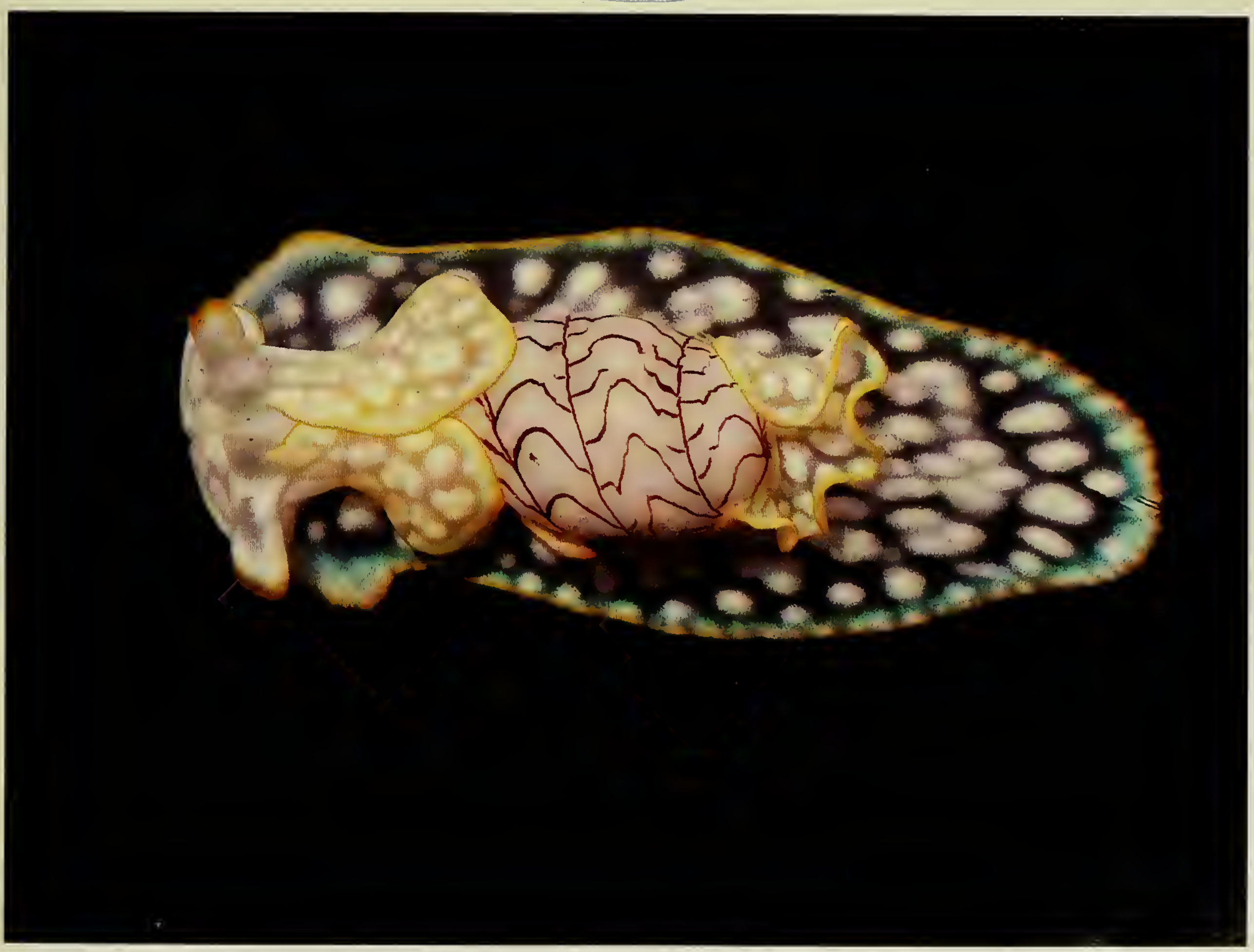
SHELLS AND SEA LIFE

FORMERLY THE OPISTHOBRANCH

MAY, 1984
$2.50

Volume 16, Number 5
Page 49



Living Guam Bubble Shell (*Micromelo undatus*) from 8 m off Cape Byron, northern New South Wales, Australia. Photograph by R. C. Willan.

The Guam Bubble Shell *Micromelo undatus* (Brugiére, 1792) in Australia

by Richard C. Willan

This attractive shelled opisthobranch is recognizable by its smooth, involute shell marked, as if by an accurate computer plotter, with a mesh of three dark spirals and numerous, wavy, intersecting radial lines. The animal's capacious foot, which can reach 23 mm when fully extended, is margined in subtlest turquoise and gold and boldly white-spotted. The sinuous head shield and infrapallial lobe carry white spots too, but their borders are yellow. The beauty of a living *Micromelo undatus* is never to be forgotten; a delight that, unfortunately, is seldom experienced by Australians because of its uncommoness. Its range extends down the eastern coast of that continent to northern New South Wales, and it is near their southern limit that I have encountered three living specimens in four years.

Actually one could hardly call my first specimen "living". The animal was being devoured by a predatory mitre shell (*Vexillum cadaverosum*). However, the two specimens that I found subsequently were very active and they survived well in the laboratory allowing me to observe and photograph them (see colored illustration). I found all three specimens between 8 and 10 metres on a substrate of clean sand and coral rubble supporting a little turfing algae.

The shell's opacity obscures the interesting features of its mantle cavity - two raised ciliated ridges (raphes), a complex gill and a large rearward extension of the mantle cavity (pallial caecum) that extends as a spiraling tube from the right posterior corner of the cavity to the very top of the visceral mass. Rudman (1972a) studied the anatomy of Hawaiian *Micromelo undatus* and concluded the species should be located in the family Hydatinidae on account of the animal's large, non-retractile and brightly-coloured animal, lack of operculum, relatively long oral tube, nervous system and radular structure.

Despite the certainty of the familial placement for the Guam Bubble, doubt remains over its correct generic and specific names. Mr. Robert Burn of Geelong, Australia, is currently investigating the generic nomenclature. And there is controversy too about the specific name because of the shell's shape and coloration. Differences in shell shape between populations from the Pacific Ocean (presently called *Micromelo guamensis* (Quoy & Gaimard, 1825)) and Atlantic Ocean (*Micromelo undatus* (Brugiére, 1792)) are not significant and the differences in colour of the lines on the shell - either red or black - appear to be merely intraspecific variation. Some specimens from the Atlantic Ocean (where the species is also widely distributed) have black-lined shells (Rosewater, 1975) but others have red-lined shells (Warmke & Abbott, 1961; Marcus & Marcus, 1967; Abbott, 1974; Humfrey, 1975). Pacific Ocean specimens display the same colour variation: black in Hawaii (Kay, 1979; Bertsch & Johnson, 1981); black in the Philippines (Abrea, 1981 - though the illustration of the animal is grossly inaccurate); red in my Australian specimens; red in the Solomon Islands (Quayle *in* Coleman, 1982). Separations based on these colour differences appear over-exact, as conchological features sometimes are in the Cephalaspidea (e.g. Marcus, 1977), because the animal shows little variation in either Atlantic or Pacific Oceans. Salisbury (1983) mentioned the colour of the animal's foot varied from pale green to transparent white. Incidentally, I have a colour slide of a living specimen from South Africa, and this time the shell's lines are reddish-black. It appears, therefore, that the two shell colour morphs are not discrete nor geographically clinal in either Atlantic or Pacific populations.

The Guam Bubble must possess a veliger stage capable of long-distance transport to account for the species' enormously wide distribution across the tropical oceans. I suggest *Micromelo undatus* and *M. guamensis* are conspecific with the one species, which by priority should be *M. undatus,* widespread in the Pacific and Atlantic. Rudman (1977b) reached this same conclusion for another member of the same family, *Hydatina physis* (Linneaus, 1758).

REFERENCES

Abbott, R.T. 1974. American Seashells (2nd ed.) Van-Nostrand Reinhold. 663 pp.

Abrea, N.S. 1981. Description and illustration of unknown cephalaspid from northern Mindanao, Philippine Islands. Hawaiian Shell News **29** (9) : 9.

Bertsch, H. & S. Johnson 1981. Hawaiian Nudibranchs Oriental Publishing Co. 112 pp.

Humfrey, M. 1975. Sea Shells of the West Indies. Collins. 351pp.

Kay, E.A. 1979. Hawaiian Marine Shells. Reef and Shore Fauna of Hawaii. Section 4 : Mollusca. Bernice P. Bishop-Museum Special Publication **64** (4). 653 pp.

Marcus, Eveline 1977. On the genus *Tornatina* and related forms. The Journal of Molluscan Studies. Supplement **2.** 35 pp.

Marcus, Eveline & Ernst Marcus 1967. American Opisthobranch Mollusks. Studies in Tropical Oceanography, Miami **6.** 256 pp.

Quayle, N. 1982. Photograph of live *Micromelo*. P. 14, IN: Coleman, N. (Ed.) Underwater **2.**

Rosewater, J. 1975. An annotated list of the marine mollusks of Ascenson Island, South Atlantic Ocean. Smithsonian Contributions to Zoology **189.** 41 pp.

Rudman, W.B. 1977a. Studies on the primitive opisthobranch genera *Bullina* Ferussac and *Micromelo* Pilsbry. Zoological Journal of the Linnean Society **51**(2) : 105-119.

Rudman, W.B. 1977b. The anatomy of the opisthobranch genus *Hydatina* and the functioning of the mantle cavity and alimentary canal. Zoological Journal of the Linnean Society **51**(2) : 121-139.

Salisbury, R. 1983. Photograph of *Micromelo* shell from Guam. Hawaiian Shell News **31** (2) : 7 (page of shell illustrations).

Warmke, G.L. & R.T. Abbott 1962. Caribbean Seashells. Livingston Publishing Co. 348 pp.

Editor's Notes:

Several subscribers have expressed concern with the expanded coverage of the **Opisthobranch** (see Jensen "Personal Notes" for example). I hope that everyone will gain with the expansion into all areas of malacology. I hope to see the journal grow even larger than the current 20 pages monthly and see articles on every aspect of malacology, shell collecting and related areas. All you have to do is write the articles. I am far from having problems with too much material.

I consider myself to be an amateur and believe very firmly that amateurs can have a major impact on the science of malacology. The data we collect, or in my case, the information I collect, can, and often does assist formal research. In addition, many of the institutions where the professionals learn and work were originally founded, and/or are currently funded, by amateur malacologists.

Professional malacologists have always given me so very much support and encouragement. They have shown time and again their willingness to exchange information with me as an amateur. The most "important" malacological professionals have always seemed to be the first ones to offer help. They must realize the contributions that shell-collectors, students, and amateurs make. Why do you think there were somewhat over 100 of S. Stillman Berry's "Berry's Boys?" (See Jack Brookshire's biographical notes on Berry in this issue.)

Please consider joining and supporting your local malacological society or club. R. Tucker Abbott's appeal in "Personal Notes" has sound reasoning. In addition to the "National" shell organizations you should also look at the "International," "Regional" and more "Local" shell groups. All consider furthering the study and enjoyment of mollusks to be their primary purpose. The **Opisthobranch** will provide information on many of these groups as space permits.

Concurrent with production of the **Opisthobranch**, I am typesetting and proof-reading the Western Society of Malacologists' Annual Report. The type is almost set and will get to a printer as soon as the remaining type can be set and pasted up.

The publication date for the April issue of the **Opisthobranch** was April 21, 1984.

Thanks to Mr. and Mrs. Gilbert Davis [Manchester, England] for lots of help and encouragement during their recent stay in Phoenix. Thanks also to Jonathan Bennett and Kristin Long for their assistance with mailings.

Thanks to the many people who make the **Opisthobranch** possible. A very special thanks to Eveline Marcus for her support over the years. She is our first "Lifetime Subscriber." Thanks to Stu Lillico and **Hawaiian Shell News** for the nice notice on the **Opisthobranch** in their April issue. R. Tucker Abbott continues to assist us in so many ways.

ISSN 0747-6078

Monthly Features

Miscellanea .... Sally Bennett
Notes from Hans Bertsch .... Hans Bertsch
Classification Notes .... Kay C. Vaught

The **Opisthobranch** is open to articles and notes on any aspect of malacology -- or related marine life. Deadlines are the first day of each month. Articles submitted for publication are subject to editorial board review and may include color or black and white illustrations.

Short articles containing descriptions of new or repositioned taxa will be given priority provided the holotype(s) have been deposited with a recognized public museum and the museum numbers are included with the manuscript. We undertake no responsibility for unsolicited material sent for possible inclusion in the publication. No material will be returned unless accompanied by return postage and packing. The author will receive 10 free reprints. Additional reprints will be supplied at cost provided they are ordered before printing.

The **Opisthobranch** is published monthly by Steven J. Long and Sally Bennett, 505 E. Pasadena, Phoenix, AZ 85012-1518 U.S.A. Telephone (602)274-3615. Subscriptions are only available by calendar year volume (January-December). U.S. Bulk Mail subscription rates are $15.00 per year for individuals or $30.00 per year for libraries. U.S. First Class mail and Foreign Subscription rates are $20.00 per year. Add $10.00 for Air Mail postage. All back volumes are available. Write for details. Rates are subject to change without notice. Arizona residents must add sales tax.

Floating docks: unique microcosms lie just beneath your feet

by Sven Donaldson and Sandra Millen

When you tie your boat up to a floating dock, it is unlikely that you ever stop to think that just a few inches underfoot is a different world — a veritable jungle of marine organisms. However, if you lie face down on the dock and hang your head over the edge (behavior common to kids, but rare in sober adults), you can see a wealth of marine life. Float communities are often comprised of groupings of plants and animals found together nowhere else, not because the substrate they live on is man-made, but because the physical environment they encounter is unique. Floating docks are very shallow subtidal habitats, yet ones that are often left relatively undisturbed year after year. Like intertidal communities, but unlike deeper subtidal communities, the plants and animals dwelling on floats are subject to substantial and abrupt variations in temperature and salinity.

Salinity changes in nearshore marine environments generally occur because freshwater is less dense than seawater and tends to form a floating surface layer. Particularly in early summer, when freshets are strong and mixing caused by storms is rare, a clear cut line of demarcation called a halocine forms between fresh surface waters and the salty waters below. Scuba divers frequently swim through the halocine — a murky-looking, turbulent area — usually found at depths of 10 to 15 ft. Because the presence of fresh surface water is transitory, wharf-dwellers (as well as intertidal and shallow subtidal organisms) are frequently exposed to grueling salinity fluctuations.

Temperature variations in surface waters come about because summer sun warms the surface waters, and, at low tide also warms the mud and rocks that an incoming tide then covers. Just as salt water becomes less dense as it is diluted, its density also decreases when it is heated. Unless mechanical mixing occurs, the warm water tends to separate into a comfortable surface layer atop the remaining much colder water. The effect is particularly pronounced in freshwater lakes, where you will usually encounter an unmistakable thermocline at a depth of six to eight ft. Many marine organisms find the effect of warm water considerably less pleasant than we do — in fact, they cannot tolerate it for more than a brief time. Those that cannot handle the combined effects of high temperature and low salinity will, of course, be excluded from floating docks.

Some organisms are excluded from floats by their physical isolation from shore. For example, the common predatory snails of the genus *Thais* are intertidal animals that can easily tolerate dock conditions. The barnacles they eat are common on many floats. However, *Thais* cannot swim and has no planktonic larval stage that can drift about and eventually colonize new habitats. As a result, it is never seen except in places where pioneering adults can crawl from their usual rocky-shore homes. In terms of biological isolation, floats are essentially little up-side-down islands, remote and inaccessible.

Other intertidal organisms don't make it on floats because they cannot stand the biological competition. In the intertidal zone, where environmental conditions are harshest of all, they may find the space and resources they need, but below the tide line — or

A few float dwellers. 1) Edible Mussel. 2) Anemone, *Tealia*. 3) Sea Slug, *Aeolidea*. 4) Anemone, *Metridium*. 5) Sea Cucumber, *Eupentacta*. 6) Tunicate, *Boltenia*. 7) Gerbil (not to scale.) 8) Alga, *Laminaria*. 9) Bryozoan, *Membranipora*. 10) Hydroid. *Obelia*. 11) Crumb-of-bread Sponge. 12) Bryozoan, *Dendrobeania*. 13) Acorn Barnacles. 14) Broken-backed Shrimp. 15) Scaleworm, *Halosydna*. 16) Sponge, *Haliclona*. 17) Tunicate, *Corella*. 18) Tube Worm, *Serpula*. 19) Hydroid, *Tubularia*. 20) Sponge, *Scypha*. 21) Plume Worm, *Eudistylia*.

beneath a floating dock — other, less hardy species can cope more successfully, and will thus crowd them out.

Finally, there are quite a few intertidal and subtidal bottom dwellers that seldom live on floats because they are too heavy and awkward — one false step and off they fall into oblivion. The longer a creature lives, of course, the greater the chance of a clumsy mistake. For this reason, one typically finds only young sea urchins, starfish, and crabs on the underside of floats.

So what *are* you likely to see when you peer beneath a float? A lot depends on where the dock is, and how long it's been in place. Ecologists have studied succession (the orderly process of colonization) in terrestrial habitats. In many cases it follows a series of predictable stages, each replacing the last in an orderly sequence, until a stable "climax community" is reached. Thus, when a field is allowed to grow over, grasses and broadleaf shrubs take hold, later to be excluded by fast- growing trees which will, in turn, be overshadowed by the larger, slower-growing trees that comprise the mature woodlot. In the marine environment, succession also occurs, but seldom in the "classical" pattern that culminates in a predictable climax community. After a bare surface — such as a new float — is submerged, a bacterial film grows to coat it. This first stage appears to be necessary before fungi and diatoms can settle and grow. Once these first two successional waves have "conditioned" the substrate, it is acceptable to a wide variety of marine plants and animals. However, what comes next is largely a matter of chance, depending upon what spores and larvae are present in the plankton at the time in that locale. Usually at least some of the third-wave colonizers will be capable of "putting down roots" and holding the ground indefinitely.

In extremely brackish waters, like False Creek in Vancouver, the available space will all go to just a few hardy organisms: green filamentous algae (commonly called slime), barnacles, and mussels. In more saline waters, a wealth of life can potentially inhabit the under-surfaces of floats. In addition, secondary inhabitants move in to occupy niches created by the presence of plants and animals already there, just as a field becomes a woodlot. There is too much variety of life beneath our local floats to describe in detail, so we will mention only a handful of the more prominent organisms. The wide-bladed brown alga *Laminaria saccharina* grows to about eight ft. in length, and is the largest plant you'll see, but the sharp-eyed observer will note many other species. The most conspicuous animals are barnacles, mussels, sea anemones, tunicates, and large plume worms. Most of these will be present in the well-developed communities occupying floats in more fertile locations, although barnacles are prone to being overgrown and smothered by other species. Sabellid tube worms, the last group mentioned, have beautiful feeding appendages resembling feather dusters. These are abruptly withdrawn into the mouths of their parchment-like tubes if the animals are disturbed. Our largest sabellid, *Eudistylia vancouveri,* is named after the B.C. city and bears a plume marked with alternating bands of green and maroon. Its tubes can be over three feet long, although the worm itself is shorter and creeps up and down inside with the aid of bristles on its paddle-like legs.

Close observers may notice areas covered with a yellow, crumbly substance attached to the float. This is one of many local sponges, the crumb-of-bread sponge, *Halichondria.* If you take a piece and smell it, you will be greeted by a foul stench reminiscent of rotting garlic. This is, in fact, one of the characteristics used to identify the species. Another sponge, *Schypha,* forms little light grey "vases" one or two inches high.

Many of the fine-textured, branching "plants" growing on docks are actually colonial animals, hydroids such as *Obelia.* Hydroids are sedentary stages in the life-cycles of hydromedusan jellyfish (PY July '81). If you shake either an algal frond or a hydroid, you will dislodge a host of little crustaceans: shrimp, flattened comma-shaped amphods, isopods (marine pillbugs), and tiny copepods, each sporting one bright red eye in the center of its head.

Those lump-like objects that squirt water when you touch them are, appropriately enough, called sea squirts or tunicates. The glassy sea squirt, *Corella,* is transparent and jelly-like, while *Boltenia* is firm and spiny. Although lacking most sense organs and incapable of locomotion, tunicates belong to the phylum Cordata, the same advanced group of animals as the vertebrates.

To take a good look at float dwelling organisms without getting wet, there are two approches. One is to grab a handful of worm tubes, seaweed and associated stuff, tear it off the float, and hold it away from the edge of the dock or submerged in a bucket of seawater where you can turn them about and examine them in strong daylight. This is somewhat analogous to bodily uprooting an acre of forest, but will do little harm to the marine habitat, provided it is not practiced indiscriminately. Another approach is to find an object hanging off a float, such as a rope, chain, or old tire, that can be pulled up, examined, and reimmersed. Just be sure to throw everything back, or you'll leave a stinking mess behind. And by the way, most float-dwelling organisms can't distinguish between the bottom of a dock and the bottom of a boat, especially one that hasn't been hauled out for quite some time. Perhaps the fascinations of a unique fouling community are even closer than you think.

A Threatened Giant

Text and photos by Alex Kerstitch

Hollywood has given the *Tridacna* clam the unwarranted reputation of being a killer which has drowned hapless divers inadvertently trapped between its giant valves. Derived from the Greek 'tridaknos', meaning 'eaten at three bites', *Tridacna* is more popularly known as the giant clam because some specimens can weigh several hundred pounds. The largest species, *Tridacna gigas* Linnaeus, has been reported to grow to over 4½ feet in length and weigh over 550 pounds.

Tridacna sp. Coral Sea.

It is not the unusually large size that make some tridacnids remarkable (some species only reach six inches), but their ability to cultivate their own food. The colorful mantle which lines the scalloped edges of the valves harbors symbiotic algae known as zooxanthellae. The giant clam and the heart cockle are two shelled mollusks that symbiotically house algae in tissues exposed to sunlight. Tridacnids live in shallow, nutrient-impoverished coral reef waters where strong sunlight is responsible for the photo-synthetic processes of zooxanthellae. The cultivated algae produce large amounts of carbohydrate released into the clam's bloodstream and, in turn, obtain nitrogen,

Tridacna gigas Linnaeus, among coral; Coral Sea.

Tridacna maxima Roeding; Coral Sea.

phosphorus and sulfur from the clam's waste material to produce protein. The well developed digestive and filtration systems of tridacnids permit them to obtain ambient phytoplankton and zooplankton. This source of food, however, cannot adequately provide the nutritive requirements for the growth of the large valves.

Under ideal conditions it may take ten years for a giant clam, such as *Tridacna gigas,* to grow to 18-20 inches and perhaps 100 years to reach maximum size. Unfortunately, commercial Taiwanese poachers destroy in a few seconds a clam a century old. It has been estimated that since 1960, Taiwanese have been poaching up to a million giant clams a year along the Great Barrier Reef of Australia. By cutting the large adductor muscle to be sold for food, the large valves are left to be picked clean by reef fishes and other marine organisms. Like tombstones, they become mementos in graveyards of empty shells.

Tridacna sp. Coral Sea.

According to a survey by Queensland University, there is an estimated population of about 15,000 giant *Tridacna gigas* per average size reef. Since the great Barrier Reef is made up of approximately 1140 reefs, the population of clams should be roughly 17 million.

Other parts of the tropical Pacific are experiencing similar overexploitation of *Tridacna* species. Fortunately, there is currently an attempt at culturing these clams in Micronesia as part of a project funded by the U.S. Sea Grant Program aimed at restoring dwindling populations in various parts of the world.

Literature Cited:

Ehrlich, Paul. Ecoscience Nov/Dec. 1981; Conservatives and Conservation. pp. 148-149
Cropp, Ben. Skin Diver; January 1982; Clam poaching on the high seas. pp. 35, 98-101
Kerstitch, Alex. Educational Images; Farming the Seas, Spring 1981; Slide Set.

Alex Kerstitch, 5436 East Bellevue Avenue, Tucson, Arizona 85712.

Reader Forum

Eveline Marcus [Caixa Postal 6994, 01051 São Paulo, Brazil]. The new species of *Bosellia* [**Opisthobranch 16** (3):18] should be compared with *Bosellia cohellia* Marcus, 1978, Bolm. Zool. **3**: 1-5, 5 figs. from the Red Sea, reconstructed from a series of 34 slides of sections!

On page 26 I find the word "lumped" nasty, it should be: synonymized!

I prefer the Cephalaspidea, Anaspidea, Notaspidea, Ascoglossa to Bullomorpha, Aplysiomorpha, Pleurobranchomorpha and Sacoglossa. When Ihering gave the name Saco- or Saccoglossa, he published that Bergh had the same in manuscript, called Ascoglossa; see Supplement 10, Journ. Moll. Stud., 1982: p.8, in my: Systematics of the ... Ascoglossa. I won't contradict Willan with his one family.

* * * * *

Kathe Jensen [Zoologisk Museum, Universitetsparken 15, DK2100 Kobenhavn, Denmark] Note to Dr. Donald Shasky's note on Cephalaspideans (Vol. 16, p. 26): Marcus (1976) *suggests* that the 3 species of *Ascobulla* may be synonymous, which is not the same as saying that they *are*. Also, the genus *Ascobulla* is an ascoglossan, whereas the genus *Cylindrobulla*, with the type species *C. beaui* Fischer, 1856, is a diaphanacean (part of the old cephalaspideans). Only by looking at radular morphology can the two genera be separated, and most likely specific differences are seen only in the soft parts -- which, unfortunately, shell-collectors show little (or no) interest in. Feeding biology and reproduction has been investigated in the West Atlantic *Ascobulla ulla* (Jensen, K.R., 1981. J. moll. Stud. 47: 190-199; Clark, K.B. and Jensen, K.R., 1981. Internat. J. Invert. Reprod. 3: 57-64), whereas nothing is known about the biology of the Californian or Japanese species. Until these species have been studied alive and their soft parts examined, I hesitate very much to synonymize them.

Publication Notes

American Malacological Bulletin February, 1984. Volume **2**: iii + 125 pp.[Received 9 April, 1984]

DeFreese, D.E. & K.B. Clark 1983. Analysis of reproductive energetics of Florida Opisthobranchia (Mollusca: Gastropoda). International Journal of Invertebrate Reproduction, **6** (1): 1-10. [#10417]; July, 1983]

Fretter, Vera 1983. Spawn and Spawn Formation in Prosobranchs as compared with Aplysiomorph Opisthobranchs. Errata. The Bulletin of the American Malacological Union, Inc., 1981. 5 separate pages mailed with the American Malacological Bulletin, **1**. [July, 1983; #10414]

Ghilarov, M.S. 1983 [#10413 included in April issue; paper is in Russian]

Rasotto, M. & P. Cardellini 1983. The Chromosomes of *Dendrodoris grandiflora* (Gastropoda, Mollusca). Caryologia, **36** (2): 175-181. [#10418]

Schmekel, L. & A. Portmann 1982. Opisthobranchia des Mittelmeeres. Nudibranchia und Saccoglossa. Fauna e Flora del Golfo di Napoli 40. Monografia della Stazione Zoologica di Napoli. Springer-Verlag, Germany, pp. 1-X + 1-410; 122 text figs.; 36 pls. including 18 color pls. [#10415; German; 107 nudibranch & 20 sacoglossan species; price approx. $170.00]

Willan, Richard & John Morton. 1984. Marine Molluscs Part 2, Opisthobranchia. University of Auckland, Leigh Marine Laboratory, Auckland, New Zealand, pp. 1-106, figures. [#10416; This part is the second of a series (of four) describing the marine mollusks from the Leigh Marine Reserve, North Auckland, New Zealand. Essentially it deals with all the mollusks occuring in northern New Zealand. Not only are the species named but the authors have tried to include a resumé of facts about each species' biology and ecology as well as a good illustration. The series originated from a workshop on the Mollusca held at the Leigh Marine Laboratory. Copies of the Opisthobranchia volume are available at $12.00 New Zealand, from the Leigh Marine Laboratory (University of Auckland), R.D. Leigh, North Auckland, New Zealand.

Current Events

The INTERNATIONAL SYMPOSIUM ON MARINE PLANKTON convened by the WESTERN SOCIETY OF NATURALISTS, USA and TOKAI UNIVERSITY, JAPAN and THE PLANKTON SOCIETY OF JAPAN. Will be held July 22 - August 4, 1984. at Tokai University, Schimizu, Japan.

* * * * *

Pre-registration for the AMERICAN MALACOLOGICAL UNION meeting is available until May 31. Send registration forms to Mrs. Wylda Stephens, AMU local chairman, 568 Longfellow Ave., Virginia Beach, VA 23462. Accomodation registration with the Holiday Inn should be made separately.

* * * * *

Pre-registration for the CONCHOLOGISTS of AMERICA convention is available until June 7. Register by May 28, to ensure accomodations at the Don CeSar Beach Resort, convention center. Registration forms are available from Donald C. Young, 11975 Third Street East, Treasure Island, Florida 33706.

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Dr. Terrence Gosliner, Department of Invertebrate Zoology, California Academy of Sciences, Golden State Park, San Francisco, CA 94118

Dr. Larry G. Harris, Zoology Building, Department of Biological Sciences, University of Sydney, Sydney, N.S.W. 2006 Austrailia. Until June, 1984?

James R. Lance, 746 Agate St., San Diego, CA 92109

Mary R. Larson, 1200 E. Central, No. 4, Sutherlin, Oregon 97479. New address effective 1 May, 1984.

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Dr. S. Stillman Berry 1887-1984

Dr. S. Stillman Berry was one of the most outstanding malacologists on this century. Moreover, his energy, diligence, and insight were also turned to the studies of zoology, botany, taxonomy, petroleum geology, and genealogy. Despite the handicaps of frail health, semi-deafness, and partial color blindness, he achieved international scientific recognition and received many honors for his work.

Samuel Stillman Berry was born in Unity, Maine, on March 16th, 1887. His frail mother had returned there from the family's Montana ranch to receive better medical support. Evelyn Berry had twin boys, but one of them died within a few hours and the doctor had little hope for the other. An aunt picked up the remaining child saying, "We aren't going to lose this one." She fashioned a homemade incubator and tended the child intensively for several days until he was out of danger. Even with care, Stillman Berry's health was fragile, at best, throughout his long life.

The father, Ralph Berry, was also from Unity, Maine, but had traveled west. In 1880, he had established the 66,000 acre Winnecook Ranch in Montana and was a pioneer in sheep raising in the territory. Stillman Berry became a member of the board of directors of the Winnecook Ranch in 1911, and was president of the Corporation from 1917 until his death.

During S. Stillman Berry's early years, the family lived in many places. Believing that the Montana environment was too harsh for their child, the Berrys searched for a climate which would be best for his health. In 1897, they settled in Redlands, California. In 1913, a move was made to another home in Redlands where Stillman Berry lived until his death on April 9th, 1984.

The contents of the Berry home reflect the activities of a person who was discriminating, sensitive and dedicated. There is an impressive quantity of antique furniture and china that his mother had brought from Maine. There are also his fabulous libraries. One library contains malacological publications from prelinnaean to the present day. Another library has letters and first editions of Darwin and a third boasts an extensive collection of publications on New England genealogy. One can even find a rare 400-year-old volume with the colophon of the Florentine Press.

There is the book of carefully arranged records and mementos of activities of Berry's high school (where he founded the yearbook in 1904). There are several full volumes that he prepared, depicting the trip Berry and his mother made to Europe in 1904. From the earliest years, he was clearly a tenacious record keeper and an orderly collector of facts. In the yard of the Berry home are varieties of flowers that he hybridized and a towering redwood tree planted by Berry on Armistice Day in 1918.

Dr. S. Stillman Berry, May 7th, 1978, at his home in Redlands - the flowering vine is *Kolkwitzia amabilis* (a member of the honeysuckle family). Photo by Art Miller, Redlands, California.

There is abundant evidence of thorough and exacting effort in all of Stillman Berry's work. From his earliest years as a malacologist, he worked to provide a collection of west coast molluscan type specimens *on* the west coast. "Why" said Dr. Berry "should a student of molluscs living on the U.S. Pacific coast depend on material in the eastern United States to refer to type specimens?" Consequently, he made purchase and exchange arrangements to acquire this material, "Often beyond my means" he said. He felt that he was treated very generously by the eastern institutions. The collection of type specimens and also his great collection of worldwide mollusca are at the Berry home.

Because of his impaired hearing, young Stillman Berry received most of his grammar school education from his mother who had been a teacher. He prevailed upon her to let him go to high school despite his handicap and proved himself a scholar. Since he could hear very little he learned to get his education from books. After high school Stillman Berry went to Stanford University where he received his bachelor's degree in 1909. His experiences during and after the 1906 San Francisco earthquake took and exciting hour to tell. While at Stanford he was a member of Phi Beta Kappa scholastic and Sigma Chi fraternity. Berry received his master's degree from Harvard in 1910 and doctorate at Stanford in 1911. His doctoral thesis, *A Review of the Cephalopods of Western North America,* was published in the *Bulletin of the U.S. Bureau of Fisheries* in 1912.

Because of his thorough knowledge of the scientific literature and background in marine biology, Stillman Berry was asked to establish the library for the Scripps Institution of Oceanography and become the first librarian. Of this period he said, "I found it incredible that some of the most desirable volumes could be bought in Europe for no more than pennies." He was very selective and miserly with the limited Scripps' money and many crates of choice reference books were sent from Europe to California. "I couldn't resist buying some books for myself if I found duplicate copies" he said "even if I had to miss lunch sometimes."

Dr. S. Stillman Berry became the leading expert in the study of octopus and squid. Over many additional years of study, he also became a recognized expert in land snails and chitons. When asked by Frank M. McFarland of the California Academy of Sciences to take up some work on opisthobranchs he said, "No thank you. I have already worked through three of the four most difficult groups in the phylum and I will be happy to give someone else the honor of doing the fourth."

In 1914, Stillman Berry began hybridizing irises and daffodils. He is credited with hybridizing and naming 2700 varieties of plants. His success at horticulture made it possible for him to support the household and help pay taxes on the Winnecook Ranch during the lean depression years.

A review of Stillman Berry's published papers shows continued industry throughout most of his years. His work appeared in scientific journals almost every year from 1906 to 1970. His own journal, *Leaflets in Malacology,* was produced through 26 numbers by 1969. There were several papers on mollusks left unfinished at his death.

He was an expert in petroleum geology and New England genealogy and was fluent in several languages including French, Greek, Latin, German, Norwegian, and Spanish. It was found that since he was deaf, he learned languages and spoke them without an accent. His ability to concentrate for long periods he attributed, in part, to his poor hearing.

Because of his capability in a variety of fields, Berry routinely met with and corresponded with royalty, heads of state, and scientific organizations all over the world. Visitors to his home included the crown prince of Japan and the prime minister of Sweden. Scientists from around the world traveled to Redlands to visit him.

S. Stillman Berry was named the only Lifetime President of the American Association for the Advancement of Science, was a Life Fellow of the San Diego Natural History Museum, Research Associate of the Smithsonian Institution, Research Associate of Stanford University, Life Member of the Conchological Society of Great Britain and Ireland, Life Member of the Malacological Society of London, and Life Member and Honorary President of the American Malacological Union.

He has had three molluscan genera named for him; *Berryiteuthis* Naef, 1921; *Berryidium* Grimpa, 1931; and *Berrya* Adam, 1939. More than a score of species and subspecies have been described carrying his name.

Two years ago he purchased the home of one of his ancestors in Unity, Maine. The structure has been given to the town of Unity where it is being used as a historical museum.

Dr. S. Stillman Berry leaves us his many publications on original work, his libraries, his collections, new varieties of flowers, his support of many promising young men, and the example he set of a man who achieved broad scientific eminence despite critical handicaps.

Jack W. Brookshire, 2962 Balboa Ave., Oxnard, CA 93030

Classification Notes

Outline of the Classification of Living Mollusca, Part 4, by Kay C. Vaught.

Superfamily TROCHACEA
Family TROCHIDAE
Subfamily MARGARTINAE


Margarites
5 mm

MARGARITES Gray, 1847
(*Eumargarita* Fischer, 1885;
Margarita Leach 1819 (non Leach, 1814);
Valvatella Melvill, 1897)
Bathymophilia Dall, 1881
Cantharidoscops Galkin, 1955
Margarella Thiele, 1893
(*Margaritella* Thiele, 1891;
Promargarita Strebel, 1908;
Submargarita Strebel, 1908)
Margaritopsis Thiele, 1906
Omphalomargarites Habe & Ito, 1965
Pupillaria Dall, 1909
(*Lirularia* Dall, 1909)
ANTIMARGARITA Powell, 1951
BATHYBEMBIX Crosse, 1893
(*Bembix* Watson, 1879;
Ginebis Otuka, 1942)


EUCHELUS
6 mm

DANILIA Brusina, 1865
(*Craspedotus* Philippi, 1847;
Heliciella O.G. Costa, 1861)
ECHINOGURGES Quinn, 1979
EUCHELUS Philippi, 1847
(*Aradasia* Gray, 1850;
Huttonia Kirk, 1882;
?*Tallorbis* G. & H. Nevill, 1869)
Antillachelus Woodring, 1928
Herpetopoma Pilsbry, 1890
?*Nevillia* H. Adams, 1868
Vaceuchelus Iredale, 1929
GRANATA Cotton, 1957 (Stomatella?)
HYBOCHELUS Pilsbry, 1889
LISCHEKEIA Fischer, 1879
Adamsenida Habe, 1957
(*Solariellopsis* Schepman, 1908)


LISCHKEIA
(50 mm)

Cidarina Dall, 1909
Turcicula Dall, 1881
MIRACHELUS Woodring, 1928
OLIVIA Cantraine, 1835
TIBATROCHUS Nomura, 1940
TROPIDOMARGA Powell, 1951
Subfamily PLANITROCHINAE
PLANITROCHUS Perner, 1903
Subfamily MONODONTINAE
MONODONTA Lamarck, 1799
(*Monodontes* Montfort, 1810;
Trochidon Swainson, 1840)


Monodonta
(30 mm)

Austrocochlea Fischer, 1885
Neomonodonta Kuroda & Habe, 1971
Osilinus Philippi, 1846
(*Trochochlea* H. & A. Adams, 1863)
(? *Pseudosilinus*)
BANKIVIA Krauss, 1848
Leiopyrga H. & A. Adams, 1863
CANTHARIDUS Montfort, 1810
(*Canthridium* Schaufuss, 1869;
Cantharis Ferussac, 1821;
El enchus Swainson, 1840)
Iwakawatrochus Kuroda & Habe, 1954
Micrelenchus Finlay, 1927
Phasianotrochus Fischer, 1885
Plumbelenchus Finlay, 1927


Cantharidus (8 mm)


Diloma
25 mm

CHRYSOSTOMA Swainson, 1840
DILOMA Philippi, 1845
(*Zediloma* Finlay, 1927)
Cavodiloma Finlay, 1927
Chlorodiloma Pilsbry, 1889
Fractarmilla Finlay, 1927
Melagraphia Gray, 1847
(*Anisodiloma* Finlay, 1927)
Oxystele Philippi, 1847
Pictodiloma Habe, 1946
JUJUBINUS Monterosato, 1884
(*Clelandella* Winkworth, 1932)
Mirulinus Monterosato, 1918
Strigosella Sacco, 1896
(*Gravijujubinus,*
Pictojujubinus ?)


Tegula
(30 mm)

TEGULA Lesson, 1835
Agathistoma Olsson & Harbison, 1953
Chlorostoma Swainson, 1840
Omphalius Philippi, 1847
Promartynia Dall, 1909
Stearnsium S.S. Berry, 1958
THALOTIA Gray, 1847
Alcyna A. Adams, 1860
Calthalotia Iredale, 1929
Odontotrochus Fischer, 1879
Prothalotia Thiele, 1930
TURCIA A. Adams, 1854
(*Ptychostylus* Gabb, 1865)
Perrinia H. & A. Adams, 1854


Gibbula
25 mm

Subfamily GIBBULINAE
GIBBULA Risso, 1826
(*Conotrochus* Pilsbry, 1889;
Magulus Monterosato, 1888;
Phorculellus Sacco, 1897;
Phorculus Monterosato, 1888;
Puteolus Monterosato, 1888)
Adriaria Pallary, 1917
Calliotrochus Fischer, 1879
Cantharidella Pilsbry, 1889
Colliculus Monterosato, 1888
(*Glomulus* Monterosato, 1888;
Glossulus Pallary, 1938)
Enida A. Adams, 1860
Eurytrochus Fischer, 1879
Forskalena Iredale, 1924
(*Forskalena* H. & A. Adams, 1854)
Forskaliopsis Coen, 1931
Hisseyagibbula Kershaw, 1955
Notogibbula Iredale, 1924
Phorcus Risso, 1926
Steromphala Gray, 1847
(*Gibbulaastra* Monterosato, 1884;
Gibbuloidella Sacco, 1896;
Korenia Friele, 1877)
Tumulus Monterosato, 1888
CITTARIUM Philippi, 1847
(*Livona* Gray, 1847;
Meleagris Montfort, 1810)
FOSSARINA Adams & Angas. 1864
(*Minos* Hutton, 1884)
Clydonochilus Fischer, 1890
Minopa Iredale, 1924
NANULA Thiele, 1924
NORRISIA Bayle, 1880
(*Trochiscus* Sowerby, 1838 non Heyden, 1826 nor Held, 1837)
PHORCULUS Cossmann, 1888
TROCHINELLA Iredale, 1937

Notes from Hans Bertsch

How Many Species in the *Cypraea teres* "Complex"?

There is a group of Indo-Pacific cowrie species that share common shell patterns and morphology. For years, collectors and professionals have carefully distinguished *Cypraea teres* Gmelin, 1791, *C. subteres* Weinkauff, 1881, and *C. rashleighana* Melvill, 1888 (see for instance Burgess, 1962 and 1969, and Thorsson & McKinsey, 1979).

In the last 3 years, Kay and Burgess have each named a new species after each other; both these species are obviously part of the "*teres*-complex." Hence, there are now 5 species in this group of apparently related species: *Cypraea alisonae* Burgess, 1983, and *Cypraea burgessi* Kay, 1981, plus the 3 already mentioned.

Most of my own research has centered on shell-less mollusks—the opisthobranch gastropods. Hence I was particularly intrigued to read that a new sea shell proposed "almost entirely on the basis of striking external anatomical differences," was recognized "while comparing photographs of the living animal." This meant that to understand these cowrie species, millions of shell enthusiasts across the universe had to "think slug"! The soft parts of the animal's body and the skin color and texture were the significant distinguishing characteristics for this new species. The shell varied inconsistently and could not be used for taxonomic differentiation.

These species invite some interesting speculation and comments on cypraeid taxonomy. But first we should make some morphological comparisons between *Cypraea teres* and the 2 recently named species

Cypraea burgessi can be separated from *C. teres* on the basis of the shell: it has a columellar callus but no labial callus (just the opposite in *C. teres*), and numerous (13-20) small (2-3 mm in diameter) spots (*C. teres* has 0 to 6 or 8 small spots). Kay also detailed several anatomical differences: *C. burgessi* has a thin mantle which does not obscure the dorsal pattern, and the papillae are dense. *Cypraea teres* has a thick mantle with much less dense papillae.

Cypraea alisonae shells tend to be more ovate than the more elongate *C. teres; C. alisonae* has a mid-dorsal blotch (absent in *C. teres*), numerous large spots (which are few or absent in *C. teres*), and a consistently uninterrupted middle dorsal color band (sometimes longitudinally divided in *C. teres*). The anatomical soft part differences were emphasized by Burgess: the papillae of *C. alisonae* are long and transversely banded along their length and distally tipped with dark gray to black (*C. teres* has white papillae), and rise from a lighter spot on the mantle (*C. teres* does not); the foot of *C. alisonae* extends posteriorly one-third to one-half the length of the shell (about one-eighth in *C. teres*). The thin mantle does not obscure the shell pattern (it is thick and obscuring in *C. teres*).

Based on these anatomical and conchological characteristics, I believe that the specimens illustrated are *C. alisonae:* central blotch, large spots on shell, length of foot, papillar length and coloration, and lighter mantle color around the base of the papillae. However, the mantle obscures the dorsal pattern (contrary to the original description of *C. alisonae*).

The geographic ranges of these species vary. *Cypraea burgessi* and *C. rashleighana* are endemic to the Hawaiian Islands, and *C. subteres* appears endemic to eastern Polynesia. *Cypraea teres* has been reported throughout the Indian and Pacific Oceans: from South Africa, Gulf of Aqaba, Fiji, Kwajalein, Philippines, the Hawaiian Island chain, and other locations in the Indo and west-central Pacific, and from Clipperton and Perlas Islands in the eastern Pacific. *Cypraea alisonae* occurs in the Hawaiian Islands, and American Samoa; it may be widespread throughout the Indo-Pacific: from west Australia, Tahiti, Fiji, Okinawa, the Philippines and eastern Africa. Specimens of *Cypraea teres* from the eastern Pacific should be examined closely to see if they may actually represent *C. alisonae.*

Over the years, various other named species have been synonymized with *Cypraea teres,* for example, *C. latior* Melvill, 1888, *C. tabescens* Dillwyn, 1817, and *C. punctulata* Hidalgo, 1907. These species are considered to fall within the range of intraspecific variation of *C. teres.* This species complex includes 5 presently accepted and very carefully differentiated species, and several synonyms.

A species is a biological entity, not to be erected or suppressed at the capricious whim of a taxonomist. Theoretically, a taxonomist attempts to understand living organisms that vary (variation is, of course, the raw material that makes evolution possible). The species therefore, should "proclaim" or dictate its presence to the investigator. Based on careful study, a taxonomist simply states that a particular relationship exists (or does not exist) among a group of organisms. The assorted currently recognized valid and synonymous taxa in this group imply a definite understanding on the part of malacologists. Those species accepted are distinct evolutionary, ecological and morphological units — each interacting reproductively among its own members, but isolated from the other four. Non-valid taxa represent names that were erroneously (mistakenly) given to members of an interbreeding unit that exhibited an individual variation.

Figure 1. *Cypraea alisonae* on sponge Ft. Kamehameha Beach, Oahu, HI.

Figure 2. (same as 1).

Figure 3. (same as 1).

Figure 4. *Cypraea alisonae*, close up of mantle & shell.

Figure 5. *Cypraea alisonae*, mantle completely extended.

Figure 6. *Cypraea alisonae*, ventral view.

All photos by Hans Bertsch.

For many years, cowrie taxonomy has been based on shell morphology. Obviously, using other criteria (such as radula, reproductive system, and mantle texture and color) may well affect our understanding of specific organisms and their taxonomic status. Such a shift in criteria is obviously necessary because, like all living organisms, cowries are evolutionary products of adaptive lineages. The significance of the mantle coloration becomes immediately apparent when the animal is seen in its natural habitat feeding on its orange-red prey sponge (see figures 1 through 3). Biologically the color of the mantle may be far more important than the color of the shell.

If new taxonomic criteria are adapted, meaningful studies on the living animals should be done to prevent the willy-nilly proliferation of additional synonyms. There are numerous questions to research: How significant a trait is the ontogeny of the group? Since maturity is reached at a variable age and size, why and how does the animal reach maturity? What are food preferences? What are the ranges of intraspecific variation for each characteristic used? What are the adaptive advantages of mantle colors and textures (smooth or with papillae)?

To understand cowrie taxonomy, cowrie biology must be understood.

ADDITIONAL READING

Burgess, C.M. 1962. A brief comparison of *Cypraea rashleighana, teres, latior* and *subteres*. Hawaiian Shell News **10** (2) : 2.

Burgess, C.M. 1969. Discussion of *Cypraea rashleighana* Melvill, *C. teres* Gmelin, *C. latior* Melvill and *C. subteres* Weinkauff. Hawaiian Shell News **17** (8) : 4-5.

Burgess, C.M. 1983. Another new *Cypraea* in the *teres* complex (Gastropoda : Cypraeidae). Venus, Japanese Journal of Malacology **42** (2) : 183-191.

Emerson, William K. 1983. New records of prosobranch gastropods from Pacific Panama. Nautilus **97** (4) : 119-123.

Kay, E. Alison. 1981. A new species of *Cypraea* from the Hawaiian Islands and a discussion of the *C. teres* species complex. Venus, Japanese Journal of Malacology **40** (3) : 111-122.

Thorsson, W., and R. McKinsey. 1979. Separating *Cypraea teres* from *C. rashleighana*. Hawaiian Shell News **27** (237) : 4.

Dr. Hans Bertsch, 4444 W. Pt. Loma Blvd. No. 83, San Diego, California 92107.

Beach Surprises Come in Different Packages

by Stephanie Prince

There is a group of strangely different crustaceans that occur frequently along our California coast on shoreline rocks. They are found worldwide. They attach themselves to rocks, driftwood, boat hulls, whales, dead and empty shells, or wharf pilings.

On the San Clemente Pier pilings I was noticing rock barnacles in huge clumps among the California Mussel shells [*Mytilus californianus*]. It was early one January afternoon and the waves were quite large. The barnacles were so far up on the pilings that when the tide is medium or low, these animals must be dry for long periods of time. They demonstrated their strength by continuing to stick on the pilings despite huge waves breaking continuously against them.

These strange-looking animals resemble a long worm with nails on its head. In reality the head or crown is made up of 4 large white or grey-white plates, 2 on each side, and many small finger-nail size plates surrounding the large ones. There are curled yellow appendages which sweep the water continuously for the tiny sea creatures for the barnacle to eat. The worm-part or attaching peduncle of the animal is brown, red or gray and can be eaten. They differ from regular barnacles by having a long, flexible attachment peduncle.

I have some Gooseneck barnacles that have 50 mm plates, and I have much smaller ones in which the plates are only 4 to 12 mm high.

In March, 1983, I was in Coronado, California after several severe storms, and several of these barnacles had been washed ashore in the rough surf. In fact, one medium-sized one measured about 112 mm long and looked like the neck had been pulled right off the rock with a tremendous surge. The neck was about 18 mm wide and a tan-gray in color. (I might add that it was also very smelly.) Another specimen I found was quite small, 18 mm long, with its neck cut off.

Figure 1. *Pollicipes polymerus* Gooseneck barnacle.

Another crustacean I find while walking the beach is the hermit crab. In Southern California there are two common hermit crabs in our area. One is the Blue-clawed Hermit Crab, *Pagurus samuelis*. The other is the Hairy Hermit Crab, *Pagurus harsutiusculus*.

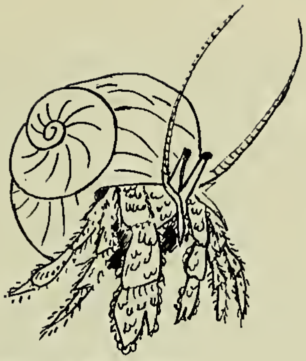

Figure 2. Hermit crab in shell

Hermit crabs differ from other crabs because of their soft, curved abdomen with the hook-like tail. This tail is entirely covered by a snail shell. Hermits protect their soft parts by hiding in abandoned sea shells. The crab usually shows only its legs and head which hang out of the aperture of the shell. If one holds the shell up, this curious crab will venture out of its shell as much as one-half of its body, only the hard shelled part, while the soft abdomen remains safely inside. Once in a great while, if the shell is held up long enough or out of the water, the crab will give up and crawl out. One must be careful as the soft abdomen will break off if the crab is pulled out of the shell quickly and forcefully.

I find most hermit crabs prefer *Tegula*, moon snail shells, periwinkles and rock snails; but once in a while I find these scavengers in broken worm shells, and they don't seem particular as to the shape the shell is in. As they grow, the crabs seek out larger empty shells. These crabs eat particles along the sand on the beach or algae in the water or on rocks.

The hairy hermit crab has antennae that are about the same color as its body, which is an orange-brown or tan color. It has white bands that encircle each antenna. There are tiny little bristle hairs all over this crab's entire body. The blue clawed hermit crab has a reddish-orange body with red antennae.

For protection the crab has two large chelipeds which protrude from the shells, one larger than the other. These can be used for protection or picking food off rocks.

I have observed hermit crabs fighting several times. They seem to have a cantankerous nature when they encounter each other. They use the two chelipeds to hold each other's legs. I haven't seen any food nearby, so I assume they are fighting.

They are scavengers and seem to eat any tid-bit offered. They pick algae off shoreline rocks, eat dead or decaying fish, or eat dead birds or pieces of snails.

Figure 3. Hermit crab without shell

I find these hermit crabs abundant in our local tide pools; in fact sometimes when I see many small shells moving about, the majority are filled with hermit crabs rather than the original home owner.

These two crustaceans — the gooseneck barnacle and the hermit crab — protect themselves by their packaging. But how differently each has evolved! The astounding features of adaptation are readily visible to anyone who takes the time to walk the beach as I do.

Drawings by Stephanie Prince.

Stephanie Price, c/o De Portola School, 27031 Preciados, Mission Viejo, California 92667.

Personal Notes

Gerard Venken [Schoolstraat 21, B-3500 Hasselt; Belgium] Writes that he is busy trading Cymatiidae around the world. He would be interested in corresponding with anyone interested in the group.

* * * * *

Sandra Millen Once classes are over (mid-April) we are going to Yugoslavia. Sven [Donaldson] has been invited to form part of a Canadian team to race in the Dalmatia cup -- a sailboat race between Split and Dubrovnik.

The 'Opisthobranch' looks sensational and I hope you get the subscriptions to afford to keep it up. I wonder about the appropriateness of the name since you are broadening the scope of the journal. My worry is what is going to happen to the references which were such a valuable part of the O.N. I would hate to have them left out or even combined with general malacological references which would make them harder to ferret.

* * * * *

R. Tucker Abbott [P.O. Box 2255, Melbourne, FL 32902-2255] Right now our science and hobby of conchology needs your support. If you have not done so already, I urge you to join one of our national shell societies. Each organization is dedicated to increasing the public's awareness of sensible conservation measures, and each goes a long way in helping fellow conchologists learn more about mollusks.

Take your choice, but please join one right away:

1. The **Conchologists of America** with a membership approaching a thousand is mainly for amateurs (or professionals who also love mollusks). A well-illustrated, exciting bulletin is issued quarterly, and soon may grow into a color-filled, popular magazine. Annual meetings are fun-filled gatherings of shellers, interesting slide lectures, field trips and a famous bourse at which dozens of dealers display their latest offerings. The dues are a very modest $7.50 (family: $10.00). You will be joining the biggest shell club membership list in America. Send your check, address and shell interests to: C.O.A., c/o Phyllis Pipher, 1116 North Street, Tekamah, NB 86061.

2. The **American Malacological Union**, the oldest and most professional society, is mainly for scientists, biology students and serious amateurs. Its annual bulletin carries the latest scientific advancements in malacology; and the annual meetings feature scientific papers, symposia, workshops and field trips. An annual prize of $250 is given for the best student paper. New members please send their check for $21.50 to A.M.U., c/o Constance Boone, 3606 Rice Boulevard, Houston, TX 77005. An information-packed booklet, "How to Study and Collect Shells," is available for an additional $3.00 (post paid).

Kathe Jensen I have just received the February and March issues of the **Opisthobranch** with somewhat mixed feelings. Of course, I am thrilled about the high quality of the color photos. Most shell-less mollusks need to be seen in full color to be properly identified – but much to my disappointment *shelled* mollusks seem to take up an increasing part of the space. There are so many publications in the areas of general malacology, shell-collecting, marine life, etc.,that I really don't think we need another one. The old **Opisthobranch Newsletter** was – as far as I know – the only publication dealing exclusively with opisthobranchs, and I think that was one of its major justifications. Publishing short, popular articles on the natural history of various opisthobranchs accompanied by color photos is a great idea, and will certainly increase the number of potential readers, but I think that the "shell-collectors" have so many other well-established publications that the **Opisthobranch** should be limited to opisthobranchs – I would like to hear how other "old-time" subscribers to ON feel about this.

My main reason for subscribing to the ON was to keep in touch with as many colleagues as possible - one letter to the ON was a lot easier than 20-30 individual ones. Also, I badly miss the opisthobranch literature citations from the ON. Maybe there is not enough opisthobranch information for a monthly publication, but I would have been satisfied with a "humbler" outfit, maybe 4-6 times a year. I have several other suggestions of what I think should be included in an opisthobranch publication – for example, Opinions, Directions, etc. from The International Commission of Zoological Nomenclature relating to opisthobranchs. Some conchological publications do this for mollusks in general, but again, I think it would be helpful to have the opisthobranch matters separately. I'll volunteer to edit such a column for as long as I am affiliated with an institution where I have access to the publications from the ICZN. I hope that future issues of the **Opisthobranch** will bring more opisthobranch articles and information. I'm sorry to say that I'm not at all interested in another "pretty pictures" shell magazine! I hope other opisthobranch enthusiasts will express their opinions on the need for a special publication on opisthobranchs.

A bit of good news: I have just been awarded a Postdoctoral Fellowship at the University of Copenhagen, so now I can concentrate on my research for the next 3 years (I shall probably have to teach a course or two also, but no worries about next month's paycheck for a change.) I hope to go to Florida in the fall to do some experimental work on chemoreception in Ascoglossa, but otherwise I will be spending most of my time here at the Zoological Museum in Copenhagen.

I hope to be able to prepare a short article for the **Opisthobranch** in the near future. I think we need to see some Atlantic species in color too.

Terry Gosliner [California Academy of Sciences, Department of Invertebrate Biology and Paleontology, Golden Gate Park, San Francisco, CA 94118] The **Opisthobranch** really looks great! I have been in the midst of moving and getting organized for my trip to Aldabra Atoll in the western Indian Ocean. I will be on a Smithsonian expedition there for five weeks and then I'm going to stop over in Cape Town [South Africa] to visit Gary Williams and do some more field work with him. I also hope to resolve the question of having my book published there or not.

I am organizing a symposium on opisthobranchs for the Western Society of Malacologists meetings in Santa Cruz [California] (August 16-19, 1984). Anyone interested in presenting a paper is more than welcome. Contact me at the Cal. Academy by June 15.

Eveline Marcus will be here [Cal. Academy] for a visit in mid-July. I will send more information when she finalizes her plans. I will also send you a report on my Indian Ocean exploits. In the meantime, keep up the good work. You really have a great looking publication.

* * * * *

Gary C. Williams [South African Museum, Department of Marine Biology; P.O. Box 61, Cape Town, South Africa 8000] I am back in the field of marine invertebrate research once again after working several years for the National Park Service. I am presently working at the South African Museum on the systematics and biology of southern African octocorals (soft corals, gorgonians, and sea pens). I am interested in predator / prey relationships of opisthobranchs and prosobranchs with alcyonarians. The subtidal invertebrate fauna in the region of the Cape Peninsula of South Africa is extremely diverse and exciting to work on. Many things are undescribed and the degree of endemism is very high.

Terry Gosliner will be here in late May after his trip to Aldabra. We will do field collecting in the eastern Cape region between Port Elizabeth and East London

* * * * *

Eveline Marcus The Pleurobranchidae are going to print. next month, and hopefully also the Umbraculacea, if I can finish the MS with poor material and poor bibliography. I am finishing my third paper on the Notaspidea. After my trip, (about June to August) I will see what I can still do. I am asked to help with the opisthos for a Brazilian book.

* * * * *

R.C. Willan "Nudibranchs of Australasia" should be published by the end of April

Errata

In the April issue. Page 37 - **Memoriam.** Page 40 -Cypraeidae. Page 47 - Evolutionary. Our apologies to everyone.

Note: The **Opisthobranch** accepts worldwide shell dealers' advertising in good faith, assuming that they will deal fairly with their customers. Inclusion of advertising in the **Opisthobranch**, however, is not intended to imply endorsement to the advertiser. If you are in doubt, investigate first. Please mention the **Opisthobranch** when you patronize our advertisers.

Miscellanea

GLOSSARY

columella (Latin columen = column): the axial pillar, the central pillar of a univalve shell around which the whorls are built, extending from the apex to the base; a portion of the columella is seen as the aperture of most spiral univalves; **columellar**: pertaining to the columella; **columella fold**: spiral ridge on the columella projecting into the interior of the shell; **columellar lip**: the inner edge of the aperture including that part that covers the last whorl. [Arnold, 1965]

columellar callus a smooth shelly area, extending over the columellar area, secreated by the mantle.[Keen, 1971]

labial (Latin labium = the lip): pertaining to the lip of the shell; **labial area**: a flattened surface extending from the inner lip; **labate**: having lip or lip-like parts, lipped. [Arnold, 1965]

labium (Latin labium = the lip): the inner lip of a univalve shell, the inner side of the aperture or columellar lip extending from the origin of the labrum and resting on the columella. [Arnold, 1965]

labrum (Latin labrum = a lip): the outer lip of a univalve shell, the right side of the aperture is formed by the outer lip; **labral**: pertaining to the labrum. [Arnold, 1965]

operculum (Latin operire = to close or shut): a horny or shelly plate serving to close the aperture, wholly or partly, when the animal is retracted; a chitinous or calcareous plate present in many groups of mollusks. (eg. *Turbo, Natica, Fusinus, Astraea*, etc.); **operculate** having an operculum; **operculigenous**: producing an operculum; **operculigerous**: having an operculum. [Arnold, 1965]

pallial pertaining to the mantle. [Keen, 1971]

pallial sinus In bivalves, an embayment of the pallial line marking the attachment of the marginal muscles of the mantle. [Keen, 1971]

papillary (Latin papilla = a nipple, pimple): small nipple-like processes, as the papillae of the tongue, minute nodes or bumps; **papilliform**: shaped like a papillae; **papillose**: covered with an abundance of little bulgings or pimples; verrucose. [Arnold, 1965].

papulous (Latin papula = pimple): covered with small bumps or pimples, as the operculum of *Nerita versicolor* Gmelin: **papula**: an isolated pimple or small bump. [Arnold, 1965].

verrucose (Latin verruca = wart): having small knobs or lumps on the surface, covered with wart-like or verruciform elevations, warty. [Arnold, 1965]

New *Cadlina* from Saudi Arabia

by Jeff Hamann

I found this nudibranch while night diving in a protected inlet in Saudi Arabia. It was relatively soft-bodied and had a series of glands around the notum. When disturbed, it exuded a milky substance from the glands and even an occasional whole gland popped out. I have been unable to identify the animal. If anyone can identify the nudibranch please send a note to the **Opisthobranch.**

Jeff Hamann, 8242 Valley High Rd., Lakeside, CA 92040

Cadlina sp. Jiddah, Saudi Arabia. Collected by Jeff Hamann in 3 m depth, March 26, 1981. Length 17 mm. Photo by Jeff Hamann

SHELLS AND SEA LIFE
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SHELLS AND SEA LIFE

A MONTHLY PUBLICATION ON MOLLUSKS AND MARINE LIFE

$2.50 JUNE, 1984 Volume 16, Number 6

Babelomurex jeanneae D'Attilio & Myers, 1984

The shell pictured on the front cover of this issue was described as *Babelomurex jeanneae* by D'Attilio and Myers in January, 1984. The original description was published in the **Transactions of the San Diego Society of Natural History**, **20**(5):81–94; 34 figs. The species had previously been figured in **Hawaiian Shell News** July, 1973, **21**(7):5 and June, 1977, **25**(6):9 (as *Latiaxis pagodus*) by Al Lopez. It is commonly called the Chrysanthemum shell because of its flower-like appearance when viewed from the spire. The holotype of this beautiful species (figured here) measures 21.5 mm in length by 25.5 mm in width. It is "creamy white stained with pale ochre . . ." The type locality is Bohol Straits between the islands of Cebu and Bohol in the Philippine Islands. The species was named for Mrs. Jeanne Pisor of San Diego.—S&SL

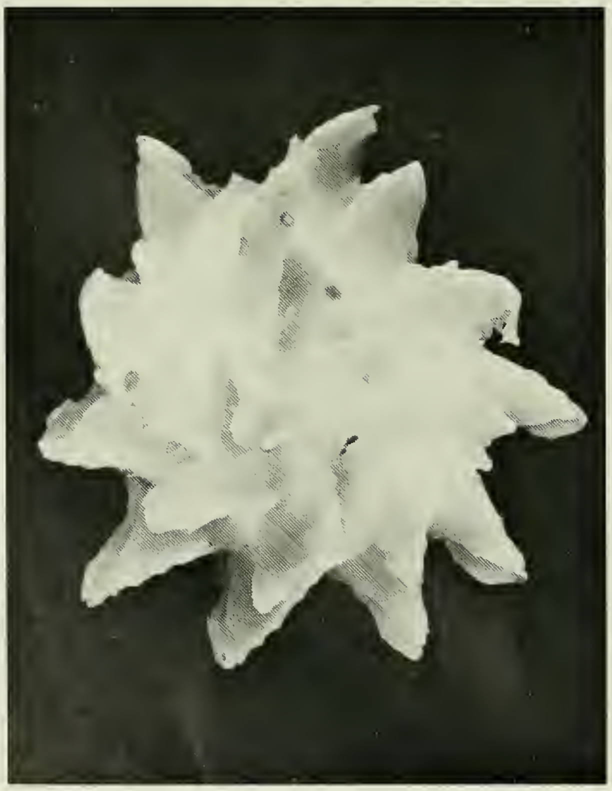
Photos by David K. Mulliner

Front Cover: Ventral view of *Babelomurex jeanneae*

Top Right: Dorsal view of *Babelomurex jeanneae*

Bottom Left: Spire view of "Chrysanthemum"

Bottom Right: Ventral view of *Babelomurex jeanneae*



SHELLS AND SEA LIFE

Shells and Sea Life was formerly known as the **Opisthobranch Newsletter.** The magazine is open to articles and notes on any aspect of malacology—or related marine life. Articles submitted for publication are subject to editorial board review and may include color or black & white illustrations. Deadlines for articles are the first day of each month for the following month. Short notes for the "Center Section" will normally appear within thirty days of submission.

Short articles containing descriptions of new or repositioned taxa will be given priority provided the holotype(s) have been deposited with a recognized public museum and the museum numbers are included with the manuscript. We undertake no responsibility for unsolicited material sent for possible inclusion in the publication. No material submitted will be returned unless accompanied by return postage and packing. Authors will receive 10 free reprints. Additional reprints will be supplied at cost provided they are ordered before printing.

Shells and Sea Life ISSN 0747-6078 is published monthly by Steven J. Long & Sally Bennett, 505 E. Pasadena, Phoenix, AZ 85012-1518 U.S.A. Telephone (602) 274-3615. U.S. subscription rates are $15.00 per volume for individuals or $30.00 per volume for libraries and for institutions requiring invoices. U.S. First Class mail and Foreign subscription rates are $20.00 per volume. Foreign subscribers should add $5.00 for First Class mail or $10.00 for Air Mail postage. Send change of address 6 weeks in advance. Charge to remail issue for any reason $3.00. All back volumes are available at $15.00 per volume postpaid. Sample copies are available for $3.00 each postpaid. Rates are subject to change without notice. Arizona residents must add 6% sales tax to all orders.

FEATURES - JUNE 1984

Back cover photo by Boris Innocenti: Cyphoma signatum, June, 1981, Cayman Islands, 18 m.

EDITOR'S NOTES....

We have had numerous comments on the name change to "Shells and Sea Life," all positive. This issue brings more exciting changes for us, adding a table of contents to each issue. In addition, we are developing the CENTER SECTION of the magazine to bring up-to-date information to you each month. Short articles and columns will go into the center section (MISCELLANEA), along with READER FORUM, PERSONAL NOTES, INFORMATION EXCHANGE, PUBLICATION NOTES, CURRENT EVENTS and CLASSIFIED ADS.

The center section will allow more time to proof-read each issue's articles and avoid the typographical errors which have been bothering us. Our apologies for failing to credit "Pacific Yachting" magazine with original publication of Millen & Donaldson's May article (Floating Docks; unique microcosms lie just beneath your feet).

We need your support! Please send articles and notes for the issues and use every opportunity to show the magazine to groups. We know you like the magazine because you have seen it -- show your friends!

Top photo: *Octopus lanulatus* Quoy & Gaimard. Coral Sea, Australia

Bottom photo: *Octopus bimaculatus* Verrill, 1883. Guaymas, Sonora, Mexico.

Octopus, The Maligned Mollusk

Text and photos by Alex Kerstitch

Since ancient times the much maligned octopus has earned the unwarranted reputation of villain of the sea. Reports of attacks on sailors lost at sea or the engulfing of entire ships by giant octopuses have increased man's fear and lack of compassion for this eight armed mollusk.

With his pen, French poet and novelist Victor Hugo administered the octopus the ultimate insult when he wrote:

> The tiger can only devour you,
> the octopus inhales you;
> to be eaten alive is terrible
> to be drunk alive is inexpressible.

Actually, the octopus is a shy, secretive animal which normally retreats from human encounters. If molested by divers, it quickly flees without resistance under rocks or in crevices. Even large species, such as the giants of Puget Sound, Washington, are timid. Known to reach over four meters (12 feet) from tip to tip, they will retreat deep inside their caves when provoked.

All octopods, however, are equipped with parrot-like beaks used for biting and tearing captured prey. If handled, an octopus, like the Gulf of California *Octopus bimaculatus* Verrill, 1883, can be driven to bite. Generally, the wound from a bite is of little consequence, usually resulting in simple punctures of the skin. But all octopods produce a toxic substance, cephalotoxin, used to paralyze and kill their prey. The toxin is secreted from salivary glands and is released during the biting action. Although cephalotoxin can kill prey animals, it may not necessarily be dangerous to man. Two species of blue-ringed octopuses, *Octopus lanulatus* Quoy and Gaimard and *Octopus maculosa* Hoyle, are highly venomous and have been responsible for several human fatalities. *Octopus lanulatus* is considered the most venomous of the two and is responsible for most human deaths. Some toxicologists believe its toxin is more potent than the venom of most dangerous snakes. The fatality rate from bites of *O. lanulatus* and *O. maculosa* is estimated to be as high as 25%, with death among some victims occuring in less than 90 minutes.

The immediate pain from blue-ringed octopus bites has been compared to bee stings, although in some victims the bite is so subtle it often goes unnoticed. The neurotoxin affects the nervous system and victims may suffer numbness, blurred vision and other systemic symptoms similar to coelenterate envenomations, such as the man-of-war. In severe cases, muscular paralysis, respiratory distress and death may result from bites of even small individuals under 100mm (about 4 inches).

There is no effective treatment or antivenin against bites from venomous octopods. It has been suggested to treat envenomations as one would with snake bites.

Even though only a few species of octopuses have been reported to be venomous to man, all should be handled cautiously since they all possess a venom apparatus. The practice of allowing even small octopods to crawl on one's arm, as occasionally seen, is certainly not recommended.

ADDITIONAL READING

Jackson, L. A. July, 1981. An Introduction To The Anatomy and Physiology of the Octopus; Aquarium magazine

Kerstitch, Alex. April, 1980. Poisonous and Venomous Marine Animals (slide set) Educational Images.

Langone, John. August, 1983. A Tentacled Neurology Lab; Discover

Pratt-Johnson, Betty. January, 1978. Everybody loves an octopus; Oceans

Alex Kerstitch, 5436 E. Bellevue Ave., Tucson, AZ 85712

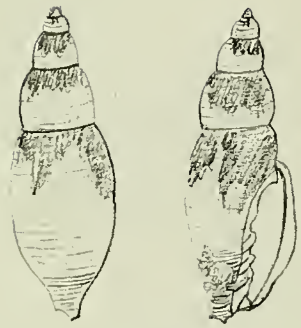


Figure 1. *Mitra idae.* Drawing by Stephanie Prince.

Mitra idae: California's Only Miter Shell
by Stephanie Prince

Mitra idae Melville, 1893, (common name, Ida's Miter) is listed as uncommon in most of my shell reference books. I have been collecting shells over 20 years and have found only four. They were empty shells that had been washed in among the rocks and tide pools close to shore on the Salt Creek Jetty in Laguna Niguel, California. It was a very low tide in the late afternoon, Sept. 1973. I wondered if a small colony had been disturbed by the unusually rough current or perhaps a predator had killed several at one time.

However, in a recent conversation with Dr. Bertsch, I realized that this species is really very common in its proper habitat. He has seen numerous specimens in the kelp beds off Pt. Loma, San Diego, in 40 to 75 feet depths. Beachcombing is not the way to find these animals; one must scuba dive! Well, this is a little more than I want to do in my quest for mollusks, so with enthusiasm I dove into my reference books to find out about *Mitra idae.*

Mitra idae is the only California member of the primarily tropical family Mitridae. Most of the more than 500 species of recent miters are found in the Indo-West Pacific; 85 are known from Hawaii and 135 species are reported from Fiji. This is similar to the distribution of the tropical cowries and cones. They also have only one representative each in the cooler temperate waters of California, but an abundance of species in warm tropical waters.

Mitra idae ranges from Crescent City, California, to Cedros Island, in the middle of the Baja California peninsula. Synonyms include *M. montereyi* Berry, *M. catalinae* Dall, and *M. diegensis* Dall.

Two of my specimens still have a portion of the thick, finely striate, black periostracum, and are mauve-brown in color on the exterior. The shell sculpture consists of fine spiral and axial striations which form a precise pitting appearance (Figure 1). Large specimens reach 60 mm; the shells vary in width, some being broad, others narrower. The aperture is long and narrow and white within. The columella has 3 to 4 large pleats at the base.

The living animal's body is snow white (Figures 2 and 3), in marked contrast to the dark shell.

The animal is carnivorous, most likely preying on marine worms and some other mollusks as well. They use their long and retractable snout in feeding on their prey.

Ida's miters burrow into the sand, keeping their siphons extended. An excellent account of the reproductive biology of *Mitra idae* appeared some years ago in **The Veliger**. James Chess and Richard Rosenthal observed these animals in the subtidal areas off La Jolla and Point Loma (San Diego, California). Sexes are separate, and fertilization is internal. The male, always smaller than the female, grasps the right side or outer whorl of the female's shell. She, in turn, firmly holds onto a hard substratum. Egg capsules are attached to hard objects, often on the sides of rocks. Larger females lay larger sized egg capsules. The capsules vary from 2 to 8 mm in length, with 77 to 945 eggs per capsule. Hatching of free-swimming veligers occurs 26–27 days after oviposition.

Figure 2. Pair of *Mitra idae,* one with an attached *Crepidula* shell. Photo by Hans Bertsch.

I haven't found any more Ida's miters here or anywhere around here since 1973. I guess they are all happily hunting worms out in the kelp beds!

Figure 3. Close up of living *Mitra idae*, showing white foot, tentacles, and anterior siphon; a black eye spot is visible. Underwater photograph taken at 50 feet, off Pt. Loma, by H. Bertsch.

ADDITIONAL READING

Abbott, R. Tucker. 1974. American Seashells. Van Nostrand Reinhold Co., New York. 237 pp.

Cate, Jean N. 1968. Mating behavior in *Mitra idae* Melvill, 1893. Veliger 10 (3): 247-252.

Chess, James R., and Richard J. Rosenthal. 1971. On the reproductive biology of *Mitra idae* (Gastropoda: Mitridae). Veliger 14 (2): 172-176.

McLean, James H. 1978. Marine shells of southern California. Natural History Museum of Los Angeles County, Science Series 24: 104 pp.

Morris, Percy A. 1966. A field guide to shells of the Pacific coast and Hawaii. Houghton Mifflin Co., Boston. plt. 40, p. 99.

Stephanie Prince, 24242 Via Aquara, Laguna Niguel, CA 92677

From Walter O. Cernohorsky [Auckland Institute and Museum, Private Bag, Auckland 1, New Zealand]. Hans Bertsch's paper is fine as it is, and there is nothing in it to which one could take exception to, although the subject itself would receive as many opinions as there are malacologists. My opinion is as follows:

Some comparisons between C.alisonae Burgess and C. teres Gmelin, as given by Burgess in his original description are not quite correct. The shape of teres is as variable as that of C. caurica, depending on whether specimens come from quiet lagoons or from localities where surf and wave action are strong. The presence or absence of a dorsal blotch in C. teres is also a variable feature: not ALL teres lack a dorsal blotch, and it would be taxonomically irresponsible to suggest that all those specimens of C. teres which do have a dorsal blotch should automatically be called C. alisonae.

We know quite a lot about the range of variation in shell-morphology, considerably less about variation in radular morphology and precious little about variation in living animal patterns within a given species. While studying animal characters of C. summersi (Schilder) in the Fiji Islands, I came across animals which had almost all simple papillae, some in which the majority of papillae were branched, and others which had simple and branched papillae in about equal numbers in the same animal. C. cribaria from Fiji, had a mantle colour which ranged from pale orange to a deep red. It soon became obvious that variation in animal pattern is just as prone to variation as the rest of the species, and such variation could be due to environment, food, developmental stage, sexual dimorphism or simple individual variation or even geographic separation. Sibling species and hybrids have always been an enigma in Cypraeidae, open to suppositions but very difficult to prove. The taxonomic application of such groups is also limited if Museum curators and collectors are unable to place their specimens in either the teres or alisonae group without detailed knowledge of the living animal.

In the few known cases where shells inseparable on shell-characters had two distinct types of radulae (e.g. Pisania luctuosa Tapparone-Canefri, in the Buccinidae), sexual dimorphism was responsible, and in Cassis cornuta, sexual dimorphism is evident in shell-characters.

From C.M. Burgess [2502 Manoa Road, Honolulu, HI 96822] Thank you for sending Hans Bertsch's article on cowrie anatomy. I believe he presents timely and clearly its probable future significance in species determination. There is only one statement that I might question. I have noticed marked color variation in the entire animal of the same species from different geographical areas or even from the same reef.

This color variation was emphasized in "Cowries of the World" (in press), and cannot be used to separate species of

READER FORUM
(Continued).......

cowries. For example the color of the animal of Cypraea eglantina Duclos, may vary from slate gray, to light orchid and jet black, golden brown or dark red.

As a further note to Bertsch I have found no "gross" variation in the external anatomy of many cowries as it develops from the bulla to the fully adult form. Cowries closely examined were caputserpentis, moneta, poraria, helvola, alisonae, tigris and leviathan. There must be many changes in the animal from the hatch to the bulla stage.

From Hans Bertsch. I suspect that Cypraea alisonae is in the Panamic faunal province. The specimens identified as C. teres need to be re-examined in light of Burgess's species. Obviously, careful comparison of specimens is necessary. That both C. teres and C. alisonae are in the Panamic region would not be that surprising.

From Robert Robertson [The Academy of Natural Sciences of Philadelphia, 19th & the Parkway, Logan Square, Philadelphia, PA 19103]. I was surprised to read in "Opisthobranch" 16(3):26 that the Pyramidellomorpha [Pyramidellidae] are "a small semi-extinct group...." Most of the animals are small, but the group is not: the Pyramidellidae are probably the second most speciose family of gastropods (second only to the Turridae), and it seems to me that more Recent than fossil species are known. Along with the Architectonicidae and a few other families, pyramidellids are transitional between the subclasses Prosobranchia and Opisthobranchia.

Good luck with "Shells and Sea Life"!

PERSONAL NOTES....

Winston A. Barney [see "Computers and Shell Collecting," July issue] One note in answer to your plea for a volunteer to coordinate a column on computers in malacology: Several months ago I volunteered to do that very same thing for readers of "Hawaiian Shell News." I have received only one reply to date. I am forced to believe there is not much interest there, however, I will be glad to take any information you may receive from readers and compile their thoughts for you. I am personally convinced that the computer can be of great value to the collector.

I use a data base (Radio Shack's "Profile") to catalog my collection. With ease, I can print out all shells in my collection from any geographical area, all shells published by a particular author, or all species by genus. I also store on disks my library references, both books and periodicals, for each shell in my collection. Wes Thorsson of Hawaii uses his computer to identify shells using a "key." The known characteristics of each species are stored in memory and the user simply answers a few questions to arrive at the correct name. This is really great for turrids and miters. John R. Lewis of Lisle, Illinois had several thousand lots of shells in four collections with different numbering systems. He used his I.B.M. computer to renumber all the shells in his four collections leaving room on each entry for family, genus, species, author & date, geographical province, locality & habitat, comments, source, date acquired, no. of specimens, cost and other remarks such as reference to publications. WOW!

Larry Harris [Zoology Department, University of New Hampshire, Durham, NH 03824] I have recently seen a new copy of the "Opisthobranch" and thought I had better get my subscription renewed since I will be doing much more nudibranch work when I return from sabbatical here in Australia. I am based at the University of Sydney and working at One Tree Island Field Station to the east of Heron Island. I have been looking at how fish affect recruitment of motile invertebrates onto coral substrates. I have used pieces of Acropora that have either been grazed (no cover) and those with damselfish gardens (cover). The key to invertebrate density and diversity is cover (shag rug works as well or better than real garden) and therefore herbivorous fish really drive the system because they remove the cover. The dominant opisthobranchs have been a couple of cephalaspideans. Since all experiments run for a week or less, I never see the animals more than a couple of mm. It is a very dynamic system, but we found that it is the same in the Gulf of Maine - panels with Obelia would have numerous and breeding Tergipes despectus in two weeks.

I have found what is probably a new species of Phestilla feeding on Goniopora. Specimens reach 60+ mm which is 20 mm larger than either P. melanobranchia or P. lugubris. I will be describing it along with Dr. Baba who was so helpful to me in identifying P. melanobranchia so many years ago.

The issue of the "Opisthobranch" that I have seen a copy of is January '84 and it has an inquiry from Alan Kuzirian about the thesis on Aeolidia papillosa and Hermissenda crassicornis. There are two that I am aware of: (1) Jack Yarnall's from about 1970 out of Stanford; and (2) Thomas Cockburn's out of the University of Victoria in 1976. Dr. Robert Reid of the Biology Department, University of Victoria was the advisor.

I am still in Durham [University of New Hampshire] and will return there by the middle of August. We will be in Santa Barbara [California] from 20 June to 10 August working with Al Ebeling and Dave Laur. Keep up the good work and you know where to find us if you are back in New England again.

THE APRICOT SLUG. Wesley M. Farmer, 11061 Lea Terrace Drive, Santee, CA 92071

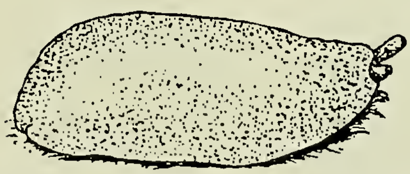
Opisthobranchs or sea slugs are found in all the oceans and seas, even under the Antarctic ice shelf. Their form and striking color make them a favorite of photographers. In the past 3 years a half dozen books have appeared illustrating the awesome color combinations and curious body shapes of opisthobranchs.

The apricot slug (also called the orange blob or the lemon pleurobranch) is common in the tropical waters of the Gulf of California and the Caribbean. It is often found in pairs under rocks (Bertsch and Ghiselin, personal communication). It has been collected rarely in southern California.

The correct species name is still in dispute. It has been called Berthellina citrina, B. engeli, and B. engeli ilisima.

This animal grows to a length of about 60 mm. Its body suggests half of an apricot, for it is smooth and orangish-red.

Opisthobranchs have few if any predators. One way to avoid being eaten is to evolve defensive acid secreting capabilities. This species is particularly offensive in its defense. On the dorsal surface are goblet cells which secrete sulfuric acid. When tested, the secretion has measured a highly acidic pH of 1.



Berthellina (engeli) ilisima Marcus & Marcus, 1967. Drawing by Wesley M. Farmer.

PUBLICATION NOTES.

Willan, Richard C. & Neville Coleman. 1984. Nudibranchs of Australasia. Australasian Marine Photographic Index, Sydney, Australia. 56 pp.; figs. 1-168 + A-F +[17]. [ON10419; Softbound; A $25.00; post/pack $3.00; overseas $2.80] About 170 color photographs in this gorgeous work. The color printing and the photography are simply excellent. Each species pictured with the name, author, date, short description, range, illustrated specimen size collecting locality. The only possible complaint about this work is the index stock cover, saddle-stapled around the beautiful contents. The book deserves a better binding and a lower price. The book belongs in every library as the prime opisthobranch reference for the Australasian region. - S&SL

Thompson, T.E. ?1984. Biology of Opisthobranch Molluscs. Volume II. The Ray Society, London. [Tom has just corrected proofs of the volume and is preparing the index. It should be published in mid-late July, 1984]

WESTERN SOCIETY OF MALACOLOGISTS: The seventeenth annual meeting will be held on the campus of the University of California at Santa Cruz on August 16-19, 1984. For information and pre-registration forms write: Mrs. Margaret Mulliner, Treasurer, Western Society of Malacologists, 5283 Vickie Drive, San Diego, CA 92109, (619)488-2701. Persons wishing to present a paper at the meeting should contact WSM President George L. Kennedy, U.S.G.S., 345 Middlefield Road, Menlo Park, CA 94025 (415)323-8111, extension 2634. Deadline fór receipt is 15 July, 1984. All students wishing to compete for the Best Student Paper Award ($100.00 first place, $75.00 second place, $50.00 third place), should include the signature and phone number of their supervising professor.

We are happy to announce the formation of a new shell club in central Pennsylvania: THE CEN PEN. BEACHCOMBERS, initiated in October of 1983. They have been organizing and growing since then to their present membership of 28. Meetings are quarterly, in the homes of members, while a permanent meeting place is found. A quarterly newsletter "The Noble Pen" is sent to all members. John J. Brandyberry is President. For further information contact: Teri Maurer, Secretary, 360 Chestnut, Columbia, PA 17512.

The Conchological Club of Southern California will hold their annual shell auction Sunday, August 26th, at 1:00 p.m. For additional details contact Kirstie Kaiser, 19545 Sherman Way #62, Reseda, CA 91335.

Schedule of Shows and Conventions

June 27-30	Conchologists of America, St. Petersburg, Florida
July 22-27	American Malacological Union, Norfolk, Virginia
July 22- August 1	International Symposium on Marine Plankton, Schimizu, Japan
July 27-29	Jacksonville Shell Show, Jacksonville Beach, Fla.
Aug. 6-9	V Congresso National de Malacologia, Vigo, Spain
Aug. 11-12	Midwest Regional Shell Show, Indianapolis, Indiana
Aug. 16-19	Western Society of Malacologists, Santa Cruz, Cal.
Sep. 12-19	Association Conchliologique de New Caledonia, Noumea, New Caledonia
Sep. 22-23	Long Island Shell Show, Freeport, New York
Oct. 13-14	Tri-State Shell Show, Cincinnati, Ohio
Oct. 13-14	Santa Barbara Shell Show, Santa Barbara, California
Oct. 20-21	Philadelphia Shell Show, Philadelphia, Pennsylvania
Dec. 27-30	Western Society of Naturalists, Denver, Colorado

This list will be updated as information arrives. Thanks to Donald Dan [Oak Brook, Illinois] for his assistance in compiling the list. - S&SL.

CLASSIFICATION NOTES: AN OUTLINE OF CLASSIFICATION OF LIVING MARINE MOLLUSCA

As the revision of the "Outline of Classification" proceeds, we realize that it is a tremendously complicated task, incorporating changes and corrections to out of date material, trying to reconcile the recent systematic revisions of various authors, and coping with my own errors. The outline presented is admittedly incomplete, and has many mistakes, which we hope to correct with the help of our readers and advisors.

Where it is possible, we are sending advance copy of each section to specialists in various fields, hoping that they will assist us in making the lists as complete, correct and current as possible.

I am most grateful to Dr. Walter Cernohorsky for his corrections and additions to the Outline thus far. Thanks also to Dr. William Emerson and Walter Sage of the American Museum of Natural History in New York for material on recent changes and for continued help and encouragement.

A corrected revision of the first four sections is printed below.

Kay C. Vaught - 8646 E. Paraiso Drive - Scottsdale, Arizona 85255

PHYLUM MOLLUSCA

Class Monoplacaphora
Order Tryblidioidea

TRYBLIDIACEA
TRYBLIIDAE (Fossils)

NEOPILINIDAE
NEOPILINA Lemche, 1957
LAEVIPILINA McLean, 1979
VEMA Clark & Menzies, 1959

Class Gastropoda
Subclass Prosobranchia
Order Archaeogastropoda

PLEUROTOMARIACEA
PLEUROTOMARIIDAE
ENTEMNOTROCHUS Fischer, 1885
MIKADOTROCHUS Lindholm, 1927
PEROTROCHUS Fischer, 1885

SCISSURELLIDAE
SCISSURELLA Orbigny, 1824
Schismope, Jeffreys, 1856;
Woodwardia Crosse & Fischer, 1861
ANATOMA Woodward, 1859
Schizotrochus Monts., 1884
Scissurona Iredale, 1924
SINEZONA Finlay, 1927
SUKASHITROCHUS Habe & Kosuge, 1964

HALIOTIDAE
HALIOTIS Linneus, 1758
EUHALIOTIS Wenz, 1938
EUROTIS Habe & Kosuge, 1964
EXOHALIOTIS Cotton & Godfrey, 1933
MARINAURIS Iredale, 1927
NORDOTIS Habe & Kosuge, 1964
NOTOHALIOTIS Cotton & Godfrey, 1933
OVINOTIS Cotton, 1943
PADOLLUS Montfort, 1810
Neohaliotis Cotton & Godfrey, 1933
PAUA Fleming, 1952
SANHALIOTIS Iredale, 1929
SCHISMOTIS Gray, 1856
SULCULUS H.& A. Adams, 1854
USAHALIOTIS Habe & Kosuge, 1964

NEOMPHALACEA
NEOMPHALIDAE
NEOMPHALUS McLean, 1981

Ref. J.H.McLean - The Galapagos Rift Limpet Neomphalus. 1981 Malacologia, 21(1-2)291-336

FISSURELLACEA
FISSURELLIDAE
EMARGINULINAE
EMARGINULA Lamarck, 1801
SEMPERIA Crosse, 1867
SUBZEIDORA Iredale, 1924
CLYPIDINA Gray, 1847
EMARGINELLA Pilsbry, 1891
HEMITOMA Swainson, 1840
Siphonella Issel, 1869;
Subemarginula Gray, 1847
MONTFORTIA Recluz, 1843
MONTFORTISTA Iredale, 1929
LAEVIEMARGINULA Habe in Kuroda, 1953
NESTA H.Adams, 1870
LAEVINESTA Pilsbry & McGinty, 1952
NOTOMELLA Cotton, 1959
PUNCTURELLA Lowe, 1827
Cemoria Lowe, 1826;
Cremoria Gray, 1842;
Rimulanax Ire., 1924;
Sypho Brown, 1827;
Sipho Brown, 1833 (non Fabricius, 1823);
Vacerra Iredale, 1924 (non Godman, 1900);
Vacerrena Iredale, 1958
CRANOPSIS A.Adams, 1860
FISSURISEPTA Seguenza, 1863
KIRA Habe, 1951
RIXA Iredale, 1924
RIMULA DeFrance, 1827
Rimularia Bronn, 1838
SCUTUS Montfort, 1810
Aviscutum Iredale, 1940;
Parmophorus Blainville, 1817;
Scutum Sowerby, 1842 (non Schumacher, 1817)
NANNOSCUTUM Iredale, 1937
TUGALIA Gray in Dieffenbach, 1843
PARMOPHORIDEA Wenz, 1938
TUGALINA Habe in Kuroda, 1953
ZEIDORA A.Adams, 1860
Zidora Fischer, 1885;
Crepiemarginula Seguenza, 1880;
Legrandia Beddome, 1833 (non Hanley, 1872)

Key to "Outline" Format:

SUPERFAMILY
FAMILY
SUBFAMILY
GENERA
SUBGENERA
Synonym

DIODORINAE
DIODORA Gray, 1821
AUSTROGLYPHIS Cotton & Godfrey, 1934
ELEGIDION Iredale, 1924
FISSURIDEA Swainson, 1840
MEGATHURA Pilsbry, 1890
STROMBOLI Berry, 1953

FISSURELLINAE
FISSURELLA Bruguiere, 1789
BALBOAINA Perez-Farfante, 1943
CARCELLESIA Per.-Far., 1952
CLYPIDELLA Swainson, 1840
CREMIDES H.& A.Adams, 1854
AMBLYCHILEPAS Pilsbry, 1890
Sophismalepas Iredale, 1924
COSMETALEPAS Iredale, 1924
FISSURELLIDEA Orbigny, 1841
PUPILLAEA G.B.Sowerby, 1835
INCISURA Hedley, 1904
LEUROLEPAS McLean, 1970
LUCAPINA Sowerby, 1835
LUCAPINELLA Pilsbry, 1890
MACROCHISMA Swainson, 1840
Macrochasma Dall, 1915;
Macroschisma Agassiz, 1846
DOLICHISCHISMA Iredale, 1940
FOROLEPAS Iredale, 1940
MEGATEBENNUS Pilsbry, 1890
MONODILEPAS Finlay, 1927 (?)
MONTFORTULA Iredale, 1915
MONTFORTULANA Habe, 1961

PATELLACEA
PATELLIDAE
PATELLINAE
PATELLA Linnaeus, 1758
Costatopatella Pallary, 1912;
Laevipatella Pallary, 1920
ANCISTROMESUS Dall, 1871
CYMBULA H.& A.Adams, 1854
OLANA H.& A.Adams, 1854
PATELLASTRA Monterosato, 1884
PATELLIDEA Thiele in Troschel, 1891
PATELLONA Thiele in Troschel, 1891
PATINA Leach in Gray, 1847
PENEPATELLA Iredale, 1929
SCUTELLASTRA H.& A.Adams, 1854
Patellanax Iredale, 1924
HELCION Montfort, 1810
ANSATES Sowerby, 1839
PATINASTRA Thiele in Troschel, 1891

NACELLINAE
NACELLA Schumacher, 1817
PATINIGERA Dall, 1905
Patinella Dall, 1871
CELLANA H.Adams, 1869
Granopatella Pallary, 1920
Helcioniscus Dall, 1871

ACMAEIDAE
ACMAEINAE
ACMAEA Escholtz, 1833
ACTINOLEUCA Oliver, 1926
ASTERACMEA Oliver, 1926
ATALACMEA Iredale, 1915
CHIAZACMEA Oliver, 1926
CONACMEA Oliver, 1926
NACCULA Iredale, 1924
NOMAEOPELTA Berry, 1958
NOTOACMEA Iredale, 1915
PARVACMEA Iredale, 1915
PATELLOIDA Quoy & Gaimard, 1834
RADIACMEA Iredale, 1915
SUBACMEA Oliver, 1926
TECTURA Gray, 1847
Niveotectura Habe, 1944
THALASSACMEA Oliver, 1926
COLLISELLA Dall, 1871
CONOIDACMEA Habe, 1944
KIKUKOZARA Habe, 1944
LOTTIA Gray, 1833
Lecania Carpenter, 1866
(non Macquart, 1839)
Tecturella Carpenter, 1860
POTAMACMAEA Peile, 1922
SCURRIA Gray, 1847

RHODOPETALINAE
RHODOPETALA Dall, 1921

PECTINODONTINAE
PECTINODONTA Dall, 1882

LEPETIDAE
LEPETA Gray, 1842
Cryptoctenidia Dall, 1918
CRYPTOBRANCHIA Middendorff, 1851
IOTHIA Forbes, 1849 (Jothia)
MAORICRATER Dell, 1956
NOTOCRATER Finlay, 1927
PILIDIUM Forbes & Hanley, 1849
(non Mueller, 1846)
PROPILIDIUM Forbes and Hanley, 1849
Rostrisepta Seguenza, 1866
PUNCTOLEPETA Habe, 1958

BATHYSCIADIIDAE
BATHYSCIADIUM Dautzenberg
& Fischer, 1900

COCCULINACEA
COCCULINIDAE

COCCULINA Dall, 1882
COCCOPYGIA Dall, 1889
(non Reichenbach, 1862)
DALLIA Jeffreys, 1883
(non Bean, 1878)
PSEUDOCOCCULINA Schepman, 1908

LEPETELLIDAE
LEPETELLA Verrill, 1880
ADDISONIA Dall, 1882
COCCULINELLA Thiele, 1909
TECTICRATER Dell, 1956
TECTISUMEN Finlay, 1927

Note: Powell, 1979, places this after Neritacea.

Ref. J.F. Quinn, Jr. - 1979
(Revision of MARGARITINAE)
Malacologia, 1979, 19(1):1-62
21(1-2):291-336

TROCHACEA
TROCHIDAE
MARGARITINAE
MARGARITES Gray, 1847
Eumargarita Fischer, 1885;
Margarita Leach in Ross, 1819
(non Leach, 1814)
Valvatella Melvill, 1897
(non Gray, 1857)
BATHYMOPHILA Dall, 1881
CANTHARIDOSCOPS Galkin, 1955
MARGARELLA Thiele, 1893
Margaritella Thiele
in Troschel, 1891
(non Meek & Hayden, 1860);
Promargarita Strebel, 1908;
Submargarita Strebel, 1908
MARGARITOPSIS Thiele, 1906
OMPHALOMARGARITES Habe & Ito, 1965
PUPILLARIA Dall, 1909
Lirularia Dall, 1909
ANTIMARGARITA Powell, 1951
BATHYBEMBIX Crosse, 1892
Bembix Watson, 1879
(non Koninck, 1844);
Ginebis Otuka, 1942
CALLIOTROPIS Seguenza, 1903
Solaricida Dall, 1919
DANILIA Brusina, 1865
Craspedotus Philippi, 1847
(non Schonherr, 1844)
Heliciella O.G.Costa, 1861
ECHINOGURGES Quinn, 1979
EUCHELUS Philippi, 1847
Aradasia Gray, 1850;
Huttonia Kirk, 1882
(non Pickard
Cambridge, 1880)
Tallorbis G.& H.Nevill, 1869)
ANTILLACHELUS Woodring, 1928
HERPETOPOMA Pilsbry, 1890
NEVILLIA H. Adams, 1868
VACEUCHELUS Iredale, 1929
GRANATA Cotton, 1957
HYBOCHELUS Pilsbry, 1889
LISCHKEIA Fischer in Keiner
& Fischer, 1880
ADAMSENIDA Habe, 1957
Solariellopsis Schepman, 1908
(non Gregorio, 1886)
CIDARINA Dall, 1909
TURCICULA Dall, 1881
MIRACHELUS Woodring, 1928
OLIVIA Cantraine, 1835,
(non Bertolini, 1810)
TIBATROCHUS Nomura, 1940
TROPIDOMARGA Powell, 1951

PLANITROCHINAE
PLANITROCHUS Perner in Barrande, 1903

MONODONTINAE
MONODONTA Lamarck, 1799
Labio Oken, 1815;
Monodontes Montfort, 1810;
Odontis Sowerby, 1825;
Pimpellies Gistl, 1848;
Trochidon Swainson, 1840
AUSTROCOCHLEA Fischer, 1885
NEOMONODONTA Kuroda & Habe, 1971
OSILINUS Philippi, 1847
Caragolus Monterosato, 1884;
Trochocochlea Moerch, 1852
BANKIVIA Beck in Krauss, 1849
LEIOPYRGA H.& A.Adams, 1863
CANTHARIDUS Montfort, 1810
Cantharidium Schaufuss, 1869;
Cantharis Ferussac, 1821
(non Linnaeus, 1758);
Elenchus Swainson, 1840
(non Curtis, 1831)
IWAKAWATROCHUS Kuroda & Habe, 1954
MICRELENCHUS Finlay, 1927
PHASIANOTROCHUS Fischer, 1885
PLUMBELENCHUS Finlay. 1927

CHRYSOSTOMA Swainson, 1840
DILOMA Philippi, 1845
Zediloma Finlay, 1927
CAVODILOMA Finlay, 1927
CHLORODILOMA Pilsbry, 1889
Latona Hutton, 1884
(non Schumacher, 1817)
FRACTARMILLA Finlay, 1927
MELAGRAPHIA Gray, 1847
Anisodiloma Finlay, 1927;
Neodiloma Fischer, 1885
OXYSTELE Philippi, 1847
PICTODILOMA Habe, 1946
JUJUBINUS Monterosato, 1884
Clelandella Winkworth, 1932
MIRULINUS Monterosato, 1917
STRIGOSELLA Sacco, 1896
TEGULA Lesson, 1835
AGATHISTOMA Olsson
& Harbison, 1953
CHLOROSTOMA Swainson, 1840
OMPHALIUS Philippi, 1847
Neomphalius Fischer, 1885
PROMARTYNIA Dall, 1909
STEARNSIUM S.S.Berry, 1958
THALOTIA Gray, 1840
ALCYNA A.Adams, 1860
CALTHALOTIA Iredale, 1929
ODONTOTROCHUS Fischer in Kiener
& Fischer, 1880
PROTHALOTIA Thiele, 1930
TURCICA H.& A.Adams, 1854
Ptychostylis Gabb, 1866
PERRINIA H.& A.Adams, 1854

GIBBULINAE
GIBBULA Risso, 1826
Conotrochus Pilsbry, 1889
(non Seguenza, 1864);
Magulus Monterosato, 1888;
Phorculellus Sacco, 1896;
Phorculus Monterosato, 1888
(non Cossmann, 1888);
Puteolus Monterosato, 1888
ADRIARIA Pallary, 1917
CALLIOTROCHUS Fischer in Kiener
& Fischer, 1880
CANTHARIDELLA Pilsbry, 1889
COLLICULUS Monterosato, 1888
Glomulus Monts., 1888;
Glossulus Pallary, 1938
ENIDA A.Adams, 1860
EURYTROCHUS Fischer in Kiener
& Fischer, 1880
FORSKALENA Iredale, 1918
Forskalia H.& A.Adams, 1854
(non Koelliken, 1853)
FORSKALIOPSIS Coen, 1931
(non Haeckel, 1888)
HISSEYAGIBBULA Kershaw, 1955
NOTOGIBBULA Iredale, 1924
PHORCUS Risso, 1826
STEROMPHALA Gray, 1847
Gibbulastra Monts., 1884;
Gibbuloidella Sacco, 1896;
Korenia Friele, 1877
TUMULUS Monterosato, 1888
CITTARIUM Philippi, 1847
Livona Gray, 1847;
Meleagris Montfort, 1810
(non Linnaeus, 1758)
FOSSARINA A.Adams & Angas, 1864
Minos Hutton, 1884
CLYDONOCHILUS Fischer, 1890
MINOPA Iredale, 1924
NANULA Thiele, 1924
NORRISIA Bayle, 1880
Trochiscus Sowerby, 1838
(non Heyden, 1826,
nor Held, 1837)
PHORCULUS Cossmann, 1888
TROCHINELLA Iredale, 1937

Figure 1. Living *Cyphoma emarginatum* on *Muricea*; underwater photograph of 20 mm long specimen in Bahía de los Angeles, Baja California, Mexico. Mantle retracted.

Figure 2. *Cyphoma emarginatum*, mantle extended. Same specimen as Figure 1.

Figure 3. Living *Cyphoma signatum* showing mantle and siphon coloration; collected on gorgonian at Galeta Reef, Panama (Caribbean coast). (see also photo, back page.)

Figure 4. *Gorgonia ventalina*, Salmadina Reef, Panama. Underwater view of *Cyphoma gibbosum* habitat.

Figure 5. *Cyphoma gibbosum* juvenile, Galeta Reef, Panama.

All photos this page by Hans Bertsch

Figure 6. *Cyphoma gibbosum* adult on Gorgonia. Note scar above right of snail where it has been feeding. Galeta Reef, Panama.

Notes from Hans Bertsch

Cyphoma: The Hump Shells

Belonging to a distinctive tropical American genus of mesogastropods, species of *Cyphoma* Roding, 1798, are characteristically gorgonian feeders. They are members of the family Ovulidae Fleming, 1822. This family of cypraeaceans is represented by four subfamilies in American waters (Abbott, 1974):

1. Eocypraeinae Schilder, 1927, with the genera *Jenneria* Jousseaume, 1884, (see Bertsch, 1984), and *Pseudocypraea* Schilder, 1927;
2. Pediculariinae Gray, 1853, with the genus *Pedicularia* Swainson, 1840;
3. Ovulinae Fleming, 1822, containing the genus *Primovula* Thiele, 1925; and
4. Simniiae Schilder, 1927, which encompasses the genera *Simnia* Risso, 1826, *Cyphoma,* and *Pseudocyphoma* Cate, 1973.

It should be noted that Keen (1971) does not use Simniinae, referring those genera to Ovulinae.

Shells of *Cyphoma* are fairly large, elongate, and often heavily calloused (with a smooth, inrolled, thick outer lip). They have broad terminal ends, with a characteristic transverse angular dorsal ridge. The word cyphoma is from the Greek, meaning hump (Emerson & Jacobson, 1976), chosen in obvious reference to this ridge. The coloration of shells in this group is similar. It is usually a delicate shade that almost defies description: cinnammon buff, pinkish-white flesh color, cartridge buff, tints of lilac, pale orange-beige, etc. Their artistic hues defy precise verbal description, but once seen they are unmistakable and immediately recognizable.

When found alive in their natural habitat, the delicate pastels of the shell are blatantly hidden under an encircling mantle of yellowish complexion on which are boldly emblazoned black or brown circles, streaks, spots, or "contorted graffiti marks resembling histological cross-sections" (Abbott, 1974: 153).

Extant species of *Cyphoma* are Caribiphilic in their distribution. With the closure of the Panamic seaway by the uplifting of the Central American mountainous land mass, evolutionary processes resulted in greater speciation in the Caribbean than in the Pacific.

There are eight nominate species that belong to this group. They have been divided into two genera by Cate (1973), or treated as members of subgenera by Abbott (1974). They fall clearly into two groups: those with a distinct transverse dorsal ridge and those without it. Abbott separated these, but Cate mixed the forms among the genera. Because of the obvious distinctness of the prominent ridge, I recommend following Abbott's clear separation of the species, but at the generic level. Hence, the classification of this group would read:

Cyphoma gibbosum Linnaeus, 1758)
C. macgintyi Pilsbry, 1939
C. alleneae Cate, 1973
C. signatum Pilsbry & McGinty, 1939
C. emarginatum (Sowerby, 1830)
Pseudocyphoma aureocinctum (Dall, 1899)
P. intermedium (Sowerby, 1828)
P. kathiewayae Cate, 1973

Pseudocyphoma kathiewayae is known from only one specimen, partly fossilized, collected off San Sebastian, NE Spain. It is the only species not reported from the American tropics. However, this species may not be extant; more research is necessary to determine the validity, biology, and distribution of this species.

Pseudocyphoma aureocinctum has been dredged from deep water (123 to 128 m) off Cuba and the West Indies, living on a white gorgonian. *Pseudocyphoma intermedium* is known from Bermuda, Florida, the West Indies, and Brazil. Its columellar lip has a prominent, oblique, funicular plait. These species respectively are about 20 mm and more than 30 mm long.

Cyphoma emarginatum occurs in the eastern Pacific, from the northern Gulf of California to Ecuador (Keen, 1971: 496). I have found it in Bahia de los Angeles (central Baja California), feeding on the gorgonian *Muricea* (see Figures 1 and 2). The shell is about 15–20 mm long, whitish to pink-flesh colored, with sharply defined, protuberant, almost bumpy margins. The mantle is varying shades of golden orange brown with darker transverse striations. It is the only *Cyphoma* presently known from the eastern Pacific. All the other species of *Cyphoma* are Caribbean and tropical west Atlantic in distribution.

Cyphoma alleneae is a rare species, reported from corals (not gorgonians) in the Florida Keys. The mantle is its most distinctive feature: the design is of convoluted lobes with anastomosing or separate vacuole-like hollows inside. This has been termed the "graffiti" design. the 20–30 mm long shell appears intermediate in shape between *C. gibbosum* and *C. macgintyi.*

Cyphoma macgintyi is known from Bermuda, the Bahamas, and the southern Atlantic U.S. coast (North Carolina to Texas) (Abbott, 1974). Cate (1973) reports it only from Florida. The shell has a very high median ridge, sloping evenly outward from the ends of the shell. It varies from about 25 to 35 mm in length. The mantle is covered with small, circular, brownish spots.

Recent reports of the distribution of *Cyphoma signatum* have been conflicting. Cate (1973) restricts it to the Florida Keys, whereas Abbott (1974) cites in addition "Bermuda (rare); Bahamas to Brazil." Since I have collected this species in Panama, Abbott's stated distribution seems the more reasonable; *C.*

signatum apparently ranges throughout the Caribbean, from Florida to Brazil. This species tends to be more elongate than *C. gibbosum*; shells 35 and 38.7 mm long were 15 and 17.1 mm wide. By comparison, a *C. gibbosum* 37.3 mm long was 18.2 mm wide. Again, the mantle (see Figure 3) is its distinctive characteristic. The enveloping skin surface is cream yellow with numerous thin, closely-spaced, black transverse lines. The specimen I collected in Panama was feeding on a small gorgonian.

The best known and most studied of these animals is *Cyphoma gibbosum*. In next month's "Notes," I will discuss the feeding and reproductive behavior of *C. gibbosum*, and include previously unpublished scanning electron micrographs of the radula.

LITERATURE CITED

Abbott, R. Tucker. 1974. American Seashells. Van Nostrand Reinhold Co., New York. 663 pp.

Bertsch, Hans. 1984. *Jenneria pustulata*, the pustulate "cowrie." Opisthobranch 16 (2): 10

Cate, Crawford Neil. 1973. A systematic revision of the recent cypraeid family Ovulidae (Mollusca: Gastropoda). Veliger 15 (Suppl.): 1-116

Emerson, William K., and Morris K. Jacobson. 1976. The American Museum of Natural History Guide to Shells, land, freshwater, and marine, from Nova Scotia to Florida. Alfred A. Knopf, New York. xviii + 482 pp.

Keen, A. Myra. 1971. Sea shells of tropical west America. Stanford University Press, Stanford, California. xiv + 1064 pp.

Photos (pg. 85) by Hans Bertsch

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SHELLS AND SEA LIFE

A MONTHLY PUBLICATION ON MOLLUSKS AND MARINE LIFE

$2.50 JULY, 1984 Volume 16, Number 7

SHELLS AND SEA LIFE

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Short articles containing descriptions of new or repositioned taxa will be given priority provided the holotype(s) have been deposited with a recognized public museum and the museum numbers are included with the manuscript. We undertake no responsibility for unsolicited material sent for possible inclusion in the publication. No material submitted will be returned unless accompanied by return postage and packing. Authors will receive 10 free reprints. Additional reprints will be supplied at cost provided they are ordered before printing.

Shells and Sea Life ISSN 0747-6078 is published monthly by Steven J. Long & Sally Bennett, 505 E. Pasadena, Phoenix, AZ 85012-1518 U.S.A. Telephone (602) 274-3615. U.S. subscription rates are $15.00 per volume for individuals or $30.00 per volume for libraries and for institutions requiring invoices. U.S. First Class mail and Foreign subscription rates are $20.00 per volume. Foreign subscribers should add $5.00 for First Class mail or $10.00 for Air Mail postage. Send change of address 6 weeks in advance. Charge to remail issue for any reason $3.00. All back volumes are available at $15.00 per volume postpaid. Sample copies are available for $3.00 each postpaid. Rates are subject to change without notice. Arizona residents must add 6% sales tax to all orders.

FEATURES - JULY 1984

Front cover photo by Boris Innocenti: _Cyphoma gibbosum_, April 1974, Roatan Island off Honduras coast, 10-13 m depth.
Back cover photo by David W. Behrens: see pg. 106

EDITOR'S NOTES....

I have wanted to get the magazine out earlier in each month since the January issue but color printing and typesetting schedules just didn't seem to allow me to catch up. Hope that you enjoy my answer - doing two complete issues at once. With any luck, the August issue will appear very early in August.

Computers are a great help with shell collections (see W.A. Barney, June and this issue) and even more help with general correspondence and setting up articles. They do come complete with problems and expense. Head crashes in June, on three separate hard disk systems, required both the June and July issues of S&SL to be typed into the computer two times when the entire data file was lost.

Notes on *Haliotis squamosa* Gray 1827
by Katharine Stewart

Haliotis squamosa Gray 1827 is a rare haliotid, little known in collections and incorrectly figured and described in publications since 1890, when it was last correctly described and figured in Pilsbry's *Manual of Conchology*. This paper attempts to trace *H. squamosa* historically, and to note those descriptions and figures which do not correspond to the examples of this species studied by the author, two in the British Museum of Natural History and two in a private collection.

The original description, appearing in the Appendix to "Narrative of a Survey of the Intertropical and Western Coasts of Australia, performed between 1818 and 1822", by Philip King, does not give locality data. Perhaps because the specimen was collected on this voyage, Reeve, 1846, attributed its habitat to Australia, citing King. Authors since Reeve have followed his example. However, the presence of *H. squamosa* in Australia has never been confirmed. There are none in the extensive *Haliotis* collection in the Australian Museum in Sydney, and it is not mentioned in Australian literature as a species native to their coasts.

Examination of the two specimens in the British Museum of Natural History, one approximately 87 mm by 41 mm, marked "Type?", and a second approximately 87 mm by 59 mm, showed them to be ovate, dull brownish red, raised spiral ribs strong and rounded, with deep interstices between them. New ribs intercalating between established ones remain smaller. These ribs, overlaid by incremental growth lines, enlarge irregularly into tubercules. Occassionally, when regular growth has been interrupted and a strong incremental line forms, the succeeding growth does not altogether match the contours of the older section and a sharp edge is produced on the rib, which resembles a short, blunt tile. On the interior the ribs are matched by deep furrows. The edge of the lip is denticulate. These unique spiral ribs distinguish *H. squamosa* from all other haliotids.

Several terms are used in the literature to describe the dorsal sculpture of this species, "tiled ribs," "tile-like scales," "sheath-shaped scales," etc. Two separate characters are being described in these publications: 1. the incremental growth lines and 2. the nature of the spiral ribs when they are crossed by a strong growth line.

Incremental growth lines in *Haliotis* may be very fine as in *H. cracherodii,* moderate as in *H. kamtschatkana,* or strong as in *H. midae, H. roei,* and *H. squamosa.* At the point where they cross spiral ribs they may look like fine concentric threads (*H. elegans*), or heavier threads leaning away from the growing edge (*H. roei*), or heavier threads leaning toward the growing edge (*H. squamosa*). These incremental lines form the "scales" in *H. squamosa.* When shell growth has slowed or forward growth temporarily stopped, the shell edge thickens and an unusually heavy line is formed. When a strong spiral rib is crossed by a heavy growth line a blunt projection may be formed at a tubercule. These are the "tiles."

Haliotis squamosa can first be traced to Martini and Chemnitz "Conchylien-Cabinet," 1769, in which a specimen called "Das grunbunte schuppichte Meerohr" is described as having six open holes, marbled white and green, with distinctly tiled ribs. Martini says, "I don't recall ever having found any information written about this Meerohr anywhere. All the more pleasure it is for me to relay an accurate description of it to our devotees from a specimen which is in the extensive Feldmann collection. You will find on the outer surface which is gently rippled, greenish in color and marked with reddish rays, rows of flat but somewhat broader ribbing formed by two bands running parallel to each other, as observed in the preceeding illustration. The difference is primarily in the convex tile-like scales with which these rib-like formations are often covered. These same ribs form corresponding concave furrows on the shiny inner surface."

The figure (Tab. XV, fig. 143) while sketchy, does show tubercular ribs, though neither scales nor tile-like projections are clear. The shell is greenish with brown rays emanating from the spire.

In "Einleitung in die Conchylienkenntnis nach Linné," 1783–1786, under the heading "Races and Mutations which are Missing in Linné," Schroeter described the green-mottled sea ear of Martini as having ribs formed by paired parallel channels, distinctive because of "crucible-shaped scales with which the ribs are copiously set. These ribs are likewise evident on the inner, shining side as concave grooves; and the channels are indented on the inside as they are high on the outside. This mutation is exceedingly rare."

In "Systema Naturae," 13th edition, 1791, Gmelin named *H. bistriata*, variety Beta, citing the figure in Martini, and gave this description: "Shell ovate, greenish stained with brown, transverse stria elevated, doubled. Rare in African Ocean. Interior silvery, exterior near the spire colored weak red-brown from which rays of the same color cross the dorsum; right edge with sharp folds, six open holes."

Haliotis roedingii, first cited by Menke in 1844 as *H. roedingii* Chemnitz, appears to be the same species. "*Haliotis* with shell elliptical-obovate, convex, outside golden red, concolored, transversely roughened with pressed together overlapping tiles; six round holes, medium sized, elevated; spire subterminal, short; lip rather broad, flat, externally rather prominant, inside slightly depressed in the middle, gradually reduced toward the front; aperature spirally sulcate within, obsoletely transversely rugose, silvery. Length 2 poll. 9 lin. (=71.94 mm), breadth 2 poll. (=52.32 mm), elevation 9.5 lin. (=20.71 mm). Habitat: Mauritius.

"The somewhat regularly arched shell is clearly ribbed outward from the posterior end of the lip margin to the row of holes on the dorsum by perhaps 32 ribs, and from the latter to the columellar margin (on the side area) by perhaps 7 spiral ribs, between which there exists deep furrows; in the opposite direction they are finely transversely lined and especially back of the lip margin, lengthwise, set off by separate, deep growth lines (antiquata). The transverse ribs, especially of the dorsal area, are alternately larger and smaller; the larger ones are elevated, strong, rounded, finely transversely wrinkled, covered by roof-tile-like, overlapping, short, blunt, sheath shaped scales, and the smaller ones at the same time irregularly interrupted by the growth lines and cut through to the base. The segments of the transverse ribs between the growth lines display for the most part, tile-shaped, in part vaulted, protuberances, from which the entire surface of the last whorl appears rough and uneven. The spire clearly shows three whorls, of which the lower ones bear granular ribs; the apex is eroded, pearl colored, shining like mother of pearl. The lip is rounded, obscurely notched around the margin. Posteriorly, near the spire, the columellar lip is 2.7 lines, near the middle 2 lines wide, nearly rounded off toward the outside."

"This species is chiefly allied with *Haliotis scabricosta*, m. Moll. N. Holl., and also seems to be related to *H. dentata* Jonas, in Zeitschr. f. Malak. S. 31. I saw it in the spring 1827, under the name given above bestowed by Chemnitz, at that time already 36 years earlier, in the collection which Peter Friederich Roeding . . . had received from a ship's doctor from Mauritius. The above diagnosis and description are derived from the specimen in the Roeding collection."

Haliotis scabricosta is a synonym for *H. roei* Gray, a south Australian species. It can easily be separated from *H. squamosa* by its rounded outline, the placement of the spire which lies approximately ⅓ of the distance from the posterior end in the lengthwise measurement, its lack of tile-like protuberances and its more numerous and smaller holes.

Haliotis dentata Jonas is a synonym for *H. mariae* Gray, a species which ranges from the Gulf of Oman to northern India. It differs from *H. squamosa* in the character of the ribs which are flatter, with wide interspaces between and no intercalation of new ribs, the established ribs broadening and at times dividing by fission as the shell enlarges. It has no tile-like protuberances and few tubercules. Rarely, when an incremental growth line has become heavy, a ledge is formed upon the suceeding growth. The nature of these ribs and interspaces is so different from those of *H. squamosa* that it is easily separated from that species.

In 1846 Reeve described and figured in excellent detail a specimen of *H. squamosa* from the Cuming collection. "Shell oblong-ovate, transversally wrinkled, spirally tubercularly ribbed, tubercules scale-like, ribs sometimes close, sometimes with a fine ridge running between them; perforations rather large, seven open; exterior spotted and variegated with yellow and orange-brown, interior whitish, irridescent. An extremely interesting species, well characterized by its close ribs of scale-like tubercules, ranging across the shell in oblique waves; in the middle portion of the shell there is a fine ridge running between the ribs; the color is also peculiar, a kind of burnt umber-stained orange. Dr. Jonas, of Hamburgh, informs me there is another specimen in the collection of Dr. Roeding of that city." Reeve adds "Hab. Australia: King," and puts *Haliotis roedingii,* Philippi as a synonym. There is no record to show that Philippi named this species.

The next reference to *H. squamosa* appears in 1858, when H. and A. Adams include it in a list of the Haliotidae. In 1859 Dr. J. C. Chenu published a figure of a shell under the name *H. squamosa* which differs markedly in the character of the ribs, which are pictured as narrower, more numerous, more closely crowded, with many more scaly protuberances and with little indication of their tubercular nature. There is no written description.

In 1883, in the second edition of "Systematisches Conchylien-Cabinet von Martini und Chemnitz," edited by Kuster, H. C. Weinkauff describes *H. squamosa* and uses Martini's figure. He says, "This species was incorrectly designated by Gmelin and although his otherwise infallible example was correctly interpreted by Schroeter, it was placed as *H. bistriata,* variety Beta because Schroeter described the sculpture as similar to *bistriata.*

"Dr. Kuster has designated in the table of contents Fig. 1 and 2 of Taf. 3 as *H. bistriata,* thereby following Gmelin's example without any criticism. The specimen I have in front of me of Mr. Paetel matches so perfectly Martini's figure and Schroeter's description as if it were their original; aside from a shorter length and less lively coloring, it also fits in completely satisfactorily with *H. squamosa* Gray as shown and figured by Reeve. I don't know whether Gray in naming his species had already thought of the one given by Schroeter, but even if not it is a good coincidence that the correct description was arrived at in two such different occasions. In fact *H. squamosa,* the scaly one, is the best name that one can find for this species."

G. B. Sowerby, in 1887, described and figured *H. squamosa* as a low ovate shell, variegated red and brown, large spiral cords squamose and nodose, interstices deeply sculptured, inner lip narrow, external edge denticulate.

In 1890 Pilsbry used Reeve's description and figure with no additional information. In the "Catalog of Exotic Shells," published in 1916 by the Museu de Zoologia da Universade de Coimbra, three specimens of *H. squamosa* are listed, with Australia given as their habitat. In Maxwell Smith's "Universal Shells," 1961, Chenu's figure of the shell was used, as it was again in three editions of Wagner and Abbott's "Standard Catalog of Shells."

This description appears in the "Card Catalogue of World-wide Shells," pack #28, Kaicher, 1981. "Variegated yellowish and orange brown; nacre whitish, irridescent; six slightly raised perforations;

Top photos by Jack Smith: *Haliotis squamosa* Gray, 1827, Indian Ocean.

Bottom photo by Pete Carmichael: *Donax variabilis* Say, 1822.

ribs finely scaled; to approx. 62 mm." The accompanying photograph is of a shell entirely lacking the tubercular and scaly spiral ribs as well as the deep interstices between that are typical of *H. squamosa.* Abbott and Dance, "Compendium of Seashells," 1982, use the same photograph with this additional data, "Western Australia. Subtidal rocks; common." This is not the *H. squamosa* of Gray, nor has its presence in Australia been confirmed.

The whereabouts of the holotype is unknown. It was not included in Gray's list of specimens from King's voyage presented to the British Museum of Natural History, according to Ms. Kathie Way of the Mollusca Section. The two specimens in their collection are from Mr. Cuming. The habitat of *H. squamosa* appears to be the Indian Ocean. The first mention of Australia as its origin is in Reeve's "Conchologia Iconica," where he cites King. It has not been found in Australia. However, a log of King's ship "Bathurst" shows that it made a stop at several Indian Ocean islands, including Mauritius. Gray's specimen may have been collected there. Its presence in the Indian Ocean is also known from two specimens collected on a Madagascar beach after a severe storm and now in a private collection in California, two in a Marine Station in Tulear, Madagascar (letter from the late Robert Talmadge, 1975) and one in the Natal Museum, Natal, South Africa from Port Blair, Andaman Islands (letter from Dr. R. N. Kilburn, 1984).

I wish to thank Dr. Peter Rodda for his encouragement, and Dr. Barry Roth for his support and help with translations. Commodore E. C. Armstrong helped with research on King's voyage, Gertrude Beer and Nizza Nedeff helped with translations, for which I am very grateful.

LITERATURE CITED

Adams, Henry & Arthur Adams 1858. The Genera of Recent Mollusca. Vol. 1, p. 442.

Chenu, J. C. 1859. Manuel de conchyliologie et de paleontologie conchyliologique. Paris, Vol. 1:I-VII, 1-508, text figs. 1-3707. [p. 367, fig. 2735]

King, Philip 1827. Narrative of a Survey of the Intertropical and Western Coasts of Australia, performed between 1818 and 1822. Vol. 2, Appendix, pp. 494-495.

Linné, Caroli A. 1791. Systema Naturae. 13th ed. revised by Gmelin, p. 3689.

Martini & Chemitz 1769. Neues Systematisches Conchylien-Cabinet. Nuremberg, Vol. 1, pp. 182-183, plt. 15, fig. 143.

Menke, Karl Theodor 1844. Zeitschrift fur Malakozoologie fur 1844, pp. 97-98.

Museu de Zoologia da Universadade de Coimbra 1916. Catalogo das Conchas Exoticas. Vol. 1

Pilsbry, Henry A. & George W. Tryon, Jr. 1890. Manual of Conchology. Vol. 12, p. 113, plt. 20, fig. 14.

Reeve, Lovell A. 1846. Conchologia iconica: or, illustrations of the shells of molluscous animals. London, plt. 7, figs. 20.

Schroeter, Johan Samuel 1783-1786. Einleitung in die Conchylienkenntniss nach Linné. p. 385.

Smith, Maxwell 1961. Universal Shells. p. 14, fig. 5.

Sowerby, G. B., Jr. 1887. Thesaurus Concyliorum. Vol 5, p. 27, plt. 8, fig. 52.

Weinkauff, H. C. 1883. Die Gattung *Haliotis. in* Systematisches Conchylien-Cabinet von Martini und Chemnitz. Nurenberg, ser. 2 6 (1b), pp. 22-23, fig. 2, plt. 3.

Katherine Stewart, 19 La Rancheria, Carmel Valley, CA 93924.

Donax variabilis Say, 1822

Text and Photo by Pete Carmichael

Donax variabilis. Probably no other mollusk in the world has such remarkable individual variety of shell color. The name *variabilis* was indeed well chosen. In the summertime, "Coquinas" can be found by the millions on gently-sloping, sandy beaches from New York to Florida and Texas. Tumbling along in the shallowest surf, it's "now you see them, now you don't."

Incoming waves dislodge Coquinas from the sand and roll them shoreward. As the wave's thrust subsides, the stranded Coquinas are visible momentarily, often in huge masses. But, quickly, they seem to disappear.

The little animals extend their fleshy pseudopods from the narrow tips of their slightly-opened valves and push these flexible "feet" down into the sand. Once anchored, the pseudopod pulls the whole shelled creature below the sand's surface.

Nestled in the sand, the Coquina extends its two siphons up into the turbulent surf. The inhalant siphon sucks in plankton-laden water and passes it over sticky gills. The exhalant siphon expels water and waste from the animal's body.

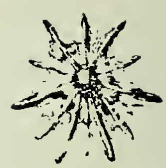
Coquinas are very sensitive to pollution and serve as an excellent index. Where they are found, we may assume the water is clean.

Albert J. Hrdlicka [2605 160th St., Redondo Beach, CA 90278] I agree with the mass that "Opisthobranch" is a poor name for a publication for *everyone*. I am sure when you received complaints on the name, all like myself looked up the word in the dictionary and were "leary" as to what they might receive. Anyway, I like the new name and am looking forward to receiving "Shells and Sea Life." Till then my best wishes and good luck.

Jeff Hamann [8242 Valley High Rd., Lakeside, CA 92040] returned in June from 2 weeks in the southwest of Puerto Rico, starting at Bahía de Bocarón and Ponce. He visited Mr. Cutrer at the La Pacaera Marine Station who provided much assistance. He collected 18 species of opisthobranchs, of which two were new to him. He got one *Okenia* off *Zoobotryon* in a little bay near Parguera which was interesting. He collected *Dondice occidentalis* off *Cassiopaea* in Parguera which was also interesting. Everything was found in less than 2 m depth water. *Murex spectrum* (Reeve, 1846) was one interesting shell found. All specimens were collected by turning rocks at low tide or free diving.

S.S. Forrest, Jr. [3117 19th St., Lubbock, TX 79410] Congratulations on your name change. Your new magazine should appeal to many more people, in its present form. The articles, and pictures are getting more interesting to me: now that the magazine covers more varied subjects on sea life.

From James H. McLean [Malacology Section, Los Angeles County Museum of Natural History, 900 Exposition Blvd., Los Angeles, CA 90007] This year I have had my share of field work relatively early. In March I accompanied LACM volunteers Edith Abbott and Joan Sherman on a shelling tour to Sri Lanka and the Maldives (Joel Greene Tours) and in May I took part in an LACM expedition to the northernmost islands of the Galápagos. The latter trip required scientific collecting permits and was primarily for fish collecting. This gave me the opportunity to collect mollusks, diving every day. Although both trips were to regions close to the equator, these places are on opposite sides of the world. Sri Lanka and the Maldives have a rich, warm water Indo-Pacific fauna and the Galápagos Islands have a somewhat depauperate fauna under the influence of a cold current. Wet suits are a must for diving in the Galápagos!



From Casto L. Fernández-Ovies [Covadonga 3 1o, Salinas Asturias, SPAIN] I have in preparation three papers (one on the anatomy of *Philine catena*, a second on a new Bosellid from the Canary Islands - with J.A. Ortea, and a third on the anatomy and systematics of the aeolid genus *Riosellolis* - with J.A. Ortea & J.M. Pérez Sánchez). I am interested to know the author of the drawing of *Bosellia* sp. from Malta ("Opisthobranch" 16(3):18) and his address. [Antonio Perrone, via Duca degli Abruzzi 15, 74100 Taranto, ITALY - S&SL]

INFORMATION EXCHANGE..........

From T.E. Thompson [Department of Zoology, University of Bristol, Bristol, England, BS8 1UG] Please: can any reader help me - I want to know what happened to Simeon Mileikovsky of the Moscow Institute of Oceanology. He published extensively on Mollusca, especially reproductive biology. I would appreciate a current address if avaiable, and news of his health.

We want to purchase or exchange worldwide cephalaspids, particularly "*Acteocina*," *Tornatina*, etc. Paula M. & Paul S. Mikkelson, Harbor Branch Foundation, Inc., R.R. 1, Box 196, Ft. Pierce, FL 33450, U.S.A.

PUBLICATION NOTES.

Marine Mollusks series, Leigh Marine Laboratory. [see S&SL 16(5):56] Parts 1 & 2 are published. Parts 3 & 4 probably will not be available prior to 1985.

MISCELLANEA.......

FIELD TRIP NOTE. Gary C. Williams, Department of Marine Biology, South African Museum, P.O. Box 61, Cape Town 8000, South Africa

Terry Gosliner of the California Academy of Sciences and Gary Williams from the South African Museum have just completed a two week field trip to the eastern Cape Province of South Africa during May of 1984. Subtidal collecting by means of SCUBA and small dredge was conducted at Algoa Bay near Port Elizabeth. Intertidal collecting was done at Knysna, Plettenberg Bay, and the Gonubie region north of East London. Of the 48 species of opisthobranchs collected, approximately 25 are undescribed. Of these, perhaps 15 are new to science. One new record to the Indian Ocean and 18 other new distributional records were also cataloged.

In addition, 15 species of octocoral cnidarians were collected, all of which are probably endemic to southern Africa.

Gosliner and Williams were aided by W.R. Liltved of the South African Museum, Philip Coetzee of the University of Port Elizabeth, and Brian Hayes of Port Elizabeth.

All in all, a most rewarding trip!

COMPUTERS AND SHELL COLLECTIONS. Winston A. Barney, 2801 Clary, Fort Worth, TX 76111.

It is widely known that most collectors are list-makers. Have you ever stopped to think how many lists YOU have made? Well, the computer is the master list maker, and in the hands of a dedicated collector it will bring many hours of pleasure. The novice computer user will want to investigate two types of software; the first being a WORD PROCESSING program. Such a program will file all your lists in the form of "documents." When you want to see the list you call for that document by name. You may want to have one long list or several shorter lists. For example, I collect five major families extensively and many other families on a lesser basis. So I have documents named "STROMBUS," "CONUS," "OLIVA," "CYPRAEA" and "HALIOTIS" for my major lists. Then I have "SHELL A-L," "SHELL M-Z," "BIVALVES," "CHITONS" and "MISC."

What do I do with all this? I print a list of my complete shell collection periodically. As I acquire new shells I pencil in their names in the correct place on the list. When the list begins to look shabby I load the program and call for each document that needs ammending, insert the new names in the document (one can also delete from a document), then run a new list on the printer. With a word processor one can go to any point in the document and add or delete as many words as needed. I simply list the species alphabetically by genus and within this listing, alphabetically by species and form. I also include geographical information with each shell listing. In my STROMBUS document a sample listing looks like this:

maculatus/Shark's Cove, Oahu
maculatus/Sand Island, Midway
maculatus (albino)/Anaa, Tahiti
maculatus (orange)/Shark's Cove, Oahu
maculatus depauperatus/Easter Island

Now that I have this wonderful list, what do I do with it? Well, what do you do with ANY list? You use it to decide what's missing from your list. Right?

The second kind of program is called a DATA BASE. It is the cat's meow in list-making because it will make several "specialized" lists from all the data you give it. The information you feed it is stored in "fields." For example, you might want to designate as fields the genus, author, geographical data and location in your collection. After entering all the information on each shell you can then call for a "search." The program will then list all shells in a particular genus or all shells named by a certain author. Maybe you would like a list of all shells from one geographical area or all shells at one location in your collection. You can even have the program list all shells of one species and their geographical areas, provided you entered "species" as a separate field.

You may want to include other data such as major book references and page #'s, catalog #'s, date acquired, cost or source. Each entry will have a "record number." You will want to be sure to include this number on your printout (you will design your own printout format) because you'll use that number to gain access to the file if you need to change or add any data. The data base is a dream-come-true for managing a large collection.

More experienced computer users may want to write their own programs, probably in "BASIC" language. With a little work one could teach the computer to identify a taxon by checking off the elements of a master I.D. "key." The biggest problem would probably be the key and not the program. You must remember that the computer can only work with yes/no or black/white answers so any key to a taxon would require much planning and research. This is an area where amateur shell collectors can be very helpful by spending the necessary time developing useful keys. A programmer/shell enthusiast might also want to design educational quizes or study programs for learning shell taxa and terms. The computer is great at multiple choice questions or true/false tests.

Finally, there are a few side benefits apart from shell collection activities. A mailing list or correspondence list, for example, is easily filed on the computer and you can run off address labels too. You may also want to use your word processor to write letters of all kinds, and if you need extra copies for filing - no problem. In short, you'll find many happy hours with your collection and your computer especially if you live hundreds of miles from the ocean. I am not a computer "expert." The only computer I am really familiar with is my own TRS-80. But I am anxious to help others discover this great addition to our common hobby. If you have programs written or just planned I'd like to hear about them. I would like to know how you use your computer to expand your shell hobby. If you care to correspond please address your letters to me.

COCOS ISLAND TREASURE. Donald R. Shasky, 834 W. Highland Ave., Redlands, CA 92373

Cocos Island, Costa Rica, is supposedly a treasure house for swag buried by pirates in ages past. Presumably, most of it remains to be found.

The malacological treasures of Cocos Island, are also largely undiscovered. Up until now, less than 130 species of marine mollusks have been reported from there.

I was able to spend 6-1/2 days SCUBA diving at Cocos Island, in April, 1983, and another 8 days in March of this year. Dr. Michel Montoya, of Managua, Nicaragua, was there in June of last year and both he and Capt. Gene Everson, of Ft. Lauderhill, Florida, were there with me in March.

Numerous Indo-Pacific species are present and many undescribed species have been found. I suspect that when the paper that Dr. Montoya and I are preparing is complete we will add another 175-200 species previously unknown from this remote area. Our next trip to Cocos Island, is in May of next year. We did a small amount of dredging on this past trip as well as utilizing a tangle net. Our 1985 trip will include considerably more dredging and tangle net trapping.

THE FEEDING, ANATOMY AND REPRODUCTIVE BIOLOGY OF *CYPHOMA GIBOSSUM*. Hans Bertsch, 4444 W. Pt. Loma Blvd. #83, San Diego, CA 92107

In last month's "Notes" I discussed the subfamilial and generic level classification of the family Ovulidae in American waters, and the various species of *Cyphoma* and *Pseudocyphoma*. My column for this month describes the natural history of *Cyphoma gibbosum* (Linnaeus, 1758) [see front cover photo this issue and several photos in S&SL June]. Most of the information that I will present is based on observations of two colleagues (Drs. Michael T. Ghiselin and Charles Birkeland) and my own field work.

But first, some short biographical notes on these students of *Cyphoma* may well be in order. Mike Ghiselin is well known as a Darwin scholar and evolutionary biologist. He studied *Cyphoma* in Puerto Rico, while holding a post-doctoral position (under Ernst Mayr) at Harvard University's Museum of Comparative Zoology. It was there I met him, and he subsequently directed my Ph.D. dissertation. He is presently a research associate at California Academy of Sciences, and is collaborating with Dr. Terrence Gosliner and myself on various aspects of opisthobranch anatomy, zoogeography, and phylogeny.

My first recollections of Chuck Birkeland are of the hundreds of coral pieces he was nurturing in running sea water aquaria for transplant experiments. He is an experimental marine ecologist, and at that time was working with the Smithsonian Tropical Research Institute's Galeta Marine Laboratory in Panama. Also at the laboratory were Dr. Gordon Hendler and Dr. David and Kaniaulono Meyer. I spent the summer of 1974 with this group (on a Smithsonian Fellowship) living in the Panamanian city of Colón, traipsing after two-toed sloths in the humid jungle, watching columns of leaf-cutter ants, and researching organisms in the intertidal and subtidal zones of both coasts of Panama. We have all ended up at far distant locations: Dr. Birkeland is presently associated with the marine laboratory of the University of Guam, Dave and Kani are at the University of Cincinnati, and Gordon is in Washington, D.C., at the Smithsonian Oceanographic Sorting Center.

One might wonder why such illustrious marine biologists devoted significant research efforts to a seemingly insignificant snail. Their papers explained that *Cyphoma gibbosum* is an interesting animal -- first because it allowed examination of foraging strategy, and second because it gave information on the functional anatomy of the reproductive system of cypraceans that was important for comparative evolutionary (phylogenetic) studies. Let me use these emphases for the major topics in my discussion of *Cyphoma gibbosum*.

The foraging behavior of *Cyphoma gibbosum* was studied by Birkeland and Gregory (1975). They used data obtained from the Tektite program at Lameshur Bay, St. John, Virgin Islands, and from the Galeta Reef area, on the Caribbean coast of Panama.

Cyphoma gibbosum feeds on various gorgonacean species, but prefers the purple sea fan, Gorgonia ventalina. (Gorgonia ventalina may be synonymous with G. flabellum.) Feeding preference is easily documented by comparing the relative abundances of prey items in an area with their relative abundance in the diet of the predator. If the abundance eaten is greater than their occurrence, it indicated a preferred food item; the opposite indicates avoiding a possible prey. Hence:

Prey species	No./44m square	%	No. in diet	%
Gorgonia	17	6.0	89	71.8
Eunicea sp. A	2	0.7	5	4.0
Pseudopterogorgia	17	6.0	16	12.9
Briareum	43	16.2	6	4.8
Eunicea sp. B	12	4.2	1	0.8
Plexaura sp. A	15	5.0	1	0.8
Pseudoplexaura	71	25.1	5	4.0
Plexaura sp. B	30	10.0	1	0.8
8 other species	76	26.8	0	0.0

These data from Birkeland and Gregory indicate that the first species is disproportionately chosen; the bottom species are disproportionately avoided.

How much does Cyphoma eat daily? How does it affect their prey? Browsing by C. gibbosum removes 8.6 cm square of Gorgonia tissue per diem. The Cyphoma population removes 62.3% of the annual tissue growth of the sea fan, but was a direct cause for mortality in only 4% of the population. It eats a lot of tissue grown, but does not kill its prey. It is a prudent predator. Cyphoma often moves from one prey individual to another. During the three weeks of the Tektite mission, 36% of the Cyphoma switched prey. It often leaves a prey colony with little damage, leaving a sufficient amount of the colony to regenerate tissue. Their feeding usually is not great enough to kill the prey. Mortality of Gorgonia is due to toppling of colonies by wave action or surge, or by weakening of the substratum by boring organisms.

Next month's notes will discuss the radula and other internal anatomy. SEM's of the radula and drawings of other parts will be included in the August issue.

REFERENCES

Birkeland, Charles & Brian Gregory. 1975. Foraging behavior and rates of feeding of the gastropod, Cyphoma gibbosum (Linnaeus). Bulletin Natural History Museum Los Angeles County, No. 20:57-67.

Ghiselin, Michael T. & Barry R. Wilson. 1966. On the anatomy natural history, and reproduction of Cyphoma, a marine prosobranch gastropod. Bulletin of Marine Science, 16(1): 132-141.

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Oliva porphyria 96 mm, found at 21 m, Escondido Bay, Baja, Mexico. Aquarium photo by David K. Mulliner.

Oliva porphyria Linnaeus, 1758

Text and photo by David K. Mulliner

Oliva with their porcellanous shells, numerous color phases, and varied color patterns, rank among the most beautiful of the molluscan shells. They were highly prized specimens in the earlier European collections. *Oliva porphyria* is one of the few west American shells to be named by Linnaeus. These gastropods are distributed in warm seas, living mostly in the shore region. They spend the day hidden under the sand and become active at night, moving about just beneath the surface of the sand.

Olives are carnivorus, preying on certain live mollusks, usually small bivalves. They are also scavengers and feed on dead fish and crustaceans. They emerge from the sand at night and track in search of food. When a clam or a morsel of food is found, it is seized with the forepart of the foot and pushed to the rear where the posterior part of the foot forms a pouch. The Olive then heads downward into the sand. The prey is then surrounded by a thick mucus which smothers the animal. Later, the prey is released from the pouch and eaten. The radular ribbon is narrow and long with about 100 rows of teeth. Each row has three teeth, a tricuspid rhachidian, with a strongly cusped lateral tooth on each side.

The *Oliva porphyria* pictured here was found alive at Escondido Bay, Baja California, Mexico, in April, 1984. Two animals were located by following partially covered trails at 21 m depth. The sand trails were probably from the previous night's foraging and could soon have been obliterated by the water action.

Both live animals were taken to San Diego, California, and maintained in an aquarium on a diet of fish. The larger (96 mm) of the two is still alive (June, 1984) and well. After several weeks, the smaller (94 mm) specimen was frozen for later anatomical studies. The 96 mm specimen has been photographed several times in the aquarium and at the beach (Mission Bay, San Diego). A sheet of plexiglass, buried in the sand, was used for ocean photographs. This prevented the animal burrowing out of sight.

REFERENCES

Fretter, V. & A. Graham. 1962. British prosobranch molluscs. Ray Society: London. 755 pp. [pp. 75, 165]

Keen, A. M. 1971. Sea shells of tropical west America; marine mollusks from Baja California to Peru, 2nd ed. Stanford Univ. Press, Stanford, Calif. xiv + 1064 pp.; illus. [pp. 623-624]

Zeigler, R. F. & H. C. Porreca. 1969. Olive shells of the world. Zeigler & Porreca: New York. 96 pp. [pp. 4-22, 32]

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Xenophoridae Part I: *Xenophora granulosa* and *Xenophora tenuis*

by Kate St. Jean

Photos by George St. Jean

Xenophora granulosa Ponder, 1983, dorsal view.

The Xenophoridae have a long evolutionary history beginning with the lowermost Upper Cretaceous 135,000,000 years ago. Dr. Winston Ponder, in his 1983 Monograph on the Xenophoridae, lists 114 fossil species. He states, "The genus diversified during the Paleogene when it probably gave rise to most of the forms existing today." Twenty-five recent species are recognized, 16 of which have a fossil record, while 9 species have no known fossil record.

The most recently named species of the *Xenophora* is *Xenophora granulosa* Ponder, 1983. Dr. Ponder described this new species on pages 36–37 of his Monograph.

The shell is moderately elevated (spire angle between 75 to 90°) with a narrow peripheral flange. It has rather solid convex whorls, and an umbilicus narrowly open in mature specimens. Attached foreign objects are usually small, with at least the lower half of the whorls exposed. Often almost ¾ of the dorsal surface is exposed. The dorsal sculpture is coarse, wavy opistocline rugae and riblets. The base is flat to slightly concave in the median region, but markedly depressed in the umbilical region. The narrow umbilicus is almost hidden by a reflected inner lip in the adult. The peripheral flange is narrow, forming a wavy, down-turned rim at the outer edge of the base. The base is sculptured with fine regular ribs crossed by spiral striae. The aperture is simple, and the basal lip is very strongly concave, but weakly and uniformly thickened in mature specimens. The color is yellowish-white to pale yellow brown dorsally. Its base is white, sometimes with a zone of pale, brownish yellow spots just inside the peripheral flange and around the umbilical region. The holotype is in the National Museum of Natural History, Paris, France. It has a completely white base, and is 32 mm high and 50 mm in diameter.

The *Xenophora* have perfected the art of agglutination. This species *(X. granulosa)* has symmetrical, precisely spaced attachments that were chosen for uniformity of size. However, the smaller the shell the smaller the space between the attachments. On the smallest shells, the attachments were almost stacked on top of each other.

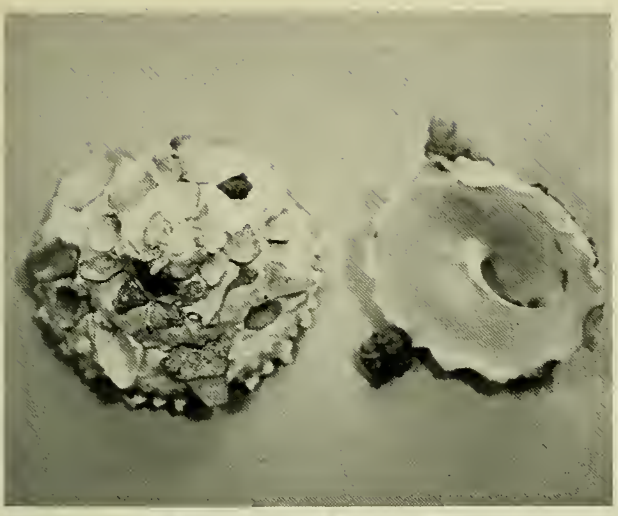
Xenophora granulosa ranges from Mauritius, Indian Ocean, South China Sea, to New Britain and New Caledonia.

The four *Xenophora granulosa* that were studied from my collection ranged in diameter from 70 to 40 mm and in height from 40 to 20 mm. The attachments are broken pieces of shell, coral, and rocks. Practically unrecognizable, they are coated with what looks like hardened sand grains, probably mixed with mud from the substrate.

The shell pictured was found by Mr. Richard Thomas of Morro Bay in a pile of rubble in a backyard, in the Phillipines. At that time he had no idea which species it was, nor did any of us. In a reply to my query, Dr. Ponder stated that it was a new *Xenophora* which he would be naming; it was subsequently described as *X. granulosa.*

The pictured *Xenophora granulosa* is 70 mm in diameter and 50 mm in height, with an open umbo of 1 mm. Circling ridges coming from the umbo to the periphery of the shell are in shades of white and yellow. The shell is completely covered with 1 mm opistocline rugae following the curving lines of the shell. All are perfect and extend about 1 mm below the periphery to form a very small flange. The shell is white with occasional yellow. The attachments are beige or light brown.

Xenophora granulosa Ponder, 1983, ventral view.



Xenophora tenuis Fulton, 1938.

This species resembles *Xenophora tenuis* Fulton, 1938, in many ways. The basal coloration and dorsal features are similar. However, the base is more strongly sculptured in *X. granulosa* and has a distinct umbilicus in the mature specimens. Dr. Ponder stated that, "It is possible that *X. tenuis* and *X. granulosa* should be regarded as subspecific but until the animal of the *X. tenuis* is known, close relationship cannot be firmly established."

The original description of *Xenophora tenuis* is brief: "Shell conical, somewhat thin, imperforate, cream colored above, lighter below, obliquely and rather widely corrugated above, lighter below, numerous small stones and shells are attached below the suture which together with the edge of the whorl is largely coronated. Base with fine granular arcuate striae. Height 29 mm; diameter 45 mm. Habitat, Kii, Japan."

Two specimens of *Xenophora tenuis* are illustrated. Shell number 1 is 25 mm high, 35 mm in diameter. Shell number 2 is 29 mm high, with a 42 mm base. The base has been broken and repaired by the animal. Attachments of Shell 1 are smaller and brown in color, while those on Shell 2 are larger and grey. The method of attachment closely resembles that used by *X. granulosa*. Moreover, the opistocline rugae on the shell are similar between the two species.

REFERENCES

Fulton, H. C. 1938. Descriptions and figures of new Japanese marine shells. Proc. Malac. Soc. London 23(1):55-56

Kira, Tetsuaki. 1962. Shells of the Western Pacific in color. Vol. 1. Hoikusha Publishing Co., Ltd., Osaka, Japan. 224 pp.

Ponder, W. F. 1983. Xenophoridae of the world. The Australian Museum Memoir 17.

[Editor: W. F. Ponder writes that T. Habe described the same species as *X. granulosa* in a paper in *Venus* last year. Habe's name becomes a synonym of *X. granulosa*.]

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Mollusks: A Look at Their Ecological Importance

By David W. Behrens

As malacologists and conchologists I would imagine that very few of us have taken the time to examine groups of molluscan species from a community standpoint, rather than each species as an individual. By this I mean thinking about the species as a member of a community, interacting with other species as you or I interact with each other, our neighbors and fellow employees, needing and providing services to one another in order to survive. An analogy would be to think about the family cat and what it needs from you, and what it provides you, even its relationship with the neighbor's dog or the mice in the field next door.

I have recently become aware of how incredibly complex at least one molluscan community is, while studing the infaunal associations and interrelationships found in four species of intertidal turf building algae. Most importantly I have learned the population status of molluscan species as a group.

The study, conducted in central California centered on four species of algae: two occurring in the lower intertidal, one in the mid tidal region and one in the upper (Kelly and Behrens, 1981). All, because of their highly articulated morphology create habitat, by providing space, for small invertebrate species and juvenile intertidal fish. The findings of this study, while extremely difficult to evaluate, have been quite informative.

First a few words about how the study was carried out. Samples of algae were collected quarterly to reveal seasonal differences in the invertebrate infauna living within the algal micro forest. Eight replicate samples of each alga were collected during each quarterly survey at five stations along about 2 miles of coastline. A single sample was a 10x10 cm scrape of a pure stand of each algal species. The sample was sorted into: algae, entrapped sediment and invertebrate species, fractions. The algae and sediment were weighed and the invertebrates identified and counted. In mere numbers, this study represents the collection and processing of 640 samples per year. We now have three years data.

To describe all the findings of the first years efforts would require far more space than is available here. I will report those findings concerning mollusks, which in several instances were the most significant finds of the study.

First an evaluation of the physical habitat provided by the algae. The high intertidal algal species sampled was *Endocladia muricata.* Although it had a lower mean weight per 10 cm square scrape, it supported the greatest number of individual infauna. The lower tidal zone species studied, *Gastroclonium coulteri* and *Gigartina canaliculata* while moderate in average weight per scrape, supported the greatest number of infaunal species. *Gastroclonium* because of its bulky twisted morphology also trapped the greatest quantity of sediment, thus providing additional habitat for infauna. The mid tidal zone species sampled was *Corallina vancouveriensis.* This species differed from the other algae in that its branches are thin and relatively tightly packed.

Invertebrate densities were analyzed by algal habitat species, by station, by season and by major invertebrate taxon (eg: arthropoda, annelida, echinodermata, mollusca etc.). As one might expect major differences in faunal composition were found between habitat forming algae species, the lower intertidal alga having higher diversities. If any, faunal similarities were shared by algal habitats of similar tidal elevation. Stations demonstrated differences which were later attributed to environmental stress, such as wave shock, wind and solar exposure. Seasonal differences were most dramatic with wide fluctuations in algal canopy and subsequent presence and abundance of infaunal species.

Of most interest to all of us was the numerical dominance of molluscan species both in species diversity and individual species abundances. In a phylogenetic breakdown (see Table), mollusks dominated all four algal habitats at all five stations both in

PHYLOGENETIC BREAKDOWN OF ASSOCIATED SPECIES (Percent Composition)

	Corallina vancouveriensis	*Endocladia muricata*	*Gastroclonium coulteri*
TOTAL MOLLUSCA	77	59	45
Gastropoda	61	10	44
Bivalvia	16	49	1
ARTHROPODA	18	39	38
ENCHINODERMATA	1	0	2
ANNELIDA	3	1	12
OTHER PHYLA	1	1	3
	100	100	100

number of species present and in overall number of individuals of each species, compared to all other invertebrate groups. An additional observation was that gastropods preferred the lower intertidal habitats while bivalves were most common in the upper intertidal algal species, *Endocladia.*

Numerically the statistics speak for themselves. In the algae *Corallina,* of 100 species of invertebrate infauna, (incl. arthropods, echinoderms and worms) 77 were mollusks. In this intertidal micro-habitat the dominant mollusk is the gastropod, *Barleeia,* followed by the bivalve, *Lasaea.* During some surveys, *Barleeia* counts numbered several hundred animals per 10x10 cm scrape. The algal habitat formed by the high intertidal species *Endocladia* was inhabitated primarily by the mussel, *Musculus* which composed 44 percent of the invertebrate infauna. Here again several hundred individuals were frequently found in a single sample. The third most numerous species inhabiting this algae was *Barleeia.*

The lower intertidal habitat formers, *Gastroclonium* and *Gigartina* were also dominated by molluscan species. In greatest abundance was the dove shell, *Alia (=Mitrella) carinata* followed in third place by *Bittium* spp.

Seasonally, although shifts were observed in species status, molluscan species dominated. In *Gastroclonium* and *Gigartina* the gastropod *Ticolia* replaced *Alia* in the fall. A similar shift in abundance was seen in the algal habitat of *Corallina* where *Tricolia* increased from 3 to 25% of the associated infauna while the bivalve *Lasaea* decreased from 14 to 0.1% from summer to fall.

One interesting, although unexplainable, observation was that during the summer 6% of the bivalve *Lasaea* were found to occur in the algae *Corallina* while in the fall 96% were found in *Endocladia.* No such habitat shift was observed in the other sympatric species.

Previous scientific reports document an increase in species diversity with lower intertidal elevation (chronicled in Ricketts et al. 1968). Reports also document species differences associated with wave and swell exposure (Lubchenco & Menge, 1978; Dommasnes, 1969). Few report the dominance of molluscan species in intertidal habitats (Glynn, 1955; Jones 1972).

Our analysis has just begun, the evidence is overwhelming that molluscan species maintain a position of ecological significance in temporate intertidal habitats because of their numerical dominance in species tallied and mere individual numbers compared with other co-occurring invertebrate species. With this knowledge we will proceed to investigate the more subtle relationships of the community organization to include resource partitioning and communal coexistence.

REFERENCES

Dommasnes, A. 1969. On the fauna of *Corallina officinalis* L. in western Norway. Sarsia 38: 71-86.

Glynn, P. W. 1965. Community composition, structure, and inter-relationships in the marine intertidal *Endocladia muricata—Balanus glandula* association in Monterey Bay. Beaufortia. Zoological Museum, Amsterdam. No. 148, Vol. 12. 198 pp.

Jones, D. J. 1972. Changes in the ecological balance of invertebrate communities in kelp holdfast habitats of some polluted North Sea Waters. Helgolander Wiss. Meeresunters. 23(2): 248-260.

Kelly, James L. and David W. Behrens. 1982. Intertidal Algal Faunal Associations Study—A progress report. Chpt 13 *in* Environmental Investigations at Diablo Canyon, 1981. Pacific Gas and Electric Company, Dept. of Engineering Research. 47 pp.

Lubchenco, J. and B. A. Menge. 1978. Community development and persistence in a lower rocky intertidal zone. Ecol. Monog. 59:67-94.

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Back cover photo by David W. Behrens: Large chiton, *Cyanoplax hartwegii*; a few *Collisella pelta* limpets; isopod *Idothea wosnesenskii* on sandstone rock with alga *Pelvetia fastigata* and other members of the community.

SHELLS AND SEA LIFE

A MONTHLY PUBLICATION ON MOLLUSKS AND MARINE LIFE

$2.50 AUGUST, 1984 **Volume 16, Number 8**

Tritons: the Trumpet Shells

by David K. Mulliner

Triton shells are named after Triton of Greek mythology, the son of Poseidon and Amphitrite. He had the head and trunk of a man and the tail of a fish. He was often depicted holding a large shell to his mouth and using it as a trumpet. The booming of this trumpet, to which he gave his name, is said to have heralded his arrival from his deep sea home. Coins minted in Sicily in 400 B.C. show Triton blowing into a shell trumpet. As religions developed, the trumpet shell became one of the most important instruments in the rituals of temple worship and tribal ceremonies. The shell trumpet was used in Crete during the Minoan civilization of the second millenium B.C.

Triton shells belong to the family CYMATIIDAE, consisting of four genera: *Cymatium*, *Austrotriton*, *Charonia* and *Distorsio*. They are found worldwide in both warm and temperate seas, some species occurring in two or more oceans. The shells are recognized by their fusiform-ovate shape, prominent varices, and elaborate spiral and axial sculpture. The adult shells are sturdy and porcelaneous. Many have a beautiful fiberous or hairy periostracum covering a very brightly colored shell. The operculum is horny, ovate, with the nucleus near the anterior end of the aperature.

Tritons are found on rocky and sand substrates or are dredged from deep water. They lay their eggs under rocks. The free swimming larval stage has a long planktonic existance, for instance *Cymatium nicobaricum* in the Atlantic has a planktonic stage of about 300 days. The ocean currents can distribute these larval animals over large areas. These premetamorphic veligers are often decorated with spines.

Tritons are carnivorous, feeding on other mollusks and echinoderms. They paralyze their prey with an acid secreted from large salivary glands (Houbrick & Fretter, 1969). The large Triton *Charonia tritonis* feeds on the crown of thorns starfish that is destroying the coral reefs. Overcollecting of this shell is one of the reasons for the increase in the number of these starfish.

Front Cover Photo:

Cymatium (Septa) pileare (Linnaeus, 1758). This shell is 66 mm long and was found in Vava'u, Tonga in May 1963. The shell is fusiform, turreted, the spire is equal to the length of the aperature and the siphonal canal. It has granular spiral cords with two prominent varices per whorl. It has red brown bands alternating with white. The aperature is ovate and orange brown with white denticles on the thickened outer lip. There are numerous irregular narrow folds on the columella and parietal wall.

REFERENCES

Houbrick, J.R., V. Fretter 1969. Some Aspects of the Functional Anatomy and Biology of *Cymatium* and *Bursa*. Proc. Malacological Soc. London **38**:415-429.

Kay, E. Alison 1979. Hawaiian Marine Shells, Reef and Shore Fauna of Hawaii, Section 4: Mollusca, Bernice P. Bishop Museum Special Publication **64**(4). p 214-223.

Sheets, Elva D. 1974. The Fascinating World of the Sea, Crown Publishers, Inc. p 159-161.

Solem, Alan Ph.D. 1974. The Shell Makers Introducing Mollusks, John Wiley & Sons, New York. p 104.

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SHELLS AND SEA LIFE

A MONTHLY PUBLICATION ON MOLLUSKS AND MARINE LIFE

Shells and Sea Life was formerly known as the **Opisthobranch Newsletter.** The magazine is open to articles and notes on any aspect of malacology—or related marine life. Articles submitted for publication are subject to editorial board review and may include color or black & white illustrations. Deadlines for articles are the first day of each month for the following month. Short notes for the "Center Section" will normally appear within thirty days of submission.

Short articles containing descriptions of new or repositioned taxa will be given priority provided the holotype(s) have been deposited with a recognized public museum and the museum numbers are included with the manuscript. We undertake no responsibility for unsolicited material sent for possible inclusion in the publication. No material submitted will be returned unless accompanied by return postage and packing. Authors will receive 10 free reprints. Additional reprints will be supplied at cost provided they are ordered before printing.

Shells and Sea Life ISSN 0747-6078 is published monthly by Steven J. Long & Sally Bennett, 505 E. Pasadena, Phoenix, AZ 85012-1518 U.S.A. Telephone (602) 274-3615. U.S. subscription rates are $30.00 per year. Foreign subscription rates are $35.00 per year. Add $10.00 for Air Mail postage. Send change of address 6 weeks in advance. Charge to remail issue for any reason $3.00. Volumes 1 through 15 of the **Opisthobranch Newsletter** are available at $15.00 per volume postpaid. Sample copies are available for $3.00 each postpaid. Rates are subject to change without notice. Arizona residents must add 6% sales tax to all orders.

Features—August 1984

Front cover photo: *Cymatium (Septa) pileare*, by David K. Mulliner: see article on page 110.

Back cover photos by Alex Kerstitch: see article beginning on page 130.

Hiding the Shell: an old Twist on the old Shell Game

Text by David W. Behrens and Hans Bertsch
Photos by David W. Behrens

Figure 1. *Erato vitellina* Hinds, 1844.

We have often heard that the shell of a snail functions as an impenetrable housing that protects the resident from the voracious appetite of a wanton predator. Although an exterior calcified shell, with its diverse arborescent protuberances and varices, is characteristic of the mollusks, many members of the phylum have hidden or ''tossed away'' the shell. This is not evolutionary suicide—the animals function quite well with alternative methods of insuring their safety and the prosperous longevity of their offspring. It is not at all incongrous that the seemingly defenseless, shell-less sea slug or octopus survives just as well as the heavily armored *Astraea* or *Haliotis* or *Bursa*. The evolutionary advantages of acid secretions, skilled swimming capabilities, camouflage, and subcutaneous armorment of siliceous spicules more than make up for the loss or reduction of the shell. In fact, there are so many predators that can crush or bore through shells (see the numerous papers by Vermeij, cited in his 1978 book), that life without a confining shell may be more felicitous! Moreover, some animals with well-developed shells depend on other means for their defense: the swimming of *Pecten* or the opercular pole-vaulting of some *Strombus* species to escape predators are well-documented instances.

Even clams, so remarkably well-adjusted to life inside the two-valved shell, have groups that hide their shell. Most famous is *Chlamydoconcha orcutti* Dall, 1884, a member of the family Galeomattidea. Within this leptonacean family, there is a series of evolutionary changes (including reduction of shell, and bending of the middle mantle fold over the shell and its asumption of the defensive role) that culminate in the morphology and biology of *Chlamydoconcha* (see Bertsch, 1984a, for a discussion of this group).

Among the prosobranch gastropods there is a similar method of shell hiding or reducing that has evolved independently in several different lineages. Many have sought to conceal themselves by imitating or mimicking their surroundings, usually their food or prey item. Hence the snail is provided cryptic protection from adversaries and is able to feed and carry out his or her procreative responsibilities.

Most have modified their appearance to closely match a prey item by producing a fleshy disguise to cover their flamboyantly-visible calcareous dwelling. This fleshy overcoat is a lateral expansion of the mantle that can be extended to cover the shell. In some species it is still retractile into the shell, while in others it permanently surrounds the shell. Usually this tissue has developed a striking resemblance both in texture and coloration to the host or model substrate (see the pictures of the orange-mantled *Cypraea alisonae* Burgess, 1983, on its orange prey sponge, in Bertsch, 1984b).

Figure 2. *Trivia californiana* (Gray, 1827).

The temperate coastal waters of California support several examples of ''shell-hiding'' snails. Representatives of these animals occur in all the major taxonomic categories of marine prosobranchs—Archaeogastropoda, Mesogastropoda, Neogastropoda, and Opisthobranchia. In this article, we will not discuss those animals that have completely lost the shell, but just those with a reduced or hidden shell.

The most primitive gastropods to test the camouflaging capabilities of the fleshy mantle are the keyhole limpets (family Fissurellidae). The prosobranchs with the greatest number of examples are the mesogastropods; in this group are found the cowries (*Cypraea*), the *Erato*, the ovulids (*Simnia*), the triviids (*Trivia*), and the lamellariids. The neogastropod Marginellidae have small, glossy shells covered by a camouflaging mantle. Finally, among the marine gastropod shell-hiders, are species of the opisthobranch orders Cephalaspidea, Anaspidea, and Notaspidea.

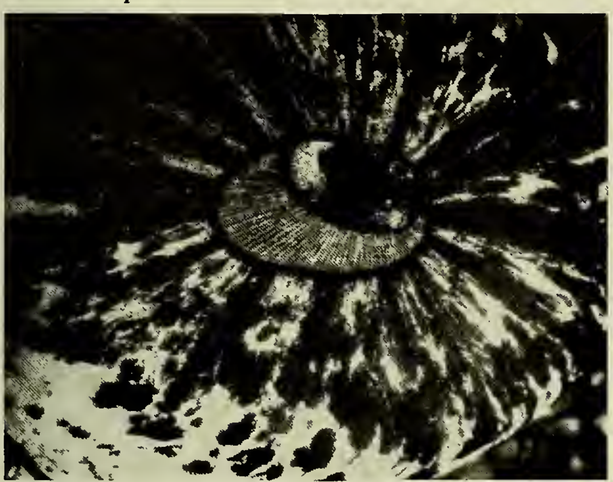


Figure 3. *Megathura crenulata* (Sowerby, 1825).

Among the members of the Fissurellidae (a family of primitive archaeogastropods) is seen a trend toward shell reduction and loss. The two common Californian species of keyhole limpet are *Megathura crenulata* (Sowerby, 1825) and *Fissurellidea bimaculata* Dall, 1871. The latter species has been known as *Megatebennus bimaculatus* for some time, but Dr. James H. McLean of the Los Angeles County Museum of Natural History has recently shown that *Megatebennus* Pilsbry, 1890, is a junior synonym of the older generic name *Fissurellidea* Orbigny, 1841. In both of these Californian species, the mantle tissue extends up the slope of the volcano-shaped shell, leaving exposed just the apical respiratory opening and a portion of the volcano-shaped shell. The mantle cannot be retracted in either of these genera. In *Megathura* the color of the mantle varies from jet black to mottled yellow and green. In *Fissurellidea* the color of the mantle tissue closely matches the color and texture of its tunicate prey item. Aiding in this camouflage is the often negatively phototropic behavior of its prey. The limpet, then, often occurs in areas of lowered light or reduced visibility, under rocks and boulders or in caves and crevices.

Fissurellidea has abandoned the habitat and defense methods of the related protectively-shelled limpet species. It is a clear example of convergent evolution, approaching the body shapes and life styles of lamellariids and nudibranchs. McLean (1984: 23 and 32) succinctly explains: "All species of the *Fissurellidea* group occur on rocky bottoms in low intertidal and sublittoral zones. They occur on undersides of rocks or beneath projecting ledges where there is a thick growth of such encrusting organisms as sponges and compound ascidians. None of the species can strongly adhere to the rock substratum; all may easily be detached when the animals are exposed at low tide . . . . One advantage of the limpet form is that of protection by means of clamping against the substratum. The loss of such capacity is a necessary consequence of shell reduction. All large-bodied fissurellids are unable to tightly adhere and are restricted to low-energy environments, where their prey organisms, sponges and tunicates, flourish. Here the fissurellids have a cryptic form, resembling their prey organisms. Indeed, their habits are more like those of the dorid nudibranchs, which they resemble, than like other limpets."

The at-times hidden shells of the cypraeid and ovulid mesogastropods are among the most favored by chonchologists. These seemingly "bashful shells" have elaborate mantles that can be filled with water and body fluids and slowly expanded out covering the surface of the shell. Retraction is a rapid muscular movement that suddenly flashes the shell at the disturbing or curious offender that touched the animal.

In the cool temperate waters of California occurs only one species of the predominantly tropical cowries: *Cypraea spadicea* Swainson, 1823. It is found subtidally to depths of about 30 meters, and grows to about 65 mm in total length. The shiny shell is smooth and glossy, a dirty white color with a rich chestnut swath on the dorsal surface. The mantle hiding the shell is a tuberculate robe of brown and white mottling. Under sponge-covered and organism-encrusted ledges *Cypraea spadicea* blends in well with the patchy, multivariegate background.

Figure 4. *Cypraea spadicea* Swainson, 1823.

Unfairly called *Trivia*, the small coffee bean shells have an interesting shell architecture. Not exceeding 20 mm in length, the snail's maroon-colored shell is laterally crossed with raised ridges. In *Trivia californiana* (Gray, 1827) this radial sculpture is cloaked with a delicate warty mantle that varies from orange to dark brown. Scattered over this cover are dark spots and flecks of white. Its foot, siphon, and sensory tentacles are adorned with white flecks. This elegant little snail has eluded the eyes of scientists so well that little is known about its natural habits. At North Cove in central California, beachcombers can collect *Trivia* shells by the dozens, yet biological studies offshore from this beach have found only one living specimen in several years of study.

The larger *Trivia solandri* (Sowerby, 1832) has well-spaced ridges that terminate dorsally in prominent, white nodes. It is more common to the south of California. We have seen it feeding on sponges in the subtidal regions off San Diego. This species has been reported from Palos Verdes, California, to Panama.

Trivia ritteri Raymond, 1903, is a deep water triviid, reported from Monterey, California, to midway down the Baja California peninsula. Bertsch & Myers (1982) state that it is most commonly collected from depths of 51 to 90 meters; they also illustrate the radula and the ontogeny of the shell's morphology.

Two species of *Erato* occur along the California coast—*Erato vitellina* Hinds, 1844, and *E. columbella* Menke, 1847. The larger of the two, *E. vitellina*, is called the Appleseed Erato. Its glossy shell, shaped like an upside-down pear, is hidden under a decorative arborescent shawl which makes it totally invisible when crawling in benthic algal turf. Delicate greenish-tan tufts of tissue branch upwards from a black background, giving this species a remarkably cryptic appearance.

Special favorites of ours are the Simnias. These delicate fusiform-shaped snails have evolved particularly astute protective resemblances to the polyp-covered gorgonian species on which they abide. Living at depths of from 10 to 30 meters in southern California and northern Baja California, these species resist detection from their enemies through

Figure 5. *Simnia vidleri* (Sowerby, 1881)

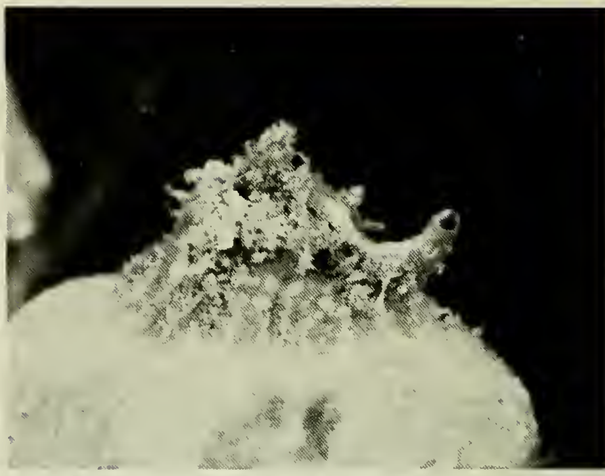


Figure 6. *Lamellaria diegoensis* Dall, 1885

the deceptive color and texture of their highly papillated, fleshy mantle covering the shell. The background color of the snail's mantle resembles that of the gorgonian on which it lives, while the papillations mimic the hue of the polyps.

Simnia vidleri (Sowerby, 1881), found primarily on the California golden gorgonian, Muricea, boasts a mantle with large red spots clearing periodicaly for a tall golden yellow papilla. When living on darker gorgonian species, the *Simnia* are darker in mantle color.

Simnia loebbeckeana (Weinkauff, 1881) is usually found preying upon sea pens or sea fans in deep water. It has a light colored red mantle with diffuse red specks.

A group of creatures providing a story all their own are the lamellariids. These fascinating sea snails are the only mesogastropods whose shell has become wholly enclosed in a non-retractible mantle. The members of the family Lamellariidae, comprised solely of tunicate predators, number six species in the northeastern Pacific (see article and photographs by Behrens, 1984). This group so closely resembles its encrusting food that finding them requires collecting the tunicate species upon which they. live. Several members of the family have cultivated the capability of acid secretion from their pelt to further dissuade the sharp-eyed intruder that has cracked the snails' exceptional disguise. One species, *Marsenina stearnsii* (Dall, 1871) lives solely and invisibly on the white encrusting tunicate *Trididemnum opacum* (Ritter, 1907). *Marseniopsis sharonae* (Willett, 1939), shaped not unlike a candy jujube, is a quiet water species known to live in bays and estuaries on the orange colonial tunicate *Botrylloides*. Although its fleshy mantle varies in color from white to deep purple, its presence on the undulating surface of its host is given away only by the pattern of six raised ribs forming the tetrahedral shape of its mantle. All members of the family share not only this highly-developed host-specific mimicry, but also the similar habits of eating their host and laying their egg capsules in the tunic of the encrusting colonial host.

A common intertidal neogastropod "shell-hider" is the California Marginella, *Volvarina taeniolata* Mörch, 1860. Along with some half-dozen other small, cryptic species, these are the cool water northeast Pacific representatives of a primarily tropical group. The yellow-orange shell of *V. taeniolata* usually has three brown bands; its mantle is tan, with a dark border and dark spots. As is the norm among the Neogastropoda, the marginellids are probably carnivorous.

The final examples of the parallel evolutionary trends among gastropods towards loss of the shell and complete reliance on the mantle are the opisthobranchs. Within this subclass we can distinguish those still retaining at least a vestigial shell, and those opisthobranchs which have totally lost the shell. Both of these groups rely on a shell during the early microscopic planktonic veliger larva stage in their life cycles. This continued use of a shell by the nudibranchs and sacoglossans during at least a short period of their life cycle, gives a clue to their recent evolutionary separation from the shell.

Figure 7. *Navanax inermis* (Cooper, 1863)

Wide variation of shell reduction exists among the shelled species. The size, shape, weight, and submergence of the shell form various parallel series from the heavy prosobranch-like shell of the barrel shell, *Rictaxis punctocaelatus* (Carpenter, 1864) to the barely identifiable relic of an internal shell of *Navanax inermis* (Cooper, 1863). Intermediately are the bubble shells, such as *Bulla gouldiana* Pilsbry, 1893, and *Haminoea vesicula* (Gould, 1855), which still carry externally a thin, almost transparent, greatly inflated shell, and the notaspideans which bear reduced, wholly internal transparent shells shaped like a greatly flattened abalone.

Evolution has worked in anthropomorphically curious ways. While the main evolutionary thrust of the mollusks has been the elaboration, development and adaptive radiation of shell structures, there are non-related lineages that exhibit recurring shell-hiding or reduction. Many such rebellious departures probably have led to evolutionary failure. There is nothing "wrong" with extinction (as long as it is not accelerated nor imposed by man). But some of these "shell-hiders" play their game well. The many that continue to be successful demonstrate the remarkable diversity, plasticity, and adaptability of the molluscan forms evolving in our oceans.

REFERENCES

Behrens, David W. 1984. Lamellariids: masters of disguise. Opisthobranch **16**(4): 42–44.

Bertsch, Hans. 1984a. The inside-out clam: *Chlamydoconcha*. Opisthobranch **16**(1): 7–8.

Bertsch, Hans. 1984b. How many species in the *Cypraea teres* "complex"? Shells and Sea Life **16**(5): 62–64.

Bertsch, Hans, and Barbara Myers. 1982. Comments on the eastern Pacific *Trivia ritteri* (Gastropoda: Triviidae). The Nautilus **96**(3): 96–99.

McLean, James H. 1984. Shell reduction and loss in fissurellids: a review of genera and species in the *Fissurellidea* group. American Malacological Union, Bulletin 2: 21–34.

Vermeij, Geerat J. 1978. Biogeography and adaptation: patterns of marine life. Cambridge, Harvard University Press. 332 pp.

David W. Behrens, P.G. & E. Bioassay Lab, P.O. Box 117, Avila Beach, CA 93424.

Dr. Hans Bertsch, 4444 W. Pt. Loma Blvd., San Diego, CA 92107.

CENTER SECTION

EDITOR'S NOTES

We need your support! Please pass the word to people about S&SL at every opportunity. We correspond with the clubs and everyone who writes but there are still many people who haven't seen S&SL. Pass on a subscription blank to a friend. We know YOU like the magazine -- now, please tell your friends!

Gary McDonald and Dave Behrens have provided many of the citations which are included in the PUBLICATION NOTES section. We hope that others will take the time to send citations for other mollusk groups. We will list them as space permits. We always appreciate reprints of articles and papers for reference for S&SL articles.

With the bibliography up to date and all features of the "Opisthobranch Newsletter" included each month -- bigger than ever, no one should complain about S&SL appealing to general malacology and even general marine life. Give us a break -- we print what you send. If you want more opisthobranch articles -- write them!

David K. Mulliner has agreed to be our Photo Editor. Dave has contributed much to the quality of our magazine. Colormasters, Inc., does our color separations. Arrowhead Press, Inc. does our printing. Both are doing an excellent job as you can see from the June and July issues and this issue.

Tucker Abbott is recovering well from his recent automobile accident. He still has (July 1) some problems with double vision. He and Cecilia were very kind to us [Steve & Sally] at the recent COA convention in Florida. They were very generous with their knowledge of publications.

Eveline DuBois-Reymond Marcus

Dr. Eveline DuBois-Reymond Marcus (São Paulo, Brazil) sent me the photo at left. It was taken especially for the Newsletter around September, 1983. The silver broach was made by Dr. M. Patricia Morse, and is Miesea evelinae (named after Eveline, naturally). The big silver buttons are Indian work, a present from Libbie Hyman, after she had visited Eveline for three weeks in 1956. The silver necklace was a present from Ernst Marcus, a short time after they were married, about 1926.

Eveline Marcus was in San Diego, California between about June 28 and July 10, 1984. She stayed with Hazel Cheatam and visited with Dave Mulliner, Steve Long, Jim Lance, Hans Bertsch, Wes Farmer, and others. Eveline went on to visit Terry Gosliner for about a week and then will travel on to Germany.

Jim Lance hosted gatherings for conversation and slide shows during Eveline's visit. Jim, along with Jerry Jacobs, has recently completed a one year survey of the branchs around San Diego. He has promised the resulting data tables for an upcoming S&SL issue. Recently, most of Jim's time has been spent working on the Panamic opisthobranch book for Sea Challengers. Jim says it will be ready to go for typesetting on or about 1 August.

Larry Wilson had his beautiful set of hand made knives on display at Jim's house. They were returning from winning first place at the county fair.

Terry Gosliner talked to me about 17 June (as he left for Baja, California, Mexico, with Hans Bertsch and Michael Ghiselin). Terry had discussions with his South African publisher while he was there (See S&SL 16(7):97) and discovered that his book on South African opisthobranchs would not go to press for at least 4 more months. At this point, Terry has no control over the publication date. He has promised a note for S&SL regarding the book soon.

Russ Jensen is still at the Delaware Museum of Natural History and will probably remain there for some time to come.

The COA meeting in St. Petersburg, Florida, was great. We met many new people and renewed many friendships. The entire convention was very well run and attended. We are planning to do most of the October issue of S&SL on the three major conventions (COA, AMU, and WSM). Please send snapshots and notes for possible inclusion in that issue before September 1st.

Michael Ghiselin was on his way back to San Francisco July 9th or so. He has been to Vienna, Austria, recently and promised a note for S&SL.

Jeff Hamann, Steve Long, and Hans Bertsch got together for a short afternoon's work on calendars and articles. Dave & Peg Mulliner took great care of me while I was in San Diego.

Sally & Steve were back in San Diego from 17-19 July. Fay Wolfson (Sea World & Hubbs Research Institute) provided a very nice day for us together with some good help on S&SL. Dave & Peg Mulliner were our gracious hosts for most of our visit. The San Diego Shell Club meeting, with guest speaker Ron McPeak, provided a great program on Escondido Bay shelling & diving (Baja, Mexico).

Jim McLean and Joel Greene have been assisting Marjorie Wing as she puts together an article on Sri Lanka shelling for (we hope) the September issue of S&SL.

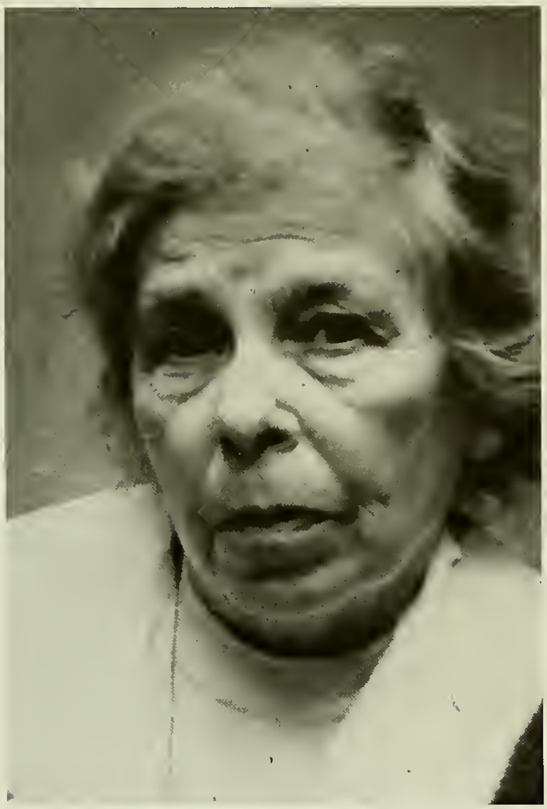
Joel Greene called my attention to a nice shelling article with photos in the August issue of "Islands" magazine. I have not yet seen the magazine but Joel says it is published in Santa Barbara, California. Please send the editors copies of articles like this when you see them so that we may call everyone's attention to them.

Don Cadien must be busy as usual since I haven't heard from him in several weeks. He was due to do some submersible work off Point Conception, California this summer and may well be there. Don has promised an article on some of the small California shelled opisthobranchs when he can find time to write it.

IN MEMORIAM

DR. ZINAIDA A. FILATOVA 1905-1984

Dr. Zinaida A. Filatova, born 8 October, 1905, Simferopol, died 11 June, 1984, Moscow, aged 78. All her life was characterized by deep devotion to science. She was one of the leading authorities in the sphere of marine biology in the USSR. Her scientific interests covered a broad spectrum. A perfect taxonomist of mollusks, geographer, oceanologist; she was the author of more than 120 scientific publications that include such diverse subjects as the fundamental investigation of our northern seas bottom fauna; quantitative distribution of deep-sea bottom fauna; Bivalvia and gastropods from northern seas of the USSR (with identification keys); the structure and phylogeny of deep sea Bivalvia; global problems of the origin and antiquity of the deep-sea fauna; new findings of Monoplacophora; and taxonomic revision of Tardigrada.



Dr. Filatova had been the nearest disciple and assistant of the late Professor L.H. Zenkevich, his co-author, the successor of his fund of oceanological investigations. After his death Dr. Filatova became the head of his laboratory -- Laboratory of Benthos in the P.P. Shirshov Institute of Oceanology (1972) and headed it up until her retirement in 1979. Dr. Filatova continued to work in the laboratory right up to the day before her sudden death.

Dr. Z.A. Filatova participated in many Soviet marine scientific expeditions. She was active in a number of International Congresses in Australia, Bulgaria, England, Denmark, Norway, USA, France, Scotland, etc. She was a member of the editorial board of "Malacologia."

Dr. Filatova was a sociable, nice person, considerate towards people; she had many friends and disciples. She was a connoisseur of literature, poetry, art and took a great interest in photography. She was a gifted artist and executed many excellent drawings for her papers. She was a good mother of a son, affectionate and considerate grandmother of twin grand-daughters and adoring great-grandmother of a great-grandson. She will be always missed by those who were acquainted with her.

P.S. Being a good photographer herself, Dr. Z.A. Filatova didn't like to be photographed. So I couldn't find a good picture of hers and am sending you only this one, I took November 26, 1981.

I.S. Roginskaya, Academician, Petrovsky str. 3, Apt. 46, Moscow, 117419 USSR.

NOTES FROM HANS BERTSCH

THE ANATOMY AND REPRODUCTIVE BIOLOGY OF CYPHOMA GIBBOSUM.

In the past two columns I have been describing various aspects of the taxonomy and biology of Cyphoma. In June's "Notes," I discussed the three species of Pseudocyphoma and 4 species of Cyphoma (C. macgintyi, C. alleneae, C. signatum, and C. emarginatum). Last month I illustrated living specimens of C. gibbosum and their gorgonian prey, and discussed Dr. Charles Birkeland's studies on the foraging behavior of C. gibbosum. In this final segment on C. gibbosum, I will describe the internal anatomy of this snail, based on my previously unpublished radular studies and the published dissections of Dr. Michael T. Ghiselin and Barry Wilson.

The shell and mantle are well known; the color illustrations published in the July issue of "Shells and Sea Life" show a Cyphoma on its prey Gorgonia, with the mantle covering the cream shell. The black rings are characteristic of the species.

The radula is illustrated (Figures 1-3) in my three scanning electron micrographs; to my knowledge, this is the first time that SEMs of the radula of this species have been published. The scythe-like laterals flank a prominent central rasping rachidian. The middle tooth has a major medial cusp, with 2 smaller cusps on each side. One micrograph documents tooth damage -- the cusps can be chipped or broken off with usage.

Figure 1. 230x magnification

Figure 2. 800x magnification

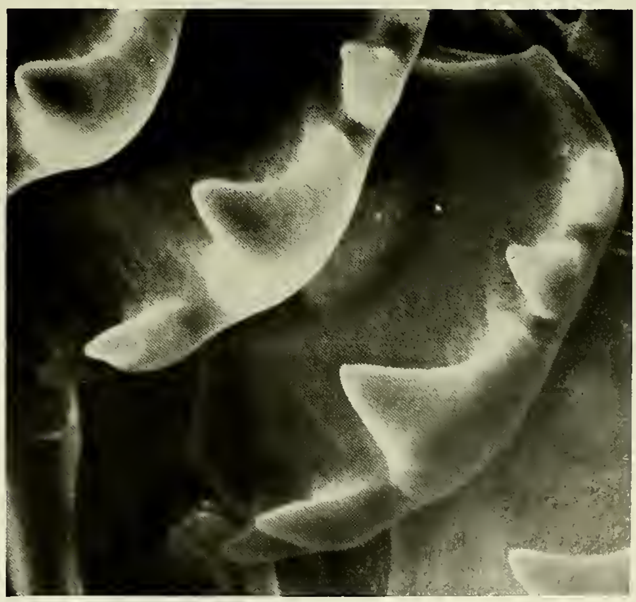
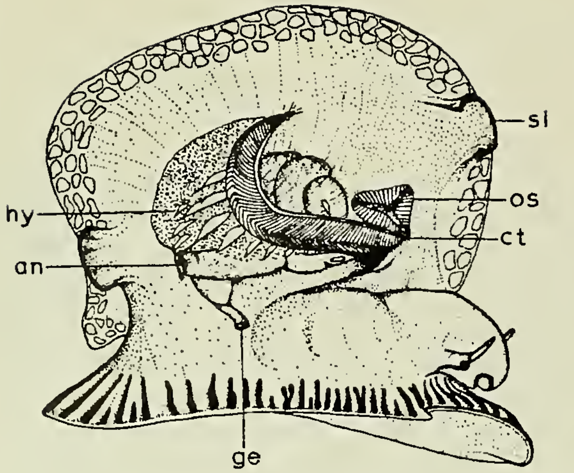


Figure 3. 1000x magnification

Figures 1 - 3. Scanning electron micrographs of the radula of Cyphoma gibbosum. Magnifications approximate. Microscopy by Hans Bertsch.



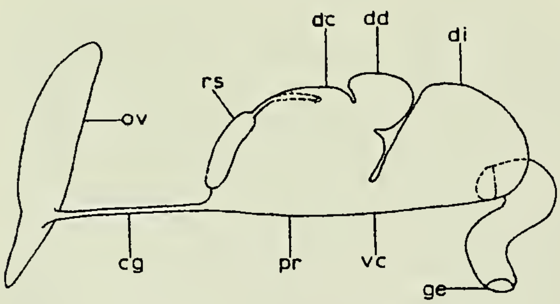
The mantle cavity (Figure 4) is elongate and shallow. When the animal is extended, the respiratory currents flow in a nearly straight path from the incurrent siphon, across the osphradium, over the ctenidium and hypobranchial gland, and out the rear of the cavity. The tripartite osphradium characterizes Cyphoma gibbosum as a cypracean (distinguished from Lamellariacea).

Figure 4. Structure of the mantle cavity of Cyphoma gibbosum; from Ghiselin & Wilson, 1966.

Key to the anatomical features

an - anus; cg - coelomic gonoduct; ct - ctenidium; dc - dorsal channel; dd - dorsal diverticulum; di- distal lobe; ge - genital opening; hy - hypobranchial gland; os - osphradium; ov - ovary; pe - penis; pr - proximal lobe; rs - receptaculum seminis; sg - seminal groove; si - incurrent siphon; vc - ventral channel

These animals are gonochoristic (separate sexes); their reproductive structures are illustrated in Figures 5 and 6. Ghiselin & Wilson (1966) discuss in detail the functioning of these parts in Cyphoma, and their homologies among the Cypraea, Trivia, Lamellaria, Littorina and the opisthobranchs.



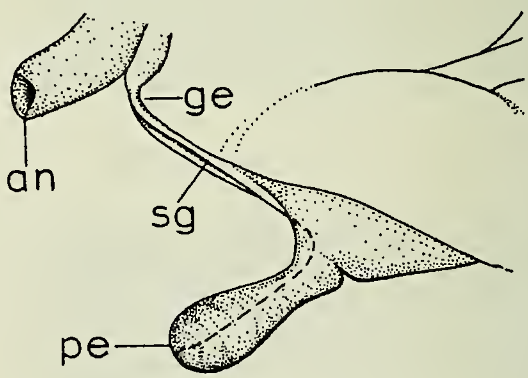


Figure 5. Diagram of female reproductive organs, Cyphoma gibbosum; from Ghiselin & Wilson, 1966.

Figure 6. External male genitalia of Cyphoma gibbosum; from Ghiselin & Wilson, 1966.

Ghiselin & Wilson (1966:135) also describe the reproductive behavior of Cyphoma signatum: "Of the three specimens of C. signatum which we collected, two were found together, and later these copulated in the laboratory. No preliminary "rituals" were observed. The male approached the female from the rear, crawled onto her dorsal surface, and inserted his penis into the mantle cavity. The pair remained in copulation for 3-1/2 hours, during which time there was little movement, except for occasional action by the buccal mass of the female."

AUTHOR'S NOTE: After eight months of columns, it is perhaps time for some comments on the goals of my monthly column, and how I wish to serve you, the reader. When your editor, Steve Long, first approached me to be a Contributing Editor, we toyed with the idea of an "Animal of the Month Column." However, we decided "Notes From..." was a better title; it would allow me greater diversity of topics to explore. Although I will maintain my thrust of writing mainly on shelled mollusks and their biology and anatomy, in future months I will be expanding the concept of my column to discuss other invertebrates (especially those ecologically related to mollusks as predators or prey); interesting marine habitats, locations, research projects, or resources (how to survive in Baja California, Oahu's Haleiwa Trench, museum facilities, etc.); responses to reader inquiries, comments, or suggestions; archaeological significance of mollusks; possibly a guest columnist once in a while (announced in advance; it would not be just because I missed the deadline); biographical or anecdotal features; or whatever might strike my fancy! Some columns may well be controversial (reader feedback is always encouraged and will be acknowledged). Disagreement requires supporting data, and that is how scientific ideas are modified and our knowledge of the world around us is shaped. My guiding concept is that I want this column to be accurate, interesting and informative. It is intended for you.

REFERENCES

Birkeland, Charles & Brian Gregory. 1975. Foraging behavior and rates of feeding of the gastropod, Cyphoma gibbosum (Linnaeus). Bulletin Natural History Museum Los Angeles County, No. 20:57-67.

Ghiselin, Michael T. & Barry R. Wilson. 1966. On the anatomy natural history, and reproduction of Cyphoma, a marine prosobranch gastropod. Bulletin of Marine Science, 16(1):132-141.

[Editor: Hans sent in the following corrections (for our errors) in his July column] Second pagagraph on page 100, as printed it reads that I met Michael Ghiselin at Harvard University's Museum of Comparative Zoology. However, the original text had the following sentences: "While at the University of California, Berkeley, he taught the invertebrate zoology course on campus. His laboratory was at the Bodega Marine Laboratory. It was there I met him...." Also, "gibbosum" was misspelled in the title.

Comment on known species of Cyphoma and Pseudocyphoma.

Steve Long called my attention to several nominate species of west Atlantic Cyphoma and Pseudocyphoma which I had not included in my summary of Cyphoma species (Bertsch, 1984). These are all recently described and relatively rare. Since most of these taxa were established from limited type material, further collections are obviously necessary to determine the status of these species:

- Cyphoma sedlaki Cate, 1976; holotype collected from the Florida Keys.
- Cyphoma rhomba Cate, 1978; named from two specimens collected at Ft. Lauderdale Reef, Florida (Living on sea whips, rather than the normal sea fan prey of C. gibbosum).
- Cyphoma macumba Petuch, 1979; based on two specimens, one live collected, from Abrolhos Reef Complex, Brazil.
- Pseudocyphoma gibbulum Cate, 1978; one specimen collected off the Dry Tortugas Islands, SW Florida.

I am grateful to Steve Long for alerting me to these omissions.

References

Bertsch, Hans. 1984. Cyphoma: the hump shells. Shells and Sea Life, 16(6):85-87.
Cate, Crawford N. 1976. Five new species of ovulidae (Mollusca: Gastropoda). The Veliger, 19(2):159-162.
Cate, Crawford N. 1978. New species of Ovulidae and reinstatement of Margovula pyrulina (A. Adams, 1854) (Gastropoda). The Nautilus, 92(4):160-167.
Petuch, Edward J. 1979. New gastropods from the Abrolhos Archipelago and reef complex, Brazil. Proc. Biol. Soc. Washington 92(3):510-526.

[Editor - Walter Sage (American Museum of Natural History) and Ed Petuch (Florida International University) each brought the information on additional Cyphomas to my attention. Thanks to each of them.]

Hans Bertsch, 4444 W. Pt. Loma Blvd. #83, San Diego, CA 92107

CLASSIFIED ADS

PERSONAL NOTES

From Heike Wägele [Fachbereich 7, Universität Oldenburg, Postfach 2503, 2900 Oldenburg, West Germany] Today you ask for comments on the May issue. I have only one: Very good and very interesting. Working on Opisthobranchs I am naturally more interested in those articles concerning the opisthos, but it is always good to "widen one's horizon." Looking forward to the next issue.

From I.S. Roginskaya [P.P. Shirshov Institute of Oceanology, Academy of Sciences of the U.S.S.R., 23 Krasikova St., Moscow, U.S.S.R., 117218] In the April number of the "Opisthobranch" you were worried by the absence of someone to survey Russian malacological literature. I would be very pleased to help you and to provide "S&SL" with recent Russian citations (or abstracts?) We have a monthly issue - "Journal of Abstracts" (my free translation of the title!), where abstracts of all recent biological publications and especially of Russian biological publications, regularly appear (in Russian). Generally most of our articles have English summaries or the title is translated into English.

Only some days ago I have returned from a short (May - 1/2 June) marine expedition in central Baltic. No Nudibranchia in macrobenthic bottom samples, no veligers of Opisthobranchia (and of Prosobranchia also) in plankton. [Editor - I will be very happy to receive abstracts and/or citations for Russian malacological publication - or any other publication on any aspect of malacology]

From Barbara Ferguson [6950-46th Ave. N., Lot 51, St. Petersburg, FL 33709] Boy am I glad I subscribed to "Shells and Sea Life." I subscribed at the COA convention, so I was able to take Jan. thru May issues home with me. Now I can't wait [July 6] for the June issue. There have been other publications, and some are still around, but I don't feel they have done what you are trying to do.

I feel you will be able to keep us all happy. The shell collectors and the opisthobranch lovers. I never realized just how beautiful some of the animals are.

I disagree with one of your readers who wrote in the May issue (Kathe Jensen) that "there are so many publications in the area of general malacology, shell collecting, marine life, etc.", that she really didn't think that we needed another one. Well, I do, because many of those publications are expensive books, technical papers that a lot of amateur or non-professional shell collectors can't really understand, what publication has ever taken the time or space to help answer questions to help shell collectors and "Opisthobranch lovers" of all levels. (And between you and me I believe conchologists outnumber the other) but if they co-exist in nature, we can too.


Lambis chiragra
(Linnaeus, 1785)

Now I need some help. I intend to enter my first shell show competition and the genus I have chosen doesn't have a whole lot of information. Where can I find more information on the genus Lambis family STROMBIDAE. I have never seen a color picture of any living Lambis. I would like to obtain these pictures and information (line drawings, etc.). I want to know more about the mollusk. Can you or any of your readers help me?

COA convention was great. Biggest ever. Glad you were there showing your publication, and hope you were able to get subscriptions. [we DID!] I fully intend to take my copies and show my friends.

P.S. Few people realize how much work goes into this type of publication, and much of yourself too.

From Sandra Millen: We thoroughly enjoyed Yugoslavia. Canada came in second to Sweden in the boat race (Dalmatian Cup) with U.S. trailing far behind. Unfortunately we did not get to dive as the sport is very seasonal (July & August) and the dive shops were all closed. I collected Haminoea sp., Janolus cristata and Spurilla neapolitana. I saw other opisthobranchs in the aquarium at the Rovinj Marine Station, where I discovered that Tom Thompson had worked a few years earlier.

From A. Myra Keen: Congratulations on the new format and the plans for "Shells and Sea Life." I hope your subscribers will enjoy the new issue as much as I did and that your clientele will increase rapidly.

You asked for comments and criticisms. I think your articles were well balanced, and I especially applaud Jack Brookshire's memorial to Dr. Berry.

My major criticism is that if you are to catch and hold the attention of the professionals, you will have to be more insistent that your authors transcribe technical names accurately.

I haven't had time to think about writing articles for the last several months, but perhaps now, with more leisure, I may get into the mood. If so, I'll remember your new publication.

READER FORUM

From I.S. Roginskaya: On page 31 of the March issue there are about two lines of text skipped beginning with the words "The radula of the 54 mm specimen.... [contained 54 rows (the maximum number of lateral teeth 79-81).

Both specimens] had only 15-13 lateral teeth in the old worn rows." The words I placed in square brackets were ommitted. [My apologies - editor]

From George L. Kennedy [President, Western Society of Malacologists] In the May issue of "Shells and Sea Life," R. Tucker Abbott encouraged readers to support the hobby of shell collecting by joining one of two national (but predominantly eastern) shell clubs, the American Malacological Union or the Conchologists of America. Despite an opinion, all too often held by many easterners, that little of consequence occurs west of the Rocky Mountains, the hobby of shell collecting and the science of malacology are thriving in the western states. The interest in, and study of, mollusks are well supported by numerous shell clubs, and by one regional molluscan organization, the Western Society of Malacologists. The Western Society of Malacologists supports the study of mollusks at all levels. The Society was founded by individuals who believed in the healthy interaction and communications between ALL persons interested in mollusks, whether they were purely amateurs interested in shell collecting or were professionally schooled in malacology or zoology, but also including a wide range of students, serious amateurs, or scientists in disciplines not entirely limited to the study of mollusks.

The Society holds an Annual Meeting each summer and in 1984 will meet at Crown College on the campus of the University of California at Santa Cruz, August 16-19. Presentations will include a full schedule of scientific papers, as well as popular accounts and travelogues of shelling expeditions. What better way is there to get to know the personalities in your field, or to exchange information on mollusks, than by meeting in person in an informal atmosphere? The Society's Annual Report, which contains the abstracts and contributed papers presented at the Annual Meeting, is free to all members and is distributed worldwide.

In addition, the Society encourages student participation in its Annual Meeting by offering, in odd-numbered years, a $500 Student Research Grant, as well as administering a second $500 student grant sponsored by the Southwestern Malacological Society. In even-numbered years, awards of $100, $75, and $50 are given to the three best student papers. Membership in the Society costs $7.50 (Regular), $3.00 (Student), or $1.00 (additional family members); applications are available from the WSM Treasurer, Mrs. Margaret Mulliner, 5283 Vickie Drive, San Diego, CA 92109.

YOUR COLLECTION - A HOW-TO COLUMN by Susan J. Hewitt
#1 WHAT MAKES A GOOD COLLECTION.

You're interested in starting a collection or improving your existing one. You should realize right now that your collection has the capability of becoming a very valuable scientific resource, not just to yourself, but also to a museum or to an educational institution. Eventually this is where all good collections should go, either during your lifetime or if you wish, upon your death. This can be written into your will right now. Naturally, you can choose which institution you prefer to donate your collection to.

In the case of a fine private collection you may be able to claim a fair-sized tax write-off when you donate it to a non-profit organization. This is of course assuming that the institution is interested in acquiring your collection. The main question is -- does it have good scientific value?

What makes a collection valuable scientifically? Curiously enough this has almost nothing to do with the so-called value of the shells/specimens as they are listed in the trade books. It also has nothing to do with how much you may have paid for specimens. What is valuable to the scientists is the information that goes along with the specimens, how reliable that information is, and whether it contains all the relevant details. This is why material you collect yourself is likely to be more valuable, since you will know all about it. You will be able -- as you actually collect it -- to write on the label all the necessary information to go with it.

Shells or other specimens with little or no information, however attractive, are worthless to scientists. Unreliable information is worse than no information. The most important facts (data) are: who collected the specimen, when it was collected (year and preferably month and day,) and where exactly it was found (country, state, county, city, site name and substrate type).

NEXT MONTH -- The how-to of labels, part one.

CURRENT EVENTS

The WESTERN SOCIETY OF MALACOLOGISTS will hold its 17th Annual Meeting at Crown College, on the campus of the University of California, Santa Cruz, California, on Thursday August 16 to Sunday August 19, 1984. A full schedule of Contributed Papers with the theme "Natural History of Marine Mollusks of the Eastern Pacific" is planned.

In addition to the regular sessions, several special symposia are planned; including ones on Nudibranchs, chaired by Terry Gosliner, Marine Mollusks of Northwestern Baja California, chaired by Hans Bertsch, and Paleoecology and Fossil Mollusks chaired by George Kennedy. Also planned are slide shows featuring nudibranchs and South African Mollusks by Terry Gosliner, Paleontology in the High Arctic (80 degrees North), by Louis Marincovich, and late AMU-PD and early WSM meetings and their participants, by Jim Mclean.

Several field trips are planned, arrangements are being made to open Moss Landing Marine Station and the U.C. Santa Cruz Long Marine Laboratory to visitors during the meeting.

There will be a shell and book auction to raise funds to support the WSM student grant and other WSM activities.

For additional information contact; Margaret Mulliner, Treasurer, WSM, 5283 Vickie Drive, San Diego, CA 92109, (619) 488-2701.

UNDERWATER PHOTOGRAPHIC SOCIETY, presents The 20th Annual Film Festival at the Civic Theater, 2021 C Street, San Diego. September 7th and 8th. Master of Ceremonies will be Jack McKenney, one of the top underwater cinematographers in the world. Programs will begin at 8:00 each evening. Tickets are $8.00 (open seating).

SCHEDULE OF SHOWS AND CONVENTIONS

1984

August	11-12	Midwest Regional Shell Show	Indianapolis, Indiana
August	11-12	Townsville Shell Show	Townsville, Australia
August	16-19	Western Society of Malacologists	Santa Cruz, Calif.
Sept.	7-8	20th. Annual Underwater Film Festival	San Diego, Calif.
Sept.	12-19	Association Conchliogique de Nouvelle Caledonie	Noumea, New Caledonia
Sept.	22-23	Long Island Shell Show	Freeport, New York
Oct.	13-14	Santa Barbara Shell Show	Santa Barbera, Calif.
Oct.	13-14	Tri-State Shell Show	Cincinnati, Ohio
Oct.	20-21	Philidelphia Shell Show	Philidelphia, Penn.
Dec.	27-30	Western Society of Naturalists	Denver, Colorado

PUBLICATION NOTES

Anonymous. 1972. Chromodoris -- the sea slug. Newsl. Bermuda Biol. Sta. Res., 1(3):2, pl. [ON10419]

Ahmed, Z. 1980. Intracellular calcium regulation and changes in pH in molluscan neurons. Dissertation Abstracts International, (B) 40(11):5519. [ON10420]

Aldrich, R.W. 1980. Cumulative inactivation of outward current in molluscan neurons and its roll in use dependent broadening of action potentials. Dissertation Abstracts International, (B) 40(11):5119-5120. [ON10421]

Amsellem, J. & G. Nicaise. 1976. Distribution of the glio-interstitial system in molluscs 2. Electron microscopy of tonic and phasic muscles in the digestive tract of Aplysia and other opisthobranchs. Cell & Tissue Research, 165(2):171-184. [ON10422]

Anderson, E.S. 1973. The association of the nudibranch Rostanga pulchra MacFarland 1905 with the sponges Ophlitaspongia pennata, Esperiopsis originalis and Plocamia karykina. Dissertation Abstracts International, (B) 33(12):5668. [ON10423]

Antonia, S. 1930. Phyllirhoe sanzoi Sparta 1927. Fauna Flore Mediterranean, 1930, pl. [ON10424]

Baba, K. 1984. Supplementary information on the morphology of Phestilla melanobranchia Bergh, 1874, from Seto, Kii, Middle Japan (Nudibranchia: Aeolidacea: Tergipedidae). Veliger, 26(4):241-247. [ON10425]

Ballesteros, M. 1977. Sobre Spurilla neapolitana Delle Chiaje (1824) y Berghia verrucicornis A. Costa (1864), dos Aeolidacea (Gastropoda: Opisthobranchia) recolectados en Cubellas (Barcelona). Publicaciones del Departmento de Zoologia, Universidad de Barcelona, 2:7-12. [In Spanish; ON10427]

Ballesteros, M. 1978. Contribucion al conocimiento de la fauna bentonica de Cubellas. Publicaciones del Departamento de Zoologia, Universidad de Barcelona, 3:11-23. [In Spanish; ON10428]

Barish, M.E. & S.H. Thompson. 1983. Calcium buffering and slow recovery kinetics of calcium-dependent outward current in molluscan neurones. J. Physiology, 337:201-220. [ON10429]

Barnes, R.S.K. [Ed.] 1984. A Synoptic Classification of Living Organisms. Blackwell Scientific Publications, Worcester, Great Britain, pp. i-ix + 1-273, 67 figs. [ISBN 0-87893-048-5; $11.50 paper; distributed by Sinauer Associates, Inc., Publishers, Sunderland, MA 01375; pp. 187- 196 Mollusca. Contains an outline of classification for all living organisms bacteria, through protists, to fungi, plants & animals. A handy reference with classification through ORDER level; ON10430]

Bertsch, Hans & Alex Kerstitch. 1984. Distribution and radular morphology of various nudibranchs (Gastropoda: Opisthobranchia) from the Gulf of California, Mexico. Veliger, 26(4):264-273. [ON10431]

Bertsch, Hans & Luis Aguilar Rosas. 1984. Range extensions of four species of nudibranchs along the Pacific coast of Baja California, Mexico. Nautilus, 98(1):9-11. [ON10432]

Brown, G.H. 1978. The north Atlantic species of Cuthona and related genera. Haliotis, 9(2):87. [ON10433]

Brown, G.H. & B.E. Picton. 1979. Nudibranchs of the British Isles -- a colour guide. Underwater Conservation Society, Manchester, pp. 1-30. [ON10434]

Connor, J.A. 1980. The fast K+ channel and repetitive firing, pp. 125-130. In: J. Koester & J.H. Byrne (Eds.). Cold Spring Harbor reports in the neurosciences, vol. 1. Molluscan nerve cells: from biophysics to behavior; meeting, Cold Spring Harbor Laboratory: Cold Spring Harbor, New York, USA, May 18-21, xix + 230 pp. [ON10435]

Cowan, M.E. 1980. Response of selected marine invertebrates to Ichthyocides. Kalikasan, 9(2-3):111-120. [ON10436]

Crow, T. & Nancy Offenbach. 1983. Modification of the initiation of locomotion in Hermissenda crassicornis: behavioral analysis. Brain Research, 271(2):301-310. [ON10437]

Derjugin, K.M. 1915. [La faune du golfe de Kola et les conditions de son existence]. Petrograd. Mem. Acad. Sci. (series 8), 34(1):i-ix, 1-929, 14 pls. [In Russian; ON10438]

Dorsett, D.A. 1974. Neuronal homologies and the control of branchial tuft movements in two species of Tritonia. J. Experimental Biology 61(3):639-654. [ON10439]

Dorsett, D.A. 1976a. The evolution of neural mechanisms underlying behaviour in Tritonia, pp. 385-397. In: P.S. Davies (Ed.). Perspectives in experimental biology, vol. 1, zoology, xiii + 525 pp. Pergamon Press. [ON10440]

Dubois, J.M. 1983. Potassium currents in the frog node of Ranvier. Progress Biophysics & Molecular Biology 42(1):1-20. [ON10441]

Edmunds, M. & H. Just. 1983. Eolid nudibranchiate Mollusca from Barbados. J. Molluscan Studies 49(3):185-(203). [ON10442]

Erokhin, V.E. 1979. The use of antibiotics when studying the feeding of invertebrates on exometabolites. Hydrobiological J. 14(4):77-80. [ON10443]

Farley, C.A. 1978. Viruses and viruslike lesions in marine mollusks. Marine Fish Rev. 40(10):18-20. [ON10444]

A Redescription of *Oliva foxi* Stingley, 1984

by Donald R. Shasky

In Vol. XVI, nos. 178–179, 1984, of **La Conchiglia**, there appeared a description of the new species *Oliva foxi* Stingley, from Cocos Island, Costa Rica. Material I collected at Cocos Island and the briefness of Stingley's description justifies a redescription of the taxon:

The description below is based on 21 specimens that are currently in my collection. These specimens were taken by SCUBA diving and dredging.

Shell cylindrical. Protoconch mammilate, 4 whorled. As the first post-nuclear whorl emerges, a deeply channeled suture also emerges which partially submerges the fourth nuclear whorl and each succeeding whorl. Post-nuclear whorls 3½. On the post-nuclear whorls, there is a faint carina just adapical to where the whorl is immersed by the channel. The carina terminates in a slight thickening at the beginning of the body whorl. Columella is gently angled abaxically. Columellar edge scalloped with weak plicae separating each scallop. There are about 11 scallops which progressively become thicker and stronger as they progress abapically. Base of columella white or yellow with 3 plaits. Protoconch color pale mauve or cream. Ground color is a dark pink on the majority of specimens, but may be yellow or white or shades in between. Color of the pattern varies from rich reddish brown to yellowish brown and coffee brown. Pattern of bold and weak zig-zag lines which form strong tenting on most specimens. Aperture brownish pink in most specimens but yellow in some.

Discussion: Stingley in his discussion states, "This Olive in no way resembles any other *Oliva* species in color, form, and disposition of markings. I know of no other species to compare this Olive with." However, at least two olive species are similar and should be carefully compared with *Oliva foxi*: the Hawaiian *Oliva richerti* Kay, 1979, (from off Oahu in 20–266 m) and the Panamic *O. kaleotina* Duclos, 1835.

I have not yet examined *Oliva richerti*, but a color photograph of this species, published prior to its description, in the June, 1976 **Hawaiian Shell News** illustrates its similarity to *O. foxi*. In reading Kay's description the principle difference I find between these 2 species is that *O. richerti* has 4 columellar plaits while *O. foxi* has 3. The length and width are the same. Dr. Kay compared *O. richerti* to *O. multiplicata* Reeve, 1850. *Oliva foxi* may prove to be synonymous with or a subspecies of *O. richerti*. The color pattern and shell characters of *Oliva foxi* are different from those of *O. kaleontina* Duclos, 1835.

Oliva foxi was first illustrated in **Hawaiian Shell News** by Zeigler in July, 1980, under the title, "An Olive Stranger from Cocos Island." I thank Lt. Bill Fenzan for reviewing the past issues of the **Hawaiian Shell News** which are cited above.

ADDITIONAL REFERENCES

Donner, Diane 1976 Eight Years of Deep-Water Shelling. Hawaiian Shell News **24**:(5) 1,5.

Fox, Eva 1984 *Oliva foxi*. Hawaiian Shell News **32**:(6) 3.

Kay, E.A. 1979. Hawaiian Marine Shells. Bishop Museum Press, Hawaii, pp. 653, figs. 195.

Zeigler, R.F. & H.C. Porreca. 1969. Olive Shells of the World. Rochester Polychrome Press, Rochester, New York, pp. 96, pls. 13.

Zeigler, Dr. Rowland F. 1980 The Olive Stranger from Cocos Island. Hawaiian Shell News **28**:(7) 12.

Dr. Donald R. Shasky. 834 W. Highland Ave., Redlands, CA 92373.

Oliva foxi Stingley, 1984. Cocos Island, Costa Rica. All photos by Don Shasky.

Partnerships in the Sea

Text and photos by Alex Kerstitch

In the predator-prey cycle of the underwater world some marine animals participate in a less savage existence. Instead they establish partnerships in which unrelated species benefit from close-knit relationships.

The late Conrad Limbaugh, a perceptive marine biologist, reported in 1961 an unusual occurrence while diving off the southern California coast. He witnessed large schools of opaleye, *Girella nigricans* (Ayers, 1860), milling about in tight clusters while a small wrasse swam from fish to fish inspecting and nibbling their skins. Later, he observed several small shrimps roaming unmolested inside the mouth of a large moray eel. These animals, explained Limbaugh, were engaged in a significant activity known as "cleaning symbiosis." This phenomenon involves the removal of ectoparasites and diseased tissue by one animal, the cleaner, from the infested body of another, the host. Both benefit from this reciprocal arrangement, the cleaner by consuming the parasites and the host by being freed from harmful unwanted guests.

In the Gulf of California I have often observed such cleaning behavior, particularly off the tip of Baja California Sur at Cabo San Lucas. On one occasion, however, I was the unexpected recipient of this benevolent grooming. Huddled under a coral overhang in shallow water I was preoccupied with photographing an uncooperative angelfish. Distracted by a mild itching on the back of my hand holding the camera, I noticed a small banded goby, *Elacatinus* sp. tugging tenaciously at bits of skin on a healing scratch. Whether it was actually ingesting tissue is not known but the persistent goby continued to groom for several minutes.

Until recent years, symbiotic cleaning was best known among terrestrial animals. The African ankole and cattle egret, red crabs and Galápagos iguana, or red-billed oxpecker and rhinoceros are just a few examples. But with the advent of SCUBA, marine biologists are discovering cleaning symbiosis is widespread among fishes and some crustaceans as well. Over 50 species of marine fishes and dozens of shrimps are confirmed cleaners. Known cleaners include wrasses, gobies, angelfishes, butterflyfishes, decapod shrimps and a few crabs.

The function of conspicuous coloration among tropical cleaners (both fishes and shrimps) is believed to be associated with cleaning symbiosis. The poster colorations serve to advertise the presence and profession of potential cleaners. The contrasting light and dark striped pattern of the cleaner wrasse, *Labroides*, the cleaner goby, *Elacatinus* sp. or the yellow bars on the black juvenile Cortez angelfish *Pomacanthus zonipectus* (Gill, 1863) characterize them as cleaners.

Alteration of coloration and pattern occurs in some host species during cleaning sessions. For example, goatfishes *Mulloidichthys* spp. normally turn reddish-pink while cleaned in contrast to their normal pale silvery hues. The function of this change is not fully understood; in addition to being a possible solicitation signal to attract a cleaner, it has been suggested that ectoparasites often mimic scale coloration of their host to which they are attached, thus making them difficult to see. A sudden color change from an infested fish would expose the parasite to the cleaner.

Cleaning stations consisting of several hundred fishes have been reported on occasions. These stations are often maintained by only a few cleaners servicing tangs, grunts, goatfishes and other species. In one hour a single cleaner, such as the barberfish, *Johnrandallia nigrirostris* (Gill, 1863) can groom as many as 300 individuals. These will actually wait in line to be attended.

The rewards of cleaning symbiosis are occasionally marred by the presence of cleaning imposters. Small wrasse-like blennies, *Plagiotremus* spp., known as fanged blennies because of their needle-sharp fangs, mimic the color pattern and body shape of some cleaner wrasses to such degree that infected fishes will mistake them for benevolent cleaners. So complete is the deception that the mimic even imitates the cleaner's swimming displays. As the unsuspecting host fish swims up with mouth opened or gills exposed to be attended, the fanged blenny imposter bites off a chunk of flesh.

Predation of cleaners is uncommon but occupational hazards exist. As a result, some cleaners possess the added protection of being distasteful to predators. At least two species from the Gulf of California, the banded cleaner goby, *Elacatinus digueti* (Pellegrin, 1901), and the widebanded cleaner goby, *Elacatinus* sp. (undescribed) appear to have this immunity.

To conclude, my own observations in various parts of the world of cleaning behavior suggest that an unexpected large number of species, both shrimps and fishes, engage to some extent in symbiotic cleaning. Many of these have yet to be reported. It is clear that, ecologically, cleaning symbiosis plays an important role. In some studies, marine biologists systematically removed all cleaners from isolated reefs. The results varied in each tested area, but in several cases fish infestations increased considerably. Subsequently, infested fishes migrated to other areas, presumably in search for potential cleaners.

See Photos back page.

REFERENCES

Brusca, Richard: Common Intertidal Invertebrates of the Gulf of California; 1980.

Gotto, R.V. Marine Animals; Partnerships and Other Associations. (1969).

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Figure 1. Wrasse, *Halichoeres* sp. cleaned by goby. West Mexico.

Figure 2. Cleaner wrasse, *Labroides* sp. Indo-Pacific.

Figure 3. Pacific green moray being cleaned by banded cleaner goby *Elacatinus digueti* (Pellegrin, 1901) Gulf of California.

Figure 5. Cleaner shrimp, *Lysmata grabhami* (Gordon) cleaning fish, Philippines.

Figure 4. Cortez angelfish, *Pomacanthus zonipectus* (Gill, 1863) showing conspicuous coleration of a cleaner; Gulf of California.

Errata

The figure descriptions nos. 4 & 5 on page 132 are reversed. Please also read coloration. Apologies to both Alex Kerstitch, the photographer of the lovely photos and our readers. S&SL.

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Chromodoris sp. 34 mm. Cedros Island, Mexico, 23 m depth, August 23, 1980. One of only two recorded specimens of this undescribed chromodorid from west America. Photo by Jeff Hamann.

IN THIS ISSUE:
SHIPWORMS, RARE DEEP-WATER SHELLS, NUDIBRANCHS & MICROMOLLUSKS.

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CONTENTS - SEPTEMBER

WOOD-WRECKING WORMS ARE ACTUALLY CALAMITOUS CLAMS

by Sven Donaldson and Sandra Millen

For early seafarers, the spectre of shipwreck was a constant companion. Often it was the insidious activities of shipworms, not the overt dangers of storms and reefs, that brought about disaster. In just a few months, given warm water and otherwise favorable conditions, shipworms could weaken a stout vessel to the point where it became unequal to the stresses of even moderately rough weather. A few months later the same hull might collapse under its own weight. On Columbus's fourth (and final) voyage to the new world, shipworms humbled the great navigator. With two ships gone, he desperately beached the remaining *Capitana* and *Santiago* in a vain attempt to halt the infestation and repair the damage. Ultimately he was rescued from the shores of Jamaica by a follow-up expedition. All in all, it is no wonder that shipworms were universally feared and loathed by early mariners.

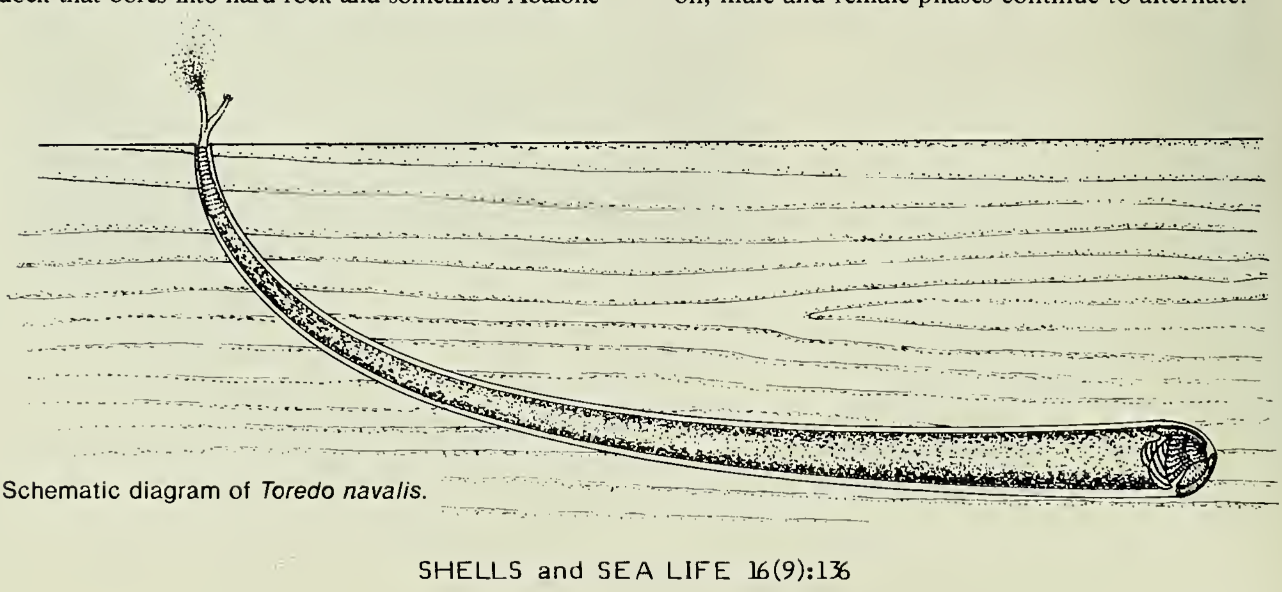
It was not until a great shipworm infestation in the 1730s threatened the dykes responsible for flood control in Holland that a scientist named Sellius learned that these worms were not worms at all, but mollusks—long, skinny clams. Although highly modified in shape, they are clearly close relatives to a group of burrowing clams called rock piddocks. Piddocks, like other clams, have a bivalve shell, but the rounded front of the shell bears file-like teeth. Young piddocks settle on hard clay or rock. As they grow, they slowly rasp away at their surroundings and bury themselves deeper and deeper. The neck of the piddock contains two siphons, one used to bring in water containing tiny food organisms and oxygen, the other used to expel oxygen-depleted water and feces. The piddock's neck is tremendously elongated to reach to the mouth of its burrow.

A common piddock is *Zirfaea pilsbryi* which lives in hard clay from Alaska to Baja California. A smaller piddock that bores into hard rock and sometimes Abalone shells, is *Penitella conradi.* Extremely common at some intertidal sites, it can greatly accelerate shoreline erosion.

There are two species of shipworms found in our area: the dreaded *Teredo navalis*, found worldwide, but fortunately rare this far north, and the somewhat less destructive *Bankia setacea.* Shipworms are still further adapted for burrowing than their relatives, the piddocks. The bivalve shell has been reduced until it no longer encloses the body, but serves solely as a boring tool. The body has evolved to become tapered and wormlike, while the siphons are similarly elongated to reach all the way to the surface (sometimes over a meter from the head of the burrow). Attached to the siphons are special calcified structures called pallets used to blockade and seal the mouth of the burrow.

Siphons of *Zirfaea pilsbryi* extend from hard mud in the passage between North and South Pender Islands, British Columbia, Canada.

A shipworm initially matures as a male. For the first several months of its adult life it produces sperm. Later it changes sex and begins to produce eggs. There is even a suspicion that in its androgonous, in-between state, it can produce both and self-fertilize. Frequently, before its first year is up, the collective activities of the shipworm and its neighbors cause its habitat to crumble away and the now unprotected saboteurs all perish. However, if our shipworm lives on, male and female phases continue to alternate.



Schematic diagram of *Toredo navalis.*

Like other bivalves, *Bankia* and *Teredo* produce an astronomical number of offspring. *Bankia* releases its eggs and sperm directly into the sea where haphazard fertilization takes place; *Teredo* retains its eggs in its gill chambers where they are fertilized and brooded to the veliger larva stage. The gill chambers of an average female *Teredo* contain 20 to 50 thousand larvae, while one prolific mama harbored over 2 million. The veliger has two ciliated lobes called the vellum for swimming, and a little bivalve shell for protection.

After a short period of planktonic life, the veliger must find a suitable wooden surface for settlement. Those that fail die, in the case of *Teredo* only four days after being released from the maternal gill chamber. Like barnacle larvae, shipworm veligers settle and metamorphose in response to complex physical and chemical cues. After a veliger has located a suitable wooden surface, it begins boring.

At this stage its shell is not yet calcified, and it lacks the rim of file-like teeth found on the shells of adults. Larval boring is believed to be a chemical process involving enzymes used to attack the wood so that sweeping movements of the delicate shell can brush away the residue. Once below the surface, the larva metamorphoses and its shell hardens. All future boring is a strictly mechanical process. To bore, the shipworm rocks its shells back and forth while gripping the burrow with its sucker-like foot so that its rasp-like shell teeth bite into the wood at the head of the burrow. As it drills, it slowly twists its body. The resulting hole is perfectly circular. To eject sawdust, the shipworm simply eats it and passes it through its digestive tract.

Several *Zirfaea* about 12 inches long extracted from their burrows. Shipworms are several times longer and thinner, with even smaller shells.

There has been much controversy as to whether shipworms actually digest the wood that passes through their intestines. Piddocks remove rock or clay in much the same manner, but obtain all nourishment from plankton drawn in through their siphons. Recent tests indicate that up to 80% of the cellulose and 50% of the hemicellulose in the injested wood is assimilated by the shipworm. It is not known whether the digestion of wood is aided either by bacterial symbionts (such as those found in the digestive tracts of termites and cattle), or by bacteria and fungi already living there. In either case, it appears that the shipworm has turned the family burrowing habit into a new way of obtaining food.

After the wood is initially penetrated, a young shipworm turns to follow the grain. Thus in a heavily-infested timber, the burrows are all parallel. Furthermore they can be very closely spaced. In addition to their sensitivity to grain direction, shipworms can tell (perhaps by feeling vibration) when they are nearing a neighbor's burrow in time to turn away slightly and avoid creating an intersection. If a shipworm can drill no deeper without hitting a neighbor, both boring and growth are inhibited, and it becomes a stunted dwarf or stenomorph.

For thousands of years man has sought ways to combat shipworms. Many ingenious methods have been tested, but to date the shipworm still appears to have the upper hand. Early methods still helpful today include hauling boats out of water and charring their surfaces or baking them in the hot sun. Taking the affected boat into fresh water also works, but any of these methods, to be effective, must be used over a lengthy period. Once a shipworm has sealed off the opening to its burrow with its pallets, it ability to resist adverse conditions is quite extraordinary. Other methods include treatment with poisons such as creosote and covering the wood with a variety of sheathing. None of these approaches is outstandingly successful. Even wooden pilings encased in concrete can fall prey to successive waves of rock piddocks and shipworms. A bizzare attempt to electrocute shipworms by passing massive charges through pilings actually seemed to encourage them; test pilings were riddled more quickly than controls. A more successful approach, used in the British Columbia logging industry, is to shake shipworms to death using either pile drivers or nearby dynamite blasts at two month intervals.

Since preventative treatments for shipworm infestation are expensive, a great deal of effort has gone into developing methods of detection. Electronic stethoscopes used to listen for characteristic rasping sounds, reflective sonic testing, and even X-radiography are employed. Most basic of course, is simply looking for the traces of sawdust that mark the tiny entrances of shipworm burrows, but this is no easy task. So if you do discover your wooden boat, dock or float has been attacked by shipworms, try not to panic. Odds are it's already too late!

[Note: This article originally published in **Pacific Yachting**, March, 1981 and is reprinted here with permission of the authors.]

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TRITONIA PICKENSI (NUDIBRANCHIA: TRITONIIDAE) FROM BAJA CALIFORNIA, MEXICO

by Hans Bertsch and Terrence Gosliner

The opisthobranch fauna of the Gulf of California, Mexico (in the tropical eastern Pacific) presently includes eight known species of the nudibranch suborder Dendronotacea:

Dendronotus nanus Marcus & Marcus, 1967
Bornella sarape Bertsch, 1980
Doto amyra Marcus, 1961
Doto lancei Marcus & Marcus, 1967
Melibe leonina (Gould, 1852)
Tritonia diomedea Bergh, 1894
Tritonia pickensi Marcus & Marcus, 1967
Crosslandia daedali Poorman & Mulliner, 1981

Doto lancei occurs throughout the Gulf of California (Bertsch, 1973); *Melibe leonina* has recently been reported from Bahía de los Angeles (Poorman & Poorman, 1978); the ranges of *Bornella sarape* and *Tritonia diomedea* have been discussed by Bertsch & Kerstitch (1984). We are not aware of additional published Gulf occurrences for the other four species since they were named or reported from the Gulf of California.

Tritonia pickensi has been reported only from Puerto Peñasco and Guaymas, Sonora, Mexico, occurring on gorgonians (Marcus & Marcus, 1967; Williams & Gosliner, 1971). Hence the following new records are noteworthy:

1. 1 specimen (7 mm long), Bahía San Carlos (several km north of Guaymas), Sonora, Mexico (27° 56′ N; 111° 08′ W); *leg*. Terrence Gosliner and Gary Williams, 22 December 1969; found on a purple *Muricea* gorgonian (see Figure 1).

Figure 1. *Tritonia pickensi* collected at Bahía San Carlos, 22 December 1969; 7 mm;photograph by Steven J. Long.

Figure 2. In situ underwater photograph of *Tritonia pickensi* on a gorgonian; Bahía de los Angeles, Baja California; 20 feet deep; 28 May 1984; photo by Hans Bertsch.

2. 1 specimen (6 mm long), subtidal, 6 m depth, Punta Gringa, Bahía de los Angeles, Baja California (29° 04′ N; 113° 35′ W); *leg*. Hans Bertsch and Nancy Love, 28 May 1984; found on a gorgonian. Based on the identification keys in Brusca (1980), the gorgonian species on which this *Tritonia pickensi* was found appears to be *Psammogorgia arbuscula* Verrill (see Figure 2, underwater photograph showing the tritoniid *in situ*).

3. 1 specimen (10 mm long), subtidal, 13 m depth, Cabo San Lucas (north side), Baja California Sur (22° 53′ N; 109° 54′ W); *leg*. T. Gosliner, 19 January 1984; found on a fishing line entwined around the same species of gorgonian as Specimen 2, above. Its egg mass was found with the nudibranch.

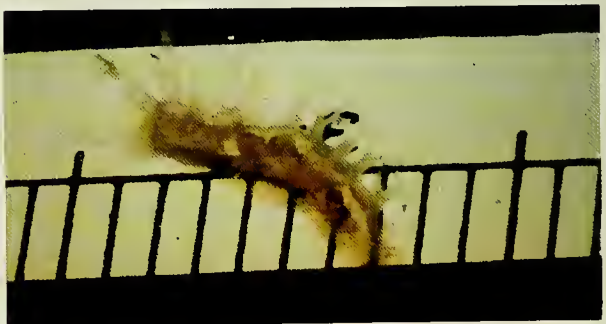

Figure 3. Original illustration of *Tritonia pickensi*, used by Marcus & Marcus in their description of the species; photo by Dr. Peter E. Pickens.

These specimens demonstrate a range of color variation for this species. The white swath on the dorsum of the animal sends lateral branches to the branchial processes on the notum margin. This swath varies in prominence or intensity. Figure 3 illustrates one of the living animals on which the original description of *Tritonia pickensi* had been based. Note that the white frosting, although present, is rather subtle. The specimen from Bahía San Carlos (Figure 1) shows quite pronounced white markings. The design is the same as that described by Marcus & Marcus, but is a bit wider and more obvious. The two specimens collected from Baja California (Figure 2) and Baja California Sur (they were feeding on a different genus of gorgonian than the animal from Bahía San Carlos) were similar to the original paratypic material in having less-pronounced white markings. The specimen collected at Cabo San Lucas had even less white frosting than the others; however, comparison of its radula (Figure 4) with a paratype's radula (Figure 5) revealed no differences, substantiating our belief they are conspecific.

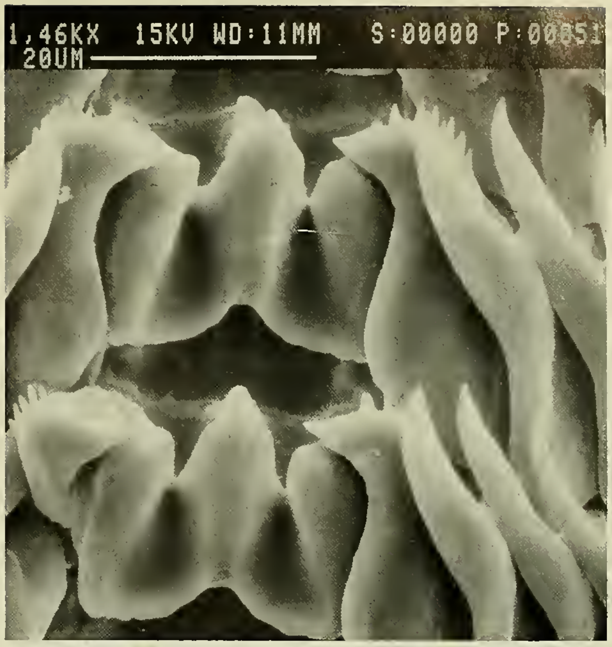

Figure 5. *Tritoni pickensi* SEM of paratype radula. SEM by Terrence Gosliner.

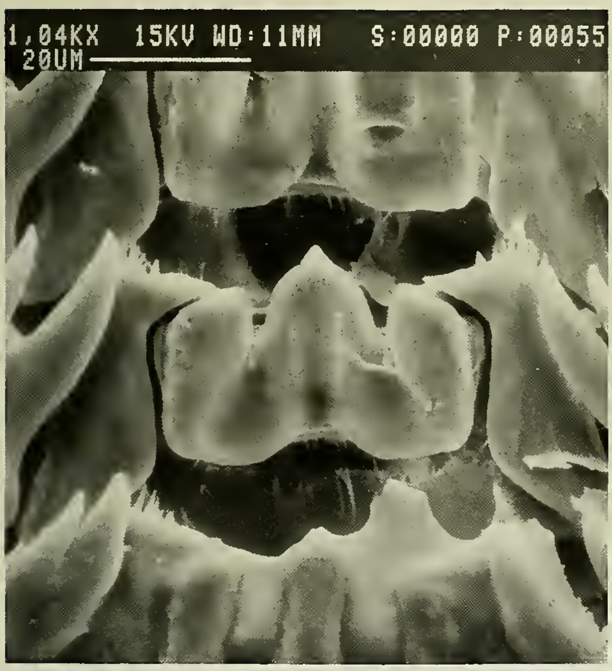

Figure 4. *Tritonia pickens* SEM of radula from specimen number 3. SEM by Terrence Gosliner.

These specimens and the accompanying illustrations represent the first report of the occurrence of *Tritonia pickensi* from the Gulf coast of Baja California and from the southern extreme of the Gulf of California (a range extension of about 600 km), the first identification of probable prey gorgonians, and the first published photographs of living animals of this species.

ACKNOWLEDGEMENTS

Part of the field work for this note was performed on a research expedition to Baja California Sur, supported by a grant from the George Lindsay Field Research Fund, California Academy of Sciences. We are grateful for this assistance, and also thank our colleagues on our various Gulf of California research trips: G. Williams and N. Love; and L. Aguilar, H. Herrmann, M. Ghiselin, W. Lee, R. van Syoc, and D. Catania.

LITERATURE CITED

Bertsch, Hans. 1973. Distribution and natural history of opisthobranch gastropods from Las Cruces, Baja California del Sur, Mexico. Veliger **16**(1):105-111.

Bertsch, Hans, and Alex Kerstitch. 1984. Distribution and radular morphology of various nudibranchs (Gastropoda: Opisthobranchia) from the Gulf of California, Mexico. Veliger **26**(4):264-273.

Brusca, Richard C. 1980. Common intertidal invertebrates of the Gulf of California. Tucson, University of Arizona Press. 513 pp.

Marcus, Eveline, and Ernst Marcus. 1967. American opisthobranch mollusks. University of Miami, Studies in Tropical Oceanography 6:256 pp.

Poorman, Forrest L., and Leroy H. Poorman. 1978. Additional molluscan records from Bahía de los Angeles, Baja California Norte. Veliger **20**(4):369-374.

Williams, Gary and Terrence M. Gosliner. 1971. The opisthobranch mollusks of San Carlos Bay, Mexico. The Echo 3:33

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NOTES FROM HANS BERTSCH:

Deep-water rarities: Calliostoma platinum **and** Lima sphoni.
Photos by Hans Bertsch

Last month concluded a series of "Notes" on **Cyphoma**, with special attention given to the well-known **C. gibbosum.** We examined the feeding, reproduction and anatomy of this species. This month, by contrast, I will present some information on two rare, deep-water species of Californian mollusks, about which there is very little biological information known. Some time ago I wrote about the commensal relationship of **Pecten diegensis** Dall, 1898, and **Capulus californicus** Dall, 1900. However, the snail and clam pair chosen for this month really have nothing in common - except that both have been collected infrequently off southern California by dredge, trawl, or submersible. So we have a rare gastropod and a bivalve to discuss this month, placed together only because they are deep-water rarities in the same faunal region.

Class Gastropoda
Subclass Prosobranchia
Order Archaeogastropoda
Trochidae
Calliostoma platinum Dall, 1889

The holotype specimen was collected in 414 fathoms (757 m) near the Santa Barbara Islands, California (Dall, 1889). Oldroyd (1927) described its range as from the Farallon Islands to San Diego, in deep water. Hanna (1952) reported dredging a specimen southwest of the Farallons (37^{0} 32.3' N; 123^{0} 2.7' W) in 340-120 fathoms (621-219 m); an illustrated specimen (Anonymous, 1952) was collected by Delbert Goodwin, north of Santa Cruz Island, California, in 220-236 fathoms (402-431 m). Abbott (1974) cited its range from Queen Charlotte Strait, British Columbia, Canada, to San Diego, California, in 50-414 fathoms (91-757 m). The illustrated specimen (Figure 1) is in the collection of the San Diego Natural History Museum. The data indicate it was collected by Ida S. Oldroyd, from Monterey, in 122 fathoms (223 m).

The shell of this species is moderate-sized for the genus (about 30 mm in height), thin, polished, and iridescent white. There are 7 whorls beside the nucleus; the shell whorls have an inflated or swollen appearance. Dall records that the subsequent whorls are slightly flattened behind the periphery, full and rounded on the base; and a "longitudinal sculpture of obscure spiral lines behind the periphery and somewhat stronger flattish threads, separ-ated by shallow grooves, on

Figure 1. Specimen of *Calliostoma platinum*, originally collected by Ida S. Oldroyd.

the base; at the periphery is a single prominent thread, immediately in front of which is the suture, the succeeding whorl being appressed against the thread." The aperture is "rounded quadrate." The outer lip is thin and sharp; the columella is slender, pearly, and slightly arched. The interior is iridescent, polished, without lirae. Dall (1889: 343) apparently did not consider this species to be representative of the highly touted beauty of mollusks: "The shell itself is less attractive than most of the group.... The exterior of this specimen shows little pearliness and is chiefly of a somewhat livid white, like the eye of a boiled fish." Well, the shell may not be as highly adorned as chorus line members of 1890's "Follies," but it is certainly straightforward, simple, clean, elegant, and exquisitely attractive. I have to admit a philosophical prejudice: everything has beauty simply because it exists. Whatever is added over and beyond mere existence is a bonus to be further appreciated. Some month I must discuss the role of anthropomorphisms, personal attitudes and individual preferences in science.

The operculum of **Calliostoma platinum** has about 14 very narrow whorls; it is polished internally and is somewhat rough externally.

The soft parts are whitish. The head and sides of the foot below the epipodial line are profusely granulose. Among the granules rise pointed, larger papillae, which are also very granulose. They appear almost arborescent. The long foot is rather narrow, double-edged, and somewhat auriculate in front. The tentacles are long and slender, and the black eyes are quite prominent.

Class Bivalvia
Subclass Pteriomorphia
Order Pterioida
Limidae
Lima sphoni Hertlein, 1963

When Gale Sphon was associated with the Santa Barbara Museum of Natural History, he sent Dr. Leo G. Hertlein (of California Academy of Sciences) a specimen of a large **Lima.** The shell had been collected by John Tennant, on the drag boat **Christine**, between Santa Catalina and Santa Barbara Islands, California, in 250-300 fathoms (457-549 m). Considering it to be new to science, Dr. Hertlein subsequently named the new species **L. sphoni.**

Before I describe the shell, two peripheral comments are appropriate. Most of the depth records of specimens dredged or trawled or netted from deep water are given as a range - from depth "x" to depth "y." Many sampling techniques of the deep ocean floor do not just drop to the bottom and pick up a scoop from one site. A catching device is often dragged over the bottom some distance (hopefully to increase what is caught on any given haul; this is more efficient because it takes a long time to drop the line all the way to the bottom and then bring it back up to the surface). Collecting data are then less precise, because the specimens could have entered the collecting device at any of the bottom depths along the line of the towed dredge. Sometimes the path travelled is long enough that different latitude and longitude coordinates must be given for the beginning and the end of the tow.

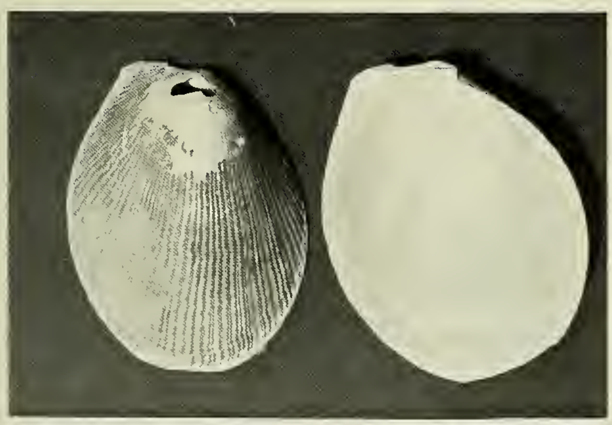

Figure 2. Outer surface of the valves of a 110 mm long specimen of *Lima sphoni*. Obtained from deep water, south of San Diego.

Figure 3. Inner surface of left valve, outer surface of right valve, of *Lima sphoni*.

The second aside concerns the patronym. Gale Sphon is presently at the Los Angeles County Museum of Natural History. His major research interests have been the Mitridae and the Opisthobranchia. In addition to this **Lima,** he has had a number of other eastern Pacific tropical molluscan species named for him: **Olivella sphoni** Burch & Campbell, 1963; **Mitra sphoni** Shasky & Campbell, 1964; and the nudlbranchs **Chromodoris sphoni** (Marcus, 1971) and **Chromodoris galexorum** Bertsch, 1978 (this last species was named after Gale Sphon and Alex Kerstitch). Of course, one should include in this list **Sclerodoris tanya** (Marcus, 1971), which Eveline Marcus named for a pet Siamese cat of Gale's; the feline's name was Tanya.

Lima sphoni is a large, thin shell, with a height of more than 110 mm. It is covered with a thin, pale brown periostracum (Figures 2 and 3). The hinge line is straight, moderately long, with a slightly oblique ligamental pit in the narrow (but very broadly triangular) cardinal area. The beaks are anterior and low. Anteriorly the valves slope steeply from the umbos to the margin, where a depressed lunular area and decided gape between the valves are present. The posterior slope is much more gentle (less steep). The sculpture consists of more than 50 rounded radial ribs (55 in the holotype, nearly 60 in the specimen illustrated here). Concentric sculpture consists of faint growth lines; 4 or 5 more prominent, concentric offsets on the ribs indicate resting stages.

The interior of the shell (Figure 3) is polished and white. It is corrugated in conformity to the exterior ribbing. The rounded muscle impressions are faintly visible. The hinge has a slight depression at the anterior end.

The specimen illustrated here was collected in 2000 feet (609 m) of water, south of San Diego, California, by the submersible Deepstar II. It is in the collection of Clifford and Clifton Martin of Oceanside, California. I am grateful to these gentlemen for having allowed me to photograph their specimen of **Lima sphoni**.

The deep water habitats of **Calliostoma platinum** and **Lima sphoni** have made these two species rare in collections. That same factor is responsible for the lack of knowledge about the biology of these organisms. It is hoped that further research by submersibles will provide us with information about the life styles of these not-so-famous mollusks.

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REFERENCES

Abbott, R. Tucker. 1974. American Seashells, Second Edition. Van Nostrand Reinhold Co., New York. 663 pp.

Anonymous. 1952. Photograph of **Calliostoma platinum**. Proc. Calif. Acad. Sci. 4th Ser. **27**(11-15):plt. 20, fig. 7.

Dall, William H. 1889. Scientific results of explorations by the U.S. Fish Commission Steamer Albatross. VII. Preliminary report on the collection of Mollusca and Brachiopoda obtained in 1887-1888. Proc. U.S.N.M. **12** (773):219-362.

Hanna, G Dallas. 1952. Geology of the continental slope off Central California. Proc. Calif. Acad. Sci., **27**(9):325-358.

Hertlein, Leo G. 1963. A new species of giant **Lima** from off southern California (Mollusca: Pelecypoda). Occas. Papers Calif. Acad. Sci., 40: 6 pp.

Oldroyd, Ida Shepard. 1927. The marine shells of the west coast of North America. Stanford University. Vol. II (III).

COMMON NAMES LIST—ANNOUNCEMENT

A preliminary list of scientific and vernacular names of mollusks has been prepared by a committee from the Council of Systematic Malacologists (CSM), American Malacological Union (AMU). The list is intended to cover those species occurring on the American continent north of Mexico and/or generally within 200 miles of its margin (to 200 m), including coastal islands, but not the West Indies. Principles governing the selection of common names were developed by the Names of Invertebrates Committee of the American Fisheries Society (AFS). This committee's main goal is to achieve uniformity and avoid confusion in vernacular nomenclature of aquatic invertebrates.

In 1983, CSM adopted the AFS principles and elected to join that Society's effort to establish common names for aquatic invertebrates. CSM's list covers living terrestrial, freshwater, and marine mollusks that have been previously described and published, preferably in monographed systematic works. Common names have been provided for most, but not all, species. AFS intends to publish the mollusk list developed by AMU within the next five years, and to publish a revision every ten years. The AFS list as it is developed and published will also include crustaceans, and other groups of aquatic invertebrates, and probably terrestrial mollusks to show AFS' appreciation of CSM's cooperative efforts.

Within the next few months, the governing principles and the draft preliminary list for terrestrial mollusks is scheduled to appear in the monthly publication **Shells and Sea Life** (505 E. Pasadena, Phoenix, AZ 85012); freshwater and marine mollusks lists will follow. The draft lists are being presented to an expanded shell audience for further review and comment. Selected comments will be published, thereby providing a forum for discussion. All draft lists of molluscan groups should be published before next year's AMU meeting.

Any questions on this CSM project should be directed to the committee chairman Dr. Donna D. Turgeon, Regulations Branch Chief, F/M12, National Marine Fisheries Service, Page Bldg. II, 3300 Whitehaven St. NW, Washington, DC 20235; phone 202-634-7432.

PRINCIPLES GOVERNING SELECTION OF COMMON NAMES OF AQUATIC INVERTEBRATES FROM AMERICA NORTH OF MEXICO.

Introductory statement on draft.--In early 1982, an American Fisheries Society Committee on Common and Scientific Names of Aquatic Invertebrates (CCSNAI) was formed to study and propose methods for standardizing common names for aquatic invertebrates of America north of Mexico. From the outset, the Committee recognized that the selection of common names for these invertebrate species is a formidable task that must be deliberate. There was never any thought that the myriad recognized aquatic invertebrate species of this region should each be assigned a common name, because there is no practical necessity in everyday use (i.e., economic, ecological, medical, scientific, recreational, or general interest) to do so. Species that are of such importance often already bear well known common names that stand in place of less familiar Latin names. Since the common names are governed by no recognized codes, there may be multiple synonyms or homonyms. The confusion which could result from these instances may be of little consequence in local applications; indeed, provincial names are often aptly descriptive. But in trade, for example, where Canadian and United States market or customs regulations apply, such informality is an impediment because single adopted common names (official names) must be used for the purposes of unambiguous recognition. The problem is so well known to anyone who reads these remarks that there is little need to amplify the argument.

After deliberation, CCSNAI decided that the Principles set forth in the American Fisheries Society-Common and Scientific Names of Fishes of North America [AFS-CSNFNA] (**American Fisheries Society Special Publication No. 12**, 4th ed, 1980, 174 pp.), and those in a projected list of common names of fishes of the world, were essentially acceptable, after moderate adjustments to meet the special problems posed by invertebrates. The Committee's intent is embodied in the remarks following each Principle that is presented, but because no common names of invertebrates have as yet been accepted, the illustrative names suggested are intended for the purpose of discussion only. Accepted example names of invertebrates can be substituted for these after they are approved. Principles 11 and 12 of the AFS-CSNFNA have been combined in Principle 11 as they are in the projected list of common names of fishes of the world.

The AFS-CSNFNA list, fourth edition, was designed to give a common name to every species of North American fish, from the continent itself to the 100-fathom line at the edge of the continental shelf. CCSNAI does not envision such a comprehensive list for the numerous aquatic invertebrate species but did decide that species eligible initially for assignment of common names should occur on the American continent north of Mexico and/or generally within 200 miles of its margin, including coastal islands, but not the West Indies.

Suggested Principles

1. **A primary vernacular name shall be accepted for each species or taxonomic unit included.** Alternate published names may be listed in order of prominence. Rationale for selection of the primary name and etymologies may be indicated.

2. **No two species on the list shall have the same primary name.** Commonly used names of extralimital species should be avoided wherever possible.

3. **The expression "common" as part of an invertebrate's name shall be avoided if possible.** Use of adjectives that also describe age or size and thus may have dual meanings shall be avoided as part of an invertebrate's name wherever possible (e.g., little, small, big, fat).

4. **Simplicity in names is favored.** Hyphens and suffixes shall be omitted (e.g., coonstripe shrimp) except where they are orthographically essential (e.g., cup-and-saucer, brown-banded), have special meaning (e.g., Jan-mayans alvania), or are necessary to avoid possible misunderstanding (e.g., half-slippershell). Compounded modifying words, including paired structures, should usually be treated as singular nouns in apposition with a group name (e.g., hawkwing conch, roostertail conch), but a plural modifier should usually be placed in adjectival form (e.g., fingered limpet, checkered pheasant), unless its plural nature is obvious (e.g., lineolate periwinkle). Preference shall be given to names that are short and euphonious.

The compounding of brief, familiar words into a single name, written without a hyphen, may in some cases promote clarity and simplicity (e.g., slippershell, moonsnail, hairyshell, seaslug, doveshell), but the habitual practice of combining words, especially those that are lengthy, awkward, or unfamiliar is to be avoided. Spelling of compound names should follow rules set forth in the Council of Biology Editors Style Manual, American Institute of Biological Sciences.

5. **Common names shall not be capitalized in text use except for those elements that are proper names** (e.g., channeled whelk but San Diego doris).

6. **Names intended to honor persons** (e.g., Marshall mussel, Jay river snail) **are discouraged in that they are without descriptive value.** In some large groups, identical specific patronymics in scientific names (sometimes honoring different persons) exist in related genera, and use of a patronymic in the common name is confusing. However, some patryonymics are already well established in literature, agency regulations, and industry (e.g., Tanner crab). Apostrophes should be deleted.

7. **Only clearly defined and well-marked taxonomic entities** (usually species) **shall be assigned common names.** Most subspecies are not suitable subjects for common names, but those forms that are so different in appearance (not just in geographic distribution) as to be distinguished readily by laymen or for which a common name constitutes a significant aid in communication may merit separate names. There is a wide divergence of opinion concerning the criteria for recognition of subspecies. We have usually not named subspecies. Exceptions are those of certain invertebrates such as the pearly mussel, **Epioblasma florentina,** which are listed by the United States Department of Interior as endangered. Subspecies have importance in evolutionary inquiry but are rarely of significance to laymen or in those aspects of biolgical endeavor in which common names are of concern. The common name for the species should apply to all subspecies of a taxon and may be appropriately modified by those treating subspecies. The practice of adding geographic modifiers to designate regional populations makes for a cumbersome terminology.

Hybrids in general are not named. The established common name of a hybrid, if important, is indicated by a footnote. Cultured varieties, phases and morphological variants are also not named even though they are important in commercial trade of aquarium animals.

8. **The common name shall not be intimately tied to the scientific name.** Thus, the vagaries of scientific nomenclature do not entail constant changing of common names. The practice of applying a name to each genus, a modifying name for each species, and still another modifier for each subspecies, while appealing in its simplicity, has the defect of inflexibility. If an invertebrate is transferred from genus to genus, or shifted from species to subspecies or vice versa, the common name should nevertheless remain unaffected. It is not a primary function of common names to indicate relationship. When two or more taxonomic groups (e.g., nominal species) are found to be identical, one name shall be adopted for the combined group.

This principle is regarded not only as fundamental to the achievement of stability, but as essential to the development of a true vernacular nomenclature.

Scientific names are governed by the International Rules of Zoological Nomenclature.

9. **Names shall not violate the tenets of good taste.**

The foregoing principles are largely in the nature of procedural precepts. Those given below are criteria that are regarded as aids in the selection of suitable names.

10. **Colorful, romantic, fanciful, metaphorical, and otherwise distinctive and original names are especially appropriate.** Such terminology adds to the richness and breadth of the nomenclature and yields a harvest of satisfaction to the user. Examples of such names include arrow crab, batwing seaslug, blackberry drupe, marsh walker, rugose nutmeg, scotch bonnet.

11. **American Indian or other truly vernacular names are welcome for adoption as common names.** Indian names in current use include the carib fossaria, cayuse physa, geoduck, and quahog. In addition to aboriginal names, names of American invertebrates have been derived from foreign languages: e.g., Spanish (abalone, pusa aglaja). Although too little genuine originality is evident, excellent names have been developed by American immigrants. Most of these conform to principles 13 and 14 below.

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12. **Commonly employed names adopted from traditional English usage** (e.g., crab, crayfish, deer, limpet, mussel, periwinkle, pig, prawn, shrimp, toe) **are given considerable latitude in taxonomic placement.** Adherence to customary English practice is to be preferred if this does not conflict with the broad general use of another name. Many English names, however, have been applied to similar-appearing but often distantly related invertebrates in America. We find shrimp in use for representatives of a host of decapod crustacean families. Crawfish or crayfish is in use for representatives of such diverse groups as the Cambaridae, Nephropidae, Palaemonidae and Palinuridae. For widely known species, the Committee believes it preferable to recognize and adopt general use than to adopt bookish or pedantic substitutes. Thus, established practice should outweigh consistency with original English usage. This may not be well understood by some zoologists who may suggest strict adherence to the former usage.

13. **Structural attributes, color, and color pattern are desirable and are in common use in forming names.** Beaded, channeled, copper, fluted, giant, hairy, keeled, mottled, shouldered, splendid, and a multitude of other descriptor decorate invertebrate names. Efforts should be made to select terms that are descriptively accurate, and to hold repetition of those most frequently employed (e.g., white, black, spotted, banded) to a minimum.

Following tradition in American invertebrate zoology, we have attempted to restrict use of line or stripe to longitudinal marks that parallel the body axis and bar or band to vertical or transverse marks.

14. **Ecological characteristics are useful in making good names.** They, too, should be properly descriptive. Terms such as reef, pond, coral, sand, rock, riffle, freshwater, and mountain are well known in invertebrate names.

15. **Geographic distribution provides suitable adjectival modifiers.** Poorly descriptive or misleading geographic characterizations should be corrected unless they are too deeply entrenched in current usage. In the interest of brevity, it is usually possible to delete words such as lake, river, or ocean in the names of species (e.g., Ohio pebblesnail, not Ohio River pebblesnail).

16. **Generic names may be employed outright** (e.g., elimia, valvata) **or in modified form** (e.g., diplodon, from **Diplodonta**, nerite, from **Neritina**) **as common names.** Once adopted, such names should be maintained even if the generic name is changed. These vernaculars should be written in Roman and without capitalization. Brevity and euphony are of especial importance for names of this type.

17. **The duplication of common names of invertebrates and other organisms should be avoided if possible, but names in wide general use need not be rejected on this basis alone.** The name tulip is commonly applied to bulbous herbs of the genus **Tulipa** and also to certain gastropods. Similarly, olive is employed for the fruit of a tree, **Olea europaea**, of the family **Oleaceae** and for various gastropods. On the basis of prevailing use, these names are admissible as invertebrate names.

YOUR COLLECTION - A HOW-TO COLUMN:

No. 2 Labels, part 1.

by Susan J. Hewitt

Labels are the keystone of a valuable collection. Good labels, with good information, are what count. Of course, a method of storing the collection which prevents the labels from becoming accidentally separated from the specimens is equally indispensable.

The most important consideration is that some kind of label is written either in the field or as soon after you return as possible. This need only have on it the location, date, and your initials. Probably the perfect labels for this would be smallish precut rectangles of good quality paper (ideally 100% rag.) Pencil is best for field label information since it is not affected by water or even alcohol. If it is not erased, pencil writing on rag paper easily lasts a hundred years.

Many collectors imagine that since a museum makes its own labels it will throw away the collector's original labels. Quite the contrary! These are kept with the specimens and considered quite valuable. So try to have blank label paper with you when you collect. This is most desirable, but admittedly not always possible. Museum curators get quite used to finding scraps of paper bag, old shopping lists and even paper towels used as emergency field labels!

NEXT MONTH - Labels, part 2.

EDITOR'S NOTES

Here we go with the September issue. It has been quite a month since we put the last issue together. We keep adding more and more to the magazine and don't quite seem to get the important (to us) stuff done (e.g., sell ads, sell books, sell subscriptions, get the computers running consistently, get more articles into typesetting.) We hope you will help us with those items (except for the computers which are beyond help) and tell friends, dealers, and anyone else you can think of about S&SL. Don't forget to keep sending in notes and articles. We don't forget them!

Sally and I attended the Western Society of Malacologists meeting and enjoyed seeing many of you there. We went to San Diego after the meeting and bought Seashell Treasures Books from Don and Jeanne Pisor. We have moved all of the books to Phoenix and are setting them into order as quickly as possible. We hope to provide the finest selection of shell books and malacological literature in the world along with the finest shell magazine!

Each issue is now 24 pages and takes a lot of juggling to make everything fit. We need color photographs along with articles or notes, notes on what interests you, comments on what you want to see in the magazine, and information on what is going on in the world of mollusks. Everyone has something worthwhile to contribute.

This month has (we think), something for everyone. Please note the common names list announcement and principles. This list will provide a complete and current systematic list of **all** scientific **and** common names for every species of mollusk found in North America, north of the Mexican/US border -- within a year! You, as readers of S&SL, are invited to participate by suggesting common names as well as current systematic classification for mollusks.

Jim McLean (and the Los Angeles County Museum of Natural History) have kindly lent us Jim's article on micromollusks. Jim wanted us to note that the article was written for the LACMNH membership magazine **Terra**, and therefore goes into many details that all of us (are supposed to) know already. I know I certainly learned a lot from the article.

Thanks to the many people who have helped us over the past couple of issues with articles, photos, corrections, and just plain moral support. Thanks also to Larry, Tina & Steve at Arrowhead Press, Inc., and Joe & Peggy at Colormasters, Inc., the people who do our printing and color separations each month. They are great people to work with.

The publication date for both the June and July issue was July 9, 1984. The August issue was published on August 3, 1984. These dates may be used for purposes of priority.

The Southwestern Malacological Society needs speakers for the programs each month. Meetings are the second Wednesday of each month. Call if you can get to Phoenix, Arizona and would like to present a program. Call, even if you don't want to give a talk and we will help you get to the meeting as a visitor.

The October issue of **Shells and Sea Life** should have a large spread on the meetings, conventions, and shows this past summer. If you have color prints or other information on one or more of the shows, please send it along to help put together a complete spread.

Steve Long

PUBLICATION NOTES

Kaas, P. & R.A. Van Belle, 1980. Catalogue of living chitons. E.J. Brill, Leiden, Netherlands, 144 pp., 8 vo. cloth. [$21.75 + $2.00 foreign postage; alphabetical list of chitons + literature references & critical notes]

Kaas, P. & R.A. Van Belle. 1981. The genus **Lepidochitona** Gray, 1821 (Mollusca: Polyplacophora) in the Northeast Alantic Ocean, the Mediterranean Sea and the Black Sea. E.J. Brill, Leiden, Netherlands, 43 pp.; 128 figs.; 3 maps. [Dutch fl. 16.75]

Van Belle, R.A. 1981. Catalogue of fossil chitons. E.J. Brill, Leiden, Netherlands, 84 pp., 8vo. cloth. [Dutch fl. 33.-; alphabetical list of fossil chitons + references & critical notes]

Van Belle, R.A. 1983. Systematic Classification of the chitons. Informations de la Society Belge de Malacologie, Serie II, (1-3): [monographic classification including most recent literature; no pagination available].

Schedule of Shows and Conventions

This list is compiled primarily by Donald Dan.
Please send corrections and additions to S&SL by the first of each month.

September, 1984
07-08 20th Annual Underwater Film Festival, San Diego, California
12-19 Association Conchyliologique de Nouvelle Caledonie, Noumea, New Caledonia
22-23 Long Island Shell Show, Freeport, New York

October, 1984
13-14 West Coast Shell Show & Fiesta of Gems, Santa Barbara, California
13-14 Tri-State Shell Show, Cincinnati, Ohio
20-21 Philadelphia Shell Show, Philadelphia, Pennsylvania

December, 1984
27-30 Western Society of Naturalists, Denver, Colorado

January, 1985
18-20 Southwest Florida Shell Show, Ft. Myers, Florida
18-20 Central Florida Shell Show, Orlando, Florida
24-27 Greater Miami Shell Show, Miami, Florida
25-27 Sarasota Shell Show, Sarasota, Florida

February, 1985
01-03 Broward Shell Show, Pompano Beach, Florida
14-17 Palm Beach Shell Show, W. Palm Beach, Florida
15-17 Naples Shell Show, Naples, Florida
22-24 St. Petersburg Shell Show, St. Petersburg, Florida

March, 1985
07-10 Sanibel Shell Show, Sanibel Island, Florida
13-14 Marco Island Shell Show, Marco Island, Florida
29-31 Astronaut Trail Shell Show, Melbourne, Florida

SHELLING IN THE MALDIVES AND SRI LANKA.

by Marjorie Wing

I left Phoenix, Sky Harbor Airport, at 10AM Wednesday, March 8th, changed planes at New York for the transatlantic flight to Frankfurt. The next morning I boarded an Airlanka plane, arriving in Colombo, Sri Lanka very early on the morning of March 10th. There I met Joel Green our tour organizer and leader and my fellow travelers who had come in from various directions. It was pleasant to meet four people I had shelled with before (Norstroms and Rhodes).

We were on our way. After a short 45 minute flight we arrived in Male airport in the Maldives. There we took a long and beautiful trip by motor launch, passing many islands on the way to Olhuveli, a very pleasant island resort of individual cottages strung out along a lovely beach. The next four days we spent shelling this island and others nearby. The Maldives apparently do not allow shelling, but one can buy shells from the natives. Joel however, had obtained official permission for us to shell. We explored the two small islands nearby. One beach had an interesting coral area, the other island bay had a mostly sand bottom. Olhuveli itself had a lovely sandy area inside the reef where there were an abundance of cones. Unfortunately I have not had time to identify all of these shells, but the following is a partial list:

Nearest Island: (Sandy bottom) **Terebra maculata, T. subulata, Lambis chiragra, Strombus gibberulus, S. marginatus, S. succinctus, Cymatium perryi.** Coral Island: **Drupa morum, D. ricinus** and three other species of **Drupa**. Olhuveli: **Conus arenatus, C. betulinus, C. ebraeus, C. eburneus, C. emaciatus, C. flavidus, C. quercinus, C. litteratus, C. striatus, C. textile** and **C. zonatus**. Others in the group found: **Cypraecassis rufa, Latirus polygonus, Lambis lambis, Nerita lineata,** and **Strombus lentiginosus.**

Thursday, March 15, we were up before sunrise, we took the motor launch back to Male airport and a plane to Colombo. There we boarded a very comfortable air-conditioned coach with a guide, driver and assistant. We drove to Sigiriya, an ancient mountain top palace, a very beautiful area. Then to the Nilaveli Beach Hotel, a fascinating drive through tropical scenery, past lakes and rice fields. The beach at the hotel was very beautiful, but not for shelling. We drove a short distance to a rocky shore where we found a few shells. That afternoon we took a short cruise through a wildlife sanctuary. The scenery was pleasant and we encountered a crocodile, a peacock high in a tree and several unidentifiable (to us) animals. The next morning was spent at Pigeon Island, shelling and snorkling. Shore fisherman took a group of us to snorkle for **Murex palmarosae.** They also had a number for sale which some of us bought. I also purchased a very nice **Murex brunneus** from a boy on the beach. Joan Caldwell bought **Conus canonicus,** two species of **Tridacna** and **Tectus pyramis** from them. My other shells from here include: **Cypraea mauritiana, C. arabica, C. caput-serpentis** and a number of others I haven't organized as yet. **Conus striatus** and **Cypraea staphylaea** were also found.

On Sunday, March 18, we left for the lodge at Habarana. On the way we toured the ancient capital of Anuradhapura. The next day we visited the ruins of Polonnaruwa, the capital after Anuradhapura was abandoned in the eleventh century. We reached Kandy (the last royal capital) about 6 PM in time to to attend the ceremonies at the Temple of the Tooth. This temple contains the sacred Tooth Relic which makes it an important holy pilgrimage city for the Buddhists. We saw an excellent performance by the Kandy

Dancers, ending with an impressive display of firewalking. The following morning we visited the Royal Botanical Gardens at Peradeniya with their beautiful orchids, the largest single collection in Asia. Then on to Nuwara Eliya through beautiful hill country climbing through miles of tea plantations by means of switchbacks which took us up to around 6,000 ft. On the way we toured a tea 'factory'.

Murex palmarosae (Lamarck, 1822) Nilaveli.

Wednesday, March 21, we drove to the popular beach resort of Hikkaduwa. On the way we passed through the gem mining area of Ratnapura with tiny individual pits scattered about in some of the fields. We stopped for lunch at a small museum where there were cut gems for sale. From there to the coast were extensive rubber plantations.

Upon reaching the coast we found the sea very rough and, in some areas, houses flooded and water washing over the highway. The following day the water was still rough but we did a little shelling at low tide close to the hotel. By Friday it was calm and we shelled a portion of the nearby reef very profitably. Shelling was also very good Saturday morning. Some of the shells I found were: **Bursa crumena, B. granularis, Conus coronatus, C. terebra, Cypraea arabica, C. moneta, C. ocellata, Mitra mitra, Oliva miniacea, Vasum turbinellus** and others as yet to be identified. Others found; **Conus flavidus, C. rattus, Cypraea ocellata, Latirus amplustre** and **Malea pomum.**

At 3.15PM we left for Colombo, stopping at Bentota for an elephant ride on the beach! On arrival at the airport I took the midnight plane out, heading for Frankfurt and home.

Fellow shellers were: Edith Abbott, Joan Caldwell, Joel Greene, Helen Greenley, Lucy Hall, Ruth and Victor Hermann, Jim McLean, William and Jo Norstrom, John Pearson, Fred and Pat Renz, Homer and Ann Rhode and Joan Sherman. Joel Greene Tours made all of the group arrangements.

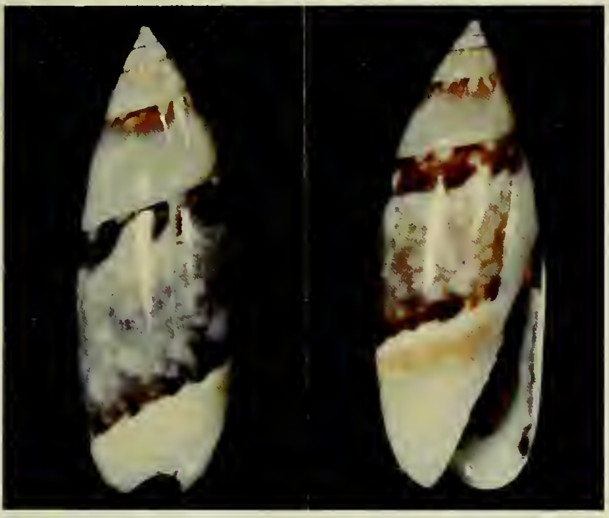
Joan Caldwell, Joel Greene, John Pearson, Pat Renz and the Ceylon Tourist Board (Sri Lanka) provided information and/or photographs for this article. Thanks to each.

Marjorie Wing, 10902 Hibiscus Dr., Sun City, AZ 85373

MOLLUSKS OF COCOS ISLAND—I: *OLIVELLA COCOSENSIS*

Text and Photos by Donald R. Shasky

Due to the high shark population and the sometimes strong currents the daylight diving at Cocos Island is usually exciting. Daylight diving is best, as it is in most localities, in substrates other than sand, since sand-dwellers creep mostly at night.



Olivella cocosensis Olsson, 1956. 16-34 m depth. In sand at night, Chatham Bay, Cocos Island, Costa Rica. March 22-25, 1984.

At night, the excitement at Cocos Island multiplies. Thousands and thousands of long-spined sea urchins emerge from pockets in the coral, waiting to impale the unwary diver. Most exciting of all is the explosion of "night crawlers" out of the sand. One of the commonest of the "night crawlers" is *Olivella cocosensis* Olsson, 1956. To my knowledge, the only reported specimens are the type lot and the specimens Keen reports from an unspecified locality in Nicaragua.

The color of the shells illustrated here is typical of most shells of this species found at Cocos Island. They have a bluish-gray ground color with varying amounts of brown suffusion. An occasional specimen has a white ground color. Most of my specimens were taken in depths of 18-36 m.

LITERATURE CITED

Keen, A. M. 1971. Sea shells of tropical west America: marine mollusks from Baja California to Peru, 2nd ed. Stanford Univ. Press, Stanford, Calif., xiv + 1064 pp.; illus.

Olsson, A. A. 1956. Studies on the Genus *Olivella*. Proc. Acad. Nat. Sci., Philadelphia, **108**:155-225; pls. 8-16.

Dr. Donald R. Shasky, 834 W. Highland Ave., Redlands, CA 92373.

AN UNUSUAL CONE.

by Iva S. Thompson

On May 28, 1984, I collected an 84 mm *Conus ammiralis* Linnaeus, 1758. It was collected in 1.5-2 m water, on sand bottom, near the Sawa-I-Lau caves, Nabuperu Bay, Yasawa Island, Fiji.

I photographed an average size cone with mine to show not only the difference in size, but the fact that my find has the color pattern reversed. How lucky can you get! The 84 mm cone appears to be a new size record.

Iva S. Thompson, 660 White Pine Tree Rd., Venice, FL 33595.

THE WORLD OF MARINE MICROMOLLUSKS

by James H. McLean

Unsorted microshells after extraction from grunge sample taken by diving at a depth of 70 feet at Punta San Pablo, Baja California, Mexico. The long slender shell is 6 mm in length.

Seashells have always had great appeal to collectors of natural objects, as they are unsurpassed in the variety and beauty of their form and color. Some shells are large enough to use as trumpets or punch bowls. However, many species of shelled mollusks are quite small, some no larger than grains of sand. There is, in fact, an entire world of seashells that the observer can only enter with the help of a binocular microscope. With magnification of five to twenty times, one can discover the many different families of minute or small-shelled mollusks known as micromollusks or microshells. All are intricate in form and color; some resemble the more familiar, larger seashells of tropical and temperate seas, but others are entirely different. One finds some species that are full grown at less than a millimeter in maximum size and many others that are mature at sizes up to 6 millimeters (one-quarter of an inch) in length.*

A close look at coarse beach sand may reveal the presence of tiny shells, but this is not the best place to look for them because such specimens are likely to be so abraded that the sculpture, or surface detail, is lost. Occasionally, good recently dead microshells are found on beaches at the drift line, where a narrow deposit of shells can be left by the uppermost reach of the preceding high tide. The best place to look for microshells, and the only place to find them in perfect condition, is where they live. The most prolific habitats are rocky places where algal growth is thick.

You can get a good introductory look at microshells by taking a handful of seaweed off the rocks, either at low tide or by reaching beneath the water as deeply as possible. The algae should be shaken in a small basin of seawater. Many tiny snails may drop off the seaweed into the basin, from which they can be transferred into a small jar. This method has the advantage of isolating living specimens away from sand and gravel particles. You can then examine the living specimens in a dish of seawater under a microscope. The snails move with great rapidity and are fascinating to observe. Unfortunately, you will collect only some of the microshells living in the vicinity with this method, as not all of the species live on the fronds of algae.

A greater variety of microshells can be collected by scooping the surface layer of sand or gravel from the bottom of a tide pool, especially the sand that accumulates under rocks. Another method is to yank surfgrass from the seafloor and shake the roots in a bucket of seawater. You can take an even larger variety of species if you are a scuba diver. On rocky bottoms, you can fill a small cloth sack with the gravel that has accumulated in crevices or under rocks. If you are diving above sandy bottoms, the most effective way to collect the microshells is to sift the sand underwater, using a fine-meshed hand net; the net will let fine sand particles pass through while retaining the larger particles as well as all the shells that were living in the sand.

An unsorted concentration of shell specimens in sand and gravel residue is appropriately known as "grunge" (this word, which brings gravel and mud to mind, is commonly used by collectors, although it is

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*Shells between one-quarter inch to one inch in length are small but are too large to be called microshells.

not yet to be found in the dictionary). Grunge samples are rich sources of small shells, but a certain amount of effort is required to separate the shells from the residue—a quart of grunge, which may yield hundreds of small specimens, can take hours to sort. If only the shells (rather than the living animals) are to be studied, it is easiest to handle the sample after it has been washed in fresh water and dried on paper towels (the specimens are so small that there is no problem with odor, but soaking the sample in alcohol prior to drying is one way to make it dry rapidly and completely prevent decay).

Once dried, the sample should be screened into different size fractions, which makes it easier to examine. A set of screens of different sizes can be made from small pieces of hardware cloth and window screening for this purpose; screens of graduated mesh size are also available from geological supply companies. After the dried sample has been screened, the larger fractions can be picked for shells by eye, and the intermediate size can be sorted with the help of a large magnifying glass mounted on a stand; the smallest sizes of the screened fraction have to be examined under a dissecting microscope. Shells of each size can be extracted with fine forceps that are available from biological or geological suppliers. The shells should then be sorted by species and placed in small vials or plastic boxes. In the Malacology Section of the Natural History Museum, we store microshells in micropaleontological slide mounts made of thick cardboard and topped with plastic cover slips; these are also available from biological or geological suppliers. Locality information is written on the slide mounts.

The number of species of microshells that can be found in one place is much greater in tropical waters than in temperate waters. In such places as the Gulf of California, the Philippines, and the Great Barrier Reef in Australia, it is not unusual to find 200, 300, or even 400 different species in one sample. (Although 400 species from one locality may seem like a large number, there are some 50,000 species of mollusks, and large numbers of species occurring at any one place are therefore not unusual.) At a depth of 100 feet, the water may be cooler, and the species diversity and composition often changes; thus many species are found only at or below this depth. Again, the variety of species to be found at these depths is greatest in tropical regions. Here in southern California, a scuba diver who takes a grunge sample at any of the Channel Islands can easily collect hundreds of small specimens, representing as many as 100 different species.

Although many guide books with colored or black and white figures of numerous shells are available to shell collectors, there are no general books that exclusively treat microshells. Indeed, there are only two books treating entire faunas that even attempt to illustrate all of the micromollusks from one region: E. A. Kay's *Hawaiian Marine Shells* (Bishop Museum Press, Honolulu, 1979) and A. W. B. Powell's *New Zealand Mollusca* (Collins, Auckland, 1979). *Marine Shells of Southern California*, which I wrote in 1969 and revised in 1978, includes most of the micromollusks that can be found by shore collectors and scuba divers on rocky bottoms in southern California.

There are four main groups of shelled marine mollusks: the Gastropoda or snails, the Bivalvia or clams, the Scaphopoda or tusk shells, and the Polyplacophora or chitons. The great majority of both small-and large-shelled marine mollusks are gastropods; there are about three times as many species of gastropods as there are of bivalves. The chitons and scaphopods, among which there are no microshells, are relatively few in number. As in all other kinds of animals, each family of marine mollusks has a consistent size range. Thus, entire families may be classified as micromollusks. These families have feeding and reproductive strategies that are as varied as those of their larger relatives.

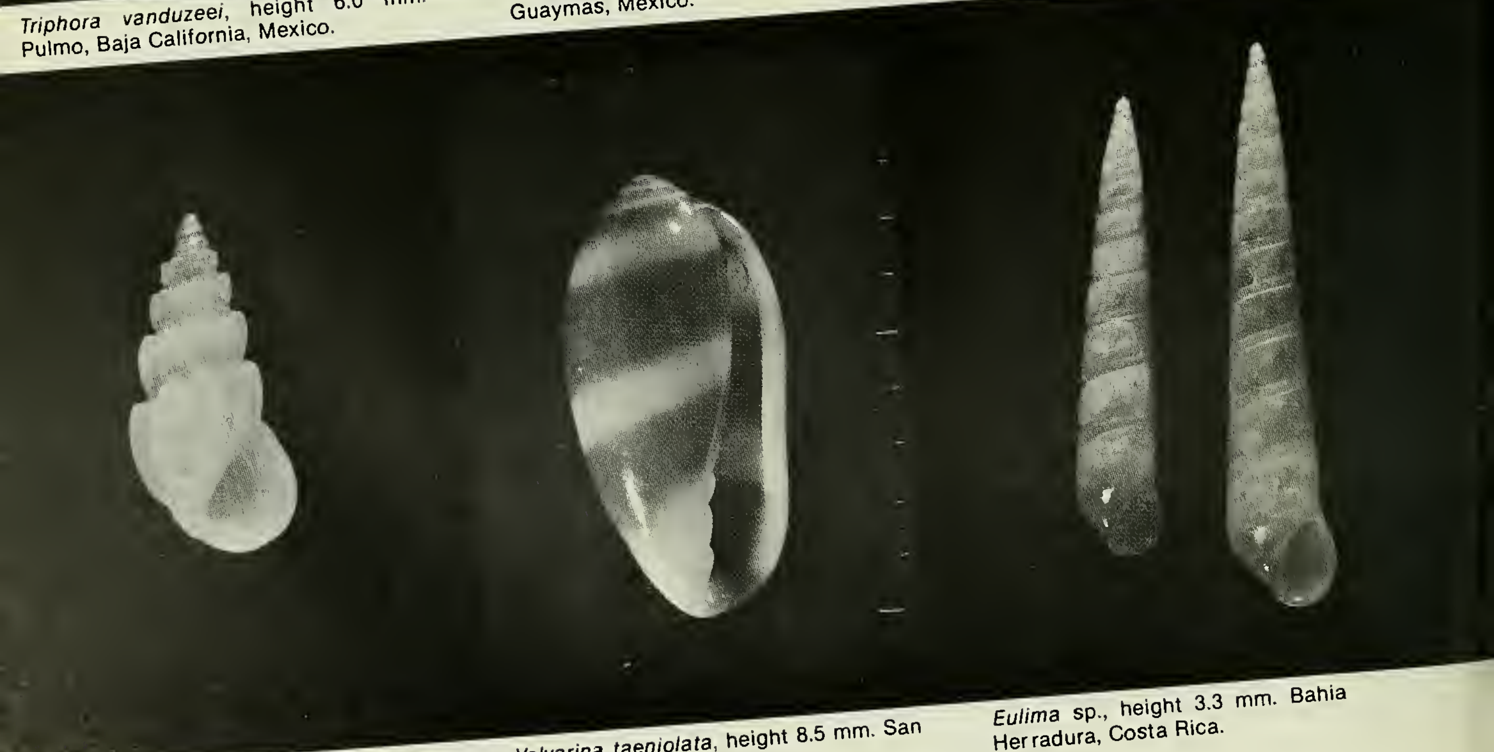
Juvenile shells (early growth stages) of large-shelled mollusks are also within the size range (up to 6 mm in length) of micromollusks. However, juvenile shells of the large species may be distinguished from those of micromollusks in having a relatively large early whorl (protoconch) of the shell. The early shell also provides clues as to the kind of embryonic development followed in gastropods. Whether the species are large or small, there are two main kinds of embryonic development: some develop directly into miniatures of the adult (after a brief larval stage, either free-swimming or taking place within the confines of egg capsules), others have a long free-swimming larval stage called a veliger. In species that develop directly, the protoconch has only one turn (whorl) before the appearance of shell sculpture like that of the mature shell. In species that have a planktonic veliger stage, the protoconch is followed by two or three whorls having sculpture that is entirely different from that of the adult snail. This early sculpture is formed during the planktonic stage, when the shell must be lighter to stay suspended in the water. The transition to adult shell sculpture, which is readily seen in the shell, marks the change from planktonic life to a life on the sea floor. Both embryonic strategies are found among the microgastropods.

Here at the Natural History Museum, the staff members in the Malacology Section have particularly concentrated on building our collection of micromollusks. Grunge samples are collected from all localities that we visit on our field trips and expeditions. The processing of the material—the picking and sorting of specimens from the grunge—has been done primarily by volunteers, who each devote a day a week to the project. Over the last 20 years, thousands upon thousands of microshells from many places around the world have been added to the research collection. This collection is a major resource, one that is used by specialists from other museums who are studying the small shells in an attempt to learn more about their classification and evolution.

Triphora vanduzeei, height 6.0 mm. Pulmo, Baja California, Mexico.

Nodiscalla spongiosa, height 8.0 mm. Guaymas, Mexico.

Microdaphne trichodes, height 4.0 mm. Santa Rosalia, Baja California, Mexico.



Rissonia signae, height 3.2 mm. Nayarit, Mexico.

Volvarina taeniolata, height 8.5 mm. San Pedro, California.

Eulima sp., height 3.3 mm. Bahia Herradura, Costa Rica.

One can generally assign a marine shell species to a genus on the basis of shell characters (features such as absolute size, color pattern, form of sculpture, etc.), but the family classification is based upon anatomical differences in the soft bodies, including internal structure and such external features as the number and placement of the sensory tentacles. Most of the large-shelled marine species are now well known, but there are many smaller species discovered and named each year and untold numbers from the more remote regions of the world yet to be discovered.

The study of micromollusks has always been difficult because of their small size. In recent years, however, a powerful new tool—the scanning electron microscope (SEM)—has made their study more rewarding. Small specimens can be photographed with an almost limitless depth of field, and small areas on the shells can be enlarged. Microsculpture on protoconchs can be examined, revealing detail that is barely visible under the dissecting microscope. Additionally, the soft bodies of these mollusks can be examined with SEM after the specimens are rendered rigid by critical-point drying, which removes all water from the tissues. Viewed with SEM, the microstructure of sense organs on the surface of the animal can be even more intricate than the fine sculpture of the shells.

The feeding device of snails, and other mollusks except bivalves, is the radula, a rasplike structure that bears rows of microscopoic teeth. The configurations of radular teeth are used in assigning species to their correct family. The SEM has greatly facilitated study of the extremely small radulae of microgastropods. Some of the applications of the SEM to research on micromollusks are shown here in a series of illustrations of the recently described monoplacophoran limpet *Vema hyalina*.

Many groups of minute mollusks continue to be known only by their shells in museum collections. The shells of different species of micromollusks often appear to be quite similar, but the anatomies differ enough to place them in quite unrelated families. Thus the species in these groups need to be examined alive before we can fully understand their relationships. Many questions remain to be answered, and our quest for micromollusks from around the world continues.

The photographs of single shells illustrating this article were taken by Bertram C. Draper, a museum volunteer who has made a specialty of the macrophotography of minute shells.

See also photos on back cover.

Reprinted from *Terra*, Vol. 22, No. 6, July/August, 1984.

Dr. James H. McLean, Malacology Section, Los Angeles County Museum of Natural History, 900 Exposition Blvd., Los Angeles, CA 90007

Right: *Moelleria costulata*, two specimens, diameter 1.7 mm. Seldovia, Alaska.

Page 154 left: *Solariella peramabilis*, two specimens, juvenile shells, 4.5 mm. Off Catalina Island, California.

Page 154 center: *Arene olivacia*, diameter 3.2 mm. Costa Rica.

Page 154 right: *Miralabrum planospiratum*, three views of same shell, diameter 4.8 mm. Guaymas, Mexico.

Balcis columbiana, height 7.3 mm. Kodiak Island, Alaska.

Clathromangelia fuscoligata, height 8.0 mm. San Pedro, California.

Ividella navisa, height 3.2 mm. Santa Rosalia, Baja California, Mexico.

Volvulella cylindrica, height 3.8 mm. San Felipe, Baja California, Mexico.

Triptychus incantata, height 7.7 mm. Nayarit, Mexico.

Mangelia hexagona, height 7.5 mm Corona del Mar, California.

SHELLS AND SEA LIFE

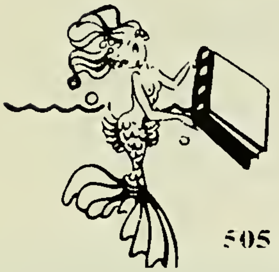
A MONTHLY PUBLICATION ON MOLLUSKS AND MARINE LIFE

$2.50 October, 1984 Volume 16, Number 10

Photograph by Richard L. Goldberg. *Elaphroconcha* sp. Citeureup, Western Java, Indonesia. 1984.

IN THIS ISSUE:
LAND SNAILS, MUREX, STARFISH, OCTOPUS, AUSTRALIAN COLLECTING PERMITS

Seashell Treasures Books



SHELLS & SEA LIFE

505 East Pasadena · Phoenix, Arizona 85012-1518 USA

EDITOR'S NOTES

The past few months have been very exciting for Sally and I. Last month we told you about our purchase of Seashell Treasure Books. This month we are happy to add Tom Rice as a Contributing Editor. We know you will be pleased to see him back writing again. Be certain to read the note from Tom at right.

In just a few short months, SHELLS and SEA LIFE has grown from a 4 page monthly newsletter to the 32 page magazine you are reading. The October issue is our 184th issue and brings us close to 2,000 subscribers — and growing daily. None of this could have been done without your support. Thanks to all of you. Please keep the notes and articles coming and keep telling your friends about S&SL!

This month we have included the entire common names list for North American terrestrial mollusks. The pages have been reduced to keep the list somewhat reasonable (at least 112 original pages for the whole list). The marine gastropod species will start in the November issue and be followed by the freshwater species and the marine bivalves. S&SL has been enlarged by eight pages each month to carry the list without reducing the number of articles each month. The Shell Show Calendar is missing this month but should return in the November issue.

Including the September issue, we have printed more than eighty photos in color this year along with many black and white photos. Upcoming issues will have articles on muricids, sacoglossans, cypraeids, marginellids, xenophorids and other groups.

The publication date of the September (183rd) issue was September 19, 1984. The October issue (our 184th issue) should be mailed at the end of October with the November issue following by about 2 weeks. Please check the label on your October issue. The first line of your address label should show the month and year your subscription expires. If you are receiving more than one copy of S&SL, please send us both labels so that we can combine the two subscriptions and extend the time you will be receiving our magazine.

The October issue of "The Festivus" reports the passing of Ben H. Purdy, San Diego, California, on September 2, 1984. Ben will be missed by many people in the U.S. and around the world.

The Autumn issue of "New York Shell Club Notes" that Mary Elizabeth Young died in Anderson, North Carolina, on August 30, 1984. She was a long-time Patron and officer of the National Capital Shell Club and was known throughout the shell world as the owner of The Shell Cabinet, in Falls Church, Virginia.

Steven J. Long

From Tom Rice, *Of Sea and Shore Magazine*, Port Gamble, Washington (September 21, 1984):

As you might have gathered by the continuing delays in getting out the last issues *Of Sea and Shore* magazine, we've been having difficulties. These have proven insurmountable and I have decided to cease publication of *Of Sea and Shore* magazine. I do this only after a great deal of thought and examination of all alternatives.

I will continue publication of "A Catalog of Dealers' Prices for Marine Shells," "A Sheller's Directory of Clubs, Books, Periodicals and Dealers," as well as the project on Minute Gastropods of the Panamic Province and other projects I have in mind. Back issues of *Of Sea and Shore* magazine will also continue to be available through our Port Gamble address. Any questions concerning missing issues up to and including Volume 13, Number 2 (the last issue published) of *Of Sea and Shore* should be directed to me.

I am very pleased to tell you that, starting with the November, 1984 issue, I will be a Contributing Editor to *Shells and Sea Life*. I am looking forward to continuing many features which my readers have enjoyed in the past — shelling trips, hints on various aspects of amateur shelling, shells-on-stamps, etc. Plus, I hope to do some more writing about my personal travels and shelling expeditions.

I look forward to a long and enjoyable association with this magazine. I hope that readers will enjoy my efforts to help them understand and enjoy their fascinating hobby.

More in November.

SHELLS AND SEA LIFE

A MONTHLY PUBLICATION ON MOLLUSKS AND MARINE LIFE

Shells and Sea Life was formerly known as the **Opisthobranch Newsletter**. The magazine is open to articles and notes on any aspect of malacology — or related marine life. Articles submitted for publication are subject to editorial board review and may include color or black & white illustrations. Deadlines for articles are the first day of each month for the following month. Short notes for the "Center Section" will normally appear within thirty days of submission.

Short articles containing descriptions of new or repositioned taxa will be given priority provided the holotype(s) have been deposited with a recognized public museum and the museum numbers are included with the manuscript. We undertake no responsibility for unsolicited material sent for possible inclusion in the publication. No material submitted will be returned unless accompanied by return postage and packing. Authors will receive 10 free reprints. Additional reprints will be supplied at cost provided they are ordered before printing.

Shells and Sea Life ISSN 0747-6078 is published monthly for $20 per year by Steven J. Long & Sally Bennett, 505 E. Pasadena, Phoenix, AZ 85012. Second-Class Postage Paid at Phoenix, AZ. POSTMASTER: Send address changes to **Shells and Sea Life**, 505 E. Pasadena, Phoenix, AZ 85012.

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CONTENTS — OCTOBER

ON THE IDENTITY OF "*MUREX*" *PEASEI* TRYON, AND ITS GENERIC PLACEMENT

by Emily H. Vokes

Radwin and D'Attilio (1976, p. 152) noted that the specimen in the Academy of Natural Sciences, Philadelphia, labeled as "holotype" of *Murex peasei* is not the West American shell and so re-named the latter as *Favartia poormani*. But, when one examines the whole story we see that Pease (1869, Amer. Jour. Conch., v. 5, p. 83, pl. 8, fig. 3) originally named *Murex foveolatus*, said to be from La Paz, height 15 mm. He described it as: "last whorl furnished with five prominent varices . . . white, interstices between the varices suffused with pale flesh color; last whorl just beneath its middle, and spire at the suture, encircled by a narrow black band."

As the name was preoccupied, Tryon (1880, p. 129) renamed it *Murex peasei* and noted: "I copy his figure which does not at all agree with **a specimen** [NOT holotype] sent to me by him, the latter is too like *M. erosus* Brod." Undoubtedly this is the specimen now residing in ANSP as "holotype" (ANSP 36144), which as Radwin and D'Attilio correctly indicate is not the same species at all. The shell has six to seven varices, is yellow in color; but "*poormani*" is described by them as "six varices, three chestnut bands, one subsutural, one medial, and one basal." Keen (1971, p. 532, fig. 1029) adds that the specimens are pinkish-brown with a white band on lower part of the body.

If one compares a specimen of *Favartia poormani* (fig. 3) with the original illustration of *Murex peasei*, (fig. 1) there seems little doubt that the two are the same. Thus, there is no reason to accept the *Favartia* specimen in the Academy (fig. 2) as anything but a mistake made by Pease when he sent the shell to Tryon (or, perhaps, even by Tryon after he received it!).

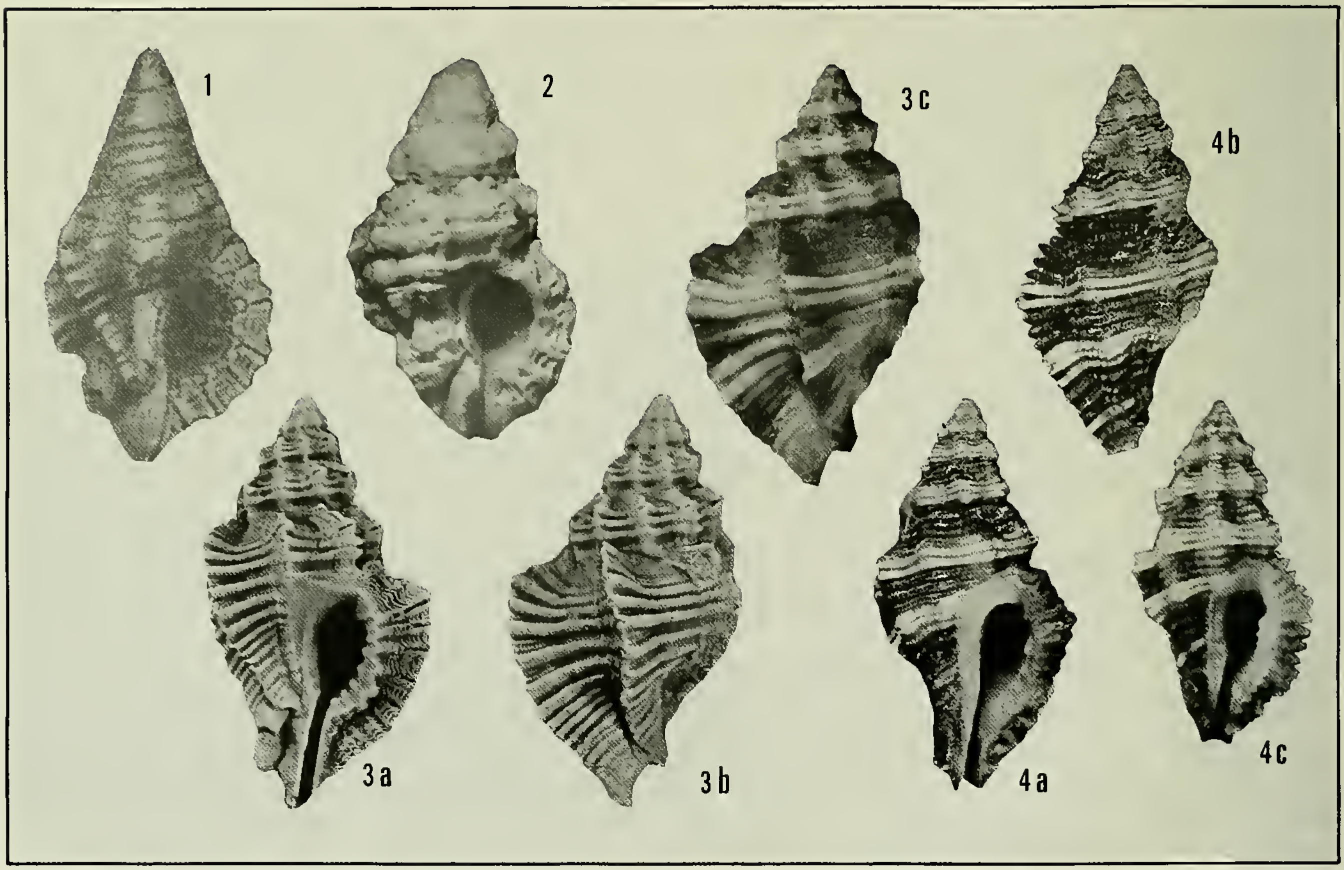

Figure 1. *Murex foveolatus* Pease. Amer. Jour. Conch., 1869, v. 5, pl. 8, fig. 3 (x 4).
Figure 2. *Favartia* sp. ANSP 36144, height 12.6 mm, diameter 6.9 mm.
Figure 3. "*Favartia poormani*" Radwin and D'Attilio. LACMNH H-2196; height 18.3 mm; Acapulco, Mexico (figs. 3a, 3b whitened to show ornamentation).
Figure 4. *Favartia* (*Pygmaepterys*?) *bicatenata* (Reeve). Fig. 4a, 4b BM(NH); height 20.2 mm; Port Blair, Andaman Island; 4c MHNParis; height 12.6 mm; no locality.

Radwin and D'Attilio (*ibid.*, fig. 180, and pl. 24, fig. 9) have given a good illustration of "*Murex*" *peasei*, assigning it to the genus *Favartia*. But, as they note: "its combination of size, color pattern, and the thin delicate structure of its varices differs from all other New World species of *Favartia* and from all other *Favartia* known to us" (*ibid.*, p. 232). They also state, in their description of *F. poormani*, that there are two or three weak denticles on the columellar lip. This combination of features indicates to me that the species is to be placed in the subtenus *Pygmaepterys* Vokes, 1978 (type species: *Murex alfredensis* Bartsch, 1915). This taxon had not been named at the time Radwin and D'Attilio published their book but, since its recognition, a number of species have been referred to it, in addition to several new species described. One of these is *Pygmaepterys juanitae* Gibson-Smith and Gibson-Smith (1983, Veliger, v. 25, p. 179, figs. 6, 7), which is the Caribbean cognate of *F. peasei*.

Another closely related form is the species named "*Ricinula*" *bicatenata* Reeve (1846, Conch. Icon., v. 3, *Ricinula*, pl. 6, fig. 48). This species has been overlooked by subsequent workers even though it is not rare, there are several specimens in the collection of the British Museum (Nat. Hist.). Two are figured here (fig. 4) for comparison.

Pygmaepterys was discussed in detail by Vokes and D'Attilio and it was shown (1980, text-fig. 1) that the radula of one of the species referred to the group (*P. germainae*) is muricopsine, indicated that the taxon is closely related to *Favartia*. But it is still not certain whether all species are congeneric or whether there are two superficially similar groups, one of which is muricine and one of which is muricopsine (like the convergence seen in *Pterynotus* and *Pteropurpura*, for example).

If all species are incorrectly referred to *Pygmaepterys*, we now see a total of eight Recent and at least four fossil species in the group: *P. alfredensis* and *maraisi*, from East Africa; *bicatenata* and *funifutiensis*, Indo-Pacific; *peasei*, East Pacific; *germainae*, *juanitae* and *lourdesae*, Caribbean; *drezi* and *pratulum*, Miocene of Florida; *subdecussatus* and *giselae*, Miocene of Europe.

SYNONYMY

Favartia (*Pygmaepterys*) *peasei* (Tyron, 1880)
Murex foveolatus Pease, 1869
(*non M. foveolatus* Hinds, 1844)
M. (*Ocinebra*) *peasei* Tryon, 1880
Ocenebra peasei (Tryon, 1880)
Favartia peasei (Tryon, 1880)
F. poormani Radwin & D'Atillio, 1976
Not *F. peasei* (Tryon, 1880) (=*F.* sp.)

Literature Cited

Keen, A.M. 1971. Sea Shells of Tropical West America, Marine Mollusks from Baja California to Peru. Second Edition. Stanford Univ. Press, Stanford, Calif., xiv - 1064 p., 22 color pls., ca. 4000 figs., 6 maps.

Radwin, G.E., & A. D'Attilio 1976. *Murex* shells of the World; an Illustrated Guide to the Muricidae. Stanford Univ. Press, Stanford, Calif., 284 p., 32 pls., 192 figs.

Tryon, G.W., Jr. 1880. Manual of Conchology, Structural and Systematic with Illustrations of the Species. v. 2, Muricinae, Purpurinae. Philadelphia, 289 p., 70 pls.

Vokes, E.H., & A. D'Attilio 1980. *Pygmaepterys*, a newly Described Taxon of Muricidae (Mollusca: Gastropoda), with the description of three new species from the Cenozoic of the Western Atlantic. Tulane Stud. Geol. Paleont., **16**(2):45-54, pls. 1-2; 1 text fig.

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YOUR COLLECTION — A HOW-TO COLUMN:

No. 3 Labels, part 2.

by Susan J. Hewitt

You have brought your specimens home with your field label, cleaned them or preserved them, and sorted them according to species, grouping them in small trays or boxes. Now you have several 'lots' from one locality and you need to label each lot.

Again you need pre-cut good rag paper. Most people use pen for this stage in labeling. India ink (a carbon suspension) is the only medium which lasts forever. It's indelible, and does not fade, but it needs a specially designed pen and is too awkward for most amateurs to bother with.

Leave a space at the top of the label for the species identification if you are not sure. Follow this with the locality data. Give enough information that someone from another state or country could find the area in which you collected the specimens. If you like you can think of it as an address. Then give the date you collected, and indicate who you are.

You could add information on tide level for example, substrate, and a brief indication if the animals happened to be feeding (on what?) or laying eggs.

It goes without saying that your handwriting should be legible. Nevertheless, somewhat untidy handwritten labels are often preferable to typed ones because a curator can be more certain who wrote down the information — was it you, the collector? Let's hope so.

NEXT MONTH — About Collecting.

A SPECIES OF *PLACOSTYLUS* FROM THE SOLOMON ISLANDS.

by Richard L. Goldberg

The genus *Placostylus* Beck, 1837, comprises some of the more intriguing members of the Family Bulimulidae. *Placostylus* ranges from the archipelagos of Solomon, Fiji, Vanuatu (New Hebrides), Loyalty, New Caledonia, Lord Howe and New Zealand. The latter three localities have species that are closely allied and represent some of the most well developed forms, with thick and heavy shells.

Ten subgenera have been proposed for the various isolated geographical complexes. The subgenus *Aspastus* Albers, 1850, is represented by one species — *P.* (*A.*) *miltocheilus* (Reeve, 1848). It is an aboreal species found in the southern Solomon Archipelago, on Ulawa, San Cristoval and its coastal Islands.

Unlike the thicker, more well developed species of *Placostylus*, *P. miltocheilus* is very light-weight, almost transparent, and more or less glossy. The living mollusk is green which shows through the shell, giving it the appearance of a lanceolate leaf. The coloring probably provides good camouflage in its aboreal habitat on palm trees and leaves of trees.

Several subspecies have been named for geographical variants. Its center of distribution is San Cristoval Island, where typical *P. milticheilus* is found. The shell is white under a pale yellow cuticle, which is generally worn away in adult shells. The striking characteristicinc of this species is the bright orange to red peristome.

Figure 1.

Figure 2.

The subspecies *P. m. albolabris* (Brazier, 1895), is found on Santa Anna Island, off southeast San Cristoval Island. This subspecies is characterized by its white peristome, squatter shape, and pale yellowish cuticle.

The subspecies *P. m. stramineus* (Brazier, 1889), is reported to have the same general range as the typical *miltocheilus*. The shell has pale straw-yellow cuticle which is retained in the adult shell. The general adult size is smaller than typical *miltocheilus*, and does not possess such strong axial ridges. The peristome is always orange-red.

The subspecies *P. m. mayri* (Clench, 1941) (= *P. m. minor* Brazier, 1895) is a smaller race with a white to yellowish shell and an orange-yellow peristome. It is limited to Ulawa Island, north of San Cristoval Island. This subspecies is the closest to the typical *P. miltocheilus*, except for the adult size.

Placostylus miltocheilus, with its delicate form and brightly colored peristome, stands out as one of the most beautiful of the genus.

Photographs by Richard L. Goldberg.

Figure 1. (left) *Placostylus* (*Aspastus*) *miltocheilus albolabris* (Brazier, 1895) — Santa Anna Island, Solomon Islands. (right) *P.* (*A*) *miltocheilus* (Reeve, 1848) — San Cristoval Island, Solomon Islands.
Figure 2. *Placostylus* (*Aspastus*) *miltocheilus stramineus* (Brazier, 1889) — San Cristoval Island, Solomon Islands.

Richard L. Goldberg, 49-77 Fresh Meadow Lane, Flushing, New York 11365.

COLLECTING ON THE GREAT BARRIER REEF (CAPRICORNIA SECTION).

John Bernard, Rt. 8, Box 480,
Crossville, TN 38555

Collecting is the taking, by any means, of any declared species of plant, animal, or marine product from the marine park, whether it is alive or dead.

Collecting with a permit is allowed throughout most of the Capricornia section. However, there are certain restrictions.

Wreck Island Reef, and surrounding waters has been declared a Preservation Zone (a no access area) to preserve the reef in its natural state, undisturbed by man. This zoning complements the status of Wreck Island, a Queensland National Park, recognised as one of the most important nesting grounds in the Pacific Region for the Loggerhead Turtle.

One Tree Island Reef and surrounding waters has been zoned for scientific research only, free from all other activities. One Tree Island Field Station, operated by the University of Sydney, has been a center for coral reef research since its founding a decade ago.

Heron Island and Wistari Reefs and surrounding waters have been given Marine National Park "A" status. Similar to the concept of a national park on land. This zoning provides for the protection of the natural resources of the area while allowing recreational activities including fishing with a rod or handline and approved research.

Llewellin Reef and surrounding waters, in response to public request to set aside an area for the appreciation and enjoyment free from all fishing and collecting, is zoned Marine National Park "B", a look but don't take status.

The Permit System

The aim in developing the Great Barrier Reef Marine Park, is to allow for responsible use of the Great Barrier Reef Region while protecting the resources of the reef. Although certain activities may appear to be reasonable, they may also have the potential for placing heavy demands on the Reef's resources. Careful monitoring of such activities is necessary to prevent major problems from developing.

Through the permit system, the Great Barrier Reef Marine Park Authority and the Queensland National Parks and Wildlife Service are able to:

*separate potentially conflicting activities.
*encourage responsible behavior in Reef users.
*gather information about the Reef and activities that may be damaging.
*impose, where necessary, limits on time and area in which such activities may occur.

The Authority controls permit issue for:

*all types of research.
*tourist cruise ships.
*tourist and educational facilities and programs.
*discharge of waste.

The Queensland National Parks and Wildlife Service, which is responsible for the day to day management of the Capricornia Section, and has been delegated powers to issue permits for:

*removal of vessels that are wrecked, stranded, sunk or abandoned.
*construction of mooring facilities.
*fishing with specific types of nets.
*aircraft operations.
*use of hovercraft.
*collecting (other than for research).

However the Authority retains the ability to issue permits for these activities, if necessary.

During certain specified periods some areas in the Section may be closed to activities, such as collecting, to allow for marine stock replenishment. Other areas may be closed to the public to afford protection to the birds and turtles during nesting season. Reef Appreciation Areas, in which collecting is not permitted, may also be declared on parts of the heavily used reefs to provide areas for public observation and appreciation of relatively undisturbed marine life. All closures are widely publicised. Permit holders must follow these rules.

a. Not more than two of any species of mollusks other than the following are to be taken: shells on egg masses, *Tridacna* species, *Cassis cornuta, Charonia tritonis.*

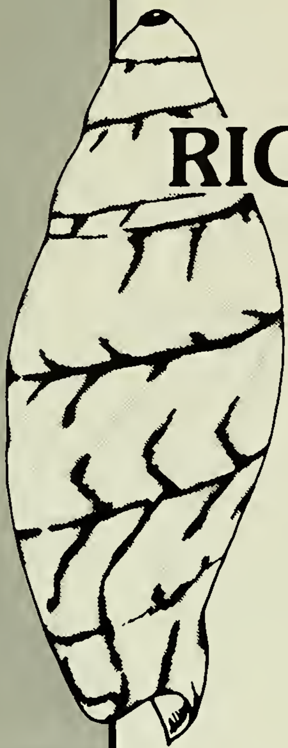
b. Permits must be available for viewing while collecting activity is taking place.

c. No collecting at Lady Elliot Island Reef and Lady Musgrove Reef pending further decision.

d. List of species, numbers and their sites of collection to be forwarded to Marine Parks Section.

The information here was taken from a pamphlet entitled "Permits and Collecting" available from: Executive Officer, Great Barrier Reef Marine Parks Authority, P.O. Box 1379, Townsville, Queensland 4810, Australia.

Collectors wishing more information would be wise to contact local shell clubs for specific information on availability of permits and more specific local conditions.



PUBLICATION NOTES

Book Reviews

Systematics of the Family Nassariidae (Mollusca: Gastropoda) by Walter O. Cernohorsky. 1984. Bulletin 14, Auckland Institute and Museum, New Zealand. 356 pages, 172 text figures, 51 black and white plates.

This extensive monograph is the latest in a series of papers by Walter O. Cernohorsky on the marine molluscan family Nassariidae, a group of predominantly small to medium sized gastropods which are characteristic of the intertidal fauna and are concentrated in distrubution in the warmer waters of the Indo-Pacific. The introduction covers family characters, the animal, the radula, larval development, classification, and distribution. Cernohorsky recognizes as "tentatively valid" well over 300 living species in this family, geographically distributed as follows: 40 species, Pacific coast of America; 23 species, Western Atlantic-Caribbean; 53 species, Europe-Eastern Atlantic; and 211 species, Indo-Pacific.

The family is divided into three subfamilies: Dorsaninae, Cylleninae, and Nassariinae. Noting the size of the family, Cernorhorsky reserves detailed treatment of Dorsaninae for a future monograph, but provides a checklist of fossil and living speciees of this subfamily, whose genera are *Bullia*, from South Africa and the western Indian Ocean; *Buccinanops*, from the southeastern coast of South America; and *Dorsanum*, from West Africa. Descriptions of the 5 fossil and 14 living species of Cylleninae (genus *Cyllene*) from the tropical Indo-Pacific, Southeast Australia, and West Africa are included. All Indo-Pacific species of Nassariinae (genera *Nassarius* with 12 subgenera), *Hebra*, and *Demoulia* are also described, while checklists of fossil and living Nassariinae from the Pacific coast of America and the western and eastern Atlantic are given, as are lists of dubious or excluded species for all subfamilies. Excellent black and white illustrations are provided for each species described.

Discussion for each species includes scientific name, author and date, complete synonymy, several sentences of description, type locality, distribution, repository of type specimens, material examined, and literature records. Two new species are described, *Nassarius* (*Plicarcularia*) *maccauslandi*, from the Fiji Islands, and *Nassarius* (*Zeuxis*) *whiteheadae*, from Queensland, Australia. A comprehensive bibliography and an index to all taxa mentioned, whether valid or synonyms, completes the volume. This work is a most important contribution on Indo-Pacific mollusks, and must be in the library of every serious student of mollusks.

Marine Mollusks of Cape Cod by Donald J. Zinn. 1984. Natural History Series no. 2, The Cape Cod Museum of Natural History, Brewster, MA. 78 pages, illustrated.

This compact, paperbound booklet will readily serve as an informal, introductory guide to the marine mollusks of Cape Cod likely to be found by the casual beachcomber. An introduction gives basic facts about mollusks in these sections: history and art, scientific nomenclature, where to find mollusks, and how to make a shell collection. A detailed glossary introduces the reader to terms used for mollusks. A systematic list outlines molluscan classification to the genus level for the species included in this book.

Five classes of mollusks are treated in the descriptive list — 1 chiton, 1 scaphopod, 30 gastropods, 35 bivalves, and 2 cephalopods. Several additional species are mentioned but not figured. The discussion of each species lists several sentences of description, supplying habitat data, size and detail of the shell or animal, and often how to distinguish a species from related forms. The well-executed line drawings should enable the novice collector to identify his finds.

An unusual and interesting feature is the inclusion of 28 recipes for the living mollusks. These recipes often are for species not usually considered for consumption, such as chitons, limpets, moon snails, and periwinkles. A page of references and indices for scientific and common names complete this volume. Novices and more advanced collectors alike will find this guide a useful and informative addition to their libraries.

The Freshwater Snails of Connecticut by Eileen H. Jokinen. 1983. Bulletin 109, State Geological and Natural History Survey of Connecticut. vii - 83 pages, 35 figures.

This fine little guide enumerates the 35 species (9 prosobranchs and 26 pulmonates) of freshwater gastropods recognized as occurring in the ponds, lakes, and rivers of Connecticut. A detailed introduction covers the classification of genera and species, and provides a key to the freshwater snails discussed; the various factors affecting the distribution and abundance of these mollusks are indicated; the geology and aquatic habitats of Connecticut are presented; methods and materials used in the collection of specimens are set forth; and information on the collection, preservation, and identification of freshwater snails is outlined.

Descriptions, distributional records, comprehensive ecological data, and good line drawings for each species constitute the central section of text. Distributional maps are added for each species, and the extensive bibliography will facilitate additional research. Appendices list habitat and water chemistry data for each site surveyed, the lakes and ponds sampled, and the drainage system of Connecticut rivers and streams.

This highly recommended volume should serve as a model for further state surveys and prove most useful to scientists and naturalists studying the mollusk fauna of neighboring states.

29 September 1984
Walter Sage

AMU Suggested Draft List of Common Names for North American Mollusks

Page 1

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Helicinidae		
Alcadia striata (Lamarck, 1822)	T	striate drop
Helicina clappi Pilsbry, 1909	T	rainbow drop
Hendersonia occulta (Say,1831)	T	cherrystone drop
Lucidella tantilla Pilsbry, 1902	T	ochre drop
Oligyra orbiculata Say, 1818	T	globular drop
Chondropomidae		
Chondropoma dentatum (Say, 1825)	T	crenulate horn
Ellobiidae		
Carychium clappi Hubricht, 1959	T	Appalachian thorn
Carychium exiguum (Say, 1822)	T	obese thorn
Carychium exile Lea, 1842	T	ice thorn
Carychium minimum Muller, 1774	T	tiny herald snail
Carichium nannodes Clapp, 1905	T	corpulent thorn
Carychium occidentale Pilsbry, 1891	T	western thorn
Carychium riparium Hubricht, 1978	T	floodplain thorn
Carychium stygium Call, 1897	T	cave thorn
Veronicellidae		
Angustipes ameghini (Gambetta, 1923)	T	black velvet leatherleaf
Diplosolenodes occidentale (Guilding, 1825)	T	spotted leatherleaf
Leidyula floridana (Leidy, 1851)	T	Florida leatherleaf
Leidyula kraussi (Ferussac, 1823)	T	dappled leatherleaf
Leidyula moreleti (Cross and Fischer, 1872)	T	tan leatherleaf
Leidyula sloani (Cuvier, 1816)	T	Sloan leatherleaf
Cochlicopidae		
Cochlicopa lubrica (Muller, 1774)	T	glossy pillar
Cochlicopa lubricella (Porro, 1838)	T	thin pillar
Pupillidae		
Bothriopupa variolosa (Gould, 1848)	T	pitted birddrop
Columella alticola (Ingersoll, 1875)	T	high-spire column
Columella edentula (Draparnaud, 1805)	T	toothless column
Chaenaxis tuba (Pilsbry and Ferriss, 1906)	T	hollow tuba
Gastrocopta armifera (Say, 1821)	T	armed snaggletooth
Gastrocopta ashmuni (Sterki, 1898)	T	sluice snaggletooth
Gastrocopta carnegiei (Sterki, 1916)	T	Erie snaggletooth
Gastrocopta cochisensis (Pilsbry and Ferriss, 1910)	T	Apache snaggletooth
Gastrocopta contracta (Say, 1822)	T	bottleneck snaggletooth
Gastrocopta corticaria (Say, 1816)	T	bark snaggletooth
Gastrocopta cristata (Pilsbry and Vanatta, 1900)	T	crested snaggletooth
Gastrocopta dalliana (Sterki, 1898)	T	shortneck snaggletooth
Gastrocopta holzingeri (Sterki, 1889)	T	lambda snaggletooth
Gastrocopta pellucida (Pfeiffer, 1841)	T	slim snaggletooth
Gastrocopta pentodon (Say, 1821)	T	comb snaggletooth
Gastrocopta pilsbryana (Sterki, 1890)	T	tall comb snaggletooth
Gastrocopta procera (Gould, 1840)	T	wing snaggletooth
Gastrocopta prototypus (Pilsbry, 1899)	T	Sonoran snaggletooth
Gastrocopta quadridens Pilsbry, 1916	T	cross snaggletooth
Gastrocopta riograndensis (Pilsbry and Vanatta, 1900)	T	Rio Grande snaggletooth
Gastrocopta rupicola (Say, 1821)	T	tapered snaggletooth
Pupoides albilabris (C. B. Adams, 1841)	T	whitelipped dagger
Pupoides hordaceus (Gabb, 1866)	T	ribbed dagger
Pupoides inornatus Vanatta, 1915	T	Rocky Mountain dagger
Pupoides modicus (Gould, 1848)	T	island dagger
Pupilla blandi Morse, 1865	T	Rocky Mountain column
Pupilla hebes (Ancey, 1881)	T	crestless column
Pupilla muscorum (Linnaeus, 1758)	T	widespread column
Pupilla sonorana (Sterki, 1899)	T	threetooth column
Pupilla syngenes (Pilsbry, 1890)	T	top-heavy column
Pupisoma dioscoricola (C. B. Adams, 1845)	T	yam babybody
Pupisoma macneilli (G. H. Clapp, 1918)	T	Gulf babybody

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SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Pupisoma minus Pilsbry, 1920	T	minute babybody
Sterkia calamitosa (Pilsbry, 1889)	T	Mexican birddrop
Sterkia clementina (Sterki, 1890)	T	insular birddrop
Sterkia eryiesi rhoadsi (Pilsbry, 1899)	T	Caribbean birddrop
Sterkia hemphilli (Sterki, 1890)	T	California birddrop
Vertigo alabamensis Clapp, 1915	T	Alabama vertigo
Vertigo allyniana Berry, 1919	T	small-tooth vertigo
Vertigo alpestris Alder, 1838	T	tundra vertigo
Vertigo andrusiana (Pilsbry, 1899)	T	Pacific vertigo
Vertigo arthuri Von Martens, 1882	T	Dakota vertigo
Vertigo berryi Pilsbry, 1919	T	ovate California vertigo
Vertigo binneyana Sterki, 1890	T	cylindrical vertigo
Vertigo bollesiana (Morse, 1865)	T	delicate vertigo
Vertigo californica (Rowell, 1861)	T	ribbed California vertigo
Vertigo clappi Brooks and Hunt, 1936	T	cupped vertigo
Vertigo columbiana Sterki, 1892	T	Columbia vertigo
Vertigo concinnula Cockerell, 1897	T	mitered vertigo
Vertigo dalliana Sterki, 1890	T	horseshoe vertigo
Vertigo elatior Sterki, 1894	T	tapered vertigo
Vertigo gouldi (Binney, 1843)	T	variable vertigo
Vertigo hebardi Vanatta, 1912	T	Keys vertigo
Vertigo hinkleyi Pilsbry, 1921	T	heart vertigo
Vertigo idahoensis Pilsbry, 1934	T	Idaho vertigo
Vertigo meramecensis Van Devender, 1979	T	bluff vertigo
Vertigo milium (Gould, 1840)	T	blade vertigo
Vertigo modesta (Say, 1824)	T	cross vertigo
Vertigo morsei Sterki, 1894	T	six-whorl vertigo
Vertigo nylanderi Sterki, 1909	T	deep-throat vertigo
Vertigo occidentalis Sterki, 1907	T	cone cross vertigo
Vertigo ovata Say, 1822	T	ovate vertigo
Vertigo oscariana Sterki, 1890	T	capital vertigo
Vertigo parvula Sterki, 1890	T	small-mouth vertigo
Vertigo perryi Sterki, 1905	T	olive vertigo
Vertigo pygmaea (Draparnaud, 1801)	T	crested vertigo
Vertigo rowelli (Newcomb, 1860)	T	threaded vertigo
Vertigo rugosula Sterki, 1890	T	striate vertigo
Vertigo sterkii (Pilsbry, 1919)	T	chestnut vertigo
Vertigo tridentata Wolf, 1870	T	honey vertigo
Vertigo ventricosa (Morse, 1865)	T	five-tooth vertigo
Vertigo wheeleri Pilsbry, 1928	T	Monte Sano vertigo
Valloniidae		
Planogyra asteriscus (Morse, 1857)	T	eastern flat-whorl
Planogyra clappi (Pilsbry, 1898)	T	western flat-whorl
Vallonia albula Sterki, 1893	T	indecisive vallonia
Vallonia costata (Muller, 1774)	T	costate vallonia
Vallonia cyclophorella (Sterki, 1892)	T	silky vallonia
Vallonia excentrica Sterki, 1893	T	oval vallonia
Vallonia gracilicosta Reinhardt, 1883	T	multiribbed vallonia
Vallonia parvula Sterki, 1893	T	trumpet vallonia
Vallonia perspectiva Sterki, 1892	T	thin-lipped vallonia
Vallonia pulchella (Muller, 1774)	T	lovely vallonia
Zoogenetes harpa (Say, 1824)	T	boreal top
Strobilopsidae		
Strobilops aenea Pilsbry, 1926	T	bronze pinecone
Strobilops affinis Pilsbry, 1893	T	eightfold pinecone
Strobilops hubbardi A. D. Brown, 1861	T	flattened pinecone
Strobilops labyrinthica (Say, 1817)	T	maze pinecone
Strobilops texasiana Pilsbry and Ferriss, 1906	T	southern pinecone
Cerionidae		
Cerion incanum (Binney, 1851)	T	gray peanut-snail
Cerion casablancae Bartsch, 1920	T	incerta cedis
Cerion chrysalis fastigatum Maynard, 1896	T	incerta cedis
Cerion sculptum marieleinum Torre, 1927	T	incerta cedis
Cerion tridentatum Pilsbry and Vanatta, 1895	T	incerta cedis
Cerion viaregis Bartsch, 1920	T	incerta cedis

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SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Ferussacidae		
Cecilioides acicula (Muller, 1774)	T	blind awlsnail
Cecilioides aperta (Swainson, 1840)	T	obtuse awlsnail
Subulinidae		
Lamellaxis clavulinus (Potiez and Michaud, 1838)	T	spike awlsnail
Lamellaxis gracilis (Hutton, 1834)	T	graceful awlsnail
Lamellaxis mauritianus (Pfeiffer, 1852)	T	Mauritian awlsnail
Lamellaxis micra (d'Orbigney, 1835)	T	tiny awlsnail
Opeas pumilum (Pfeiffer, 1840)	T	dwarf awlsnail
Opeas pyrgula Schmacker and Boettger, 1891	T	sharp awlsnail
Rumina decollata (Linneaus, 1758)	T	decollate snail
Subulina octona Bruguiere, 1792	T	miniature awlsnail
Spiraxidae		
Euglandina rosea (Perussac, 1818)	T	rosey wolfsnail
Euglandina singleyana Binney, 1892	T	striate wolfsnail
Euglandina texasiana (Pfeiffer 1857)	T	glossy wolfsnail
Melaniella gracillima (Pfeiffer, 1839)	T	brown foxsnail
Pseudosubulina cheatumi Pilsbry, 1950	T	Chisos foxsnail
Achatinidae		
Achatina fulica (Ferussac, 1821)	T	African giant snail
Streptaxidae		
Huttonella bicolor (Hutton, 1834)	T	two-toned gulella
Haplotrematidae		
Haplotrema alameda Pilsbry, 1930	T	Alameda lancetooth
Haplotrema caelatum Mazyck, 1886	T	slotted lancetooth
Haplotrema catalinensis (Hemphill, 1890)	T	Santa Catalina lancetooth
Haplotrema concavum (Say, 1821)	T	gray-footed lancetooth
Haplotrema costatum Smith, 1957	T	costate lancetooth
Haplotrema duranti (Newcomb, 1864)	T	ribbed lancetooth
Haplotrema keepi (Hemphill, 1890)	T	glassy lancetooth
Haplotrema kendeighi Webb, 1951	T	blue-footed lancetooth
Haplotrema minimum (Ancey, 1888)	T	California lancetooth
Haplotrema sportella (Gould, 1846)	T	beaded lancetooth
Haplotrema transfuga (Hemphill, 1892)	T	striate lancetooth
Haplotrema vancouverense (Lea, 1839)	T	robust lancetooth
Haplotrema voyanum (Newcomb, 1865)	T	hooded lancetooth
Urocoptidae		
Bostrychocentrum metcalfi Thompson, 1974	T	Metcalf holospira
Cochlodinella poeyana (d'Orbigney, 1841)	T	truncate urocoptid
Holospira arizonensis Sterns, 1890	T	Arizona holospira
Holospira bilamellata Dall, 1895	T	bilamellate holospira
Holospira chiricahuana Pilsbry, 1905	T	Cave Creek holospira
Holospira cockerelli Dall, 1897	T	Cockerell holospira
Holospira crossei Dall, 1895	T	Cross holospira
Holospira danielsi Pilsbry and Ferris, 1915	T	strongrib holospira
Holospira ferrissi Pilsbry, 1905	T	stocky holospira
Holospira montivaga Pilsbry, 1946	T	vagabond holospira
Holospira oritis Pilsbry and Cheatum, 1951	T	mountain holospira
Holospira pityis Pilsbry and Cheatum, 1951	T	pinecone holospira
Holospira regis Pilsbry and Cockerell, 1905	T	royal holospira
Holospira tantalus Bartsch, 1906	T	teasing holospira
Holospira whetstonensis Pilsbry and Ferriss, 1923	T	Whetstone holospira
Holospira yucatanensis Bartsch, 1906	T	Bartsch holospira
Metastoma goldfussi (Menke, 1847)	T	New Braunfels metastoma
Metastoma hamiltoni Dall, 1897	T	Hamilton metastoma
Metastoma mesolia Pilsbry, 1912	T	widemouth metastoma
Metastoma pasonis Dall, 1895	T	robust metastoma
Metastoma riograndensis Pilsbry, 1946	T	Rio Grand metastoma
Metastoma roemeri (Pfeiffer, 1848)	T	distorted metastoma

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SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Microceramus floridanus (Pilsbry, 1898)	T	Florida urocoptid
Microceramus pontificus (Gould, 1848)	T	pontiff urocoptid
Microceramus texanus (Pilsbry, 1898)	T	Texas urocoptid
Bulimulidae		
Bulimulus guadalupensis (Bruguiere, 1789)	T	West Indian bulimulus
Drymaeus dominicus (Reeve, 1850)	T	master treesnail
Drymaeus dormani (Binney, 1857)	T	manatee treesnail
Drymaeus multilineatus (Say, 1825)	T	lined treesnail
Liguus fasciatus (Muller, 1774)	T	Florida treesnail
Orthalicus floridensis Pilsbry, 1899	T	banded treesnail
Orthalicus reses nesodryas Pilsbry, 1946	T	Florida Keys treesnail
Orthalicus reses reses (Say, 1830)	T	Stock Island treesnail
Rabdotus alternatus (Say, 1830)	T	striped rabdotus
Rabdotus dealbatus (Say, 1821)	T	whitewashed rabdotus
Rabdotus mooreanus (Pfeiffer, 1868)	T	little prairie rabdotus
Rabdotus nigromontanus (Dall, 1897)	T	Black Mountain rabdotus
Rabdotus pilsbryi (Ferriss, 1925)	T	elongate rabdotus
Punctidae		
Punctum blandianum Pilsbry, 1900	T	brown spot
Punctum californicum Pilsbry, 1898	T	ribbed spot
Punctum conspectum (Bland, 1865)	T	striate spot
Punctum minutissimum (Lea, 1841)	T	small spot
Punctum randolphi (Dall, 1895)	T	conical spot
Punctum smithi Morrison, 1935	T	lamellate spot
Punctum vitreum (Baker, 1930)	T	glass spot
Zonites diegoensis Hemphill, 1892	T	incerta sedis
Charopidae		
Radiodiscus millicostatus Pilsbry and Ferriss, 1906	T	ribbed pinwheel
Radiodiscus abietum Baker, 1930	T	fir pinwheel
Helicodiscidae		
Helicodiscus barri Hubricht, 1962	T	raccoon coil
Helicodiscus bonamicus Hubricht, 1978	T	spiral coil
Helicodiscus diadema Grimm, 1967	T	shaggy coil
Helicodiscus eigenmanni Pilsbry, 1900	T	Mexican coil
Helicodiscus enneodon Hubricht, 1967	T	bluff coil
Helicodiscus fimbriatus Wetherby, 1881	T	fringed coil
Helicodiscus hadenoecus Hubricht, 1962	T	cricket coil
Helicodiscus hexodon Hubricht, 1966	T	toothy coil
Helicodiscus intermedius Morrison, 1942	T	Pickwick coil
Helicodiscus lirellus Hubricht, 1975	T	rubble coil
Helicodiscus multidens Hubricht, 1962	T	cave coil
Helicodiscus notius Hubricht, 1962	T	tight coil
Helicodiscus nummus (Vanatta, 1899)	T	wax coil
Helicodiscus parallelus (Say, 1817)	T	compound coil
Helicodiscus punctatellus Morrison, 1942	T	punctate coil
Helicodiscus salmonaceus Binney, 1886	T	salmon coil
Helicodiscus saludensis (Morrison, 1937)	T	corncob snail
Helicodiscus shimeki Hubricht, 1962	T	temperate coil
Helicodiscus singleyanus (Pilsbry, 1890)	T	smooth coil
Helicodiscus triodus Hubricht, 1958	T	tallus coil
Polygriscus virginicus Burch, 1947	T	Virginia coil
Speleodiscoides spirellum Smith, 1957	T	glass coil
Discidae		
Anguispira alternata (Say, 1816)	T	flamed disc
Anguispira cumberlandiana (Lea, 1840)	T	Cumberland disc
Anguispira fergusoni (Bland, 1861)	T	Coastal Plains disc
Anguispira mordax (Shuttleworth, 1852)	T	Appalachian disc
Anguispira nimapuna Baker, 1932	T	Nimapuna disc
Anguispira knoxensis (Pilsbry, 1899)	T	Black Range disc
Anguispira kochi (Pfeiffer, 1821)	T	banded globe
Anguispira picta (Clapp, 1920)	T	painted disc
Anguispira strongyloides (Pfeiffer, 1854)	T	southeastern disc
Discus bryanti (Harper, 1881)	T	saw-toothed disc

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Discus bryantwalkeri (Pilsbry, 1924)	T	smooth-base disc
Discus catskillensis (Pilsbry, 1896)	T	angular disc
Discus clappi (Pilsbry, 1924)	T	channelled disc
Discus cronkhitei (Newcomb, 1865)	T	forest disc
Discus macclintocki (Baker, 1928)	T	Pleistocene disc
Discus marmorensis Baker, 1932	T	marbled disc
Discus nigrimontanus (Pilsbry, 1924)	T	Black Mountain disc
Discus patulus (Deshayes, 1830)	T	domed disc
Discus rotundatus (Muller, 1776)	T	rotund disc
Discus selinitoides (Pilsbry, 1890)	T	file disc
Discus shimeki (Pilsbry, 1890)	T	striate disc

Arionidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Anadenulus cockerelli (Hemphill, 1890)	T	American keeled slug
Arion ater (Linneaus, 1758)	T	black arion
Arion circumscriptus Johnston, 1828	T	brownbanded arion
Arion distinctus Mabille, 1868	T	darkfaced arion
Arion fasciatus (Nilsson, 1822)	T	orangebanded arion
Arion hortensis Ferussac, 1819	T	garden arion
Arion intermedius (Normand, 1852)	T	hedgehog arion
Arion owenii Davies, 1979	T	warty arion
Arion rufus (Linneaus, 1758)	T	chocolate arion
Arion subfuscus (Draparnaud, 1805)	T	dusky arion
Arion sylvaticus Lohmander, 1937	T	forest arion
Ariolimax californicus Cooper, 1872	T	California banana slug
Ariolimax columbianus (Gould, 1851)	T	Pacific banana slug
Ariolimax dolichophallus Mead, 1943	T	slender banana slug
Binneya guadalupensis Pilsbry, 1927	T	Guadalupe shelled slug
Binneya notabilis Cooper, 1863	T	Santa Barbara shelled slug
Hemphillia burringtoni Pilsbry, 1948	T	keeled jumping slug
Hemphillia camelus Pilsbry and Vanatta, 1897	T	pale jumping slug
Hemphillia danielsi Vanatta, 1914	T	marbled jumping slug
Hemphillia dromedarius Branson, 1972	T	dromedary jumping slug
Hemphillia glandulosa Bland and Binney, 1872	T	warty jumping slug
Hemphillia malonei Pilsbry, 1917	T	Malone jumping slug
Hemphillia pantherina Branson, 1975	T	panther jumping slug
Hesperarion hemphilli (Binney, 1875)	T	Hemphill western slug
Hesperarion niger (Cooper, 1872)	T	black western slug
Magnipelta micophaga Pilsbry, 1953	T	spotted fungus slug
Prophysaon andersoni (Cooper, 1872)	T	reticulated taildropper
Phophysaon boreale Pilsbry, 1946	T	yellow-bordered taildropper
Prophysaon coeruleum Cockerell, 1890	T	bluegrey taildropper
Prophysaon dubium Cockerell, 1890	T	papillose taildropper
Prophysaon fasciatum Cockerell, 1890	T	banded taildropper
Prophysaon foliolatum (Gould, 1851)	T	yellow-bordered taildropper
Prophysaon humile Cockerell, 1890	T	smoky taildropper
Prophysaon obscurum Cockerell, 1890	T	mottled taildropper
Prophysaon vanattae Pilsbry, 1946	T	scarletback taildropper

Philomycidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Pallifera dorsalis (Binney, 1842)	T	pale mantleslug
Pallifera flexuolaris Rafinesque, 1820	T	winding mantleslug
Pallifera fosteri Baker, 1939	T	Foster mantleslug
Pallifera hemphilli (Binney, 1885)	T	black mantleslug
Pallifera marmorea Pilsbry, 1948	T	marbled mantleslug
Pallifera mutabilis Hubricht, 1951	T	changeable mantleslug
Pallifera ohioensis (Sterki, 1908)	T	redfoot mantleslug
Pallifera pilsbryi Miles and Mead, 1960	T	Arizona mantleslug
Pallifera ragsdalei Webb, 1950	T	whiteface mantleslug
Pallifera secreta Cockerell, 1900	T	severed mantleslug
Pallifera varia Hubricht, 1953	T	variable mantleslug
Pallifera wetherbyi Binney, 1874	T	blotchy mantleslug
Philomycus carolinianus (Bosc, 1802)	T	Carolina mantleslug
Philomycus togatus (Gould, 1841)	T	toga mantleslug
Philomycus venustrus Hubricht, 1953	T	brownspotted mantleslug
Philomycus virginicus Hubricht, 1953	T	Virginia mantleslug
Zacoleus idahoensis Pilsbry, 1903	T	Idaho sheathed slug

Succineidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Catinella aprica Hubricht, 1968	T	diurnal ambersnail
Catinella hubrichti Grimm, 1960	T	Snow Hill ambersnail

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Catinella oklahomarum (Webb, 1953)	T	Sardis ambersnail
Catinella parallela Franzen, 1979	T	Wabash ambersnail
Catinella pinicola Grimm, 1960	T	pine ambersnail
Catinella prolongata Franzen, 1983	T	elongate ambersnail
Catinella pugilator Hubricht, 1961	T	maple ambersnail
Catinella rehderi (Pilsbry, 1948)	T	chrome ambersnail
Catinella texana Hubricht, 1961	T	Texas ambersnail
Catinella vagans (Pilsbry, 1900)	T	wandering ambersnail
Catinella waccamawensis Franzen, 1981	T	Waccamaw ambersnail
Catinella wandae (Webb, 1953)	T	Alma ambersnail
Oxyloma decampi (Tryon, 1866)	T	Marshall ambersnail
Oxyloma deprimida Franzen, 1973	T	depressed ambersnail
Oxyloma effusa (Pfeiffer, 1853)	T	effuse ambersnail
Oxyloma effusa subeffusa Pilsbry, 1948	T	subeffuse ambersnail
Oxyloma groenlandica (Muller, 1842)	T	ruddy ambersnail
Oxyloma hawkinsi (Baird, 1863)	T	Hawkin ambersnail
Oxyloma haydeni (W. G. Binney, 1858)	T	Niobrara ambersnail
Oxyloma haydeni kanabensis Pilsbry, 1948	T	Kanab ambersnail
Oxyloma missoula Hubricht, 1982	T	Ninepipes ambersnail
Oxyloma nuttalliana (Lea, 1841)	T	oblique ambersnail
Oxyloma nuttalliana chasmodes Pilsbry, 1948	T	yawning ambersnail
Oxyloma retusa (Lea, 1834)	T	retuse ambersnail
Oxyloma salleana (Pfeiffer, 1849)	T	Salle ambersnail
Oxyloma sanibelensis (Rehder, 1933)	T	Sanibel ambersnail
Oxyloma sillimani (Bland, 1865)	T	Humboldt ambersnail
Oxyloma verrilli (Bland, 1865)	T	Verrill ambersnail
Succinea aurea Lea, 1846	T	golden ambersnail
Succinea avara Say, 1824	T	suboval ambersnail
Succinea bayardi Vanatta, 1914	T	globose ambersnail
Succinea californica Fischer and Crosse, 1878	T	San Tomas ambersnail
Succinea campestris Say, 1817	T	crinkled ambersnail
Succinea concordialis Gould, 1848	T	spotted ambersnail
Succinea gabbi Tryon, 1866	T	riblet ambersnail
Succinea grosvenori Lea, 1864	T	Santa Rita ambersnail
Succinea luteola Gould, 1848	T	Spanish ambersnail
Succinea oregonensis Lea, 1841	T	Oregon ambersnail
Succinea ovalis Say, 1817	T	oval ambersnail
Succinea pennsylvanica Pilsbry, 1948	T	Derrick City ambersnail
Succinea pronophobus Pilsbry, 1948	T	mythical ambersnail
Succinea pseudavara Webb, 1954	T	Lake Takoma ambersnail
Succinea strigata Pfeiffer, 1855	T	striate ambersnail
Succinea rusticana Gould, 1846	T	rustic ambersnail
Succinea solastra Hubricht, 1961	T	sunshine ambersnail
Succinea stretchiana Bland, 1865	T	Sierra ambersnail
Succinea unicolor Tryon, 1866	T	squatty ambersnail
Succinea urbana Hubricht, 1961	T	urban ambersnail
Succinea vaginacontorta Lee, 1951	T	xeric ambersnail
Succinea wilsoni Lea, 1864	T	Wilson ambersnail

Helicarionidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Dryachloa dauca Thompson and Lee, 1980	T	carrot glass
Euconulus chersinus (Say, 1821)	T	wild hive
Euconulus chersinus dentatus (Sterki, 1893)	T	toothed hive
Euconulus chersinus polygyratus (Pilsbry, 1899)	T	fat hive
Euconulus chersinus trochulus (Reinhardt, 1883)	T	silk hive
Guppya gundlachi (Pfeiffer, 1839)	T	glossy granule
Euconulus fulvus (Muller, 1774)	T	brown hive
Euconulus fulvus alaskensis Pilsbry, 1899	T	northern hive
Guppya miamiensis Pilsbry, 1903	T	smooth granule
Guppya sterki (Dall, 1888)	T	brilliant granule

Zonitidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Gastrodonta fonticula Wurtz, 1948	T	spring bellytooth
Gastrodonta interna (Say, 1822)	T	brown bellytooth
Glyphyalinia carolinensis (Cockerell, 1890)	T	spiral mountain glyph
Glyphyalinia clingmani (Dall, 1890)	T	fragile glyph
Glyphyalinia cryptomphala (Clapp, 1915)	T	thin glyph
Glyphyalinia cryptomphala solida (Baker, 1930)	T	talus glyph

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SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Glyphyalinia cumberlandiana (Clapp, 1919)	T	hill glyph
Glyphyalinia floridana (Morrison, 1937)	T	Ocala glyph
Glyphyalinia indentata (Say, 1823)	T	carved glyph
Glyphyalinia junaluskana (Clench and Banks, 1932)	T	dark glyph
Glyphyalinia latebricola Hubricht, 1968	T	stone glyph
Glyphyalinia lewisiana (Clapp, 1908)	T	pale glyph
Glyphyalinia luticola Hubricht, 1966	T	furrowed glyph
Glyphyalinia ocoae Hubricht, 1978	T	blue-gray glyph
Glyphyalinia pecki Hubricht, 1966	T	blind glyph
Glyphyalinia pentadelphia (Pilsbry, 1900)	T	pink glyph
Glyphyalinia picea Hubricht, 1976	T	rust glyph
Glyphyalinia praecox (Baker, 1930)	T	brilliant glyph
Glyphyalinia raderi (Dall, 1898)	T	Maryland glyph
Glyphyalinia rhoadsi (Pilsbry, 1899)	T	sculpted glyph
Glyphyalinia rimula Hubricht, 1968	T	tongued glyph
Glyphyalinia roemeri (Pilsbry and Ferriss, 1906)	T	pretty glyph
Glyphyalinia sculptilis (Bland, 1858)	T	suborb glyph
Glyphyalinia specus Hubricht, 1965	T	hollow glyph
Glyphyalinia umbilicata (Cockerell, 1893)	T	Texas glyph
Glyphyalinia vanattai (Pilsbry and Walker, 1902)	T	honey glyph
Glyphyalinia virginica (Morrison, 1937)	T	depressed glyph
Glyphyalinia wheatleyi (Bland, 1883)	T	bright glyph
Hawaiia alachuana (Dall, 1885)	T	southeastern gem
Hawaiia miniscula (Binney, 1840)	T	minute gem
Hawaiia neomexicana (Cockerell and Pilsbry, 1900)	T	striate gem
Mesomphix andrewsae (Pilsbry, 1895)	T	mountain button
Mesomphix andrewsae montivagus (Pilsbry, 1895)	T	mountain wandering button
Mesomphix anurus Hubricht, 1962	T	frog button
Mesomphix capnodes (Binney, 1857)	T	dusky button
Mesomphix cupreus cupreus (Rafinesque, 1831)	T	copper button
Mesomphix cupreus ozarkensis (Pilsbry and Ferriss, 1906)	T	western copper button
Mesomphix cupreus miktus Pilsbry, 1946	T	interior copper button
Mesomphix cupreus politus (Pilsbry, 1898)	T	glossy copper button
Mesomphix derochetus Hubricht, 1962	T	long button
Mesomphix friabilis (Binney, 1857)	T	brittle button
Mesomphix globosus (MacMillan, 1940)	T	globose button
Mesomphix inornatus (Say, 1821)	T	plain button
Mesomphix latior latior (Pilsbry, 1900)	T	broad button
Mesomphix latior monticola Pilsbry 1911	T	broad mountain button
Mesomphix perlaevis (Pilsbry, 1900)	T	smooth button
Mesomphix pilsbryi (Clapp, 1904)	T	striate button
Mesomphix ruidus Hubricht, 1958	T	rough button
Mesomphix rugeli (Binney, 1879)	T	wrinkled button
Mesomphix rugeli oxycoccus (Vanatta, 1903)	T	cranberry wrinkled button
Mesomphix subplanus subplanus (Binney, 1842)	T	flat button
Mesomphix subplanus planus Banks, 1933	T	shiny flat button
Mesomphix vulgatus Baker, 1933	T	common button
Mesomphix vulgatus hartwrighti Pilsbry, 1946	T	Florida common button
Mesomphix perfragilis (Wetherby, 1894)	T	fragile button
Nesovitrea binneyana binneyana (Morse, 1864)	T	blue glass
Nesovitrea binneyana occidentalis (Baker, 1930)	T	spiral blue glass
Nesovitrea dalliana (Pilsbry and Simpson, 1889)	T	depressed glass
Nesovitrea electrina (Gould, 1841)	T	amber glass
Nesovitrea susannae Pratt, 1978	T	live oak glass
Oxychilus alliarius (Miller, 1822)	T	garlic glass-snail
Oxychilus cellarius (Muller, 1774)	T	cellar glass-snail
Oxychilus draparnaudi (Beck, 1837)	T	dark-bodied glass-snail
Oxychilus helveticus (Blum, 1881)	T	Swiss glass-snail
Paravitrea alethia Hubricht, 1978	T	true supercoil
Paravitrea amicalola Hubricht, 1976	T	tight supercoil
Paravitrea andrewsae (Binney, 1874)	T	Tall Mountain supercoil
Paravitrea aulacogyra (Pilsbry and Ferris, 1906)	T	striate supercoil
Paravitrea bellona Hubricht, 1978	T	clubbed supercoil
Paravitrea bidens Hubricht, 1963	T	gray supercoil
Paravitrea blarina Hubricht, 1963	T	shrew supercoil

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SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Paravitrea calcicola Baker, 1931	T	pearl supercoil
Paravitrea capsella (Gould, 1851)	T	funneled supercoil
Paravitrea capsella lacteodens (Pilsbry, 1903)	T	Ramp Cove supercoil
Paravitrea ceres Hubricht, 1978	T	sidelong supercoil
Paravitrea clappi (Pilsbry, 1898)	T	Mirey Ridge supercoil
Paravitrea conecuhensis (Clapp, 1917)	T	triangular supercoil
Paravitrea dentilla Hubricht, 1978	T	comb supercoil
Paravitrea diana Hubricht, 1983	T	hunted supercoil
Paravitrea grimmi Hubricht, 1968	T	buff supercoil
Paravitrea hera Hubricht, 1983	T	spirit supercoil
Paravitrea lamellidens (Pilsbry, 1898)	T	lamellate supercoil
Paravitrea lapilla Hubricht, 1965	T	shiny supercoil
Paravitrea metallacta Hubricht, 1963	T	Caneyfork supercoil
Paravitrea mira Hubricht, 1975	T	funnel supercoil
Paravitrea multidentata (Binney, 1840)	T	dentate supercoil
Paravitrea petrophila (Bland, 1883)	T	Cherokee supercoil
Paravitrea pilsbryana (Clapp, 1919)	T	translucent supercoil
Paravitrea pontis Baker, 1931	T	Natural Bridge supercoil
Paravitrea reesi Morrison, 1937	T	round supercoil
Paravitrea septadens Hubricht, 1978	T	brown supercoil
Paravitrea seradens Hubricht, 1972	T	barred supercoil
Paravitrea significans (Bland, 1866)	T	domed supercoil
Paravitrea simpsoni (Pilsbry, 1889)	T	amber supercoil
Paravitrea subtilis Hubricht, 1978	T	slender supercoil
Paravitrea tantilla Hubricht, 1963	T	teasing supercoil
Paravitrea ternaria Hubricht, 1978	T	sculpted supercoil
Paravitrea tiara Hubricht, 1978	T	crowned supercoil
Paravitrea toma Hubricht, 1975	T	sharp supercoil
Paravitrea tridens Pilsbry, 1946	T	white-footed supercoil
Paravitrea umbilicaris (Ancey, 1887)	T	open supercoil
Paravitrea variabilis Baker, 1929	T	variabile supercoil
Paravitrea varidens Hubricht, 1978	T	roan supercoil
Pilsbryna aurea Baker, 1929	T	ornate bud
Pilsbryna castanea Baker, 1931	T	prominent bud
Pristiloma arcticum arcticum (Lehnert, 1884)	T	northern tightcoil
Pristiloma arcticum crateris Pilsbry, 1946	T	crescent tightcoil
Pristiloma chersinella (Dall, 1886)	T	black-footed tightcoil
Pristiloma gabrielinum (Berry, 1924)	T	waxy tightcoil
Pristiloma idahoensis Pilsbry, 1902	T	thin-lipped tightcoil
Pristiloma johnsoni (Dall, 1895)	T	broadwhorl tightcoil
Pristiloma juniperum A. G. Smith, 1957	T	cedar tightcoil
Pristiloma lansingi (Bland, 1875)	T	denticulate tightcoil
Pristiloma nicholsoni Baker, 1930	T	riparion tightcoil
Pristiloma orotis (Berry, 1930)	P	minute tightcoil
Pristiloma pilsbryi Vanatta, 1899	T	crowned tightcoil
Pristiloma shepardae (Hemphill, 1892)	T	island tightcoil
Pristiloma stearnsi (Bland, 1875)	T	striated tightcoil
Pristiloma subrupicola spelaeus (Dall, 1895)	T	large southern tightcoil
Pristiloma subrupicola subrupicola (Dall, 1877)	T	southern tightcoil
Pristiloma wascoense (Hemphill, 1911)	T	shiny tightcoil
Striatura exigua (Stimpson, 1850)	T	ribbed striate
Striatura ferrea Morse, 1864	T	black striate
Striatura meridionalis (Pilsbry and Ferriss, 1906)	T	median striate
Striatura milium (Morse, 1859)	T	fine-ribbed striate
Striatura pugentensis (Dall, 1895)	T	northwest striate
Ventridens acerra (Lewis, 1870)	T	glossy dome
Ventridens arcellus Hubricht, 1976	T	golden dome
Ventridens brittsi (Pilsbry, 1892)	T	western dome
Ventridens cerinoideus (Anthony, 1865)	T	wax dome
Ventridens coelaxis (Pilsbry, 1899)	T	bidentate dome
Ventridens collisella (Pilsbry, 1896)	T	sculptured dome
Ventridens decussatus (Walker and Pilsbry, 1902)	T	crossed dome
Ventridens demissus (Binney, 1843)	T	perforate dome
Ventridens eutropis Pilsbry, 1946	T	carinate dome
Ventridens gularis (Say, 1822)	T	throaty dome
Ventridens intertextus (Binney, 1841)	T	pyramid dome
Ventridens lasmodon (Phillips, 1841)	T	hollow dome
Ventridens lawae (Binney, 1892)	T	rounded dome
Ventridens ligera (Say, 1821)	T	globose dome
Ventridens monodon Hubricht, 1964	T	single dome

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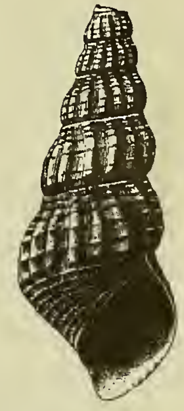

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SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Ventridens percallosus (Pilsbry, 1898)	T	Chattanooga dome
Ventridens pilsbryi Hubricht, 1964	T	yellow dome
Ventridens suppressus (Say, 1829)	T	flat dome
Ventridens theloides (Walker and Pilsbry, 1902)	T	copper dome
Ventridens virginicus (Vanatta, 1936)	T	split-tooth dome
Ventridens volusiae (Pilsbry, 1900)	T	fragile dome
Vitrea contracta (Westerlund, 1871)	T	contracted glass-snail
Vitrizonites latissimus (Lewis, 1875)	T	glassy grapeskin
Zonitoides arboreus (Say, 1816)	T	quick gloss
Zonitoides elliotti (Redfield, 1856)	T	green dome
Zonitoides kirbyi Fullington, 1974	T	Schulze Cave gloss
Zonitoides lateumbilicatus (Pilsbry, 1895)	T	striate gloss
Zonitoides limatulus (Binney, 1840)	T	dull gloss
Zonitoides nitidus (Muller, 1774)	T	black gloss
Zonitoides patuloides (Pilsbry, 1895)	T	Appalachian gloss

Vitrinidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Vitrina alaskana Dall, 1908	T	autumn glass-snail
Vitrina limpida (Gould, 1850)	T	clear glass-snail
Vitrina pellucida angelicae Beck, 1837	T	polished glass-snail

Limacidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Deroceras caruanae (Pollonera, 1891)	T	longneck field slug
Deroceras hesperium Pilsbry, 1944	T	evening field slug
Deroceras heterura (Pilsbry, 1944)	T	false marsh slug
Deroceras laeve (Muller, 1774)	T	marsh slug
Deroceras monentolophus Pilsbry, 1944	T	one-ridge field slug
Deroceras reticulatum (Muller, 1774)	T	gray field slug
Limax flavus Linneaus, 1758	T	yellow garden slug
Limax marginatus Muller, 1774	T	tree slug
Limax maximus (Linneaus, 1758)	T	giant garden slug
Limax nyctelius Bourguignat, 1861	T	false tree slug
Limax valentianus Ferussac, 1823	T	three-banded garden slug

Milacidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Milax gagates (Draparnaud, 1801)	T	jet greenhouse slug

Testacellidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Testacella haliotidea Draparnaud, 1801	T	earshell slug

Polygyridae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Allogona lombardii Smith, 1943	T	Selway forestsnail
Allogona profunda (Say, 1821)	T	broadbanded forestsnail
Allogona ptychophora (Brown, 1870)	T	Idaho forestsnail
Allogona townsendiana (Lea, 1838)	T	Oregonian forestsnail
Ashmunella amblya Pilsbry, 1940	T	Pine Springs woodlandsnail
Ashmunella angulata Pilsbry, 1905	T	angulate woodlandsnail
Ashmunella animasensis Vagvolgyi, 1974	T	Animas Peak woodlandsnail
Ashmunella ashmuni (Dall, 1896)	T	Jemez woodlandsnail
Ashmunella auriculata Vagvolgyi, 1974	T	Boulder Canyon woodlandsnail
Ashmunella bequaerti Clench and Miller, 1966	T	Goat Cave woodlandsnail
Ashmunella binneyi Pilsbry and Ferriss, 1917	T	Silver Creek woodlandsnail
Ashmunella carlsbadensis Pilsbry, 1932	T	Guadelupe woodlandsnail
Ashmunella chiricahuana (Dall, 1895)	T	Cave Creek woodlandsnail
Ashmunella cockerelli Pilsbry and Ferriss, 1917	T	Black Range woodlandsnail
Ashmunella danielsi Pilsbry and Ferriss, 1915	T	Whitewater Creek woodlandsnail
Ashmunella escuritor Pilsbry, 1915	T	Barfoot woodlandsnail
Ashmunella ferrissi Pilsbry, 1905	T	Reed's Mountain woodlandsnail
Ashmunella harrisi Metcalf and Smartt, 1977	T	Goat Mountain woodlandsnail
Ashmunella hebardi Pilsbry and Vanatta, 1923	T	Hacheta Grande woodlandsnail
Ashmunella kochi Clapp, 1908	T	San Andreas woodlandsnail
Ashmunella lepiderma Pilsbry and Ferriss, 1910	T	whitetail woodlandsnail
Ashmunella levettei (Bland, 1882)	T	Huachuca woodlandsnail
Ashmunella macromphala Vagvolgyi, 1974	T	Cook's Peak woodlandsnail

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Ashmunella mearnsi (Dall, 1895)	T	Big Hatchet woodlandsnail
Ashmunella mendax Pilsbry and Ferriss, 1917	T	Iron Creek woodlandsnail
Ashmunella mogollonensis Pilsbry, 1905	T	Mogollon woodlandsnail
Ashmunella mudgei Cheatham, 1971	T	Sawtooth Mountain woodlandsnail
Ashmunella organensis Pilsbry, 1936	T	Organ Mountains woodlandsnail
Ashmunella pasonis (Drake, 1951)	T	Franklin Mountains woodlandsnail
Ashmunella pilsbryana Ferriss, 1914	T	Blue Mountains woodlandsnail
Ashmunella proxima Pilsbry, 1915	T	Chiricahua woodlandsnail
Ashmunella pseudodonta (Dall, 1897)	T	Capitan woodlandsnail
Ashmunella rhyssa (Dall, 1897)	T	Sierra Blanca woodlandsnail
Ashmunella rileyensis Metcalf and Hurley, 1971	T	Mount Riley woodlandsnail
Ashmunella salinasensis Vagvolgyi, 1974	T	Salinas Peak woodlandsnail
Ashmunella sprouli Fullington and Fullington, 1978	T	Hell's Canyon woodlandsnail
Ashmunella tetrodon Pilsbry and Ferriss, 1915	T	Dry Creek woodlandsnail
Ashmunella thompsoniana (Ancey, 1887)	T	Sangre de Christo woodlandsnail
Ashmunella todseni Metcalf and Smartt, 1977	T	Maple Canyon woodlandsnail
Ashmunella varicifera (Ancey, 1897)	T	Miller Canyon woodlandsnail
Ashmunella walkeri Ferriss. 1904	T	Florida Mountains woodlandsnail
Cryptomastix devia (Gould, 1846)	T	Puget Sound oregonian
Cryptomastix germana (Gould, 1851)	T	pygmy oregonian
Cryptomastix hendersoni (Pilsbry, 1928)	T	Columbia River oregonian
Cryptomastix magnidentata (Pilsbry, 1940)	T	Mission Creek oregonian
Cryptomastix mullani blandi (Hemphill, 1892)	T	Postfalls oregonian
Cryptomastix mullani clappi (Hemphill, 1897)	T	Salmon River oregonian
Cryptomastix mullani latilabris (Pilsbry, 1940)	T	John Day oregonian
Cryptomastix mullani mullani (Bland and Cooper, 1861)	T	Coeur d'Alene oregonian
Cryptomastix mullani olneyae (Pilsbry, 1891)	T	Olney oregonian
Cryptomastix sanburni (W. G. Binney, 1886)	T	Kingston oregonian
Cryptomastix mullani tuckeri (Pilsbry and Henderson, 1930)	T	Clearwater oregonian
Cryptomastix harfordiana (Binney, 1878)	T	incerta sedis
Euchemotrema cheatumi (Fullington, 1974)	T	palmetto pillsnail
Euchemotrema fasciatum (Pilsbry, 1940)	T	mountain pillsnail
Euchemotrema fraternum (Say, 1824)	T	upland pillsnail
Euchemotrema hubrichti (Pilsbry, 1940)	T	carinate pillsnail
Euchemotrema leai (Binney, 1841)	T	lowland pillsnail
Euchemotrema wichitorum (Branson, 1972)	T	Wichita Mountains pillsnail
Mesodon andrewsae Binney, 1879	T	balsam globe
Mesodon appressus (Say, 1821)	T	flat bladetooth
Mesodon approximans (Clapp, 1905)	T	tight-gapped shagreen
Mesodon archeri Pilsbry, 1940	T	Ocoee covert
Mesodon binneyanus (Pilsbry, 1899)	T	half-lidded oval
Mesodon chilhoweensis (Lewis, 1870)	T	queen crater
Mesodon christyi (Bland, 1860)	T	glossy covert
Mesodon clarki (Lea, 1858)	T	dwarf proud globe
Mesodon clausus (Say, 1821)	T	yellow globelet
Mesodon clenchi (Rehder, 1932)	T	calico rock oval
Mesodon downieanus (Bland, 1861)	T	dwarf globelet
Mesodon edentatus (Sampson, 1889)	T	smooth-lipped shagreen
Mesodon elevatus (Say, 1821)	T	proud globe
Mesodon ferrissi (Pilsbry, 1897)	T	Smokey Mountain covert
Mesodon indianorum (Pilsbry, 1899)	T	lidded oval
Mesodon inflectus (Say, 1821)	T	shagreen
Mesodon jonesianus (Archer, 1938)	T	big-toothed covert
Mesodon kalmianus Hubricht, 1965	T	brown globelet
Mesodon kiowaensis (Simpson, 1888)	T	drywoods oval
Mesodon leatherwoodi Pratt, 1971	T	Pedernales oval
Mesodon magazinensis (Pilsbry and Ferris, 1906)	T	Magazine Mountain shagreen
Mesodon mitchellianus (Lea, 1839)	T	sealed globelet
Mesodon normalis (Pilsbry, 1900)	T	grand globe
Mesodon orestes Hubricht, 1975	T	engraved covert
Mesodon panselenus Hubricht, 1976	T	Virginia bladetooth
Mesodon pennsylvanicus (Green, 1827)	T	proud globelet
Mesodon perigraptus Pilsbry, 1894	T	engraved bladetooth
Mesodon roemeri (Pfeiffer, 1848)	T	Texas oval
Mesodon rugeli (Shuttleworth, 1852)	T	deep-tooth shagreen
Mesodon sanus (Clench and Archer, 1933)	T	squat globelet

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SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Mesodon sargentianus (Johnson and Pilsbry, 1892)	T	grand bladetooth
Mesodon sayanus (Pilsbry, 1906)	T	spike-lipped crater
Mesodon smithi (Clapp, 1905)	T	Alabama shagreen
Mesodon subpalliatus (Pilsbry, 1893)	T	velvet covert
Mesodon thyroidus (Say, 1816)	T	whitelipped globe
Mesodon wetherbyi (Bland, 1873)	T	clifty covert
Mesodon wheatleyi (Bland, 1860)	T	cinnamon covert
Mesodon zaletus (Binney, 1837)	T	toothed globe
Polygyra auriculata Say, 1818	T	Ocala liptooth
Polygyra auriformis (Bland, 1859)	T	Gulf Coast liptooth
Polygyra avara Say, 1818	T	Florida liptooth
Polygyra cereolus (Muhlfeld, 1818)	T	southern flatcoil
Polygyra delecta Hubricht, 1976	T	Gulf Hammocks liptooth
Polygyra dorfueilliana (Lea, 1838)	T	Oakwoods liptooth
Polygyra gracilis Hubricht, 1961	T	Edwards Plateau liptooth
Polygrya hausmani Jackson, 1948	T	Dixie liptooth
Polygyra mooreana (Binney, 1858)	T	Blackland liptooth
Polygyra peninsulae Pilsbry, 1940	T	St. Johns liptooth
Polygyra plana bahamensis Vanatta, 1919	T	Bahaman flatcoil
Polygyra polita Pilsbry and Hinkley, 1907	T	Tamaulipas liptooth
Polygyra postelliana (Bland, 1859)	T	Sea Islands liptooth
Polygyra pustula (Say, 1821)	T	grooved liptooth
Polygyra pustuloides (Bland, 1858)	T	tiny liptooth
Polygyra septemvolva (Say, 1818)	T	Florida flatcoil
Polygyra subclausa Pilsbry, 1940	T	Suwannee liptooth
Polygyra texasiana (Moricand, 1833)	T	Texas liptooth
Polygyra tholus (Binney, 1858)	T	Brazos liptooth
Polygyra uvulifera (Shuttleworth, 1852)	T	peninsula liptooth
Praticolella bakeri Vanetta, 1915	T	Orlando shrubsnail
Praticolella berlandieriana (Moricand, 1833)	T	shoulderbanded shrubsnail
Praticolella candida Hubricht, 1983	T	white shrubsnail
Praticolella griseola (Pfeiffer, 1841)	T	Vera Cruz shrubsnail
Praticolella jujuna (Say, 1821)	T	Florida shrubsnail
Praticolella lawae (Lewis, 1874)	T	Appalachian shrubsnail
Praticolella mobiliana (Lea, 1841)	T	Mobile shrubsnail
Praticolella pachyloma (Menke, 1847)	T	coastal prairie shrubsnail
Praticolella taeniata Pilsbry, 1940	T	many-banded shrubsnail
Praticolella trimatris Hubricht, 1983	T	Hidalgo shrubsnail
Stenotrema angellum Hubricht, 1958	T	Kentucky slitmouth
Stenotrema altispira (Pilsbry, 1894)	T	Black Mountains slitmouth
Stenotrema barbatum (Clapp, 1904)	T	bristled slitmouth
Stenotrema barbigerum (Redfield, 1856)	T	fringed slitmouth
Stenotrema blandianum (Pilsbry, 1903)	T	Missouri slitmouth
Stenotrema brevipila (Clapp, 1907)	T	Talladega slitmouth
Stenotrema calvescens Hubricht, 1961	T	Chattanooga slitmouth
Stenotrema cohuttense (Clapp, 1914)	T	Cohutta slitmouth
Stenotrema deceptum (Clapp, 1905)	T	Monte Sano slitmouth
Stenotrema depilatum (Pilsbry, 1895)	T	Great Smokeys slitmouth
Stenotrema edgarianum (Lea, 1841)	T	Sequatchie slitmouth
Stenotrema edvardsi (Bland, 1856)	T	ridge-and-valley slitmouth
Stenotrema exodon (Pilsbry, 1900)	T	Alabama slitmouth
Stenotrema florida Pilsbry, 1940	T	Applachicola slitmouth
Stenotrema hirsutum (Say, 1817)	T	hairy slitmouth
Stenotrema labrosum (Bland, 1862)	T	Ozarkian slitmouth
Stenotrema magnafumosum (Pilsbry, 1900)	T	Appalachian slitmouth
Stenotrema maxillatum (Gould, 1848)	T	ridgelipped slitmouth
Stenotrema pilsbryi (Ferriss, 1900)	T	Rich Mountain slitmouth
Stenotrema pilula (Pilsbry, 1900)	T	pygmy slitmouth
Stenotrema simile Grimm, 1971	T	Bear Creek slitmouth
Stenotrema spinosum (Lea, 1830)	T	carinate slitmouth
Stenotrema stenotrema (Pfeiffer, 1842)	T	southern slitmouth
Stenotrema unciferum (Pilsbry, 1900)	T	Oachita slitmouth
Stenotrema waldense Archer, 1938	T	Doaks Creek slitmouth
Triodopsis alabamensis (Pilsbry, 1902)	T	Alabama three-tooth
Triodopsis albolabris (Say, 1816)	T	whitelip
Triodopsis alleni (Sampson, 1883)	T	western whitelip
Triodopsis burchi Hubricht, 1950	T	Pittsylvania three-tooth
Triodopsis caroliniensis (Lea, 1834)	T	blunt wedge
Triodopsis chadwicki (Ferriss, 1907)	T	Kaw River whitelip
Triodopsis claibornensis Lutz, 1950	T	Claiborne three-tooth
Triodopsis complanata (Pilsbry, 1898)	T	glossy three-tooth
Triodopsis cragini Call, 1886	T	Post Oak three-tooth
Triodopsis dentifera (Binney, 1837)	T	big-toothed whitelip

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SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Triodopsis denotata (Perussac, 1821)	T	black velvet wedge
Triodopsis discoidea Pilsbry, 1894	T	rivercliff three-tooth
Triodopsis divesta (Gould, 1848)	T	Ozarkian whitelip
Triodopsis fallax (Say, 1825)	T	pinhole three-tooth
Triodopsis fosteri (Baker, 1821)	T	bladetooth wedge
Triodopsis fradulenta (Pilsbry, 1894)	T	baffled three-tooth
Triodopsis fulciden Hubricht, 1952	T	dwarf buttressed three-tooth
Triodopsis henriettae (Mazyck, 1877)	T	Pineywoods three-tooth
Triodopsis hopetonensis (Shuttlesworth, 1852)	T	sand three-tooth
Triodopsis juxtidens (Pilsbry, 1894)	T	Atlantic three-tooth
Triodopsis lioderma (Pilsbry, 1902)	T	Tulsa whitelip
Triodopsis major (Binney, 1837)	T	southeastern whitelip
Triodopsis maratima (Pilsbry, 1890)	T	coastal whitelip
Triodopsis messana Hubricht, 1952	T	pinhole sand three-tooth
Triodopsis multilineata (Say, 1821)	T	striped whitelip
Triodopsis neglecta (Pilsbry, 1899)	T	Ozark three-tooth
Triodopsis obsoleta (Pilsbry, 1894)	T	smooth-lipped sand three-tooth
Triodopsis obstricta (Say, 1821)	T	sharp wedge
Triodopsis occidentalis (Pilsbry and Ferriss, 1894)	T	Arkansas wedge
Triodopsis palustris Hubricht, 1958	T	Santee three-tooth
Triodopsis pendula Hubricht, 1952	T	Hanging Rock three-tooth
Triodopsos picea Hubricht, 1958	T	Spruce Knob three-tooth
Triodopsis platysayoides (Brooks, 1933)	T	Cheat River three-tooth
Triodopsis rugosa Brooks and McMillan, 1940	T	buttressed three-tooth
Triodopsis soelneri (Henderson, 1907)	T	Cape Fear three-tooth
Triodopsis tridentata (Say, 1816)	T	northern three-tooth
Triodopsis tennesseensis (Walker, 1902)	T	budded three-tooth
Triodopsis vannostrandi (Bland, 1875)	T	tight-coiled three-tooth
Triodopsis vulgata Pilsbry, 1940	T	dished three-tooth
Triodopsis vultuosa (Gould, 1848)	T	Texas three-tooth
Trilobopsis loricata (Gould, 1846)	T	scaley chaparral
Trilobopsis penitens (Hana and Rixford, 1923)	T	Mormon Island chaparral
Trilobopsis roperi (Pilsbry, 1899)	T	shasta chaparral
Trilobopsis tehamana (Pilsbry, 1928)	T	Tehama chaparral
Trilobopsis trachypepla (Berry, 1933)	T	Bridge Creek chaparral
Upsilodon chisosensis (Pilsbry, 1936)	T	Chisos liptooth
Upsilodon deltoidea (Simpson, 1889)	T	Oklahoma liptooth
Upsilodon fatigiata (Say, 1829)	T	New Harmony liptooth
Upsilodon hippocrepis (Pfeiffer, 1848)	T	horseshoe liptooth
Upsilodon leporina (Gould, 1848)	T	Gulf Coast liptooth
Upsilodon jacksoni (Bland, 1866)	T	Ozark liptooth
Upsilodon peregrina (Rehder, 1932)	T	White River liptooth
Upsilodon plicata (Say, 1821)	T	Cumberland liptooth
Upsilodon simpsoni (Pilsbry and Ferriss, 1907)	T	Wyandotte liptooth
Upsilodon troostiana (Lea, 1839)	T	Nashville liptooth
Vespericola armigera (Ancey, 1887)	T	Santa Cruse hesperian
Vespericola columbiana (Lea, 1838)	T	northwest hesperian
Vespericola hapla (Berry, 1933)	T	Butte Creek hesperian
Vespericola karakorum Talmadge, 1962	T	Karok hesperian
Vespericola megasoma (Pilsbry, 1928)	T	redwood hesperian
Vespericola pinicola (Berry, 1916)	T	Monterey hesperian
Vespericola shasta (Berry, 1921)	T	shasta hesperian
Vespericola sierrana (Berry, 1921)	T	Siskiyou hesperian

Sagdidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Hojeda inaguensis (Weinland, 1880)	T	Keys mudcloak
Lacteoluna selenina (Gould, 1848)	T	moonlight mudcloak

Thysanophoridae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Microphysula cookei (Pilsbry, 1922)	T	Vancouver snail
Microphysula ingersolli (Bland, 1874)	T	spruce snail
Thysanophora horni (Gabb, 1866)	T	southwestern fringed snail
Thysanophora plagioptycha (Shuttleworth, 1854)	T	lyrate fringed snail

Camaenidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Zachrysia auricoma (Ferussac, 1821)	T	golden zachrysia

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Zachrysia provisoria (Pfeiffer, 1858)	T	Cuban garden zachrysia
Ammonitellidae		
Ammonitella yatesi (Cooper, 1868)	T	ammonite snail
Glyptostoma gabrielense Pilsbry, 1938	T	San Gabriel chestnut
Glyptostoma newberryanum (Binney, 1858)	T	San Diego chestnut
Megomphix californica Smith, 1960	T	Natural Bridge megomphid
Megomphix hemphilli (Binney, 1879)	T	Oregonian megomphid
Megomphix leutarius Baker, 1932	T	Umatilla megomphid
Polygyrella polygyrella (Bland and Cooper, 1861)	T	Coeur d'Alene snail
Polygyroidea harfordiana (Cooper, 1870)	T	Wawona Point snail
Oreohelicidae		
Oreohelix alpina (Elrod, 1901)	T	alpine mountainsnail
Oreohelix amariradix Pilsbry, 1902	T	Bitter Root mountainsnail
Oreohelix anchana Gregg, 1953	T	Ancha mountainsnail
Oreohelix barbata Pilsbry, 1905	T	bearded mountainsnail
Oreohelix californica Berry, 1931	T	Clark mountainsnail
Oreohelix carinifera Pilsbry, 1912	T	keeled mountainsnail
Oreohelix concentrata (Dall, 1890)	T	Huachuca mountainsnail
Oreohelix confragosa Metcalf, 1974	T	Pinos Altos mountainsnail
Oreohelix elrodi (Pilsbry, 1900)	T	carinate mountainsnail
Oreohelix eurekensis Henderson and Daniels, 1916	T	Eureka mountainsnail
Oreohelix florida Pilsbry, 1939	T	Florida mountainsnail
Oreohelix grahamensis Gregg and Miller, 1974	T	Pinaleno mountainsnail
Oreohelix handi Pilsbry and Ferriss, 1918	T	Spring mountainsnail
Oreohelix haydeni (Gabb, 1869)	T	lyrate mountainsnail
Oreohelix hemphilli (Newcomb, 1869)	T	pine mountainsnail
Oreohelix hendersoni Pilsbry, 1912	T	pallid mountainsnail
Oreohelix houghi Marshall, 1929	T	Canyon Diablo mountainsnail
Oreohelix howardi Jones, 1944	T	Mill Creek mountainsnail
Oreohelix idahoensis (Newcomb, 1866)	T	costate mountainsnail
Oreohelix intersum (Hemphill, 1890)	T	Deep Slide mountainsnail
Oreohelix jaegeri Berry, 1931	T	Kyle Canyon mountainsnail
Oreohelix jugalis (Hemphill, 1890)	T	Boulder Pile mountainsnail
Oreohelix junii Pilsbry, 1934	T	Grand Coulee mountainsnail
Oreohelix littoralis Crews and Metcalf, 1982	T	San Augustin mountainsnail
Oreohelix magdalenae Pilsbry, 1939	T	Magdalena mountainsnail
Oreohelix metcalfei Cockerell, 1905	T	Black Range mountainsnail
Oreohelix nevadensis Berry, 1932	T	Schell Creek mountainsnail
Oreohelix peripherica (Ancey, 1881)	T	Deseret mountainsnail
Oreohelix pilsbryi Ferriss, 1917	T	Mineral Creek mountainsnail
Oreohelix pygmaea Pilsbry, 1913	T	pygmy mountainsnail
Oreohelix socorroensis Pilsbry, 1905	T	Socorro mountainsnail
Oreohelix strigosa (Gould, 1846)	T	Rocky mountainsnail
Oreohelix subrudis (Reeve, 1854)	T	subalpine mountainsnail
Oreohelix swopei Pilsbry and Ferriss, 1917	T	Morgan Creek mountainsnail
Oreohelix tenuistriata (Henderson and Daniels, 1916)	T	thin-ribbed mountainsnail
Oreohelix uinta Brooks, 1939	T	Uinta mountainsnail
Oreohelix vortex Berry, 1932	T	whorled mountainsnail
Oreohelix waltoni Solem, 1975	T	lava rock mountainsnail
Oreohelix yavapai Pilsbry, 1905	T	yavapai mountainsnail
Radiocentrum avalonensis (Hemphill, 1905)	T	Catalina mountainsnail
Radiocentrum chiricahuana (Pilsbry, 1905)	T	Chiricahuana mountainsnail
Radiocentrum clappi (Ferriss, 1904)	T	Cave Creek mountainsnail
Radiocentrum ferrissi (Pilsbry, 1915)	T	fringed mountainsnail
Radiocentrum hachetana (Pilsbry, 1915)	T	Hacheta mountainsnail
Udosarx lyrata Webb, 1959	T	lyre mantleslug
Bradybaenidae		
Bradybaena similaris (Ferussac, 1821)	T	Asian tramp
Helminthoglyptidae		
Eremarionta aquaealbae Berry, 1922	T	Whitewater dessertsnail
Eremarionta brunnea Willett, 1935	T	Chuckwalla Spring dessertsnail
Eremarionta greggi Miller, 1981	T	Panamint dessertsnail
Eremarionta immaculata Willett, 1937	T	white dessertsnail

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Eremarionta indioensis (Yates, 1890)	T	Coachella dessertsnail
Eremarionta millepalmarum Berry, 1930	T	Thousand Palms dessertsnail
Eremarionta morongoana Berry, 1929	T	Morongo dessertsnail
Eremarionta orocopia Willett, 1939	T	Orocopia dessertsnail
Eremarionta rowelli (Newcomb, 1865	T	eastern dessertsnail
Eremariontoides argus (Edson, 1912	T	Argus dessertsnail
Eremarionta newcombi Pilsbry and Ferriss, 1923	T	incerta sedis
Gliabates oregonia Webb, 1959	T	salamander slug
Helminthoglypta allyniana (Berry, 1920)	T	Sierra shoulderband
Helminthoglypta allynsmithi Pilsbry, 1939	T	Merced Canyon shoulderband
Helminthoglypta arrosa (Binney, 1858)	T	bronze shoulderband
Helminthoglypta ayresiana (Newcomb, 1861)	T	San Miguel shoulderband
Helminthoglypta benitoensis Lowe, 1930	T	Pinnacles shoulderband
Helminthoglypta berryi Hanna, 1929	T	Tehachapi shoulderband
Helminthoglypta californiensis (Lea, 1838)	T	Point Pinos shoulderband
Helminthoglypta callistoderma (Pilsbry and Ferriss, 1918)	T	Kern River shoulderband
Helminthoglypta carpenteri (Newcomb), 1861)	T	San Joaquin shoulderband
Helminthoglypta caruthersi Willett, 1934	T	Morris Canyon shoulderband
Helminthoglypta contracosta (Pilsbry, 1895)	T	contracosta shoulderband
Helminthoglypta crotalina Berry, 1928	T	Sidewinder shoulderband
Helminthoglypta cypreophila (Binney and Bland, 1869)	T	foothills shoulderband
Helminthoglypta cuyama Hanna and Smith, 1937	T	Cuyama shoulderband
Helminthoglypta cuyamacensis (Bartsch, 1895)	T	Cuyamaca shoulderband
Helminthoglypta diabloensis (Cooper, 1868)	T	silky shoulderband
Helminthoglypta dupetithoursi (Deshayes, 1840)	T	cypress shoulderband
Helminthoglypta edwardsi Gregg and Miller, 1976	T	Pine Valley shoulderband
Helminthoglypta euomphalodes Berry, 1938	T	greenhorn shoulderband
Helminthoglypta exarata (Pfeiffer, 1857)	T	Santa Cruz shoulderband
Helminthoglypta expansilabris (Pilsbry, 1898)	T	Mendocino shoulderband
Helminthoglypta ferrissi Pilsbry, 1924	T	Kings River shoulderband
Helminthoglypta fieldi Pilsbry, 1930	T	surf shoulderband
Helminthoglypta fisheri Bartsch, 1904	T	Panamint shoulderband
Helminthoglypta fontiphila Gregg, 1931	T	Soledad shoulderband
Helminthoglypta graniticola Berry, 1926	T	granite shoulderband
Helminthoglypta greggi Willett, 1931	T	Mohave shoulderband
Helminthoglypta hertleini Hanna and Smith, 1937	T	Oregon shoulderband
Helminthoglypta inglesi Berry, 1938	T	Horse Meadows shoulderband
Helminthoglypta isabella Berry, 1938	T	yucca shoulderband
Helminthoglypta jaegeri Berry, 1928	T	Sweetwater shoulderband
Helminthoglypta liodoma Berry, 1938	T	cottonwood shoulderband
Helminthoglypta micrometalleoides Miller, 1970	T	mimic shoulderband
Helminthoglypta mohaveana Berry, 1927	T	Victorville shoulderband
Helminthoglypta napaea Berry, 1938	T	bigtree shoulderband
Helminthoglypta nickliniana (Lea, 1838)	T	Coast Range shoulderband
Helminthoglypta petricola (Berry, 1916)	T	Transverse Range shoulderband
Helminthoglypta orina Berry, 1938	T	Breckenridge shoulderband
Helminthoglypta proles (Hemphill, 1892)	T	Yosemite shoulderband
Helminthoglypta reediana Willett, 1932	T	Lowe Canyon shoulderband
Helminthoglypta similans Hanna and Smith, 1937	T	Coalinga shoulderband
Helminthoglypta sequoicola (Cooper, 1866)	T	redwood shoulderband
Helminthoglypta sonoma Pilsbry, 1937	T	Sonoma shoulderband
Helminthoglypta stageri Willett, 1938	T	Piute shoulderband
Helminthoglypta stiversiana (Cooper, 1875)	T	Point Reyes shoulderband
Helminthoglypta thermimontis Berry, 1953	T	coyote shoulderband
Helminthoglypta traski (Newcomb, 1861)	T	Peninsular Ranges shoulderband
Helminthoglypta tudiculata (Binney, 1843)	T	Southern California shoulderband
Helminthoglypta tularensis (Hemphill, 1892)	T	Tulare shoulderband
Helminthoglypta umbilicata (Pilsbry, 1897)	T	Big Sur shoulderband
Helminthoglypta walkeriana (Hemphill, 1911)	T	Morro shoulderband
Helminthoglypta waltoni Gregg and Miller, 1976	T	Laguna shoulderband
Hemitrochus varians (Menke, 1829)	T	sea grape snail
Humboldtiana agavophila Pratt, 1971	T	Agave threeband
Humboldtiana cheatumi Pilsbry, 1935	T	Davis Mountains threeband

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SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Humboldtiana chisosensis Pilsbry, 1927	T	Chisos threeband
Humboldtiana edithae Parodiz, 1954	T	boulder slide threeband
Humboldtiana ferrissiana Pilsbry, 1928	T	Mitre Peak threeband
Humboldtiana fullingtoni Cheatham, 1972	T	Capote threeband
Humboldtiana hoegiana praesidii Pilsbry, 1939	T	San Carlos threeband
Humboldtiana palmeri Clench, 1930	T	Mt. Livermore threeband
Humboldtiana texana Pilsbry, 1891	T	Stockton Plateau threeband
Humboldtiana ultima Pilsbry, 1927	T	northern threeband
Micrarionta facta (Newcomb, 1864)	T	Santa Barbara islandsnail
Micrarionta feralis (Hemphill, 1901)	T	San Nicolas islandsnail
Micrarionta gabbi (Newcomb, 1864)	T	San Clemente islandsnail
Micrarionta opuntia Roth, 1975	T	pricklypear islandsnail
Micrarionta rufocincta (Newcomb, 1864)	T	Santa Catalina islandsnail
Mohavelix micrometaleus (Berry, 1930)	T	El Paso shoulderband
Monadenia churchi Hanna and Smith, 1933	T	Klamath sideband
Monadenia circumcarinata (Stearns, 1879)	T	keeled sideband
Monadenia fidelis (Gray, 1834)	T	Pacific sideband
Monadenia hillebrandi (Newcomb, 1864)	T	Mariposa sideband
Monadenia infumata (Gould, 1855)	T	redwood sideband
Monadenia marmoratis Berry, 1940	T	marble sideband
Monadenia mormonum (Pfeiffer, 1857)	T	Sierra sideband
Monadenia setosa Talmadge, 1952	T	bristled sideband
Monadenia troglodytes Hanna and Smith, 1933	T	Shasta sideband
Monadenia tuolumnea Berry, 1955	T	tuolumnea sideband
Monadenia callipeplus Berry, 1940	T	incerta cedis
Monadenia cristulata Berry, 1940	T	incerta cedis
Monadenia rotifer Berry, 1940	T	incerta cedis
Plesarionta stearnsiana (Gabb, 1867)	T	speckled cactussnail
Sonorella allynsmithi Gregg and Miller, 1969	T	Squaw Park talussnail
Sonorella ambigua Pilsbry and Ferriss, 1915	T	Papago talussnail
Sonorella anchana Berry, 1948	T	Sierra Ancha talussnail
Sonorella animasensis Pilsbry, 1939	T	Animas talussnail
Sonorella apache Pilsbry and Ferriss, 1915	T	Apache talussnail
Sonorella ashmuni Bartsch, 1904	T	Richinbar talussnail
Sonorella baboquivariensis Pilsbry and Ferriss, 1915	T	Baboquivari talussnail
Sonorella bagnarai Miller, 1967	T	Rincon Peak snail
Sonorella bartschi Pilsbry and Ferriss, 1915	T	Escabrosa talussnail
Sonorella bequaerti Miller, 1976	T	Happy Valley talussnail
Sonorella bicipitis Pilsbry and Ferriss, 1910	T	Dos Cabezas talussnail
Sonorella binneyi Pilsbry and Ferriss, 1910	T	Horseshoe Canyon talussnail
Sonorella bowiensis Pilsbry, 1905	T	Quartzite Hill talussnail
Sonorella caerulifluminis Pilsbry and Ferriss. 1919	T	Blue River talussnail
Sonorella christenseni Fairbanks and Reeder, 1980	T	Clark Peak talussnail
Sonorella clappi Pilsbry and Ferriss, 1915	T	Madera talussnail
Sonorella coloradoensis (Stearns, 1890)	T	Grand Canyon talussnail
Sonorella coltoniana Pilsbry, 1939	T	Walnut Canyon talussnail
Sonorella compar Pilsbry. 1919	T	Oak Creek talussnail
Sonorella dalli Bartsch, 1904	T	Garden Canyon talussnail
Sonorella danielsi Pilsbry and Ferriss, 1910	T	Bear Canyon talussnail
Sonorella delicata, Pilsbry 1919	T	Tollhouse Canyon talussnail
Sonorella dragoonensis Pilsbry and Ferriss, 1915	T	Stronghold Canyon talussnail
Sonorella eremita Pilsbry and Ferriss, 1915	T	San Xavier talussnail
Sonorella ferrissi Pilsbry, 1915	T	Dragoon talussnail
Sonorella franciscana Pilsbry and Ferriss, 1919	T	St. Francis River talussnail
Sonorella galiurensis Pilsbry and Ferriss, 1919	T	Galiuro talussnail
Sonorella grahamensis Pilsbry and Ferriss, 1919	T	Pinaleno talussnail
Sonorella granulatissima Pilsbry, 1905	T	Ramsey Canyon talussnail
Sonorella hachitana (Dall, 1896)	T	New Mexico talussnail
Sonorella huachucana Pilsbry, 1905	T	Huachuca talussnail
Sonorella imitator Gregg and Miller, 1972	T	mimic talussnail
Sonorella imperatrix Pilsbry, 1939	T	Total Wreck talussnail
Sonorella imperialis Pilsbry and Ferriss, 1923	T	Empire Mountains talussnail
Sonorella insignis Pilsbry and Ferriss, 1919	T	Whetstone talussnail

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SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Sonorella macrophallus Fairbanks and Reeder, 1980	T	Wet Canyon talussnail
Sonorella magdalenensis (Stearns, 1890)	T	Sonoran talussnail
Sonorella meadi Miller, 1966	T	Aqua Dulce talussnail
Sonorella metcalfi Miller, 1976	T	Franklin Mountain talussnail
Sonorella micra Pilsbry and Ferriss, 1910	T	pygmy sonorella
Sonorella micromphala Pilsbry, 1939	T	Mik Ranch talussnail
Sonorella milleri Christensen and Reeder, 1981	T	Table Top talussnail
Sonorella mustang Pilsbry and Ferriss, 1919	T	mustang talussnail
Sonorella neglecta Gregg, 1951	T	portal talussnail
Sonorella odorata Pilsbry and Ferriss, 1919	T	pungent talussnail
Sonorella optata Pilsbry and Ferris, 1910	T	Big Emigrant talussnail
Sonorella orientis Pilsbry, 1936	T	Organ Mountain talussnail
Sonorella papagorum Pilsbry and Ferriss, 1915	T	Black Mountain talussnail
Sonorella parva Pilsbry, 1905	T	little talussnail
Sonorella rinconensis Pilsbry and Ferriss, 1910	T	Posta Quemada talussnail
Sonorella rooseveltiana Berry, 1917	T	Roosevelt talussnail
Sonorella rosemontensis Pilsbry, 1939	T	Rosemont talussnail
Sonorella sabinoensis Pilsbry and Ferriss, 1919	T	Santa Catalina talussnail
Sonorella santaritana Pilsbry and Ferriss, 1910	T	Aqua Caliente talussnail
Sonorella simmonsi Miller, 1966	T	Picacho talussnail
Sonorella sitiens Pilsbry and Ferriss, 1915	T	Las Guijas talussnail
Sonorella superstitionis Pilsbry, 1939	T	Superstition Mountains talussnail
Sonorella todseni Miller, 1976	T	Dona Ana talussnail
Sonorella tortillita Pilsbry and Ferriss, 1919	T	Tortolita talussnail
Sonorella tryoniana Pilsbry and Ferriss, 1923	T	Sanford talussnail
Sonorella vespertina Pilsbry and Ferriss, 1915	T	evening talussnail
Sonorella virilis Pilsbry, 1905	T	Chiricahua talussnail
Sonorella waltoni Miller, 1968	T	Doubtful Canyon talussnail
Sonorella walkeri Pilsbry and Ferris, 1915	T	Santa Rita talussnail
Sonorella xanthenes Pilsbry and Ferriss, 1923	T	Kitt Peak talussnail
Sonorelix angelus Gregg, 1949)	T	Soledad dessertsnail
Sonorelix avawatzica (Berry, 1930)	T	Avawatz dessertsnail
Sonorelix baileyi (Bartsch, 1904)	T	Resting Springs dessertsnail
Sonorelix borregoensis (Berry, 1929)	T	Borrego dessertsnail
Sonorelix harperi (Bryant, 1900)	T	Mountain Spring dessertsnail
Sonorelix melanophylon (Berry, 1930)	T	Black Rock dessertsnail
Sonorelix rixfordi (Pilsbry, 1919)	T	Joshua Tree dessertsnail
Xerarionta intercisa (Binney, 1851)	T	plain cactussnail
Xerarionta kelletti (Forbes, 1850)	T	Catalina cactussnail
Xerarionta redimita (Binney, 1857)	T	wreathed cactussnail
Xerarionta tryoni (Newcomb, 1864)	T	bicolored cactussnail

Helicellidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Candidula intersecta (Poiret, 1801)	T	wrinkled helicellid
Cochlicella barbara (Linnaeus, 1758)	T	potbellied helicellid
Helicella obvia (Menke, 1828)	T	heath helicellid
Trichia hispida (Linnaeus, 1758)	T	hairy helicellid
Trichia striolata (Pfeiffer, 1828)	T	furrowed helicellid
Trochoidea elegans (Gmelin, 1791)	T	elegant helicellid

Helicidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Helix aperta Born, 1778	T	green gardensnail
Helix aspersa Muller, 1774	T	brown gardensnail
Helix pomatia Linnaeus, 1758	T	Roman gardensnail
Cepaea hortensis (Muller, 1774)	T	white-lipped gardensnail
Cepacea nemoralis (Linnaeus, 1798)	T	grove gardensnail
Eobania vermiculata (Muller, 1774)	T	chocolate band snail
Monacha cantiana (Montagu, 1803)	T	Kentish gardensnail
Otala lactea Muller, 1774	T	milk snail
Theba pisana (Muller, 1774)	T	white gardensnail

The Seventeenth Annual Meeting of the Western Society of Malacologists was held during August, in Santa Cruz, California. About 100 persons attended and many excellent papers were presented. The Annual Report should appear before the end of 1984.

The Fiftieth Annual Meeting of the American Malacological Union was held during July, in Norfolk, Virginia. About 200 persons attended with several field trips and simultaneous sessions on various aspects of malacology. The report of the meetings should appear in the "American Malacological Bulletin" within the next few months.

Don CeSar Beach Resort Hotel, St. Petersburg Beach, Florida. Some of the over 400 shellers who registered and attended the 12th annual convention of the Conchologists of America.

Wine & Hor d'houvres Welcome and Get Acquainted Party hosted by the St. Petersburg Shell Club.

Dinner before the field trip at Fort DeSoto Park.

Dealer's Bourse where almost any rare or unusual shell you could want was available. Probably the largest and most attractive bourse held anywhere with dealers from all over the U.S. and several foreign countries in attendance and displaying their wares.

PERSONAL NOTES

From Kathe Jensen [Zoological Museum, Universitetsparken 15, DK-2100 Copenhagen 0, Denmark]: I have just had a visit from Dr. Tom Gascoigne, who is now 81 years old, almost blind, but "still going strong." We had some very rewarding discussions on two papers which he is preparing for publication, and also he taught me some special tricks in fine dissection. Beside this he entertained the entire marine invertebrate department with stories from his teaching career.

In May I went to Tenerife, Canary Islands for a vacation, but of course I could not stay away from collecting ascoglossans, and found *Ercolania funerea*, *Aplysiopsis* sp. (possibly *A. zebra* Clark, 1982), and a juvenile *Caliphylla mediterranea*. The former two species are new records for the island.

I am still working on the taxonomic problems surrounding the *Stiligr/Ercolania* complex and have enclosed a short article on the confusing history of these genera, which I would like you to consider for publication in "Shells and Sea Life". It may be a little drier and duller than most of your articles, but I think that it may be very useful to other taxonomists, and hopefully will show others the amount of tedious bibliographic research involved if a species is not properly identified and described in the first place.

In tracing all the facts for the enclosed article I have been able to see at least copies of most of the original descriptions. However, the original descriptions of Costa's species have not been available to me, and I would greatly appreciate if anyone could provide me with a photocopy of these descriptions (I will pay copying costs and postage). Also, I am very interested in hearing from others about the proposal of retaining the name *Ercolania funerea* for Costa's species. If this can be generally accepted, it should be submitted to the ICZN. In this connection I would like to hear from people who have experience in submitting applications to the ICZN and who might be interested in helping and/or supporting me in writing such an application.

From Gary C. Williams [Department of Marine Biology, South African Museum, P.O. Box 61, Cape Town 8000, South Africa] G.C. Williams and William R. Liltved of the South African Museum took part in a ten day dredging cruise in the western Indian Ocean during July aboard the CSIR research vessel, *Meiring Naude*. We collected mollusks, octocorals, stylasterine and scleractinian corals, brachiopods, and other invertebrates off the east coast of South Africa. The research crew was headed by Dr. Richard N. Kilburn of the Natal Museum and included Dr. David Herbert, recently arrived from Great Britain to take a malacology post at the Natal Museum. Herbert's research will concentrate on southern African archaeogastropods.

The hundreds of species of prosobranch gastropods and bivalves collected will be retained at the Natal Museum in Pietermaritzburg to be studied by Kilburn and Herbert. Over forty species of octocoral cnidarians and nine species of nudibranchs were also collected. These specimens, as well as a great deal of material representing ten phyla, will be retained at the South African Museum marine invertebrate collection in Cape Town.

A total of 82 dredge samples were taken at depths ranging from 30-510 meters along the coasts of southern Natal, Transkei and the eastern Cape. Technical assistance was provided by Ruth Fregona, Candy Seymour, Neal Young, and Peter Goldman. We thank Captain George Foulis for a most productive cruise!

From Philippe Bouchet [Museum National d'Histoire Naturelle, 55 rue du Buffon, Paris 5e, France] I am reviewing the deep-water Turbinellidae (excluding Columbariinae) from depths exceeding 150-200 m (100 fathoms). I will be interested to hear from anyone with relevant material world-wide.

From Gamil N. Soliman [Drexel University, Environmental Studies Institute, Philadelphia, Pennsylvania 19104] Current research: The molluscan fauna (gastropods & pelecypods) of the northern Red Sea and eastern Mediterranean and their migration through the Suez Canal; histological and physiological studies on Red Sea prosobranchs (*Lambis lambis*, *Chicoreus virgineus* & *Pleuroploca*) with relation to their feeding habits; ecological studies on the snail vectors of schistomiasis (*Bulimus truncatus* and *Biomphalaria alexandrina*); and development of nudibranchs.

CATRIONA RICKETTSI BEHRENS, 1984

The nudibranch pictured here was recently described as *Catriona rickettsi* by David W. Behrens in July, 1984. The original description was published in The Veliger 27(1): 65-71, 7 figures. The species was previously figured in Pacific Coast Nudibranchs, (pages 104-105 as *Trinchesia* sp.). This species is one of the most common nudibranchs in South San Francisco Bay, occurring by the dozen on *Tubularia crocea*, *Obelia* sp., and *Halipanella luciae*. This species ranges in size up to 20 mm.

Figure 1.

Figure 2.

Figure 3.

The body color is transparent allowing the organs to show through. There is opaque white pigment on the distal 1/3 of the rhinophores and cephalic tentacles, below which is a band of orange. The ceratal core varies from yellow through orange, pink, red-brown, burgundy, or brownish-green. They are tipped with white. The coloration of the certata is nearly identical to that of the hydranth of *Tubularia*, upon which they feed.

The oral tentacles and rhinophores of this species are long slender and tapering. The cerata vary greatly in shape from fusiform to more club shaped.

The egg masses, which are present all year-round, are a good indication of the presence of the animal. They are an irregularly twisted gelatinous string housing a spiral of white-cream eggs. The average twisted mass measures 2 by 6 mm. They are usually attached to the stalk of the hydroid.

This species is named in honor of Edward F. Ricketts (1897-1948) for his outstanding contributions in the fields of philosophy and intertidal ecology.

Photos by D.W. Behrens.

Figure 1. Dorsal view of *Catriona rickettsi*.
Figure 2. Dorsal view of *Catriona rickettsi*.
Figure 3. Egg mass of *Catriona rickettsi*.

THE INTELLIGENT OCTOPUS.

Boris Innocenti, Aqua - Sports,
4230 E. Indian School Rd.,
Phoenix, AZ 85018

The intelligence level of marine creatures (excluding the mammals) has never really impressed me, with the exception of the octopus. If I were placed in a position of having to quantitatively measure the intelligence of the octopus, I would have to beg off and defer that to those individuals far more qualified than I and hopefully they would not limit their observations to life in an aquarium.

It is evident to anyone who has spent any amount of time observing the octopus, that one is observing an intelligence well above that of its other marine neighbors. Almost 30 years of underwater observation has convinced me that a large percentage of its behavior seems to be due to a thinking process and not just conditioned reflexes or instincts, compared to its other neighbors. I'm convinced that it is a mental giant. Based on this aspect of its biology I have to keep reminding myself that it is a mollusk.

Its power of camouflage is legend even though most observations are made in aquaria on a usually very sedentary octopus. To observe one in the "wild" is indeed a treat. Its color and texture changes occur as rapidly as it can move over the varied bottom. Fire a strobe at it, in a photographic attempt, and it flares out like an open umbrella (see Figure 1) and goes partially to totally white. When one considers how fast the strobe and camera are operating one must marvel at such speed. I have seen too many photographs of this response to assume the action started to occur prior to the strobe firing. Equally exciting are the varied color phases that represent various moods of the octopus.

The octopus shown in the photos a Caribbean octopus, probably *Octopus vulagris*.

In my early encounters, before I knew of their venom apparatus, I enjoyed playing with them. With this knowledge, however, my encounters became more visual and some intimacy was lost. Discretion was the better part of valor. As you become an octopus watcher, you become aware of a number of defenses it has against predation.

Besides camouflage, it has of course, its inky smoke screen accompanied by a jet action get-away. As it travels it coils its delicate tentacle tips under its mantle. Mainly, however, it seems to rely on concealment in cracks and crevices among the rocks, corals, or junk. On numerous occasions I have noticed them hiding in such a way as to present only their suction cups toward the opening and in this position attach old bivalve shells to them in such a manner as to produce a "door", or perhaps they prefer the term operculum. Watching for shell mounds simplifies finding its den.

One of their most interesting abilities is that of being able to "flow" through an opening so small that one would assume only a portion of the tentacle could pass through. From observation in aquaria I would guess that if the opening is large enough to allow its beak to pass through the entire octopus can, too.

If my only encounter with the octopus had been a dissecting table or in aquaria it is not unlikely that my opinion of it would be much lower than it is. Fortunately our encounters have been in its own baliwick. Try it, you will be impressed also by this lovely mollusk.

NOTES FROM HANS BERTSCH:

An International Reconnaissance Expedition to Baja California Sur, Mexico: Part I.

The peninsula of Baja California has attracted the interest of numerous scientists during the past several hundred years. Expeditions from institutions around the world have trekked the length of the peninsula by foot, muleback, or four-wheel drive vehicles. Some have even arrived by sea or by air.

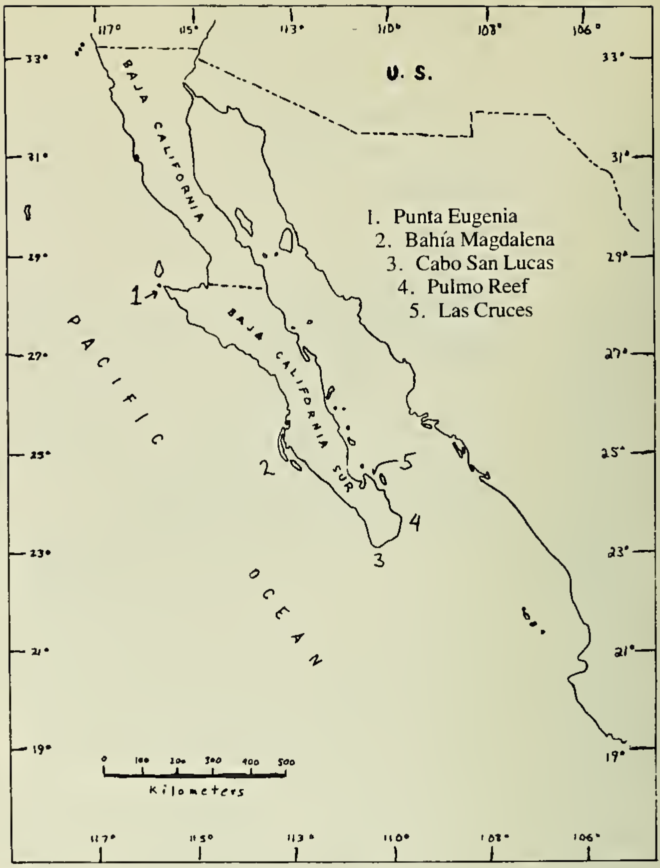
The foci of their studies have been as diverse as the peninsula and its inhabitants: forests of gangling cirios, basalt rocks wrested from mainland Mexico by the spreading of the east Pacific rise, lifesize aboriginal cave paintings of red and black shamans and deer, fish-catching bats, or cascading underwater sandfalls. The existence of this incredible land and its oceans is a scientific gauntlet thrown against our thoughts of what the world is all about.

Nearly everyone has his or her favorite geological, biological or anthropoligical Baja-oddity. Regardless of one's preference, this elongate stretch of land between two seas amazes, captivates, and challenges. It is non-relenting, whether for good or bad. It always must be treated with respect, because it is a harsh wilderness. It has probably started as many love affairs as revulsion reactions. Baja must be dealt with on its own terms.

I am one of its lovers.

During January and June of this year, I participated in an international reconnaissance expedition along the Pacific coastline of Baja California Sur. (The peninsula consists of two states: the northern Baja California and the southern Baja California Sur. The dividing line is the 28th parallel.) Under the auspices of the California Academy of Sciences in San Francisco, our team was supported by a grant from the George Lindsay Field Research Fund and consisted of CAS staff members and faculty and students of the Universidad Autónoma de Baja California and the Centro de Investigación Científica y de Educación Superior de Ensenada (CICESE). The purpose of these trips was to select sites for more intense study and to develop preliminary data as a basis for a major grant proposal. We were interested in an ecological community (opisthobranch mollusks and their prey) in an area of great zoogeographic significance — the region of faunal overlap between the warm temperate Californian province and the eastern Pacific tropical province. During the course of these two expeditions we surveyed the intertidal and subtidal fauna between Punta Eugenia and Cabo San Lucas (on the outer coast of Baja California Sur), and on up inside the Gulf of California to Las Cruces (see map).

In this month's and next month's Notes I will describe some of our adventures from these expeditions and some of the animals that we found. Most of our scientific results are still in preliminary analysis; we reported some of them at



August's meeting of the Western Society of Malacologists in Santa Cruz. We are in the process of working up possible new genera and species, but dissections, literature searches, and writing will take some time.

Participating in both expeditions were Drs. Michael T. Ghiselin, Terrence M. Gosliner, Welton Lee (sponge taxonomist at CAS) and I; curatorial assistants Robert van Syoc and David Catania; and Oceanólogo Luis Aguilar Rosas (researcher with UABC in Ensenada). On the first expedition Hans Herrmann, graduate student at CICESE, joined us; we avoided the confusion of an Mexican and an American with the same German first name by pronouncing them differently. We had a newly-wed couple accompany us (direct from their honeymoon in Hawaii) on the second expedition, along with cnidarian taxonomist Dr. Daphne Fautin Dunn.

The January expedition covered the extreme southern portion of the Baja California peninsula. It was also meant to work out logistic problems and to blend the group as an efficient field team. Assembling people from various cities, states, and countries to travel to another site requires some thought and planning. The group met at my home in San Diego, carpeted Nancy's and my living room floor with bodies overnight, and then spent the following morning repacking diving gear, personal clothes, food, collecting equipment, and camera equipment into Dave Catania's Land Rover and my jeep and the rental trailer it pulled. Since six of us could not fit into the two gear-laden four-by-fours, Michael drove his battered Pinto to Ensenada; it was left there in exchange for a third four-wheel drive vehicle (a four passenger truck) that was loaned to us by CICESE. After a day in Ensenada, and with two more people (our Mexican colleague Luis and the graduate student from CICESE), more gear and more food, our three vehicle international caravan headed south.

After all the early winter rains, the desert was lush, and we stopped periodically to photograph the incredible greenness. Large cardon cacti were surrounded by verdant hills. Just north of the oasis of San Ignacio we saw volcanic hills, with brown-black basalt contrasting against blue skies, white cumulus clouds, and water-logged vegetation.

Although most of the main transpeninsular highway was in fairly good repair (with the exception of 50 miles of potholes south of Cataviña), our travels took us off the peninsula's major paved road. Many times we traversed miles of dirt road. Even if we found a paved road, there was the possibility that it had been washed away by flash floods. One part of paved road was barely wide enough for the vehicles to cross; a six-foot drop into the arroyo had been carved by the force of the rushing waters. Farther south an unpaved road crossing a deep arroyo had been washed out, with a new trail curling along the mountain to the stream bed and then back up the other side. There were no signs that trucks should use low gear; the 30° slope was warning enough.

The most disastrous portion was a stretch of road that Michael and I had travelled ten years earlier. It is part of the road from La Paz to Las Cruces, deliberately unkept and one of the worst roads imaginable. In the midst of this expletive-filled road is one particularly gruesome stretch that we had nicknamed previously "Arroyo de Machismo." The arroyo lived up to its monicker (chosen not in reference to sexism, but because it was a **brute** of an arroyo). The road winds down across a sloping mountainside with bumps and two feet ruts and pot holes, over granite boulders and slick hardpan dirt, with nary any clearance at times, into a sandy wash. This year it had been well-packed, and was not the tire-grabbing, car-stalling sand pit that it could have been. However, on the far side is an equally uneven, abrupt incline (nearly a 45° slope), gouged deep into the hillside. Midway up, my jeep reached its limit, and the clutch dislocated in two separate places. At the time I was pulling the trailer in which were all our diving bags, four scuba tanks, and a compressor. The torque needed and the splaying apart of the jeep's body, wheels and motor bouncing up the hillside were too much.

Dave and I worked on the clutch, attempted the hill once more, only to have the clutch dislocate again. So we unloaded the trailer, carried all the gear uphill, rolled the trailer back down into the arroyo, let my jeep roll backwards to be repaired again, used the eight-cylinder CICESE vehicle to haul the trailer up (to the accompaniement of appropriate cheers and jeers), reassulted the scarred road with my re-repaired jeep, repacked the trailer, and then drove on to Las Cruces. The rest of the drive was not uneventful. At a rest stop further along, we spent 15 minutes pulling cholla cactus spines out of the arm and back of an anonymous expedition member who had slipped on a steep portion of the road.

The itinerary of our January expedition included travelling along the entire extreme southerly coastline of Baja California Sur, from Bahía Magdalena to Las Cruces. We stopped at numerous places that looked promising. There were rocky headlands interspersed among sandy beaches; some coastline was hammered by strong surf, limiting our entry.

We collected in the mud of Bahía Magdalena (learning the excitement of "slough diving," where everyone gets slimed), at the southern tip of Isla Magdalena (reached by launch), intertidally at Todos Santos-Los Cerritos, 60 feet deep in the canyon at Cabo San Lucas, at Puerto Chileno, Pulmo Reef and at Las Cruces. The dive at Isla Magdalena was notable for the motor problems on the launch (we had to turn back to find another motor that would work), Luis cutting open his foot on a submerged metal hook in the mud (luckily the fishing village had a clinic staffed by a doctor who stitched closed the injury), and the myriad Californian garibaldi fish and tropical angel and damselfishes swimming together. That would be comparable to zebra and timber wolves roaming the same region.

Some collecting sites yielded more than others, and we will return to them for additional research. At Cabo San Lucas we found the rare nudibranch *Tritonia pickensi* Marcus & Marcus, 1967 (See Bertsch & Gosliner, 1984); at Pulmo Reef we found an unnamed species of chromodorid that James Lance is naming; and at Bahía Las Cruces we found *Phidiana lascrucensis* Bertsch & Ferreira, 1874. I will discuss the nudibranchs in more detail next month, along with some overall results and June's expedition.

Some of the more interesting animals we found in January were the sea stars: the reddish, pencil-thin *Mithrodia bradleyi*, and the large (25 cm diameter) *Oreaster occidentalis* which is gray with bright orange red mottling. Some exhibited curious biological associations. On the sea star *Phataria unifascialis* we found the parasitic gastropod *Thyca callista* Berry, 1959. On one sea star were 2 large specimens, rather than the usual one large female (see Bertsch, 1975a and 1975b for more information on this snail, its dwarf male, and how it feeds on sea stars). *Acanthaster elisii* is the eastern Pacific crown-of-thorns. Like its Indo-Pacific congener, *A. planci*, it grazes on corrals. I found several specimens of a well-camouflaged shrimp commensally occurring among the spines of the aboral surface.

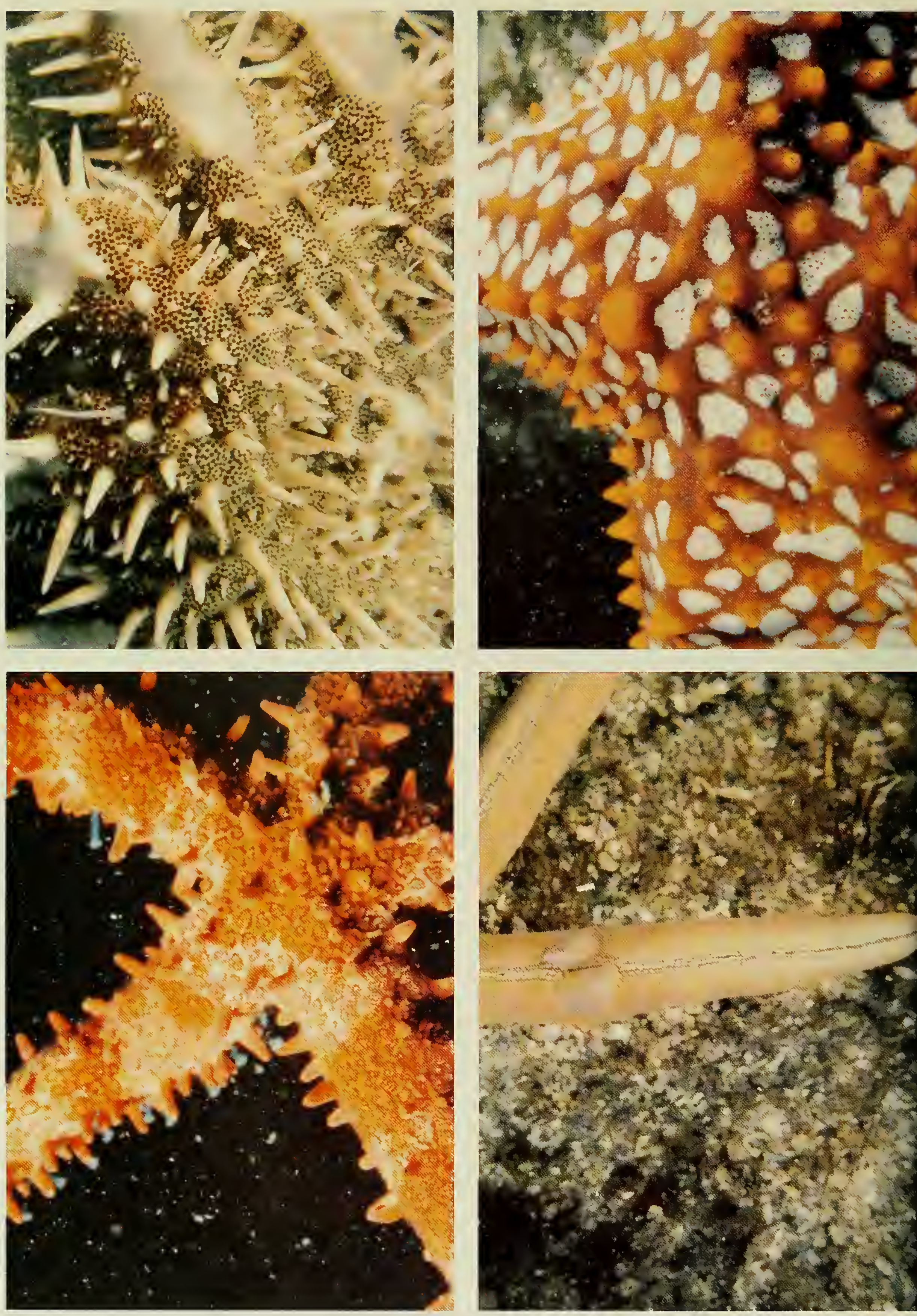
The Baja California peninsula is a unique terrestrial and marine habitat. Nearly every trip I have ever made to the area has resulted in finding something previously unknown. These expeditions have been no exception.

Literature Cited

Bertsch, Hans, 1975a. New data for *Thyca callista* (Gastropoda: Capulidae). The Veliger, **18**(1):99-100.

Bertsch, Hans, 1975b. A Snail that eats Sea Stars. Sea Frontiers, **21**(5):281.

Bertsch, Hans & Terrence Gosliner. 1984. *Tritonia pickensi* (Nudibranchia: Tritoniidae) from Baja California, Mexico. Shells and Sea Life, **16**(9): 138-139.



Photos by Hans Bertsch. Top left - *Acanthaster elisii* with 2 camoflaged commensal shrimp (right center edge of picture). Top right - *Oreaster occidentalis* from Las Cruces. Bottom left - *Mithrodia bradleyi* from Las Cruces. Bottom right - pair of the parasitic prosobranch *Thyca callista* on the sea star *Phataria unifascailis* from Las Cruces. See article starting on page 182.

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PACIFIC - *Chicoreus* (*Phyllonotus*) n.sp.
Photo by Donald R. Shasky

Chicoreus (*Phyllonotus*) *oculatus* - ATLANTIC
Cover photos except at left by Emily Vokes

PACIFIC - *Chicoreus* (*Phyllonotus*) *erythrostoma*
C. (*P.*) *globosus* - ATLANTIC

PACIFIC - *Chicoreus* (*Phyllonotus*) *peratus*
C. (*P.*) *pomum* - ATLANTIC

IN THIS ISSUE: Baja Collecting Trip, Gastropod List, Nudibranchs, Murex, Pedicularia & much more!

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SHELLS and SEA LIFE ISSN 0747-6078 is published monthly for $20 per year by Steven J. Long & Sally Bennett, 505 E. Pasadena, Phoenix, AZ 85012. Second-Class Postage Paid at Phoenix, AZ. POSTMASTER: Send address changes to SHELLS and SEA LIFE, 505 E. Pasadena, Phoenix, AZ 85012.

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Volume 16, Number 11

EDITOR'S NOTES

Thanks to all of you who have contributed to recent issues of of S&SL. We welcome your articles and notes. Short notes and articles are especially appreciated on amost any subject. If you don't have time or inclination to write a major article -- at least drop us a line every month or so and tell us what your current interests are and where you have been collecting. You can tell that others are interested by the fact that you read the personal notes with interest. We would like to see some articles on fossil shells.

I think it is about time to mention the costs involved with producing S&SL for you each month -- about $4000.00 per month in direct costs, not counting salaries, equipment or facilities. That works out to about $2.00 per copy of the magazine! Most of the shell magazines you see cost less than half our per page cost to produce. We need your renewals early so that we can schedule our printing quantities. Renewals for the January issue should be in our hands by December 1, 1984.

Those Of Sea & Shore subscribers who have joined us recently should take a close look at their mailing label. The month and year of expiration is shown on the top line. That month is the last issue you will receive. Please renew your subscription early. It takes a lot of time and effort preparing mailings for so many copies of the magazine and early renewals help us a lot. If you feel that we have not computed your subscription months properly, or if you are receiving two copies of the magazine at two different addresses (or under two different names), please let us know quickly. Please note that second class mail is not forwarded by the post office. In many cases, we will not even be notified of the address change for several weeks or months. You must write us with changes of address at least 6 weeks in advance.

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A NOMENCLATURAL PROBLEM IN THE ASCOGLOSSA -- OR: WHY ONE SHOULD NEVER NAME A GREEN SEA-SLUG "VIRIDIS".

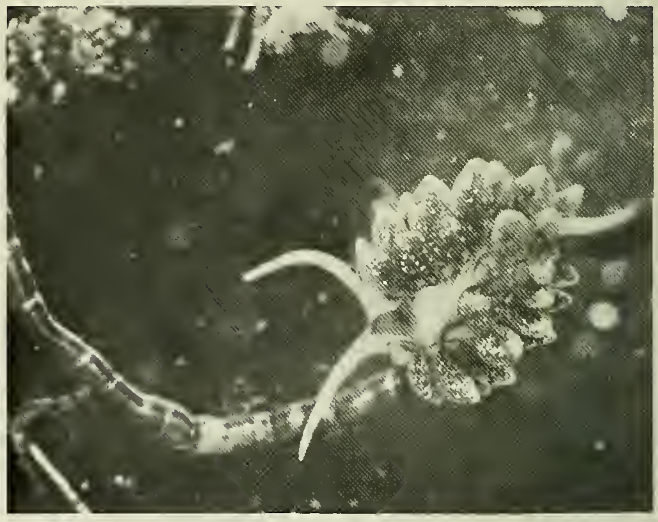
by **Kathe R. Jensen**

In the 19th century naturalists all over the world excelled in describing new species of marine mollusks. These descriptions were often based on a single specimen and often in the preserved state.

In 1866 the Italian naturalist A. da Costa described two species of small shell-less opisthobranchs, *Embletonia viridis* and *Embletonia nigrovittata*, sent preserved specimens to R. Bergh in Copenhagen. In 1878 Bergh gave detailed anatomical descriptions of these specimens which transferred from the nudibranch genus *Embletonia* to the ascoglossan (=sacoglossan) genus *Ercolania*. Also, Bergh (1878) considered *E. nigrovittata* a color variety of *E. viridis*.

The genus *Ercolania* had been described a few years earlier (1872) by another Italian malacologist, S. Trinchese. Trinchese had named 3 species, *E. panceri, E. uzielli,* and *E. siotti.* Only the latter was described in detail and has been accepted as the type-species of the genus by subsequent workers (Baba & Hamatani, 1970a, b; Marcus, 1982; Pruvot-Fol, 1954; Schmekel & Portmann, 1982). Trinchese did not clearly distinguish between generic and specific characters, but later workers have used canaliculated rhinophores and elongate renopericardial ridge as hallmarks for the genus (Bergh, 1878; Pruvot-Fol, 1954). These characters are, however, very variable even within one species (Marcus & Marcus, 1956; Marcus, 1982; Jensen, in press). The only reliable characters separating *Ercolania* from *Stiliger* and *Calliopaea* are the sabot-shaped radular teeth and the short recurved penial style (Trinchese, 1872; Baba & Hamatani, 1970b; Jensen, 1980, in press).

In 1867 Costa described a third species, *Embletonia funerea.* This species Bergh (1886) considered a *Stiliger*, whereas Vayssière (1888) transferred it to *Ercolania.* Vayssière (1888) mentioned *Ercolania viridis, E. nigrovittata* and *E. siotti* as synonyms of *E. funerea*, and acting as first revisor, chose the name *E. funerea* to designate this species. His reason for rejecting *E. viridis* and *E. nigrovittata* was that they were described from juvenile specimens. This is not in accordance with the International Code of Zoological Nomenclature, in which Article 24b states that the Law of Priority applies also when the description is based on a part or stage of an animal. The name *Ercolania viridis* was almost forgotten from the time of Bergh's redescription (1878) until the publication of Pruvot-Fol's volume on opisthobranchs in the series "Faune de France" (1954). Since then *E. viridis* as well as *E. funerea* and also *Stiliger funereus* have been used for the species in question.



Ercolania funerea (Costa), Windley Key, Florida. Photo by K.B. Clark.

The introduction of the genus *Stiliger* into the synonymy of *Ercolania*, first suggested by Eliot (1903), further added to the confusion of later malacologists. The genus *Stiliger* was introduced by Ehrenberg in 1831 to designate a small sea-slug from the Red Sea, which named *S. ornatus.* The description was very poor, and the animal has never been recollected from the original locality.

In 1865, Meyer & Möbius had described *Embletonia mariae* from Kieler Bücht. This was transferred to the genus *Stiliger* by Bergh (1872). In accordance with Alder & Hancock (1855), Bergh considered the genus *Calliopaea* d'Orbigny, 1837 a junior synonym of *Stiliger*, but retained the specific name *mariae* although d'Orbigny's type-species of *Calliopaea, C. bellula*, had priority. This mistake was corrected by Eliot (1910), and this species has been known as *Stiliger bellulus* since then. In 1839-53 Deshayes described *Custiphorus vesiculosus*, which Bergh (1878) transferred to *Stiliger* and in 1886 considered a possible synonym of *S. funereus.* Others have considered this species a synonym of *S. bellulus* (Schmekel & Portmann, 1982), whereas others have considered it a separate species, *S. vesiculosus* (Haefelfinger, 1962; Gascoigne & Sigurdsson, 1977).

Meanwhile, in a completely different part of the world, (Ceylon), Kelaart (1858) described another new shell-less opisthobranch, *Pterochilus viridis*. This species was transferred to the genus *Stiliger* by Eliot (1906). Apparently Eliot was unaware of the existence of Costa's *Ercolania viridis*, which according to Eliot's own suggested synonymy (1903) must also be named *Stiliger viridis*. This inconsistency was pointed out by Marcus & Marcus (1970). They chose the second name introduced by Costa in 1866 and named this species *Stiliger nigrovittatus* (Costa, 1866). Unfortunately Rao & Rao (1963) had described a species from India under that name, and Marcus & Marcus (1970) renamed this species *Stiliger raorum*. In the same article Marcus & Marcus described *Stiliger* (*Stiliger*) *funereus* (Costa, 1867) from Curaçao and Puerto Rico. Apparently they did not agree with Vayssiere's synonymies (1888). This caused subsequent workers in the Caribbean to identify this species as *Stiliger funereus* (Marcus, 1972, 1977) or *Ercolania funerea* (Clark & Goetzfried, 1978; Clark & Jensen, 1981; DeFreese & Clark, 1983; Jensen, 1981, 1983; Jensen & Clark, 1983).

In 1970 Baba & Hamatani gave a description of a species collected in Japan, which they identified as Ehrenberg's *Stiliger ornatus*. The anatomical details given in this paper led Baba & Hamatani to reestablish *Ercolania* as well as *Calliopaea* to full generic rank. This has been accepted by most contemporary workers although a few, notably the Marcuses (1970, 1982) and T.E. Thompson (1973, 1976) still consider these three genera synonymous.

At the present time "*Stiliger*" *bellulus* is known as *Calliopaea bellula* (see description by Gascoigne & Todd, 1977), which may or may not be synonymous with "*Stiliger*" *vesiculosus* (Gascoigne & Sigurds-son, 1977; Schmekel & Portmann, 1982). Costa's Mediterranean species is definitely an *Ercolania*, but it remains to be settled whether its specific name should be *viridis*, as would be required by the Law of Priority, or *funerea* as suggested by the first revisor (Vayssière, 1888). Also, *E. funerea* is the most widely used synonym. The generic status of *Pterochilus viridis* from Ceylon remains unsettled. I suggest that the Mediterranean species be named *Ercolania funerea* to avoid future confusions should Kelaart's *Pterochilus viridis* be recollected and turn out to be an *Ercolania*. *Stiliger nigrovittatus* Rao & Rao, 1963 is in fact an *Ercolania*. The specific name *nigrovittata* has been rejected for Costa's species by Bergh (1878) as well as by Vayssiere (1888). Hence it should not be used for another species of the same genus. Thus the Indian species should be named *Ercolania raorum* (Marcus & Marcus, 1970). Judging from the geographical distribution of *E. funerea* (Mediterranean, East and West Atlantic, Caribbean), *E. raorum* may well turn out to be synonymous with *E. funerea*. The anatomical differences are very slight, and the habitats are almost identical.

References

Alder, J. & A. Hancock, 1845-55. A Monograph of British Nudibranchiate Mollusca. Parts I-VII. Ray Society, London, 438pp., 84 pls.

Baba, K. & I. Hamatani, 1970a. Occurrences of Specimens Presumably Identifiable with Stiliger ornatus Ehrenberg, 1831, at Seto, Kii, Middle Japan (Opisthobranchia: Sacoglossa). Publ. Seto Mar. Biol. Lab., 18:199-206, pls. 3-4.

Baba, K. & I. Hamatani, 1970b. The Anatomy of Ercolania boodleae (Baba, 1938) from Seto, Kii, Middle Japan (Opisthobranchia: Sacoglossa). Publ. Seto Mar. Biol. Lab., 18:215-222, pls. 5-7.

Bergh, R. 1872. Semper's Reisen im Archipel der Philippinen. Malacologische Untersuchungen. 1 (3&4):137-203, pls. 17-24.

Bergh, R. 1878. Beiträge zur Kenntniss der Aeolidiaden, V. Verh. Zool.-Bot. Gesellsch. Wien, 27:807-840, pls. 11-13.

Bergh, R. 1886. Beiträge zur Kenntniss der Aeolidiaden, VIII. Verh. Zool.-Bot. Gesellsch. Wien, 35:1-60, pls. 1-7.

Clark, K.B. & A. Goetzfried, 1978. Zoogeographic Influences on Development Patterns of North Atlantic Ascoglossa and Nudibranchia, with a Discussion of Factors Affecting Egg Size and Number. J. Moll. Stud., 44:283-294.

Clark, K.B. & K.R. Jensen, 1981. A Comparison of Egg Size, Capsule Size, and Development Patterns in the Order Ascoglossa (Sacoglossa) (Mollusca: Opisthobranchia). Int. J. Invert. Reprod., 3:57-64.

Costa, A. da 1866. Saggio sui molluschi eolididei del Golfo di Napoli. Ann. Mus. Zool. Napoli, 3:59-90, 4 pls.

Costa, A. da 1867. Saggio sui molluschi eolididei del Golfo di Napoli. Ann. Mus. Zool. Napoli, 4:26-37, 2 pls.

DeFreese, D.E. & K.B. Clark, 1983. Analysis of Reproductive Energetics of Florida Opisthobranchia (Mollusca: Gastropoda). Int. J. Invert. Reprod., 6:1-10.

Deshayes, G.P. 1839-53. Traité elementaire de conchliologie avec les applications de cette science â la geologie. Victor Masson, Paris, vol. 1, pt. 1, 368pp.; pt. 2, 818pp.; vol. 2, 384pp.; atlas of 132 pls.

Ehrenberg, C.G. 1831. Symbolae physicae, seu icones et descriptiones animalium evertebratorum seposito insectis. Decas prima. Gastropoda branchia. Berlin, Academy, not paged, 10 pls.

Eliot, C. 1903. On some Nudibranchs from East Africa and Zanzibar. Part II. Proc. Zool. Soc. Lond., 1903, vol. 1:250-257.

Eliot, C. 1906. On the Nudibranchs of Southern India and Ceylon with Special Reference to the Drawings by Kelaart and the Collections Belonging to Alder and Hancock Preserved in the Hancock Museum at Newcastle-on-Tyne. Proc. Zool. Soc. Lond., 1906:636-691.

Eliot, C. 1910. A Monograph of the British Nudibranch Mollusca. Supplement. Ray Society, London, 198pp., 8 pls.

Gascoigne, T. & J.B. Sigurdsson, 1977. Calliopaea oophaga Lemche, 1974, a species new to the British Fauna (Opisthobranchia: Sacoglossa). J. Moll. Stud., 43:286-289.

Gascoigne, T. & C.D. Todd, 1977. Description of a Specimen of Calliopaea bellula d'Orbigny, 1837 Found at Robin Hood's Bay, North Yorkshire (Opisthobranchia: Sacoglossa). J. Moll. Stud., 43:290-295.

Haefelfinger, H.-R. 1962. Quelques faits concernant la nutrition chez Favorinus branchialis (Rathke, 1806) et Stiliger vesiculosus (Deshayes, 1864), deux mollusques opisthobranches. Rev. Suisse Zool., 69:311-316.

Jensen, K.R. 1980. A Review of Sacoglossan Diets, with Comparative Notes on Radular and Buccal Anatomy. Malacol. Rev., 13:55-77.

Jensen, K.R. 1981. Observations on Feeding Methods in some Florida Ascoglossans. J. Moll. Stud., 47:190-199.

Jensen, K.R. 1983. Factors Affecting Feeding Selectivity in Herbivorous Ascoglossa (Mollusca: Opisthobranchia). J. Exp. Mar. Biol. Ecol., 66:135-148.

Jensen, K.R. In press. Annotated Checklist of Hong Kong Ascoglossa (Mollusca: Opisthobranchia), with Descriptions of Four New Species. Proc. 2nd Int. Workshop Malacofauna of Hong Kong and Southern China.

Jensen, K.R. & K.B. Clark, 1983. Annotated Checklist of Florida Ascoglossan Opisthobranchia. Nautilus, 97:1-13.

Kelaart, E.F. 1859. Descriptions of New and Little-Known Species of Ceylonese Nudibranchiate Mollusks. Ann. Mag. Nat. Hist. 3rd series, 3:488-496. (Reprint of article printed in: Journal of the Ceylon Branch of the Royal Asiatic Society for 1858).

Marcus, E. 1972. On some Opisthobranchs from Florida. Bull. Mar. Sci., 22:284-308.

Marcus, E. 1977. An Annotated Checklist of the Western Atlantic Warm Water Opisthobranchs. J. Moll. Stud. Suppl., 4:1-22.

Marcus, E. 1982. Systematics of the Genera of the Order Ascoglossa (Gastropoda). J. Moll. Stud. Suppl., 10:1-31.

Marcus, E. & E. Marcus, 1956. On two Sacoglossan Slugs from Brazil. Amer. Mus. Nov., 1796:1-21.

Marcus, E. & E. Marcus, 1970. Opisthobranchs from Curacao and Faunistically Related Regions. Stud. Fauna Curacao other Caribb. Isl., 33:1-129.

Meyer, H.A. & K. Möbius, 1865. Die Fauna der Kieler Bücht I. Die Hinterkiemer oder Opisthobranchia. Engelmann, Leipzig, 88 pp., 19 pls.

Orbigny, A. d' 1837. Mémoire sur des espèces et sur des genres nouveaux de l'ordre des nudibranches. Guerin Mag. Zool., 7:1-16, pls. 102-109.

Pruvot-Fol, A. 1954. Mollusques opisthobranches. Faune de France 58. Lechevalier, Paris, 460pp.

Rao, K.V. & K.P. Rao, 1963. Stiliger nigrovittatus sp. nov., a Sacoglossan Mollusc from the Gulf of Mannar. J. Mar. Biol. Assoc. India, 5:232-238.

Schmekel, L. & A. Portmann, 1982. Opisthobranchia des Mittelmeeres. Nudibranchia und Saccoglossa. Springer, Berlin, 410pp.

Thompson, T.E. 1973. Sacoglossan Gastropod Molluscs from Eastern Australia. Proc. Malacol. Soc. Lond., 40:239-251.

Thompson. T.E. 1976. Biology of Opisthobranch Molluscs. Vol. 1. Ray Society, London, 207pp.

Trinchese, S. 1872. Un nuovo genere della famiglia degli Eolididei. Ann. Mus. Civ. Stor. Nat. Genova, 2:86-132, pls. 4-13.

Vayssière, A. 1888. Recherches zoologique et anatomiques sur les mollusques opisthobranches du Golfe de Marseille. II. Nudibranches (Cirrobranches) et ascoglosses. Ann. Mus. Hist. Nat. Marseille Zool., 3(4):1-160, pls. 1-7.

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PERSONAL NOTES

Don Cadien presented the October meeting program to the Conchological Club of Southern California. He is currently a project scientist with M.B.C. Applied Environmental Sciences in Costa Mesa, California (for about 12 years or so) and is doing an ongoing study of the invertebrate fauna off the central California coast. [Don Cadien, 1006 - 37th St., San Pedro, California 90831]

From **Adam Gakgański**: This letter will probably surprise you, but,I hope you will receive it with sympathy. I am twenty-two, I live in Poland. I am one of many people who have been fascinated by the beauty of the underwater world. Molluscs are phylum that interested me particularly.

Collecting shells is my life passion. I devote much of my free time and energy to the collection of mine. It is not as rich as I would like it to be, but slowly I am gaining more and more specimens, and maybe one day I will be proud of my shells. As I mentioned before my collection is not big and that is why I collect all the shells not excluding freshwater and land snails. However my attention is drawn to sea shells (snails only) among which I am mostly preoccupied with these families: Conidae, Cypraeidae, Ovulidae, Architectonicidae. Unfortunately, malacology is not a very popular hobby in my country. There are no shell societies here in Poland and I am very lonely with my hobby. Because of a little number of people interested in this field of zoology there is almost no literature that accounts for this subject. Being devoid of my own country literature I am not able to buy any foreign editions as no such exist here.

I can not afford buying shells and books from foreign dealers either as I do not have dollars which are exchangable for Polish currency. Even if I had the money there exist no banks that would take the money and make the proper deal. Thus, as you see, collecting shells in my country is very difficult. As I can not fulfill foreign clubs' requirements I do not belong to any of them. The only possibility of gaining information is correspondence with collectors from other countries. The say the truth -- the notion: favorite families is in my case a little inexact and caused by the fact that all collectors get specialized in something. However one can get really specialized if he has a direct access to shells and I haven't got it. A very important thing is also an access to scientific literature. Can I specialize having so great problems with all that? I am pleased with every new shell.

In my country, malacology has few fans and I therefore have great difficulty getting books and periodicals devoted to the life of the molluscs. For this reason I have dared to write to ask for any material connected with my hobby. I would be very happy if you could send me anything that would be of use.

At the end of my letter I would like to say that I will be very happy if I receive an answer from you even if my request is impossible to fulfill. [Adam Gakganski, Chrobrego-2/4, 85-047 Bydgoszcz, Poland]

From **Kerry B. Clark** Rumors of my commitment to an asylum are unfounded. Actually, I have a contract to work here. But in explanation of what happened to Clark in recent years, herewith:

Several years back, after finding some interesting effects of temperature on the biochemistry of *Elysia tuca* and *Costasiella ocellifera* and their symbiotic chloroplasts, I decided to examine a cnidarian-zooxanthellal symbiosis to see whether the same effect occurred in other phytosymbioses. This work took much longer than I expected, and I was unable to do much slug science during that period. Then, for about the last two and a half years, I have been working day and night on a system for computer assisted karyotyping for human medical genetics laboratories. I am happy to report that the system is completed, on the market, and hopefully will sell like crazy. At least our reviews have been excellent. All through this time I've been dying to get back to opisthobranchs, and started about a year and a half ago with a trip to Belize to work on Ascoglossa. This spring I was able to finish work on opisthobranchs of Bermuda, and this summer I returned to Bermuda to do some physiological work on *Volvatella bermudae*, to determine whether its chloroplasts are functional. I also did some work on oxygen conformity in several species. I haven't completed my data analysis, but it appears that oxygen availability is much more critical for opisthobranchs than I'd expected. This may explain much more of the habitat selectivity we've noted in tropical species, and also could account for some of the behavior we have noted. We often note our slugs clustering around the air-lift tubes in aquaria, and either they are orienting rheotaxically or are able to sense an oxygen gradient. I was able to glean lots more published egg and development data at the

Bermuda Biological Station library, and am currently working on an analysis of this for a paper at the Friday Harbor development symposium in the spring. I'm due for sabbatical leave at the end of spring quarter, and I am tentatively planning to spend a good chunk of time on the west coast doing more work on opisthobranch reproductive ecology, if I can arrange financing. If any of you have suggestions for the best labs where we could work for about 8 weeks at a time, anywhere from Panama to Alaska, I'd certainly welcome suggestions. We hope to work at several sites in different areas to evaluate biogeographic effects. Since I've never been to California, and have never met most of the west coast workers, I'm really looking forward to the trip. I also welcome any advice about collecting areas, etc., and if any of you can volunteer as guides, this would save us considerable time looking around. Basically we hope to "fill in the holes" for some types of egg and development data, and also look at some new types of data that we've been collecting on Florida species.

During my hiatus from opisthobranch work, I'm afraid I got way behind on reprint mailings. Please let me know if I've missed sending papers to any of you. [Dr. Kerry B. Clark, Florida Institute of Technology, 150 West University Blvd., Melbourne, Florida 32901]

From **David K. Johnson**: I would like to make some suggestions on future features & articles. It would be nice to see some articles on certain sea & ocean areas such as: Great Barrier Reef, Red Sea, Sargasso Sea & Sulu Sea. Also, more articles on sea life such as: sharks, whales, sea turtles etc.

Recently, I started collecting shell stamps. You might include some tips by an expert collector on this subject. In closing, I enjoy your publication. I've learned a great deal from it. Please keep up the good work. [David K. Johnson, 705 N. Grace Avenue, New Bern, NC 28560]

READER FORUM

From **W.B. Rudman**: [August 23, 1984] I just noticed a photograph of Jeff Hamann's on the back of Vol. 16(5) of **Shells and Sea Life** which has been identified as a species of *Cadlina*. It is actually a new species of *Noumea* which I am describing in a paper on similarly coloured chromodorids at present in press with the **Zool. J. Linn. Soc. Lond.** My material came from across the Red Sea, in Sudan. I have written to Jeff Hamann separately. [Dr. W.B. Rudman, The Australian Museum Sydney, P.O. Box A285, Sydney South, NSW 2000, Australia]

From **Eveline Marcus**: [September 25, 1984] On page 111 you only accept descriptions of new taxa, provided the holotypes have been deposited with a recognized public museum. This is feasible in most cases. But, if only one specimen is recognized as new, I think it is more necessary to make a complete description, including radula and reproductive organs, even if the specimen is torn to pieces. Of course the remains, the radula and the dissected or sectioned parts should be deposited. Figures of all characters and drawings or photographs of the living animal in color are also necessary. However, if there are two or more specimens, it may not be sure that they really belong to one and the same species:

Verrill in 1882:545-6 described the new genus *Koonsia* and the species *obesa*, but figured only the entire animal (1884, pl. 1, fig. 7), and the same in 1885, fig. 107. (copied by Marcus, 1984, fig. 25c). Bergh 1897 requested and received paratypes from the original vial, conforming with Verrill's description of the genus, not with Verill's description of the species, nor with his figure. Therefore I, in 1984, am calling Bergh's animal a new species, *Pleurobranchaea confusa*. Vayssière did not tell, whether he had specimens or only dealt with Bergh's description. Verrill evidently had two different species. His figured species, narrow with a long tail; and that described by Bergh and in the genus, with a broad mantle overhanging the sides.

I also asked U.S. National Museum for a paratype and received from vial 784567, off Delaware Bay, 4 specimens, considered as paratypes of *Koonsia obesa*. These turned out to be *Pleurobranchus* (*Oscanius*) *membranaceus*!

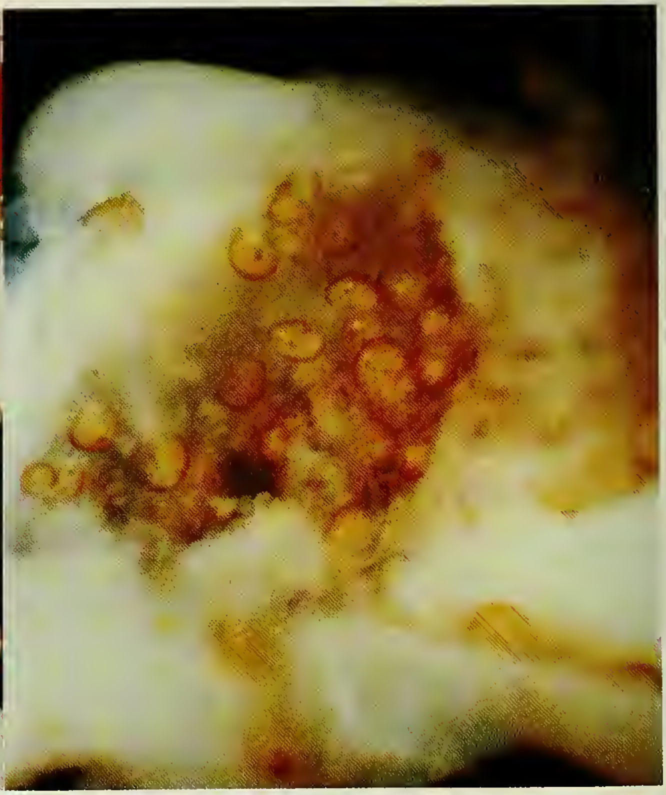
Until now the type of *Koonsia obesa* has not been seen again. Bergh's specimens did not have the penial hooks which Verrill described.

Verrill had indicated two localities: Delaware Bay, USNM 784657, and Marthas Vinyard, USNM 34217. One would have to go through all the remaining specimens, in vial 784657, perhaps to find the narrow one. [Dr. Eveline Marcus, Caixa Postal 6994, Sao Paulo, Brazil 01051]

Living *Pedicularia elegantissima.* Dredged off Ngabara Point, Transkei, Southern Africa 32°27"2'S, 28°55"9'E at 250 m, on a rocky bottom with sparse pockets of stylasterine corals.

Pedicularia elegantissima **in situ** on stylasterine coral. Trawled by a commercial trawler in +/- 100 m off East London, Eastern Cape, Southern Africa.

Depression made in coral by *Pedicularia.*



Pedicularia larvae inside mother.

NOTES ON PEDICULARIA ELEGANTISSIMA DESHAYES, 1863

by **Bill Liltved**

Pedicularia elegantissima a close relative to the Ovulidae, rarely reaching a maximum of 12 mm in length, is restricted to the Western Indian Ocean. This species has been recorded from the Seychelles, the Mascarene Archipelago, to the Eastern Cape coast of Southern Africa. *P. elegantissima*, a deep water species, lives in intimate association with stylasterine corals such as *Errina* spp. As a juvenile, the cowrie-like subadult moves freely on its host coral. As it nears maturity the gastropod becomes sedentary and the shell develops into a limpet-like form. The *Pedicularia* now being virtually immobile, must in some way be able to browse for food. If *Pedicularia* supposedly derived its nutrition by feeding on the actual coral polyps (as some ovulids do), it would soon obliterate all the live polyps situated in its immediate vicinity, thus ruining its food source. I speculate rather that it feeds on the mucoid secretions exuded by the stylasterine, to which micro-organisms and detritus may adhere.

Pedicularia elegantissima has a long protusible neck and a well developed snout for reaching from its fixed position where it makes a depression in the coral (fig 3). Its two tentacles are long, slender and seem to be ciliated. These cilia probably aid in the detection of food particles which the animal rakes in and scoops into its mouth with the comb-like outer lateral teeth of its radula.

An interesting aspect in the development of this species is that it is viviparous: the larvae appear to be incubated inside the female they are ready to be expelled into the water as fully developed veligers. The larvae are not contained in any type of thecae (egg cases), but were observed to be randomly deposited in the reproductive tract of the mother. Each almost spherical larval shell measures 1.2 mm in length.

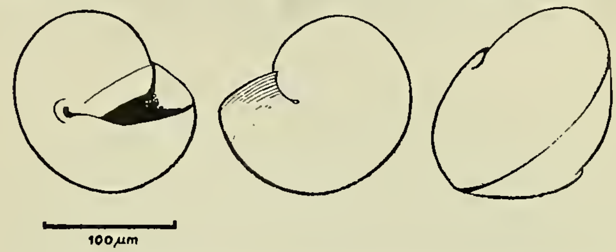


Figure 1. *Pedicularia elegantissima* larval shells.

Viviparity is not a very widespread phenomena in marine prosobranch mollusks. It has been documented in species such as *Littorina saxatilis* Olivi, of the British Isles and in *Cymbium* spp. of West Africa.

Additional Reading

Barnard, K.H. 1963. Contributions to the knowledge of South African Marine Mollusca. Part III. Gastropods: Prosobranchia: Taenioglossa. Ann. S. African Museum, Vol. 47.

Fretter, V. & A. Graham, 1962. British Prosobranch Molluscs. Ray Society, London, xvi + 755pp.

Marche-Marchad, I. 1977. Remarks on the Biology, Ecology and Systematics of the Genus Cymbium Roeding, 1798 (Gastropoda Prosobranchia). La Conchiglia, No. 104-105.

Scheltema, R. S. Larval Dispersal as a Means of Genetic Exchange Between Geographically Separated Populations of Shallow-Water Benthic Marine Gastropods. Biol. Bull. Woods Hole, 140:

Bill Liltved, Dept. Marine Biology, South African Museum, P.O. Box 61, Cape Town, South Africa.

DEALING WITH DEALERS:

Those Exasperating One-of-a-Kind Shells.
by **David DeLucia**

Here's the scene: Billy Bivalve, an avid collector, is perusing his newly received dealer list. Suddenly an item catches his eye: "*Cardita crassicosta* COLOR SERIES, 8 different colors including lemon yellow - only $50.00." Breathing as infrequently as possible to avoid hyperventilating, he races to the phone and makes the quickest call of his life. "I'm sorry," the dealer says, "That set has just been sold." Bang! Billy's balloon falls to the ground with a burst. Collecting seashells has ceased to be fun. He quits and goes into computers instead.

All of us, at one time or another have felt the same type of frustration as Billy after missing out on that long-awaited one-of-a-kind shell. Since so few people are good losers, there must be a better way to handle the listing of these elusive rarities.

One solution might be to have a mail order auction for one-of-a-kind items. Under this system, all customers would be allowed to bid for any specimen within a reasonable time period, say 20 days, and the one with the highest bid would receive that particular shell. Certainly, this would be a fair method, but it is time consuming to prepare and ties up the dealer's stock longer than necessary.

Another possibility would be to offer one-of-a-kind shells as incentives to larger orders. For example, a $200.00 order would allow one to choose two one-of-a-kind species, a $300.00 order three species, etc. A major drawback to this approach is that expensive one-of-a-kind shells (and many are) would not be appropriate as premiums. However, for moderately priced specimens, this technique could be a useful alternative to the usual 10-15% discount on large orders.

Probably the best solution to the one-of-a-kind lists with particular rules (i.e., no phone orders accepted, no dealer orders, etc.). This would not completely eliminate the "first come, first served" problem, but with so many alternatives, one is less likely to experience frustration at missing out on a certain species. To prevent one or two customers from buying out the whole list, there would be a limit of five species per person. This method would also entail more preparation on the dealer's part, but might be worth the extra effort in the long run.

One could argue that the thrill of shell collecting lies in the chase, and that one-of-a-kind shells are a luxury that should always be just beyond reach. Well, that's fine on paper, but meanwhile, I will continue to be annoyed upon missing out on such beauties as *Amaea mitchelli* Dall, *Latiaxis kiranus* Kuroda, and *Mactra violacea* Gmelin, the three species heading my "most wanted" list. As for Billy, maybe I'll give him my *Cardita crassicosta* color series. On second thought, I wonder if he does trading...?

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SCHEDULE: SHOWS AND CONVENTIONS

1984

Western Society of Naturalists
Denver, Colorado, December 27-30

1985

Central Florida Shell Show
Orlando, Florida, January 18-20
Southwest Florida Shell Show
Ft. Myers, Florida, January 18-20
Greater Miami Shell Show
Miami, Florida, January 24-27
Sarasota Shell Show
Sarasota, Florida, January 25-27
Broward Shell Show
Pompano Beach, Florida, February 1-3
Naples Shell Show
Naples, Florida, February 15-17
Palm Beach County Shell Show
W. Palm Beach, Florida, February 20-24
St. Petersberg Shell Show
St. Petersberg, Florida, February 22-24
Sanibel Shell Fair
Sanibel, Florida, March 7-10
Marco Island Shell Show
Marco Island, Florida, March 13-14
Astronaut Trail Shell Show
Melbourne, Florida, March 29-31
Georgia Shell Show
Atlanta,Georgia, April 12-14
Underwater Photography Convention
Our World - Underwater XV, Chicago, Illinois, May 17-19
5th International Coral Reef Congress
Papeete, Tahiti, May 27 - June 1
Conchologists of America
Philadelphia, Pennsylvania & Cape May, New Jersey, June
American Malacological Union
Kingston, Rhode Island, July 29 - August 3
Western Society of Malacologists
Santa Barbara, California, August 18-21

1986

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

If we have missed a show or convention that you are aware of please excuse us, and send the information for inclusion in next month's issue. We would especially like to hear of overseas shows and meetings. Thanks to Donald Dan for keeping us informed of many of these dates.

CURRENT EVENTS

The Conchological Club of Southern California has elected the following slate of officers for the year 1985: President - Bertram Draper, Vice President - Ralph Ferguson, Treasurer - Clifton Coney, Secretary - Jo Ramsaran, Corresponding Secretary - Kirstie Kaiser.

At the October meeting, Roy and Forrest Poorman were given Honorary Life Memberships for the numerous contributions to the C.C.S.C. and to malacology. Congratulations to both of them!

AMU COMMON NAMES LIST

The American Malacological Union "AMU Suggested Draft List of Common Names for North American Mollusks" continues with the marine gastropods on the next page. This section will continue for two months or more.

The "OCCURRENCE" codes for the marine gastropod list are as follows: A = Atlantic coast of North America from boundary with Arctic Ocean south to U.S.-Mexican border, including coast of Gulf of Mexico from Florida through Texas; Ac = waters of Arctic Ocean contiguous to North America; E = estuarine (exclusively); F = freshwater in addition to saltwater; [I] = introduced, intentionally or accidentally, by human activity; P = Pacific coast of North America from Bering Strait south to U.S.-Mexican border. Designations in parentheses denote extralimital occurrence beyond the scope of this listing.

The entire terrestrial mollusk list was included in the October issue. Please note that the "OCCURRENCE" between the scientific name and the common name indicates "T" for terrestrial.

Refer to the "Principles Governing Selection of Common Names of Aquatic Invertebrates from America North of Mexico" (S&SL 16(9):143) for additional information on selecting or changing names. Please note that these lists are based on the most recent **published** names. Send comments, corrections, or additions to: Editor, 505 E. Pasadena, Phoenix, Arizona 85012, U.S.A.

CLASS GASTROPODA -- SNAILS

ORDER ARCHAEOGASTROPODA

Pleurotomariidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Perotrochus adansonianus (Crosse and P. Fischer, 1861)	A	Adanson slitsnail
Perotrochus amabilis (F.M. Bayer, 1963)	A	lovely slitsnail
Perotrochus quoyanus (P. Fischer and Bernardi, 1856)	A	Quoy slitsnail

Scissurellidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Anatoma baxteri J.H. McLean, 1984	P	Baxter scissurelle
Scissurella cingulata O.G. Costa, 1861	A	belt scissurelle
Scissurella crispata (Fleming, 1828)	A,P,Ac	crispate scissurelle
Scissurella keenae J.H. McLean, 1970	P	Keen scissurelle
Scissurella lamellata (A. Adams, 1862)	P	lamellate scissurelle
Scissurella lyra S.S. Berry, 1947	P	lyre scissurelle
Scissurella proxima Dall, 1927	A	Florida scissurelle
Scissurella soyoae (Habe, 1951)	P	Soyo scissurelle
Sinezona rimuloides (Carpenter, 1865)	P	rimmed scissurelle

Haliotidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Haliotis assimilis Dall, 1878	P	threaded abalone
Haliotis corrugata Wood, 1828	P	pink abalone
Haliotis cracherodii Leach, 1814	P	black abalone
Haliotis fulgens Philippi, 1845	P	green abalone
Haliotis kamtschatkana Jonas, 1845	P	pinto abalone
Haliotis pourtalesii Dall, 1881	A	Pourtalès abalone
Haliotis rufescens Swainson, 1822	P	red abalone
Haliotis sorenseni Bartsch, 1940	P	white abalone
Haliotis walallensis Stearns, 1899	P	flat abalone

Fissurellidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Diodora aguayoi Pérez Farfante, 1943	A	Aguayo keyhole limpet
Diodora arcuata Sowerby, 1862	A	arcuate keyhole limpet
Diodora arnoldi J.H. McLean, 1966	P	neat-rib keyhole limpet
Diodora aspera (Rathke in Eschscholtz, 1833)	P	rough keyhole limpet
Diodora bermudensis (Dall and Bartsch, 1911)	A	Bermuda keyhole limpet
Diodora cayenensis (Lamarck, 1822)	A	Cayenne keyhole limpet
Diodora dysoni (Reeve, 1850)	A	Dyson keyhole limpet
Diodora fluviana (Dall, 1889)	A	Gulf Stream keyhole limpet
Diodora jaumei Aguayo and Rehder, 1936	A	Jaume keyhole limpet
Diodora listeri (d'Orbigny, 1842)	A	Lister keyhole limpet
Diodora meta (von Ihering, 1927)	A	meta keyhole limpet
Diodora minuta (Lamarck, 1822)	A	dwarf keyhole limpet
Diodora sayi (Dall, 1899)	A	Say keyhole limpet
Diodora tanneri A.E. Verrill, 1883	A	Tanner keyhole limpet
Diodora variegata Sowerby, 1862	A	variegate keyhole limpet
Diodora viridula (Lamarck, 1822)	A	green keyhole limpet
Diodora wetmorei Pérez Farfante, 1945	A	Wetmore keyhole limpet
Emarginula dentigera Heilprin, 1889	A	toothed emarginula
Emarginula nordica Pérez Farfante, 1947	A	northern emarginula
Emarginula phrixodes Dall, 1927	A	ruffled emarginula
Emarginula pumila (A. Adams, 1851)	A	pygmy emarginula
Emarginula sicula Gray, 1825	A	dagger emarginula
Emarginula tuberculosa Libassi, 1859	A,(P)	tuberculate emarginula
Fissurella angusta (Gmelin, 1791)	A	narrow keyhole limpet
Fissurella barbadensis (Gmelin, 1791)	A	Barbados keyhole limpet
Fissurella fascicularis Lamarck, 1822	A	wobbly keyhole limpet
Fissurella nodosa (Born, 1778)	A	knobby keyhole limpet
Fissurella punctata P. Fischer, 1857	A	punctate keyhole limpet
Fissurella rosea (Gmelin, 1791)	A	rosy keyhole limpet
Fissurella volcano Reeve, 1849	P	volcano keyhole limpet
Hemitoma bella Gabb, 1865	P	elegant emarginula
Hemitoma emarginata (Blainville, 1825)	A	emarginate emarginula
Hemitoma octoradiata (Gmelin, 1791)	A	eight-rib emarginula
Lucapina aegis (Reeve, 1850)	A	aegis fleshy limpet
Lucapina eolis Pérez Farfante, 1945	A	Eolis fleshy limpet
Lucapina philippiana (Finlay, 1930)	A	Philippi fleshy limpet
Lucapina sowerbii (Sowerby, 1835)	A	Sowerby fleshy limpet
Lucapina suffusa (Reeve, 1850)	A	cancellate fleshy limpet
Lucapinella callomarginata (Dall, 1871)	P	fleshy keyhole limpet
Lucapinella limatula (Reeve, 1850)	A	file fleshy limpet
Megatebennus bimaculatus (Dall, 1871)	P	two-spot keyhole limpet
Megathura crenulata (Sowerby, 1825)	P	giant keyhole limpet
Nesta atlantica Pérez Farfante, 1947	A	Atlantic nesta
Puncturella asturiana (P. Fischer, 1882)	A	Atlantic puncturella
Puncturella billsae Pérez Farfante, 1947	A	Bills puncturella
Puncturella caryophylla Dall, 1914	P	clove puncturella
Puncturella cooperi Carpenter, 1864	P	Cooper puncturella
Puncturella cucullata (Gould, 1846)	P	hooded puncturella
Puncturella decorata Cowan and J.H. McLean, 1968	P	painted puncturella
Puncturella erecta Dall, 1889	A	erect puncturella
Puncturella galeata (Gould, 1846)	P	helmet puncturella
Puncturella granulata Seguenza, 1863	A	granulate puncturella
Puncturella longifissa Dall, 1914	P	long-slot puncturella
Puncturella major Dall, 1891	P	great puncturella
Puncturella multistriata Dall, 1914	P	many-ribbed puncturella
Puncturella noachina (Linnaeus, 1771)	A,P,Ac	Linné puncturella
Puncturella punctocostata S.S. Berry, 1947	P	dot-rib puncturella
Rimula aequisculpta Dall, 1927	A	webbed rimula
Rimula californiana S.S. Berry, 1964	P	California rimula
Rimula dorriae Pérez Farfante, 1947	A	coarse rimula
Rimula frenulata Dall, 1889	A	bridle rimula
Rimula pycnonema Pilsbry, 1943	A	threaded rimula

Acmaeidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Acmaea funiculata (Carpenter, 1864)	P	corded white limpet
Acmaea mitra Rathke in Eschscholtz, 1833	P	whitecap limpet
Collisella alveus (Conrad, 1831)	A?,P	bowl limpet
Collisella asmi (Middendorff, 1847)	P	black limpet
Collisella borealis Lindberg, 1982	P	boreal limpet
Collisella conus (Test, 1945)	P	Test limpet
Collisella digitalis (Rathke in Eschscholtz, 1833)	P	ribbed limpet
Collisella instabilis (Gould, 1846)	P	unstable limpet
Collisella jamaicensis (Gmelin, 1791)	A	Jamaica limpet
Collisella leucopleura (Gmelin, 1791)	A	black-rib limpet
Collisella limatula (Carpenter, 1864)	P	file limpet
Collisella ochracea (Dall, 1871)	P	yellow limpet
Collisella pelta (Rathke in Eschscholtz, 1833)	P	shield limpet
Collisella scabra (Gould, 1846)	P	rough limpet
Collisella strigatella (Carpenter, 1864)	P	strigate limpet
Collisella triangularis (Carpenter, 1864)	P	triangular limpet
Lottia gigantea (Sowerby, 1834)	P	owl limpet
Notoacmea depicta (Hinds, 1842)	P	painted limpet
Notoacmea fenestrata (Reeve, 1855)	P	fenestrate limpet
Notoacmea insessa (Hinds, 1842)	P	seaweed limpet
Notoacmea paleacea (Gould, 1853)	P	surfgrass limpet
Notoacmea persona (Rathke in Eschscholtz, 1833)	P	mask limpet
Notoacmea scutum (Rathke in Eschscholtz, 1833)	P	plate limpet
Notoacmea testudinalis (O.F. Müller, 1776)	A,P,Ac	plant limpet
Patelloida pustulata (Helbling, 1779)	A	spotted limpet
Tectura rosacea (Carpenter, 1864)	P	rosy Pacific limpet
Problacmaea apicina (Dall, 1879)	P	cap limpet
Problacmaea moskalevi Golikov and Kussakin, 1972	P	Moskalev limpet
Problacmaea rubella (Fabricius, 1780)	Ac	reddish limpet
Problacmaea sybaritica (Dall, 1871)	P	lush limpet
Rhodopetala rosea (Dall, 1872)	P	pink limpet

Lepetidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Lepeta alba (Dall, 1869)	P	white blind limpet
Lepeta caeca (O.F. Müller, 1776)	A,P,Ac	northern blind limpet
Lepeta caecoides Carpenter, 1865	P,Ac	dead-end blind limpet
Lepeta concentrica Middendorff, 1851	P,Ac	ringed blind limpet

Cocculinidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Cocculina beanii Dall, 1882	A	Bean cocculina
Cocculina casanica Dall, 1919	P	Alaska cocculina
Cocculina rathbuni Dall, 1882	A	Rathbun cocculina
Cocculina reticulata A.E. Verrill, 1885	A	reticulate cocculina

Lepetellidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Addisonia lateralis (Requien, 1848)	A	
Addisonia paradoxa Dall, 1882	A	

Trochidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Calliostoma adelae Schwengel, 1951	A	Adele topsnail
Calliostoma annulatum (Lightfoot, 1786)	P	purple-ring topsnail
Calliostoma bairdii A.E. Verrill and S.I. Smith, 1880	A	Baird topsnail
Calliostoma barbouri Clench and Aguayo, 1946	A	Barbour topsnail
Calliostoma bernardi J.H. McLean, 1984	P	Bernard topsnail
Calliostoma canaliculatum (Lightfoot, 1786)	P	channeled topsnail
Calliostoma euglyptum (A. Adams, 1854)	A	sculptured topsnail
Calliostoma fascinans Schwengel and McGinty, 1942	A	enchanting topsnail
Calliostoma gemmulatum Carpenter, 1864	P	gem topsnail
Calliostoma gloriosum Dall, 1871	P	glorious topsnail
Calliostoma javanicum (Lamarck, 1822)	A	chocolate-line topsnail
Calliostoma jujubinum (Gmelin, 1791)	A	mottled topsnail
Calliostoma keenae J.H. McLean, 1970	P	Keen topsnail
Calliostoma ligatum (Gould, 1849)	P	blue topsnail
Calliostoma marionae Dall, 1906	A	Marion topsnail
Calliostoma occidentale (Mighels and C.B. Adams, 1842)	A	north Atlantic topsnail
Calliostoma platinum Dall, 1890	P	silvery topsnail
Calliostoma psyche Dall, 1889	A	psyche topsnail
Calliostoma pulchrum (C.B. Adams, 1850)	A	beautiful topsnail
Calliostoma roseolum Dall, 1881	A	rosy topsnail
Calliostoma sapidum Dall, 1881	A	
Calliostoma splendens Carpenter, 1864	P	splendid topsnail
Calliostoma supragranosum Carpenter, 1864	P	granulose topsnail
Calliostoma tricolor Gabb, 1865	P	tricolor topsnail
Calliostoma turbinum Dall, 1895	A	spindle topsnail
Calliostoma variegatum Carpenter, 1864	P	variegate topsnail
Calliostoma yucatecanum Dall, 1881	A	depressed topsnail
Calliotropis oxybasis (Dall, 1890)	P	
Calliotropis regalis (A.E. Verrill and S.I. Smith, 1880)	A	regal spiny margarite
Cittarium pica (Linnaeus, 1758)	A	West Indian topsnail
Dentistyla asperrima (Dall, 1881)	A	rough topsnail
Euchelus guttarosea Dall, 1889	A	red-spot euchelus
Gaza superba (Dall, 1881)	A	superb gaza
Halistylus pupoides (Carpenter, 1864)	P	pupoid halistyle
Lirularia acuticostata (Carpenter, 1864)	P	sharp-rib lirularia
Lirularia discors J.H. McLean, 1984	P	different lirularia
Lirularia parcipicta (Carpenter, 1864)	P	few-spotted lirularia
Lirularia succincta (Carpenter, 1864)	P	girdled lirularia
Lischkeia bairdii (Dall, 1889)	P	Baird spiny margarite
Lischkeia carlotta (Dall, 1902)	P	Charlotte Island spiny margarite
Lischkeia cidaris (Carpenter, 1864)	P	Adams spiny margarite
Lischkeia imperialis (Dall, 1881)	A	imperial spiny margarite
Margarites althorpensis Dall, 1919	P	Port Althorp margarite
Margarites bicostatus J.H. McLean, 1964	P	two-rib margarite
Margarites costalis (Gould, 1841)	A,P	boreal rosy margarite
Margarites frigidus Dall, 1919	P,Ac	polar margarite
Margarites giganteus (Leche, 1878)	P,Ac	giant margarite
Margarites groenlandicus (Gmelin, 1791)	A,Ac	Greenland margarite

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Margarites healyi Dall, 1919	Ac	Healy margarite
Margarites helicinus (Phipps, 1774)	A,P,Ac	spiral margarite
Margarites hickmanae J.H. McLean, 1984	P	Hickman margarite
Margarites keepi A.G. Smith and Gordon, 1948	P	Keep margarite
Margarites lirulatus (Carpenter, 1864)	P	lirulate margarite
Margarites minutissimus Mighels, 1843	A	miniature margarite
Margarites multilineatus De Kay, 1843	A	many-lined margarite
Margarites olivaceus (Brown, 1827)	A,P,Ac	olive margarite
Margarites optabilis (Carpenter, 1864)	P	choice margarite
Margarites pupillus (Gould, 1849)	P	little margarite
Margarites rhodia Dall, 1920	P	Pacific rosy margarite
Margarites salmoneus (Carpenter, 1864)	P	salmon margarite
Margarites simbla Dall, 1913	P	beehive margarite
Margarites smithi Bartsch, 1927	P	Smith margarite
Margarites vahlii (Möller, 1842)	A,P,Ac	Vahl margarite
Margarites vorticiferus (Dall, 1873)	P,Ac	vortex margarite
Microgaza rotella Dall, 1881	A	Dall dwarf gaza
Microgaza rotella inornata Quinn, 1979	A	
Mirachelus clinocnemus Quinn, 1979	A	stooped mirachelus
Mirachelus corbis (Dall, 1889)	A	basket mirachelus
Norrisia norrisi (Sowerby, 1838)	P	Norris topsnail
Pseudostomatella erythrocoma (Dall, 1889)	A	Dall false stomatella
Solariella intermedius (Leche, 1878)	P	intermediate solarelle
Solariella lacunella (Dall, 1881)	A	channeled solarelle
Solariella laevis Friele, 1886	A	smooth solarelle
Solariella lamellosa A.E. Verrill and S.I. Smith, 1880	A	lamellose solarelle
Solariella lewisae Willett, 1946	P	Lewis solarelle
Solariella micraulax J.H. McLean, 1964	P	fine-groove solarelle
Solariella nuda Dall, 1896	P	naked solarelle
Solariella obscura (Couthouy, 1838)	A,P,Ac	obscure solarelle
Solariella periscopia (Dall, 1927)	A	look-around solarelle
Solariella permabilis Carpenter, 1864	P	lovely Pacific solarelle
Solariella rhyssa Dall, 1919	P	wrinkled solarelle
Solariella triplostephanus Dall, 1910	P	three-ring solarelle
Solariella varicosa (Mighels and C.B. Adams, 1842)	A,P	varicose solarelle
Synaptocochlea picta (d'Orbigny, 1842)	A	painted false stomatella
Tegula aureotincta Forbes, 1850	P	gilded tegula
Tegula brunnea Philippi, 1848	P	brown tegula
Tegula eiseni Jordan, 1936	P	western banded tegula
Tegula excavata (Lamarck, 1822)	A	green-base tegula
Tegula fasciata (Born, 1778)	A	smooth Atlantic tegula
Tegula funebralis (A. Adams, 1855)	P	black tegula
Tegula gallina Forbes, 1850	P	speckled tegula
Tegula hotessieriana (d'Orbigny, 1842)	A	Caribbean tegula
Tegula lividomaculata (C.B. Adams, 1845)	A	West Indian tegula
Tegula montereyi (Kiener, 1850)	P	Monterey tegula
Tegula pulligo (Gmelin, 1791)	P	dusky tegula
Tegula regina Stearns, 1892	P	queen tegula
Turcica caffea (Gabb, 1865)	P	two-tooth topsnail

Seguenziidae

Ancistrobasis depressa Dall, 1889	A	depressed basilissa
Seguenzia giovia Dall, 1919	P	California seguenzia
Seguenzia monocingulata Seguenza, 1876	A	girdle seguenzia

Cyclostrematidae

Arene bairdii (Dall, 1889)	A	Baird cyclostreme
Arene briareus (Dall, 1881)	A	briar cyclostreme
Arene cruentata (Mühlfeld, 1829)	A	star cyclostreme
Arene diegensis J.H. McLean, 1964	P	San Diego cyclostreme
Arene farallonensis (A.G. Smith, 1952)	P	Farallon Island cyclostreme
Arene tricarinata (Stearns, 1872)	A	gem cyclostreme
Arene variabilis (Dall, 1889)	A	variable cyclostreme
Arene venustula Aguayo and Rehder, 1936	A	venuste cyclostreme
Coronadoa simonsae Bartsch, 1946	P	Simons cyclostreme
Cyclostrema cancellatum Marryat, 1818	A	cancellate cyclostreme
Cyclostrema huesonicum Dall, 1927	A	Key West cyclostreme
Cyclostrema tortuganum (Dall, 1927)	A	Tortugas cyclostreme
Liotia fenestrata Carpenter, 1864	P	California cyclostreme
Macrarene cookeana (Dall, 1918)	P	Cook cyclostreme
Parviturbo acuticostatus (Carpenter, 1864)	P	sharp-rib cyclostreme
Parviturbo calidimaris Pilsbry and McGinty, 1945	A	tropical cyclostreme
Parviturbo francesae Pilsbry and McGinty, 1945	A	Frances cyclostreme
Parviturbo rehderi Pilsbry and McGinty, 1945	A	Rehder cyclostreme
Parviturbo weberi Pilsbry and McGinty, 1945	A	Weber cyclostreme
Sansonia tuberculata (Watson, 1886)	A	tuberculate cyclostreme

Skeneidae

Skenea californica (Bartsch, 1907)	P	California skenea
Skenea carmelensis A.G. Smith and Gordon, 1948	P	Carmel skenea
Skenea concordia (Bartsch, 1920)	P	beaded skenea
Skenea coronadoensis (Arnold, 1903)	P	Coronado Island skenea

Turbinidae

Astralium phoebia (Röding, 1798)	A	long-spine starsnail
Homalopoma albidum (Dall, 1881)	A	white dwarf turban
Homalopoma baculum Carpenter, 1864	P	berry dwarf turban
Homalopoma carpenteri (Pilsbry, 1888)	P	Carpenter dwarf turban
Homalopoma draperi J.H. McLean, 1984	P	Draper dwarf turban
Homalopoma engbergi (Willett, 1929)	P	Engberg dwarf turban
Homalopoma grippi (Dall, 1911)	P	Gripp dwarf turban
Homalopoma indutum (Watson, 1879)	A	two-faced dwarf turban
Homalopoma juanensis (Dall, 1919)	P	northwest dwarf turban
Homalopoma luridum (Dall, 1885)	P	dark dwarf turban
Homalopoma paucicostatum (Dall, 1871)	P	few-ribbed dwarf turban
Homalopoma radiatum (Dall, 1918)	P	radiate dwarf turban
Lithopoma americana (Gmelin, 1791)	A	American starsnail
Lithopoma caelata (Gmelin, 1791)	A	carved starsnail
Lithopoma gibberosa (Dillwyn, 1817)	P	red turban
Lithopoma tecta (Lightfoot, 1786)	A	West Indian starsnail
Lithopoma tuber (Linnaeus, 1767)	A	green starsnail
Lithopoma undosa (W. Wood, 1828)	P	wavy turban
Moelleria costulata (Möller, 1842)	A,Ac	
Moelleria drusiana Dall, 1919	P	
Moelleria quadrae Dall, 1897	P	
Turbo cailletii P. Fischer and Bernardi, 1856	A	filose turban
Turbo canaliculatus Hermann, 1781	A	channeled turban
Turbo castanea Gmelin, 1791	A	chestnut turban

Phasianellidae

Tricolia affinis (C.B. Adams, 1850)	A	checkered pheasant
Tricolia bella (M. Smith, 1937)	A	shouldered pheasant
Tricolia compta (Gould, 1855)	P	banded pheasant
Tricolia cruenta Robertson, 1958	A	stained pheasant
Tricolia pterocladica Robertson, 1958	A	rhodophyte pheasant
Tricolia pulloides (Carpenter, 1865)	P	sullied pheasant
Tricolia rubrilineata (Strong, 1928)	P	red-line pheasant
Tricolia substriata (Carpenter, 1864)	P	low-line pheasant
Tricolia thalassicola Robertson, 1958	A	turtlegrass pheasant
Tricolia variegata (Carpenter, 1864)	P	Pacific micro pheasant

Neritidae

Nerita fulgurans Gmelin, 1791	A	Antillean nerite
Nerita peloronta Linnaeus, 1758	A	bleeding tooth
Nerita tessellata Gmelin, 1791	A	tessellate nerite
Nerita versicolor Gmelin, 1791	A	four-tooth nerite
Neritina clenchi Russell, 1940	A(E,F)	Clench nerite
Neritina reclivata (Say, 1822)	A(E,F)	olive nerite
Neritina virginea (Linnaeus, 1758)	A(E)	virgin nerite
Puperita pupa (Linnaeus, 1767)	A	zebra nerite
Smaragdia viridis (Linnaeus, 1758)	A	emerald nerite

Phenacolepadidae

Phenacolepas hamillei (P. Fischer, 1857)	A	Hamille limpet

ORDER MESOGASTROPODA

Lacunidae

Haloconcha minor Dall, 1919	P	lesser lacuna
Haloconcha reflexa (Dall, 1884)	P	reflexed lacuna
Lacuna carinata Gould, 1848	P	carinate lacuna
Lacuna crassior (Montagu, 1803)	A,P	thick lacuna
Lacuna marmorata Dall, 1919	P	chink snail
Lacuna pallidula (E.M. da Costa, 1778)	A	pale lacuna
Lacuna parva (E.M. da Costa, 1778)	A	tiny lacuna
Lacuna succinea S.S. Berry, 1953	P	amber lacuna
Lacuna unifasciata Carpenter, 1856	P	one-band lacuna
Lacuna vaginata Dall, 1918	P	delightful lacuna
Lacuna variegata Carpenter, 1864	P	variegate lacuna
Lacuna vincta (Montagu, 1803)	A,P,Ac	northern lacuna

Littorinidae

Algamorda newcombiana (Hemphill, 1876)	P	Newcomb periwinkle
Littorina angustior (Mörch, 1876)	A	slender periwinkle
Littorina irrorata (Say, 1822)	A	marsh periwinkle
Littorina keenae Rosewater, 1978	P	eroded periwinkle
Littorina lineolata d'Orbigny, 1840	A	lineolate periwinkle
Littorina littorea (Linnaeus, 1758)	A	common periwinkle
Littorina meleagris (Potiez and Michaud, 1838)	A	white-spot periwinkle
Littorina mespillum (Mühlfeld, 1824)	A	dwarf brown periwinkle
Littorina nebulosa (Lamarck, 1822)	A	cloudy periwinkle
Littorina neglecta Bean, 1844	A	obscure periwinkle
Littorina obtusata (Linnaeus, 1758)	A	yellow periwinkle
Littorina saxatilis (Olivi, 1792)	A,P,Ac	rough periwinkle
Littorina scabra angulifera (Lamarck, 1822)	A	mangrove periwinkle
Littorina scutulata Gould, 1849	P	checkered periwinkle
Littorina sitkana Philippi, 1846	P	Sitka periwinkle
Littorina ziczac (Gmelin, 1791)	A	zebra periwinkle
Nodilittorina tuberculata (Menke, 1828)	A	pricklywinkle
Tectarius muricatus (Linnaeus, 1758)	A	beaded periwinkle
Tectininus nodulosus (Pfeiffer, 1839)	A	false pricklywinkle

Rissoidae

Alvania acuticostata (Dall, 1889)	A	sharp-rib alvania
Alvania alaskana Dall, 1886	P	
Alvania almo Bartsch, 1911	P	
Alvania areolata Stimpson, 1851	A	
Alvania auberiana (d'Orbigny, 1842)	A	West Indian alvania
Alvania aurivillii Dall, 1886	P	
Alvania bakeri Bartsch, 1910	P	
Alvania bartolomensis Bartsch, 1917	P	
Alvania brychia (A.E. Verrill, 1884)	A,Ac	Jan-mayan alvania
Alvania burrardensis Bartsch, 1921	P	
Alvania carpenteri (Weinkauff, 1885)	P	
Alvania castanea Möller, 1842	A	
Alvania castanella Dall, 1886	P	
Alvania dalli Bartsch, 1927	P	
Alvania dinora Bartsch, 1917	P	
Alvania exarata Stimpson, 1851	A	
Alvania filosa Carpenter, 1865	P	
Alvania keenae Gordon, 1939	P	
Alvania kyskaensis Bartsch, 1917	P	
Alvania latior (Mighels and C.B. Adams, 1842)	A	
Alvania microglypta Hase, 1943	P	microglypta alvania
Alvania montereyensis Bartsch, 1911	P	
Alvania multilineata (Stimpson, 1851)	A	
Alvania pedroana Bartsch, 1911	P	

Thailand and Hong Kong
A Shelling Adventure

ITIC711JG

18 Days

Departure
March 18, 1985

All-inclusive fare: **$2650** from West Coast
$2875 from New York

Featuring:
— Roundtrip Economy Class Airfare
— First Class and Deluxe Accommodations
— Breakfast and Dinner **everyday** in Thailand
— Breakfast everyday and **Farewell Banquet** in Hong Kong
— All Tours and Boat Cruises as listed

Day 1: Depart **United States** bound for **Thailand.**

Day 2: Overnight in **Taipei.**

Day 3: Flight to **Bangkok**, short domestic flight to **Phuket.**

Day 3 to Day 8: Shelling the rich waters of the **Andaman Sea.** Boat trips included to choice shelling locales and the bizarre limestone islands of **Phangnga.**

Day 8 to Day 10: Return to **Bangkok.** City tour, including the **Grand Palace and the Temple of the Emerald Buddha.** Festive **Banquet** with Folk Dance Performance. Time for shopping and visiting the famous "klongs," or canals.

Day 10 to Day 13: Transfer by motor coach to **Hua Hin** on the **Gulf of Thailand** for 3 days of productive shelling.

Day 13 to Day 15: Short flight to **Chiang Mai** in the hill country noted for its refreshing clime. We will tour this beautiful area with its temples, palaces, gardens, and handicraft villages.

Day 15: Return to **Bangkok** and transfer to flight for **Hong Kong.**

Day 15 to Day 18: Three exciting days in this fabulous port city-state. **Included are a Hong Kong Island** tour and a memorable **Chinese Farewell Banquet.** Great opportunities for duty-free shopping and **tailor-made clothing.**

Day 18: Depart for the **United States** and home! Cross Date Line and return **home the same day.**

The Philippines—
A Shelling Adventure
15 Days

ITAP711JG

Departure
May 11, 1985

All-inclusive fare: **$1995** from San Francisco

Featuring:
— Roundtrip Economy Class Airfare
— First Class and Deluxe Accommodations
— Breakfast and Dinner **everyday** including Welcome Banquet and Gala Farewell Dinner Show
— All Tours and Boat Cruises as listed

Day 1: Depart **United States** bound for **Manila.**

Day 3: Crossing the International Date Line, we arrive 2 days later in **Manila.** Transfer to the **Manila Holiday Inn**, overlooking **Manila Bay** and the Cultural Center. Welcome Dinner at **Josephine's Restaurant**, one of Manila's finest.

Day 4: Morning tour of **Manila City** and Suburbs. Afternoon flight to **Zamboanga** with accommodations at the **Lantaka Hotel** on the **Sulu Sea.** Dinner on the verandah, where Morro water gypsies offer their shells, corals and handicrafts from boats moored right next to your table.

Day 5 thru Day 8: Days of shelling and exploring **Zamboanga**, including 2 boat trips to Little and Big **Santa Cruz Islands** off the coast. These are coral reefs and offer wonderful opportunities for snorkeling, reefwalking and beachcombing.. We also visit local shell dealers, the Barter Trade Market, and antique dealers to view a great selection of Muslim antiquities and handicrafts.

Day 9: Flight to **Mactan, Cebu.** Transfer to the **Tambuli Beach Resort** on **Mactan Island,** in close proximity to the fabled shelling village of **Puente Engano.**

Day 10 thru Day 12: We will be enjoying both a full-day and a half-day cruise to some of the best shelling spots on the **Visayan Sea.** There is also excellent intertidal collecting on the beachfront of the Resort and mud-flat collecting nearby. Visits to **Puente Engano** By Jeepney to bargain directly with the fishermen for their rare and choice specimen shells. Tour of the historic **Magellan** and **LapuLapu** monuments. Optional watersports include windsurfing and hobycatting.

Day 13: Flight back to **Manila** and return to **Manila Holiday Inn.** Afternoon free for shopping, exploring, relaxing or visiting local shell dealers.

Day 14: A 5-hour tour to **Tagaytay,** overlooking one of the world's wonders–**Taal Volcano.** This incredible formation consists of a volcano within a lake within a volcano! Gala Farewell Dinner and Show this evening at the **Sulo Restaurant.**

Day 15: Depart this morning for return flight back to the **United States.** Crossing the International Date Line once more, we gain a day and arrive the same afternoon.

Joel Greene Tours

P.O. Box 99331
San Francisco, CA 94109
(415) 922-9441

Reservations Application

Return to:
Joel Greene Tours
P.O. Box 99331
San Francisco, CA 94109

Name ______________________________

Address ______________________________

City, State & Zip ______________________________

Telephone ______________________________

I have read and accept the General Conditions and I understand the cancellation rules with regards to the trip.

Signature: ______________ Date: ______________

Thailand and Hong Kong — March 18, 1985

My/our deposit is enclosed in the amount of $250. per person.
With regards to accommodations, I request the following:
☐ Twin room ☐ Single room (supplement $350)
☐ Willing to share if possible

The Philipines — May 11, 1985

My/our deposit is enclosed in the amount of $250. per person.
With regards to accommodations, I request the following:
☐ Twin room ☐ Single room (supplement $200.)
☐ Willing to share if possible

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Prices subject to change should there by any revisions in exchange rates or operational costs.

Places pictured are in the geographical area but may not be included in specific tours described herein.

PAN AM

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PAN AM

GENERAL INFORMATION AND CONDITIONS

HOTELS: Selected First Class hotels are based on two persons sharing twin-bedded room with private bath. Single rooms are subject to availability at the time of booking at the quoted supplement. If ever necessary, alternate hotels of equal quality may be provided. Every effort will be made to accommodate singles who wish roommates. If this cannot be done, single supplement will be required.

MEALS: Full American breakfast daily plus lunches and dinners as indicated.

TRANSFERS: Included for all movements between airports and hotels while on tour.
BAGGAGE: Tour members are requested to limit themselves to one checked suitcase per person, plus one flight bag. Porterage is included with all transfers. IATA regulations limit checked baggage to a maximum of 2 pieces.
DOCUMENTATION: A valid passport is required.
RESERVATIONS: Reservations will not be considered firm until a deposit of $250 is received. Full payment is due no later than 60 days prior to departure. Tour members joining less than 60 days prior to departure must enclose full payment with reservation application.
CANCELLATIONS: There is a $25 non-refundable registration fee. Within 60 days prior to departure, all monies will be refunded, less any charges imposed by hotels or suppliers, and a nominal $200 handling fee. Within 30 days of departure, a forfeiture of 50% of the Special airfare may apply. Once travel has commenced, no refund will be made for any portion of the tour package that the tour member does not utilize. An application for trip cancellation insurance will follow upon receipt of your deposit.

OUR TOUR PRICE DOES NOT INCLUDE: Additional air transportation not specified in tour feature or itinerary, pre-departure costs, documentation, vaccinations or inoculations, foreign airport taxes, and expenses for services obviously not included such as excess baggage charges, additional meals, beverages or spirits, accident and baggage insurance, laundry, phone calls and items of a personal nature.

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Alvania pelagica (Stimpson, 1851)	A	carinate alvania
Alvania precipitata (Dall, 1889)	A	precipitate alvania
Alvania rosana Bartsch, 1911	P	Santa Rosa alvania
Alvania sanjuanensis Bartsch, 1920	P	
Alvinia compacta (Carpenter, 1864)	P	compact alvania
Alvinia oldroydae (Bartsch, 1911)	P	Oldroyd alvania
Alvinia purpurea (Dall, 1871)	P	purple alvania
Amphithalamus inclusus Carpenter, 1864	P	
Amphithalamus lacunatus Carpenter, 1864	P	
Amphithalamus tenuis Bartsch, 1911	P	
Amphithalamus vallei Aguayo and Jaume, 1947	A	del Valle tiny snail
Anabathron muriel Bartsch and Rehder, 1939	P	Muriel anabathron
Benthonella gaza Dall, 1889	A	
Benthonella nisonis Dall, 1889	A	nison benthonella
Cingula aculeus Gould, 1841	A	pointed cingula
Cingula alaskana Bartsch, 1912	P	
Cingula aleutica Dall, 1886	P	
Cingula asser (Bartsch, 1910)	P	
Cingula castanea (Möller, 1842)	A,Ac	
Cingula cerinella (Dall, 1887)	P	
Cingula eyerdami Willett, 1934	P	Eyerdam cingula
Cingula forresterensis Willett, 1934	P	
Cingula globula (Möller, 1842)	A	
Cingula globuloidea Warén, 1972	A	
Cingula jacksoni Bartsch, 1953	A	Jackson cingula
Cingula katherinae Bartsch, 1912	P	
Cingula kyskensis (Bartsch, 1911)	P	
Cingula martyni Dall, 1887	P	
Cingula moerchi Collin, 1887	A,P,Ac	
Cingula montereyensis Bartsch, 1912	P	Monterey cingula
Cingula palmeri (Dall, 1919)	P	
Cingula robusta scipio Dall, 1887	P	
Crepitacella vestalis Rehder, 1943	A	
Floridiacrobs dysbatus (Pilsbry and McGinty, 1949)	A	
Mereline sequisculpta (Keep, 1887)	P	evenly-sculpted alvania
Merelina cosmia (Bartsch, 1911)	P	cosmic alvania
Microdochus floridanus Rehder, 1943	A	Florida cingula
Nannoteretispira kelseyi (Bartsch, 1911)	P	Kelsey alvania
Rissoa bermudezi Aguayo and Rehder, 1936	A	Bermudez risso
Rissoa toroensis Olsson and McGinty, 1958	A	
Rissoina bakeri Bartsch, 1902	P	
Rissoina bryerea (Montagu, 1803)	A	
Rissoina californica Bartsch, 1915	P	
Rissoina cancellata Philippi, 1847	A	
Rissoina catesbyana d'Orbigny, 1842	A	Catesby risso
Rissoina cleo Bartsch, 1915	P	
Rissoina coronadoensis Bartsch, 1915	P	
Rissoina dalli Bartsch, 1915	P	
Rissoina decussata (Montagu, 1803)	A	
Rissoina hannai A.G. Smith and Gordon, 1948	P	
Rissoina keenae A.G. Smith and Gordon, 1948	P	
Rissoina kelseyi (Dall and Bartsch, 1902)	P	
Rissoina mayori Dall, 1927	A	
Rissoina multicostata (C.B. Adams, 1850)	A	
Rissoina newcombei Dall, 1897	P	
Rissoina sagraiana d'Orbigny, 1842	A	
Rissoina striosa (C.B. Adams, 1850)	A	
Zebina browniana (d'Orbigny, 1842)	A	smooth risso

Barleeidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Barleeia acuta (Carpenter, 1864)	P	acute barleysnail
Barleeia alderi (Carpenter, 1864)	P	Alder barleysnail
Barleeia bentleyi Bartsch, 1920	P	Bentley barleysnail
Barleeia californica Bartsch, 1920	P	California barleysnail
Barleeia carpenteri Bartsch, 1920	P	Carpenter barleysnail
Barleeia haliotiphila Carpenter, 1864	P	abalone barleysnail
Barleeia subtenuis Carpenter, 1864	P	fragile barleysnail

Assimineidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Assiminea californica (Tryon, 1865)	P(E)	California assiminea
Assiminea succinea (Pfeiffer, 1840)	A(E)	Atlantic assiminea

Hydrobiidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Hydrobia boonae Morrison, 1973	A(E)	Boone hydrobia
Hydrobia totteni Morrison, 1954	A(E)	minute hydrobia
Littoridina sphinctostoma Abbott and Ladd, 1951	A(E)	smallmouth hydrobia

Truncatellidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Truncatella californica Pfeiffer, 1857	P	California truncatella
Truncatella caribaeensis Reeve, 1842	A	Caribbean truncatella
Truncatella pulchella Pfeiffer, 1839	A	beautiful truncatella
Truncatella scalaris (Michaud, 1830)	A	ladder truncatella

Rissoellidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Rissoella caribaea Rehder, 1943	A	Caribbean risso
Rissoella hertleini A.G. Smith and Gordon, 1948	P	Monterey risso

Skeneopsidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Skeneopsis alaskana Dall, 1919	P	Alaska skenea
Skeneopsis planorbis (Fabricius, 1780)	A	flat skenea

Omalogyridae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Omalogyra atomus (Philippi, 1841)	A	atom snail

Vitrinellidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Anticlimax athleenae Pilsbry and McGinty, 1946	A	Athleen vitrinella
Anticlimax pilsbryi McGinty, 1945	A	cupola vitrinella
Aorotrema cistronium (Dall, 1889)	A	
Aorotrema erraticum Pilsbry and McGinty, 1945	A	
Aorotrema pontogenes (Schwengel and McGinty, 1942)	A	
Circulus cosmius Bartsch, 1907	P	
Circulus dalli Bush, 1897	A	Dall vitrinella
Circulus multistriatus (A.E. Verrill, 1884)	A	threaded vitrinella
Circulus rossellinus Dall, 1919	P	
Circulus semisculptus (Olsson and McGinty, 1958)	A	
Circulus suppressus (Dall, 1889)	A	suppressed vitrinella
Cyclostremiscus beauii (P. Fischer, 1857)	A	Beau vitrinella
Cyclostremiscus jeannae (Pilsbry and McGinty, 1945)	A	
Cyclostremiscus ornatus Olsson and McGinty, 1958	A	
Cyclostremiscus pentagonus (Gabb, 1873)	A	trilix vitrinella
Didianema pauli Pilsbry and McGinty, 1945	A	
Epicynia devexa Keen, 1946	P	devex vitrinella
Epicynia inornata (d'Orbigny, 1842)	A	hairy vitrinella
Epicynia multicarinata (Dall, 1889)	A	fringed vitrinella
Parviturboides interruptus (C.B. Adams, 1850)	A	interrupted vitrinella
Pleuromalaxis balesi Pilsbry and McGinty, 1945	A	Bales vitrinella
Scissilabra dalli Bartsch, 1907	P	splitlip vitrinella
Solariorbis arnoldi Bartsch, 1927	P	
Solariorbis blakei Rehder, 1944	A	
Solariorbis infracarinata Gabb, 1881	A	Gabb vitrinella
Solariorbis mooreana Vanatta, 1904	A	
Teinostoma bibbiana Dall, 1919	P	
Teinostoma biscaynense Pilsbry and McGinty, 1945	A	Biscayne vitrinella
Teinostoma cerinicallus Pilsbry and McGinty, 1946	A	
Teinostoma clavium Pilsbry and McGinty, 1945	A	
Teinostoma cocolitoris Pilsbry and McGinty, 1945	A	
Teinostoma cryptospira A.E. Verrill, 1884	A	
Teinostoma goniogyrus Pilsbry and McGinty, 1945	A	
Teinostoma lerema Pilsbry and McGinty, 1945	A	
Teinostoma lituspalmarum Pilsbry and McGinty, 1945	A	
Teinostoma megastoma (C.B. Adams, 1850)	A	
Teinostoma minusculum (Bush, 1897)	A	
Teinostoma multistriata A.E. Verrill, 1884	A	
Teinostoma nesaeum Pilsbry and McGinty, 1945	A	
Teinostoma obtectum Pilsbry and McGinty, 1945	A	
Teinostoma parvicallum Pilsbry and McGinty, 1945	A	
Teinostoma pilsbryi McGinty, 1945	A	
Teinostoma reclusa (Dall, 1889)	A	
Teinostoma salvania Dall, 1919	P	
Teinostoma sapiella Dall, 1919	P	
Teinostoma semistriata (d'Orbigny, 1842)	A	
Teinostoma supravallatum (Carpenter, 1864)	P	upright vitrinella
Vitrinella alaskensis Bartsch, 1907	P	
Vitrinella berryi (Bartsch, 1907)	P	
Vitrinella bicaudata Pilsbry and McGinty, 1946	A	two-tail vitrinella
Vitrinella carinata (d'Orbigny, 1842)	A	
Vitrinella columbiana Bartsch, 1921	P	
Vitrinella diaphana (d'Orbigny, 1842)	A	
Vitrinella eshnaurae Bartsch, 1907	P	
Vitrinella filifera Pilsbry and McGinty, 1946	A	threaded vitrinella
Vitrinella floridana Pilsbry and McGinty, 1946	A	Florida vitrinella
Vitrinella helicoidea C.B. Adams, 1850	A	helix vitrinella
Vitrinella hemphilli Vanatta, 1913	A	Hemphill vitrinella
Vitrinella oldroydi Bartsch, 1907	P	Oldroyd vitrinella
Vitrinella praecox Pilsbry and McGinty, 1946	A	premature vitrinella
Vitrinella smithi Bartsch, 1927	P	
Vitrinella stearnsi Bartsch, 1907	P	Stearns vitrinella
Vitrinella terminalis Pilsbry and McGinty, 1946	A	terminal vitrinella
Vitrinella texana Moore, 1965	A	Texas vitrinella
Vitrinella thomasi (Pilsbry, 1945)	A	Tom McGinty vitrinella
Vitrinella tryoni Bush, 1897	A	
Vitrinella williamsoni Dall, 1892	P	
Vitrinorbis diegensis (Bartsch, 1907)	P	San Diego vitrinella

Tornidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Cochliolepis parasitica Stimpson, 1858	A	parasitic scalesnail
Cochliolepis striata Dall, 1889	A	striate scalesnail
Tornus callanus (Dall, 1919)	P	

Caecidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Caecum antillarum Carpenter, 1858	A	Antillean caecum
Caecum bipartitum De Folin, 1870	A	
Caecum californicum Dall, 1885	P	California caecum
Caecum carolinianum Dall, 1892	A	Carolina caecum
Caecum carpenteri Bartsch, 1920	P	Carpenter caecum
Caecum clava De Folin, 1867	A	blade caecum
Caecum condylum Moore, 1969	A	bone caecum
Caecum cooperi S.I. Smith, 1860	A	Cooper Atlantic caecum
Caecum cornucopiae Carpenter, 1858	A	horn-of-plenty caecum
Caecum crebricinctum Carpenter, 1864	P	many-named caecum
Caecum cubitatum De Folin, 1868	A	smooth caecum
Caecum cycloferum De Folin, 1867	A	fatlip caecum
Caecum dalli Bartsch, 1920	P	Dall caecum
Caecum floridanum Stimpson, 1851	A	Florida caecum
Caecum gurgulio Carpenter, 1858	A	windpipe caecum
Caecum heladum Olsson and Harbison, 1953	A	fine-line caecum
Caecum imbricatum Carpenter, 1858	A	imbricate caecum
Caecum johnsoni Winkley, 1908	A	Johnson caecum
Caecum nitidum Stimpson, 1851	A	little horn caecum
Caecum plicatum Carpenter, 1858	A	plicate caecum
Caecum profundicolum Bartsch, 1920	P	deepwater caecum
Caecum pulchellum Stimpson, 1851	A	beautiful caecum
Caecum ryssotitum De Folin, 1867	A	minute caecum
Caecum textile De Folin, 1867	A	textile caecum
Caecum tortile Dall, 1892	A	twisted caecum

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Caecum vestitum De Folin, 1870	A	Vera Cruz caecum
Fartulum occidentale (Bartsch, 1920)	P	western caecum
Fartulum orcutti (Dall, 1885)	P	Orcutt caecum

Turritellidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Tachyrhynchus erosus (Couthouy, 1838)	A,P,Ac	eroded turretsnail
Tachyrhynchus lacteolus (Carpenter, 1865)	P	milky turretsnail
Tachyrhynchus pratomus Dall, 1919	P	
Tachyrhynchus reticulatus (Mighels and C.B. Adams, 1842)	A,P,Ac	
Tachyrhynchus stearnsii Dall, 1919	P	
Turritella acropora Dall, 1889	A	boring turretsnail
Turritella cooperi Carpenter, 1864	P	Cooper turretsnail
Turritella exoleta (Linnaeus, 1758)	A	eastern turretsnail
Turritella mariana Dall, 1908	P	Maria turretsnail
Turritella orthosymmetrica S.S. Berry, 1953	P	symmetrical turretsnail
Turritella variegata (Linnaeus, 1758)	A	variegate turretsnail
Turritellopsis acicula (Stimpson, 1851)	A,P,Ac	needle turretsnail
Vermicularia fargoi Olsson, 1951	A	Fargo wormsnail
Vermicularia fewkesi Yates, 1890	P	Fewkes wormsnail
Vermicularia knorrii (Deshayes, 1843)	A	Florida wormsnail
Vermicularia radicula Stimpson, 1851	A	northern wormsnail
Vermicularia spirata (Philippi, 1836)	A	West Indian wormsnail

Siliquariidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Siliquaria squamata Blainville, 1827	A	slit wormsnail

Vermetidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Dendropoma lituella (Mörch, 1861)	P	flat wormsnail
Petaloconchus compactus (Carpenter, 1864)	P	compact wormsnail
Petaloconchus erectus (Dall, 1888)	A	erect wormsnail
Petaloconchus montereyensis Dall, 1919	P	Monterey wormsnail
Petaloconchus varians (d'Orbigny, 1841)	A	variable wormsnail
Serpulorbis decussatus (Gmelin, 1791)	A	decussate wormsnail
Serpulorbis squamigerus (Carpenter, 1857)	P	scaled wormsnail
Spiroglyptus annulatus Daudin, 1800	A	ringed wormsnail
Spiroglyptus irregularis (d'Orbigny, 1842)	A	irregular wormsnail
Spiroglyptus rastrus (Mörch, 1861)	P	California wormsnail

Planaxidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Planaxis lineatus (E.H. da Costa, 1778)	A	dwarf planaxis
Planaxis nucleus (Bruguière, 1789)	A	black planaxis

Modulidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Modulus modulus (Linnaeus, 1758)	A	buttonsnail

Potamididae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Batillaria minima (Gmelin, 1791)	A	West Indian false cerith
Batillaria zonalis (Bruguière, 1792)	P[1]	Japanese false cerith
Cerithidea californica (Haldeman, 1840)	P(E)	California hornsnail
Cerithidea costata (E.H. da Costa, 1778)	A(E)	costate hornsnail
Cerithidea pliculosa (Menke, 1829)	A(E)	plicate hornsnail
Cerithidea scalariformis (Say, 1825)	A(E)	ladder hornsnail

Cerithiidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Alaba catalinensis Bartsch, 1920	P	
Alaba incerta (d'Orbigny, 1842)	A	varicose cerith
Alaba jeanettae Bartsch, 1910	P	
Alaba serrana A.G. Smith and Gordon, 1948	P	
Bittium alternatum (Say, 1822)	A	alternate cerith
Bittium armillatum (Carpenter, 1864)	P	
Bittium asperum Gabb, 1861	P	
Bittium attenuatum Carpenter, 1864	P	slender cerith
Bittium challisae Bartsch, 1917	P	
Bittium eschrichtii (Middendorff, 1849)	P	threaded cerith
Bittium fastigiatum Carpenter, 1864	P	
Bittium fetellum Bartsch, 1911	P	
Bittium interfossum (Carpenter, 1864)	P	white cancellate cerith
Bittium johnstonae Bartsch, 1911	P	
Bittium larum Bartsch, 1911	P	
Bittium munitum (Carpenter, 1864)	P	
Bittium oldroydae Bartsch, 1911	P	
Bittium purpureum (Carpenter, 1864)	P	
Bittium quadrifilatum Carpenter, 1864	P	four-thread cerith
Bittium rugatum (Carpenter, 1864)	P	
Bittium sanjuanense Bartsch, 1917	P	
Bittium serra Bartsch, 1917	P	
Bittium tumidum Bartsch, 1907	P	
Bittium vancouverense Dall and Bartsch, 1910	P	
Bittium varium (Pfeiffer, 1840)	A	grass cerith
Cerithium atratum (Born, 1778)	A	dark cerith
Cerithium eburneum Bruguière, 1792	A	ivory cerith
Cerithium guinaicum Philippi, 1849	A	Guinea cerith
Cerithium litteratum (Born, 1778)	A	stocky cerith
Cerithium lutosum Menke, 1828	A	variable cerith
Cerithium muscarum Say, 1822	A	flyspeck cerith
Finella adamsi (Dall, 1889)	A	Adams cerith
Finella barbarensis Bartsch, 1911	P	Santa Barbara cerith
Finella californica (Dall and Bartsch, 1901)	P	California cerith
Finella dubia (d'Orbigny, 1842)	A	dubious cerith
Finella hamlini Bartsch, 1911	P	
Finella io Bartsch, 1911	P	
Finella phanea Bartsch, 1911	P	
Finella tenuisculpta (Carpenter, 1864)	P	fine-sculpted cerith
Litiopa melanostoma Rang, 1829	A	sargassum snail

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME

Cerithiopsidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Cerithiopsis alcima Bartsch, 1911	P	
Cerithiopsis antefilosum Bartsch, 1911	P	
Cerithiopsis antemundum Bartsch, 1911	P	
Cerithiopsis arnoldi Bartsch, 1911	P	
Cerithiopsis berryi Bartsch, 1911	P	
Cerithiopsis carpenteri Bartsch, 1911	P	Carpenter miniature cerith
Cerithiopsis cesta Bartsch, 1911	P	
Cerithiopsis charlottensis Bartsch, 1917	P	
Cerithiopsis columnum Carpenter, 1864	P	
Cerithiopsis cosmia Bartsch, 1907	P	
Cerithiopsis costulatum Möller, 1842	A	
Cerithiopsis crystallinum Dall, 1881	A	crystal miniature cerith
Cerithiopsis diegensis Bartsch, 1911	P	
Cerithiopsis diomedea Bartsch, 1911	P	
Cerithiopsis emersonii (C.B. Adams, 1838)	A	awl miniature cerith
Cerithiopsis fraseri Bartsch, 1921	P	
Cerithiopsis fusiforme (C.B. Adams, 1850)	A	
Cerithiopsis gloriosum Bartsch, 1911	P	
Cerithiopsis greeni (C.B. Adams, 1839)	A	Green miniature cerith
Cerithiopsis grippi Bartsch, 1917	P	
Cerithiopsis ingens Bartsch, 1907	P	
Cerithiopsis montereyensis Bartsch, 1911	P	
Cerithiopsis onealense Bartsch, 1921	P	
Cerithiopsis paramoea Bartsch, 1911	P	
Cerithiopsis pedroanum Bartsch, 1907	P	
Cerithiopsis pulchellum Jeffreys, 1858 (non C.B. Adams, 1850)	A	
Cerithiopsis rowelli Bartsch, 1911	P	
Cerithiopsis signa Bartsch, 1921	P	
Cerithiopsis stejnegeri Dall, 1884	P	
Cerithiopsis stephensae Bartsch, 1909	P	
Cerithiopsis truncatum Dall, 1886	P	
Cerithiopsis tubercularis floridanum Dall, 1892	A	
Cerithiopsis tumidum Bartsch, 1907	P	
Cerithiopsis vanhyningi Bartsch, 1918	A	
Cerithiopsis virginicum Henderson and Bartsch, 1914	A	
Cerithiopsis willetti Bartsch, 1921	P	
Seila adamsi (H.C. Lea, 1845)	A	Adams miniature cerith
Seila montereyensis Bartsch, 1907	P	Monterey miniature cerith

Mathildidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Mathilda barbadensis Dall, 1889	A	Barbados mathilda
Mathilda hendersoni Dall, 1927	A	Henderson mathilda
Mathilda yucatecana (Dall, 1881)	A	Yucatan mathilda

Architectonicidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Architectonica discus (Philippi, 1844)	A,(P)	keeled sundial
Architectonica nobilis Röding, 1798	A,(P)	common sundial
Heliacus alleryi (Monterosato, 1873)	A	
Heliacus architae (O.G. Costa, 1830)	A,(P)	noduled sundial
Heliacus bisulcatus (d'Orbigny, 1842)	A,(P)	beaded sundial
Heliacus borealis (A.E. Verrill and S.I. Smith, 1880)	A	boreal sundial
Heliacus cylindricus (Gmelin, 1791)	A	Atlantic cylinder sundial
Heliacus perrieri (Rochebrune, 1881)	A,(P)	channeled sundial
Philippia krebsii (Mörch, 1875)	A	smooth sundial
Pseudomalaxis lamellifera Rehder, 1935	A	lamellate false dial
Pseudomalaxis nobilis A.E. Verrill, 1885	A	noble false dial
Spirolaxis centrifuga (Monterosato, 1890)	A	exquisite false dial

Triphoridae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Metaxia abrupta (Watson, 1880)	A	
Metaxia convexa (Carpenter, 1857)	P	
Metaxia metaxae (Delle Chiaje, 1829)	A	
Metaxia rugulosa (C.B. Adams, 1850)	A	
Metaxia taeniolata (Dall, 1889)	A	
Triphora callipyrga (Bartsch, 1907)	P	
Triphora carpenteri (Bartsch, 1907)	P	
Triphora catalinensis (Bartsch, 1907)	P	
Triphora decorata (C.B. Adams, 1850)	A	mottled triphora
Triphora intermedia (Dall, 1881)	A	
Triphora lilacina (Dall, 1889)	A	
Triphora longissima (Dall, 1881)	A	
Triphora melanura (C.B. Adams, 1850)	A	white Atlantic triphora
Triphora montereyensis (Bartsch, 1907)	P	
Triphora nigrocincta (C.B. Adams, 1839)	A	black-line triphora
Triphora ornata (Deshayes, 1832)	A	
Triphora pedroana (Bartsch, 1907)	P	San Pedro triphora
Triphora peninsularis (Bartsch, 1907)	P	
Triphora pulchella (C.B. Adams, 1850)	A	beautiful triphora
Triphora pyrrha Henderson and Bartsch, 1914	A	
Triphora stearnsi (Bartsch, 1907)	P	
Triphora turristhomae (Holten, 1802)	A	St. Thomas triphora

Janthinidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Janthina exigua Lamarck, 1816	A	dwarf janthina
Janthina globosa Swainson, 1822	A	elongate janthina
Janthina janthina (Linnaeus, 1758)	A	common janthina
Janthina pallida (Thompson, 1840)	A	pale janthina
Recluzia rollandiana Petit de la Saussaye, 1853	A,(P)	brown janthina

Epitoniidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Acirsa borealis (Lyell, 1841)	A,P	chalky wentletrap
Alexania floridana (Pilsbry, 1945)	A	smooth Florida wentletrap
Amaea mitchelli (Dall, 1896)	A	Mitchell wentletrap
Amaea retifera (Dall, 1889)	A	reticulate wentletrap
Asperiscala bellastriata (Carpenter, 1864)	P	well-threaded wentletrap
Asperiscala cookeana (Dall, 1917)	P	Cooke wentletrap

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Asperiscala lowei (Dall, 1906)	P	Lowe wentletrap
Boreoscala greenlandica (G. Perry, 1811)	A,P	Greenland wentletrap
Cirsotrema dalli Rehder, 1945	A	Dall wentletrap
Cirsotrema pilsbryi (McGinty, 1940)	A	Pilsbry wentletrap
Couthouyella striatula (Couthouy, 1839)	A	northern rough wentletrap
Depressiscala nautlae (Mörch, 1874)	A	slender wentletrap
Depressiscala nitidella (Dall, 1889)	A	mottled wentletrap
Depressiscala polita (Sowerby, 1844)	P	polished wentletrap
Epitonium albidum (d'Orbigny, 1842)	A	bladed wentletrap
Epitonium angulatum (Say, 1830)	A	angulate wentletrap
Epitonium apiculatum (Dall, 1889)	A	semismooth wentletrap
Epitonium babylonium (Dall, 1889)	A	tower wentletrap
Epitonium blainei Clench and Turner, 1953	A	Blaine wentletrap
Epitonium candeanum (d'Orbigny, 1842)	A	Cande wentletrap
Epitonium championi Clench and Turner, 1952	A	Champion wentletrap
Epitonium denticulatum (Sowerby, 1844)	A	tooth-rib wentletrap
Epitonium echinaticostum (d'Orbigny, 1842)	A	wide-coil wentletrap
Epitonium foliaceicostum (d'Orbigny, 1842)	A	wrinkle-rib wentletrap
Epitonium fractum Dall, 1927	A	humble wentletrap
Epitonium frielei (Dall, 1889)	A	Friele wentletrap
Epitonium humphreysii (Kiener, 1838)	A	Humphreys wentletrap
Epitonium krebsii (Mörch, 1874)	A	Krebs wentletrap
Epitonium lamellosum (Lamarck, 1822)	A	lamellose wentletrap
Epitonium matthewsae Clench and Turner, 1952	A	Matthews wentletrap
Epitonium multistriatum (Say, 1826)	A	many-ribbed wentletrap
Epitonium novangliae (Couthouy, 1838)	A	New England wentletrap
Epitonium occidentale (Nyst, 1871)	A	fine-ribbed wentletrap
Epitonium pourtalesii (A.E. Verrill and S.I. Smith, 1880)	A	Pourtalès wentletrap
Epitonium rupicolum (Kurtz, 1860)	A	brown-band wentletrap
Epitonium rushii (Dall, 1889)	A	frosted wentletrap
Epitonium sericifilum (Dall, 1889)	A	silky wentletrap
Epitonium tollini Bartsch, 1938	A	Tollin wentletrap
Epitonium unifasciatum (Sowerby, 1844)	A	one-band wentletrap
Nitidiscala caamanoi (Dall and Bartsch, 1910)	P	tabulate wentletrap
Nitidiscala californica (Dall, 1917)	P	California wentletrap
Nitidiscala catalinae (Dall, 1908)	P	
Nitidiscala catalinensis (Dall, 1917)	P	
Nitidiscala hindsii (Carpenter, 1856)	P	Hinds wentletrap
Nitidiscala indianorum (Carpenter, 1865)	P	money wentletrap
Nitidiscala sawinae (Dall, 1903)	P	Sawin wentletrap
Nitidiscala tincta (Carpenter, 1864)	P	tinted wentletrap
Nystiella atlantis Clench and Turner, 1952	A	Atlantic wentletrap
Nystiella concava (Dall, 1889)	A	concave wentletrap
Opalia abbotti Clench and Turner, 1952	A	Abbott wentletrap
Opalia andrewsii (A.E. Verrill, 1882)	A	Andrews wentletrap
Opalia aurifilia (Dall, 1889)	A	fine-mesh wentletrap
Opalia borealis Keep, 1881	P	boreal wentletrap
Opalia burryi Clench and Turner, 1950	A	Burry wentletrap
Opalia crenata (Linnaeus, 1758)	A	coarse wentletrap
Opalia eolis Clench and Turner, 1950	A	cancellate wentletrap
Opalia funiculata (Carpenter, 1857)	P	scalloped wentletrap
Opalia hotessieriana (d'Orbigny, 1842)	A	pitted wentletrap
Opalia infrequens (C.B. Adams, 1852)	P	sparse wentletrap
Opalia montereyensis (Dall, 1907)	P	Monterey wentletrap
Opalia pumilio (Mörch, 1874)	A	dwarf wentletrap
Opalia spongiosa (Carpenter, 1866)	P	spongy wentletrap
Sthenorytis pernobilis (P. Fischer and Bernardi, 1857)	A	noble wentletrap

Aclididae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Aclis carolinensis Bartsch, 1911	A	Carolina aclis
Aclis eolis Bartsch, 1947	A	Eolis aclis
Aclis hypergonia Schwengel and McGinty, 1942	A	angular aclis
Aclis lata Dall, 1889	A	wide aclis
Aclis occidentalis Hemphill, 1894	P	Pacific aclis
Aclis shepardiana Dall, 1919	P	Shepard aclis
Aclis striata A.E. Verrill, 1880	A	striate aclis
Aclis tenuis A.E. Verrill, 1882	A	thin aclis
Aclis turrita Carpenter, 1864	P	turreted aclis
Aclis underwoodae (Bartsch, 1947)	A	Underwood aclis
Bermudaclis tampaensis Bartsch, 1947	A	Tampa Bay aclis
Henrya morrisoni Bartsch, 1947	A	Morrison aclis
Schwengelia hendersoni (Dall, 1927)	A	Henderson aclis

Eulimidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Balcis thersites (Carpenter, 1864)	P	
Cythnia albida Carpenter, 1864	P	
Ersilia stancyki Warén, 1980	A	eastern brittlestar snail
Eulima fulvocincta C.B. Adams, 1850	A	brown-varice eulima
Eulima schwengelae (Bartsch, 1938)	P	
Eulimostraca hemphilli (Dall, 1884)	A	brown eulima
Eulimostraca subcarinata (d'Orbigny, 1842)	A	brown-line eulima
Melanella arcuata (C.B. Adams, 1850)	A	twisted eulima
Melanella bakeri Bartsch, 1917	P	
Melanella berryi Bartsch, 1917	P	
Melanella californica Bartsch, 1917	P	
Melanella catalinensis Bartsch, 1917	P	Catalina eulima
Melanella columbiana Bartsch, 1917	P	
Melanella comoxensis Bartsch, 1917	P	
Melanella compacta Carpenter, 1864	P	
Melanella conoidea Kurtz and Stimpson, 1851	A	conoidal eulima
Melanella delmontensis (A.G. Smith and Gordon, 1948)	P	
Melanella elongata Buquoy, Dollfus and Dautzenberg, 1883	A	
Melanella eulimoides (C.B. Adams, 1850)	A	grooved eulima
Melanella gibba De Folin, 1867	A	
Melanella gracilis (C.B. Adams, 1850)	A	
Melanella grippi Bartsch, 1917	P	
Melanella jamaicensis (C.B. Adams, 1845)	A	Jamaica eulima
Melanella lastra Bartsch, 1917	P	
Melanella macra Bartsch, 1917	P	
Melanella micans (Carpenter, 1864)	P	Carpenter eulima
Melanella montereyensis Bartsch, 1917	P	Monterey eulima
Melanella oldroydi Bartsch, 1917	P	
Melanella peninsularis Bartsch, 1917	P	Baja eulima
Melanella randolphi Vanatta, 1899	P	
Melanella rutila (Carpenter, 1864)	P	auburn eulima
Melanella tacomaensis Bartsch, 1917	P	Tacoma eulima
Melanella titubans (S.S. Berry, 1956)	P	
Niso aegleea Bush, 1885	A	brown-line niso
Niso hendersoni Bartsch, 1953	A	Henderson niso
Niso hipolitensis Bartsch, 1917	P	Hipolito niso
Niso lomana Bartsch, 1917	P	
Oceanida graduata De Folin, 1871	A	shouldered eulima
Oceanida inglei Lyons, 1978	A	
Pelseneeria stimpsoni (A.E. Verrill, 1872)	A	
Sabinella troglodytes (Thiele, 1925)	A	pencil-spine eulima
"Scalenostoma" babylonia Bartsch, 1912	P	keeled eulima
Strombiformis alaskensis Bartsch, 1917	P	Alaska eulima
Strombiformis almo Bartsch, 1917	P	Almo eulima
Strombiformis auricinctus Abbott, 1958	A	gold-stripe eulima
Strombiformis bifasciatus d'Orbigny, 1842	A	two-band eulima
Strombiformis bilineatus Alder, 1848	A	two-line eulima
Strombiformis californicus Bartsch, 1917	P	California eulima
Strombiformis patula (Dall and Simpson, 1901)	A	largemouth eulima

Entoconchidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Enteroxenos parasitichopoli (Tikasingh, 1961)	P	
Entocolax ludwigii Voigt, 1888	P	
Thyonicola americana Tikasingh, 1961	P	

Aporrhaidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Aporrhais occidentalis Beck, 1836	A,Ac	American pelicanfoot

Strombidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Strombus alatus Gmelin, 1791	A	Florida fighting conch
Strombus costatus Gmelin, 1791	A	milk conch
Strombus gallus Linnaeus, 1758	A	roostertail conch
Strombus gigas Linnaeus, 1758	A	pink or queen conch
Strombus pugilis Linnaeus, 1758	A	West Indian fighting conch
Strombus raninus Gmelin, 1791	A	hawkwing conch

Hipponicidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Hipponix antiquatus (Linnaeus, 1767)	A,P	white hoofsnail
Hipponix subrufus (Lamarck, 1819)	A,(P)	orange hoofsnail
Hipponix tumens Carpenter, 1864	P	ribbed hoofsnail

Fossaridae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Fossarus bellus (Dall, 1889)	A	beautiful fossarus
Fossarus compactus (Dall, 1889)	A	compact fossarus
Fossarus elegans A.E. Verrill and S.I. Smith, 1882	A	elegant fossarus
Macromphalina adamsii (Fischer, 1857)	A	Adams macromphaline
Macromphalina californica Dall, 1903	P	California macromphaline
Macromphalina floridana Moore, 1965	A	Florida macromphaline
Macromphalina palmalitoris Pilsbry and McGinty, 1950	A	Palm Beach macromphaline
Macromphalina pierrot Gardner, 1948	A	Pierrot macromphaline

Vanikoroidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Vanikoro oxychone Mörch, 1877	A	West Indian vanikoro

Capulidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Capulus californicus Dall, 1900	P	California capsnail
Capulus incurvatus (Gmelin, 1791)	A	incurved capsnail
Capulus ungaricus (Linnaeus, 1767)	A,Ac	fool's capsnail

Trichotropidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Torellia ammonia Dall, 1919	P	
Torellia fimbriata A.E. Verrill and S.I. Smith, 1882	A	
Torellia vallonia Dall, 1919	P	
Torellia vestita Jeffreys, 1867	A	
Trichotropis bicarinata (Sowerby, 1825)	A,P,Ac	two-keel hairysnail
Trichotropis borealis Broderip and Sowerby, 1829	A,P,Ac	boreal hairysnail
Trichotropis cancellata (Hinds, 1843)	P	cancellate hairysnail
Trichotropis coronata Gould, 1860	P,Ac	
Trichotropis insignis Middendorff, 1849	P	gray hairysnail
Trichotropis kroyeri Philippi, 1848	P,Ac	
Trichotropis migrans Dall, 1881	A	

Calyptraeidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Calyptraea burchi A.G. Smith and Gordon, 1948	P	Burch Chinese hat
Calyptraea centralis (Conrad, 1841)	A	circular Chinese hat
Calyptraea fastigiata Gould, 1856	P	Pacific Chinese hat
Cheilea equestris (Linnaeus, 1758)	A,(P)	false cup-and-saucer
Crepidula aculeata (Gmelin, 1791)	A,P	spiny slippersnail
Crepidula adunca Sowerby, 1825	P	hooked slippersnail
Crepidula convexa Say, 1822	A,[P(I)]	convex slippersnail
Crepidula fornicata (Linnaeus, 1758)	A,[P(I)]	common Atlantic slippersnail
Crepidula grandis Middendorff, 1849	P	great slippersnail
Crepidula maculosa Conrad, 1846	A	spotted slippersnail
Crepidula naticarum Williamson, 1905	P	
Crepidula norrisiarum Williamson, 1905	P	Norris slippersnail
Crepidula nummaria Gould, 1846	P	western white slippersnail

PUBLICATION NOTES

Terry Gosliner's book on South African opisthobranchs will not be published by Verhoef in South Africa. An agreement is working with Dan Gotshall to publish it with Sea Challengers.

Scott Johnson did a good review of Jeff Hamann's nudibranch calendar in the November issue of Hawaiian Shell News. The calendar is both beautiful and functional. See ad in this issue for more details. [STB#90692]

Abbott, R. Tucker. 1984. Collectible Shells of Southeastern U.S., Bahamas, and Caribbean. Amer. Malacologists, Inc., Melbourne, Florida, 64 pp., many color photos. [For many years there has been a need for a really excellent and inexpensive all-color guide to the readily collected shells of the southeastern United States and the Caribbean. With his latest book Dr. Abbott has filled this need and provided the person new to shells and shelling an authoritative booklet that gives common name, scientific name (with author and date), habitat, and relative availability of 300 species of mollusks. It is important to note that a special edition of this book has been issued for the Florida tourist trade under the name Collectible Florida Shells. Both titles are also available printed on a special waterproof, tearproof plastic paper. -- Walter Sage; STB#90816 & STB#90817]

Vokes, Harold E. & Emily H. Vokes, 1983. Distribution of Shallow-Water Marine Mollusca, Yucatan Peninsula, Mexico. Meso-american Ecology Institute Monograph 1, Middle American Research Institute, Tulane Univ., New Orleans, Louisiana, 183pp., 50 pls. [Illustrates nearly 800 species of mollusks from Isla Carmen on the Gulf of Mexico to Belize on the Caribbean coast of the Yucatan Peninsula.; STB#90511]

EXCHANGE

Information or other exchanges wanted will be include at not charge on a space-available basis. Offers must not be for sale.

Helen Lorenz, Arenal Grande 2082, Montevideo, Uruguay would like to exchange shells with collectors worldwide. She has volutes, pectens, olives, trophons and other specimens from Rio de la Plata and the south of Argentina.

Shell collector from N.W. Florida (Gulf of Mexico) would like to exchange shells for shells of other areas. I can exchange from the largest Pleuroploca gigantea to the smallest Favartia cellulosa. All letters answered. R. Melvin, 661 Cypress Ave., Panama City, FL32401.

NOTES FROM HANS BERTSCH:
AN INTERNATIONAL RECONNAISSANCE EXPEDITION TO BAJA CALIFORNIA SUR, MEXICO: PART II.

Last month I confessed my love affair with Baja California and described some of the logistics of the recent research expeditions sponsored by the California Academy of Sciences. In that column we concentrated on a "peripatetic" survey of the southern coastline of Baja California completed during January. This month's column discusses the June-July trip we made, and describes some of the mollusks we found on both trips.

The June-July expedition explored one of the more isolated regions of Baja California -- the western-protruding Punta Eugenia peninsula. We left the paved road at Crucero del Pacifico, about 10 miles north of San Ignacio and drove nearly 500 miles over washboard scrapings; across dry, desolate fossil-laden terraces; through narrow canyons gouged out by flash floods and past hillsides covered with pink-blooming elephant trees. We travelled through small fishing villages where the only drinking water available is either hauled to town in rusty 55 gallon drums on exhaust-spewing trucks or is made from ocean water at a local desalination plant. There are no telephone wires or electric lines between towns. Communication is by radio or microwave; electricity is made at local diesel-powered generating stations.

One of the most bizarre driving experiences I have ever had was on the broad salt marsh flats northwest of Punta Abreojos. The road lifts over a small sand hill leaving town, then crosses hardpan that parallels a mangrove-lined estuary. The road is a hard-packed scar crossing a salt marsh that divides and rejoins itself. One must choose carefully .... the "main road" can be covered with hypersaline water while some of the detours are dry! Surrealistic mirages completely surrounded us. We drove straight across a constantly changing island of sand, keeping our eyes close in front of us. The dry road was only immediately around us. Everywhere else we looked, we saw water. One could understand the source of those ancient cosmological myths that described the earth as an island surrounded by a flat sea. To our vision, we were driving right into the sea, and straight out of it! It would have inspired even

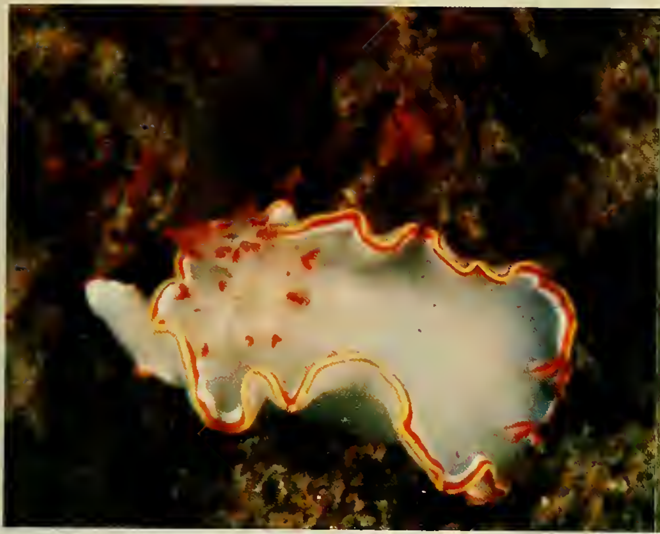
The roads were hard on the vehicles. We had 5 flat tires, two broken body frames (the supporting chassis of Dave's Landrover had to be welded at Bahía Tortugas and at Guerrero Negro), and a broken radiator that quickly fumed out all its water. It had to be removed, repaired and reinstalled in the jeep at San Ignacio! Ah, the rigors of Baja California....

We finally did get into the water, sampling intertidal and subtidal locations in the Punta Eugenia area. The biological data we gathered gave us a much better perspective on the zoogeographic relationships of opisthobranchs located along the outer coast of Baja California.

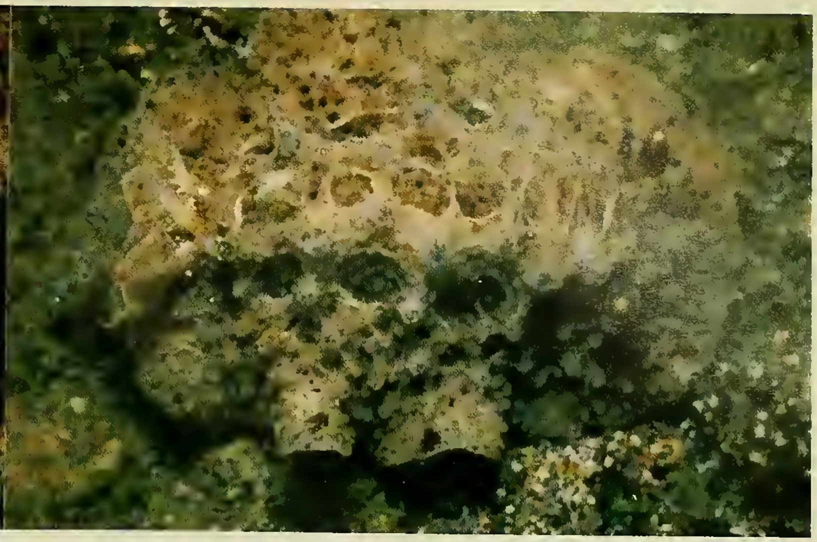
While at Bahía Tortugas, we stayed at Centro de Acuacultura, the Centro Regional de Investigaciones Pesqueras, which is under the directorship of Biol. Armando Vega Velazquez. He was most courteous to us and, along with his staff, accompanied us on several subtidal research dives at the southeast entrance to the bay. We were most grateful for his hospitality and sent him copies of some of our publications on Baja California marine life when we returned to the U.S.

On both trips we were interested mainly in the opisthobranch mollusk fauna (Gosliner, Ghiselin, and Bertsch, **in press**). Our January expedition had concentrated on the extreme southern tip of Baja California Sur, from Bahía Magdalena, to Cabo San Lucas, to Las Cruces. We also made a collecting stop at Loretto, about one-third of the way into the Gulf of California along the Baja California coastline. The animals were nearly all Panamic species; we found very few Californian species.

This Panamic dominance can be seen from the chromodorid nudibranchs that we collected. Chromodorids were not seen at Bahía Magdalena. At Loreto and 5 sites between Cabo San Lucas and Las Cruces, we collected over 40 specimens of 7 species of these colored nudibranchs: *Chromodoris baumanni* Bertsch, 1970, *C. norrisi* Farmer, 1963, *C.* sp., *Glossodoris sedna* (Marcus & Marcus, 1967), *G. dalli* (Bergh, 1879), *Hypselodoris agassizii* (Bergh, 1894) and *H. ghiselini* Bertsch, 1978. The *Hypselodoris ghiselini* was the most common species we found, and totalled nearly 50% of the chromodorids we encountered. These are all tropical eastern Pacific species; we did not collect any of the three Californian temperate species

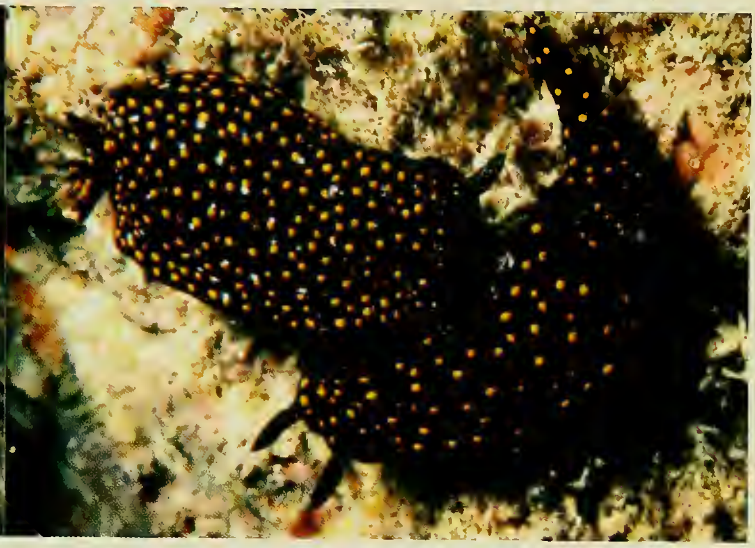


Glossodoris sedna, underwater photo at 18.3 m depth, Cabo San Lucas, 19 January, 1984.

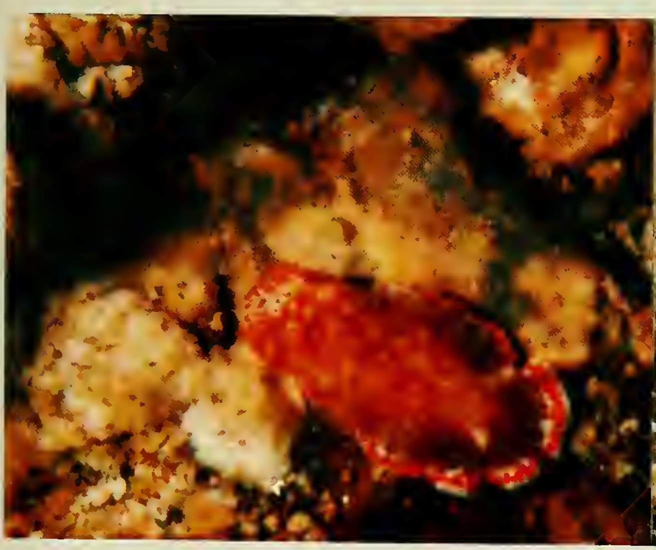


Sclerodoris tanya, collected intertidally at Bahía Tortugas, 29 June, 1984.

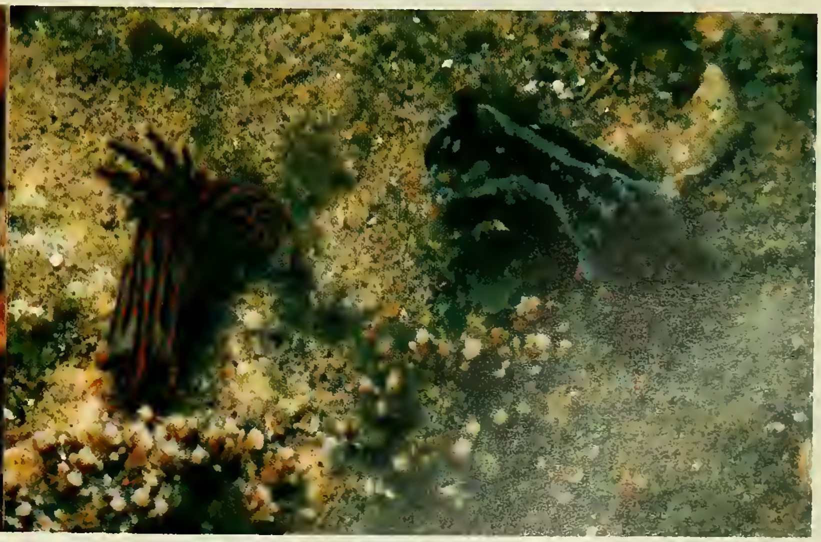
Hypselodoris agassizii, underwater photo, Puerto Chileno, 20 January, 1984.



Copulating pair of *Hypselodoris ghiselini*, Puerto Chileno, 20 January, 1984.



Chromodoris baumanni, 30 mm, 17 m depth, at Cabo San Lucas, 19 January, 1984.



Polycera atra (11 mm) and *P. hedgpethi* (12 mm), collected 28 June, 1984, from Bahia Tortugas.

during the January trip. These data tell us that the southern Gulf of California coast of Baja California Sur is distinctly Panamic tropical in its faunal composition. The zone of overlap between the temperate and tropical waters is restricted to the outer coast of the Baja California peninsula.

Our second expedition, collecting in the immediate environs of Punta Eugenia, gave us totally different results. We collected 51 species, 4-7 of which are probably unnamed species. The named species were either Panamic tropical, Californian warm temperate, or shared Californian-Panamic species. For instance, *Chromodoris norrisi* Farmer, 1963, *Polycera alabe* Collier & Farmer, 1964, and *Tambja eliora* (Lance, 1968) are distinctly tropical species (Keen, 1971), at the northern margin of their normal distribution. *Chromodoris macfarlandi* Cockerell, 1901, and *Polycera atra* MacFarland, 1905, are Californian species near their known southern distributional limits (Bertsch, 1978 and Bertsch, 1983). *Spurilla chromosoma* Cockerell in Cockerell & Eliot, 1905, and *Sclerodoris tanya* (Marcus, 1971) are species that are fairly well known from southern California and from the Gulf of California.

Polycera hedgpethi Marcus, 1964, has been reported from Marin County, California, to Bahia de los Angeles in the Gulf of California (Behrens, 1980), but its distribution along the outer coast of Baja California has not been documented often. It is of note that Behrens (1983) reports *P. hedgpethi* from Bahia Sebastian Vizcaino, and that we found this species at Bahia Tortugas, La Balisa south of Punta Abreojos, and at Campo Rene, along the entrance to Estero Coyote. This species has recently been reported from South Africa (Gosliner, 1982), Australia and New Zealand (Willan & Coleman, 1984).

The history of our knowledge of *Sclerodoris tanya* is most revealing. It was originally named from one specimen collected at Newport Bay, California. During the next ten years, it was found frequently in the San Diego area, and collected at various times throughout the Gulf of California (Bertsch, 1981). Since then it has been collected along the northeastern coastline of Baja California (Bertsch, 1983). We found *Sclerodoris tanya* at Bahía Tortugas, a significant midpoint between its previously disjunct known collecting sites from northwestern Baja California and Isla San Jose in the southern Gulf of California.

Sclerodoris tanya emphasizes the importance of research along the outer Baja California coastline as there are many gaps in our knowledge of species' distributions. Many species are known only from either the adjacent northern or southern faunal regions. Probably many more species will be found to occur along the central Baja California coastline. Panamic species are regularly being reported from the outer coast of Baja California Sur. Based on our collections of opisthobranchs it appears the southern Pacific coastline of the Baja California peninsula is a major provincial ecotone. Eugene P. Odum (1971: 157) defined ecotone as a boundary region between two communities:

> An ecotone is a transition between two or more diverse communities as, for example, between forest and grassland or between a soft bottom and hard bottom marine community. It is a junction zone or tension belt which may have considerable linear extent but is narrower than the adjoining community areas themselves. The ecotonal community commonly contains many of the organisms of each of the overlapping communities and, in addition, organisms which are characteristic of and often restricted to the ecotone. Often, both the number of species and the population density of some of the species are greater in the ecotone than in the communities flanking it. The tendency for increased variety and density at community junctions is known as the edge effect.

It is certainly not an inappropriate broadening of the term to apply it to the overlapping area between two marine faunal provinces.

Having two different bodies of water so close together gives Baja its own unique zoogeography. I am reminded of Panama and Hawaii. Panama is bounded by two tropical seas: the Caribbean and the eastern Pacific. Although the shores are a scant 90-minute train ride apart, the animals have been separated for a million or more years and have speciated into two major faunal assemblages. There is very little faunal interchange between these two regions today. On the Hawaiian Island of Oahu, different species of chromodorids occur in different leeward and windward habitats (Bertsch & Johnson, 1980). But all the animals are basically tropical central Pacific or Indo-Pacific species. By contrast, animals from the eastern coast of Baja California Sur are Panamic in nature whereas animals from the outer coast of Baja California are a mixture of Californian temperate water and Panamic tropical water species, and a large percentage of shared species. There are very different isolating barriers operating in these areas with varying efficiencies. The excitement of zoogeographic studies is discovering the many ways different animals have evolved and adapted to different geographic regions.

There will be lots to write about Baja California in future columns. In fact, as I write these paragraphs, I am planning a research trip to Bahía de los Angeles with Drs. Terrence M. Gosliner and Antonio J. Ferreira; possibly, David Mulliner will be there. It should be a productive trip.

REFERENCES

Behrens, David W. 1980. Pacific coast nudibranchs: a guide to the opisthobranchs of the northeastern Pacific. Sea Challengers, Los Osos, Calif., 112 pp.

Behrens, David W. 1983. Report on the 1982 Outer Baja California Expedition. Opisthobranch Newsletter, 15(4): 18-19.

Bertsch, Hans. 1978. The Chromodoridinae nudibranchs from the Pacific coast of America. -- Part II. The genus Chromodoris. Veliger, 20(4):307-327.

Bertsch, Hans. 1981. Rectification of the generic placement of Sclerodoris tanya (Marcus, 1971), comb. nov., a nudibranch from southern California, with a range extension to the Gulf of California, Mexico. Veliger, 23(3):217-220.

Bertsch, Hans. 1983. Estudios de ecosistemas bentonicos a lo largo de la costa noroccidental de Baja California, Mexico: Distribucion y presa de varios invertebrados marinos. Ciencias Marinas, 8(2):91-123.

Gosliner, Terrence M. 1982. A new record of the nudibranch gastropod Polycera hedgpethi Marcus, from the Indian Ocean of South Africa. Jour. Moll. Stud., 48:30-35.

Gosliner, Terrence M., Michael T. Ghiselin & Hans Bertsch. In press. Opisthobranch mollusks of the Punta Eugenia region (Baja California Sur, Mexico), with a discussion of biogeographical affinities. Western Soc. Malacologists, Ann. Rept., 17.

Keen, A. Myra. 1971. Sea shells of tropical west America. Marine mollusks from Baja California to Peru. 2nd edition. Stanford Univ. Press, Stanford, Calif., xiv + 1064 pp.

Odum, Eugene P. 1971. Fundamentals of ecology. 3rd edition. W.B. Saunders Co., Philadelphia, Pennsylvania, 574 pp.

Willan, Richard C. & Neville Coleman. 1984. Nudibranchs of Australasia. Australasian Marine Photographic Index, Sydney, Australia, 56 pp.

All photographs by Hans Bertsch.

Dr. Hans Bertsch, 4444 W. Pt. Loma Blvd. #83, San Diego, CA92107

YOUR COLLECTION - A HOW TO COLUMN: No. 4. ABOUT COLLECTING.

by Susan J. Hewitt

If you have a desire to collect, try to specialise in something local to your area. Consider land or fresh water species if you don't live near the coast. Many of these are quite fascinating, especially the smaller forms. If you find it hard to get oriented in these more unusual areas of collecting, contact your nearest Natural History Museum. The staff are usually more than happy to help a keen enthusiastic amateur who is interested in a scientific approach, especially if you offer to donate some of the results of your endeavors to the Museum.

Try not to think of collecting as simply accumulating objects. If you cannot add something to the total sum of biological information by making a collection, then taking live animals, disturbing local ecology and threatening population levels of rare species, is really only a form of vandalism. Unfortunatly, buying shells is very often a way of encouraging this vandalism in others.

Use collecting to develop your interest, to teach yourself about the local fauna, and to learn to observe and record. That way you can start to amass ideas and information. There is enormous scope for amateurs to do excellent origional research in field biology. For example the details of the life, reproductive behavior, and growth of many common species are virtually unknown. A careful amateur making notes over a few years can make discoveries well worth publishing.

The science of malacology (the study of mollusks), originally called conchology (the study of shells), was born out of the efforts of amateurs. Amateurs have sustained it throughout its history and still have a most important role to play.

Susan J. Hewitt, 75 Leonard St. #4 NE, New York, NY 10013

NEXT MONTH - Keeping a field note book.

COMPARISON OF THE MURICIDAE OF THE EASTERN PACIFIC AND WESTERN ATLANTIC, WITH COGNATE SPECIES.

by **Emily H. Vokes**

The subject of cognate species between the eastern Pacific and western Atlantic molluscan fauna has been the object of much study over the years. The most detailed was that of the late George Radwin, who in 1969, attempted a complete list of cognates (and, incidentally, coined the word "cognate" at that time) based on material sent to the U.S. National Museum by Robert H. Stewart from Payardi Island, on the Atlantic coast of Panama. On the basis of his count, he arrived at a figure of 29% cognate species between the two regions. He suggested that, because his study was based upon a single collecting site in the Atlantic, the number was not surprisingly low.

Since 1969 we have gained a great deal of knowledge concerning the two faunas. Keen's second edition of **Seashells of Tropical West America** (1971) almost doubled the number of species in the first edition (1958), going from approximately 1700 to 3300 between the two volumes. But the increase in knowledge continues. In 1982 a Symposium "updating Keen" was held at the 15th Annual Meeting of the Western Society of Malacologists, at which time I added another ten species to the Muricidae alone (Vokes, 1983).

Much the same sort of "information explosion" has been taking place in the western Atlantic, even though we have nothing so comprehensive as Keen to help us keep track. In an attempt to better comprehend the degree of similarity between the western Atlantic and eastern Pacific faunas I undertook to make a thorough list of all known species on both coasts, but only for the gastropod family Muricidae. Because of the use of Keen as a baseline for the Pacific, I limited the western Atlantic fauna to the tropical area also, excluding those species endemic to the temperate regions. In the Northern Hemisphere, due to the Gulf Stream, there is only one (*Urosalpinx cinera*) but in the temperate zone of South America, from Rio de Janiero south, there are several species that are excluded, just as there are numerous species both north and south of Keen's tropical zone on the West Coast.

Likewise, the members of the subfamily Trophoninae are excluded for they are so poorly known as to be almost meaningless. Except for these, we find a total of 96 taxa on the eastern Pacific coast, and 110 taxa on the Atlantic side. But, of this total number, only 36 may be considered cognates. So, the figure arrived at by Radwin was actually not too far off the mark.

The following list is based upon many sources and includes several species known to me but as yet undescribed. There are a number of cases where some explanation is due the reader and so a series of notes is appended. Cognate species are adjacent on same line. Names not listed are considered to be synonyms of some listed taxon.

PACIFIC	ATLANTIC
Family MURICIDAE	
Subfamily Muricinae	
Genus *Murex*[1]	
--	*anniae* Smith*
--	*bellegladeensis* Vokes*
lividus tricoronis Berry	*blakeanus* Vokes
elenensis Dall	*cabritii* Bernardi
--	*chrysostoma* Sowerby
--	*donmoorei* Bullis
lividus Carpenter	*messorius* Sowerby
--	*olssoni* Vokes
--	*rubidus* Baker
recurvirostris Broderip	*sallasi* Rehder & Abbott
--	*tryoni* Hidalgo in Tryon
--	*surinamensis* Okutani[2]
sp. cf. *elenensis*[3]	--
Genus *Chicoreus*	
Subgenus *Chicoreus s.s.*	
--	*brevifrons* (Lamarck)
--	*bullisi* Vokes
--	*cosmani* Abbott & Finlay
--	*dilectus* (A. Adams)
--	*florifer* (Reeve)
--	*mergus* Vokes
--	*spectrum* (Reeve)
Subgenus *Siratus*	
--	*aguayoi* (Clench & Pérez Farfante)
--	*articulatus* (Reeve)
--	*beauii* (Fischer & Bernardi)
--	*cailleti* (Petit de la Saussaye)

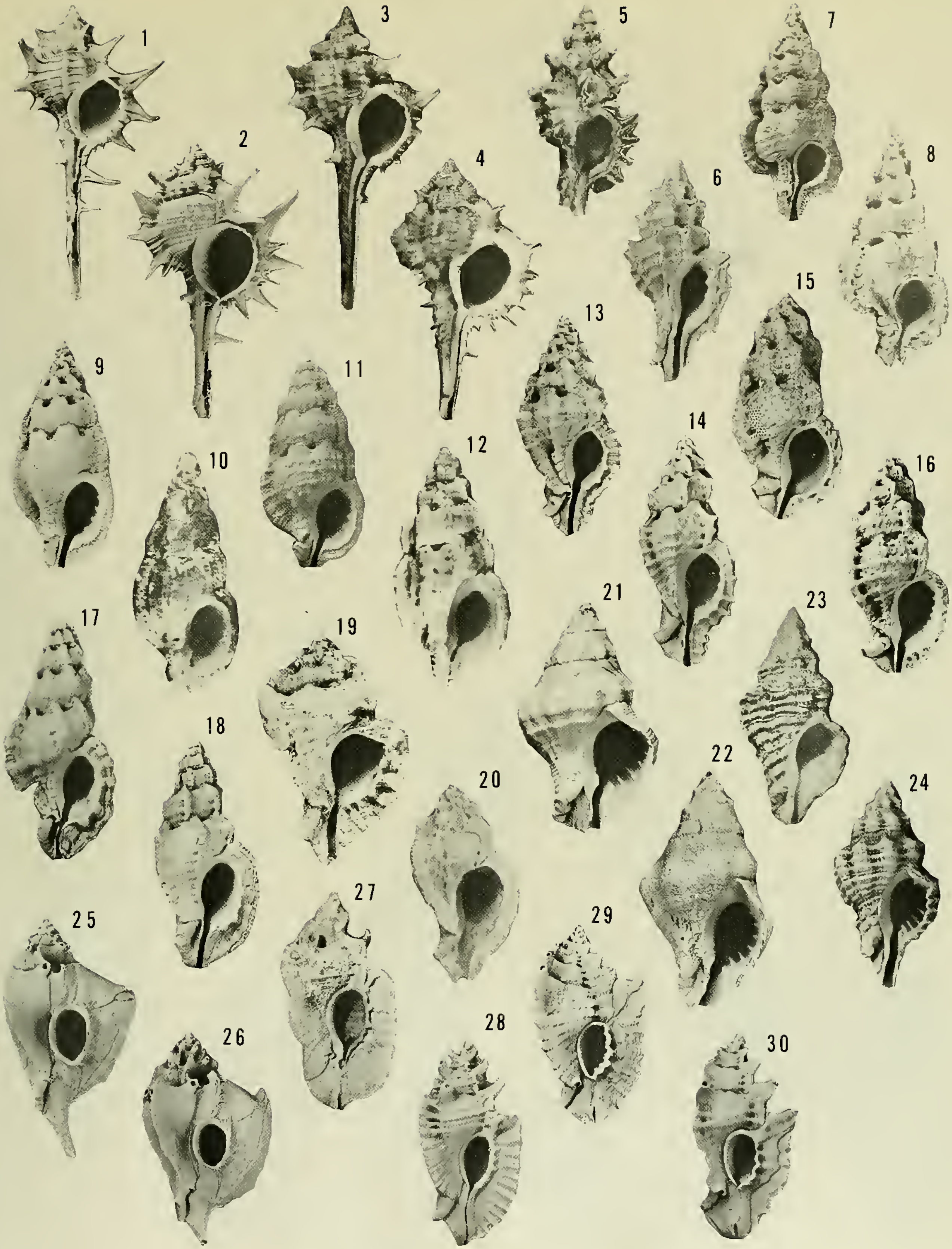


Plate 1 -- MURICINAE, TYPHINAE

1. Murex lividus tricoronis 2. M. blakeanus 3. M. lividus 4. M. messorius 5. Poirieria (Pazinotus) advenus 6. P. (P.) bowdenensis 7. Aspella pollux 8. A. castor 9. A. pyramidalis 10. A. cryptica 11. A. hastula 12. A. morchi 13. Dermomurex (Dermomurex) indentatus 14. D. (D.) alabastrum 15. D. (D.) obeliscus 16. D. (D.) pauperculus 17. D. (Gracilimurex) bakeri 18. D. (G.) elizabethae 19. D. (Trialatella) cunninghamae 20. D. (T.) abyssicola 21. Attiliosa nodulosa 22. A. philippiana 23. Calotrophon turritus 24. C. ostrearum 25. Typhis (Talityphis) latipennis 26. T. (T.) expansus 27. Pterotyphis (Pterotyphis) fimbriatus 28. P. (P.) pinnatus 29. Pterotyphis (Tripterotyphis) lowei 30. P. (T.) triangularis

--	*ciboney* (Clench & Pérez Farfante)
--	*consuela* (Verrill)
--	*formosus* (Sowerby)
	gundlachi (Dunker)
--	*motacilla* (Gmelin)
--	*perelegans* Vokes
--	*springeri* (Bullis)
--	*thompsoni* (Bullis)
Subgenus *Phyllonotus*	
brassica (Lamarck)	--
erythrostoma (Swainson)	*globosus* (Emmons)*
--	*margaritensis* (Abbott)
n. sp.	*oculatus* (Reeve)
peratus (Keen)	*pomum* (Gmelin)
regius (Swainson)	--
Genus *Hexaplex*	
Subgenus *Muricanthus*	
ambiguus (Reeve)	--
callidinus (Berry)	--
nigritus (Philippi)	--
princeps (Broderip)	*fulvescens* (Sowerby)
radix (Gmelin)	--
Genus *Pterynotus*	
Subgenus *Pterynotus s.s.*	
--	*guesti* Harasewych & Jensen
--	*lightbourni* Harasewych & Jensen
--	*phaneus* (Dall)
--	*phyllopterus* (Reeve)
--	*radwini* Harasewych & Jensen
--	*xenos* Harasewych
Subgenus *Pterochelus*	
--	*ariomus* (Clench & Pérez Farfante)[4]
Subgenus *Purpurellus*	
macleani Emerson & D'Attilio	--
pinninger (Broderip)	--
Genus *Poirieria*	
Subgenus *Poirieria s.s.*	
--	*actinophorus* (Dall)
Subgenus *Paziella*	
--	*atlantis* (Clench & Pérez Farfante)
--	*nuttingi* (Dall)
--	*oregonia* (Bullis)
--	*pazi* (Crosse)
galapagana (Emerson & D'Attilio)	--
Subgenus *Pazinotus*	

advenus (Poorman)	*bowdenensis* Vokes*[5]
--	*hystricinus* (Dall)
--	*stimpsonii* (Dall)
Subgenus *Panamurex*	
--	*carnicolor* (Clench & Pérez Farfante)
--	*velero* Vokes
Genus *Aspella*	
pollux Radwin & D'Attilio	*castor* Radwin & D'Attilio
pyramidalis (Broderip)	*cryptica* Radwin & D'Attilio
hastula (Reeve)	*morchi* Radwin & D'Attilio
--	*senex* Dall*
n. sp. Vokes, **in press**	--
Genus *Dermomurex*	
Subgenus *Dermomurex s.s.*	
indentatus (Carpenter)	*alabastrum* (A. Adams)
obeliscus (A. Adams)	*pauperculus* (C.B. Adams)
n. sp. Vokes, **in press**	--
Subgenus *Gracilimurex*	
bakeri (Hertlein & Strong)	*elizabethae* (McGinty)
Subgenus *Trialatella*	
cunninghamae (Berry)	*abyssicola* (Crosse)
--	*oxum* Petuch
Subgenus *Takia*	
myrakeenae (Emerson & D'Attilio)	--
Genus *Calotrophon*	
--	*andrewsi* Vokes
turritus (Dall)	*ostrearum* (Conrad)
Genus *Attiliosa*	
--	*aldridgei* (Nowell-Usticke)
nodulosa (A. Adams)	*philippiana* (Dall)
Subfamily Muricopsinae	
Genus *Murexiella*	
diomedaea (Dall)	*hidalgoi* (Crosse)
exigua (Broderip)	*levicula* (Dall)
humilis (Broderip)	*macgintyi* (Smith)*
keenae Vokes	n. sp. 1
lappa (Broderip)	*glypta* (Smith)*[6]
laurae Vokes	n. sp. 2
mildredae Poorman	--
minuscula (Smith)[7]	--
perita (Hinds)	--
radicata (Hinds)	--
radwini Emerson & D'Attilio	--
santarosana (Dall)	--
venustula Poorman	--
vittata (Broderip)	--

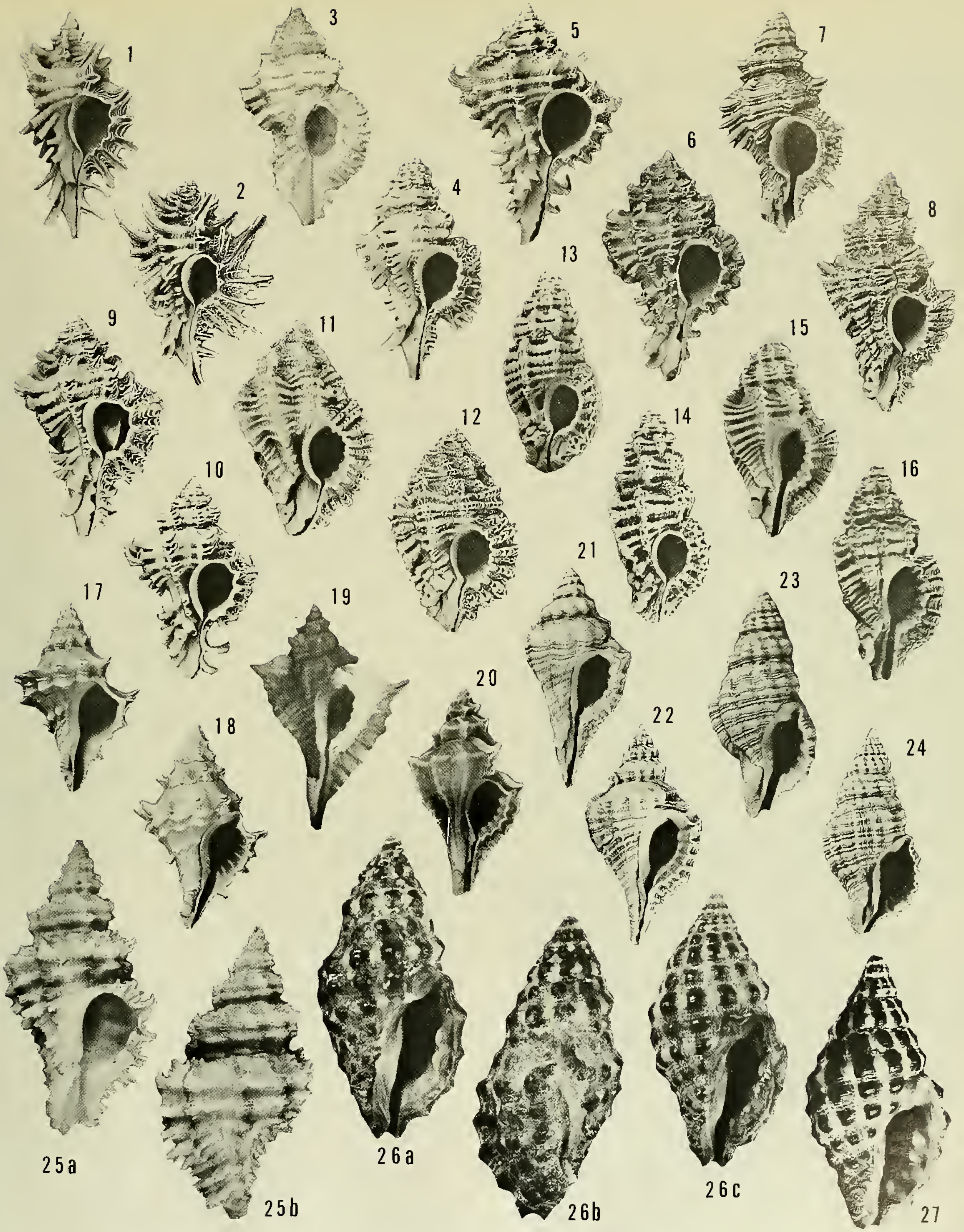


Plate 2 -- MURICOPSINAE, OCENEBRINAE

1. Murexiella diomedea 2. M. hidalgoi 3. M. exigua 4. M. levicula 5. M. humilis 6. M. macgintyi 7. M. lappa 8. M. glypta 9. M. laurae 10. M. n. sp. 2 11. Favartia (Favartia) incisa 12. F. (F.) nucea 13. F. (Caribiella) erosa 14. F. (C.) alveata 15. F. (Pygmaepterys?) peasei 16. F. (P.?) juanitae 17. Acanthotrophon sentus 18. A. striatoides 19. Eupleura muriciformis 20. E. sulcidentata 21. E. triquetra 22. E. caudata 23. Trachypollia lugubris 24. T. sclera 25. Murexsul dipsacus (Broderip) [Murex] syntype BM(NH); height 27.3 mm; St. Elena, Ecuador. 26. Trachypollia ferruginosa (Reeve) [Ricinula], syntypes BM(NH) 198462; a & b) height 17.4 mm (Reeve's figured specimen); c) height 14.0 mm. [Added on board -- "W. Indies - nodulosa C. B. Ad."] 27. Trachypollia nodulosa (C.B. Adams) [Purpura], lectotype Harvard MCZ 177045; height 15.7 mm; Jamaica.

Genus *Murexsul*	
dipsacus (Broderip)[8]	--
jacquelinae Emerson & D'Attilio	--
--	*emipowlusi* (Abbott)
Genus *Maxwellia*	
angermeyerae (Emerson & D'Attilio)	--
Genus *Homalocantha*	
oxyacantha (Broderip)	--
tortuus (Broderip in Sowerby[9]	--
Genus *Muricopsis*	
Subgenus *Muricopsis s.s.*	
armatus (A. Adams)	*oxytata* (Smith)*
jaliscoensis Radwin & D'Attilio	--
pauxillus (A. Adams)	--
--	*praepauxillus* (Maury)*
tulensis Radwin & D'Attilio	--
zeteki Hertlein & Strong	--
--	*huberti* Radwin & D'Attilio
--	*oxossi* Petuch
Subgenus *Risomurex*	
--	*caribbaeus* (Bartsch & Rehder)[10]
--	*deformis* (Reeve)[11]
--	*gilbertharrisi* (Weisbord)*
--	*roseus* (Reeve)[12]
--	n. sp., Vokes & Houart, **in press**
Genus *Favartia*	
Subgenus *Favartia s.s.*	
--	*cellulosa* (Conrad)
--	*minirosea* (Abbott)
incisa (Broderip)	*nucea* (Mörch)
Subgenus *Caribiella*	
erosa (Broderip)	*alveata* (Kiener)
purdyae Vokes & D'Attilio	--
Subgenus *Pygmaepterys?*[13]	
--	*germainae* (Vokes & D'Attilio)
peasei (Tryon)[14]	*juanitae* (Gibson-Smith & Gibson-Smith)
--	*lourdesae* (Gibson-Smith & Gibson-Smith)
Genus *Acanthotrophon*	
carduus (Broderip)	--
sentus Berry	*striatoides* Vokes
sorenseni Hertlein & Strong	--

Subfamily Ocenebrinae	
Genus *Ocenebra*	
fontainei (Tryon)	--
lugubris (Broderip)	--
Genus *Ceratostoma*	
monoceros (Sowerby)	--
unicorne (Reeve)	--
Genus *Pteropurpura*	
Subgenus *Pteropurpura s.s.*	
centrifuga (Hinds)	--
deroyana Berry	--
erinaceoides (Valenciennes)	*bequaerti* (Clench & Pérez Farfante)
Subgenus *Calcitrapessa*	
leeana (Dall)	--
Genus *Pterorytis*	
hamatus (Hinds)	--
Genus *Eupleura*	
muriciformis (Broderip)	*sulcidentata* Dall
nitida (Broderip)	--
pectinata (Hinds)	--
triquetra (Reeve)	*caudata* (Say)
Genus *Urosalpinx*	
--	*perrugata* (Conrad)
--	*tampaensis* (Conrad)
Genus *Trachypollia*	
--	*didyma* (Schwengel)
--	*nodulosa* (C.B. Adams)
lugubris (C.B. Adams)	*sclera* Woodring*
Subfamily Ergalataxinae	
Genus *Cytharomorula*	
--	*grayi* (Dall)
Genus *Bizetiella*	
carmen (Lowe)	--
micaela Radwin & D'Attilio	--
shaskyi Radwin & D'Attilio	--
Genus *Pascula*	
rufonotata (Carpenter)[15]	--
"*ferruginosa* (Reeve)"[16]	--
Genus *Phyllocoma*	
scalariformis (Broderip)	--
Genus *Ergalatax*	
buxeus (Broderip)	--
Genus *Xanthochorus*	
broderipii (Michelotti)	--
Genus *Vitularia*	
salebrosa (King & Broderip)	--
Subfamily Typhinae	
Genus *Typhis*	
Subgenus *Haustellotyphis*	
cumingii Broderip	--
Subgenus *Talityphis*	
latipennis Dall	*expansus* Sowerby[17]
Subgenus *Typhisopsis*	
clarki Keen & Campbell	--

coronatus Broderip	--
grandis A. Adams	--
Subgenus *Rugotyphis*	
--	*puertoricensis* Warmke[17]
Subgenus *Typhinellus*	
--	*sowerbii* Broderip
Genus *Cinclidotyphis*	
myrae DuShane	--
Genus *Distichotyphis*	
vemae Keen & Campbell	--
Genus *Siphonochelus*	
Subgenus *Siphonochelus s.s.*	
--	*longicornis* (Dall)
--	*radwini* Emerson & D'Attilio
--	*riosi* (Bertsch & D'Attilio)[18]
--	*tityrus* (Bayer)
Subgenus *Laevityphis*	
--	*bullisi* Gertman
Genus *Pterotyphis*[19]	
Subgenus *Pterotyphis s.s.*	
fimbriatus (A. Adams)	*pinnatus* (Broderip)
Subgenus *Tripterotyphis*	
arcana DuShane	--
fayae Keen & Campbell	--
lowei (Pilsbry)	*triangularis* (A. Adams)

Notes

* Originally described as a fossil, but now known to be living in the western Atlantic.

1. In a study of the genus Murex in the Indo-Pacific (to be published in Records of the Australian Museum , with Winston Ponder), it became painfully obvious that there are no members of Murex s.s. in the New World, all should be referred to the subgenus Haustellum.
2. This recently described (1982, Venus, v. 41, p. 102, pl. 1, figs. 1-2; text figs. 1, 2) taxon is a Murex s.s., with small secondary spines at right angles to the major spines, and an operculum with a central nucleus, like that in M. nigrispinosus (Radwin and D'Attilio, 1976, text fig. 42). I seriously doubt that it is a western Atlantic species.
3. The species from the Gulf of California that is called M. elenensis (e.g., Keen, 1971, fig. 975) is not the same as the typical form, which is confined to the coast of Ecuador. I know of no occurrences of the species between Ecuador and the Gulf of California and would appreciate hearing of any.
4. I have no knowledge of any specimens of this species ever having been found since it was described in 1945. It is probably an adventitious specimen of Pterochelus triformis from Australia.
5. D'Attilio (1980, Festivus, v. 12, no. 8, p. 95, fig. 1) has referred hystricinus to Paziella. The laminate varices suggest that perhaps Pazinotus is a better placement, but I am not certain.
6. The recently described M. iemanja (Petuch, 1979, Proc. Biol. Soc. Wash., v. 92, p. 518, figs. 1-I, 1-J) is a synonym.
7. I have yet to see a specimen that matches Smith's type (re-figured in Keen, 1971, fig. 992). I assume it is a valid taxon.
8. Examination of the types of dipsacus in the BM(NH) reveals that it is a Murexsul, not Murexiella. I have not seen any specimens from West America that match it, but I assume it is valid. (see pl. 2, fig. 25)
9. The correct name for Murex crispus Broderip non Lamarck, is tortuus Broderip in Sowerby, 1834; M. multicrispata is a synonym.
10. The correct name for Fusus muricoides Adams non Deshayes is caribbaeus.
11. Unfortunately, study of the type collection in the BM(NH) disclosed that Ricinula deformis Reeve, 1846, is the correct name for the shell usually cited as Engina schrammi Crosse, 1863, the type of Risomurex.
12. Although Cernohorsky (1978, Rec. Auckland Inst. Mus., v. 15, p. 76, fig. 23) apparently confirmed Reeve's original locality of "Philippine Islands" for Ricinula rosea, examination of numerous specimens, in addition to the types in the BM(NH), verified that rosea is the Caribbean species usually called by that name. Vokes and Houart have a paper in press on all of the species of Risomurex in which this will be documented.
13. It is still not certain that the East African type of Pygmaepterys is congeneric with the several Favartia-like species placed therein. If not, then a new taxon will be necessary as they do form a valid group.
14. Although Radwin and D'Attilio (1976, p. 231) rejected peasei for the West Coast species long known by that name, their identification of an Indo- Pacific specimen as the "holotype" is incorrect and the new name proposed by them as poormani is unnecessary. (see Shells and Sea Life 16(10):160)
15. Regrettably, the genus Evokesia Radwin and D'Attilio, 1972, is a synonym of Pascula Dall, 1908.
16. The type specimens of Ricinula ferruginosa Reeve, 1846, in the BM(NH) all prove to be specimens of the Atlantic Trachypollia nodulosa (C.B. Adams). This leaves the Pacific species usually called "ferruginosa" without a name that I know of. (see pl. 2, figs. 26, 27)
17. Radwin and D'Attilio (1976, p. 201) concluded that T. puertoricensis was actually the species usually called T. expansus in the western Atlantic and renamed the later T. perchardei (p. 236, figs. 190-193). However, Sowerby's type specimen at the National Museum of Wales is indeed that form always so considered and T. puertoricensis is not the same. This will be discussed in more detail, and the holotype figured, in a forthcoming paper by Vokes.
18. Originally described as occuring only off southern Brazil, this is the same species figured by Bayer (1971, Bull. Mar. Sci., v. 21, p. 161, figs. 31, 34A, 35A, 36B) as "longicornis Dall" from the Bahamas and Jamaica. Although atypical, it is a Siphonochelus, as Bayer indicated, rather than a Typhina, as it was named by Bertsch and D'Attilio.
19. D'Attilio (1982, Festivus, v. 14, no. 8, p. 94) has presented convincing evidence that Pterotyphis, Tripterotyphis, and Cinclidotyphis are muricine rather than typhine. I agree completely, but will leave them in the accustomed place pending a more complete review of the problem.

Literature Cited

Keen, A.M. 1958. Sea Shells of Tropical West America. Stanford Univ. Press, Stanford, Calif., xi + 624 p., 10 color pls., 1709 figs., 6 text figs.

Keen, A.M. 1971. Sea Shells of Tropical West America, Marine Mollusks from Baja California to Peru. Second Edition. Stanford Univ. Press, Stanford, Calif., xiv + 1064 p., 22 color pls., ca. 4000 figs., 6 maps.

Radwin, G.E. 1969. A Recent Molluscan Fauna from the Caribbean Coast of Southeastern Panama. San Diego Soc. Nat. Hist., Trans., 15(14):229-239, 1 text fig.

Vokes, E.H. 1983. Update of Muricidae for "Sea Shells of Tropical West America." Western Soc. Malac., Ann. Rep., 15:10-12.

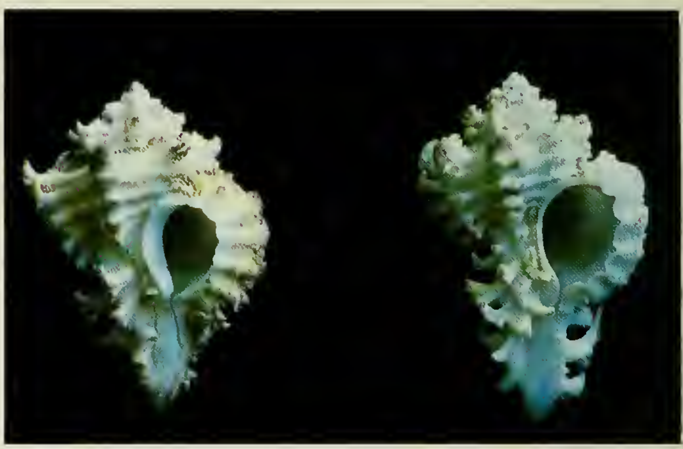
All photos with the exception of front cover top left photo by Emily H. Vokes.

Dr. Emily H. Vokes, Department of Geology, Tulane University, New Orleans, LA 70118.

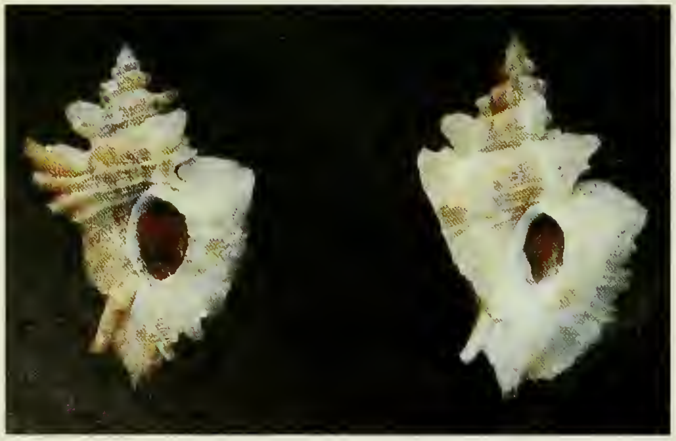
PACIFIC - *Murex elenensis*
Murex cabritii - ATLANTIC

PACIFIC - *Murex recurvirostris*
Murex sallasi - ATLANTIC

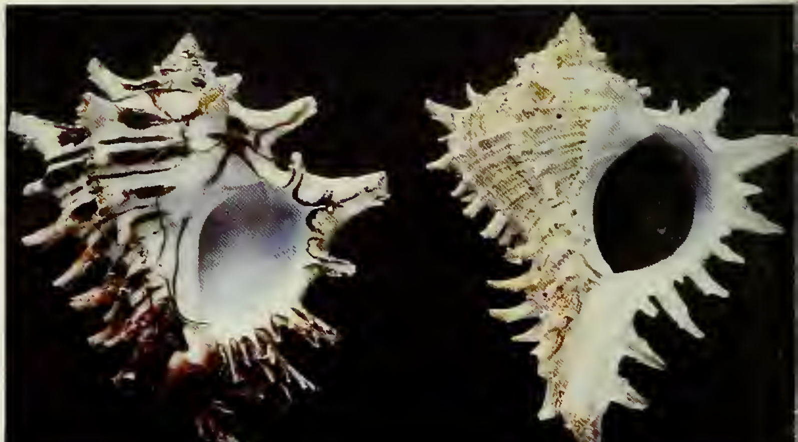
PACIFIC - *Muricopsis (Muricopsis) armatus*
M. (M.) oxytata - ATLANTIC



PACIFIC - *Murexiella keenae*
Murexiella n.sp. - ATLANTIC



PACIFIC - *Pteropurpura (Pteropurpura) erinaceoides*
P. (P.) bequaerti - ATLANTIC



PACIFIC - *Hexaplex (Muricanthus) princeps*
H. (M.) fulvescens - ATLANTIC

SHELLS AND SEA LIFE

A MONTHLY PUBLICATION ON MOLLUSKS AND MARINE LIFE

$2.50 DECEMBER, 1984 **VOLUME 16, NUMBER 12**

Flabellina trilineata (left), 10 mm long, and the amphipod *Podocerus* sp. (body length, 5 mm) found 30 June, 1984, Middle Cove, Cape Arago, Oregon. Jeff Goddard photo. See article starting page 20 of this issue.

IN THIS ISSUE: Amphipods, Nudibranchs, Gorgonians, Marginellids, Anemones and Index to Volume 16.

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Volume 16, 1984

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Volume 16, Number 12

EDITOR'S NOTES

Shells and Sea Life has been growing and growing this year. Two hundred and fifty pages plus more than ten color photos per issue and many other illustrations. We owe a big thank-you to our subscribers, and to our advertisers who have helped support the cost of producing the magazine. We hope that you will take the time to tell them you saw their ad in S&SL. If all of you resubscribe (and tell your friends about us) and our list of advertisers continues to grow, we should be adding more color pages within the next few months.

The coming year will bring even more with close to four hundred pages. We have articles in preparation on all of your favorite shells and sea life. Starting soon, we will have a series of "what is it" photos of all types of invertebrates for you to identify. If you have a good photo of a species you cannot identify, send it in and we will try to get in a few each month. We hope that all of you who offered to send articles will send them in. We love to have short notes, especially field observations on shells and other invertebrates.

Both November and December have been busy for us. You saw the results of many of our efforts in the November issue. A large (for us) investment in additional computer typesetting equipment to allow us more control and faster preparation for each issue (and less errors). The November issue was mailed out in paper envelopes to keep the issues as clean and safe as possible. The cost is higher (about $1.50/subscriber/year) but the issues will be ready for mailing earlier each month. Sally and I can certainly use the time to do other things for the magazine.

Stay with us and watch us grow!

PRESUMPTIVE BATESIAN MIMICRY OF AN AEOLID NUDIBRANCH BY AN AMPHIPOD CRUSTACEAN.

by **Jeff Goddard**

Introduction

Some organisms gain protection from predators by resembling conspicuous and unpalatable or offensive species that are avoided by predators. This resemblance is known as Batesian mimicry. The latter species are referred to as models, the former as mimics. Though common among some groups of terrestrial insects (Wickler, 1968; Owen, 1980), few examples of Batesian mimicry are known to occur in marine invertebrate associations (Crane, 1969; Field, 1974; Abbott & Haderlie, 1980:257).

As noted by Field (1974), opisthobranch mollusks should make good mimicry models: many are distasteful to predators, possess bright warning coloration, and are often quite abundant. Yet, to my knowledge, no examples of Batesian mimicry involving an opisthobranch have been reported in the literature. In this note I describe what appears to be Batesian mimicry of an aeolid nudibranch *Flabellina trilineata* (O'Donoghue, 1921) by an intertidal amphipod crustacean from Cape Arago, Oregon.

The Aeolid

Flabellina trilineata is the most abundant aeolid nudibranch at Cape Arago (Goddard, 1984) and one of the most abundant nudibranchs in the northeastern Pacific (Nybakken, 1974; Beeman & Williams, 1980; pers. obs.). During low tide at Cape Arago, *F. trilineata* is usually found in shaded, rocky habitats feeding on its major prey, the hydroid *Tubularia marina* (Torrey, 1902), or is observed crawling in the open, presumably searching for *Tubularia*, other hydroids, or mates (pers. obs.). With its moderate size, bright orange to red cerata, white cephalic tentacles and rhinophores, and three longitudinal, opaque white lines on its otherwise translucent body, *F. trilineata* is conspicuous even on *Tubularia*. The colors and color pattern of *F. trilineata* probably warn visual predators that it is distasteful. As with many other aeolids, distastefulness is at least partially conferred by the presence of nematocysts acquired from its hydroid prey and stored in cnidosacs at the cerata tips (Beeman & Williams, 1980). Noxious secretions are known to be produced by some aeolids (Edmunds, 1966, cited by Thompson, 1976:52) and may also be utilized by *F. trilineata*. In the field I have occasionally observed *F. trilineata* crawling with seeming impunity directly in front of tidepool sculpin.

Figure 1. Same individuals of *Podocerus* sp. and *Flabellina trilineata* as in cover photograph.

Preliminary laboratory observations are consistent with previously published observations that *Flabellina trilineata* is distasteful to some predators. A potential visual predator of *F. trilineata*, and one of the more common tidepool fishes at Cape Arago, is the rosylip sculpin *Ascelichthys rhodorus* Jordan & Gilbert, 1880 (D. Varoujean, pers. comm.). Six of these, ranging in length from 8 to 11 cm, were collected from intertidal pools at Cape Arago and maintained in an aquarium with flowing seawater for one week. During their second week of captivity, the sculpin were fed bits of clam meat at the same time each day. The fish approached and rapidly ingested the meat either after it had reached bottom or as it was falling. At feeding time on day 15, 12 *F. trilineata*, instead of clam meat, were dropped one by one into the aquarium. With the exception of two fish that moved closer to inspect the aeolids, the sculpin showed no response. This suggests that either they recognize some aspect of *F. trilineata* and associate it with a bad meal or are indifferent. Further observations, using a number of potential predators, are needed to confirm the unpalatability of *F. trilineata.*

The Amphipod

On 29 June, 1984, while searching for opisthobranchs in the semi-protected, rocky, low-intertidal at Middle Cove, Cape Arago, I turned over a submerged boulder and spotted what appeared to be an individual of *Flabellina trilineata. F. trilineata* often occur on *Tubularia* on the undersides of low-intertidal boulders at Cape Arago. Upon looking closer to see if the "aeolid" was on or near any hydroids I realized that I was looking at an amphipod crustacean and not a mollusk. The amphipod had a body length of about 5 mm and was clinging to the rock with its legs (posterior pereopods). With some difficulty the animal was removed from the rock and placed in a jar. I observed two more specimens on the side of the boulder and gently prodded one of them into crawling into another jar.

As seen in the cover photograph and Figures 1 and 2, there is a marked resemblance between the amphipod and *Flabellina trilineata*, a resemblance all the more remarkable in that it is between members of two phyla possessing very different basic structural designs. The white antennae of the amphipod resemble the cephalic tentacles and rhinophores of *F. trilineata.* The red-orange pigment is similar to the color of the cerata cores of *F. trilineata* and is positioned on the amphipod in a way that approximates two clusters of cerata with a few cerata on the side. The cerata of *F. trilineata* insert primarily on the sides of the body and occur in distinct clusters (cover photograph, Figure 1).

When the body of the aeolid is arched, as when crawling over irregular surfaces, one often sees what appear to be two groups of cerata: the anterior clusters (one on each side of the body) separated by the bare cardiac region from the posterior clusters. The amphipod also possesses two opaque white lines on its dorsal surface which closely match the white lines on *F. trilineata.* Though *F. trilineata* has three white lines, from most angles of view, only one or two are usually visible (cover photograph, Figure 1).

I noted, as did Field (1974) for the amphipod *Stenopleustes* sp. mimicking snails of the genus *Lacuna*, that the amphipod, unlike other intertidal gammarid amphipods, is not readily provoked into swimming. It usually crawls when prodded. This behavior is probably adaptive in that swimming would, in Field's words, "betray the ... disguise" of the amphipod.

Three apparent flaws in the mimicry are noted: 1) The second antennae are bent at two joints and thus angular in appearance. This contrasts with the smooth curve or straightness of the cephalic tentacles of *F. trilineata.* 2) Red pigment is present on the head of the amphipod, close to the base of the antennae, but on the aeolid the first cerata are some distance posterior to the head. 3) The white legs of the amphipod are conspicuous and almost give it an anterior-posterior symmetry. However, the legs may not be as conspicuous in the wild, depending on what the amphipod usually clings to. For example, the legs would be camouflaged on white objects (such as *Spirorbis* tubes) or out of view if wrapped around narrow objects. Though not enough field observations were made to determine what substrates the amphipod usually attaches to, I did observe (see below) two individuals in the field clinging to the edge of small, pale salmon colored (almost white) alcyonacean soft coral colonies.

On the basis of morphology, the amphipod keys to *Podocerus cristatus* (Thompson, 1879) in Smith and Carlton (1975). However, Dr. J.L. Barnard of the Smithsonian Institution informs me that the species of *Podocerus* are in need of clarification, and that the *P. cristatus* in Smith and Carlton (1975) probably includes a number of undescribed species, one of which could well be represented by the above specimens from Cape Arago.

Figure 2. Amphipod *Podocerus* sp. (body 5 mm long) clinging to a piece of *Pista elongata* tube. Note tiny juveniles also clinging to the substrate in lower left of photo.

On 30 June and 1 July, 1984, I returned to Middle Cove during minus tides specifically to look for *Podocerus* sp. One cluster of nine individuals (body lengths ranging from 2 to 5 mm) was found on 30 June just below the water surface on a small, shaded, vertical rock wall. A *Flabellina trilineata* was crawling about 30 cm away on the same wall. These specimens were found among the hydroids *Tubularia marina* and *Abietinaria* sp., sponges (especially ?*Astylinifer arndti* de Laubenfels, 1930), aggregations of low, round to bean shaped, undescribed, alcyonacean soft coral colonies (mentioned above), and tubes of the polychaete worm *Pista elongata* Moore, 1909. The amphipods are apparently free-living, grasping the substrate with their posterior appendages and holding their bodies at an angle of about 45° into the water column (as in the figures).

Podocerus sp. is rare at Cape Arago. In three years of intensive searching for opisthobranchs (examining ledges, boulders, and pools) I have found 15 specimens of the amphipod (collected 6). Batesian mimicry should usually work better when the mimic is less abundant than the model. Otherwise, predators will not make as good an association between the unpalatability of the model and the appearance of the mimic. Other things being equal, the lower the relative abundance of the mimic, the better its chances of being actively avoided by a predator.

Some of the larger *Podocerus* sp. I collected in June and July, 1984, were gravid. While in captivity the eggs of one hatched, allowing me to make a few observations on the newly hatched juveniles. They are about 1 mm long, cling to the substrate like the adults, have a semi-translucent body with red and white eyes, and possess a granular white pigment lightly scattered in two lines, one on each side of the gut. No other white or red pigmentation is present. It would be interesting to know at what size they acquire the adult coloration.

Conclusions

Wickler (1968) and Field (1974) have discussed some of the criteria necessary to establish cases of Batesian mimicry. The major ones are: 1) The model must be recognized by predators as being unpalatable or offensive and thus avoided by those predators. 2) The edible mimic should closely resemble the model. 3) Model and mimic should generally occupy the same habitat, with the mimic usually less abundant than the model. This criterion is not rigid, though, depending on predator distribution, behavior, and learning capabilities. 4) One should be able to demonstrate that, although edible, the mimic gains some protection from predators (and, thus, increased fitness) through its resemblance to the model. As seen above, the first three criteria appear to apply to *Flabellina trilineata* and *Podocerus* sp. The rarity of the amphipod precluded the observations and experiments necessary to determine the applicability of the fourth, and most important, criterion. Further work is thus needed to establish the resemblance of *Podocerus* sp. to *F. trilineata* as a valid case of Batesian mimicry.

More examples of Batesian mimicry involving opisthobranch models are likely to be found. However, the requirement that the model usually be more abundant that the mimic makes the role of model unlikely for many of the rarer opisthobranch species, as well as for some of the more common forms that undergo large and sustained fluctuation in population size in a given locality.

Acknowledgements

I thank Peter W. Frank for his helpful suggestions on the manuscript.

Literature Cited

Abbott, D.P. & E.C. Haderlie, 1980. ProsobranchJ: Marine Snails. In: R.H. Morris, D.P. Abbott & E.C. Haderlie (Eds.), Intertidal Invertebrates of California. Stanford Univ. Press, Stanford, Calif. [pp. 230-307]

Beeman, R.D. & G.C. Williams, 1980. Opisthobranchia and Pulmonata: the Sea Slugs and Allies. In: R.H. Morris, D.P. Abbott, & E.C. Haderlie (Eds.), Intertidal Invertebrates of California. Stanford Univ. Press, Stanford, Calif. [pp. 308-354]

Crane, J. 1969. Mimicry of the Gastropod Mitrella carinata by the amphipod Pleustes platypa. Veliger, 12:200.

Field, L.H. 1974. A Description and Experimental Analysis of Batesian Mimicry Between a Marine Gastropod and an Amphipod. Pac. Sci., 28:439-447.

Goddard, J.H.R. 1984. The Opisthobranchs of Cape Arago, Oregon, with Notes on Their Biology and a Summary of Benthic Opisthobranchs Known from Oregon. Veliger, 27:143-163.

Nybakken, J. 1974. A Phenology of the Smaller Dendronotacean, Arminacean, and Aeolidacean Nudibranchs at Asilomar State Beach over a Twenty-Seven Month Period. Veliger, 16:370-373.

Owen, D. 1980. Camouflage and Mimicry. Univ. Chicago Press, Chicago, Ill., 158 pp.

Smith, R.I. & J.T. Carleton (Eds.) 1975. Light's Manual. Intertidal Invertebrates of the Central California Coast. 3rd. ed. Univ. Calif. Press, Berkeley, Calif., 716 pp.

Thompson, T.E., 1976. Biology of Opisthobranch Molluscs. Ray Soc., London, Vol. 1. 207 pp.

Wickler, W. 1968. Mimicry in plants and Animals. McGraw-Hill, New York, 254 pp.

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AN ALTERNATE FOOD FOR SOME CAPTIVE NUDIBRANCHS

by **Roland Anderson**

Dendronotus iris Cooper, 1863 eating split mussel. Seattle Aquarium display tank. Photo Buzz Shaw.

As a whole nudibranchs, tend to be rather finicky eaters. Most are carnivorus; many are predators on a single species. The food of different groups of nudibranchs, many of which range in Puget Sound, has been studied and documented by various investigators, notably McDonald and Nybakkan (1978).

At the Seattle Aquarium, a display tank is devoted to nudibranchs. It is stocked with a variety of species that are easily seen, brightly colored or have some have some curiosity value. A typical assemblage includes *Melibe leonia*, *Archidoris montereyensis*, *A. odhneri*, *Tritonia diomeda* and *Armina californica*. Occasionally our divers bring up an uncommon species such as *Dendronotus iris* but because of its unusual diet, the burrowing sea anemone, *Pachycerianthus fimbriatus* Behrens (1980), it can not be included.

Continuously supplying some nudibranchs with their natural diet is difficult. Burrowing anemones are very hard to dig under water and hydroids and bryozoans are unavailable during certain times of the year. Collecting trips are both expensive and time-consuming and as a result cannot be solely devoted to finding food items for nudibranchs. Even if prey organisms can be found, maintaining them becomes a problem. Consideration must also be given to the fact that certain food items might clutter an already crowded display tank.

An alternative food that is readily available is one solution to the problem. *Dendronotus iris*, *Hermisseda crassicornis*, *Dirona albolineata* and *Triopha catalinae* will accept the bay mussel, *Mytilus edulis*. These mussels are always available in Seattle, either on local beaches or in local seafood markets. By cutting the mussel in half between the shells and placing each half on the bottom of the tank, the nudibranchs soon find it.

Literature Cited

McDonald, Gary R. & James W. Nybakken. 1978. Additional Notes on the Food of Some California Nudibranchs with a summary of Known Food Habits of California Species. The Veliger, 21(1): 110-119.

Behrens, David W. 1980. Pacific Coast Nudibranchs. Sea Challengers, Los Osos, California. 112p.

Roland Anderson, The Seattle Aquarium, Pier 59, Seattle, WA 98101

Dirona albolineata Cockerell & Eliot, 1905 eating mussel. Photo Buzz Shaw.

PERSONAL NOTES

From **Ben Hayes**: We were up to Quebec [Canada] last year at Perce Rock for Devonian trilobites and visited another area recently discovered in the last few years. We plan a further trip -- more extended and better prepared -- next summer. If something like this is of interest for an article, would be glad to write it up. [Ben Hayes, P.O. Box 1500, Portsmouth, New Hampshire 03801]. [Editor -- Yes, we would like to see many articles like this!]

From **Winston A. Barney**: While puttering with my computer the other day I wrote a very short program which I'm sure will interest some of our friends, especially shell dealers. This nifty program will whip out 20 to 40 data slips per minute, depending on whether you own a dot-matrix or daisy-wheel printer. The program is written in BASIC for my TRS-80, but may easily be adapted to other computers:

```
10 CLS
20 CLEAR 100
30 INPUT "SHELL NAME, AUTHOR AND
      DATE ... ENCLOSE IN QUOTES";N$
40 INPUT "DATA ... ENCLOSE IN QUOTES";D$
50 INPUT "HOW MANY COPIES?";C
60 FOR X=1 TO C
70 LPRINT N$
80 LPRINT D$
90 LPRINT:LPRINT
100 NEXT X
110 INPUT "DO YOU WANT TO RUN AGAIN?
      Y - N";R$
120 IF R$ = "Y" THEN GOTO 10 ELSE 130
130 END
```

In lines 30 and 40 data typed in must be in quotes if you want the program to print commas. You can add more space between data slips by adding more LPRINTs in line 90. Hope someone will find this program useful. [Winston A. Barney, 2801 Clary, Fort Worth, Texas 76111]

From **Eveline Marcus**: [September 4, 1984] It was nice to see you, and my whole trip was enjoyable! Not many opisthos, but many opisthofriends. As I have broken my arm, I am for 4 weeks restricted in many movements and cannot do more than writing for the next fortnight. I have just received the marvelous paper of Beatrix Sanders-Esser, Zool. Jahrb. Anat. **111**:195-243. This is half of her thesis; she was promoted in Munster, 1983. The subject is comparative anatomy and histology of the anterior genital organs of Ascoglossans. She figures diagrams of 24 species! Function, systematics, and phylogeny are discussed.

[September 25, 1984] I got rid of the bandage on my arm and am beginning to work again, a paper on one specimen of *Coriocella nigra* from the Red Sea, not very exciting. Gosliner's and my paper on the Pleurobranchaeidae is out. My Pleurobranchidae are **in press**. [Dr. Eveline Marcus, Caixa Postal 6994, Sao Paulo, Brazil 01051]

From **Dale Walker**: I am happy you use scientific names as well as common. References at end of articles are helpful. I think you should continue to concentrate on the how's and why's of biological interaction, and not just pictures of shell species. [D.C. Walker, M.D., Orlando Medical Office, Rt. 175, Orlando, ME 04472]

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Crepidula onyx Sowerby, 1824	P	onyx slippersnail
Crepidula perforans (Valenciennes, 1846)	P	white slippersnail
Crepidula plana Say, 1822	A	eastern white slippersnail
Crepidula striolata Menke, 1851	P	ridged slippersnail
Crepipatella charybdis (S.S. Berry, 1940)	P	greedy slippersnail
Crepipatella lingulata (Gould, 1846)	P	Pacific half-slippersnail
Crepipatella orbiculata (Dall, 1919)	P	round slippersnail
Crucibulum auricula (Gmelin, 1791)	A	West Indian cup-and-saucer
Crucibulum spinosum (Sowerby, 1824)	P	spiny cup-and-saucer
Crucibulum striatum Say, 1824	A	striate cup-and-saucer

Xenophoridae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Xenophora caribaea Petit de la Saussaye, 1856	A	Caribbean carriersnail
Xenophora conchyliophora (Born, 1780)	A,(P)	American carriersnail
Xenophora longleyi Bartsch, 1931	A	Longley carriersnail

Lamellariidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Capulacmaea commodum (Middendorff, 1851)	(A),P,Ac	widemouth lamellaria
Lamellaria diegoensis Dall, 1885	P	San Diego lamellaria
Lamellaria digueti Rochebrune, 1895	P	Diguet lamellaria
Lamellaria koto Schwengel, 1944	A	Koto lamellaria
Lamellaria leucosphaera Schwengel, 1942	A	white-ball lamellaria
Lamellaria pellucida A.E. Verrill, 1880	A	transluscent lamellaria
Lamellaria perspicua (Linnaeus, 1758)	A,(P)	transparent lamellaria
Lamellaria rhombica Dall, 1871	P	rhombic lamellaria
Lamellaria stearnsii Dall, 1871	P	Stearns lamellaria
Marsenina ampla A.E. Verrill, 1880	A	great lamellaria
Marsenina glabra (Couthouy, 1832)	A,Ac	bald lamellaria
Marsenina globosa L. Perry, 1939	A	rotund lamellaria
Marseniopsis sharonae (Willett, 1939)	P	Sharon lamellaria
Onchidiopsis corys Balch, 1910	A	
Onchidiopsis glacialis (M. Sars, 1851)	A,P,Ac	icy lamellaria
Onchidiopsis hannai Dall, 1916	P	Hanna lamellaria
Onchidiopsis kingmaruensis H.D. Russell, 1942	A	
Velutina conica Dall, 1887	P	conical lamellaria
Velutina granulata Dall, 1919	P	granular lamellaria
Velutina lanigera Möller, 1842	A,P	wooly lamellaria
Velutina plicatilis (O.F. Müller, 1776)	A,P,Ac	oblique lamellaria
Velutina prolongata Carpenter, 1865	P	elongate lamellaria
Velutina rubra Willett, 1919	P	red lamellaria
Velutina undata (Brown, 1839)	A,P,Ac	wavy lamellaria
Velutina velutina (O.F. Müller, 1776)	A,P,Ac	smooth lamellaria

Triviidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Erato albescens Dall, 1905	P	whitish erato
Erato columbella Menke, 1847	P	pigeon erato
Erato maugeriae Gray, 1832	A	green erato
Erato vitellina (Hinds, 1844)	P	appleseed erato
Trivia antillarum F.A. Schilder, 1922	A	Antilles trivia
Trivia californiana (Gray, 1827)	P	California trivia
Trivia candidula Gaskoin, 1835	A	little white trivia
Trivia maltbiana Schwengel and McGinty, 1942	A	Maltbie trivia
Trivia nix (F.A. Schilder, 1922)	A	white-globe trivia
Trivia pediculus (Linnaeus, 1758)	A	coffeebean trivia
Trivia quadripunctata (Gray, 1827)	A	four-spot trivia
Trivia ritteri Raymond, 1903	P	Ritter trivia
Trivia solandri (Sowerby, 1832)	P	Solander trivia
Trivia suffusa (Gray, 1832)	A	pink trivia

Cypraeidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Cypraea cervus Linnaeus, 1771	A	Atlantic deer cowrie
Cypraea cinerea Gmelin, 1791	A	Atlantic gray cowrie
Cypraea spadicea Swainson, 1823	P	chestnut cowrie
Cypraea spurca acicularis Gmelin, 1791	A	Atlantic yellow cowrie
Cypraea surinamensis G. Perry, 1811	A	Surinam cowrie
Cypraea zebra Linnaeus, 1758	A	measled cowrie

Ovulidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Aperiovula abbotti C.N. Cate, 1973	A	Abbott miniovula
Cymbula acicularis (Lamarck, 1810)	A	West Indian simnia
Cyphoma alleneae C.N. Cate, 1973	A	Allene cyphoma
Cyphoma aureocinctum (Dall, 1899)	A	gold-line cyphoma
Cyphoma gibbosum (Linnaeus, 1758)	A	flamingo tongue
Cyphoma macgintyi Pilsbry, 1939	A	McGinty cyphoma
Cyphoma rhomba C.N. Cate, 1978	A	bullroarer cyphoma
Cyphoma signatum Pilsbry and McGinty, 1939	A	fingerprint cyphoma
Delonovolva aequalis vidleri (Sowerby, 1881)	P	Vidler simnia
Neosimnia avena ruthturnerae C.N. Cate, 1973	A	Ruth Turner simnia
Neosimnia spelata capitia C.N. Cate, 1973	A	Keya simnia
Pedicularia californica Newcomb, 1864	P	California pedicularia
Pedicularia decussata (Gould, 1855)	A	cross-hatch pedicularia
Phenacovolva piragua (Dall, 1889)	A	slender simnia
Primovula solemi C.N. Cate, 1973	A	robust miniovula
Pseudocyphoma gibbulum C.N. Cate, 1978	A	plump cyphoma
Pseudocyphoma intermedium (Sowerby, 1828)	A	intermediate cyphoma
Pseudosimnia pyrifera C.N. Cate, 1973	A	pear simnia
Pseudosimnia sphoni C.N. Cate, 1973	A	Sphon simnia
Pseudosimnia vanhyningi (M. Smith, 1940)	A	Van Hyning simnia
Simnialena marferula C.N. Cate, 1973	A	sea-whip simnia
Simnialena uniplicata (Sowerby, 1848)	A	one-tooth simnia
Spiculata advena C.N. Cate, 1978	P	
Spiculata barbarensis (Dall, 1892)	P	Santa Barbara simnia
Spiculata loebbeckeana (Weinkauff, 1881)	P	Loebbeck simnia
Subsimnia bellamaris (S.S. Berry, 1946)	P	Pacific simnia
Volva volva striata (Lamarck, 1810)	A	lined egg spindle

Atlantidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Atlanta brunnea Gray, 1850	A	brown atlanta
Atlanta helicinoides Souleyet, 1852	A,(P)	
Atlanta inclinata Gray, 1850	A,P	
Atlanta lesueuri Souleyet, 1852	A,P	
Atlanta peronii Lesueur, 1817	A,P	Péron atlanta
Atlanta pulchella A.E. Verrill, 1884	A	
Atlanta quoyii Gray, 1850	A,(P)	
Oxygyrus keraudrenii (Lesueur, 1817)	A,P	Keraudren atlanta
Protatlanta souleyeti (E.A. Smith, 1888)	A,(P)	

Carinariidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Cardiapoda placenta (Lesson, 1830)	A,P	flat cardiapod
Carinaria cithara Benson, 1835	P	harp carinaria
Carinaria galea Benson, 1835	P	helmet carinaria
Carinaria lamarcki Péron and Lesueur, 1810	A,(P)	Lamarck carinaria

Pterotracheidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Firoloida demarestia Lesueur, 1817	A,(P)	
Pterotrachea keraudrenii Eydoux and Souleyet, 1832	A	
Pterotrachea scutata Gegenbaur, 1855	A,(P)	

Naticidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Amauropsis islandica (Gmelin, 1791)	A,Ac	Iceland moonsnail
Amauropsis purpurea Dall, 1871	P	purple moonsnail
Bulbus fragilis (Leach, 1819)	P,Ac	fragile moonsnail
Bulbus smithii (Brown, 1839)	A	Smith moonsnail
Calinaticina oldroydii (Dall, 1897)	P	Oldroyd moonsnail
Cryptonatica clausa (Broderip and Sowerby, 1829)	A,P,Ac	Arctic moonsnail
Elachisina grippi Dall, 1918	P	Gripp moonsnail
Euspira heros (Say, 1822)	A	northern moonsnail
Euspira immaculata (Totten, 1835)	A	immaculate moonsnail
Euspira levicula (A.E. Verrill, 1880)	A	lightweight moonsnail
Euspira lewisii (Gould, 1847)	P	Lewis moonsnail
Euspira nana (Möller, 1842)	A,P,Ac	tiny moonsnail
Euspira pallida (Broderip and Sowerby, 1829)	A,P,Ac	pale moonsnail
Euspira politiana (Dall, 1919)	P	polished moonsnail
Euspira tenuis (Recluz, 1850)	A	thin moonsnail
Euspira triseriata (Say, 1826)	A	spotted moonsnail
Gyrodes depressa Seguenza, 1874	A	
Haliotinella patinaria (Guppy, 1876)	A	fingernail moonsnail
Natica affinis Gmelin, 1791	A,P,Ac	
Natica canrena (Linnaeus, 1758)	A	colorful moonsnail
Natica castrensis Dall, 1889	A	netted moonsnail
Natica floridana (Rehder, 1943; non Dall, 1890)	A	Florida moonsnail
Natica janthostoma Deshayes, 1841	P	purplemouth moonsnail
Natica livida Pfeiffer, 1840	A	livid moonsnail
Natica marochiensis (Gmelin, 1791)	A	Morocco moonsnail
Natica sagraiana d'Orbigny, 1842	A	lined moonsnail
Naticarius verae Rehder, 1947	A	
Neverita duplicata (Say, 1822)	A	shark eye
Neverita reclusiana (Deshayes, 1839)	P	Recluz moonsnail
Polinices altus (Pilsbry, 1929)	A	tall moonsnail
Polinices draconis (Dall, 1903)	P	Drake moonsnail
Polinices hepaticus (Röding, 1798)	A	brown moonsnail
Polinices lacteus (Guilding, 1834)	A	milk moonsnail
Polinices uberinus (d'Orbigny, 1842)	A	dwarf white moonsnail
Sigatica carolinensis (Dall, 1889)	A	Carolina moonsnail
Sigatica semisulcata (Gray, 1839)	A	semisulcate moonsnail
Sinum debile Gould, 1853	P	slight baby ear
Sinum keratium Dall, 1919	P	waxy baby ear
Sinum maculatum (Say, 1831)	A	brown baby ear
Sinum minor (Dall, 1889)	A	dwarf baby ear
Sinum perspectivum (Say, 1831)	A	white baby ear
Sinum scopulosum (Conrad, 1849)	P	fat baby ear
Stigmaulax sulcatus (Born, 1778)	A	grooved moonsnail
Tectonatica pusilla (Say, 1822)	A	miniature moonsnail

Cassidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Casmaria ponderosa atlantica Clench, 1944	A	Atlantic casmaria
Cassis flammea (Linnaeus, 1758)	A	princess or flame helmet
Cassis madagascariensis Lamarck, 1822	A	queen or emperor helmet
Cassis madagascariensis spinella Clench, 1944	A	
Cassis tuberosa (Linnaeus, 1758)	A	king helmet
Cypraecassis testiculus (Linnaeus, 1758)	A	reticulate cowrie-helmet
Morum dennisoni (Reeve, 1842)	A	Dennison morum
Morum lamarcki (Deshayes, 1844)	A	rose-mouth morum
Morum oniscus (Linnaeus, 1767)	A	Atlantic morum
Phalium coronadoi (Crosse, 1867)	A	Coronado bonnet
Phalium granulatum (Born, 1778)	A,(P)	Scotch bonnet
Sconsia striata (Lamarck, 1816)	A	royal bonnet

Cymatiidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Charonia variegata (Lamarck, 1816)	A	trumpet triton
Cymatium amictum tremperi Dall, 1907	P	Tremper triton
Cymatium cingulatum (Lamarck, 1822)	A	ringed triton
Cymatium corrugata tremperi Dall, 1907	P	
Cymatium femorale (Linnaeus, 1758)	A	angular triton
Cymatium krebsii Mörch, 1877	A	Krebs triton
Cymatium labiosum (W. Wood, 1828)	A,(P)	lip triton
Cymatium moritinctum caribbaeum Clench and Turner, 1957	A	dog-head triton
Cymatium muricinum (Röding, 1798)	A,(P)	knobbed triton
Cymatium nicobaricum (Röding, 1798)	A,(P)	gold-mouth triton
Cymatium parthenopeum (von Salis, 1793)	A,(P)	giant triton
Cymatium pharcidum Dall, 1889	A	slender triton
Cymatium pileare (Linnaeus, 1758)	A,(P)	hairy triton
Cymatium rubeculum occidentale Clench and Turner, 1947	A	Atlantic ruby triton
Cymatium testudinarium rehderi A.H. Verrill, 1950	A	twisted triton
Cymatium vespaceum (Lamarck, 1822)	A	dwarf triton
Distorsio clathrata (Lamarck, 1816)	A	Atlantic distorsio

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Distorsio constricta mcgintyi Emerson and Puffer, 1953	A	McGinty distorsio
Distorsio perdistorta Fulton, 1938	A,(P)	Quasimodo distorsio
Fusitriton oregonensis (Redfield, 1848)	P	Oregon triton

Bursidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Bufonaria bufo (Bruguière, 1792)	A	chestnut frogsnail
Bursa corrugata (G. Perry, 1811)	A,(P)	gaudy frogsnail
Bursa finlayi McGinty, 1962	A	Finlay frogsnail
Bursa granularis cubaniana (d'Orbigny, 1842)	A	granular frogsnail
Bursa pacamoni Matthews and Coelho, 1971	A	elegant frogsnail
Bursa ranelloides tenuisculpta (Dautzenberg and P. Fischer, 1906)	A	fine-sculpted frogsnail
Bursa thomae (d'Orbigny, 1842)	A	St. Thomas frogsnail
Crossata californica (Hinds, 1843)	P	California frogsnail

Tonnidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Eudolium crosseanum (Monterosato, 1869)	A	Crosse tun
Eudolium thompsoni McGinty, 1955	A	Thompson tun
Tonna galea (Linnaeus, 1758)	A,(P)	giant tun
Tonna maculosa (Dillwyn, 1817)	A	Atlantic partridge tun

Oocorythidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Oocorys bartschi Rehder, 1943	A	Bartsch false tun
Oocorys sulcata P. Fischer, 1883	A	sulcate false tun

Ficidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Ficus carolae Clench, 1945	A	Carol figsnail
Ficus communis Röding, 1798	A	Atlantic figsnail

ORDER NEOGASTROPODA

Muricidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Acanthina lugubris (Sowerby, 1821)	P	dark unicorn
Acanthina paucilirata (Stearns, 1871)	P	checkered unicorn
Acanthina punctulata (Sowerby, 1825)	P	spotted unicorn
Acanthina spirata (Blainville, 1832)	P	angular unicorn
Acanthotrophon striatoides E.H. Vokes, 1980	A	knobbed trophon
Aspella senex Dall, 1903	A	graybeard aspella
Attiliosa philippiana (Dall, 1889)	A	
Austrotrophon cerrosensis catalinensis I. Oldroyd, 1927	P	Catalina forreria
Boreotrophon albospinosus (Willett, 1931)	P	white-spine trophon
Boreotrophon avalonensis (Dall, 1902)	P	Avalon trophon
Boreotrophon bentleyi (Dall, 1908)	P	
Boreotrophon beringi (Dall, 1902)	P,Ac	tabulate trophon
Boreotrophon cepulus (Sowerby, 1880)	P	scallion trophon
Boreotrophon clathratus (Linnaeus, 1758)	A,Ac	clathrate trophon
Boreotrophon cymatus (Dall, 1902)	P	wavy trophon
Boreotrophon disparilis (Dall, 1891)	P	girdled trophon
Boreotrophon eucymatus (Dall, 1902)	P	grooved trophon
Boreotrophon macouni (Dall, 1910)	P	corded trophon
Boreotrophon multicostatus (Eschscholtz, 1829)	P	ribbed trophon
Boreotrophon orpheus (Gould, 1849)	P	threaded trophon
Boreotrophon pacificus (Dall, 1902)	P,Ac	elegant trophon
Boreotrophon rotundatus (Dall, 1902)	P	rotund trophon
Boreotrophon staphylinus (Dall, 1919)	P	carrot trophon
Boreotrophon stuarti (E.A. Smith, 1880)	P	winged trophon
Boreotrophon triangulatus (Carpenter, 1864)	P	triangular trophon
Boreotrophon truncatus (Strøm, 1768)	A,P	bobtail trophon
Calotrophon andrewsi E.H. Vokes, 1976	A	Andrews drill
Calotrophon ostrearum (Conrad, 1846)	A	mauve-mouth drill
Ceratostoma foliatum (Gmelin, 1791)	P	foliate thornmouth
Ceratostoma nuttalli (Conrad, 1837)	P	Nuttall purpura or Nuttall thornmouth
Chicoreus florifer dilectus (A. Adams, 1855)	A	lace murex
Chicoreus mergus E.H. Vokes, 1974	A	
Dermomurex elizabethae (McGinty, 1940)	A	Elizabeth aspella
Dermomurex pauperculus (C.B. Adams, 1850)	A	beggar aspella
Eupleura caudata (Say, 1822)	A	thick-lip drill
Eupleura sulcidentata Dall, 1890	A	sharp-rib drill
Favartia alveata (Kiener, 1842)	A	frilly dwarf triton
Favartia cellulosa (Conrad, 1846)	A	pitted murex
Favartia minirosea (Abbott, 1954)	A	rosy drill
Forreria belcheri (Hinds, 1843)	P	Belcher murex
Maxwellia gemma (Sowerby, 1879)	P	gem murex
Maxwellia santarosana (Dall, 1905)	P	Santa Rosa murex
Murex anniae M. Smith, 1940	A	Annie murex
Murex beauii Fischer and Bernardi, 1857	A	Beau murex
Murex cabritii Bernardi, 1859	A	Cabrit murex
Murex rubidus F.C. Baker, 1897	A	rose murex
Murex tryoni Hidalgo in Tryon, 1880	A	Tryon murex
Murexiella glypta (M. Smith, 1938)	A	carved murex
Murexiella hidalgoi (Crosse, 1869)	A	Hidalgo murex
Murexiella levicula (Dall, 1889)	A	lightweight murex
Murexiella macgintyi (M. Smith, 1938)	A	McGinty murex
Muricanthus fulvescens (Sowerby, 1834)	A	giant eastern murex
Muricopsis oxytata (M. Smith, 1938)	A	hexagonal murex
Nipponotrophon fabricii	A	
Nipponotrophon lasius (Dall, 1919)	P	sandpaper trophon
Nipponotrophon scitulus (Dall, 1891)	P	spiny trophon
Nodulotrophon dalli (Kobelt, 1878)	P,Ac	crown trophon
Nucella canaliculata (Duclos, 1832)	P	channeled dogwinkle
Nucella emarginata (Deshayes, 1839)	P	emarginate dogwinkle
Nucella lamellosa (Gmelin, 1791)	P	frilled dogwinkle
Nucella lapillus (Linnaeus, 1758)	A	Atlantic dogwinkle
Nucella lima (Gmelin, 1791)	P	file dogwinkle
Ocenebra atropurpurea Carpenter, 1865	P	purple rocksnail
Ocenebra barbarensis (Gabb, 1865)	P	Santa Barbara rocksnail
Ocenebra beta (Dall, 1919)	P	beta rocksnail
Ocenebra circumtexta (Stearns, 1871)	P	circled rocksnail
Ocenebra crispatissima S.S. Berry, 1953	P	curly rocksnail
Ocenebra foveolata (Hinds, 1844)	P	dim rocksnail
Ocenebra gracillima Stearns, 1871	P	graceful rocksnail
Ocenebra grippi (Dall, 1911)	P	Gripp rocksnail
Ocenebra inornata (Recluz, 1851)	P	Japanese rocksnail
Ocenebra interfossa Carpenter, 1864	P	Carpenter rocksnail
Ocenebra lurida (Middendorff, 1848)	P	lurid rocksnail
Ocenebra minor Dall, 1919	P	minor rocksnail
Ocenebra painei (Dall, 1903)	P	ribbed rocksnail
Ocenebra squamulifera (Carpenter in Gabb, 1869)	P	scaly rocksnail
Ocenebra tracheia Dall, 1919	P	
Ocinebrina emipowlusi (Abbott, 1954)	A	Powlus drill
Paziella nuttingi (Dall, 1896)	A	
Paziella pazi (Crosse, 1869)	A	
Pazionotus stimpsonii (Dall, 1889)	A	
Phyllonotus pomum (Gmelin, 1791)	A	apple murex
Pterochelus ariomus (Clench and Pérez Farfante, 1945)	A	
Pteropurpura bequaerti (Clench and Pérez Farfante, 1945)	A	Bequaert murex
Pteropurpura festiva (Hinds, 1844)	P	festive murex
Pteropurpura macroptera (Deshayes, 1839)	P	frill-wing murex
Pteropurpura trialata (Sowerby, 1834)	P	western three-wing murex
Pteropurpura vokesae Emerson, 1964	P	wrinkle-wing murex
Pterotyphis triangularis (A. Adams, 1856)	A	
Pterynotus phaneus (Dall, 1889)	A	shining murex
Purpura patula (Linnaeus, 1758)	A	wide-mouth rocksnail
Roperia poulsoni (Carpenter, 1864)	P	Poulson rocksnail
Siratus beauii (P. Fischer and Bernardi, 1857)	A	Beau murex
Siratus cailleti (Petit de la Saussaye, 1856)	A	
Siratus consuela (A.H. Verrill, 1950)	A	
Siratus formosus (Sowerby, 1841)	A	Antilles murex
Thais deltoidea (Lamarck, 1822)	A	deltoid rocksnail
Thais haemastoma canaliculata (Gray, 1839)	A	Hays rocksnail
Thais haemastoma floridana (Conrad, 1837)	A	Florida rocksnail
Thais rustica (Lamarck, 1822)	A	rustic rocksnail
Trachypollia didyma (Schwengel, 1943)	A	twin drupe
Trachypollia lugubris (C.B. Adams, 1852)	P	dark drupe
Trachypollia nodulosa (C.B. Adams, 1845)	A	blackberry drupe
Trachypollia sclera Woodring, 1928	A	
Trophonopsis kamchatkanus (Dall, 1902)	P	Kamchatka trophon
Trophonopsis keepi (Strong and Hertlein, 1937)	P	
Typhis sowerbii Broderip, 1833	A	frilly typhis
Urosalpinx cinerea (Say, 1822)	A,[P(I)]	Atlantic oyster drill
Urosalpinx macra A.E. Verrill, 1887	A	waxy drill
Urosalpinx perrugata (Conrad, 1846)	A	Gulf oyster drill
Urosalpinx sclera Dall, 1919	P	
Urosalpinx subangulata (Stearns, 1873)	P	
Urosalpinx tampaensis (Conrad, 1846)	A	Tampa drill

Coralliophilidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Coralliophila abbreviata (Lamarck, 1816)	A	short coralsnail
Coralliophila aberrans (C.B. Adams, 1850)	A	globose coralsnail
Coralliophila caribaea Abbott, 1958	A	Caribbean coralsnail
Coralliophila scalariformis (Lamarck, 1822)	A	staircase coralsnail
Latiaxis costatus (Blainville, 1832)	P	California latiaxis
Latiaxis dalli Emerson and D'Attilio, 1963	A	Dall latiaxis
Latiaxis kincaidi Dall, 1919	P	
Latiaxis mansfieldi (McGinty, 1940)	A	
Latiaxis oldroydi (I. Oldroyd, 1929)	P	Oldroyd latiaxis

Columbellidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Aesopus chrysalloideus (Carpenter, 1864)	P	cocoon dovesnail
Aesopus eurytoideus (Carpenter, 1864)	P	
Aesopus goforthi Dall, 1912	P	
Aesopus myrmecoon Dall, 1916	P	ant-egg dovesnail
Aesopus sanctus Dall, 1919	P	Santa Monica dovesnail
Aesopus stearnsii (Tryon, 1883)	P	
Aesopus subturritus (Carpenter, 1864)	P	graceful dovesnail
Alia carinata (Hinds, 1844)	P	carinate dovesnail
Amphissa bicolor Dall, 1892	P	two-tone amphissa
Amphissa columbiana Dall, 1916	P	wrinkled amphissa
Amphissa cymata Dall, 1916	P	wavy amphissa
Amphissa haliaeeti (Jeffreys, 1867)	A	Atlantic amphissa
Amphissa reticulata Dall, 1916	P	reticulate amphissa
Amphissa undata (Carpenter, 1864)	P	Carpenter amphissa
Amphissa versicolor Dall, 1871	P	variegate amphissa
Anachis avara (Say, 1822)	A	greedy dovesnail
Anachis catenata (Sowerby, 1844)	A	chain dovesnail
Anachis floridana Rehder, 1939	A	Florida dovesnail
Anachis hotessieriana (d'Orbigny, 1842)	A	Hotessier dovesnail
Anachis iontha (Ravenel, 1861)	A	lineate dovesnail
Anachis lafresnayi (P. Fischer and Bernardi, 1856)	A	well-ribbed dovesnail
Anachis obesa (C.B. Adams, 1845)	A	fat dovesnail
Anachis pulchella (Blainville, 1829)	A	beautiful dovesnail
Anachis semiplicata Stearns, 1873	A	Gulf dovesnail
Anachis sparsa (Reeve, 1859)	A	sparse dovesnail
Anachis subturrita Carpenter, 1866	P	
Columbella mercatoria (Linnaeus, 1758)	A	West Indian dovesnail
Columbella rusticoides Heilprin, 1887	A	rusty dovesnail
Cosmioconcha calliglypta (Dall and Simpson, 1901)	A	flame dovesnail
Mitrella amiantis (Dall, 1919)	P	
Mitrella argus d'Orbigny, 1842	A	argus dovesnail
Mitrella aurantiaca (Dall, 1871)	P	golden dovesnail
Mitrella callimorpha (Dall, 1919)	P	
Mitrella clementensis Bartsch, 1927	P	San Clemente dovesnail
Mitrella diaphana (A.E. Verrill, 1882)	A	translucent dovesnail
Mitrella hypodra (Dall, 1916)	P	
Mitrella idalina (Duclos, 1840)	A	
Mitrella lunata (Say, 1826)	A	lunar dovesnail

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Mitrella lutulenta (Dall, 1919)	P	muddy dovesnail
Mitrella multilineata (Dall, 1889)	A	brown-band dovesnail
Mitrella nycteis (Duclos, 1846)	A	fenestrate dovesnail
Mitrella ocellata (Gmelin, 1791)	A,(P)	white-spot dovesnail
Mitrella permodesta (Dall, 1890)	P	
Mitrella profundi (Dall, 1889)	A	deep water dovesnail
Mitrella pura (A.E. Verrill, 1882)	A	simple dovesnail
Mitrella raveneli (Dall, 1889)	A	Ravenel dovesnail
Mitrella rosacea (Gould, 1841)	A,P	rosy northern dovesnail
Mitrella tuberosa (Carpenter, 1864)	P	variegate dovesnail
Nassarina bushiae (Dall, 1889)	A	
Nassarina glypta (Bush, 1885)	A	engraved dovesnail
Nassarina grayi Dall, 1889	A	
Nassarina minor (C.B. Adams, 1845)	A	banded dovesnail
Nassarina monilifera (Sowerby, 1844)	A	many-spotted dovesnail
Nassarina penicillata (Carpenter, 1864)	P	penciled dovesnail
Nitidella gausapata Gould, 1850	P	shaggy dovesnail
Nitidella gouldi (Carpenter, 1857)	P	Gould dovesnail
Nitidella laevigata (Linnaeus, 1758)	A	smooth dovesnail
Nitidella nitida (Lamarck, 1822)	A	glossy dovesnail
Nitidella parva Dunker, 1847	A	

Buccinidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Antillophos candei (d'Orbigny, 1842)	A	beaded phos
Bailya intricata (Dall, 1884)	A	intricate phos
Bartschia significans Rehder, 1943	A	
Beringius crebricostatus (Dall, 1877)	P	thick-cord whelk
Beringius eyerdami A.G. Smith, 1959	P	
Beringius frielei (Dall, 1894)	P	
Beringius indentatus (Dall, 1919)	P	
Beringius kennicottii (Dall, 1907)	P	Kennicott whelk
Beringius malleatus (Dall, 1884)	P,Ac	hammered whelk
Beringius marshalli (Dall, 1919)	P	
Beringius stimpsoni (Gould, 1860)	P,Ac	
Beringius turtoni (Bean, 1834)	A,Ac	
Buccinum abyssorum A.E. Verrill, 1884	A	shingled whelk
Buccinum aleuticum Dall, 1894	P	Aleut whelk
Buccinum angulosum Gray, 1839	Ac	angular whelk
Buccinum angulosum subcostatum Dall, 1885	Ac	
Buccinum angulosum transliratum Dall, 1919	P,Ac	
Buccinum baerii (Middendorff, 1848)	P	Baer whelk
Buccinum castaneum Dall, 1877	P	chestnut whelk
Buccinum castaneum fluctuatum Dall, 1919	P	
Buccinum castaneum triplostephanum Dall, 1919	P	
Buccinum chishimanum Pilsbry, 1904	P	
Buccinum ciliatum Fabricius, 1780	A,P	
Buccinum cyaneum Bruguière, 1792	A	bluish whelk
Buccinum cyaneum patulum G.O. Sars, 1878	A	
Buccinum cyaneum perdix Mörch, 1868	A	
Buccinum eugrammatum Dall, 1907	P	lirate whelk
Buccinum fischerianum Dall, 1871	P	
Buccinum fringillum Dall, 1877	P	finch whelk
Buccinum glaciale Linnaeus, 1761	A,P,Ac	glacial whelk
Buccinum gouldii A.E. Verrill, 1882	A	
Buccinum hertzensteini Verkrüzen, 1882	P	
Buccinum humphreysianum Bennett, 1825	A,P	
Buccinum hydrophanum Hancock, 1846	A,Ac	
Buccinum inexhaustum Verkrüzen, 1878	A	
Buccinum kadiakense Dall, 1907	P	Kodiak whelk
Buccinum micropoma Thorson, 1944	A,Ac	berry whelk
Buccinum normale Dall, 1885	Ac	
Buccinum ochotense (Middendorff, 1848)	P,Ac	Okhotsk whelk
Buccinum oedematum Dall, 1907	P	swollen whelk
Buccinum onismatopleura Dall, 1919	P,Ac	
Buccinum pemphigus major Dall, 1919	P	
Buccinum pemphigus orotundum Dall, 1907	P	widemouth whelk
Buccinum percrassum Dall, 1881	P,Ac	crude whelk
Buccinum physematum Dall, 1919	P,Ac	
Buccinum picturatum Dall, 1877	P	painted whelk
Buccinum planeticum Dall, 1919	P	wandering whelk
Buccinum plectrum Stimpson, 1865	A,P,Ac	sinuous whelk
Buccinum polare Gray, 1839	(A),P,Ac	polar whelk
Buccinum scalariforme Möller, 1842	A,P,Ac	ladder whelk
Buccinum sericatum Hancock, 1846	A,P,Ac	silkly whelk
Buccinum simulatum Dall, 1907	P	
Buccinum solenum Dall, 1919	P	
Buccinum striatissimum Sowerby, 1899	P	
Buccinum strigillatum fucanum Dall, 1907	P	juanmore whelk
Buccinum tenebrosum Hancock, 1846	A,P	dusky whelk
Buccinum tenellum Dall in Kobelt, 1883	P,Ac	
Buccinum totteni Stimpson, 1865	A,Ac	thin whelk
Buccinum undatum Linnaeus, 1758	A,Ac	waved whelk
Buccinum viridum Dall, 1889	P	turban whelk
Caducifer weberi Watters, 1983	A	banded phos
Cantharus cancellarius (Conrad, 1846)	A	cancellate cantharus
Cantharus multangulus (Philippi, 1848)	A	ribbed cantharus
Colus barbarinus (Dall, 1919)	P	Santa Barbara whelk
Colus bristolensis (Dall, 1919)	P	
Colus caelatus (A.E. Verrill and S.I. Smith, 1880)	A	carved whelk
Colus capponius (Dall, 1919)	P	
Colus errones (Dall, 1919)	P	wayward whelk
Colus esychus (Dall, 1907)	P,Ac	
Colus georgianus (Dall, 1920)	P	
Colus halidonus (Dall, 1919)	P	
Colus halimeris (Dall, 1919)	P	
Colus halli (Dall, 1873)	P	
Colus herendeenii (Dall, 1902)	P	
Colus hypolispus (Dall, 1891)	P,Ac	
Colus islandicus (Gmelin, 1791)	A,Ac	Iceland whelk
Colus jordani (Dall, 1913)	P	
Colus lividus (Mörch, 1862)	A	bruised whelk
Colus martensi (Krause, 1885)	P,Ac	
Colus morditus (Dall, 1919)	P	
Colus nobilis (Dall, 1919)	P	noble whelk
Colus obesus (A.E. Verrill, 1884)	A	plump whelk
Colus ombronius (Dall, 1919)	P	shady whelk
Colus periscelidus (Dall, 1891)	P	garter whelk
Colus pubescens (A.E. Verrill, 1882)	A,Ac	hairy whelk
Colus pulcius (Dall, 1919)	P,Ac	
Colus pygmaeus (Gould, 1841)	A	pygmy whelk
Colus roseus (Dall, 1877)	P,Ac	rosy whelk
Colus sabinii (Gray, 1824)	A	
Colus spitzbergensis (Reeve, 1855)	A,P,Ac	Spitzbergen whelk
Colus stimpsoni (Mörch, 1867)	A	Stimpson whelk
Colus timetus (Dall, 1919)	P	
Colus trombinus (Dall, 1919)	P	
Colus trophius (Dall, 1919)	P	
Colus ventricosus (Gray, 1839)	A	ventricose whelk
Engina caribbaea Bartsch and Rehder, 1939	A	Caribbean engina
Engina corinnae Crovo, 1971	A	Corinne engina
Engina turbinella (Kiener, 1835)	A	white-spot engina
Exilioidea kelseyi (Dall, 1908)	P	
Exilioidea rectirostris (Carpenter, 1865)	P	
Kelletia kelleti (Forbes, 1850)	P	Kellet whelk
Liomesus nassula Dall, 1901	P	basket whelk
Liomesus nux Dall, 1877	P	nut whelk
Liomesus ooides (Middendorff, 1848)	P,Ac	egg whelk
Macron lividus (A. Adams, 1855)	P	livid macron
Mohnia carolinensis (A.E. Verrill, 1884)	A	Carolina whelk
Mohnia simplex (A.E. Verrill, 1884)	A	
Neptunea amianta (Dall, 1890)	P	
Neptunea behringiana (Middendorff, 1848)	P	
Neptunea beringiana (Dall, 1919)	P	
Neptunea communis (Middendorff, 1849)	(A),P,Ac	
Neptunea despecta (Linnaeus, 1758)	A	
Neptunea eucosmia (Dall, 1891)	P	corded whelk
Neptunea insularis (Dall, 1895)	P	
Neptunea lyrata lyrata (Gmelin, 1791)	P,Ac	lyre whelk
Neptunea lyrata decemcostata (Say, 1826)	A	wrinkle whelk
Neptunea lyrata turnerae A.H. Clarke, 1956	A	
Neptunea magna (Dall, 1895)	P	helmet whelk
Neptunea pribiloffensis (Dall, 1919)	P	Pribiloff whelk
Neptunea smirnia (Dall, 1919)	P	smirnia whelk
Neptunea stilesi A.G. Smith, 1968	P	inflated whelk
Neptunea tabulata (Baird, 1863)	P	tabled whelk
Neptunea ventricosa (Gmelin, 1791)	P,Ac	fat whelk
Neptunea vinosa (Dall, 1919)	P	wine whelk
Pisania auritula (Link, 1807)	A	gaudy cantharus
Pisania pusio (Linnaeus, 1758)	A	miniature trumpet triton
Pisania tincta (Conrad, 1846)	A	tinted cantharus
Plicifusus arcticus (Philippi, 1850)	A,P,Ac	arctic whelk
Plicifusus brunneus (Dall, 1877)	P	brown whelk
Plicifusus cretaceus (Reeve, 1847)	A	chalky whelk
Plicifusus griseus (Dall, 1890)	P	gray whelk
Plicifusus incisus Dall, 1919	P	
Plicifusus johanseni Dall, 1919	Ac	
Plicifusus kroyeri (Möller, 1842)	A,P,Ac	
Plicifusus laticordatus (Dall, 1907)	P	broad-cord whelk
Plicifusus oceanodromae Dall, 1919	P	seahorse whelk
Plicifusus syrtensis (Packard, 1867)	A	
Plicifusus verkruzeni (Kobelt, 1876)	(A),P,Ac	
Plicifusus virens (Dall, 1877)	P	green whelk
Ptychosalpinx globulus (Dall, 1889)	A	globose whelk
Searlesia dira (Reeve, 1846)	P	dire whelk
Volutharpa ampullacea (Middendorff, 1848)	P	paper whelk
Volutopsius attenuatus (Dall, 1874)	P,Ac	elongate whelk
Volutopsius behringi (Middendorff, 1849)	P,Ac	
Volutopsius callorhinus (Dall, 1877)	P	strombiform whelk
Volutopsius callorhinus stejnegeri (Dall, 1884)	P	
Volutopsius castaneus (Mörch, 1858)	P	volute whelk
Volutopsius deformis (Reeve, 1847)	(A),P,Ac	warped whelk
Volutopsius filosus Dall, 1919	P	threaded whelk
Volutopsius fragilis (Dall, 1891)	P	fragile whelk
Volutopsius harpa (Mörch, 1858)	P	left-handed whelk
Volutopsius middendorffii (Dall, 1891)	P	tulip whelk
Volutopsius norvegicus (Gmelin, 1791)	A	Norway whelk
Volutopsius regularis (Dall, 1873)	P	regular whelk
Volutopsius rotundus Dall, 1919	P	rotund whelk
Volutopsius simplex Dall, 1907	P	simple whelk
Volutopsius stefanssoni Dall, 1919	P,Ac	shouldered whelk
Volutopsius trophonius Dall, 1902	P	frilled whelk

Colubrariidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Colubraria lanceolata (Menke, 1828)	A	arrow dwarf triton
Colubraria obscura (Reeve, 1844)	A	obscure dwarf triton

Melongenidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Busycon candelabrum (Lamarck, 1816)	A	splendid whelk
Busycon carica (Gmelin, 1791)	A	knobbed whelk
Busycon laeostomum Kent, 1982	A	snow whelk
Busycon pulleyi Hollister, 1958	A	prickly whelk
Busycon sinistrum Hollister, 1958	A	lightning whelk
Busycotypus canaliculatus (Linnaeus, 1758)	A,[P(I)]	channeled whelk
Busycotypus spiratus (Lamarck, 1816)	A	true pearwhelk
Busycotypus plagosus (Conrad, 1863)	A	shouldered pearwhelk
Melongena corona (Gmelin, 1791)	A	crown conch

Nassariidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Ilyanassa obsoleta (Say, 1822)	A,[P(I)]	eastern mudsnail
Ilyanassa trivittata (Say, 1822)	A	three-line mudsnail
Nassarius acutus (Say, 1822)	A	sharp nassa
Nassarius albus (Say, 1826)	A	white nassa
Nassarius antillarum (d'Orbigny, 1842)	A	Antilles nassa
Nassarius consensus (Ravenel, 1861)	A	striate nassa
Nassarius fossatus (Gould, 1849)	P	channeled nassa

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Nassarius fraterculus (Dunker, 1860)	P(I)	Japanese nassa
Nassarius hotessieri (d'Orbigny, 1845)	A	miniature nassa
Nassarius insculptus (Carpenter, 1864)	P	smooth western nassa
Nassarius mendicus (Gould, 1849)	P	lean western nassa
Nassarius mendicus cooperi (Forbes, 1850)	P	lean nassa
Nassarius perpinguis (Hinds, 1844)	P	fat western nassa
Nassarius polygonatus ciniscu1us (Reeve, 1853)	A	black-spot nassa
Nassarius rhinetes S.S. Berry, 1953	P	California nassa
Nassarius scissuratus (Dall, 1889)	A	carved nassa
Nassarius tegula (Reeve, 1853)	P	western mud nassa
Nassarius vibex (Say, 1822)	A	bruised nassa

Fasciolariidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Dolicholatirus cayohuesonicus (Sowerby, 1878)	A	Key West latirus
Dolicholatirus pauli (McGinty, 1955)	A	slender latirus
Fasciolaria bullisi Lyons, 1972	A	yellow tulip
Fasciolaria lilium G. Fischer, 1807	A	banded tulip
Fasciolaria lilium branhamae Rehder and Abbott, 1951	A	
Fasciolaria lilium hunteria (G. Perry, 1811)	A	
Fasciolaria lilium tortugana Hollister, 1957	A	
Fasciolaria tulipa (Linnaeus, 1758)	A	true tulip
Fusinus aepynotus (Dall, 1889)	A	graceful spindle
Fusinus alcimus (Dall, 1889)	A	stout spindle
Fusinus amphiurgus (Dall, 1889)	A	slender spindle
Fusinus barbarensis (Trask, 1855)	P	Santa Barbara spindle
Fusinus benthalis (Dall, 1889)	A	modest spinkle
Fusinus couei (Petit de la Saussaye, 1853)	A	Coue spindle
Fusinus eucosmius (Dall, 1889)	A	apricot spindle
Fusinus harfordii (Stearns, 1871)	P	Harford spindle
Fusinus helenae Bartsch, 1939	A	brown spindle
Fusinus kobelti (Dall, 1877)	P	Kobelt spindle
Fusinus luteopictus (Dall, 1877)	P	painted spindle
Fusinus monksae (Dall, 1915)	P	
Fusinus stegeri Lyons, 1978	A	ornamented spindle
Heilprinia timessus (Dall, 1889)	A	turnip spindle
Latirus angulatus (Röding, 1798)	A	short-tail latirus
Latirus cariniferus Lamarck, 1822	A	yellow latirus
Latirus infundibulum (Gmelin, 1791)	A	brown-line latirus
Latirus nematus Woodring, 1928	A	threaded latirus
Leucozonia nassa (Gmelin, 1791)	A	chestnut latirus
Leucozonia ocellata (Gmelin, 1791)	A	white-spot latirus
Pleuroploca gigantea (Kiener, 1840)	A	horse conch

Olividae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Jaspidella blanesi (Ford, 1898)	A	Blanes dwarf olive
Jaspidella jaspidea (Gmelin, 1791)	A	jasper dwarf olive
Jaspidella miris Olsson, 1956	A	
Oliva reticularis Lamarck, 1810	A	netted olive
Oliva sayana Ravenel, 1834	A	lettered olive
Olivella adelae Olsson, 1956	A	Adele dwarf olive
Olivella baetica Carpenter, 1864	P	beatic dwarf olive
Olivella biplicata (Sowerby, 1825)	P	purple dwarf olive
Olivella bullula (Reeve, 1850)	A	bubble dwarf olive
Olivella dealbata (Reeve, 1850)	A	whitened dwarf olive
Olivella floralia (Duclos, 1853)	A	rice olive
Olivella fuscocincta Dall, 1889	A	
Olivella macgintyi Olsson, 1956	A	
Olivella minuta (Link, 1807)	A	minute dwarf olive
Olivella mutica (Say, 1822)	A	variable dwarf olive
Olivella nivea (Gmelin, 1791)	A	snowy dwarf olive
Olivella parva T.S. Oldroyd, 1921	P	
Olivella pedroana (Conrad, 1856)	P	San Pedro dwarf olive
Olivella perplexa Olsson, 1956	A	
Olivella pusilla (Marrat, 1871)	A	tiny dwarf olive
Olivella rotunda Dall, 1889	A	
Olivella stegeri Olsson, 1956	A	
Olivella thompsoni Olsson, 1956	A	
Olivella watermani McGinty, 1940	A	

Mitridae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Mitra barbadensis (Gmelin, 1791)	A	Barbados miter
Mitra florida Gould, 1856	A	royal Florida miter
Mitra fultoni E.A. Smith, 1892	P	Fulton miter
Mitra idae Melvill, 1893	P	Ida miter
Mitra nodulosa (Gmelin, 1791)	A	beaded miter
Mitra straminea A. Adams, 1853	A	Gulf Stream miter
Mitra swainsonii antillensis Dall, 1889	A	Antillean miter

Costellariidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Thala foveata (Sowerby, 1874)	A	beaded miter
Vexillum dermestinum (Lamarck, 1811)	A	mottled miter
Vexillum epiphaneum (Rehder, 1943)	A	half-brown miter
Vexillum exiguum (C.B. Adams, 1845)	A	Hanley miter
Vexillum gemmatum (Sowerby, 1874)	A	gem miter
Vexillum hendersoni (Dall, 1927)	A	Henderson miter
Vexillum histrio (Reeve, 1844)	A	harlequin miter
Vexillum laterculatum (Sowerby, 1874)	A	pitted miter
Vexillum puella (Reeve, 1845)	A	white-spot miter
Vexillum pulchellum (Reeve, 1844)	A	beautiful miter
Vexillum styria (Dall, 1889)	A	dwarf deepsea miter
Vexillum sykesi (Melvill, 1925)	A	white-band miter
Vexillum trophonium (Dall, 1889)	A	
Vexillum wandoense (Holmes, 1860)	A	waxy miter

Volutomitridae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Microvoluta blakeana (Dall, 1889)	A	
Volutomitra groenlandica (Möller, 1842)	A	false Greenland miter

Turbinellidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Metzgeria californica Dall, 1903	P	California false spindle
Metzgeria montereyana A.G. Smith and Gordon, 1948	P	Monterey false spindle
Ptychatractus ligatus (Mighels and C.B. Adams, 1842)	A	ligate false spindle
Ptychatractus occidentalis Stearns, 1873	P	
Vasum muricatum (Born, 1778)	A	Caribbean vase

Volutidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Arctomelon stearnsii Dall, 1872	P	Alaska volute
Enaeta cylleniformis (Sowerby, 1844)	A	sand lyria
Scaphella dubia (Broderip, 1827)	A	dubious volute
Scaphella gouldiana (Dall, 1887)	A	banded volute
Scaphella junonia (Shaw, 1808)	A	junonia

Marginellidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Cystiscus jewetti (Carpenter, 1857)	P	Jewett marginella
Cystiscus polita (Carpenter, 1857)	P	polished marginella
Cystiscus politulus (Dall, 1919)	P	polite marginella
Cystiscus subtrigona (Carpenter, 1864)	P	triangular marginella
Dentimargo aureocincta (Stearns, 1872)	A	gold-line marginella
Dentimargo eburneola (Conrad, 1834)	A	tan marginella
Granulina hadria (Dall, 1889)	A	
Granulina margaritula (Carpenter, 1857)	P	pear-shaped marginella
Granulina ovuliformis (d'Orbigny, 1841)	A	teardrop marginella
Marginella amabilis Redfield, 1852	A	queen marginella
Marginella apicina Menke, 1828	A	common Atlantic marginella
Marginella bella Conrad, 1868	A	la belle marginella
Marginella borealis (Verrill, 1884)	A	boreal marginella
Marginella carnea (Storer, 1837)	A	orange marginella
Marginella cassis Dall, 1889	A	
Marginella cineracea Dall, 1889	A	gray marginella
Marginella evelynae F.M. Bayer, 1943	A	
Marginella guttata (Dillwyn, 1817)	A	white-spot marginella
Marginella hartleyanum Schwengel, 1941	A	Hartley marginella
Marginella hematita Kiener, 1834	A	carmine marginella
Marginella idiochila Schwengel, 1943	A	
Marginella lavalleeana d'Orbigny, 1841	A	snowflake marginella
Marginella nobiliana F.M. Bayer, 1943	A	
Marginella perexilis Bavay, 1922	A	
Marginella roosevelti Bartsch and Rehder, 1939	A	Roosevelt marginella
Marginella roscida Redfield, 1860	A	seaboard marginella
Marginella virginiana Conrad, 1868	A	Virginia marginella
Marginellopsis serrei Bavay, 1911	A	Serre marginella
Persicula catenata (Montagu, 1803)	A	princess marginella
Persicula pulcherimma (Gaskoin, 1849)	A	decorated marginella
Volvarina albolineata (d'Orbigny, 1842)	A	white-line marginella
Volvarina avena (Kiener, 1834)	A	orange-band marginella
Volvarina avenacea (Deshayes, 1844)	A	little oat marginella
Volvarina pallida (Linnaeus, 1758)	A	pallid marginella
Volvarina subtriplicata (d'Orbigny, 1842)	A	three-rib marginella
Volvarina taeniolata (Mörch, 1860)	P	California marginella
Volvarina torticula (Dall, 1881)	A	knave marginella
Volvarina veliei (Pilsbry, 1896)	A	Velie marginella

Cancellariidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Admete californica Dall, 1908	P	California admete
Admete circumcincta (Dall, 1873)	P	corded admete
Admete couthouyi (Jay, 1839)	A,P,Ac	northern admete
Admete gracilior (Carpenter in Gabb, 1869)	P	slender admete
Admete modesta (Carpenter, 1865)	P	modest admete
Admete regina Dall, 1911	P,Ac	noble admete
Admete rhyssa (Dall, 1919)	P	wrinkled admete
Admete seftoni S.S. Berry, 1956	P	stubby admete
Admete unalashkensis (Dall, 1873)	P	Aleutian admete
Admete woodworthi (Dall, 1905)	P	graceful admete
Agatrix agassizii (Dall, 1889)	A	Agassiz nutmeg
Cancellaria cooperi Gabb, 1865	P	Cooper nutmeg
Cancellaria corbicula Dall, 1908	P	basket nutmeg
Cancellaria crawfordiana (Dall, 1891)	P	Crawford nutmeg
Cancellaria reticulata (Linnaeus, 1767)	A	common nutmeg
Cancellaria reticulata adelae Pilsbry, 1940	A	Adele nutmeg
Olssonella smithii (Dall, 1888)	A	Smith nutmeg
Trigonostoma rugosum (Lamarck, 1822)	A	rugose nutmeg
Trigonostoma tenerum (Philippi, 1848)	A	Philippi nutmeg

Conidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Conus amphiurgus Dall, 1889	A	Julia cone
Conus armiger Crosse, 1858	A	mace cone
Conus attenuatus Reeve, 1844	A	slender cone
Conus californicus Hinds, 1844	P	California cone
Conus cancellatus Hwass, 1792	A	cancellate cone
Conus daucus Hwass, 1792	A	carrot cone
Conus delessertii Recluz, 1843	A	Sozon cone
Conus ermineus Born, 1778	A	agate cone
Conus flamingo Petuch, 1980	A	flamingo cone
Conus flavescens Sowerby, 1834	A	flame cone
Conus floridanus Gabb, 1868	A	Florida cone
Conus floridensis Sowerby, 1870	A	
Conus granulatus Linnaeus, 1758	A	glory-of-the-Atlantic cone
Conus jaspideus Gmelin, 1791	A	jasper cone
Conus macgintyi Pilsbry, 1955	A	McGinty cone
Conus mindanus Hwass, 1792	A	Bermuda cone
Conus mus Hwass, 1792	A	mouse cone
Conus patae Abbott, 1971	A	sunrise cone
Conus perryae Clench, 1942	A	
Conus rainesae McGinty, 1953	A	Raines cone
Conus regius Gmelin, 1791	A	crown cone
Conus sennottorum Rehder and Abbott, 1951	A	speckled cone
Conus spurius Gmelin, 1791	A	alphabet cone

TOM SHEPHERD

2222 Beech Street
Virginia Beach, Va.
23451

I am starting a mail order business that offers marine specimen shells. Many of the shells that are offered were collected during my travels while in the Navy. In order for me to better serve you, please complete the following questionaire and return it to me at the above address. Upon receipt of the completed questionaire you will be sent a catalog and one free introductory shell (my choice).

All orders placed before March 31st. will be entered into a drawing for a free *Conus bengalensis*. The larger the order, the more entries you receive; $25.00 or less = one entry, $25.01 to $50.00 = two entries and so on. The drawing will be held on April 2nd, 1985. The winner will be announced in Shells and Sea Life.

(please print or type)

NAME ____
(last) (first) (middle)

HOME ADDRESS: Street ______________________________________

City ______________________________________
(state and zip)

YOUR SHELL CLUB NAME: ______________________________________

Street ______________________________________

City ______________________________________
(state and zip)

MEETINGS HELD AT: ______________________________________
(location)

MEETING HELD ON: ______________________________________
(time of day and month)

SHELL CLUB'S
SECRETARY: ___________________________________

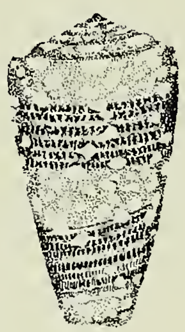
ADDRESS: Street ________________________________

City ________________________________

State ________________ Zip code ___________

Phone Number (___) ___ - ____

NEXT SHELL SHOW WILL BE: ___________________________
(inclusive dates)



LOCATION: _________________

STREET _________________

CITY _________________

TELL ME ABOUT YOUR SHELL COLLECTION (give main emphasis, such as *Conus*, *Voluta*, fossils, self collected etc.):

____

____

____

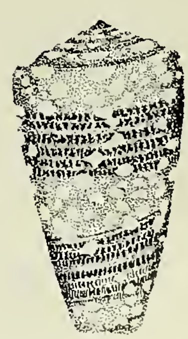
____

APPROXIMATE NUMBER OF SPECIES: _______________________

SHELLS YOU HAVE FOR TRADE OR SALE (Give species, size, grade and method of collection):

SHELLS YOU WANT FOR YOUR COLLECTION:

FAVORITE REFRENCE BOOKS ARE:



AREAS YOU HAVE COLLECTED FROM:

(For the statements below cross out AM or AM NOT as prefered):

I AM AM NOT INTERESTED IN FREAK SHELLS.

I AM AM NOT INTERESTED IN COLOR SLIDES OF UNUSUAL SPECIMENS.

I AM AM NOT INTERESTED IN COLOR PRINTS OF UNUSUAL SPECIMENS.

I AM AM NOT INTERESTED IN SPECIMENS FROM UNUSUAL LOCATIONS.

A big THANK YOU to Ray and Delores Pease, who got me started, and to Greg Curry Sr. who has been a big help along the way.

Happy Shelling,

Tom

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Conus stearnsi Conrad, 1869	A	dusky cone
Conus stimpsoni Dall, 1902	A	yellow cone
Conus villepini P. Fischer and Bernardi, 1857	A	Villepin cone

Terebridae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Hastula cinerea (Born, 1778)	A	gray auger
Hastula hastata (Gmelin, 1791)	A	shiny auger
Hastula maryleeae (R.D. Burch, 1965)	A	Marylee auger
Hastula salleana (Deshayes, 1859)	A	Salle auger
Terebra acrior Dall, 1889	A	
Terebra arcas Abbott, 1954	A	Arcas Cays auger
Terebra benthalis Dall, 1899	A	
Terebra concava Say, 1827	A	concave auger
Terebra crenifera Deshayes, 1859	P	western crenate auger
Terebra danai S.S. Berry, 1958	P	Dana auger
Terebra dislocata (Say, 1822)	A	eastern auger
Terebra floridana Dall, 1889	A	yellow auger
Terebra glossema Schwengel, 1940	A	tongue auger
Terebra hemphilli Vanatta, 1924	P	Hemphill auger
Terebra nassula Dall, 1889	A	
Terebra onslowensis Petuch, 1972	A	Onslow Bay auger
Terebra pedroana Dall, 1908	P	San Pedro auger
Terebra protexta (Conrad, 1845)	A	fine-ribbed auger
Terebra rushii Dall, 1889	A	porcelain auger
Terebra taurinus Lightfoot, 1786	A	flame auger
Terebra texana Dall, 1898	A	Texas auger
Terebra vinosa Dall, 1889	A	lilac auger

Turridae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Aforia circinata (Dall, 1873)	P	keeled aforia
Agathotoma stellata (Mörch, 1860)	P	
Antiplanes abarbarea Dall, 1919	P	
Antiplanes briseis Dall, 1919	P	
Antiplanes bulimoides Dall, 1919	P	
Antiplanes catalinae (Raymond, 1904)	P	
Antiplanes diaulax (Dall, 1908)	P	
Antiplanes hyperia Dall, 1919	P	
Antiplanes litus Dall, 1919	P	
Antiplanes major Bartsch, 1944	P	large perverse turrid
Antiplanes perversa (Gabb, 1865)	P	perverse turrid
Antiplanes santarosana (Dall, 1902)	P	
Antiplanes voyi (Gabb, 1866)	P	left-handed turrid
Antiplanes willetti S.S. Berry, 1953	P	
Bactrocythara asarca (Dall and Simpson, 1901)	A	
Bathytoma viabrunnea (Dall, 1889)	A	brown-band turrid
Bellaspira grippi (Dall, 1908)	P	
Bellaspira pentagonalis (Dall, 1889)	A	pentagonal drillia
Borsonella bartschi (Arnold, 1903)	P	
Borsonella civitella Dall, 1919	P	
Borsonella coronadoi (Dall, 1908)	P	
Borsonella diegensis (Dall, 1908)	P	
Borsonella nicoli Dall, 1919	P	
Borsonella nychia Dall, 1919	P	
Borsonella omphale Dall, 1919	P	
Borsonella pinosensis Bartsch, 1944	P	
Brachycythara barbarae Lyons, 1972	A	
Brachycythara biconica (C.B. Adams, 1850)	A	
Cerodrillia bealiana Schwengel and McGinty, 1942	A	
Cerodrillia clappi Bartsch and Rehder, 1939	A	
Cerodrillia girardi Lyons, 1972	A	
Cerodrillia perryae Bartsch and Rehder, 1939	A	Perry drillia
Cerodrillia schroederi Bartsch and Rehder, 1939	A	
Cerodrillia simpsoni (Dall in Simpson, 1887)	A	
Cerodrillia thea (Dall, 1883)	A	thea drillia
Cerodrillia verrilli (Dall, 1881, p. 68, non p. 57)	A	
Clathromangelia fuscoligata (Dall, 1871)	P	
Clathromangelia interfossa (Carpenter, 1864)	P	cliff-dwelling turrid
Clathurella canfieldi (Dall, 1871)	P	
Clathurella capaniola Dall, 1919	P	
Clathurella castianira Dall, 1919	P	
Clathurella conradiana Gabb, 1869	P	
Clathurella crystallina Gabb, 1865	P	
Clathurella rava (Hinds, 1843)	P	
Clathurella rigida (Hinds, 1843)	P	
Cochlespira elegans (Dall, 1881)	A	elegant star turrid
Cochlespira radiata (Dall, 1889)	A	lesser star turrid
Compsodrillia eucosmia (Dall, 1889)	A	eucosmia drillia
Compsodrillia haliostrephis (Dall, 1889)	A	
Crassispira cubana Melvill, 1923	A	Cuban turrid
Crassispira montereyensis Stearns, 1871	P	Monterey turrid
Crassispira phasma Schwengel, 1940	A	
Crassispira rhythmica Melvill, 1927	A	
Crassispira sanibelensis Bartsch and Rehder, 1939	A	Sanibel turrid
Crassispira semiinflata (Grant and Gale, 1931)	P	
Cryoturris cerinella (Dall, 1889)	A	little waxy mangelia
Cryoturris citronella (Dall, 1889)	A	little yellow mangelia
Cryoturris fargoi McGinty, 1955	A	Fargo mangelia
Cryoturris filifera (Dall, 1881)	A	
Cryoturris quadrilineata (C.B. Adams, 1850)	A	
Cymakra aspera (Carpenter, 1864)	P	beaded turrid
Cymakra gracilior (Tryon, 1884)	P	
Cymatosyrinx hemphilli (Stearns, 1871)	P	
Cymatosyrinx johnsoni Arnold, 1903	P	
Cymatosyrinx pagodula (Dall, 1889)	A	
Daphnella clathrata (Gabb, 1865)	P	
Daphnella corbicula Dall, 1889	A	
Daphnella lymneiformis (Kiener, 1840)	A	volute turrid
Daphnella margaretae Lyons, 1972	A	
Daphnella morra (Dall, 1881)	A	Morro turrid
Daphnella reticulosa Dall, 1889	A	
Daphnella retifera Dall, 1889	A	
Daphnella stegeri McGinty, 1955	A	Steger turrid
Drillia acurugata (Dall, 1890)	A	roughed drillia
Drillia albicoma (Dall, 1889)	A	
Drillia canna (Dall, 1889)	A	
Drillia cydia (Bartsch, 1943)	A	glorious drillia
Drilliola loprestiana (Calcara, 1841)	A	
Elaeocyma empyrosia (Dall, 1899)	P	
Eubela macgintyi Schwengel, 1943	A	
Fenimorea fucata (Reeve, 1845)	A	
Fenimorea halidorema (Schwengel, 1940)	A	
Fenimorea janetae Bartsch, 1934	A	
Gemmula hindsiana S.S. Berry, 1958	P	Hinds gem turrid
Gemmula periscelida (Dall, 1889)	A	Atlantic gem turrid
Glyphostoma adria Dall, 1919	P	
Glyphostoma cymodoce Dall, 1919	P	
Glyphostoma dentifera Gabb, 1872	A	
Glyphostoma elsae Bartsch, 1934	A	
Glyphostoma gabbii Dall, 1889	A	Gabb mangelia
Glyphostoma golfoyaquensis Maury, 1917	A	
Glyphostoma hesione (Dall, 1919)	P	
Glyphostoma pilsbryi Schwengel, 1940	A	
Glyphostomops hendersoni Bartsch, 1934	A	
Glyphoturris quadrata (Reeve, 1845)	A	
Glyphoturris diminuta (C.B. Adams, 1850)	A	
Glyphoturris eritima (Bush, 1885)	A	
Glyphoturris rugirima (Dall, 1889)	A	
Granoturris presleyi Lyons, 1972	A	
Gymnobela agassizii (A.E. Verrill and S.I. Smith, 1880)	A	
Hindsiclava alesidota (Dall, 1889)	A	
Inodrillia acova Bartsch, 1943	A	
Inodrillia aepynota (Dall, 1889)	A	tall-spired drillia
Inodrillia avira Bartsch, 1943	A	
Inodrillia carpenteri (A.E. Verrill and S.I. Smith 1880, non DeFolin, 1867)	A	
Inodrillia dalli (A.E. Verrill and S.I. Smith, 1882)	A	
Inodrillia dido Bartsch, 1943	A	
Inodrillia gibba Bartsch, 1943	A	
Inodrillia hatterasensis Bartsch, 1943	A	
Inodrillia ino Bartsch, 1943	A	
Inodrillia martha Bartsch, 1943	A	
Inodrillia miamia Bartsch, 1943	A	
Inodrillia vetula Bartsch, 1943	A	
Ithycythara cymella (Dall, 1889)	A	
Ithycythara lanceolata (C.B. Adams, 1850)	A	spear mangelia
Ithycythara parkeri Abbott, 1958	A	Parker mangelia
Ithycythara pentagonalis (Reeve, 1845)	A	
Ithycythara psila (Bush, 1885)	A	
Kurtzia arteaga (Dall and Bartsch, 1910)	P	beaded mangelia
Kurtziella accincta (Montagu, 1808)	A	
Kurtziella atrostyla (Tryon, 1884)	A	brown-tip mangelia
Kurtziella cerina (Kurtz and Stimpson, 1851)	A	
Kurtziella diomedea Bartsch and Rehder, 1939	A	
Kurtziella limonitella (Dall, 1883)	A	punctate mangelia
Kurtziella newcombei (Dall, 1919)	P	
Kurtziella perryae Bartsch and Rehder, 1939	A	
Kurtziella plumbea (Hinds, 1843)	P	violet-band mangelia
Kurtziella rubella (Kurtz and Stimpson, 1851)	A	reddish mangelia
Kurtziella serga (Dall, 1881)	A	
Kurtziella variegata (Carpenter, 1864)	P	tan mangelia
Kylix halocydne (Dall, 1919)	P	
Leptadrillia cookei (E.A. Smith, 1882)	A	
Leptadrillia splendida (Bartsch, 1934)	A	
Leucosyrinx kincaidi Dall, 1919	P	
Mangelia aculea (Dall, 1919)	P	
Mangelia amatula (Dall, 1919)	P	
Mangelia astricta Reeve, 1846	A	
Mangelia bandella (Dall, 1881)	A	
Mangelia ceroplasta Bush, 1885	A	
Mangelia cesta Dall, 1919	P	
Mangelia constricta Gabb, 1865	P	
Mangelia densilineata (Dall, 1921)	P	
Mangelia eriphyle Dall, 1919	P	
Mangelia evadne Dall, 1919	P	
Mangelia hexagona Gabb, 1865	P	
Mangelia hooveri Arnold, 1903	P	
Mangelia louisa (Dall, 1919)	P	
Mangelia merita Hinds, 1843	P	
Saccharoturris monocingulata (Dall, 1889)	A	
Mangelia painei Arnold, 1903	P	
Mangelia perattenuata Dall, 1905	P	
Mangelia philodice Dall, 1919	P	
Mangelia pomara (Dall, 1919)	P	
Mangelia victoriana (Dall, 1897)	P	
Megasurcula carpenteriana (Gabb, 1865)	P	Carpenter turrid
Megasurcula remondii (Gabb, 1866)	P	
Megasurcula stearnsiana (Raymond, 1904)	P	Stearns turrid
Miraclathurella herminea (Bartsch, 1934)	A	
Mitrolumna biplicata (Dall, 1889)	A	
Mitromorpha carpenteri Glibert, 1954	P	filose turrid
Nannodiella melanitica (Bush, 1885)	A	
Nannodiella oxia (Bush, 1885)	A	
Nannodiella vespuciana (d'Orbigny, 1842)	A	
Nototoma impressa (Mörch, 1869)	(A),P,Ac	
Obesotoma arctica (A. Adams, 1855)	P	
Obesotoma lawrenciana (Dall, 1919)	P	
Oenopota alaskensis (Dall, 1871)	P	Alaska turrid
Oenopota albrechti (Krause, 1885)	P	
Oenopota aleutica (Dall, 1871)	P,Ac	Aleut turrid
Oenopota alitakensis (Dall, 1919)	P	
Oenopota althorpensis (Dall, 1919)	P	
Oenopota althorpi (Dall, 1919)	P	
Oenopota amianta (Dall, 1919)	P	
Oenopota angulosa (G.O. Sars, 1878)	A	

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Oenopota babylonia (Dall, 1919)	P	
Oenopota beckii (Möller, 1842)	Ac	
Oenopota bicarinata (Couthuoy, 1833)	A	two-keel turrid
Oenopota blaneyi (Bush, 1909)	A	
Oenopota cancellata (Mighels and C.B. Adams, 1842)	A	cancellate turrid
Oenopota chiachiana (Dall, 1919)	P	
Oenopota concinnula (A.E. Verrill, 1882)	A	
Oenopota decussata (Couthouy, 1839)	A,Ac	decussate turrid
Oenopota elegans (Möller, 1842)	A,P	elegant turrid
Oenopota eriopis (Dall, 1919)	P	
Oenopota exarata (Möller, 1842)	A	
Oenopota excurvata (Carpenter, 1865)	P	squat turrid
Oenopota fidicula (Gould, 1849)	P	
Oenopota fiora (Dall, 1919)	P	
Oenopota galgana (Dall, 1919)	P	
Oenopota gouldii (A.E. Verrill, 1882)	A	Gould northern turrid
Oenopota grantica (Dall, 1919)	P	
Oenopota harpa (Dall, 1885)	P,Ac	harp turrid
Oenopota harpularia (Couthouy, 1838)	A,P,Ac	big harp turrid
Oenopota healyi (Dall, 1919)	P	
Oenopota hebes (A.E. Verrill, 1880)	A	
Oenopota incisula (A.E. Verrill, 1882)	A,Ac	incised northern turrid
Oenopota inequita (Dall, 1919)	P	
Oenopota krausei (Dall, 1886)	P	
Oenopota kyskana (Dall, 1919)	P	
Oenopota laevigata (Dall, 1871)	P	
Oenopota levidensis (Carpenter, 1864)	P	violet turrid
Oenopota lotta (Dall, 1919)	P	
Oenopota luetkeni (Dall, 1919)	P	
Oenopota lutkeana (Krause, 1885)	P	
Oenopota maurellei (Dall and Bartsch, 1910)	P	
Oenopota metschigmensis (Krause, 1885)	P	
Oenopota mitrata (Dall, 1919)	P	
Oenopota morchi (Leche, 1878)	P,Ac	
Oenopota murdochiana (Dall, 1885)	P,Ac	
Oenopota nazanensis (Dall, 1919)	P	
Oenopota nodulosa (Krause, 1885)	P	
Oenopota novajasemljensis (Leche, 1878)	P,Ac	
Oenopota nunivakensis (Dall, 1919)	P	Nunivak turrid
Oenopota pavlova (Dall, 1919)	P	
Oenopota pingelii (Möller, 1842)	A	
Oenopota pleurotomaris (Couthuoy, 1838)	A	
Oenopota popovia (Dall, 1919)	P	
Oenopota pribilova (Dall, 1919)	P,Ac	Pribiloff turrid
Oenopota pyramidalis (Strøm, 1788)	A,P,Ac	pyramid turrid
Oenopota rassina (Dall, 1919)	P	
Oenopota regulus (Dall, 1919)	P	
Oenopota reticulata (Brown, 1827)	A,P,Ac	reticulate turrid
Oenopota rosea (Lovén, 1846)	P	pink turrid
Oenopota rosea (G.O. Sars, 1878)	A	
Oenopota sarsii (A.E. Verrill, 1880)	A	
Oenopota scalaris (Möller, 1842)	A,Ac	
Oenopota sculpturata (Dall, 1886)	P	
Oenopota simplex (Middendorff, 1849)	P,Ac	
Oenopota solida (Dall, 1887)	P	
Oenopota subvitrea (A.E. Verrill, 1884)	A	
Oenopota tabulata (Carpenter, 1865)	P	tabulate turrid
Oenopota tenuilirata cymata (Dall, 1919)	P	
Oenopota tenuissima (Dall, 1919)	P	
Oenopota turricula (Montagu, 1803)	A,P,Ac	turriculate turrid
Oenopota violacea (Mighels and C.B. Adams, 1842)	A,P,Ac	two-cord turrid
Oenopota woodiana (Möller, 1842)	A,P,Ac	
Ophiodermella cancellata (Carpenter, 1864)	P	little cancellate turrid
Ophiodermella inermis (Hinds, 1843)	P	gray snakeskin turrid
Ophiodermella montereyensis Bartsch, 1944	P	
Pilsbryspira albomaculata (d'Orbigny, 1842)	A	white-band drillia
Pilsbryspira leucocyma (Dall, 1883)	A	white-knob drillia
Pilsbryspira monilis (Bartsch and Rehder, 1939)	A	
Pleurotomella blakeana (Dall, 1889)	A	Blake turrid
Pleurotomella packardii (A.E. Verrill, 1872)	A	
Polystira albida (G. Perry, 1811)	A	white giant turrid
Polystira tellea (Dall, 1889)	A	delicate giant turrid
Polystira vibex (Dall, 1889)	A	
Pseudomelatoma grippi (Dall, 1919)	P	
Pseudomelatoma penicillata (Carpenter, 1864)	P	
Pseudomelatoma sticta S.S. Berry, 1956	P	
Pseudomelatoma torosa (Carpenter, 1865)	P	
Pyrgocythara balteata (Reeve, 1846)	A	balteate mangelia
Pyrgocythara candidissima (C.B. Adams, 1845)	A	Cox mangelia
Pyrgocythara filosa Rehder, 1943	A	filose mangelia
Pyrgocythara hemphilli Bartsch and Rehder, 1939	A	Hemphill mangelia
Pyrgocythara plicosa (C.B. Adams, 1850)	A	plicate mangelia
Pyrgospira ostrearum (Stearns, 1872)	A	oyster turrid
Pyrgospira tampaensis (Bartsch and Rehder, 1939)	A	
Rhodopetoma rhodope (Dall, 1919)	P	
Saccharoturris monocingulata (Dall, 1889)	A	
Splendrillia lissotropis (Dall, 1881)	A	
Splendrillia moseri (Dall, 1889)	A	
Splendrillia moseri brunnescens Rehder, 1943	A	
Splendrillia woodringi (Bartsch, 1934)	A	
Stellatoma stellata (Stearns, 1872)	A	
Strictispira solida (C.B. Adams, 1850)	A	solid drillia
Suavodrillia kennicottii (Dall, 1871)	P	
Suavodrillia willetti Dall, 1919	P	small suavodrillia
Tenaturris bartletti (Dall, 1889)	A	Bartlett turrid
Tenaturris janira (Dall, 1919)	P	
Typhlomangelia nivalis (Lovén, 1846)	A	
Viridrillia cervina Bartsch, 1943	A	
Viridrillia hendersoni Bartsch, 1943	A	
Viridrillia williami Bartsch, 1943	A	
Vitricythata elata (Dall, 1889)	A	
Vitricythara metria (Dall, 1903)	A	

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Pyramidellidae		
Boonea bisuturalis (Say, 1822)	A	two-groove odostome
Boonea impressa (Say, 1822)	A	impressed odostome
Boonea seminuda (C.B. Adams, 1839)	A	half-smooth odostome
Cyclostremella californica Bartsch, 1907	P	
Cyclostremella conradia Bartsch, 1920	P	
Cyclostremella humilis Bush, 1897	A	
Fargoa bartschi (Winkley, 1909)	A	
Fargoa bushiana (Bartsch, 1909)	A	Bush odostome
Fargoa dianthophila (H. Wells and M.J. Wells, 1961)	A	serpulid odostome
Fargoa gibbosa (Bush, 1909)	A	
Iselica anomala (C.B. Adams, 1850)	A	anomalous fossarus
Iselica obtusa (Carpenter, 1864)	P	obtuse fossarus
Iselica ovoidea (Gould, 1853)	P	
Kleinella cedrosa (Dall, 1884)	A	
Miralda havanensis (Pilsbry and Aguayo, 1933)	A	
Odostomia aepynota Dall and Bartsch, 1909	P	
Odostomia aequisculpta Carpenter, 1864	P	
Odostomia aleutica Dall and Bartsch, 1909	P	
Odostomia altina Dall and Bartsch, 1909	P	
Odostomia americana Dall and Bartsch, 1904	P	
Odostomia amianta Dall and Bartsch, 1907	P	
Odostomia amilda Dall and Bartsch, 1909	P	
Odostomia angularis Dall and Bartsch, 1907	P	
Odostomia arctica Dall and Bartsch, 1909	P	
Odostomia astricta Dall and Bartsch, 1907	P	lattice odostome
Odostomia atossa Dall, 1908	P	
Odostomia bachia Bartsch, 1927	P	
Odostomia baldridgae Bartsch, 1912	P	
Odostomia barkleyensis Dall and Bartsch, 1910	P	
Odostomia beringi Dall, 1871	P	
Odostomia calcarella Bartsch, 1912	P	
Odostomia callimene Bartsch, 1912	P	
Odostomia callimorpha Dall and Bartsch, 1909	P	
Odostomia calliope Bartsch, 1912	P	
Odostomia cancellata d'Orbigny, 1842	A	
Odostomia canfieldi Dall, 1908	P	
Odostomia capitana Dall and Bartsch, 1909	P	
Odostomia cassandra Bartsch, 1912	P	
Odostomia catalinensis Bartsch, 1927	P	
Odostomia chinooki Bartsch, 1927	P	
Odostomia churchi A.G. Smith and Gordon, 1948	P	
Odostomia cincta (Carpenter, 1864)	P	
Odostomia clementensis Bartsch, 1927	P	
Odostomia clementina Dall and Bartsch, 1909	P	
Odostomia columbiana Dall and Bartsch, 1907	P	
Odostomia cookeana Bartsch, 1912	P	
Odostomia cumshewaensis Bartsch, 1921	P	
Odostomia cypria Dall and Bartsch, 1912	P	
Odostomia dicella Bartsch, 1912	P	
Odostomia dinella Dall and Bartsch, 1909	P	dinella odostome
Odostomia edmondi E. Jordan, 1920	P	
Odostomia eldorana Bartsch, 1912	P	
Odostomia elsa Dall and Bartsch, 1909	P	
Odostomia enbergi Bartsch, 1920	P	
Odostomia engonia Bush, 1885	A	
Odostomia enora Dall and Bartsch, 1909	P	
Odostomia esilda Dall and Bartsch, 1909	P	
Odostomia eucosmia Dall and Bartsch, 1909	P	graceful odostome
Odostomia eugena Dall and Bartsch, 1909	P	
Odostomia euglypta E. Jordan, 1920	P	
Odostomia exara Dall and Bartsch, 1907	P	
Odostomia excisa Bartsch, 1912	P	
Odostomia eyerdami Bartsch, 1927	P	
Odostomia farallonensis Dall and Bartsch, 1909	P	
Odostomia farma Dall and Bartsch, 1909	P	
Odostomia fetella Dall and Bartsch, 1909	P	fetella odostome
Odostomia franciscana Bartsch, 1917	P	
Odostomia gloriosa Bartsch, 1912	P	
Odostomia gravida Gould, 1852	P	
Odostomia grippiana Bartsch, 1912	P	
Odostomia hartfordensis Dall and Bartsch, 1907	P	
Odostomia heathi A.G. Smith and Gordon, 1948	P	
Odostomia helena Bartsch, 1912	P	
Odostomia helga Dall and Bartsch, 1909	P	Helga odostome
Odostomia hemphilli Dall and Bartsch, 1909	P	
Odostomia hendersoni Bartsch, 1909	A	
Odostomia herilda Dall and Bartsch, 1909	P	
Odostomia heterocincta Bartsch, 1912	P	
Odostomia hypatia Bartsch, 1912	P	
Odostomia hypocurta Dall and Bartsch, 1909	P	
Odostomia iliuliukensis Dall and Bartsch, 1909	P	
Odostomia inflata Carpenter, 1864	P	
Odostomia kelseyi Bartsch, 1912	P	
Odostomia kennerleyi Dall and Bartsch, 1907	P	
Odostomia killisnooensis Dall and Bartsch, 1909	P	
Odostomia krausei Clessin, 1900	P	
Odostomia laevigata (d'Orbigny, 1842)	A	ovoid odostome
Odostomia lastra Dall and Bartsch, 1909	P	
Odostomia laxa Dall and Bartsch, 1909	P	lax odostome
Odostomia martensi Dall and Bartsch, 1906	P	
Odostomia moratora Dall and Bartsch, 1909	P	
Odostomia movilla Dall and Bartsch, 1909	P	
Odostomia navisa Dall and Bartsch, 1907	P	navisa odostome
Odostomia nemo Dall and Bartsch, 1909	P	
Odostomia nota Dall and Bartsch, 1909	P	
Odostomia nuciformis Carpenter, 1865	P	nut-shaped odostome
Odostomia nunivakensis Dall and Bartsch, 1909	P	
Odostomia oregonensis Dall and Bartsch, 1909	P	Oregon odostome
Odostomia ornatissima (Haas, 1943)	P	
Odostomia phanella Dall and Bartsch, 1909	P	
Odostomia pharcida Dall and Bartsch, 1907	P	
Odostomia pocahontasae Henderson and Bartsch, 1914	A	

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Odostomia pratoma Dall and Bartsch, 1909	P	
Odostomia producta (C.B. Adams, 1840)	A	produced odostome
Odostomia profundicola Dall and Bartsch, 1909	P	
Odostomia pulcherrima Dall and Bartsch, 1909	P	
Odostomia pulcia Dall and Bartsch, 1909	P	
Odostomia quadrae Dall and Bartsch, 1910	P	
Odostomia resina Dall and Bartsch, 1909	P	
Odostomia richi Dall and Bartsch, 1909	P	
Odostomia ritteri Dall and Bartsch, 1909	P	
Odostomia sanjuanensis Bartsch, 1920	P	
Odostomia sapia Dall and Bartsch, 1909	P	
Odostomia satura Carpenter, 1865	P	full odostome
Odostomia septentrionalis Dall and Bartsch, 1909	P	
Odostomia sillana Dall and Bartsch, 1909	P	
Odostomia skidegatensis Bartsch, 1912	P	
Odostomia smithii A.E. Verrill, 1880	A	
Odostomia spreadboroughi Dall and Bartsch, 1910	P	
Odostomia strongi Bartsch, 1927	P	
Odostomia subglobosa Bartsch, 1912	P	
Odostomia subturrita Dall and Bartsch, 1909	P	
Odostomia sulcosa (Mighels, 1843)	A	
Odostomia tacomaensis Dall and Bartsch, 1907	P	
Odostomia tenuisculpta Carpenter, 1864	P	fine-sculpted odostome
Odostomia teres Bush, 1885	A	
Odostomia thalia Bartsch, 1912	P	
Odostomia thea Bartsch, 1912	P	
Odostomia tornata A.E. Verrill, 1884	A	
Odostomia trachis Dall and Bartsch, 1909	P	
Odostomia tremperi Bartsch, 1927	P	
Odostomia turricula Dall and Bartsch, 1903	P	
Odostomia unalaskensis Dall and Bartsch, 1909	P	
Odostomia unidentata Fleming, 1813	A	
Odostomia vancouverensis Dall and Bartsch, 1910	P	
Odostomia vicola Dall and Bartsch, 1909	P	
Odostomia vincta Dall and Bartsch, 1909	P	
Odostomia virginalis Dall and Bartsch, 1909	P	virginal odostome
Odostomia virginica Henderson and Bartsch, 1914	A	Virginia odostome
Odostomia washingtonia Bartsch, 1920	P	Washington odostome
Odostomia whitei Bartsch, 1927	P	
Odostomia willetti Bartsch, 1917	P	
Odostomia winkleyi Bartsch, 1909	A	
Odostomia youngi Dall and Bartsch, 1910	P	
Peristichia agria Dall, 1889	A	
Peristichia pedroana (Dall and Bartsch, 1909)	P	San Pedro corded pyram
Peristichia toreta Dall, 1889	A	
Pyramidella adamsi Carpenter, 1864	P	Adams pyram
Pyramidella candida Mörch, 1875	A	brilliant pyram
Pyramidella crassula Forbes, 1843	A	
Pyramidella crenulata (Holmes, 1859)	A	
Pyramidella dolabrata (Linnaeus, 1758)	A	giant Atlantic pyram
Pyramidella mazatlanticus Dall and Bartsch, 1909	P	
Pyramidella mexicana Dall and Bartsch, 1909	P	
Pyramidella resticula (Dall, 1889)	A	
Pyramidella unifasciata Forbes, 1843	A	
Pyramidella ventricosa Forbes, 1843	A	
Sayella chesapeakea Morrison, 1939	A	
Sayella crosseana (Dall, 1885)	A	
Sayella fusca (C.B. Adams, 1839)	A	brown sayella
Sayella hemphilli (Dall, 1889)	A	
Sayella livida Rehder, 1935	A	livid sayella
Triptychus niveus Mörch, 1875	A	three-cord pyram
Turbonilla acra Dall and Bartsch, 1909	P	acra turbonille
Turbonilla adusta Dall and Bartsch, 1909	P	
Turbonilla aepynota Dall and Bartsch, 1909	P	
Turbonilla aequalis (Say, 1827)	A	equal turbonille
Turbonilla alaskana Dall and Bartsch, 1909	P	
Turbonilla almo Dall and Bartsch, 1909	P	
Turbonilla antestriata Dall and Bartsch, 1907	P	
Turbonilla aragoni Dall and Bartsch, 1909	P	
Turbonilla aresta Dall and Bartsch, 1909	P	
Turbonilla attrita Dall and Bartsch, 1909	P	attrita turbonille
Turbonilla aurantia (Carpenter, 1865)	P	golden turbonille
Turbonilla auricoma Dall and Bartsch, 1903	P	
Turbonilla bakeri Bartsch, 1912	P	
Turbonilla barcleyensis Bartsch, 1917	P	
Turbonilla belotheca Dall, 1889	A	belotheca turbonille
Turbonilla burchi Gordon, 1938	P	
Turbonilla callia Dall and Bartsch, 1909	P	
Turbonilla callimene Bartsch, 1912	P	
Turbonilla canadensis Bartsch, 1917	P	
Turbonilla canfieldi Dall and Bartsch, 1907	P	
Turbonilla carpenteri Dall and Bartsch, 1909	P	
Turbonilla castanea Keep, 1888	P	
Turbonilla castanella Dall, 1908	P	
Turbonilla chocolata (Carpenter, 1865)	P	chocolate turbonille
Turbonilla clarinda Bartsch, 1912	P	
Turbonilla clementina Bartsch, 1927	P	
Turbonilla conradi Bush, 1899	A	Conrad turbonille
Turbonilla curta Dall, 1889	A	short turbonille
Turbonilla dalli Bush, 1899	A	Dall turbonille
Turbonilla delmontana Bartsch, 1937	P	
Turbonilla diegensis Dall and Bartsch, 1909	P	San Diego turbonille
Turbonilla dinora Bartsch, 1912	P	
Turbonilla dora Bartsch, 1917	P	
Turbonilla dracona Bartsch, 1912	P	
Turbonilla edwardensis Bartsch, 1909	P	
Turbonilla elegantula A.E. Verrill, 1882	A	
Turbonilla elegantula branfordensis Bartsch, 1909	A	
Turbonilla encella Bartsch, 1912	P	
Turbonilla engbergi Bartsch, 1920	P	
Turbonilla enna Bartsch, 1927	P	
Turbonilla eschscholtzi Dall and Bartsch, 1907	P	
Turbonilla eucosmobasis Dall and Bartsch, 1907	P	
Turbonilla eva Bartsch, 1917	P	
Turbonilla exilis (C.B. Adams, 1850)	A	
Turbonilla eyerdami Bartsch, 1927	P	
Turbonilla fackenthallae A.G. Smith and Gordon, 1948	P	
Turbonilla franciscana Bartsch, 1917	P	
Turbonilla gabbiana Cooper, 1870	P	
Turbonilla gilli Dall and Bartsch, 1907	P	
Turbonilla gilli delmontensis Dall and Bartsch, 1907	P	
Turbonilla gloriosa Bartsch, 1912	P	
Turbonilla grippi Bartsch, 1912	P	
Turbonilla halibrecta Dall and Bartsch, 1909	P	
Turbonilla halistrepta Dall and Bartsch, 1909	P	
Turbonilla hecuba Dall and Bartsch, 1913	A	
Turbonilla hemphilli Bush, 1899	A	Hemphill turbonille
Turbonilla hypolispa Dall and Bartsch, 1909	P	
Turbonilla ilfa Bartsch, 1927	P	
Turbonilla ina Bartsch, 1917	P	
Turbonilla incisa Bush, 1899	A	
Turbonilla incisa constricta Bush, 1899	A	
Turbonilla interrupta (Totten, 1835)	A	interrupted turbonille
Turbonilla ista Bartsch, 1917	P	
Turbonilla jewetti Dall and Bartsch, 1909	P	
Turbonilla kelseyi Dall and Bartsch, 1909	P	Kelsey turbonille
Turbonilla kincaidi Bartsch, 1921	P	
Turbonilla kurtzii Mazÿck, 1913	A	
Turbonilla laevis (C.B. Adams, 1850)	A	
Turbonilla laminata (Carpenter, 1865)	P	laminate turbonille
Turbonilla lituyana Dall and Bartsch, 1909	P	
Turbonilla lordi (E.A. Smith, 1880)	P	
Turbonilla louiseae A.H. Clarke, 1954	A	
Turbonilla lyalli Dall and Bartsch, 1907	P	
Turbonilla macouni Dall and Bartsch, 1910	P	
Turbonilla middendorffi Bartsch, 1927	P	
Turbonilla mighelsi Bartsch, 1909	A	
Turbonilla morchi Dall and Bartsch, 1907	P	
Turbonilla multicostata (C.B. Adams, 1850)	A	
Turbonilla muricatoides Dall and Bartsch, 1907	P	
Turbonilla nereia Dall and Bartsch, 1909	P	
Turbonilla newcombei Dall and Bartsch, 1907	P	
Turbonilla nivea (Stimpson, 1851)	A	milky turbonille
Turbonilla nuttingi Dall and Bartsch, 1909	P	
Turbonilla obeliscus (C.B. Adams, 1850)	A	
Turbonilla obesa Dall and Bartsch, 1909	P	
Turbonilla oregonensis Dall and Bartsch, 1907	P	
Turbonilla pauli A.G. Smith and Gordon, 1958	P	
Turbonilla pentalopha Dall and Bartsch, 1903	P	
Turbonilla perlepida A.E. Verrill, 1885	A	
Turbonilla pesa Dall and Bartsch, 1910	P	
Turbonilla pluto Dall and Bartsch, 1909	P	
Turbonilla pocahontasae Henderson and Bartsch, 1914	A	
Turbonilla polita (A.E. Verrill, 1872)	A	
Turbonilla powhatani Henderson and Bartsch, 1914	A	
Turbonilla protracta Dall, 1892	A	drawn-out turbonille
Turbonilla pugetensis Bartsch, 1917	P	
Turbonilla puncta (C.B. Adams, 1850)	A	
Turbonilla punicea Dall, 1884	A	
Turbonilla pusilla (C.B. Adams, 1850)	A	
Turbonilla rathbuni A.E. Verrill and S.I. Smith, 1880	A	
Turbonilla raymondi Dall and Bartsch, 1909	P	Raymond turbonille
Turbonilla recta Dall and Bartsch, 1909	P	
Turbonilla reticulata (C.B. Adams, 1850)	A	
Turbonilla ridgwayi Dall and Bartsch, 1909	P	
Turbonilla rinella Dall and Bartsch, 1910	P	
Turbonilla santarosana Dall and Bartsch, 1909	P	
Turbonilla serrae Dall and Bartsch, 1907	P	
Turbonilla shuyakensis Bartsch, 1927	P	
Turbonilla signae Dall and Bartsch, 1909	P	
Turbonilla simpsoni Dall and Bartsch, 1909	P	
Turbonilla stelleri Bartsch, 1927	P	
Turbonilla stillmani A.G. Smith and Gordon, 1948	P	
Turbonilla stimpsoni Bush, 1899	A	
Turbonilla strongi Willett, 1931	P	
Turbonilla styliformis Mörch, 1875	A	
Turbonilla stylina (Carpenter, 1865)	P	many-named turbonille
Turbonilla subulata (C.B. Adams, 1850)	A	
Turbonilla sumneri Bartsch, 1909	A	
Turbonilla swani Dall and Bartsch, 1909	P	
Turbonilla talma Dall and Bartsch, 1910	P	
Turbonilla taylori Dall and Bartsch, 1907	P	
Turbonilla tenuicula (Gould, 1853)	P	slight turbonille
Turbonilla textilis (Kurtz, 1860)	A	
Turbonilla torquata (Gould, 1852)	P	Vancouver turbonille
Turbonilla toyatani Henderson and Bartsch, 1914	A	
Turbonilla tremperi Bartsch, 1917	P	
Turbonilla tridentata (Carpenter, 1864)	P	three-tooth turbonille
Turbonilla unilirata Bush, 1899	A	
Turbonilla verrillii Bartsch, 1909	A	
Turbonilla vexativa Dall and Bartsch, 1909	P	
Turbonilla virga Dall, 1884	A	
Turbonilla virgata Dall, 1892	A	
Turbonilla virginica Henderson and Bartsch, 1914	A	
Turbonilla virgo (Carpenter, 1864)	P	
Turbonilla viridaria Dall, 1884	A	
Turbonilla weldi Dall and Bartsch, 1909	P	
Turbonilla whiteavesi Bartsch, 1909	A	
Turbonilla wickhami Dall and Bartsch, 1909	P	
Turbonilla willetti A.G. Smith and Gordon, 1948	P	

ORDER CEPHALASPIDEA

Acteonidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Acteon candens Rehder, 1939	A	Rehder baby-bubble
Acteon finlayi McGinty, 1955	A	Finlay baby-bubble
Acteon traskii Stearns, 1898	P	Trask baby-bubble
Japonacteon pusillus (Forbes, 1843)	A	miniature baby-bubble
Microglyphis breviculus (Dall, 1902)	P	short baby-bubble
Microglyphis estuarinus (Dall, 1908)	P	estuarine baby-bubble
Mysouffa cumingii (A. Adams, 1854)	A	Cuming baby-bubble
Rictaxis painei Dall, 1903	P	Paine baby-bubble
Rictaxis punctocaelatus (Carpenter, 1864)	P	Carpenter baby-bubble
Rictaxis punctostriatus (C.B. Adams, 1840)	A	pitted baby-bubble

Bullinidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Bullina exquisita McGinty, 1955	A	exquisite bubble

Hydatinidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Hydatina physis (Linnaeus, 1758)	A,(P)	brown-line paper-bubble
Micromelo undata (Bruguière, 1792)	A,(P)	miniature melo

Ringiculidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Ringicula nitida A.E. Verrill, 1873	A	Verrill helmet-bubble
Ringicula semistriata d'Orbigny, 1842	A	striate helmet-bubble

Scaphandridae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Acteocina atrata Mikkelsen and Mikkelsen, 1984	A	blackback barrel-bubble
Acteocina bidentata (d'Orbigny, 1841)	A	two-tooth barrel-bubble
Acteocina bullata (Kiener, 1834)	A	striate barrel-bubble
Acteocina canaliculata (Say, 1826)	A	channeled barrel-bubble
Acteocina candei (d'Orbigny, 1841)	A	
Acteocina cerealis (Gould, 1853)	P	grain barrel-bubble
Acteocina culcitella (Gould, 1853)	P	pillow barrel-bubble
Acteocina eburnea A.E. Verrill, 1885	A	ivory barrel-bubble
Acteocina inculta (Gould, 1855)	P	rude barrel-bubble
Acteocina infrequens (C.B. Adams, 1852)	P	infrequent barrel-bubble
Acteocina intermedia Willett, 1928	P	intermediate barrel-bubble
Acteocina magdalenensis Dall, 1919	P	Magdalena Bay barrel-bubble
Acteocina oldroydi Dall, 1925	P	
Acteocina oryza (Totten, 1835)	A	rice barrel-bubble
Acteocina recta (d'Orbigny, 1841)	A	straight barrel-bubble
Acteocina smirna Dall, 1919	P	Smirna barrel-bubble
Scaphander pilsbryi McGinty, 1955	A	Pilsbry canoe-bubble
Scaphander punctostriatus (Mighels, 1841)	A,Ac	giant canoe-bubble
Scaphander watsoni Dall, 1881	A	Watson canoe-bubble
Scaphander willetti Dall, 1919	P	Willett canoe-bubble

Cylichnidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Cylichna alba (Brown, 1827)	A,P,Ac	white chalice-bubble
Cylichna attonsa (Carpenter, 1864)	P	deep trouble chalice-bubble
Cylichna diegensis (Dall, 1919)	P	San Diego chalice-bubble
Cylichna eburnea A.E. Verrill, 1885	A	ivory chalice-bubble
Cylichna gouldii (Couthouy, 1839)	A,Ac	Gould chalice-bubble
Cylichna linearis Jeffreys, 1867	A	lined chalice-bubble
Cylichna nucleola (Reeve, 1855)	P,Ac	kernel chalice-bubble
Cylichna occulta (Mighels and C.B. Adams, 1842)	A,P,Ac	concealed chalice-bubble
Cylichna verrillii Dall, 1889	A	

Aglajidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Aglaja ocelligera (Bergh, 1894)	P	eyespot aglaja
Chelidonura hirundinina (Quoy and Gaimard, 1833)	A	
Chelidonura sabina Ev. Marcus and Er. Marcus, 1970	A	Sabine Island aglaja
Melanochlamys diomedea (Bergh, 1894)	P	albatross aglaja
Navanax aenigmaticus (Bergh, 1893)	A,P	mysterious aglaja
Navanax inermis (Cooper, 1863)	P	California aglaja
Philinopsis pusa (Ev. Marcus and Er. Marcus, 1967)	A	pusa aglaja

Philinidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Philine alba Mattox, 1958	A,P	white paper-bubble
Philine angulata Jeffreys, 1867	A	angled paper-bubble
Philine bakeri Dall, 1919	P	Baker paper-bubble
Philine californica Willett, 1944	P	California paper-bubble
Philine cingulata G.O. Sars, 1878	A	girdled paper-bubble
Philine finmarchia M. Sars in G.O. Sars, 1878	A	Finmark paper-bubble
Philine fragilis G.O. Sars, 1878	A	fragile paper-bubble
Philine lima (Brown, 1825)	A,Ac	file paper-bubble
Philine polaris Aurivillius, 1885	P,Ac	axial paper-bubble
Philine quadrata (S. Wood, 1839)	A,Ac	quadrate paper-bubble
Philine sagra (d'Orbigny, 1841)	A	crenulate paper-bubble
Philine sinuata (Stimpson, 1850)	A,P	sinuate paper-bubble
Philine tincta A.E. Verrill, 1882	A	tinted paper-bubble

Gastropteridae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Gastropteron cinereum, Dall, 1925	P	gray batwing seaslug
Gastropteron pacificum Bergh, 1894	P	Pacific batwing seaslug
Gastropteron rubrum (Rafinesque, 1814)	A	batwing seaslug
Gastropteron vespertilium Gosliner and Armes, 1984	A	flapping dingbat

Diaphanidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Diaphana brunnea Dall, 1919	P	brown paper-bubble
Diaphana californica Dall, 1919	P	California paper-bubble
Diaphana debilis (Gould, 1839)	A	weak paper-bubble
Diaphana minuta (Brown, 1827)	A,P,Ac	Arctic paper-bubble
Woodbridgea polystrigma (Dall, 1908)	P	furrowed paper-bubble

Runcinidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Runcina divae (Ev. Marcus and Er. Marcus, 1963)	A	

Bullidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Bulla clausa Dall, 1889	A	imperforate bubble
Bulla gemma A.E. Verrill, 1880	A	jewel bubble
Bulla gouldiana Pilsbry, 1895	P	California bubble
Bulla solida Gmelin, 1791	A	solid bubble
Bulla striata Bruguière, 1792	A	striata bubble

Atyidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Atys caribaeus (d'Orbigny, 1841)	A	Caribbean glassy-bubble
Atys castus Carpenter, 1864	P	clean glassy-bubble
Atys nonscriptus (A. Adams, 1850)	P	clean slate glassy-bubble
Atys obscuratus Dall, 1896	A	obscure glassy-bubble
Atys riiseanus Mörch, 1875	A	Riise glassy-bubble
Atys sandersoni Dall, 1881	A	Sanderson glassy-bubble
Haminoea antillarum (d'Orbigny, 1841)	A	Antilles glassy-bubble
Haminoea elegans (Gray, 1825)	A	elegant glassy-bubble
Haminoea petitii (d'Orbigny, 1841)	A	straight glassy-bubble
Haminoea solitaria (Say, 1822)	A	solitary glassy-bubble
Haminoea succinea (Conrad, 1846)	A	amber glassy-bubble
Haminoea vesicula Gould, 1855	P	blister glassy-bubble
Haminoea virescens (Sowerby, 1833)	P	green glassy-bubble

Retusidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Coleophysis carinatus (Carpenter, 1857)	P	keeled barrel-bubble
Coleophysis harpa (Dall, 1871)	P	harp barrel-bubble
Pyrunculus caelatus (Bush, 1885)	A	engraved barrel-bubble
Pyrunculus ovatus (Jeffreys, 1870)	A	ovate barrel-bubble
Retusa mayoi (Dall, 1889)	A	
Retusa montereyensis A.G. Smith and Gordon, 1948	P	Monterey barrel-bubble
Retusa obtusa (Montagu, 1803)	A,P,Ac	Arctic barrel-bubble
Retusa sulcata (d'Orbigny, 1841)	A	sulcate barrel-bubble
Sulcoretusa xystrum (Dall, 1919)	P	polished barrel-bubble
Volvulella californica Dall, 1919	P	California spindle-bubble
Volvulella cylindrica (Carpenter, 1864)	P	cylindrical spindle-bubble
Volvulella panamica Dall, 1919	P	Panamic spindle-bubble
Volvulella paupercula (Watson, 1883)	A	spineless spindle-bubble
Volvulella persimilis (Mörch, 1875)	A	southern spindle-bubble
Volvulella recta (Mörch, 1875)	A	spined spindle-bubble
Volvulella texasiana Harry, 1967	A	Texas spindle-bubble

ORDER ACOCHLIDIOIDEA

Microhedylidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Unela remanei Er. Marcus, 1953	A	Remane sand nudibranch

ORDER THECOSOMATA

Limacinidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Limacina bulimoides (d'Orbigny, 1836)	A,(P)	bulimoid pteropod
Limacina helicina (Phipps, 1774)	A,P,Ac	helicid pteropod
Limacina inflata (d'Orbigny, 1836)	A,(P)	planorbid pteropod
Limacina lesueurii (d'Orbigny, 1836)	A,(P)	Lesueur pteropod
Limacina retroversa (Fleming, 1823)	A,Ac	retrovert pteropod
Limacina trochiformis (d'Orbigny, 1836)	A,(P)	trochiform pteropod

Cavoliniidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Cavolina gibbosa (d'Orbigny, 1836)	A,P	gibbose cavoline
Cavolina inflexa (Lesueur, 1813)	A,P	inflexed cavoline
Cavolina longirostris (Blainville, 1821)	A,P	long-snout cavoline
Cavolina tridentata (Niebuhr, 1775)	A,P	three-tooth cavoline
Cavolina uncinata (Rang, 1829)	A,(P)	uncinate cavoline
Clio chaptalii Gray, 1850	A,(P)	Chaptal clio
Clio cuspidata (Bosc, 1802)	A,(P)	cuspidate clio
Clio polita (Pelseneer, 1888)	A,(P)	two-keel clio
Clio pyramidata Linnaeus, 1767	A,P	pyramid clio
Clio recurva (Children, 1823)	A,P	wavy clio
Creseis acicula (Rang, 1828)	A,P	straight needle-pteropod
Creseis virgula (Rang, 1828)	A,P	curved needle-pteropod
Cuvierina columnella (Rang, 1827)	A,P	cigar pteropod
Diacria quadridentata (Blainville, 1821)	A,P	four-tooth cavoline
Diacria trispinosa (Blainville, 1821)	A,P	three-spine cavoline
Hyalocylis striata (Rang, 1828)	A,(P)	striate clio
Styliola subula (Quoy and Gaimard, 1827)	A,P	keeled clio

Peraclididae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Peracle apicifulva Meisenheimer, 1906	(A),P	
Peracle bispinosa Pelseneer, 1888	A,(P)	two-spine pteropod
Peracle reticulata (d'Orbigny, 1836)	A,P	reticulate pteropod
Peracle tricantha P. Fischer, 1882	A	

Cymbuliidae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Corolla calceola A.E. Verrill, 1880	A	Atlantic corolla
Corolla spectabilis Dall, 1871	P	spectacular corolla

Desmopteridae

SCIENTIFIC NAME	OCCURRENCE	COMMON NAME
Desmopterus pacificus Essenberg, 1919	P	
Desmopterus papilio Chun, 1889	A	

DEALING WITH DEALERS:
ON RETURNING SHELLS
by **David DeLucia**

Sooner or later it happens to everyone. The "super fabulous beauty" you ordered turns out to be a "super fabulous dog". Unless you want to swallow your pride and use the specimen as a paperweight, your only recourse is to send it back. But how? Like trading, returning shells is an art that must be learned by anyone hoping to receive a significant portion of their specimen shells via mail order.

The first problem is finding the right box. Whenever possible, use the original parcel. In case this has been damaged through your enthusiasm, choose the sturdiest container possible, preferably one that is resistant to crushing. The object is to keep the shell from moving around en route. A delicate lip or spine can chip very easily if the specimen is able to roll back and forth within a small plastic box, for example. I would put the shell in a zip-lock bag, then wrap it carefully in kleenex. For further protection, the whole affair can then be wrapped in newspaper which should be taped as tightly as possible. Use styrofoam "peanuts" to line the box as these keep the shell in place. Bubble wrap is also useful, either as a final covering or in place of the styrofoam as a cushioning agent.

Another dilemma is deciding how soon to return the shells without incurring the dealer's wrath. Policies differ across the board -- most parties like the shells back within 7-10 days of receipt of the package, but 15 days is not that uncommon and I have even seen 20 days! In general, try to get the package **in the mail** within two weeks of receipt. If more time is needed, send a postcard explaining why the delay is necessary. Ship all boxes first class or air mail, insuring the contents when appropriate.

Which shells should be returned? I would send back all misidentified specimens, juveniles sent as adults, damaged material, and any shell that is graded incorrectly. In addition, species with questionable data should be returned, as such material has little scientific value. Moreover, if you ever use these shells for trading, you will be perpetuating misinformation. Finally, it's O.K. to send back something if it wasn't what you had expected. Not all the species you get will resemble the picture in the book!

If you're still reluctant to return shells at this point, remember you may actually be helping the dealer by pointing out misidentification, incorrect data, etc. Moreover, a returned specimen indicates that you're a very discriminating collector that won't put up with any old shell. Send back a few items now and then and you'll be surprised at some of the replacements. Many happy returns!

David DeLucia, 7 Sunset Hill Drive, Branford, CT 06405.

A MARGINELLID DILEMMA

by **David W. Behrens**

Numerous changes in the taxonomy of the family Marginellidae, particularly concerning those species of west America, are carefully chronicled in Coan (1965) and Coan & Roth (1966). Of particular interest to malacologists studying central California marginellids are the genera *Cystiscus* Stimpson, 1865 and *Granulina* Jousseaume, 1888. During a study of the ecological associations of invertebrates in turf-building intertidal seaweeds (see **Shells and Sea Life**, June, 1984, pages 106-108) a problem in identification of preserved specimens of the two genera arose. Specimens representing various stages of shell development from the bubble-shell stage to mature shell shared characteristics of both *Cystiscus jewettii* (Carpenter, 1857) and *Granulina margaritula.* Live specimens of all stages were sought from the study area, a difficult task in itself as all specimens were less than 1.5 mm long. Mantle and radula were closely examined. After careful scrutiny, all specimens were determined to be *G. margaritula.*

Coincidentally, while collecting opisthobranchs at my favorite "secret" spot several miles south, I stumbled on a somewhat larger marginellid-like beast climbing surfgrass in quiet tidepools. A dozen of so specimens were collected and subjected to similar mantle and radular examination. Lo and behold, *Cystiscus jewettii*, but not without a caveat: lateral teeth on the radula.

Excluding the type-species of the genus *Marginella* (*M. glabella*), all other members of the family Marginellidae have rachiglossate radula (a single series of rachidian teeth). *M. glabella* has no radula at all. The rachidian tooth varies in its morphology, bearing various numbers and shapes of denticular cusps. This radular characteristic has held consistent until now.

Early in the century however, one malacologist speculated otherwise. Some may wonder at his wisdom or reasoning, but on November 11, 1921, Rev. Dr. A.H. Cooke while reading a paper to the Malacological Society of London, on the radula of the Volutidae, a gastropod group whose radula consists of rachidian and paired lateral teeth, stated "Someday a *Marginella* with laterals will turn up." The marginellid species *Cystiscus jewettii* appears to have lateral teeth on the radula.

Excited with my new information, I telephoned Dr. Barry Roth at the California Academy of Sciences in San Francisco to report my find. Barry, in his wonderfully polite and respectful manner, was excited to learn that someone else had also observed this morphological inconsistency. As it turns out, Dr. Roth previously had reported on such lateral teeth during a presentation to the Western Society of Malacologists in 1972 (see **Echo** 5:24-25). Because no detailed description of the radula, with or without laterals, or details on the exquisite morphology of the mantle of either *Granulina margaritula* or *Cystiscus jewettii* exist, the following observations are presented to supplement information on the shells.

Granulina margaritula

(=*Cypraeolina margaritula* fide McLean, 1978) Mantle: When extended, almost entirely covers shell (Figure 1). Tuberculate, with largest tubercles near edge of mantle and laterally along foot. Ground color brown with a black edge along margin. Mantle variously covered with blue spots interspersed with smaller orange spots. Tubercles white to yellow apically. Cephalic tentacles and siphon transparent with yellow spots. The tail is also transparent with a broad medial splash of yellow pigmentation.

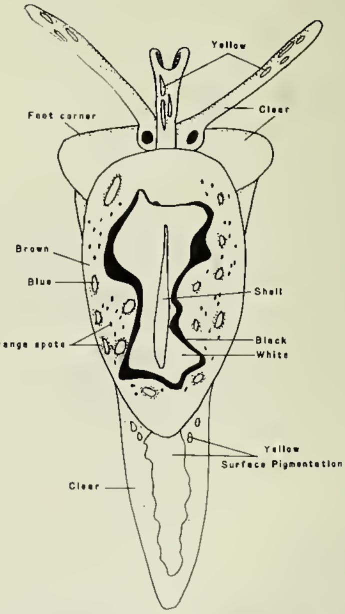


Figure 1. Drawing of a living specimen of *Granulina margaritula*

Radula: A single series of rachidian teeth up to 159 teeth in length. The rachidian tooth is arched, extremely small, with 5 denticles to each side of a large central cusp (Figure 2). The outermost denticles are slightly longer than the central cusp.

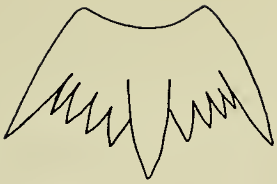
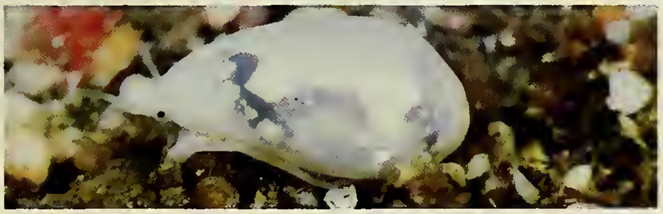


Figure 2. Radular tooth of *Granulina margaritula*

Living *Cystiscus jewettii* photographed in shallow tide pool near Avila Beach, California. Specimen is approximately 2.0 mm in length. All photos by George D. Lepp (Bio-Tech Images), Los Osos, California.

Cystiscus jewetti
(=*Marginella jewettii*)
Mantle: Greatly reduced, not covering shell. Because the shell is nearly transparent, body organs show through, giving a mottled appearance (Figure 3). Foot corners triangular, with a labial fold juxtaposed along the frontal margin. This portion of the foot, and the broad, blunt tail, bear large white-yellow patches. Those on the tail may have streaks of orange pigment. The cephalic tentacles are transparent with white-yellow spots. The siphon is yellow with orange streaks.



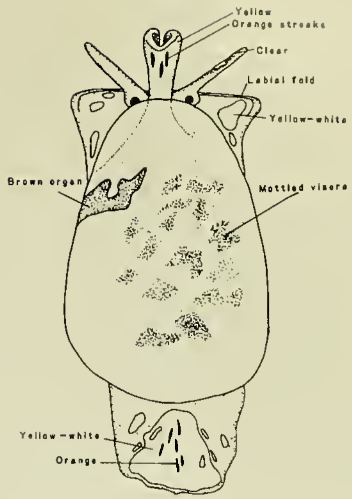


Figure 3. Drawing of a living specimenof *Cysticus jewettii*

Radula: Triseriate (Figure 4), with 66-102 rows of teeth. The rachidian is arched and bears three large denticles. The lateral teeth are faintly discernable triangular plates.

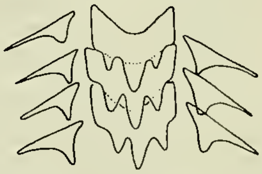


Figure 4. Radular teeth of *Cystiscus jewettii*

Simply stated, the radula of *Cystiscus jewettii* is nearly identical to those of *Volutocorbis abyssicola* and *Ternivoluta studeri*, both species of Volutidae, another family in which most taxa are typified by uniserial rachiglossate radula (Weaver & duPont, 1970). Further examination of the minute marginellid species is certainly required before the phylogenetic significance of this observation is fully understood. This information should help indicate the systematic position of the genus *Cystiscus* in the family Marginellidae. More importantly, the presence of lateral teeth, as vestigial as they appear, may indicate a common volutid-marginellid ancestral stock and could have implications concerning the origin of the marginellids.

Literature Cited

Coan, Eugene. 1965. A Proposed Reclassification of the Family Marginellidae (Mollusca: Gastropoda). The Veliger, 7(3):184-194.

Coan, Eugene & Barry Roth. 1966. The West American Marginellidae. The Veliger, 8(4):276-299.

Cooke, A.H. 1921. The Radula of the Volutidae. Proc. Malac. Soc. Lond., 15(1):6-12.

McLean, James H. 1978. Marine Shells of Southern California. Nat. Hist. Mus. Los Angeles County, Science Series 24, Revised Ed., 104pp.

Weaver, Clifton Stokes & John Eleuthere duPont. 1970. Living Volutes: a Monography of the Recent Volutidae of the World. Monographic Ser. No. 1, Delaware Mus. Nat. Hist., Greenville, Delaware,

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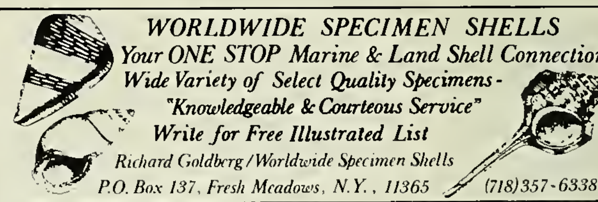

YOUR COLLECTION -- A HOW-TO COLUMN:

No. 5. KEEPING A FIELD NOTE BOOK

by Susan J. Hewitt

Buy yourself a nice, pocket-sized hardbound notebook. You can cover it with plastic if you like. Get yourself a waterproof pen. Then make it a routine to take them with you on any field trip, along with your hand lens and collecting equipment.

Don't be intimidated by the grand idea of writing! Just jot down the date and where you visited, and then make notes of anything you see which seems interesting. Details of appearance and behavior of live animals are always worth recording. Habitat, changes in local distribution, appearances and disappearances of groups of animals; you will soon get a feel for what is worth recording.

It is sometimes much easier to draw something rapidly than to try to describe it. Again, don't be self-conscious about your drawing ability -- this is not for artistic purposes, it is simply to record a point that you want to be able to remember later.

You will find as time goes by, that your note book becomes a little treasury of information, fun to read over, and extremely useful as a memory aid. If you ever want to start a small research project it will be an invaluable resource.

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NOTES FROM HANS BERTSCH:
GORGONIANS: THE OCEAN'S FANCIFUL MENORAHS AND CHRISTMAS TREES.

The fanciful resemblance of gorgonians to menorahs and Christmas trees allows me to discuss these sea dwellers as an imaginative season's greetings to you! Gorgonians are a group of coelenterates (members of the phylum Cnidaria); their relatives include jellyfish, the Portugese man-of-war, sea anemones, true corals, hydroids, etc. Some careful taxonomic explanations are necessary to understand just what these animals are (Table I).

Table I. Abbreviated Classification of Gorgonians

*PHYLUM CNIDARIA: Internal space for digestion (only one opening) called gastrovascular cavity; body wall of three layers, the middle called mesoglea; radially symmetrical; unique explosive stinging cells called cnidocytes.
- *CLASS HYDROZOA: Both polypoid and medusoid; acellular mesoglea; cnidocytes restricted to epidermis; gametes develop in epidermis. Hydroids, Portugese man-of-war, stinging or fire coral.
- *CLASS SCYPHOZOA: Medusoid dominant; gonads gastrodermal; lack velum. Jellyfish.
- *CLASS CUBOZOA: Bell with four flattened sides and simple margins; extremely virulent sting. Cubomedusae.
- *CLASS ANTHOZOA: Exclusively polypoid; cnidocytes epidermal and on gastric filaments; gonads gastrodermal. Corals, anemones, soft corals.
  - *Subclass ZOANTHARIA: Polyps with more than 8 tentacles, usually not pinnate. Anemones, true coral, black coral.
  - *Subclass ALCYONARIA or OCTOCORALLIA: Polyps with 8 pinnate tentacles. Gorgonians, sea pens, soft coral.
    - *Order TELESTACEA: Telesto.
    - *Order ALCYONACEA: Anthelia, soft corals.
    - *Order GORGONACEA: Gorgonians, sea fans, sea whips.

Cnidarians are a primitive group of animals that exhibit two major body types: polyp and medusa. Polyps are bag-like, cylindrical animals, attached by tentacles. This is the familiar shape of sea anemones. Medusae are floating bells, with tentacles dangling down from around the margin of the bell. Both polyp and medusa shapes are radially symmetrical -- they have a circular body shape that is similar all around the circumference. Cnidarians have only a single body space (the single-opening gastrovascular cavity) and the middle of the three tissue layers is a gelatinous mass called mesoglea.

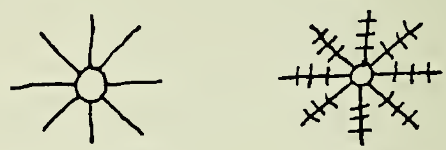
Unique to this phylum is the stinging cell cnidocyte, which fires harpoon-like nematocysts at potential prey or enemies.

Taxonomically, cnidarians are divided into 4 classes, each of which is subdivided further into orders, families, genera, and species. Of concern to us is the division of one class, the Anthozoa. As can be seen from Table I, there are two phylogenetic lineages within Anthozoa.

Zoantharia include the solitary sea anemones, colonial reef-building corals, black corals, and other forms. Their polyps have numerous smooth tentacles.

By contrast, the Octocorallia (or Alcyonaria) have 8 pinnate (feather-like) tentacles on each polyp. Examine Figures 1 and 3, the close-up photographs of *Telesto* and *Anthelia*; note that the tentacles are always 8 in number and each tentacle has numerous side branches extending from its main axis.

One of the common names for members of this group is sea fan. That name implies a functional shape. Octocorals are sessile, or attached, animals, often spread out fan-like to face ocean currents. Filter feeders, they exist by trapping small nutrient material from the water. The pinnate shape of the tentacles provides a dense network that has a much greater food trapping efficiency -- an obvious evolutionary advantage.



Non-pinnate   Pinnate

Gorgonians, then, are one kind of Octocorallia. Table I lists 3 of the half-dozen orders of octocorals. These animals are not the true stony corals that build massive reefs. They belong to a different subclass of Anthozoa and have numerous anatomical differences, even though both are loosely (and incorrectly) called "corals."

The Octocorals are colonial. Numerous polyps grow out of an internal skeletal matrix that may be composed of separate or fused calcareous spicules or of a horny material. The pictures of *Muricea* (Figure 2) and *Psammogorgia* (Figures 5 & 7) clearly indicate the colonial arrangement of the polyps.

What are the important characteristics of the different orders of Octocorallia?

The order Telestacea consists of members that have basally connected polyps which form lateral buds and erect colonies. *Telesto riisei* (Figure 1) occurs in the west Atlantic, from Florida to Brazil. It has recently been reported from Hawaii, probably an unwitting recent introduction by human activities (Devaney, 1977:122).

Members of the order Alcyonacea are called

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soft corals; the hard skeleton is replaced by a fleshy, rubbery mass. These tropical organisms are common in Palau and throughout the heart of the Indo-Pacific. One of the two known alcyonaceans in the Hawaiian Islands is the endemic *Anthelia edmondsoni* (Figure 3). This gorgeous soft coral is a delicate turquoise color, and forms sheets or mats in the shallow subtidal region. It is usually found in embayments or in quieter water. I have found it at Pupukea, on the north shore of Oahu, where it grows as a horizontal band just below the low tide mark. The dendronotid nudibranch *Tritonia hawaiiensis* (also an endemic Hawaiian species) feeds on *Anthelia edmondsoni*. The nudibranch's lateral branchial tufts and coloration camouflage it well when it is on its prey (Bertsch & Johnson, 1981).

The order Gorgonacea comprises the gorgonians, properly speaking. The name is derived from those three snaky-haired sisters of Greek mythology, the Gorgons, the very sight of whom turned a man to stone. The one mortal sister, Medusa, was slain by Perseus; it is her name which is applied to the jellyfish shape of hydrozoans and scyphozoans.

Muricea californica (Figure 2) is a common gorgonian from southern California. Sometimes the ovulid snail *Simnia vidleri* can be found eating this gorgonian. As the colonies grow, they form annual growth rings in the skeleton. The colonies grow as separate sexes, requiring 5-10 years to reach sexual maturity.

Based on the identification keys in Brusca (1980), Figures 5 and 7 are *Psammogorgia arbuscula*. This bright red gorgonian grows with the stalks all straight upward, and may reach heights of 30 to 40 cm. It occurs in the Gulf of California, Mexico. This species has been identified recently as they prey of the small white dendrontoid nudibranch *Tritonia pickensi* (see Bertsch & Gosliner, 1984).

The brilliant orange-yellow *Eugorgia aurantica* (Figures 6 to 8) is one of my favorites in the Gulf of California. I have seen forests of this species and several other gorgonian species while scuba diving at Bahía de los Angeles in Baja California. The Spanish name for gorgonian is "arbolitos del mar" -- little trees of the sea.

In Figure 9, the two gray-white branching structures in the foreground are staghorn coral, *Janaria mirabilis*. These hydrocorals (they belong to the class Hydrozoa) house a hermit crab, *Pylopagurus varians*, inside them. This living protection has replaced the typical dead gastropod shell within which a hermit crab normally hides. *Pylopagurus* starts inside a gastropod shell, then the hydrocoral begins growing on it, and in time chemically erodes away the original gastropod shell.

Another common invertebrate at Bahía de los Angeles is the large round pink sponge, *Pseudosuberites pseudos* (Figure 4). Looking carefully at the right side of *Eugorgia* (in Figure 4), where it touches the sponge, you can see how the gorgonian has grown around the edge of the sponge.

Often the *Eugorgia* is covered with one or more specimens of the anemone *Antiparactis* (Figure 6). Because there are so many sessile (attached) animals in the ocean, space can be a very valuable commodity. If there is no room at the inn, or on a local rock, one can always settle down on top of another organism!

The anemone just uses the gorgonian for living space. Other animals living on the gorgonians eat their host. I have already mentioned *Tritonia* and the sea shells *Simnia* (see also my recent columns on *Cyphoma*). Another possible predator is the basket star *Astrodictyum panamense* (Figure 8). Brusca (1980:410) has written, "Many basket stars are known to feed on gorgonian corals and several of the smaller species, in the size range of *A. panamense*, may spend their entire life on a single organism." The biology of Gulf gorgonians and of most of their associated organisms is virtually unknown.

We have looked briefly at just a few species of gorgonians. These animals spend their entire adult lives spread out, exposed to the currents of the oceans. Animals grow on them, some animals eat them, and other animals are eaten by them. There are many complex biological interactions that need to be studied. Season's greetings!

References

Bertsch, Hans & Terrence M. Gosliner, 1984. Tritonia pickensi (Nudibranchia: Tritoniidae) from Baja California, Mexico. Shells & Sea Life, 16(9):138-139.

Bertsch, Hans & Scott Johnson, 1981. Hawaiian Nudibranchs. Oriental Publ. Co., Honolulu, Hawaii, 112 pp.

Brusca, Richard C. 1980. Common Intertidal Invertebrates of the Gulf of California. 2nd edition. Univ. of Arizona Press, Tucson, Arizona, 513 pp.

Devaney, Dennis M. 1977. Subclass Octocorallia. In: Reef and Shore Fauna of Hawaii. Section 1: Protozoa through Ctenophora. B.P. Bishop Museum Spec. Publ. 64 (1):119-129.

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Figure 1. Telesto riisei, Magic Island, Hawaii.

Figure 2. Muricea californica, 16 m depth, Pt. Loma, San Diego, California.

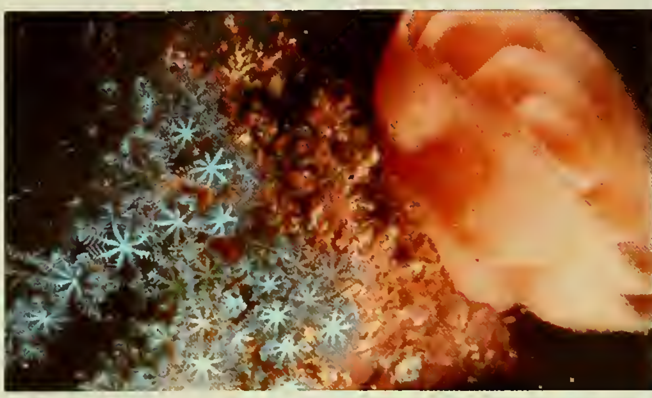

Figure 3. Anthelia edmondsoni, alongside Hexabranchus sanguineus eggs, Pupukea, Oahu, Hawaii.

Figure 4. Eugorgia, with pink sponge Pseudosuberites pseudos, Bahía de los Angeles, Mexico.

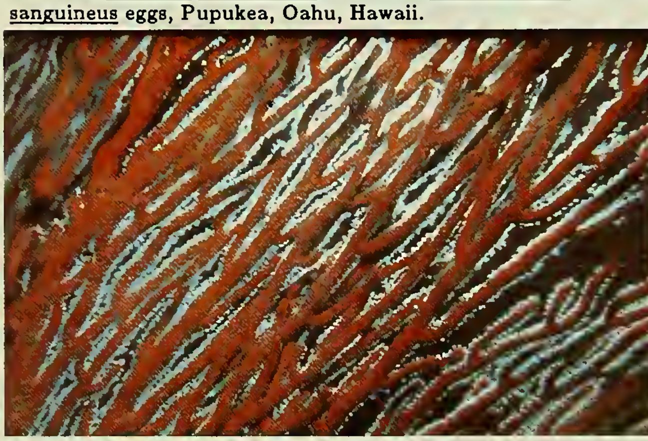

Figure 5. Psammogorgia polyps, Bahia de los Angeles.

Figure 6. Anemone Antiparactis on Eugorgia, Bahía de los Angeles.

Figure 7. Psammogorgia polyps, Bahía de los Angeles.

Figure 8. Basket star, Astrodictyum panamense on gorgonian Lophogorgia alba, 13 m depth, Bahía de los Angeles.

Figure 9. Gorgonian Eugorgia aurantica with Janaria mirabilis hydrocoral, 8 m depth, Bahía de los Angeles.