocene fauna, which has close ties with the Panamic fauna, described by Keen (1971), has persisted in the N.W. Gulf of Mexico where it is undoubtedly somewhat shielded from the Caribbean fauna which is essentially South American by the sediment-laden plume of the Mississippi River which arcs to the southwest.

Both the Cerithiopsidae and the Triphoridae furnish another argument for my thesis that the Texas-Western Louisiana fauna and the Carolinian fauna (off the Carolinas) are old faunas with abundant ties with the Panamic fauna. After the formation of the Isthmus of Panama the intrusion of the tropical Caribbean fauna around Florida separated the Carolinian fauna from the Texas

fauna. The latter has retained many of its Panamic relationships. Hence, it is no surprise that much of the material from the N.W. Gulf of Mexico in this family looks suspiciously like the species described from the Panamic faunal province.

278. Triphora (Cosmotriphora) melanura (C.B. Adams, 1850)

This is a widely distributed species throughout the calcareous environment over the Texas-Louisiana shelf area. Also found on the Miocene-shale uplifts (Stetson Bank and Three Hickey Rock). Most specimens are straight sided conical shells of snow white color with a very contrasting nucleus, hence the name. Some, however, are elongate-oval in shape. Our material is overall slightly more slender than the photographs in Abbott (1974) indicate. In some specimens a deep anal notch develops. The hollow tube of the posterior canal slowly fills up completely, and along it a new groove is constructed. The closing of the anal notch in senile specimens creates an almost perfectly circular aperture. The planktotrophic nucleus is typical and well figured by Olsson and Harbisson (1953) and Marshall (1983). The two spirals on the nucleus in melanura are wider apart than in any other Cosmotriphora I have seen and the ribbing is coarser.

Records HMNS Survey Collection: 14 lots, of which two contain live collected material.
Depth range: 10-40 fms; alive 10-15 fms.
Geographical range: "North Carolina to both sides of Florida and Brazil" (Abbott, 1974).
Maximum size: 8.5 mm.

279. Triphora (Cosmotriphora) turristhomae (Holton, 1802)

Dall placed (1889) this species under a section headed "apical nucleus swollen, mammillary." This makes it clear that he discussed some other species than what is now considered turristhomae, which has the same type of planktotrophic nucleus as melanura: about 3-5 whorls with two spirals and a multitude of small radical riblets. T. mirabilis (C.B. Adams, 1850) is the same.

Its color pattern is striking: a continuous dark brown band narrower than the width of the beads encircles the whorl over the lower spiral beads. In some rare cases this band becomes broken into a line of dashes. The internal column within the shell is always dark brown.

In several respects turristhomae differs from other species in the N.W. Gulf of Mexico. In the first

place there are the extremely well developed extra holes and in the second place the aperture of mature specimens is an almost perfect circular tube. There is no indication of an anal notch. The whorls are more inflated than in most other triphorids.

The species is widely distributed in all calcareous environments both offshore Texas and Louisiana and on the Miocene shale uplifts (Stetson Banks, etc.).

Records HMNS Survey Collection: 15 lots of which 3 contain live collected material.
Depth range: 10-55 fms; alive 13-24 fms.
Geographical range: "North Carolina to Brazil; Bermuda" (Abbott, 1974).
Maximum size: 6.8 mm.

280. Triphora (Cosmotriphora) decorata (C.B. Adams, 1850)

A quite common species in the calcareous environment over the shelf area. Rarely on the Miocene shale uplifts such as Stetson Bank. It can be immediately recognized by the pattern of small reddish brown flecks on a background of very light brown or white. As in almost all species there are three rows of beads on the later whorls in mature specimens. The first whorl of the teleoconch ususally has only two rows, and one is slowly inverted when the upper one splits into two. Our material never reaches the large size quoted by Abbott (1974).

Records HMNS Survey Collection: 12 lots of which one contains live collected material (Flower Gardens).
Depth range: 13-55 fms; alive: 24 fms.
Geographical range: "Southeast Florida, the West Indies to Brazil and Bermuda" (Abbott, 1974).
Maximum size: 6.1 mm.

281. Triphora (Cosmotriphora) ornata (Deshayes, 1832)

A number of irregularly colored, coarsely beaded specimens I have brought together under this label. Most of the material corresponds fairly well with an illustration in Warmke and Abbott (1961). On those whorls having two rows of beads the upper one has a sequence of some white and some brown beads. The second row is entirely white. Abbott (1974) states that its beads are more numerous and smaller than those of decorata, but this is contrary to my observations. In my opinion, this species is not close to decorata. It has been found on the coral reefs and Stetson and Clay Pile Bank.

Records HMNS Survey Collection: 8 lots, one containing fresh material.

Depth range: 10-36 fms.
Geographical range: "Southeast Florida, the West Indies to Brazil and Bermuda" (Abbott, 1974).
Maximum size: no complete specimen of large size available.

282. Triphora (Cosmotriphora) pulchella (C.B. Adams, 1850)

This species and the next two are very closely related; in fact so close that they could be taken as color varieties of the same species. They differ considerably in color patterns but not in structure which is very much the same for all of these: pulchella has a very delicate color pattern of 3 spiral color bands 1) an upper one dark reddish brown 2) a middle one light brown, and 3) a white one below. The first whorls of the teleoconch are whitish. However, in some specimens the color is dark brown overall but banding can still be seen. Most interesting is the occurrence of specimens whith a hole at the suture formed by partial closing of the anal notch and the development of an extra tube for the siphon. T. sp. indet. A has a dark nucleus followed by at least 3 snow white whorls of the teleoconch, abruptly changing to uniform reddish brown whorls. This produces a very striking shell. Finally Triphora hemphilli Bartsch described from the Panamic Province and also described as Triphora bolax Olsson and Harbison from the Pliocene of Florida is colored a uniform brown and perhaps somewhat slenderer than T. sp. indet. A. All three species have in common that the first and third spiral row are heavily developed but the middle spiral is a mere thread over many whorls. But even on the body whorl it is rather weakly formed. The nucleus is as in other species and the suture is well indented.

T. pulchella is mainly restricted to the calcareous environment and the shale domes off the Texas-Louisiana coast and deeper water off Louisiana.

Records HMNS Survey Collection: 15 lots, of which one contains live collected material.
Depth range: 24-55 fms; alive: ±30 fms on Stetson Bank.
Geographical range: South Florida and the West Indies to Brazil (Abbott, 1974).
Maximum size: 6.7 mm.

283. Triphora sp. indet. A

This is perhaps a somewhat fatter species than T. pulchella, but is clearly related. In the Tex. Conchol. Vol. 9 (1973), p. 63, it was reported as T. sp. indet. D. This must be a well established species because in the survey collection are no less

than 10 lots of this striking species. Its shape is somewhat oval-elongate, (bottle shaped), where the nucleus (dark) is the cork, the neck of the bottle is snow white and the main part is uniform brown.

Sp. indet. A is most abundant on the coral reefs (Flower Gardens and off Louisiana) but has also established on the Pleistocene rockridges off Freeport. As in Cerithiopsis this species often shows a repaired aperture. Apparently the outer lip, after being broken and removed can, if the damage to the mantle is not serious, be replaced with some structureless shell material of matching color.

Records HMNS Survey Collection: 10 lots, of which 2 contain live collected material.
Depth range: 8-55 fms; alive: 15-24 fms.
Geographical range: Unknown.
Maximum size: 5.0 mm.

284. Triphora hemphilli Bartsch, 1907

This Panamic species was described from Baja California and in my opinion is the same as T. bolax Olsson and Harbison, 1953 described from the Pliocene of Florida. This circumstance is by no means rare because there are more Panamic species also known from the Florida Pliocene. It conforms in structure exactly with the two previous ones: a thin spiral between two strongly beaded ones. Its color is uniformly brown, no banding or initial white whorls on the teleoconch.

It is a fairly common species along the Texas coast, where it has been taken on Pleistocene beach ridges south of Freeport, shelly bottoms offshore Galveston, Stetson Bank and offshore coral reefs.

Records HMNS Survey Collection: 18 lots, some fresh material.
Depth range: 7-55 fms.
Geographical range: Baja California (T. hemphilli); Pliocene of Florida (T. bolax).
Maximum size: 5.7 mm.

285. Triphora (Cosmotriphora) sp. indet. B

This species is only remotely related to the three previous species. The color pattern is more orders the inverse of that of pulchella: a white row of beads above a spiral of brown beads on a brown background. The beads are considerably coarser than those of pulchella and all the whorls except the last carry only two rows of beads. A thin row, the middle one, can be see as an extremely thin thread between

the two other ones. This species also appears to be unnamed. Once taken in 6 fms. at the end of the Galveston jetty, but most of our material comes from the offshore coral reefs and Stetson Bank. Also in the mudlump fauna.

It is possible that our material contains two rather similar species, one straight sided conical with large beads and less intense coloration, and the other a more "bottle" shaped one with darker color. There is not enough good quality material to settle this problem.

Records HMNS Survey Collection: 10 lots, no live material.
Depth range: 6-40 fms.
Geographical range: Unknown.
Maximum size: 4.0 mm.

286. Triphora (Cosmotriphora ?) sp. indet. D

A number of lots, all from the coral reefs and shale domes I have set aside without name. This species resembles very closely the figure of Triphora (Cosmotriphora) dupliniana in Olsson and Harbison's treatise. It is probably closely related to that species, but I need to see authentic material for a comparison. Its color is uniformly light to somewhat darker brown.

T. dupliniana Olsson was described from the Miocene of the Eastern United States. It is perhaps possible that a species can persist that long. Also there are some very similar forms in the Panamic Province.

All our material comes from the offshore coral and algal reefs offshore Texas and Louisiana except for one lot from a shale dome (Stetson Bank).

Records HMNS Survey Collection: 11 lots of which 2 contain live collected material.
Depth range: 13-40 fms; alive: 15-36 fms.
Geographical range: Miocene and Pliocene of Eastern U.S.A.
Maximum size: 4.7 mm.

287. Triphora (Cosmotriphora) sp. indet. E

This possibly is only a color variety of sp. indet. A. It is entirely brown (no white neck) except for the upper row of beads which is white or almost white. There are not many other differences to mention. We have only three lots of this "species" in our collection. Obtained from coral reef off Texas and deep water off Louisiana. Also in the mudlump fauna.

Records HMNS Survey Collection: 3 lots, no live material.
Depth range: 36-55 fms.
Geographical range: Unknown.
Maximum size: 3.6 mm.

288. Triphora (Cosmotriphora) lilacina Dall, 1889

I have identified some material as T. lilacina Dall on the basis of the figure of this species given by Vokes and Vokes, 1983, pl. 27, fig. 13. Our material looks exactly the same, especially the very much smaller middle spiral in this species is quite characteristic. I believe that the Eastern Pacific T. panamensis Bartsch, 1907, from Panama Bay is the same. Our material has been collected on Miocene shale domes (Stetson Bank and Clay Pile).

Records HMNS Survey Collection: 2 lots, none alive.
Depth range: 15-17 fms.
Geographical range: "Florida Keys, 6 fms, West Florida, 30 to 100 fms." (Abbott, 1974).
Maximum size: 4.8 mm.

289. Triphora (Monophorus) nigrocincta (C.B. Adams,1839)?

I have added a question mark to this identification, because in spite of the fact that this is in the literature the most widespread species along the Atlantic cost of the U.S.A., and has been widely quoted for the Texas fauna, its identification in Texas remains for several reasons highly problematical. These reasons are: 1)size, 2) lack of characters of Monophorus; 3)structural details.

Perry and Schwengel, 1955, followed by Andrews, 1971, quote for this species a size of 11, resp. 10 mm, but Abbott (1974) gives 1/8 to 1/4 inch which practically is only half that size. In the material I have labeled "nigrocincta" the largest specimen would, if complete, be about 7 mm in length. Almost all other material is below 5 mm. Its color justifies in no way the name, but is an even brown without banding, varying between yellowish brown to darker reddish brown. Only a single specimen from beachdrift on St. Joseph Island shows a dark colored copper spiral. Offshore another species of Monophorus occurs, which reaches the enormous size of 16 mm, which is dark brown with even darker banding, almost black at the suture.

Very few specimens of my material resemble even distantly the figure of nigrocincta in Abbott (1974) but most conform rather well with the figure and description of T. pedroana Bartsch, 1907. The

nucleus of my material is overall rather small, smaller than of most other species in Cosmotriphora; the radial ribbing appears to be somewhat finer, but in general aspects there is hardly any significant difference. Marshall (1983) places the European perversus, closely related to our nigrocincta, in Monophorus Grillo, 1897, which, unfortunately, has an almost identical nucleus as Cosmotriphora and can only be separated from it by equipment I have no access to. I suspect that the Texas "nigrocincta" belongs to the subgenus Cosmotriphora and is more closely related to the Pacific pedroanus Bartsch than the New England nigrocincta.

This species has been collected both in the bays and along the coast in shallow water. Until I prepared this report I was not aware that the survey collection lacked live collected bay material; there is dead material, but apparently in spite of the several hundred bay samples taken no live shells were dredged. Rather fresh material has been collected along the causeway to South Padre Island and some was taken on the beach. The species lives off Freeport on the Pleistocene beach ridges. It was also collected among the fossil material of Cerithiopsis along the old Aransas Pass Causeway; this material appears to be the same as more recent material.

Records HMNS Survey Collection: 30 lots, no live material but some fresh.
Depth range: 0-27 fms; one lot from 55 fms (displaced) off Louisiana.
Geographical range: "Massachusetts to Florida, Texas to Brazil; Bermuda." (Abbott, 1974).
Maximum size: ±7 mm (extrapolated from fragmentary shell), but usually under 5 mm.

290. Triphora (Monophorus) sp. indet. C

Among the offshore material are three, each of a single specimen of a truely gigantic Triphora. Unfortunately in each specimen the nucleus is missing, but in two specimens the original color is preserved. This is a very dark coffee brown especially near the sutures and slightly lighter on the whorls. The sculpture is rather decussate, the beads are rather subdued and widely spaced so that they appear as knobs on the corners of small rectangles. Although Marshall (1983) states that no microsculpture exists in Monophorus, the largest and freshest specimen shows under high magnification a faint sculpture of very fine pustules. The size is surprising. The largest specimen is, although incomplete (nucleus removed and outer lip of aperture broken), no less than 15.2 mm in length. If

complete, I believe the specimen might have measured over 16 mm. Another more seriously defective specimen is over 13.5 mm and a smaller fragment comes from the Flower Garden reef. The shape of these specimens is that of a perfectly straightsided cone.

Records HMNS Survey Collection: 3 lots, no live material.
Depth range: 24-30 fms.
Geographical range: Unknown.
Maximum size: 15.2 mm; if complete over 16 mm.

Genus *Inella* Bayle, 1879

Slender, straight conical shells, mostly with lecithotrophic nucleus. Spiral sculpture strong, axial sculpture suppressed. Marshall (1983) states that in most species the teleoconch starts with three spiral rows. However, in the two species present in the survey collection the teleoconch begins with only two spirals. Our species are also somewhat different from Marshall's diagnosis of the genus in that the second spiral is inserted later than spirals one and three. Nevertheless, the habitus of these shells is so different from the other triphorids of the area that I have no doubt that they belong in *Inella*.

291. *Inella* c.f. *samanae* Dall, 1889

Two lots of a small flecked *Inella* are present, one having exactly the coloration of *Triphora decorata*: irregularly placed brown spots on a whitish cream background. The nucleus is lecithotrophic and there is a deep anal notch. As in many species in the family the early teleoconch has only two spirals, and a third is inserted gradually on the later whorls so that there are three spirals on the body whorl. Both lots were taken in coral rubble off the Louisiana coast.

Records HMNS Survey Collection: 2 lots, no live material.
Depth range: 36-50 fms.
Geographical range: Reported by Dall (1889) from Samana Bay, Santo Domingo, from dredgings at 16 fms.
Maximum size: 5.6 mm (incomplete).

292. *Inella sp. indet. A*

A thinner, longer and more heavily beaded *Inella* is present in the collection. This may reach a considerable size, but we have no perfect material in our collection. The longest specimens would have, if complete, well over twenty whorls and to judge from several fragmental parts, large specimens should reach over 15 mm. Our longest fragment is only 11.6 mm in length and has about 15 whorls. For the time

being we leave this material unidentified. Early whorls have only two spirals; on later whorls the lowest spiral becomes the most developed one and below it is a well excavated rather deep suture. Most material has been taken off the Louisiana coast in deep water. Also in the mudlump fauna and on Stetson Bank.

Records HMNS Survey Collection: 7 lots no live material.
Depth range: 40-63 fms.
Geographical range: Unknown.
Maximum size: 11.6 mm (incomplete).

(To be continued)

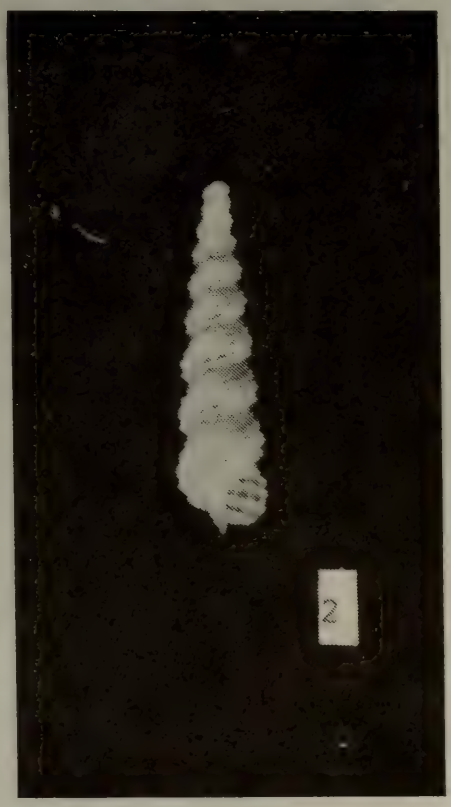

Fig. 1. *Metaxia exilis*, 6.1 mm, collected by divers on the USS Haynsworth DD 700, at East Flower Gardens Coral Reef, 103 miles SE of Galveston, Texas, Oct. 6, 1967

Fig. 2. *Metaxia abrupta*, 3.8 mm, dredged by GUS III, Bureau of Commercial Fisheries, in 24 fms, 55 miles SE of Freeport, Texas, Dec. 7, 1966.

Fig. 3. Triphora (Cosmotriphora) melanura, 4.6 mm, collected by divers on the USS Haynsworth DD 700, at East Flower Gardens Coral Reef, 103 miles SE of Galveston, Texas, October 6, 1967.

Fig. 4. Triphora (Cosmotriphora) turristhomae, 6.20 mm, collected by divers on the USS Haynsworth DD 700, at East Flower Gardens Coral Reef, 13-16 fms, 103 miles SE of Galveston, Texas, Oct. 8, 1967.

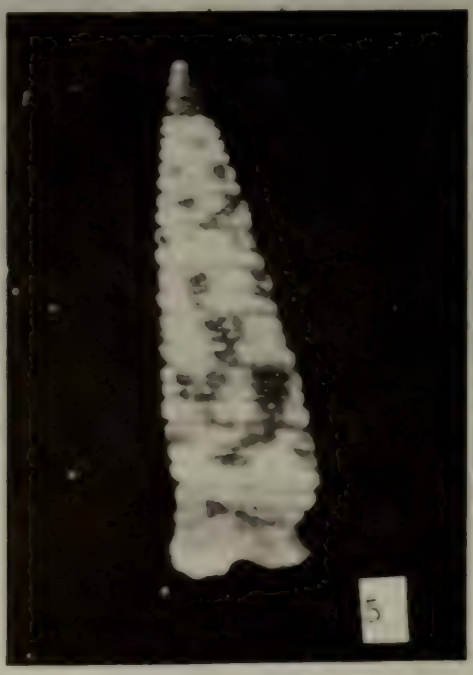

Fig. 5. Triphora (Cosmotriphora) decorata, 4.7 mm, collected by divers paarticipating in the research trip on the USS Haynsworth DD 700, at the 24 fm lump, 113 mi SE of Galveston, Texas, Oct. 7, 1967.

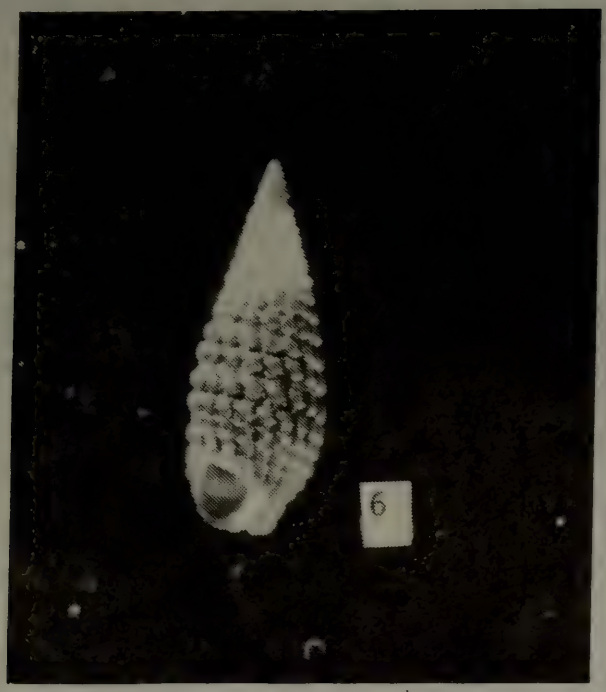

Fig. 6. Triphora sp. indet. A, 4.30 mm, collected by divers participating in the research trip on the USS Haynsworth DD 700 at the East Flower Gardens Coral Reef, 103 miles SE of Galveston, Texas, Oct. 6, 1967.

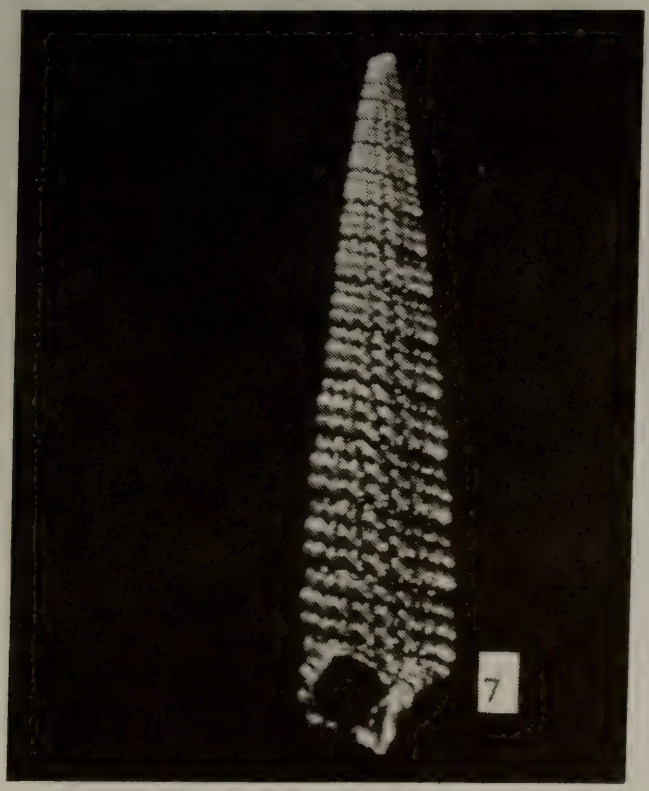

Fig. 7. Triphora (Monophorus) sp. indet. C, 15 mm, dredged by T.E. Pulley and Paul McGee at Stetson Bank, 74 miles SSE of Galveston, Texas in 39-40 fms, 1965.

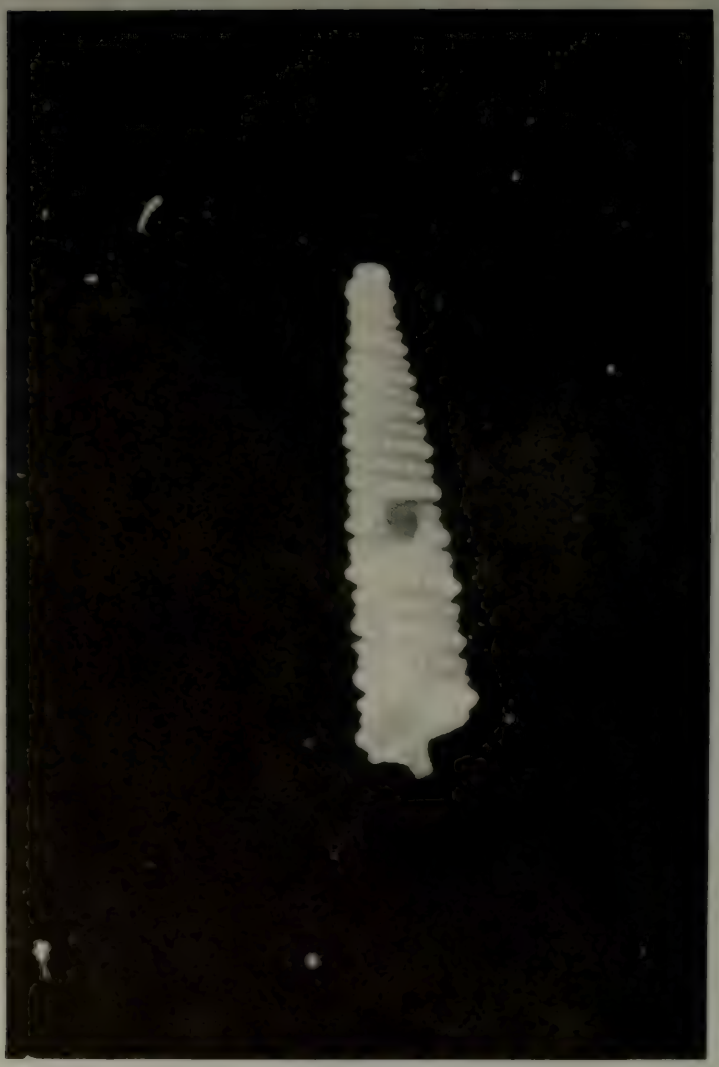

Fig. 8. *Inella* c.f. *samanae*, 4.65 mm, dredged by T.E. Pulley and Paul McGee at Stetson Bank, 74 miles SSE of Galveston, Texas, in 30-40 fms, 1963.

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