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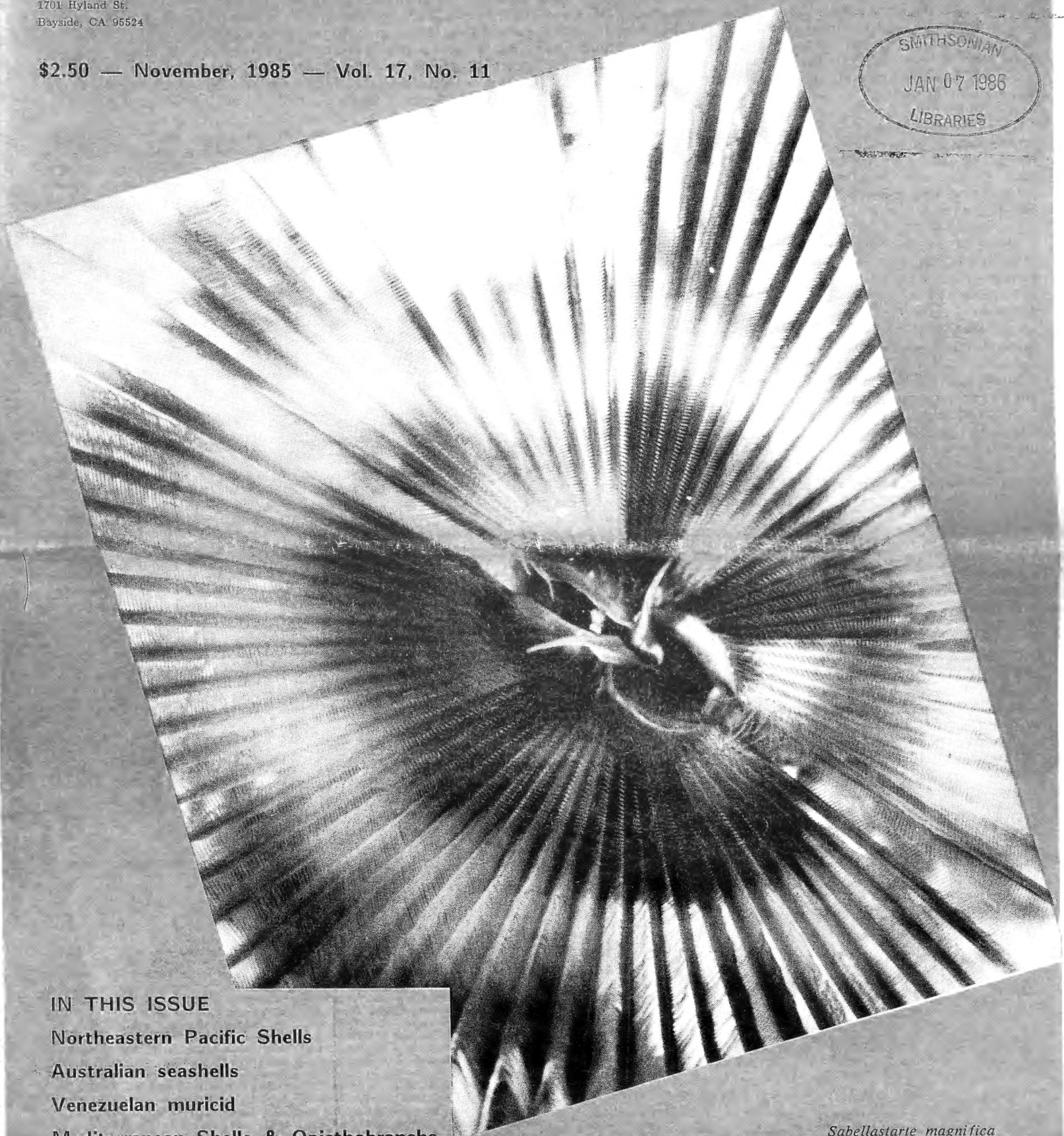
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IN THIS ISSUE

Northeastern Pacific Shells

Australian seashells

Venezuelan muricid

Mediterranean Shells & Opisthobranchs

and more!

Sabellastarte magnifica
Cozumel, Mexico, 10 meter depth.
Photo by Ron Shimek

EDITOR'S NOTES

Here is the November issue. We hope to continue with a minimum of 24 pages each month and eventually to be able to add more along with some color. December is coming along well and should follow this issue within two weeks. We had hoped to have this issue out earlier but the large number of subscriptions and book orders kept me very busy. Thank you for your patience while Sally was in England. Now that she has returned we hope to stay caught up.

This issue should have something for everyone: turrids, muricids, micro-shells, opisthobranchs, meeting notices, show photos and more. We have a lot more coming for December and January but need to get more articles from more people as well as show information, photos and personal notes. YOU know where you are going — share it with us!

My goal has always been to provide communications and information for everyone interested in mollusks and associated marine life. This newspaper format allows us to continue publishing and ultimately achieve that goal. Each month more people are hearing about us and writing or calling. Each month we reach over a thousand NEW people in addition to the basic subscribership which is growing daily.

Shells and Sea Life is designed to provide all of the information you want and need on a monthly basis. Advertisers are an important part of this service and also help keep subscription rates down to reasonable levels. We encourage advertising that will directly help you with your enjoyment of shells: travel to collect and study; microfilm to help you obtain books and research material otherwise unavailable; shells and fossils for your research collection; books to help you understand the animals and shells; craft materials for your hobby; and all of the tools and other equipment used to enjoy your studies. Support the advertisers; they are a tremendous resource!

Please send all of the field notes and comments you can. Anyone can help and further the study of shells. If you have a photo you can't identify — send it with all the information you can. If you have an observation on shells — send it. We have people with the answers who will be happy to give them for everyone's use. Collection reports are also very useful. Keys to differentiate species or groups are welcome.

We also want to cover all new molluscan species with information on where they were published and a short synopsis of the information presented (and a photograph, if possible). In fact, please send bibliographical information and a synopsis of the material covered for all molluscan articles along with any corrections or additions.

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We encourage your comments to improve Shells and Sea Life. Your positive comments can help make us better. Keep in mind the format limitations. The page size and paper quality cannot be changed without radically increasing the production costs. Even something as "simple" as trimming and stapling the issues would increase the costs by about 25% with no comparable increase in usability. A change in paper would increase costs about 40% but will be probable with a significant increase in the number of subscribers. Keep in mind that even such a simple change will add about a week's delay in the production of each issue since the printing press must be changed over for the new paper and then returned to the original stock. In addition, the mailing weight (and cost) increases significantly.

We welcome book reviews. If you come across a book on seashells that you have not seen reviewed in Shells and Sea Life, please photocopy the title page and send it along to us with any additional information. We will try to obtain copies and review it for our readers. This is especially true for non-U.S. publications, many of which we will never hear of without your help. We are doing our best to make EVERY publication on mollusks available to our readers.

We are already the world's largest supplier of shell publications. Our goal is to be a single, complete source. We apologize for the minimum charge of \$3 per item (necessary to cover the cost of listing, locating and billing the individual items). Those who have institutional services and unlimited free photocopying available will have little use for the services anyway but should appreciate knowing that the article exists.

We hope to see many of you here in Bayside, California. We have a small spare bedroom with two single beds. We also have a concrete pad next to the garage for any size trailer or motor-home with 220 vac and 110 vac power available as well as a gray-water drain. If camping is your preference, there is ample "wild" area with trees and blackberries to set up three or four tents.

We are situated 275 miles north of San Francisco, California, on Highway 101, between Eureka, California, and Arcata, California. It is only another 100 miles to the southern border of Oregon. Humboldt State University is about one mile north and the California Redwoods are both north and south of us in easy driving distance. Call or write if you plan to be on the coast — we would love to see you.

Steve Long

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Cold-water Conus: some aspects of the natural history of the turrids of the Pacific Northwest

Ronald L. Shimek P.O. Box 42014, Tucson, AZ 85733

The prosobranch family Turridae, the largest family of marine snails, is one of the largest families of marine organisms, with over 1500 genera, and several thousand described species. Indeed, in some coastal areas, the number of reported turrid species may exceed the number of species reported for all other groups of snails combined. Nonetheless, the average shell collector, biologist, or casual naturalist seldom sees or recognizes one of these animals.

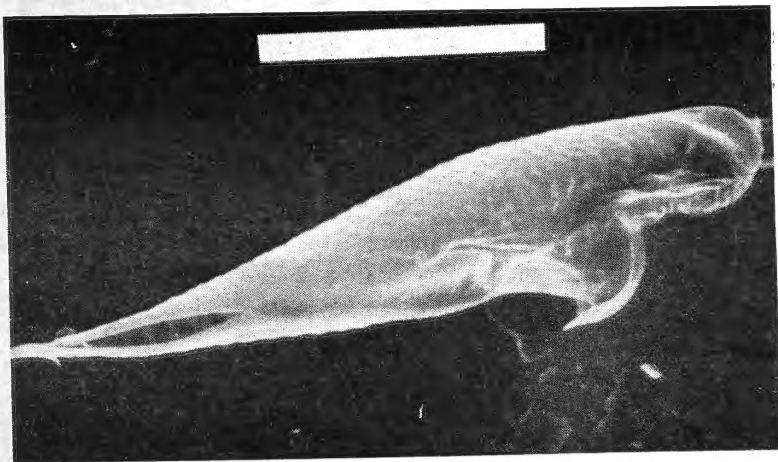
As a consequence, relatively little is known of the natural history or ecology of this most successful group of snails.

One can ask any number of questions concerning these animals, but probably the first question to be addressed is: "What are turrid gastropods, and why are they so poorly known?"

The systematic placement of the turrids follows:

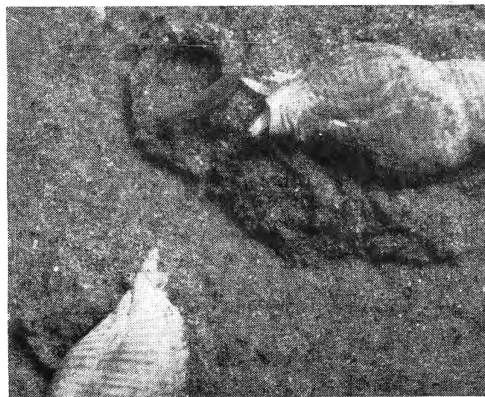
CLASS GASTROPODA
SUBCLASS PROSOBRANCHIA
ORDER MONOTOCARDIA
SUPERFAMILY CONACEA
FAMILY TURRIDAE
FAMILY CONIDAE
FAMILY TEREBRIDAE

The Conacea is a natural grouping, and thus the turrids are most closely related to the cones and terebrids. In fact, based on the evidence of radular morphology, both of these groups undoubtedly evolved from the turrids (Powell, 1942, 1964, 1966, 1969; Shimek & Kohn, 1981). All of these families share common primitive characters in the presence of a sophisticated venom apparatus. Most species also have a highly modified radula used to deliver a toxin rather than to rasp or bore their prey (Shimek & Kohn, 1981).



Radular tooth of *Oenopota tabulata* (Carpenter, 1864). Scale bar = 50 μ m. Note: Small barb at tip, and the "pebbled" surface.

Although the internal anatomies of these three families are quite similar, the external shells differ substantially. The two smaller families are generally recognizable; one can almost always easily recognize a cone shell or terebrid. The turrids, on the other hand, are exceedingly varied in shape and size, and there is only one, supposedly, consistent shell character in the family. This character is the presence of a secondary, or anal, notch at the posterior end of the aperture. Unfortunately, this notch is obscure, variable, or lacking in many of the common temperate or boreal species. The lack of a consistently recognizable, easily differentiated shell makes



Two *Ophiodermella inermis* near their prey, the polychaete, *Owenia fusiformis*. The upper individual has extended its proboscis and is in the process of "stinging" the worm with its venom-laden radular tooth, which is held in the tip of the proboscis.

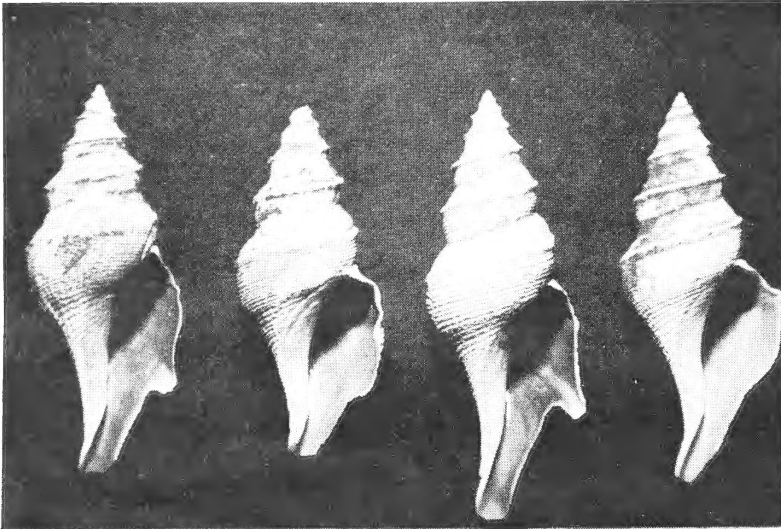
many of the common northern turrids difficult to identify as to family, let alone more precisely. Furthermore, while many of the tropical turrids are large or brightly colored, the temperate forms are generally small and white. Finally, virtually all northern species are only found subtidally. Thus, while many of our northern turrids are common, and possibly ecologically quite important, they tend to be overlooked because they are small, subtidal and relatively drab.

The same diversity of these northern turrids that makes them difficult to work with also makes them attractive to study, as they can be used to address questions of resource partitioning and speciation. Most of the well-studied marine examples of very diverse taxa are of tropical organisms, for example, *Conus* (Kohn, 1959, 1967, 1968; Kohn & Nybakken, 1975; Leviten, 1978). In fact, so much work has been done with tropical diversity that many biologists have considered that diverse marine genera are exclusively tropical in origin. This consideration is patently false, and one of the best examples of boreal diversity is the Turridae.

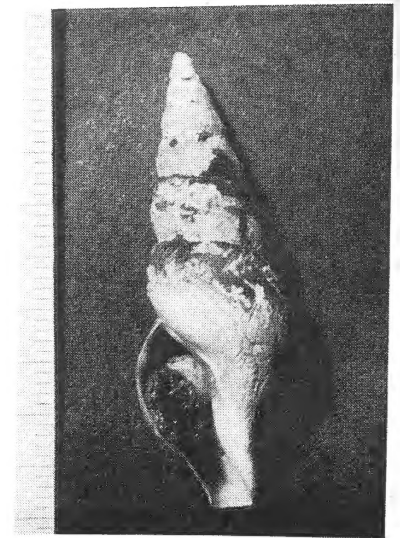
Most of the shallow-water turrids in the Northeastern Pacific belong to the subfamily Mangelinae, which is characterized by the most highly modified types of toxoglossan radulae (McLean, 1971; Shimek & Kohn, 1981). This grade of radular structure is functionally, and morphologically, similar to that found in the well-studied *Conus*, and except for some simplifications due to the small size of the turrids, all of the highly modified structures seen in the *Conus* radula can be found in these turrids, particularly in the genus *Oenopota*.

Oenopota is a very diverse genus, with well over 100 species described, most of which may be valid. In general, these are animals found in cold environments, either in the temperate or boreal regions, or in very deep waters. They are generally small, the average length is often less than a centimeter, with white shells, and a milky white body. The shells of most species, while relatively drab in color, are often delightfully and intricately sculptured, although a microscope is generally necessary to appreciate it.

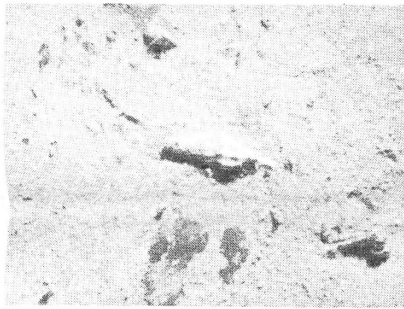
REPRESENTATIVE NORTHEASTERN PACIFIC TURRIDS



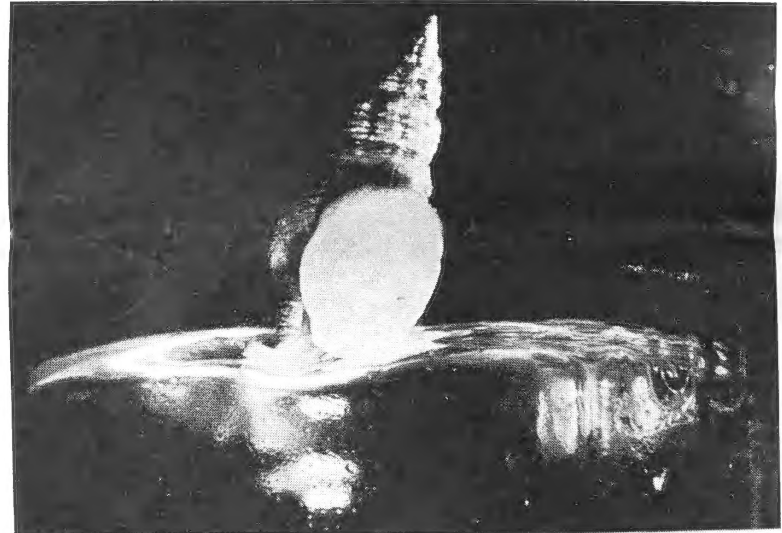
Aforia circinata (Dall, 1873) Four individuals, from left to right (with the slide oriented so the apices are up). Male, Female, Female, Female. Note sexual dimorphism apparent in outer lip; the female has an accessory or tertiary notch. Specimens are from the Bering Sea, collected at 100+m. Largest individual about 110 mm long.



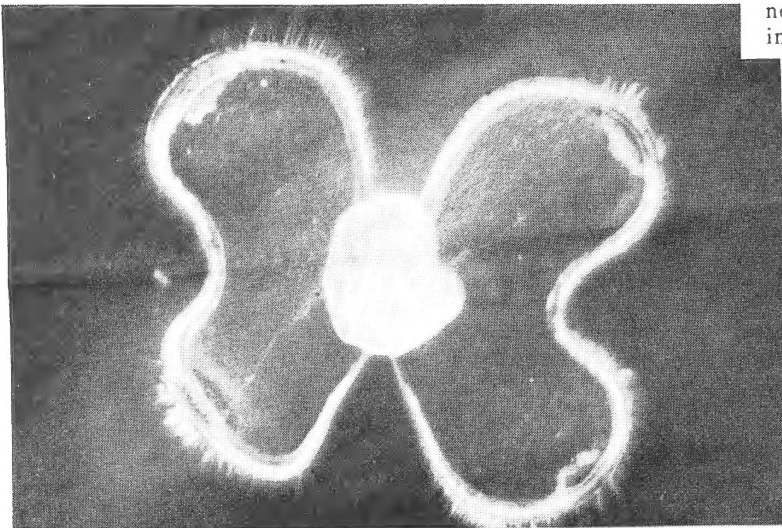
Antiplanes voyi (Gabb, 1866) Common sinistral turrid. Can be found as shallow as 30 m. More commonly below 50 m. This individual was collected from Salmon Bank, south of San Juan Island, Washington, 100 m.



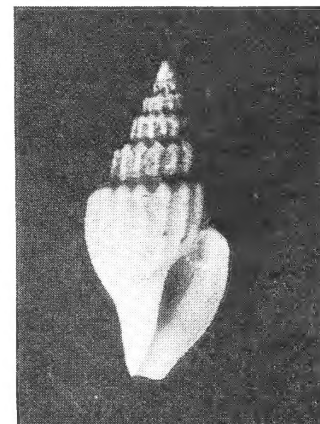
Kurtziella plumbea (Hinds, 1843) Photographed *in situ* in Friday Harbor Bay, San Juan Island, Washington, 21 February, 1976 at 18 m. Animal about 1 cm long.



Oenopota levidensis (Carpenter, 1864) Animal collected from -5 m, near Orcas Island, Washington. Depositing an egg capsule on inside of glass jar in laboratory. Individual about 15 mm length.



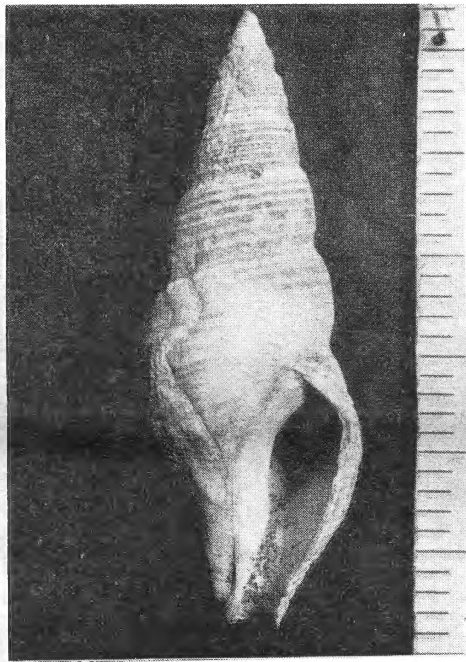
Oenopota levidensis veliger, 10 days post-hatching. Shell length about 300µm.



Oenopota turricula (Montagu, 1803). Collected from between Jones and Yellow Island, Washington. From 100+ m.

They are rarely seen in intertidal areas, but they occupy all possible subtidal habitats. Some, such as *Oenopota fidicula*, are habitat generalists and may be found in sandy, rocky, or muddy areas. Others are much more specialized, for example, *O. tabulata* is found on rocks and seems to prefer living on cliffs, while *O. elegans* lives in sediments dominated by shell fragments (Shimek, 1983b).

In the Pacific Northwest about 30 species of *Oenopota* may be collected, although only 6 or so are found in waters of SCUBA depth. Most of these are relatively rare, although *O. levidensis*, *O. fidicula*, and *O. tabulata* can all occasionally attain abundances in excess of 10/m². This rarity is probably a function of their predatory habits. All turrids are carnivores, and all *Oenopota* studied so far are predators on tube-dwelling polychaete annelids. As with *Conus*, they kill their prey by injecting it with a toxin using their harpoon-like hypodermic toxoglossan teeth. As might be expected, the diets vary substantially, although most specialize on one or two species of worms. *Oenopota fidicula*, an exception to the rule, is a dietary generalist (Shimek, 1983b).



Ophiidermella inermis (Hinds, 1843).

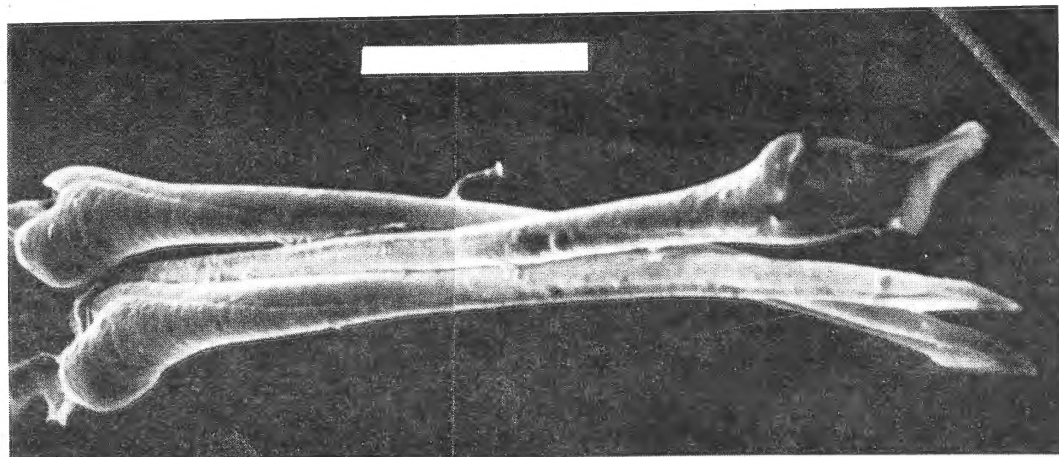
Most *Oenopota* appear to bury in sediment after feeding, while they digest their meals. As they are exposed to potential predators for only brief periods, while hunting, they may have little need for protective or cryptic coloration. This may be one reason for their white coloration. *Oenopota levidensis*, probably the most colorful of the Pacific Northwest *Oenopota*, prefers spionid polychaetes. Many of these prey live in interstices in rocky areas which have few pockets of sediment. The violet-grey coloration of *O. levidensis* is cryptic in these habitats, and is similar to the coloration of the other small gastropods found in those areas, *Bittium eschrichtii*, and *Amphissa columbiana*.

Although most species of *Oenopota* are northern, a few can be found along Californian coast, albeit they are most plentiful in deep cold waters. The genus appears to be most abundant in the south-central Alaskan region where I have found as many as 19 individuals representing a total of 10 species in a single square meter. Over 60 species are recorded from this area, and more are likely to be described from the region (Baxter, 1983). From this apparent center of distribution, the genus has radiated into the Arctic and thence into the Atlantic. Some species, such as *Oenopota turricula*, may be represented in both the Atlantic and Pacific oceans.

Oenopotine species lay lenticular egg capsules containing up to several hundred eggs, with the number of eggs being proportional to the size of the female. Capsules are deposited singularly or in small groups in crevices, on bivalve shell fragments, or on worm tubes. Turrid egg capsules contain no nurse eggs, and all the eggs develop to hatch as veligers. In *Oenopota levidnesis* and *O. fidicula*, the veligers feed and develop for up to 50 days prior to metamorphosis. They then settle and metamorphose about the same time as do the larvae of their prey, so presumably the small juvenile snails will have proportionally small worms to eat. They grow relatively rapidly, and it appears most species reach adult size in two or three years.

While most of the shallow water turrid species in the Northeastern Pacific belong in *Oenopota*, other species in the genera *Antiplanes*, *Clathromangelia*, *Kurtzia*, *Kurtziella*, *Ophiidermella*, and *Rectiplanes* can be locally abundant. Similar dietary and habitat utilization patterns can be seen in these species as well, although not to the extent observed in the much more diverse *Oenopota* (Shimek, 1983a, 1983c).

For example, *Ophiidermella* (Subfamily Borsoniinae) is represented in this region by two species, *O. inermis* and *O. cancellata*. The former is the largest of the shallow-water turrids in the Pacific Northwest and is relatively common intertidally in the Puget Sound region, although it is often overlooked, possibly as it is similar in appearance to *Searlesia dira*, a small common whelk. *Ophiidermella inermis* lives on sandy beaches, and preys exclusively on the polychaete species, *Owenia fusiformis*, which it spears with its long slender radular tooth. The worm rapidly becomes limp, and the snail eats it whole, much like a strand of annelidan spaghetti. Its smaller deep-water relative, *O. cancellata* may be the most abundant



Three radular teeth of *Ophiidermella inermis*. Scale bar = 100 μ m.
Note the cutting apical blades.

turrinid in the region, being relatively common on most of the muddy areas that are the major subtidal habitats of the region. It also eats an oweniid polychaete species, *Myriochele oculata* and its radular teeth are very similar to those found in the larger species and, in turn, these are both similar to the teeth found in other Borsoniinae (McLean, 1971). It is tempting to speculate that this radular tooth morphology evolved concurrently with the specialization of some ancestral species as predators of oweniid polychaetes.

The other turrinid genera in the area await further study. Of particular interest would be an analysis of the diets of the non-toxoglossan turrinids. The radula in the species of the sinister genus *Antiplanes* (Subfamily Turrinae) and its dextral counterpart *Rectiplanes* are not toxoglossan, and have radular teeth on a ribbon. I suspect these animals are dietary generalists as the radula does not appear to vary much from species to species, and does not seem to be as correlated with the prey capturing function of feeding as does the hypodermic toxoglossan radular tooth found in the other subfamilies in the region.

The family Turridae is an assemblage of several related, successful, groups of snails. Selection favoring various types of radular modifications has resulted in a wide array of lineages, many of which are spectacularly diverse. This family, although poorly known, is the most successful gastropod family in terms of species number. Turrinids are important components of many marine benthic habitats, from the warm tropic shallows to the abyssal plains, and as such, they should be more fully investigated.

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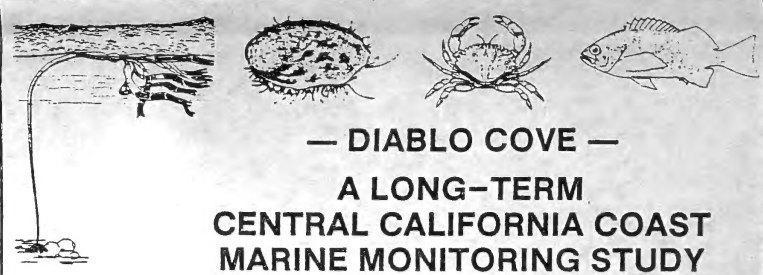
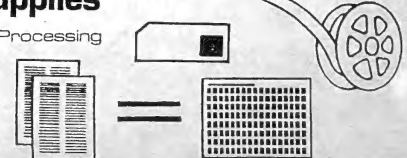
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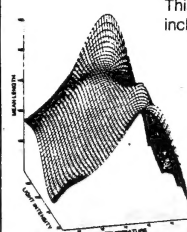
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This session will present a selection of the results obtained prior to 1985 and will include papers covering:

- Allocation of sampling resources
- Long-term changes in the marine communities
- Light and temperature changes in nearshore habitats
- Aspects of marine invertebrate communities
- Juvenile fish communities
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A minor range extension for the muricid *Pterotyphis pinnatus* (Broderip, 1832), and a note on its habitat.

J. Gibson-Smith and W. Gibson-Smith
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The genus *Pterotyphis* Jousseaume, 1880, was shown by D'Attilio (1982, p. 94) to be a muricine rather than a typhine. The only representative of *Pterotyphis* s.s. in the Americas is *P. (P.) pinnatus* (Broderip, 1833), for which a type locality was designated by Gertman (1969, p. 183) as New Providence Island in the Bahamas. He extended the range into the Caribbean, based on two specimens dredged from off northern Panama by the R/V Anton Bruun. The range was then extended to Colombia by Bayer (1971, p. 169), based on a single specimen dredged at 37 m by the R/V Pillsbury. Abbott (1974, p. 192) included Florida and Cuba in the provenance, noting that the species is uncommon in shallow water.



Pterotyphis (P.) pinnatus. AMNH 202292. Height 17.9 mm, diameter 8.1 mm. Borburata, Carabobo State, Venezuela. Recent.

In our collection of the Recent fauna of Venezuela there are 44 specimens of *Pterotyphis pinnatus*, of which 36 came from Borburata, Carabobo State, a locality with a fringing coral reef lying 120 km west of Caracas. Almost all these specimens were occupied by hermit crabs, and were collected along the shore at the back of the reef on which the animal presumably lives, although none were found alive. The remaining specimens came from beach-drift at five localities also associated with reefs. The most easterly of these is Carenero, Miranda State, 80 km east of Caracas. Although reefs occur again on the Chimanas Islands off Puerto La Cruz, Sucre State, 150 km further to the east, the species has not been found there so far. The intervening coast is low and swampy, comprised of sandy beaches backed by brackish lagoons, and it may form a natural barrier. The species was not reported by Altana (1975) from Suriname, a coast devoid of reefs, nor by Rios (1975) from Brazil.

The Borburata specimens were collected on numerous visits over a number of years, but the total would have been insignificant had they not been scavenged and concentrated by hermit crabs. Over the same period many other taxa were collected in far greater numbers, but we would still regard *Pterotyphis pinnatus* as uncommon.

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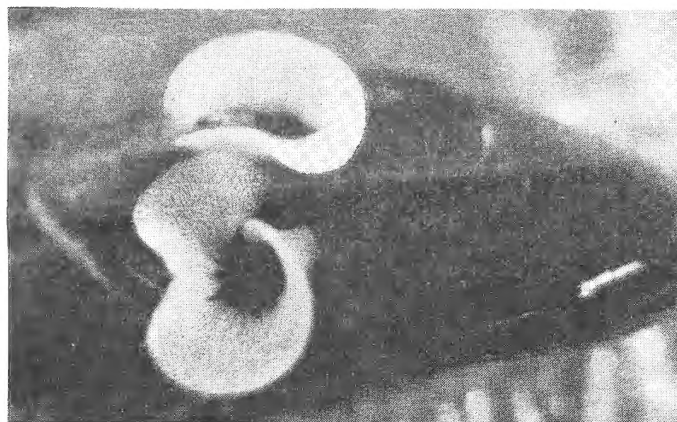
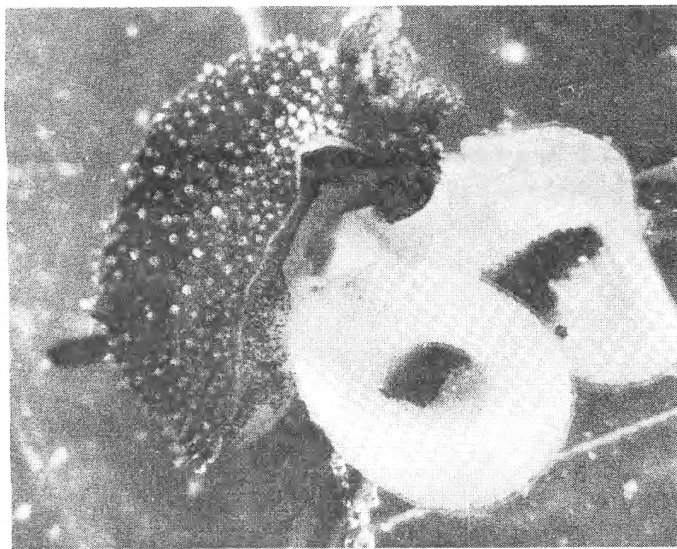
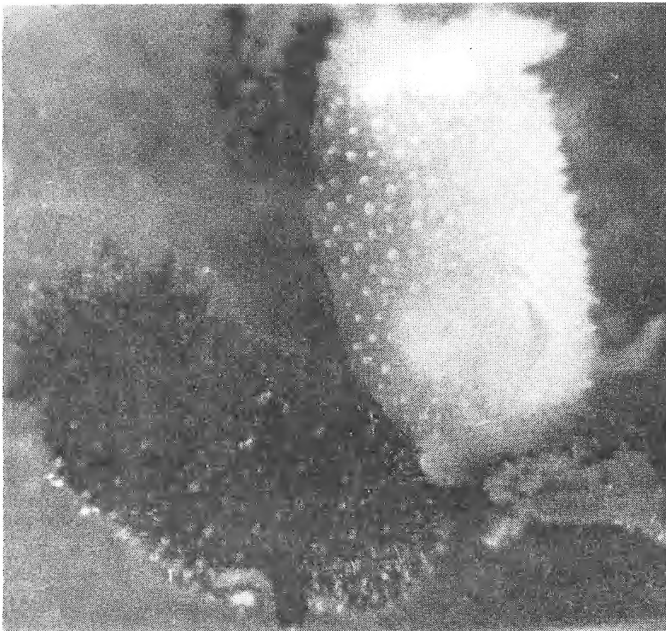
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"	doris Roding, live, jewels, Ascension Is.	34mm+	F	65.00
HELIACUS	faliaciosus Tib, w/o, interesting Sun Dial, It.	d16mm+	F	4.00
LAMBIS	scorpius L, some unusual colors, Philippines	111mm+	F+	5.00
"	violacea Swain, good color, Mauritius	120mm+	F+	100.00

READER FORUM

From I.S. Roginskaya: I am sending you some pictures of a very common White Sea intertidal nudibranch — *Acanthodoris pilosa* (Abildgaard in Mueller, 1789) that I had collected and photographed at the end of July, 1977, at Selenetsky [sp.?] Islands.



The white collars of the spawn of this species were very abundant at that time on *Ascophyllum nodosum* and more rarely on the stones and Bivalvia shells (such as the live *Mytilus* shown here). The brown-black specimen (l=21mm) on the pictures demonstrate almost the extreme dark variation (often called in the literature *A. pilosa* var. *fusca* Loven) of *A. pilosa*, whose colour by the White Sea specimens displays the complete range of variation from pure white and cream, peppered with light grey, through in different ways speckled examples up to almost black. In the littoral zone of the White Sea *Acanthodoris pilosa* are feeding upon the encrusting bryozoan *Flustrella hispida* (Fabricius, 1780). The irregular thick, soft, brown with bluish hue plaster and muffs of this species are very common on *Ascophyllum nodosum*. The brown *A. pilosa* are completely unnoticeable while feeding on the colonies of this ectoproct, successfully imitating the texture of *F. hispida* as well. Though the white specimens, clearly conspicuous on the colonies of *F. hispida*, also show preference to this very species. Note: In American literature *Flustrella hispida* is called *Flustrellidra hispida*? — Dr. I.S. Roginskaya, P.P. Shirshov Institute of Oceanology, Academy of Sciences of the USSR, 23, Krasikova St., Moscow, USSR, 117218

* * * * *

From Margaret C. Teskey: Dear friends,

There is a movement afoot to secure official endorsement of a mollusk to represent each state in the Union. Most have established a representative of much of the fauna indigenous to that area — a tree, bird, flower; why not add a mollusk?

Of course the idea is not new. Florida has adopted the huge horse conch, Oregon calls the hairy triton its own, and the Carolinas are represented, North and South, by the Scotch bonnet and the lettered olive. There are others, of course, which have not been brought to public attention.

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Your promotional agent, — Margaret C. Teskey, 5450 Erickson Ave., Apt. A-321, Beaverton, OR 97005

* * * * *

From Rae Baxter: I have received a couple of helpful remarks on that massive bunch of comments I had on the common name list. Dr. Ronald Shimek pointed out that *Ophiidermella rhines* (Dall, 1908) is a junior synonym for *O. cancellata* (Carpenter, 1864). Also *Ophiidermella inermis* (Hinds, 1843) = *O. incisa* (Carpenter, 1864) = *O. ophioderma* (Dall, 1908).

Plicifusus stejneri (Dall, 1884) is junior to *Plicifusus callorhinus* (Dall, 1877). Extended the range quite a ways north for this species in September when we took 3 from Northwestern Norton Sound in the Northeastern Bering Sea. — Rae Baxter, Box 96, Bethel, AK 99559

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From Karen Thomas: I am an amateur collector and I am employed by a world wide seashell importer. In the years of my studies, I have not been able to find the scientific name of the commonly called "China Clam." I have looked through all my publications and asked more professional collectors who've said they even asked Philipinos who were shell experts & no one knows. [ed. Perhaps one of our readers can come up with a good photo print of the China Clam along with the nomenclature.] — Karen Thomas, c/o P.O. Box 1830, Fort Myers, FL 33902

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PERSONAL NOTES

Sally Bennett has just returned from a month in England with her family. Sally's mother, Mrs. Gilbert Davis, is recovering from recent surgery. Sally's nephew, Ben, seems to be an avid shell collector, thus carrying on the family tradition.

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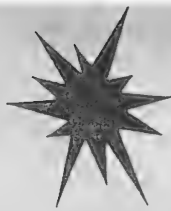
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CURRENT EVENTS

Schedule: Shows & Conventions

1985

The Western Society of Naturalists, in conjunction with the Moss Landing Marine Laboratories and The Monterey Bay Aquarium presents its 66th Annual Meeting at the Monterey Conference Center, Monterey, California — December 27-30, 1985. Four symposia, together with four afternoons of Contributed Paper Sessions and Poster Presentations on several disciplines of Biology constitute the academic portion of the program. A special session entitled "Diablo Cove — A long term central California coast marine monitoring study" has been organized by David W. Behrens and Phillip A. Lebednik, and will be chaired by James Adams. For additional information write to Prof. David H. Montgomery — WSN Secretary, Biological Sciences Department, California Polytechnic State University, San Luis Obispo, California 93407.

1986

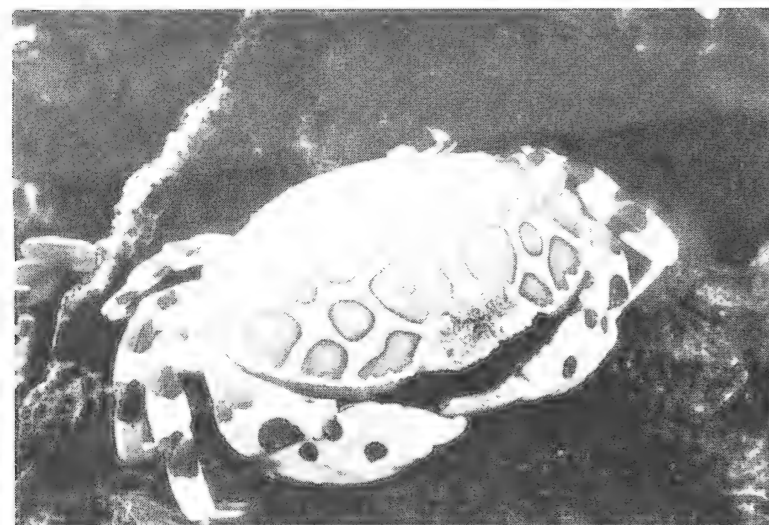
Sarasota Shell Club will hold its 23rd Annual Shell Show on February 21, 22, and 23, 1986, at the Sarasota Exhibition Hall at 801 N. Tamiami Trail, Sarasota, Florida. Local and worldwide shells, shell art, and shellcraft will be in competition and on exhibition. Show hours will be from 12 noon to 5 pm on Friday, and 10 am to 5 pm on both Saturday and Sunday. The Sarasota Shell Club is a non-profit organization, with all proceeds going to schools, museums, research, marine institutions, libraries, etc. For further information and entry forms, contact Bet Hamilton, 1240 Primrose, Venice, Florida 33595, or call 813-497-2809.

2nd International Symposium on Indo-Pacific Marine Biology Guam, Truk & Ponape, Sponsored by the Western Society of Naturalists, June 22 - July 9

American Malacological Union
Western Society of Malacologists Joint Meeting, Monterey, California, July 2-7

What is it? #17

Photo by E.R. Degginer Common Name: ?Stone Crab
Scientific Name: ?*Hepatus epheliticus*
Locality: ?Caribbean



SUN	MON	TUE	WED	THU	FRI	SAT
1 Advent	2	3	4	5	6	7 Pearl Harbor Day
8 Hanukkah	9	10	11	12	13	14
15	16	17	18	19	20	21 Winter
22	23	24	25 Christmas	26	27 WESTERN SOCIETY OF NATURALISTS	28
29	30	31	Last Quarter 5th	New Moon 11th	First Quarter 18th	Full Moon 27th

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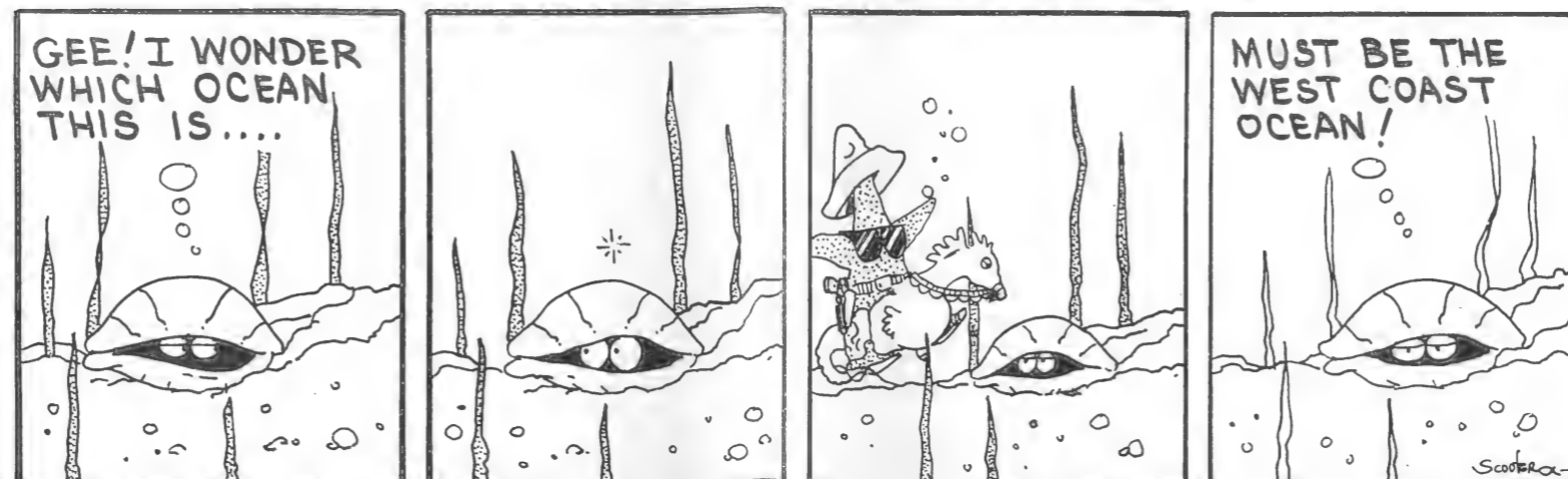
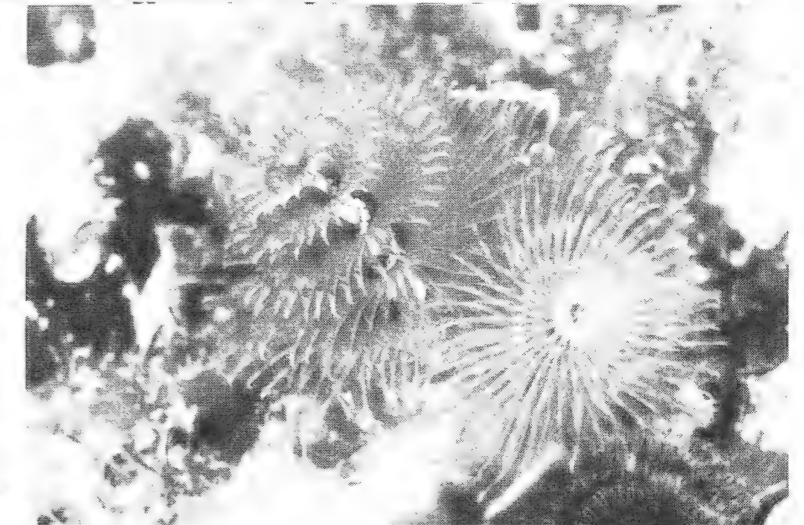
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What is it? #41

Photo by E.R. Degginer
Common Name: ?Christmas tree worm
Scientific Name: ?
Locality: ?



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The England trip provided the opportunity to meet Christopher Garvie, who has recently moved from Texas, back to London, and several others from Britain. Sally tried to see as many people as possible, but spent most of the time with her family in Manchester. We hope we can both get back soon with more travel time available.

* * * * *

On my address you show Alaska Department of Fish & Game. You should take this part of my address off. I no longer work for the Department. When I retired I took my post office box number with me.

I will be in Arcata (where my interest in mollusks began) next month and would like to meet you. — Rae Baxter, Box 96, Bethel, AK 99559

* * * * *

Dr. Dolores S. Dundee (Louisiana), Ross Lemire (Canada), Ted Phillips (Arizona), Dr. Thomas E. Pulley (Texas), and Rev. Jack Wilkins (Florida), have recently passed away. They will all be sorely missed. Our sympathy to their families and friends. We hope to have some biographical notes in upcoming issues.

* * * * *

Drs. Terry Gosliner and Michael Ghiselin are in Mexico until about December 15th. Don't know who else is along but I would guess Dr. Hans Bertsch.

* * * * *

From **Kathe Jensen**: I was slightly disappointed to see that my personal notes were published in a different issue from article, because I had specific requests concerning the article in the notes. [see Jensen, S&SL 16(11):88, Nov. 84] Now I doubt that anyone will recall my requests, i.e. copies of Costa's description of *Embletonia viridis*, *E. nigrovittata*, and *E. funerea*, and opinions on whether the specific name *viridis* (oldest) or *funerea* (most widely used and chosen by first revisor) should be used for this species. In the article, you left the word "he" out in two places. [second paragraph, fourth line "*nigrovittata*. He sent preserved specimens to R. Bergh" and second column, 3rd paragraph, 6th line "from the Red Sea, which he named *S. ornatus*. The"]

I was in Florida in October and November 1984, working on the chemoreception of ascoglossans, and I am now trying to make sense

of the experimental results. I tried to bring back live specimens of some species with direct development, hoping to be able to start cultures here in Copenhagen, but they did not produce any eggs and over Christmas break the temperature in my office got so low that almost all the animals died. The local Danish *Elysia viridis* survives very well in my office. I have 2 specimens that I have had since September 1983! But unfortunately they have planktotrophic development, so I cannot culture them.

A few words to "Billy Bivalve" (introduced by (but I hope not synonymous with) David DeLucia in the November issue of S&SL): I shall never be able to understand how one can possibly derive pleasure from "collecting" shells from a mail order catalogue! To me shells have always been prettiest and most valuable in nature, with the live mollusc inside. I can understand that one wants to keep specimens that one has studied alive in the field or in an aquarium, and I can understand collecting pretty shells washed up on the beach, but commercial "collecting" is just beyond my comprehension. Collecting shells for money may be a very welcome way to supplement an otherwise meagre income in third-world countries, but all too often it leads to the destruction of unique habitats, not to mention extinction (total or local) of rare and slowly reproducing species. Or, it forces local governments to enforce strict regulations, making it increasingly difficult for those of us who want to study the animals alive in the laboratory to obtain collecting permits. So: Dear Billy Bivalve, please read Susan Hewitt's excellent series in S&SL on how to be a good collector — or get into computers! — Kathe Jensen, Zoologisk Museum, Universitetsparken 15, DK 2100 Copenhagen, Denmark

* * * * *

Richard E. Petit recently returned from a week's visit at the Smithsonian Institution in Washington, D.C.

* * * * *

UPI reported that the states of Washington, Oregon, California, Rhode Island, and Alabama planned massive volunteer beach cleanups during September. Other New England states and Hawaii planned similar cleanups during October. Questionnaires returned by the volunteers are producing volumes of information on the composition of garbage and its affect on marine life.

* * * * *

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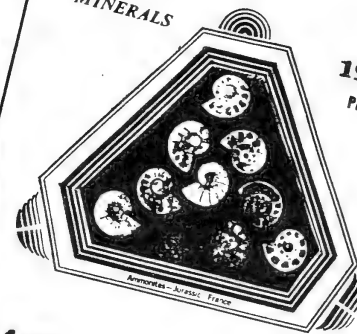
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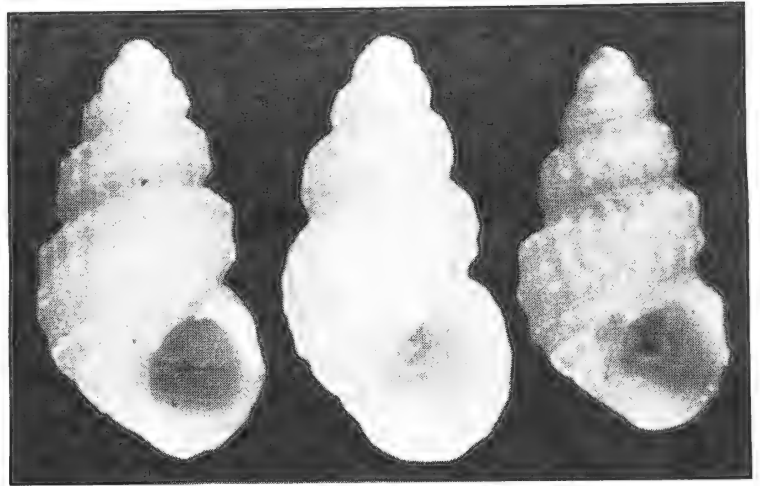
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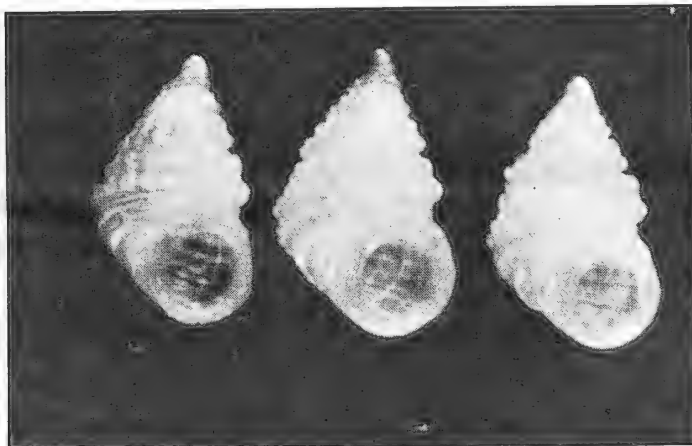
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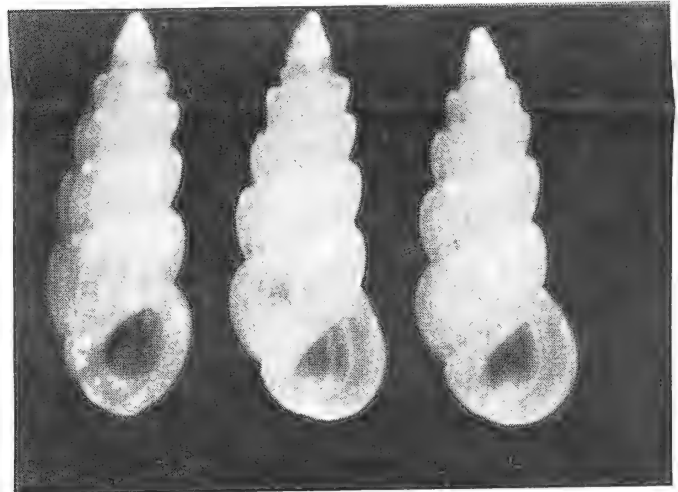
Manzonia (Alvinia) sp., Largest length 1.4mm
Similar to *Merelina wanawana* Kay, 1979 but sculpture and shell proportional shape (width to length) varies considerably. From Harbor at Kawaihae, Hawaii in grunge from government dredging in 8-10m. Collected by B. Draper, October, 1981. Photo by Bert Draper



Two species of *Manzonia (Alvinia)* sp., Largest length 2.7mm
Left & right shells same species — center shell probably a different species. From Harbor at Kawaihae, Hawaii in grunge from government dredging in 8-10m. Collected by B. Draper, October, 1981. Photo by Bert Draper

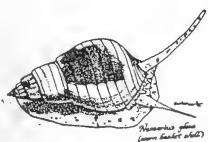


Sansonia kenneyi (Ladd, 1966), Largest length 1.5mm
From Harbor at Kawaihae, Hawaii in grunge from government dredging in 8-10m. Collected by B. Draper in October, 1981. Above name is change in generic placement from *Merelina kenneyi* by Ponder, 1985. Photo by Bert Draper



Schwartziella ephamilla (Watson, 1886), Largest length 2.3mm
From Harbor at Kawaihae, Hawaii in grunge from government dredging in 8-10m. Collected by B. Draper, October, 1981. Above generic name change is from *Rissoina* by Ponder, 1985. Photo by Bert Draper

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The ascoglossan opisthobranchs of a caulerpan fauna of the Mediterranean Sea

Luis Murillo, Jose Templado & Pedro Talavera
Wssell de Guimbarde, 12. Cartagena (Murcia), Spain
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In the majority of cases, opisthobranchs have developed an interesting nourishing specialization. Most of them are carnivorous. Some species of bullomorphs which feed on vegetable detritus (*Bulla*) or filamentous seaweed (*Haminoea*), the aplysiomorphs, which are macroherbivorous and, finally the Ascoglossans, which are also herbivorous and have adopted a very specialized nourishing mechanism — they suck seaweed's cellular juices — can be mentioned as exceptions.

The ascoglossans (=sacoglossans) have got a very typical uniseried radula whose formula is $n(0.1.0)$ in which the only tooth of each row is longshaped and sharp-pointed. This type of radula allows them to drill the walls of the plant cells sucking their juices by means of the action of a muscular pharinx. A lot of them present the property of asimilating the chloroplast of the seaweed they take in, storing them into little sharings in the digestive system where they stay active during more or less long periods of time. As exceptions within this order three species which have adapted themselves to feed on egg contents of other opisthobranchs (JENSEN, 1980): *Stiliger vesiculosus* (Deshayes), *Olea hansinensis* (Agersborg) and *Calliopa oophaga* (Lemche) are known.

Within the ascoglossans, in spite of the uniformity in the feeding diet and in the habitats (almost all of them live among seaweeds in shallow waters), a great morphologic variety is found. Within this order the five levels of organization described by MORTON (1963) for the opisthobranchs are shown. There are species with external shell in which the animal can retreat completely (among them we can find the only bivalve gastropods). Others have got a reduced shell which can be totally or partially covered by parapodia and, finally, there are species without a shell which, in their turn, can show a plain mantle or a mantle with numerous dorsal prolongations (cerata).

We can observe that all the shelled Ascoglossans (about 50 species which are known nowadays, belonging to four families) feed on seaweed belonging to the genus *Caulerpa*, and as a consequence of this, they live associated with them. These are considered the most primitive ascoglossans and the naked forms, which originated from them, have adapted to feed on several genera of seaweed, almost always chlorophyceans.

The genus *Caulerpa* Lamoroux belongs to the order Caulerpales (Chlorophyceae) and included about 60 living species distributed among all the tropical and subtropical seas (MEINESZ, 1973). Most of them can be found in the Indo-West Pacific region. Therefore this is the marine region where the main number of species of shelled ascoglossans can be found, as we shall observe further on. Besides, it's worth taking into account that the Philippines area, where there are about 50 *Caulerpa* species and subspecies (MENEZ & CALUMPONG, 1982), is not too much studied from the point of view of opisthobranchs.

On the other hand, in the Mediterranean Sea there is only one species of *Caulerpa*, *C. prolifera* (Forsk.) Lamoroux, which can be placed in this sea in the northern border of its distribution area. However, it's worthwhile to point out that *Caulerpa prolifera* is extending rapidly in many areas in the Mediterranean Sea (TEMPLADO, 1983) because of being a species which is able to bear pollution very well.

We are going to briefly describe the four families of shelled ascoglossans indicating their geographic distribution and pointing out, within each of them, whether or not they have representatives in the Mediterranean Sea.

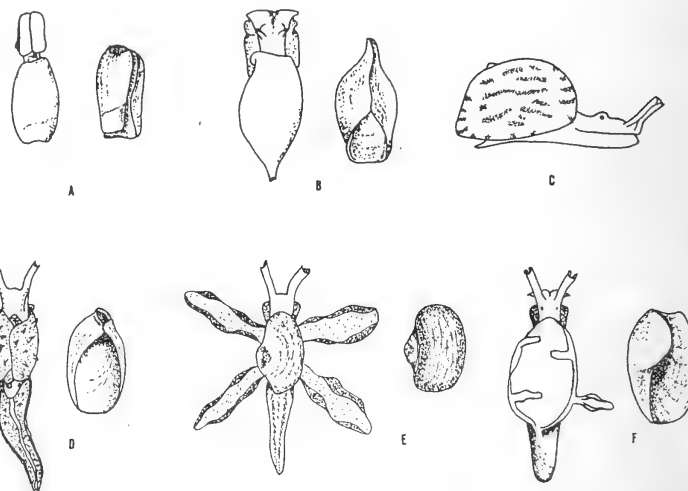


Figure 1. A - *Cylindrobulla fragilis* (Jeffreys). B - *Volvatella* cf. *vigorouxi* (Montrouzier). C - *Berthelinia typica* (Gatliff & Gabriel). D - *Oxynoe olivacea* Rafinesque. E - *Lobiger serradifalci* (Calcara). F - *Lophopleurella wilsoni* (Tate). (Partially based on BURN, 1972)

Order ASCOGLOSSA Bergh, 1876 (=SACOGLOSSA Ihering, 1876) Family CYLINDROBULLIDAE Thiele, 1931

Animal with soft and cylindrical shell in which they can retreat completely. They show a very developed cephalic disc which is longitudinally divided (Fig. 1A). The eyes are internal and the animal is whitish colored. They are diggers and live buried among the rhizoids of *Caulerpa* on which they feed.

It includes about a dozen species all over the world (see HAMATANI, 1967 & 1971, and MARCUS & MARCUS, 1970). One of them, *Cylindrobulla fragilis* (Jeffreys), can be found in the Mediterranean Sea; two of them in the American Atlantic coast (from Brazil to Florida); one of them in the east Pacific coast (California Gulf); one of them in South Africa, and the rest of them in the Indo-West Pacific region.

At first all species belonging to this family were included within one genus, *Cylindrobulla* Fischer, 1857, due to the great homogeneity in the shell of all of them and to the external morphology of the animal. Later on it was found out that some species presented outstanding radular differences with regard to the type species of the genus, *C. beauii* Fischer, 1856. Thus Marcus (1972), according to Hamatani (1971), describes the new genus *Ascobulla* in which the mentioned species are included.

With regard to other species belonging to the family only the shell is known and its inclusion into one genus or other won't be possible until the radula and anatomic characters are studied. That is the case with the Mediterranean species *Cylindrobulla fragilis*.

Marcus (1977) includes the Cylindrobullidae family within the order Bullomorpha, setting it between the Akeridae and Microhedylidae families. However, most authors agree to include it within ascoglossans. This family would constitute a like between the bullomorphs and the remaining ascoglossans.

Family VOLVATELLIDAE Baba, 1966

In the species belonging to this family the animal can also retreat completely inside the shell, which is wide in its central part and narrow in its back forming a sort of terminal trap (see Fig. 1B). The cephalic shield is less developed than that of *Cylindrobulla s.l.*, and it shows two labial widenings and two dorsal tentacular lobes. The foot is short and wide. The animal is usually whitish-colored, though some species show pink or green shades. They are also diggers and live among the rhizoids of *Caulerpa*.

This family includes only one genus, *Volvatella* Pease, 1860, without representatives in the Mediterranean Sea. Thompson (1979) offers a list of all the living species and we have to add *V. viridis* Hamatani, 1976 and *V. bermudae* Clark, 1982. The latter was found in the Bermuda Islands and constitutes the only reference for the genus in the Atlantic Ocean. The remaining species are in the Indo-West Pacific, *V. cumingi* (Adams, 1855) in the coast of west Colombia and *V. laguncula* (Sowerby, 1894) in South Africa (see THOMPSON, 1979).

Family OXYNOIDAE Fischer, 1883

They have a very open shell in which the animal cannot retreat completely. They feed on *Caulerpa* leaves and belong to the epifauna. They are generally green-colored like seaweed. It includes three genera:

1) *Oxynoe* Rafinesque, 1819. It shows a thin and fragile globular shell with a very spacious last turn; with parapodia covering partially the shell and a long laterally compressed tail. (see Fig. 1D).

This genus is widely distributed all over the world, though according to Jensen (1980) and Hamatani (1980) there are only six living species: *O. olivacea* Rafinesque, 1819 in the Mediterranean Sea and west coast of Africa; *O. viridis* (Pease, 1861) and *O. kabirensis* Hamatani, 1980 in the Indo-West Pacific; *O. panamensis* Pilsbry & Olsson, 1943, in the East Pacific (Panama, Lower California), and *O. antillarum* Morch, 1863, and *O. azuropunctata* Jensen, 1980 in the Caribbean Sea.

2) *Lobiger* Pease, 1861. The shell is oval, bellied and fragile without visible spire and a very great last turn. The animals show four very developed and characteristic parapodial lobes (see Fig. 1E). The tail is long and more dorso-ventrally depressed than in *Oxynoe*.

Nowadays three species belonging to this genus are recognized in the world: *L. serradifalci* (Calcara, 1840) in the Mediterranean Sea; *L. souverbiei* (Fischer, 1856) (= *L. viridis* Pease, 1863) in the Indo-West Pacific, East Pacific and Caribbean, and *L. sagamensis* Baba, 1955, in Japan.

3) *Lophopleurella* (Zilch, 1955) (= *Lophopleura* Thiele, 1912). Shell as in *Oxynoe* but a little bit more prolonged and animals as in *Lobiger* but with more little parapodial lobes (according to BURN, 1972). Nowadays only two species of this genus are known: *L. wilsoni* (Tate, 1889) in Australia (see Fig. 1F), and *L. capensis* (Thiele, 1912) in South Africa.

Some authors following Pruvot-Fol (1954) include the genus *Lobiger* into a separate family (BURN, 1966, ORTEA, 1977), Lobigeridae. In this case and according to Burn, *Lophopleura* would remain in the family Oxynoidae.

Family JULIIDAE Dall, 1898

They are the only gastropods noted with a bivalve shell, which is able to enclose the animal completely. This shows a false hinge and its periostracum acts as a ligament. Both valves can shut by means of a horizontal adductor muscle. They feed on *Caulerpa* leaves and belong to the epifauna. They usually show a green coloration.

This family includes about twenty present species divided into two genera: *Julia* Gould, 1862 and *Berthelinia* Grosse, 1875, and a subfamily has been erected for each of them: Juliinae and Berthelininae (see Fig. 1C). Within the genus *Berthelinia* four subgenera are recognized: *Berthelinia s.s.*, *Tamanovalva*, *Edentellina* and *Midorigai*, which Burn (1965, 1966, ...) considers as valid genera, restricting the genus *Berthelinia* to some fossil species.

Kay (1968) made an excellent review of this family, which has no representatives in the Mediterranean Sea nor in the East Atlantic (so far none has been found). Only one of this species has been found in the West Atlantic, *Berthelinia caribbea* Edmunds, 1963. The others have been cited in several places in the Indo-West Pacific region and two of them in the coast of California and West Central America, *Julia equatorialis* Pilsbry & Olsson, 1944, and *Berthelinia chloris* Dall, 1918.

MEDITERRANEAN SPECIES

From the present revision we can observe that only three species of shelled ascoglossans have been found in the Mediterranean Sea up to now: *Cylindrobulla fragilis*, *Oxynoe olivacea* and *Lobiger serradifalci*. The three species are associated with the green

seaweed *Caulerpa prolifera*, the only species of the genus *Caulerpa* in the Mediterranean sea.

Cylindrobulla fragilis (Jeffreys, 1856)

We have found five specimens of this species in the coast of Murcia (S.E. Spain), all of them among the rhizoids of *Caulerpa prolifera* less than one meter depth. Three specimens were taken up in Playa de la Barra (Cabo de Palos) (37° 38'N, 0° 42'W; UTM: 30SYG0367) in October 1982 and two in the north area of La Manga del Mar Menor (37° 46'N, 0° 45'W; UTM: 30SYG9983), in an inlet open to the Mediterranean Sea, in August 1983 (Fig. 2).

Fasulo *et al.* (1981) have found several specimens in the west Italian coast. It has also been cited in Cartagena (S.E. Spain), Kebir Sea (Morocco), Greece? and Madeira. The authors already cited recently in Cabo de Palos (TEMPLADO, TALAVERA & MURILLO,

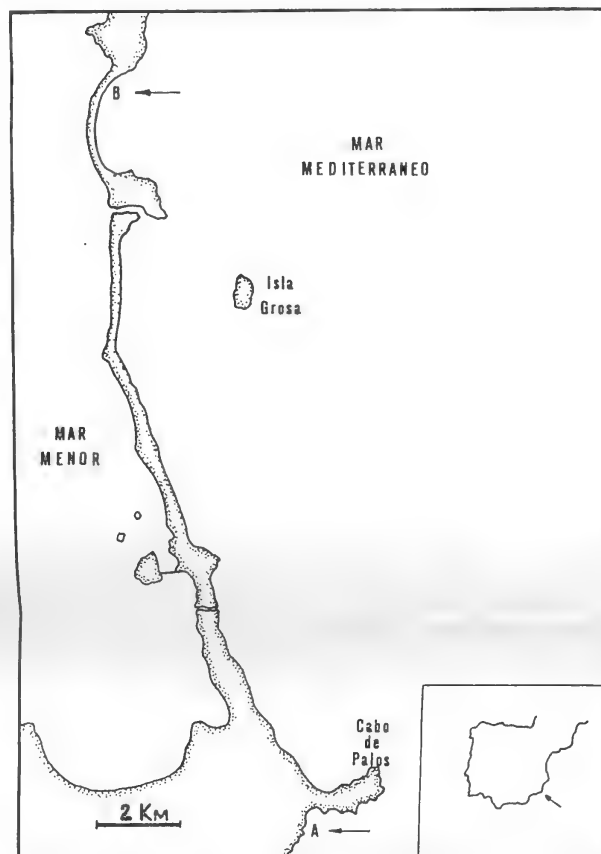


Figure 2. The place where *Cylindrobulla fragilis* specimens were found. A - Playa de la Barra. B - North area of La Manga del Mar Menor. The biggest specimen was 7 mm (the shell 4 mm). The animal is whitish-colored and translucent, allowing the orange-colored viscera to be seen. The eyes can't be observed. This species has seldom been cited.



1. *Cylindrobulla fragilis* (Jeffreys)

1983). It has also been found in the Canary Islands (ORTEA pers. commun.) and in Almeria (S.E. Spain) (MORENO pers. commun.).

Currently Dr. Fernandez-Ovies is carrying out anatomic studies on this species, which will probably determine its inclusion into the genus *Ascobulla*, as it was mentioned when talking about the family Cylindrobuliidae.

The egg-laying has only been observed in an aquarium. It consists of a whitish string, approximately 1 mm wide, which turns several times around itself in an irregular fashion.



2. *Oxynoe olivacea* Rafinesque

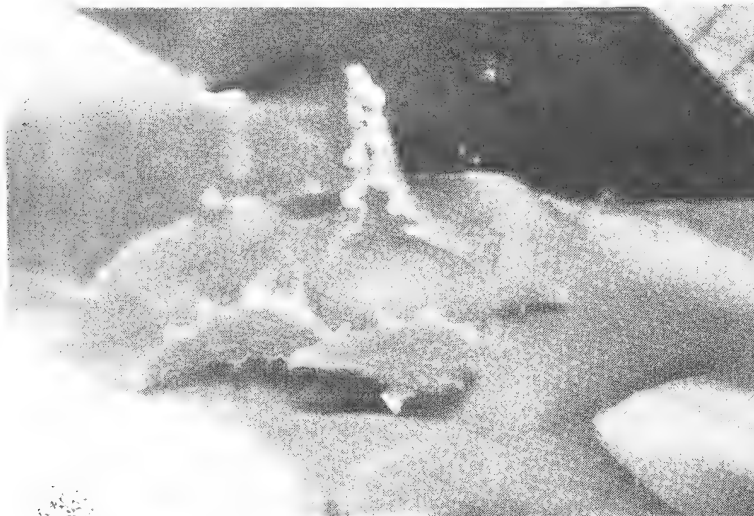
Oxynoe olivacea Rafinesque, 1819.

This is an abundant species in Cabo de Palos (Murcia, Spain) where we have taken up more than 100 specimens, always on the leaves of *Caulerpa prolifera* at depths of 0-6 m.

The biggest specimen was 52 mm alive. The general color is intense green with the foot edge and rhinophores yellow with blue spots. Sometimes it shows the edge of the parapodia, medium dorsal line of the tail and tubercles in light colors.

It is most abundant during the summer months, when their egg-laying can be observed frequently. These consist of a whitish-colored string about 3 mm wide with a zigzag-like arrangement on the leaves of *Caulerpa* in order to make good use of the leaves surface. The leaves which have fed these animals show some colorless areas in their edges. These marks are very characteristic.

This species has been found in several places in the Mediterranean Sea. In the Atlantic Ocean it has only been cited in Cape Verde Islands (ELIOT, 1906) and in Canary Islands (ORTEA, 1981).

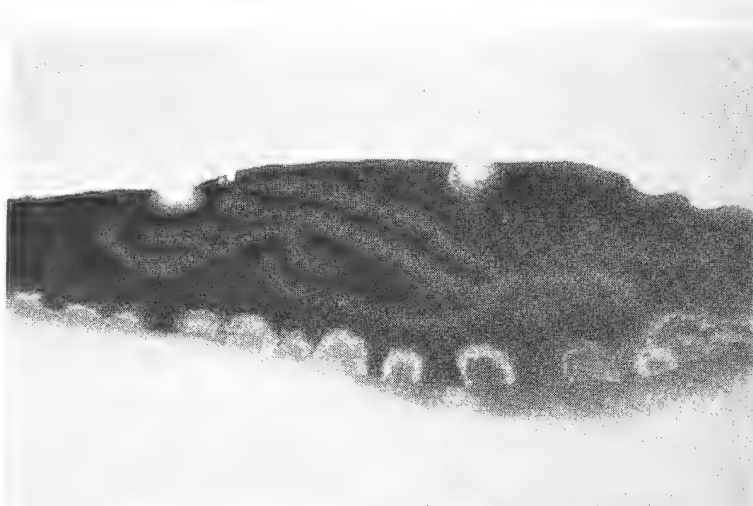


3. *Lobiger serradifalci* (Calcara)

Lobiger serradifalci (Calcara, 1840)

This is less abundant than *O. olivacea* in Cabo de Palos but it has also been found frequently in the same places as the former species, always on the *Caulerpa* at depths of 0-10 metres. About 50

specimens were collected measuring 3 to 45 mm when alive. The color is uniform green and sometimes it shows red shades in the edge of the parapodial lobes.



4. The spawn of *Lobiger* on a *Caulerpa* leaf (see eaten side).

The same as *Oxynoe*, it is more abundant during the summer and the main breeding period takes place at the end of this season. The egg-laying consists of whitish-colored string about 2 mm wide, quit long looping round the leaf of *Caulerpa*.

The marks left on these leaves as a consequence of their feeding are very similar to those of *O. olivacea* and were already described by GONOR (1961). When they are disturbed they can autotomize the four lateral expansions which can be regenerated. They also expel a repulsive white liquid. The same secretion is made by the other two previously mentioned species, and generally, by all shelled ascoglossans.

The authors are currently studying the development and life cycles of the three aforementioned species.

DISCUSSION

From the previous study it can be observed that a majority of the species of shelled ascoglossans can be found in the Indo-West Pacific region, because this is the marine area where there are the most species of *Caulerpa*. In the Mediterranean this group of animals is represented by three species, a fact which can be explained if we take into account that there is only one species of *Caulerpa* in this sea.

The main limiting factor for *Caulerpa prolifera* is low temperatures (MEINESZ, 1973). This species is distributed around the coast of West Africa and in the Mediterranean Sea and it has the northern limit of its distribution area. Due to the strong temperature fall which is suffered by the waters in this sea in winter (up to 11-14° C depending on the areas) *C. prolifera* loses its leaves during this period and only the rhizoids stay. On the other hand, in the African coasts and in the western Mediterranean the leaves stay throughout the year.

According to this it could be thought that the main distribution area for the three ascoglossans considered here, could be the coasts of West Africa and it could be thought that they were rare in the Mediterranean, which is the limit for their distribution area, and they have to adapt to the annual cycle for the seaweed. However, almost all the existing citations for these three species belong to Mediterranean waters and, in the Atlantic, they have been cited (Madeira, Canary Islands and Cape Verde Islands). We believe that this fact is due to the little amount of study which has been done on the western African coasts from the viewpoint of opisthobranchs. Conversely, the Mediterranean coasts have been the aim of a great number of studies.

It is worth taking also into account the massive invasion that has been made in some Mediterranean areas over the last years by *Caulerpa prolifera*, which is a seaweed that withstands the strong pollution and the substrata constituted by slime and mud. Such invasion could have determined a strong increase in the populations of *C. fragilis*, *O. olivacea* and *L. serradifalci* in this sea.

It is also worth commenting something about all the species of opisthobranchs which we have found in the *Caulerpa* beds, as other authors have already made. Kay (1964) studies the ascoglossans associated with *Caulerpa racemosa* in the Hawaiian Islands and mentions three species: *Berthelinia pseudochloris* Kay, *Lobiger souverbiei* (Fischer) and *Elysia aff. cauze* Marcus. Burn (1966) cites the following species: *Runcina marshae* Burn, *Volvatella ficula* Burn, *Tamanovalva fijiensis* Burn, *Oxynoe viridis* (Pease) and *Lobiger viridis* (Pease) in a work over the opisthobranchs associated with *Caulerpa* in the Fiji Islands. Hamatani (1972) among the species which accompany *Volvatella ayakii* Hamatani in *Caulerpa brachypus* beds in Japanese waters cites two species of *Philine*, *Cylindrobulla fulvipunctata* Baba, *Gastropteron* sp., two species of *Runcina*, *Cylindrobulla japonica* Hamatani, *Oxynoe viridis* (Pease), *Lobiger sagamensis* Baba, *Phyllobranchillus orientalis* (Kelaart), *Hermaea dendritica* (Alder & Hancock) and one species of Tritoniidae.

We have found in the *Caulerpa prolifera* beds of Cabo de Palos (S.E. Spain), apart from the three Mediterranean shelled ascoglossans, numerous specimens of *Retusa truncatula* (Brugiere) and some of *Philine aperta* (Linnaeus) among the sediment. And we have found some specimens of *Chelidomura italica* Sordi and some of *Elysia viridis* Montagu among the leaves.

We have to point out that from all opisthobranchs which are in the *Caulerpa* beds only the shelled ascoglossans are strictly associated to it. The remaining species can be considered as companions because they are present in other habitats too.

Among the species found in Cabo de Palos, *Retusa* and *Philine* are depredators. The former feeds principally on foraminiferans and the second on other molluscs. Both species can also be found in the muddy bottoms without *Caulerpa*.

Chelidomura and *Elysia* belong to the epifauna and they can occasionally be found. The first on those *Caulerpa* beds where rest of other seaweed are accumulated (*Jania*, *Cladostephus*, ...) and feeds on little turbellarians which it finds among them. *E. viridis* is more abundant on other seaweed (above all in *Codium vermilara*). It has not been observed feeding on *Caulerpa*.

ACKNOWLEDGMENTS

We would like to express our gratitude to Mr. Eduardo Espin, habitual companion of diving, who has found some of the specimens of *Cylindrobulla* commented on here, and to Mr. Antonio J. Himenez, who has translated this report.

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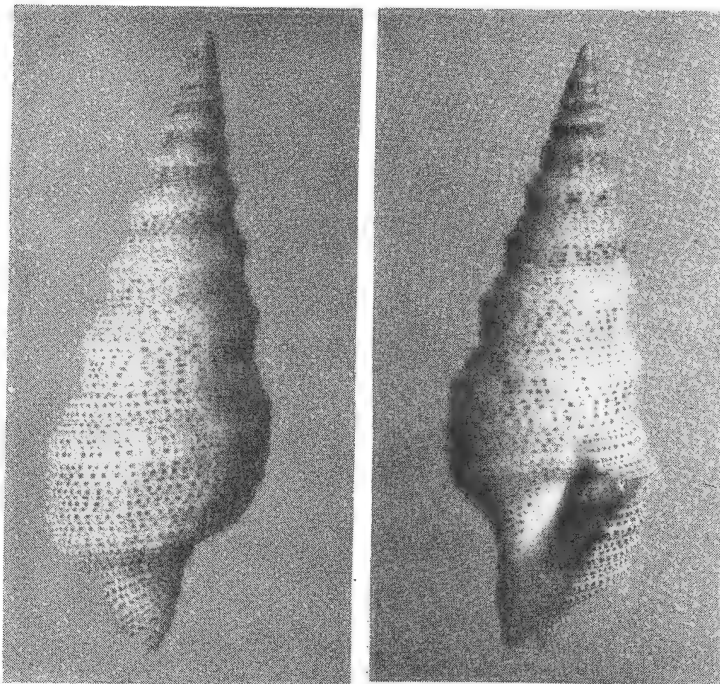
ON THE REEF WITH BOB PURTYMUN: *Xenuroturris*

Bob Purtymun, P.O. Box 643, West Point, CA 95255

In December, 1983 I was in 8m water over a coral rubble bottom with scattered sand patches and an occasional coral slab. A few yards away the solid coral wall of Wheeler Reef (off Queensland, Australia) reached upward toward the surface. Fanning to a depth of 100mm in one of these sand patches produced a gem *Xenuroturris millepunctata* (Sowerby, 1909). What a welcome addition to my collection! It was the first one I had ever seen. The shell is 34mm long by 12mm wide. Is it a range extension? I only find records for Japan, New Caledonia, Okinawa, and Fiji.

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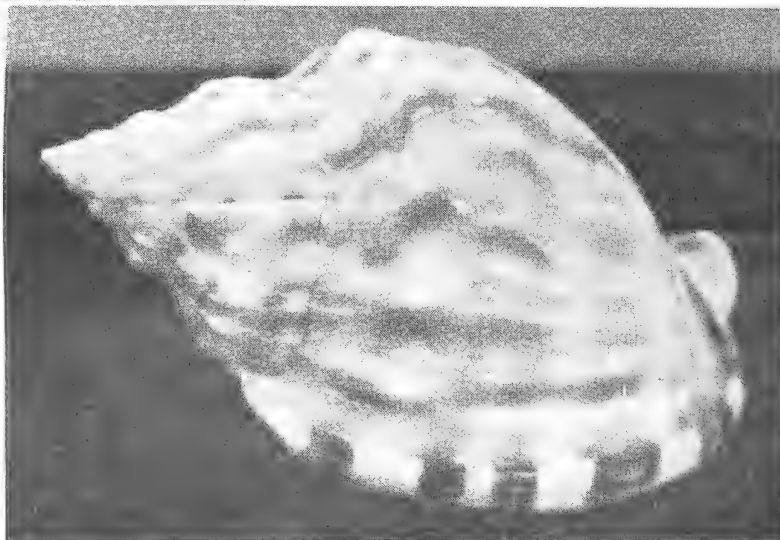


Show area.



Show area.

Xenophalium royanum, First place in open class for single specimen — R. Foster & C. Glass. Their cowrie exhibit also won the COA Award for most outstanding exhibit. Their *Cypraea iu-tsui* won Shell of Show.



Latiaxis terimachii Kuroda, 1959, gave Diane Dunhill the prize for best single specimen shown by an amateur. Jack Gilbody's exhibit "The Six Classes of the Phylum Mollusca," won the amateur small exhibit prize. (no photos)

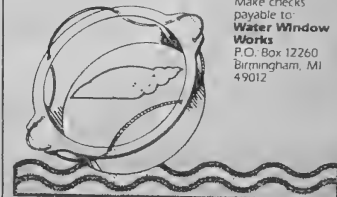
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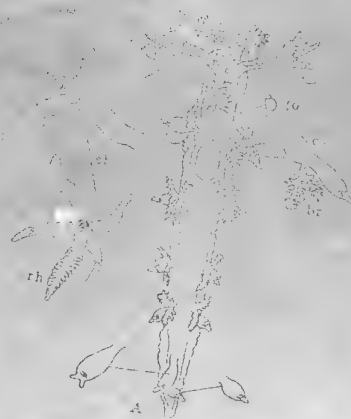
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EDITOR'S NOTES

Year number seventeen is complete with this issue. It has taken a lot of work to get here. We have tried to bring more information and enjoyable articles with each issue and to improve the overall quality of each issue.

December has been extremely busy for Sally & I. We are now shipping almost 5000 copies per month of S&SL. Comments from our readers run all the way from "I hate it" to "I love it" with the majority well to the positive side. We believe that you will enjoy the publication more and more in 1986.

Our apologies to Jack Brookshire for not crediting him with the photos and information on the Santa Barbara show on the back page of the November issue.

Best regards,



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The Family Strombidae in Brazil

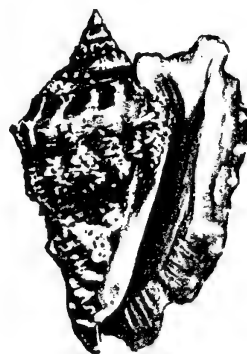
Luis Eduardo Martins da Silva, Sociedade Brasileira de Malacologia
Av. Eptacio Pessoa, 617/33, Santos - Cep. 11.100 - S.P., Brazil

Systematic Classification:

- Phylum Mollusca
- Class Gastropoda
- Subclass Prosobranchia
- Order Mesogastropoda
- Suborder Stromboidea
- Superfamily Strombacea
- Family STROMBIDAE Rafinesque 1815
- Genus *Strombus* Linné, 1758
- (*S. pugilis* Linné, 1758)
- Subgenus *Tricornis* Jousseaume, 1886
- (*S. raninus* Gmelin, 1791,
- S. gallus* Linné, 1758,
- S. costatus* Gmelin, 1791,
- S. goliath* Schröeter, 1805)

In Brazil, only the genus *Strombus*, represents the family STROMBIDAE and there are five species. They live exclusively in tepid or warm water, almost always at shallow depths over muddy or sand surface, close to corals or rocky coasts. They are all kind herbivorous, feeding of seaweeds (green, blue or brown), sargassos, vegetable detritus and some other marine plants. As every mollusk from the order Mesogastropoda, the *Strombus* have radula with seven series of teeth.

The most rare of the *Strombus* is certainly the *S. goliath*. In Brazil on the contrary of what occurs in the Antilles and Florida. *S. raninus* is more rare than *S. gallus*. *S. costatus* occurs in the continental part of Brazil as well as several Brazilian tropical islands far away from the continent. The only *Strombus* that occurs away from continental Brazil, which is "Caribe," is *Strombus pugilis*, — the commonest of the five Brazilian *Strombus*. It occurs along almost all of the Brazilian coastline. This species' commensal is a little crustacean *Pinnotheres strombi* and the advantages to each animal are still unknown.



Strombus raninus Gmelin, 1791

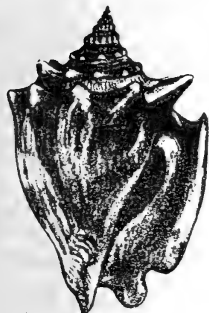


50 mm

Strombus (Tricornis) raninus, Gmelin, 1791
Distribution: From the State of Ceara to the State of Piaui
Habitat: Waters from 30m to 120m, on muddy surface and marine vegetation. Rare.
Size: to 109mm.
Synonyms: *Strombus ranimus* Bosc, 1801
Strombus bituberculatus Lamarck, 1822
Strombus lobatus Swainson, 1822
Strombus nanus Balles, 1938

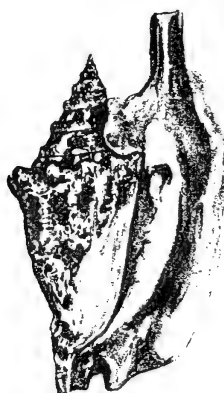


Strombus pugilis Linné, 1758



50 mm

Strombus pugilis Linné, 1758
Distribution: From the State of Ceara to the State of Santa Catarina.
Habitat: Flat waters, over muddy surface, from 0 to 30 m depth. Very common.
Size: to 110mm.
Synonym: *Strombus peculiaris* M. Smith, 1940



50 mm



Strombus gallus Linné, 1758

Strombus (Tricornis) gallus Linné, 1758
Distribution: From the State of Ceara to the State of Alagoas and in the oceanic island of Trinidad.
Habitat: From 0 to 80m on sandy surfaces, over calcareous seaweeds or seldom over corals. Uncommon.
Size: to 192mm.
Synonymous: *Strombus solitarius* Perry, 1811.



70 mm



Abrolhos Islands
Trindade
Island

Strombus costatus Gmelin, 1791

Strombus (Tricornis) costatus Gmelin, 1791

Distribution: From the State of Maranhao to the State of Alagoas and in the Abrolhos Islands (Bahia) and in the oceanic island of Trinidad.

Habitat: From 20 to 100m on coral cays or in the deep with calcareous seaweeds. Common.

Size: to 231mm.

Synonyms: *Strombus inermis* Swainson, 1822

Strombus accipitrinus Lamarck, 1822

Strombus leidyi Heilprin, 1887

Strombus spectabilis Verrill, 1950

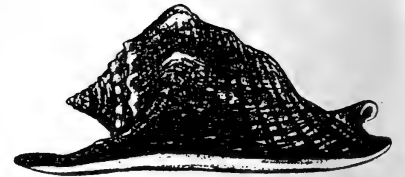


Abrolhos
Islands

Strombus goliath Schröter, 1805



150 mm



Strombus (Tricornis) goliath Schröter, 1805

Distribution: From the State of Ceara to the State of Alagoas and in the islands: Itaparica (Bahia), Abrolhos (Bahia) and Sao Mateus (Espírito Santo). It is an endemic mollusk in Brazil.

Habitat: Flat waters, sandy surfaces, from 2 to 25m. Very rarely collected alive.

Size: It is the second Brazilian gastropod reaching 368mm.








Synonyms: *Strombus goliath* Dillwyn, 1817.

Shell illustrations by Rolf Karl-Heinz Grantsau

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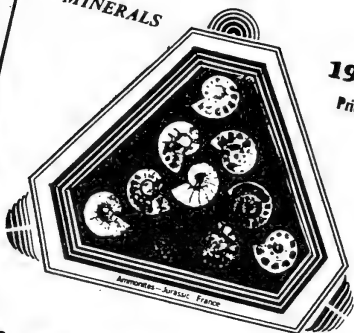
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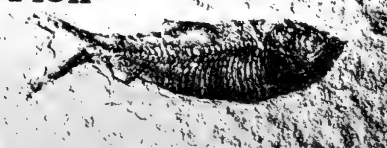
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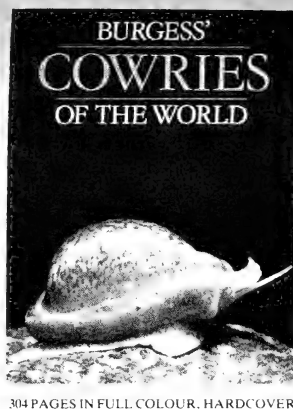
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Return of The Nautilus.

Following the publication in 1975 of the *Best of the Nautilus*, a chronicle of early conchology in America, editor R. Tucker Abbott began to assemble a fascinating sequel of stories and accounts of shell collecting at the turn of this century. We hope to publish some of these short stories taken from his forthcoming, *The Return of the Nautilus*.

Shelling on the Pacific Coast

Many interesting short accounts of collecting conditions on the Californian coast were published in the 1880's and 1890's in the first volumes of the journal, *The Nautilus*. Among the better romantic writers was a Williard M. Wood about which little is known. On March 6, 1891, he wrote to C.W. Johnson, the secretary of the newly-formed Association of American Conchologists in Philadelphia, asking about membership. At the time, Wood was about 30 years old and was employed by an accident insurance company in San Francisco. He was personally acquainted with some of the leading shell people of that period — Prof. Josiah Keep, from whose shell book Wood obtained identifications, Dr. J.G. Cooper of Hayward, and Henry Hemphill of San Diego. I suspect Wood originated in New York, for he was a personal friend of Williams H. Weeks, Jr., a Brooklyn hardware store owner and great shell collector.

Williard lived at 2817 Clay Street, San Francisco, and took monthly excursions with friends to the shore to collect. Bolinas, just to the north of the bay entrance, was his annual Mecca. "Aqui estoy ostravez!!" — here I come again, was his collecting battlecry. In his final sentence, written in Spanish, he hoped that his shelling paradise would always remain unchanged. — R. T. Abbott

THE NAUTILUS.

VOL. XI.

SEPTEMBER, 1897.

No. 5.

BOLINAS, CALIFORNIA; THE CONCHOLOGISTS PARADISE.

BY WILLIARD M. WOOD.

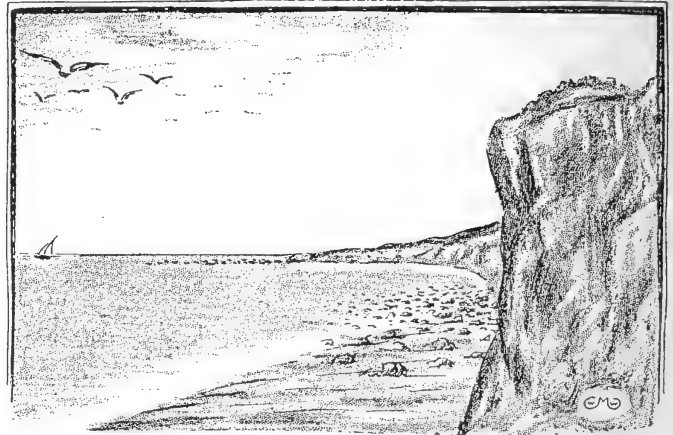
Aqui estoy otravez!

Once more I have reached the rocky shores of dear old historic Bolinas. I could never tear myself from this antique Spanish town by the Ocean. How I love to hear the mighty waves beat wildly against the solid rocks, and see the lofty yellow bluffs which rise so majestically from Neptune's enchanting home.

Annually, during the summer months, I find that I am—like the proverbial Snail, wending my way, through exquisite redwood forests and inhaling the salubrious mountain air. The point of destination is always Bolinas. Bolinas, thou art and ever shall be my Mecca.

This year, Mr. George E. Townsend and the writer concluded to pitch tent and camp upon one of the smaller bluffs, by the side of a delightful rippling creek, within a stone's throw of the beach which is used for bathing purposes, in lieu of making the hotel our headquarters during our stay. We also decided to "tramp it," and as each possessed a good pair of strong limbs, the start was made from San Anselmo Station, Marin County. The distance from the station to Bolinas is estimated at about twenty miles. Ten miles of this number is entirely devoted to up hill climbing, and so steep, that in portions where there is no shelter from the sun as it sends forth its penetrating rays, one becomes quite exhausted, especially when one is principally confined in a down town office, pondering over innumerable books and papers, and not used to mountain climbing.

While going toward the "Summit," how truly beautiful were the rustic wooden bridges over which we passed, and the cool-looking, shaded, rainbow-tinted and trout laden streams. How the saucy big blue jays scolded when we ventured too close to their nesting places! Then there were numerous tiny golden-breasted wild canaries; how beautifully they did sing! The peacock-green throated humming-birds were busy flying hither and thither, abstracting the honey from the delicately scented flowers. Cotton-tails would occasionally be seen running frantically across the broad road and hiding among the heavy brush, so that they would not fall victims to the many hawks and red-necked buzzards which appear at all times to hover overhead.



The beach, bluffs and Duxbury Reef.

Several times we came across a flock of mountain quail. The minute we were observed by them, they would take to the wing. The noise caused by their flying resembled greatly an immense buzz saw revolving with great rapidity and cutting through heavy timber.

When we reached "the ridge," we were rewarded by a superb view of the surrounding country. Not a particle of fog was within sight. The atmosphere was as clear as crystal. The view covered an expanse of scenery which could not be emulated for picturesque variety. Mountains, forests, lakes, valleys, rocks, straits and capes, cities, towns and villages spread themselves in a magnificent panorama.

The ten mile descent of the mountain on its western side was comparatively easy as the road was in excellent condition. The weather has been delightful since we have been here and trust that it will continue so throughout our stay.

Although the ground on the mountain's side was quite dry, careful searching with the aid of a short limb of a tree, raking deeply among the fallen leaves, revealed to us, quantities of the following *Helicis*, all with the living animal within.

Helix arrosa, *nickliniana*, *Polygyra armigera* and *Selenites vancouverensis*. No fresh-water shells were found in the streams and pools on the way over. In fact, I do not believe there are any in the vicinity of this place, for I have been unable to secure a single specimen during the past six years.

The tides so far, have been very good and several species have been added to my collection, which are entirely new to me.

The beach from the bluffs near the channel (entrance to the Bay of Bolinas) out to the dangerous reef—Duxbury reef—is at intervals composed of billions of particles of shells, ground so fine that the casual observer would naturally suppose they were grains of sand. Certain spots I have seen on the beach are almost wholly composed of these diminutive bits to a depth of about five or six inches.

The reef upon which I had formerly seen attached thousands of immense *Chlorostoma funebre* and fairly good sized *Chrysodomus dirus* are now almost destitute of the above named species. The reason of their disappearance is unknown to me. The species observed attached to the rocks and the blue clay at the present date are *Monoceros engonatum* and *Litorina scutulata*. *M. engonatum* predominating. Of *Chlorostoma brunneum*, I have gathered hundreds at previous visits, from a point just a short distance from the reef in a north-westerly direction. Not one in a living state have I found since arriving.

Strolling up the sandy beach in the early morning, (4.30) until we reached the stretch of mossy rocks which had been left bare by the retreating tide, we secured dozens of the common edible clam, *Tapes staminea*, which is sold by the sackful in the markets of San Francisco. These were brought back to our camp and served at breakfast.

The Bay of Bolinas, which at one time was quite commodious, is now almost completely filled with sand and mud. The channel, no doubt will soon be closed and not even the smallest boat will be able to enter this once beautifully situated bay.

When low tide occurs in the bay, the "necks" of thousands of *Schizothærus Nuttalli* may be seen projecting an inch or so out of the gray mud. Although the shells themselves are buried quite deeply under the surface, it is with difficulty that these huge specimens may be obtained. Think of gathering clams almost the size of dinner plates. We managed to secure several splendid specimens. The "necks" when fully extended are about three feet long. It requires several persons with rubber boots, shovels and pails to "catch" one, as they will withdraw their "necks" quickly and bury themselves out of view and reach, if disturbed. The strength of one person is required to hold the neck on the surface while another person digs around it and bails out the fast in-coming mud and water. It is indeed hard work to capture one of them, but well worth the trouble and time spent over them.

The Bay also produces thousands of dead, yet fresh-looking specimens of *Macoma secta*. These are found either upon the surface or an inch or two below, imbedded in the soft mud. Hundreds were secured and after having given them a thorough washing, they were packed away carefully in cotton batting.

Living *Cryptomya californica* in considerable numbers seem to be washed upon the mud flats. They range in size from a pin head to a quarter of a dollar.

When low tide occurs at the reef, one may dig in the clay for borers and be rewarded with several species. The clay is fairly alive with them.

Occasionally I have found cast up on the beach by the waters, fine examples of that immense "rock oyster" *Hinnites giganteus*. Several contained the living animal. One specimen picked up measures almost ten inches in diameter. Who says we do not have large oysters! The beach is covered with great numbers of worn valves. The young shells are easily mistaken for *Pecten hastatus* and I have often been fooled in this respect. Fresh, full grown specimens are very hard to obtain.

What do you suppose to-day—the glorious fourth of July—brought forth? Two most interesting species that I have found up to date. I had not searched for these and they were entirely a surprise to me. Doubly welcome are my new friends on this day. We were sitting lazily upon the pebbly beach watching the waves as they washed upon the shore. Suddenly a larger wave than those which I had been accustomed to see, rushed forward and with a mighty splash, broke within a few feet of us. The water and foam crept so quickly in our direction that my shoes were soon filled with the cold sea-water. With a quick spring, I was upon my feet and hurrying from the scene of the unfortunate event. When returning to the spot where we had left a stick half buried in the sand, I came across unexpectedly two valves of *Semele rubrolineata* and a most delicate and perfect fresh-looking specimen of *Mytilimeria Nuttalli* Conr.

How truly patriotic were the little shells to come and cast themselves at my very feet, upon this eventful day. The rose colored radiations on the *Semele* were beautiful and looked like many sky-rockets going heavenward.

Among the species collected which are not mentioned above, are as follows:

Acnæa asmi, *mitra*, *patina*, *pelta*, *persona*, *spectrum*, *incessa*, *instabilis*, *Adula falcata*, *stylina*, *Amphissa corrugata*, *Amycla carinata*, *Bittium flosum*, *Calliostoma costatum*, *Cardium corbis*, *Cerostoma foliatum*, *Chama pellucida*, (valves only) *Chlorostoma montereyi*, *Pfeifferi*, ? *Crepidula adunca*, *navicelloides*, *Entodesma saxicola*, *Lithophagus plumula*, *Fissuridea aspera*, *Haliotis fulgens*, (large but poor specimens, washed ashore) *Hipponyx tumens*, *Kellia Laperousii*, var. *Chironii*, *Lacuna unifasciata*, *Lazarus subquadrata*, (valves), *Litor-*

ina planaxis, *Lunatia Lewisii*, (half a foot in length) *Lyonsia Californica*, *Macoma nasuta*, *inquinata*, *Siliqua patula*, *Mytilus Californianus*, *Nassa fossata*, *Cooperi*, *Margarita pupilla*, *Ocenebra lurida*, *interfossa*, *Olivella biplicata*, *Petricola carditoides*, *Pecten hastatus*, (valves) *Pholadidea penita*, *parva*, *Platydodon cancellatus*, *Parapholas californica*, *Placunanomia macroschisma*, (valves) *Purpura crispata*, *lima*, *saxicola*, *ostrina*, *Saxicava arctica*, *Saxidomus aratus*, *Tapes staminea*, *tenerrima*, *runderata*, *Tellina Bodegensis*, (valves) *Zirphea crispata*, *Cryptochiton Stelleri*, (seven inches long) *Ischnochiton Cooperi*, *Mopalia Hindsii* and *muscosa*.

I have not gone carefully over the species collected—doubtless many others might be included in this list—but the above will serve to show the rich molluscan fauna of this certainly delightful peninsula. The territory worked over by me cannot be more than four miles square. The specimens collected already number many thousands and the rate at which they are being gathered, who knows but it shall require the chartering of the small schooner now lying in the channel, to carry them down to the City!

Deseo que el lugar que ha sido tan atractivo y productivo en lo pasado para el que se suscribe para siempre permanetea inmutable.
Bolinas, Cal., July 4th.



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The Camaenidae (Part 2): The New World Genera

Richard L. Goldberg P.O. Box 137, Fresh Meadows, NY 11365

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In the first part of this article, I covered a few of the Camaenid genera found in Southeast Asia, including *Albersia*, *Chloritis*, *Camaena*, and the subgenus *Pseudobba* (S&SL Jan., 1985). In the next two parts I will concentrate on the New World genera of the Americas. The New World Camaenids range from northern South America, Central America as far north as Costa Rica, the Caribbean with a large number of species in the Greater Antilles, and Florida (introduced). They vary considerably in size and shape from the 12mm diameter *Pleurodonte guadeloupensis dominicana* Pilsbry & Cockerell, 1937, from Dominica to the 70mm *Polydonte gigantea* (Scopoli, 1876) from Haiti, and the vitriniform *Coloniconcha prima* Pilsbry, 1933, to the globose *Polydonte undulata* (Ferussac, 1819) from Hispaniola.

reportedly collected by M.E. Marie (Maze, generic or subgeneric ranking of various groups of Camaenids under the genus *Pleurodonte*. For consistency, I have followed Zilch (1960), throughout.

marginella can be found living high on the branches of the "flamboyant" tree (*Poinciana regia*) [fig. 3], whereas *P. (C.) carocolla* is found on various trees and foliage, as well as on the ground. All of the species in this subgenus are characterized by their helical-depressed shape with a rather sharply keeled periphery.

Probably the most spectacular species under the genus *Pleurodonte* are in the subgenus *Dentellaria* Schumacher, 1817. As the name implies, the *Dentellaria* species have constricted folds within the aperture which

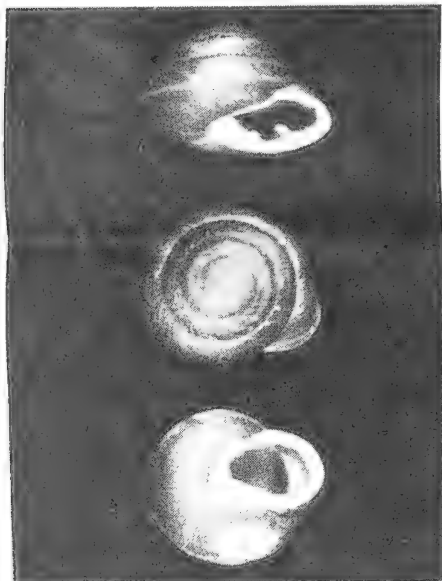


fig. 1. *Pleurodonte lychnuchus* (Mueller, 1774) Basse Terre, Guadeloupe, 25mm.

The structure of the shells in most cases are without teeth, i.e., subgenus *Caracolus*, some *Pleurodonte*, and most of the *Polydonte*. Some genera have well-developed tooth-like folds, which give the shells a labyrinthine appearance, as in the genus *Labyrinthus*, and the subgenus *Dentellaria*. Many of these species are spectacular in form and shape, which makes up for their relatively drab (or lack of) pattern and pigmentation.

The type species of the genus *Pleurodonte* Fischer, 1807, is *lychnuchus* (Mueller, 1774) from Martinique, and Guadeloupe. [fig. 1] The species is characterized by its light to dark brown banding, slightly keeled periphery, one large and one small tooth inside the basal lip, and sparse flecks of tannish cuticle in fresh collected specimens. The species lives aboreally on leaves and branches of foliage. A sinistral species was

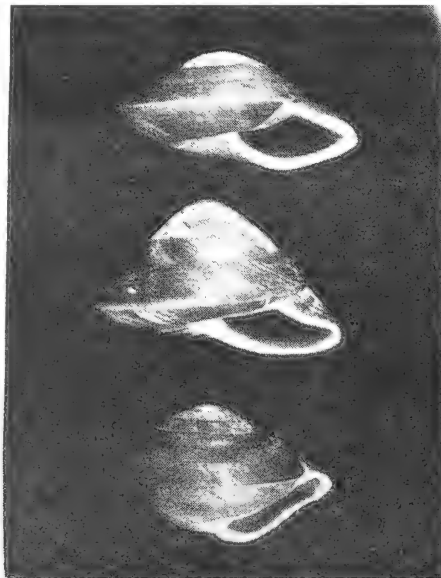


fig. 2. [top] *Pleurodonte (Caracolus) carocolla* (Linne, 1758) El Yunque, Luquillo Rain Forest, Puerto Rico, 60mm. [middle] *P. (C.) excellens* (Pfeiffer, 1853) Palmarito, 6km S.W. of Savana la Mar, Santo Domingo, leg. W.J. Clench, 1937, 57mm. [bottom] *P. (C.) carocolla*, a freak specimen from the same locality as top specimen.

The subgenus *Caracolus* Montfort, 1810, is found through the Greater Antilles, and specifically Cuba, Hispaniola and Puerto Rico. The type of the subgenus is *P. (C.) carocolla* (Linne, 1758) from Puerto Rico. The type of the subgenus is *P. (C.) excellens* (Pfeiffer, 1853) from Santo Domingo. [fig. 2] It differs from the former by its rather elevated spire. As opposed to the rather drab brown coloring of *carocolla* and *excellens*, species like *P. (C.) sagemon* (Beck, 1837) and its varieties from Cuba, and *P. (C.)*



fig. 3. *Pleurodonte (Caracolus) marginella* (Gmelin, 1854) *in situ*, Sabana Seca, west of San Juan, Puerto Rico.

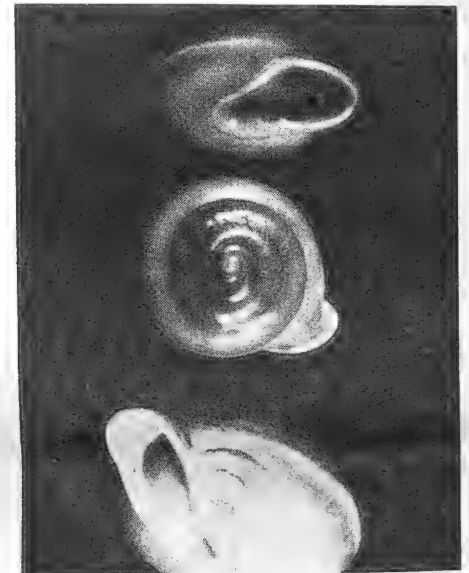


fig. 4. *Pleurodonte (Dentellaria) sinuata* (Mueller, 1774) Fern Gully, St. Ann's, Jamaica, leg. J. Greenlaw, 1983, 27mm. [bottom - close-up of indentations behind outer lip]

form tooth-like structures. This subgenus is confined to the island of Jamaica, where numerous species can be found. The type species of this group is *P. (D.) sinuata* (Mueller, 1774). The apertural teeth appear as indentations behind the outer lip, one for each corresponding tooth. [fig. 4] The



fig. 5. *Pleurodonte (Dentellaria) anomala* (Pfeiffer, 1849) Aberdeen, Trelawny, Jamaica, 25mm.

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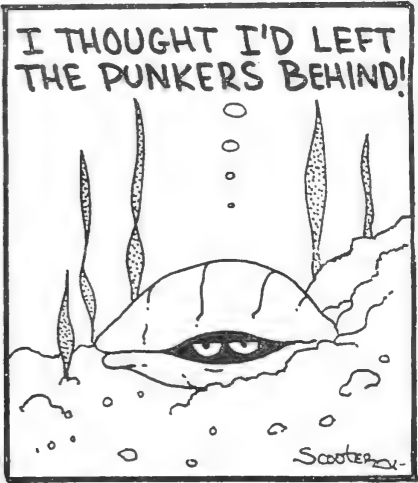
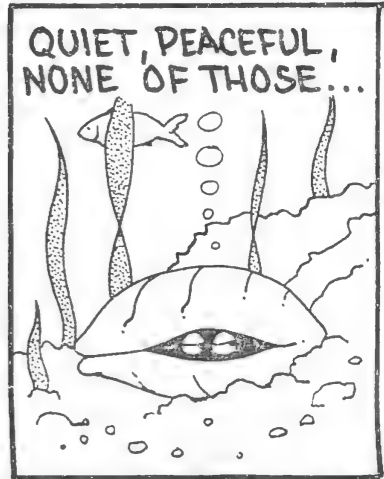
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2nd International Symposium on Indo-Pacific Marine Biology Guam, Truk & Ponape, Sponsored by the Western Society of Naturalists, June 22 - July 9. Contact: David H. Montgomery, WSN Secretary, Biological Sciences Dept., California State Polytechnic University, San Luis Obispo, CA 93407.

American Malacological Union Western Society of Malacologists Joint Meeting, July 2-7, Monterey, California. Contact: Paula Mikkelsen or Margaret S. Mulliner

JANUARY 1986

MONDAY	TUE	WED	THU	FRI	SAT	SUN
<p>DECEMBER</p> <p>M T W T F S S</p> <p>1</p> <p>2 3 4 5 6 7 8</p> <p>9 10 11 12 13 14 15</p> <p>16 17 18 19 20 21 22</p> <p>23 24 25 26 27 28 29</p> <p>30 31</p>	<p>JANUARY</p> <p>M T W T F S S</p> <p>1</p> <p>2</p> <p>3 4 5 6 7 8 9</p> <p>10 11 12 13 14 15 16</p> <p>17 18 19 20 21 22 23</p> <p>24 25 26 27 28</p>	<p>1</p> <p>HAPPY NEW YEAR</p> <p>New Year's Day</p>	<p>2</p>	<p>3</p>	<p>4</p>	<p>5</p>
<p>MONDAY 6</p>	<p>7</p>	<p>8</p>	<p>9</p>	<p>10</p>	<p>11</p>	<p>12</p>
<p>MONDAY 13</p>	<p>14</p>	<p>15</p>	<p>16</p>	<p>17</p>	<p>18</p>	<p>19</p>
	<p>Eastern Orthodox Christmas (Old Calendar)</p>			<p>Central Florida Shell Show</p>		
				<p>Southwest Florida Shell Show</p>		
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number of teeth vary in different species. In the complex of *P. (D.) acuta* (Lamarck, 1816), the number of tooth structures varies, and a variety of form names have been proposed. One of the most beautifully patterned species of this group is *P. (D.) picturata* (C.B. Adams, 1849) [fig. 6] which is covered with an axially radiating hydrophaneous cuticle. Records of this species are from the Westmoreland province of Jamaica. Some species, such as a *P. (D.) anomala* (Pfeiffer, 1844) are umbilicate. [fig. 5] An unusual and distinctive characteristic of this species is its downwardly deflected aperture with an expanded lip, which mimics the nozzle from a Hoover vacuum-cleaner! Species such as *P. (D.) ingens* (C.B. Adams, 1850) and *P. (D.) peracutissima* (C.B. Adams, 1845) [fig. 7] represent the greatest acuteness of the periphery.

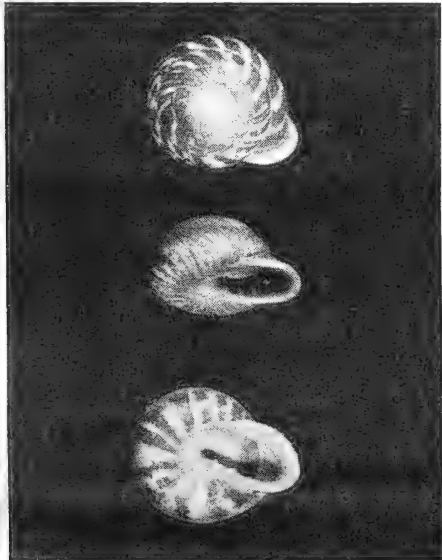


fig. 6. *Pleurodonte (Dentellaria) picturata* (C.B. Adams, 1849) Negril, Westmoreland, Jamaica, 20-23mm.

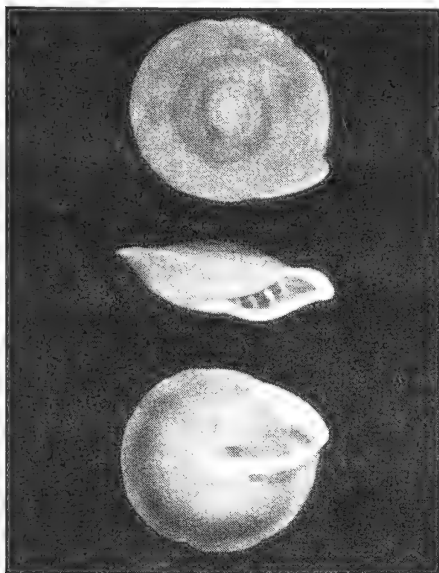


fig. 7. *Pleurodonte (Dentellaria) peracutissima* (C.B. Adams, 1845) Jamaica, 38mm

Two closely related genera which exhibit tooth-like structures within the aperture are *Labyrinthus* and *Isomeria*, of Central and South America. These mainland Neotropical Camaenids are closely related anatomically, but their altitudinal differences

(*Labyrinthus* being found in lowland to medium elevations, and *Isomeria* being found in high mountainous areas), and their distinct conchological characteristics separate these two genera.

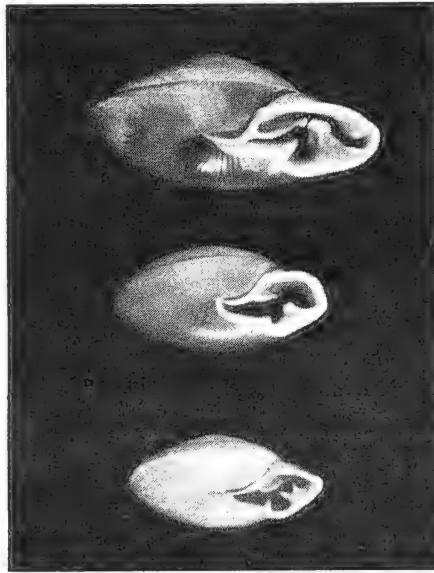


fig. 8. [top] *Labyrinthus otis orthorhinus* Pilsbry, 1910, El Valle, Panama, 51mm. [middle] *L. plicatus* (Born, 1780) Puerto Cabello, Venezuela, 37mm. [bottom] *L. raimondii* (Philippi, 1867) Mera, Oriente, Ecuador, 32mm

The genus *Labyrinthus* Beck, 1837, is found from northern Costa Rica, through Peru, and east into Para, Brazil. The type species of the genus, *L. otis* (Lightfoot, 1786), is from Columbia, and the subspecies *L. otis orthorhinus* Pilsbry, 1910, [fig. 8] ranges from the Columbian-Panamanian border into northern Costa Rica. *Labyrinthus* range in size from approximately 12mm to 70mm, and are characterized by their well-developed apertural teeth. In some species they appear as folds or lamellae, or even as hook-like teeth. In species like *L. otis orthorhinus* the apertural lamellae almost completely choke off the opening! There are 28 recognized species of *Labyrinthus*.

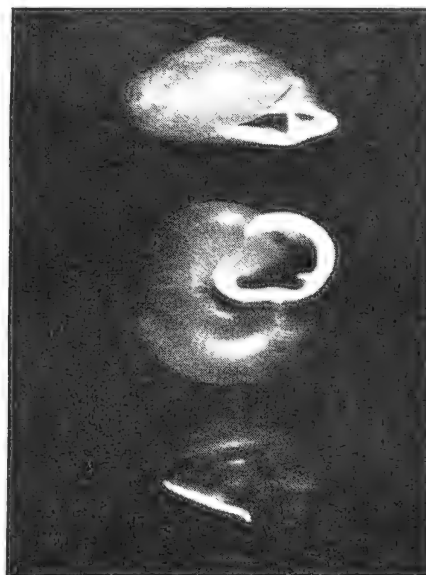


fig. 9. *Isomeria globosa* (Broderip, 1832) Mera, Oriente, Ecuador, 36mm.

The genus *Isomeria* Albers, 1850, on the other hand, have species that are toothless, or a few small to medium size conical lamellae

or denticles. Few of the *Isomeria* have the periphery as acutely angulated as is found with most *Labyrinthus*. The species of this group range from the high elevations of Columbia and Ecuador, into Peru, with the greatest concentration of species being found in Ecuador. As mentioned previously, most *Isomeria* are found at high elevation (762m to over 3048m above sea level), but in one case, *I. globosa* (Broderip, 1832), [fig. 9] it has been recorded from the Pacific lowlands of Ecuador from less than 300m elevation. Dwarfed populations do exist in certain species, which makes size of little importance in identification. As with the *Labyrinthus*, 28 species are recognized in the genus *Isomeria*. The type species is *I. oreas* (Koch, 1844) from Columbia.

The genus *Polydontes* Montfort, 1810, comprises species that range throughout the Greater Antilles, and more specifically eastern Cuba through Hispaniola, Puerto Rico and the Virgin Islands. There has been much disagreement about the placement of several subgenera in the genus. Wurtz (1955) placed the subgenera *Parthena*, *Granodomus*, *Luquillia*, *Hispaniolana*, *Lissembrion*, and *Polydontes* s.s. under the genus *Polydontes*, and *Granodomus*, *Parthena* among others, under the genus *Eurycratera*. Again, for the sake of consistency, I will follow Zilch.

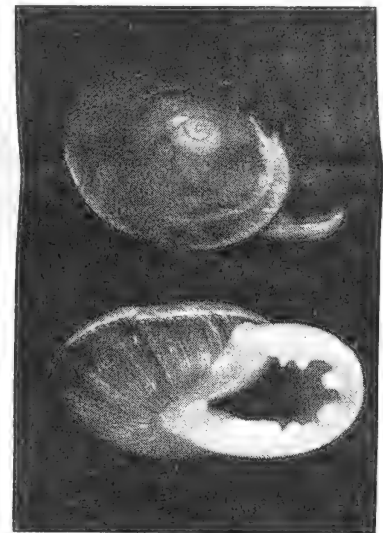


fig. 10. *Polydontes imperator* Montfort, 1810, Loma del Llano, Cape Maisi Region, Oriente, Cuba, 56mm

Polydontes imperator Montfort, 1810, [fig. 10] from Cuba is the type species of the genus, and is one of the most spectacular species of the group. The inside of the outer lip is lined with short blunt white teeth which are a beautiful contrast to the rather drab coloring of the body whorl. Five *Polydontes* species are found in the Oriente Province of eastern Cuba. All are relatively large and solid shells.

The subgenus *Luquillia* Crosse, 1892, is represented by only one species, *P. (L.) luquillensis* (Shuttleworth, 1854) from Puerto Rico. [fig. 11]. This species is not only endemic to Puerto Rico, but has not been found outside the high elevations of the Luquillo Rainforest, where it is relatively scarce. It lives on branches and leaves of



fig. 11. *Polydontes (Luquillia) luquillensis* (Shuttleworth, 1854) El Yunque, Luquillo Rain Forest, Puerto Rico, at 1000m above sea level. On Sierra Palm leaf, 35mm (shell size). Photo by Frank Robb.

trees, but is very hard to spot because it is not a very active species. Only once have I seen this species crawling on the leaf of a palm tree, during a heavy rain on El Yunque Mountain. Other times they were found estivating inside the bracts of bromeliads in palm trees, or the undersides of broad leaves. The species' size averages about 30 mm.

The subgenera *Hispaniolana* and *Lissembryon* [both Pilsbry, 1933] are confined to the island of Hispaniola. [fig. 12] They are characterized by their rather thin shells and globular shape. In most cases they have either a few or many encircling bands. The type species of *Lissembryon* is *P. (L.) dilatata* (Pfeiffer, 1846), and this group is represented by two species. *P. (H.) undulata* (Ferussac, 1819) is the type species of *Hispaniolana*. Seven species are recognized in this group, which also contains the largest species of any of the *Polydontes* subgenera.

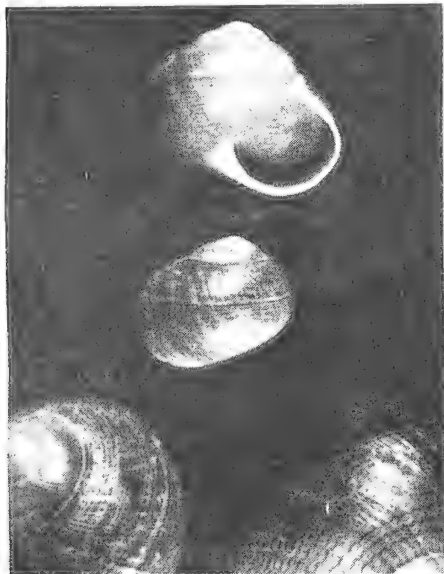


fig. 12. [top] *Polydontes (Hispaniolana) undulata* (Ferussac, 1819) Bassin Blue, Jacmel district, south Haiti, 36mm. [middle] *Polydontes (Lissembryon) dilatata* (Pfeiffer, 1846) Azua, Peravia, Dominican Republic, 30mm. [bottom] Comparison of patterns *P. (L.) dilatata* (left) and *P. (H.) undulata* (right).

The genus *Eurycratera* Beck, 1837, was considered to be a subgenus of *Pleurodonte*, but was given full generic status by Zilch (1960). He places *Thelidomus*, *Granodomus*, *Parthena*, and *Eurycratera* s.s. as subgenera.

Thelidomus Swainson, 1840, is confined to the island of Jamaica with the type species being *E. (T.) aspera* (Ferussac, 1821). [fig. 13] This rather large white species is characterized by its granular surface sculpture, and short tooth-like nodules on the basal lip. The solid white color of this species makes it easily identifiable. A form of *E. (T.) aspera*, *cognata* (Ferussac, 1821), is differentiated by its smooth surface, less produced or lack of tooth structures on the basal lip, and its somewhat tannish-brown coloration with sparse brown spots on the upper part of the body whorl. I have received specimens of this form only from the west end of the island, but suspect that it might have a wider range on Jamaica. It would be interesting to find out whether the typical *aspera* and the *cognata* form are found mixed in the same populations. When compared side-by-side they are quite distinct. The *cognata* form might very well be a valid subspecies.



fig. 13. [top] *Eurycratera (Thelidomus) aspera* (Ferussac, 1821) Mandeville, Manchester Province, Jamaica, 50mm. [middle] *E. (T.) aspera*, form *cognata* (Ferussac, 1821) north of Negril, Westmoreland Province, Jamaica, 48mm. [bottom] Comparison of surface sculpture *E. (T.) aspera* (left) and *E. (T.) aspera*, form *cognata* (right).

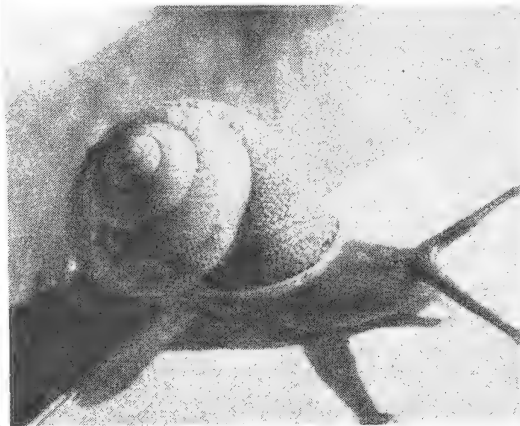


fig. 14. *Eurycratera (Granodomus) lima* (Ferussac, 1821) Hills above Vega Baja, north central Puerto Rico, on dead leaves at base of limestone outcroppings, 26mm (shell size).

The subgenus *Granodomus* Pilsbry, 1931, is represented by two species in Puerto Rico and the Virgin Islands. *E. (G.) lima* (Ferussac, 1821) from Puerto Rico is the type species of the subgenus. [fig. 14] As the name implies, they have a granular, almost beaded surface, although some populations

of *E. (G.) lima* were found to be completely devoid of granular sculpture. The average size is about 25mm. A form of *E. (G.) lima*, *maricao* Clench, 1940, is differentiated by its somewhat stunted, finely granular shell. It comes from the higher elevations in Puerto Rico. At Vega Baja, north central Puerto Rico, at approximately 250m above sea level, I found the typical form of *lima* on leaves and branches of trees on the outside edge of a steep cliff along a mountain road. The form *maricao* was found on the limestone outcroppings just across the road.

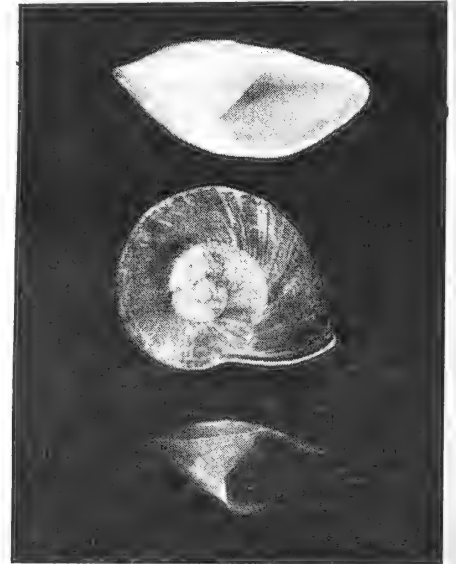


fig. 15. *Eurycratera (Parthena) acutangula* (Burrow, 1815) El Yunque, Luquillo Rain Forest, Puerto Rico. [top] Adult specimen, 43mm. [middle] Uncleaned specimen covered with algae often found on specimens during the rainy season. [bottom] Fragile juvenile specimen, 29mm.

The subgenus *Parthena* Albers, 1850, is found in Haiti and Puerto Rico with two species recognized. *E. (P.) acutangula* (Burrow, 1815) from Puerto Rico is the type species of the subgenus. [fig. 15 top] The shells of this species are rather thin and transparent when held up to a light, and adult specimens range in size from about 35-50mm. Specimens I collected in the Luquillo Rain Forest were covered with a thin algae from the large amount of rain that falls in this area. [fig. 15 middle] It is an aboreal species mostly found on leaves and branches of trees and Sierra palms in the higher elevation rain forests of the east end of the island. During the dry season, *E. (P.) acutangula* can be found inside the water-filled bracts of the aboreal bromeliads, as with other members of the *Polydontes* genus. The animal greatly exceeds the shell size, and it is amazing that it can retract back into the shell. [fig. 16] The animal exudes a slimy yellow mucous which is virtually impossible to wipe off your hands or collecting receptacle without a good scrubbing of soap and water! The animal's color is a pretty yellow, with a black coloration to its head, and a bright reddish-orange border around the edge of the foot. A synonym of *E. (P.) acutangula* is *angulata* (Ferussac, 1821).

Eurycratera s.s. is confined to Jamaica, and the type species is *jamaicensis* (Gmelin, 1790), and the only species of this subgenus. [fig. 17] The species is immediately identifiable by its distinctive, large, globose body whorl. It is quite rare, and at one time was

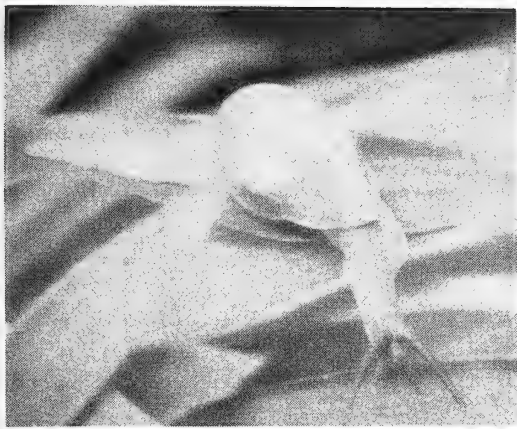


fig. 16. *Eurycratera (Parthena) acutangula* (Burrow, 1815) El Yunque, Luquillo Rain Forest, Puerto Rico, at 792m above sea level, in dense foliage, 44mm (shell size). Photo by Frank Robb.

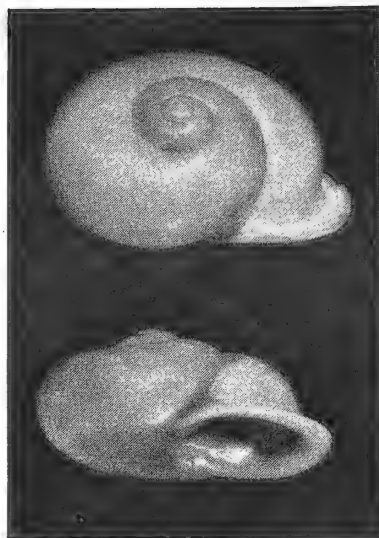


fig. 18. *Zachryisia (Megachryisia) petitiiana* (Orbigny, 1841) Trinidad Mountains, Santa Clara, central Cuba, 62mm (periostracum removed).

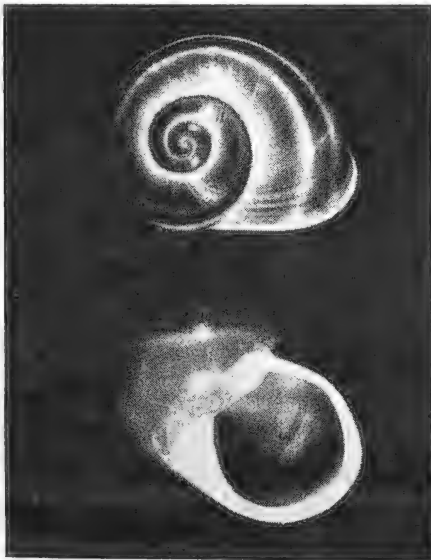


fig. 17. *Eurycratera (E.) jamaicensis* (Gmelin, 1790) Lincoln, Jamaica, 54mm

thought to be extinct. I have seen only dead collected specimens from isolated areas around Jamaica.

The genus *Zachryisia* Pilsbry, 1894, has a central distribution throughout Cuba, but have been introduced into south Florida from Miami into the Florida Keys, the Bahamas, the Canal Zone of Panama, the Yucatan and Puerto Rico. *Z. (Chrysius) provisoria* (Pfeiffer, 1858) [fig. 19 top] is the only representative of the Camaenidae in the eastern United States. The genus is divided into four subgenera based upon anatomical differences. The subgenera include *Zachryisia* s.s., *Auritesta*, *Chrysius*, and *Megachryisia*, the latter three proposed by Pilsbry in 1928. The largest species of the genus is *Z. (Megachryisia) petitiiana* (Orbigny, 1841) from central Cuba, and is the type species, and only species of the subgenus. [fig. 18] The subgenus *Auritesta* is characterized by their rather compressed and twisted shape. *Z. (A.) torrei* (Henderson, 1916) is the most compressed of this group. [fig. 19 bottom] The type species of the subgenus is *Z. (A.) proboscidea* (Pfeiffer, 1856). They are limited to Oriente Province of eastern Cuba. *Zachryisia* s.s. has two species — *auricoma* (Ferussac, 1821) (with two forms) [fig. 19 middle], and *rangelina* (Pfeiffer, 1854) —

considered by some to be a synonym of *auricoma*. *Zachryisia auricoma havanensis* Pilsbry, 1894, has been introduced into Puerto Rico where it inhabits the northern coastal plain between Arecibo and Toa Alta. I have found adult and juvenile specimens on the limestone outcroppings along the mountainous roads above Vega Baja. [fig. 20] The introduction of this species to Puerto Rico must have been within the past 40 years, since the first record of it was by Van der Schalie (1948). A species of this size most certainly would have been recorded earlier by naturalists if present. This form has also been introduced into Panama and the Yucatan. In Puerto Rico, I have found this species to be subarboreal; during the rainy season it can be found crawling on leaves and vines over-hanging limestone

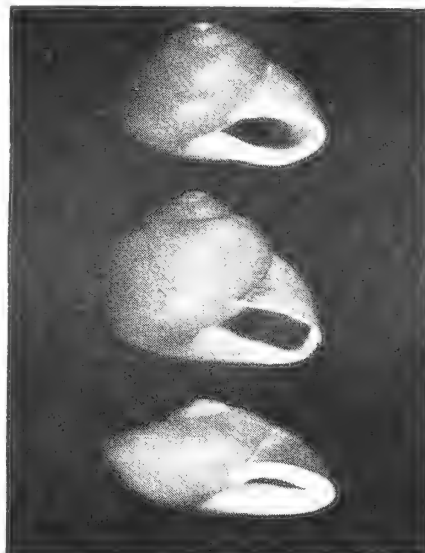


fig. 19. [top] *Zachryisia (Chrysius) provisoria* (Pfeiffer, 1858) New Providence, Bahamas, 25mm (introduced species). [middle] *Zachryisia auricoma* (Ferussac, 1821) Arroyo Naraujo, Pinar del Rio, Cuba, 27mm. [bottom] *Zachryisia (Auritesta) torrei* (Henderson, 1916) Caijo Rey, Oriente Province, Cuba, 31mm.

outcroppings, and during the dry season buried in rotted leaves and mulch on the ground at the base of these outcroppings. *Z. a. havanensis* is differentiated from typical *auricoma* by its smaller size, and the

columellar plate being strongly truncate at the base. All of the *Zachryisia* species are characterized by their few-whorled yellowish shells.

The genus *Solaropsis* Beck, 1837, in most literature is included under the Camaenidae, but Wurtz (1955) stated "it apparently represents a very ancient stock and its affinities are not known." Zilch (1960) though, has also included *Solaropsis* in the Camaenidae. I will outline this genus in a future article. Presented here are just some of the more showy American Camaenid genera and subgenera. In the next part of this article, I will cover the genus *Amphidromus*.

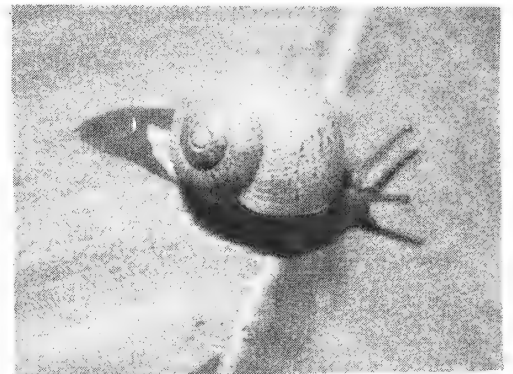


fig. 20. *Zachryisia auricoma havanensis* Pilsbry, 1894, hills above Vega Baja, north central Puerto Rico, at 250m above sea level, a juvenile specimen, 18mm (shell size).

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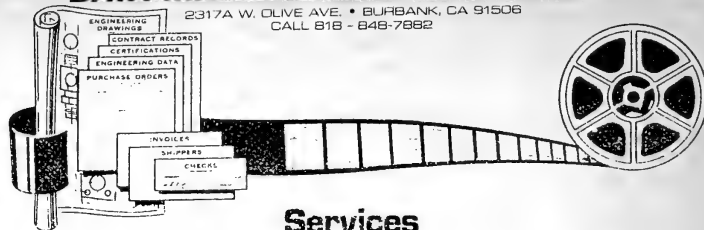
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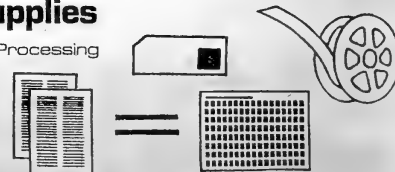
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"	vulpecula L, black form, Indonesia	52mm+	F	8.50
*VOLUTA	arasiaca Light, w/o, great color, rare, Maldives	48mm+	F+/G	4.00
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"	dufresnei Don, orange aperture, nice glaze, Brazil	25mm	G	30.00
"	lorisi Val, peach, dark lines, Nicobar Is.	116mm+	F	8.50
"	olla L, w/perio, large and nice, Portugal	67mm+	F+	22.50
GLOSSUS	humanus L, some w/perio, unusual colled umbo, Italy	103mm+	F/F+	7.50
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*PECTEN	gemmaulata Ave, variable, lovely shades, New Zealand	36mm+	F	1.00
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Bornella semperi Crosse, 1875 from Noumea, New Caledonia

K. Baba¹ & I. Hamatani²

¹Shigigaoka 35, Minami-ll-jyo, Sango-cho, Ikoma-gun, Nara-ken, Japan 636

²2-18-24 Bessho-cho, Kishiwada-shi, Osaka, Japan 596

Bornella semperi Crosse, 1875. Figs. 1-4.

Bornella? sp. Bergh, 1870: pl. 1, f. 3-5 (name and figures only).

Bornella sp., Semper, MSS. Bergh, 1874:289. Luzon (Semper) (list only).

Bornella semper Crosse, 1875b:324-325. Luzon (Semper).

non *Bornella caledonica* Crosse, 1875a:318-319, pl. 12, f. 10. Noumea.

Material:

Noumea, N. Caled., VIII-9-1982, 1 sp., coll. and fig. from life by Hamatani, length 25mm; anatomy by Baba.

Range: Philippines (Luzon), the type locality; New Caledonia (Noumea).

Body yellowish white, dorsally reticulated with orange yellow, digitiform processes each having a subapical ring of the same color. Four pairs of cerata, the first cerata on each side bifid, the rest as a rule simple, each cerata provided with 2 branchial plumes. Radular formula 40x9-10.1.9-10; medium cusp of the central tooth smooth, non-denticulated on the edge. Jaw-plates as usual in the genus. Stomach armed, liver passing into cerata, distal opening of vas deferens encircled with blackish brown hooks, with 6 gonads.

This specimen was referred to *B. semperi* because of the morphology and arrangement of the cerata on back margins. The smooth median cusp of the central tooth in connection with the presence of a circlet of hooks on the vas deferens is also characteristic to *B. semperi*.

The authors (K.B. & I.H.) are indebted to Dr. W.B. Rudman (Australian Museum, Sydney) for taking reproduced copies of part of Bergh's 1870 and 1874 papers.

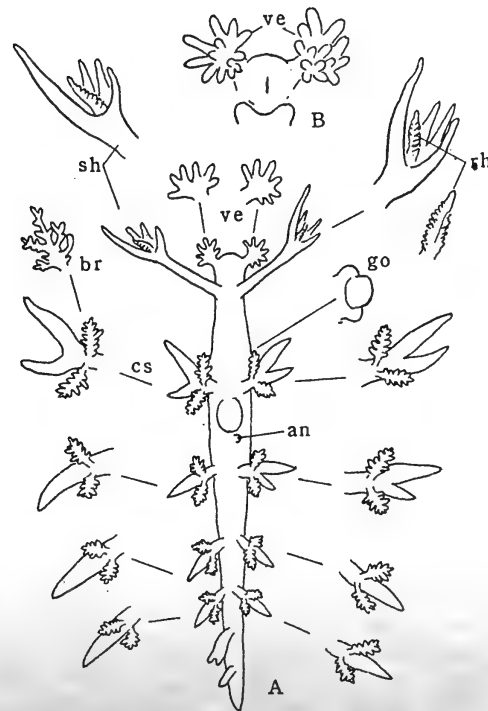


Fig. 2. A. Preserved animal from above; B. head and foot from below.

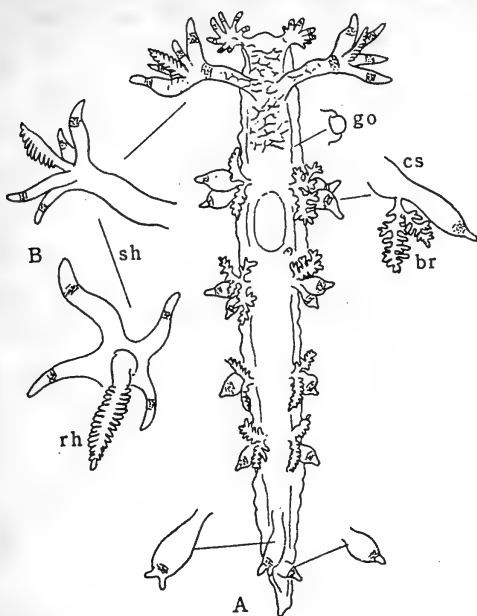


Fig. 1. A. Living animal from above (length 25mm); B. different views of rhinophoral sheath.

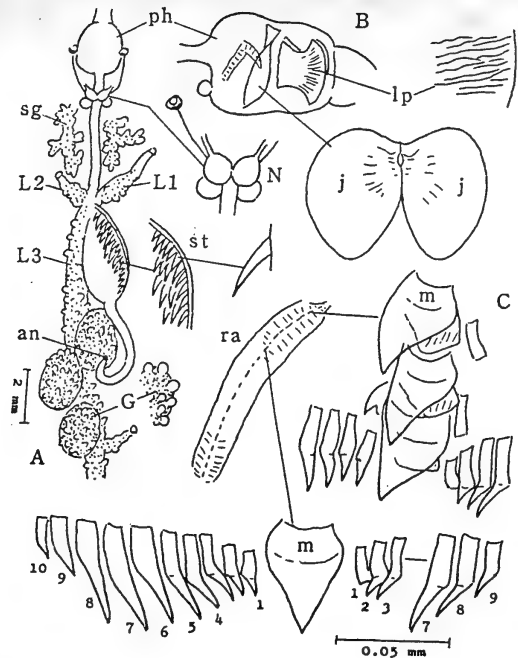


Fig. 3. A. Digestive system from above; B. pharynx with internal structures; C. radula and radular rows.

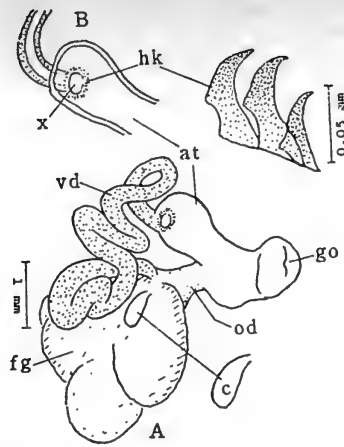


Fig. 4. A. Genital system from above; B. male armatures.

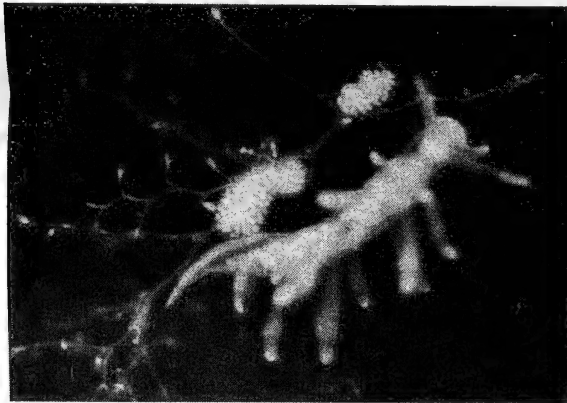
an - anus; at - atrium; br - branchial plume; c - spermatocyst; ca - ceras; fg - female gland mass; G - gonad; go - genital orifice; hk - hooks; j - jaw-plate; lp - lip plate; L1 - right liver; L2 - left liver; L3 - posterior liver; m - central tooth; N - nerve center; od - oviduct; ph - pharynx; ra - radula; rh - rhinophore; sg - salivary gland; sh - rhinophoral sheath; st - stomachal plates; vd - vas deferens; ve - velum; x - opening of vas deferens.

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READER FORUM

From I.S. Roginskaya: Thank you very much indeed for beautiful no. 3 and no. 4 of "Shells and Sea Life" that, contrary to my fears, safely arrived today! So many interesting papers and wonderful color photographs of living mollusks; from the paper of R. Anderson (no. 4) at last I have seen what the living *Tochuina tetraquetra* is like, and also learnt some remarkable details about this species!



Two photographs of *Eubranchus exiguus* and his egg-masses are enclosed, with some "news from the shore." *Eubranchus exiguus* (Alder & Hancock), the smallest White Sea nudibranch (1-10mm) in warm season forms numerous and rather stable populations in the hydroid fouling of the intertidal zone of Kandalaksha Bay (near the White Sea Biological Station of MSU). In the White Sea, where summer exhibits a tendency to move towards autumn, the spawning of this boreal species starts not earlier than at the end of June and the most reproduction occurs in summer and early autumn. The last egg-masses of *E. exiguus* are still observed at the end of September. [ed. — each egg in the photo is approximately 0.1mm diameter] The minute reniform spawns of *E. exiguus* with small number of eggs (usually 19-220) are attached mainly to *Obelia*, overgrowing algae, underwater parts of boats and piles, floating artificial substrates of the fouling study etc. More than seven egg-masses can be laid by one specimen throughout the breeding season. The volume of the egg-capsules (each enclosing only one egg, with mean diameter 95.5 um) increases considerably in the course of development, especially beginning from the time of larval shell formation. The hatching of free-swimming veligers (shell of Type 2) in aquaria takes place on or about the seventh day after oviposition ($T^{\circ}=14, 5-14, 8^{\circ}\text{C}$). Late autumn, winter and early spring are characterized by the complete decline of intertidal populations of *E. exiguus*: neither adults, nor their spawn were observed until next spring when approximately two weeks before the beginning of emergence of first *E. exiguus* in the littoral zone, the adults are occasionally caught by plankton net. Isn't, perhaps, the first sign of onset of ashore breeding migration, realized by water currents? — Dr. I.S. Roginskaya, P.P. Shirshov Institute of Oceanology, Academy of Sciences of the USSR, 23, Krasikova St., Moscow, USSR, 117218

* * * * *

From Roland Anderson: Much verbiage has been written in *Shells and Sea Life* recently concerning the AMU list of common names of mollusks. As an exhibitor of marine invertebrates I am frequently in a quandry as to what common names to use when labeling my animals. Should I use the common name listed by the AMU, or the common name used by native Americans? As much as possible I use names that local people will recognize, names I judge are the most commonly used by lay people, who are the ultimate judge of any common name. The venerable Libbie Hyman in 1955 in her treatise on echinoderms suggested that "zoologists drop the name starfish in favor of sea stars, as the former is apt to mislead the public." Today, thirty years later, under "sea stars" in Webster is the succinct "see starfish," which suggests that the public has not been misled at all. The AMU list is a good working tool, but the public is the ultimate authority on common names. — Roland Anderson, Invertebrate Biologist, The Seattle Aquarium, Pier 59, Seattle, WA 98101

* * * * *

PERSONAL NOTES

From **Bradford Randall Norman** During my summer employments in Alaskan waters I made extensive collections of the organisms encountered. I can offer specimens or series of specimens to researchers for taxonomic research. This includes some of the more remote coastal areas of Alaska and Washington State. — Bradford Randall Norman, 7811-1/2 Grant Drive, Everett, WA 98203.

MARGINELLIDAE wanted for worldwide research — common or rare. I am working toward revising the family worldwide. Most important currently is a revision of the genera worldwide which involves extracting radulae from as many species as possible. [To date I have prepared over 70 slides]. I am also currently revising many species groups (W. Afr. *Glabella*, W. Atl. *Granulina*, W. Atl. *Volvarina*, plus many others.) I am looking for more material for my study collection (recent & fossil) but I especially need specimens with the animal inside for radular extraction. But shells of deepwater and small species are also wanted, as well as "grunge" samples. Will buy or exchange (I have a very large, ca. 80,000 specimen worldwide collection of all families). — Gary A. Covert, Dayton Museum of Natural History, 2629 Ridge Ave., Dayton, OH 45414 or home: 36 Prospect Ave., Dayton, OH 45415

From **Dr. Eveline Marcus**: I am working at the revision of the genus *Phyllaplysia* with a new species. I still need more specimens from the Brazilian coast. I have found a color type in the papers that may also turn out to be a new species, but I need to get the radula. — Dr. Eveline Marcus, Caixa Postal 6994, 01051 Sao Paulo, Brazil. [ed. — Dr. Marcus has recently been honored by Marseille University (France) with a Doctor H.C. title. Congratulations!!]

From **June King**: Several times in the last few months I was about to write to you people to ask what was going on & could I have a complete book list. Well, I tend to be lazy & procrastinate — and I'm glad I did — for getting all of those editions at one time enabled me to make out my list of book wants — the 1st group of books I want are enclosed. Another list will come later as my budget permits.

I'm not sure I like your newspaper type publication — but I understand why you're doing it and I applaud your efforts and your success in publishing under what must be at times excruciating circumstances. — June King, 4269 Hawk St., San Diego, CA 92103

National Marine Fisheries Laboratory, Sandy Hook, New Jersey. On September 21, 1985, an intentionally set fire destroyed the library and several hundred thousand dollars worth of equipment.

From **Dr. Norman D. Paschall**: Returned from Costa Rica trip to find duplicate copies of the last 4 issues in my mail. General opinion at Orlando Shell group & the 14 on the Costa Rica trip as well as other shell correspondence say "It's a 'glorified price list' for your books." Need a lot more articles on shells & shell trips etc. Get back to a magazine type of publication like Rice's S & Shore. At best they all feel this is a trashy "throw away newspaper."

Successful trip to Costa Rica. Collected *Epitonium gradatum* Sowerby & *Epitonium canna* Dall at Tamarino Bay. Lots of Rock species, *Conus* and *Cypis*. Off to Rio Dec. 28 - Jan. 12 if we can get a Brazil visa by then. Watch your dupe's. Cost money you can use for a magazine type like Sea & Shore was. — Norman Paschall, 2695 Frances Dr., Deland, FL 32724.

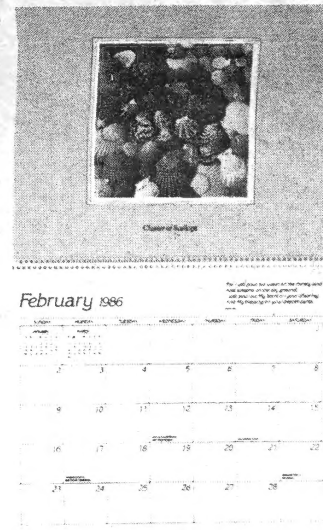
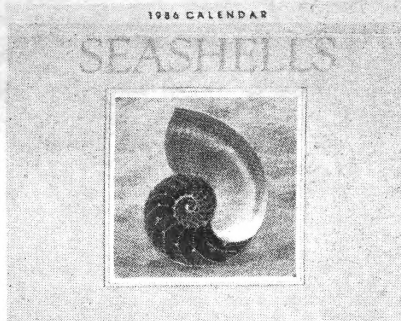
Dr. Jerry Haraseywich (Smithsonian Inst.) recently spent some time with Dr. R. Tucker Abbott. Hope to hear some news on the long-term disposition of **The Nautilus** soon.

Seashells

1986 CALENDAR

Colorful treasures plucked from the sand and sea adorn each page of this charming calendar. Accompanying each photograph taken by Pete Carmichael is a legend of the shell: its name, description, and where it can be found. A unique collection for armchair beachcombers!

Product #14620
ISBN 0-89505-312-8
12" x 10"
\$6.95

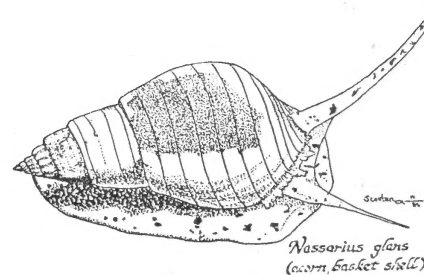
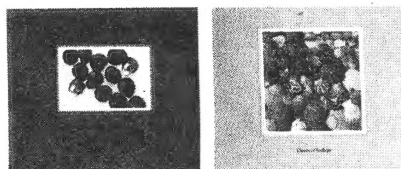
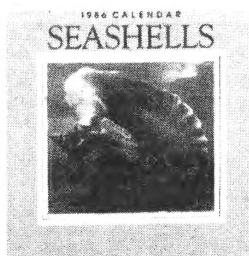


Seashells

1986 PERSONAL-SIZE CALENDAR

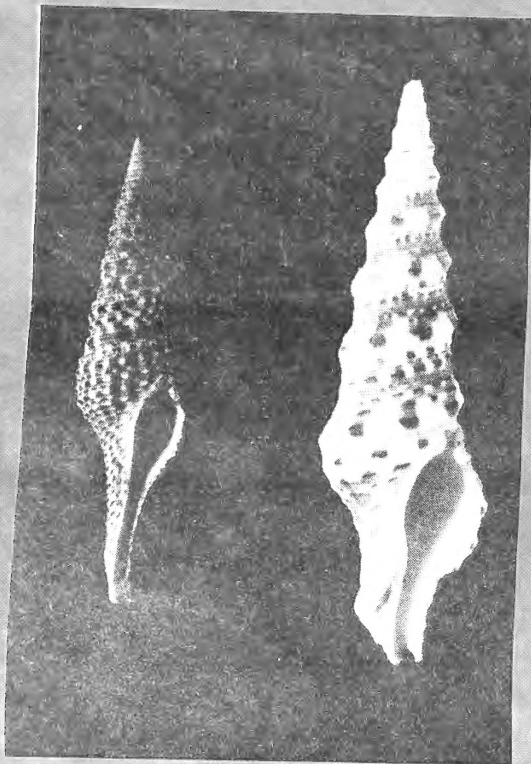
Carry your seashell collection everywhere—it's easy to do with this convenient personal-size calendar with photographs by Pete Carmichael. Each month features a different sea-treasure—like the tropical Purple Sea Snail, the delicately beaded Strawberry Top Shell, and the glistening, iridescent Abalone. The calendar's handy size makes it small enough to fit in purse or drawer, yet roomy enough to record all sorts of reminders.

Product #14700
ISBN 0-89505-322-5
5 3/4" x 5 3/4"
\$3.25

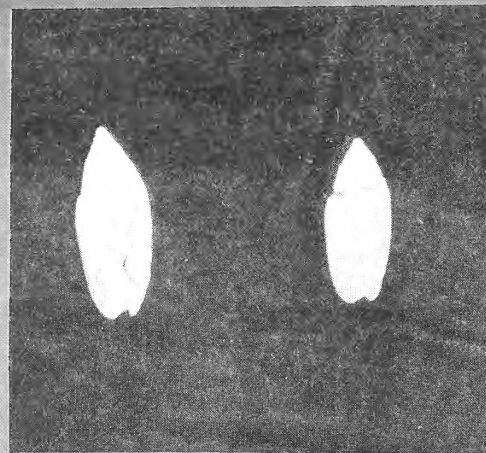


Fijian Shells

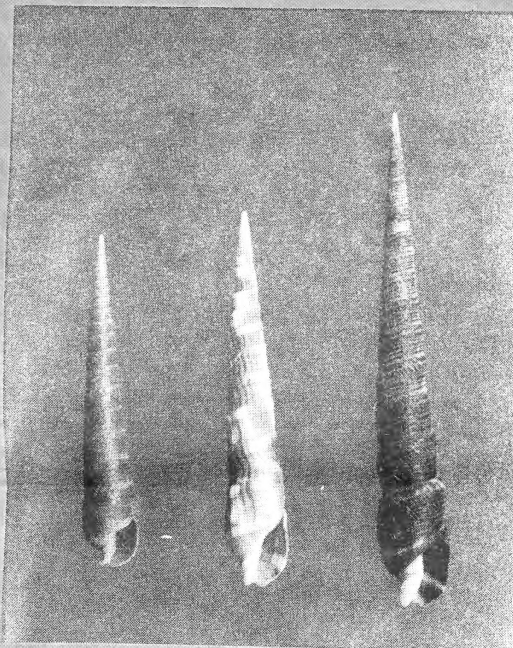
Kolinio Vola, Lami, Fiji



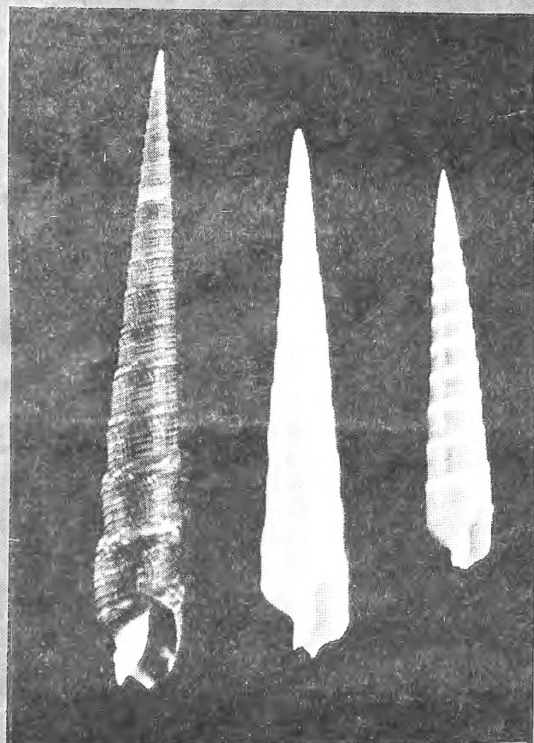
Left - *Turris spectabilis* Reeve; Right - *Turris crispa* Lamarck



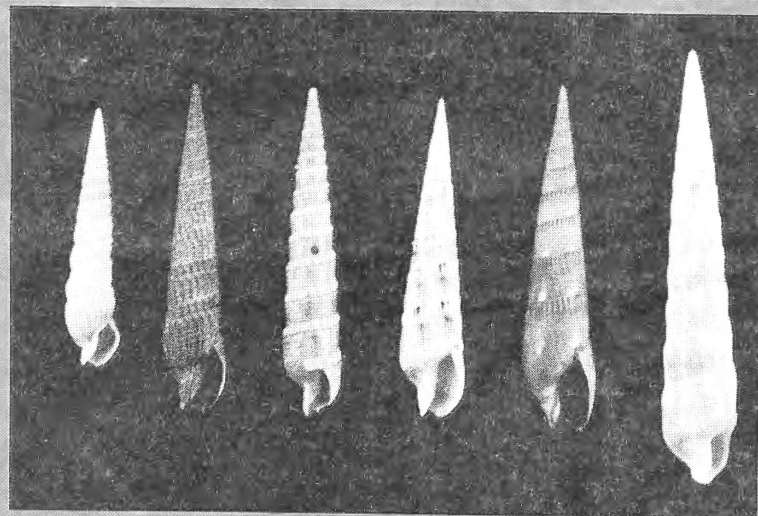
Left - *Oliva* sp.; Right - *Oliva paxillus* Reeve



Left - *Terebra punctatostriata* Gray; Middle - *Terebra nebulosa* Sowerby; Right - *Terebra commaculata* Gmelin



Left - *Terebra commaculata* Gmelin; Center - *Terebra succinea* Hinds; Right - *Terebra cingulifera* forma *albomarginata* Deshayes



From Left - *Terebra* sp.; *Terebra succincta* Gmelin; *Terebra amanda* Hinds; *Terebra amoena* Deshayes; *Hastula cernohorskyi* Burch; *Terebra montgomeryi* Burch - Right

Phase scan
under barcode:

39088012887731